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ABSTRACT

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This paper proposes a sequential merger formation game with cost synergies to study how trade policy can influence firms' choice between domestic and cross-border mergers in an international Cournot oligopoly. We find that the equilibrium market structure depends heavily on: (i) the level of trade costs; and (ii) whether or not active antitrust authorities are incorporated within the sequential merger game. In addition, it is shown that whenever mergers occur in equilibrium, they occur in waves and the merger wave comprises at least one cross-border merger. We also analyze how the equilibrium market structures are affected by the presence of lobbying efforts.

JEL Classification: F10, F13, L13 and L41
Keywords: endogenous mergers, merger waves and tariff-jumping fdi

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1 Introduction

Cross-border mergers, i.e., mergers where the acquiring and acquired companies stem from different nations, have clearly become an increasingly important characteristic of the industrial organization of most advanced countries. According to the UNCTAD's 2004 World Investment Report (henceforth WIR 2004), cross-border mergers constitute the key driver of global FDI since the late 1980s. In particular, "during the 1990s, cross-border mergers and acquisitions became a widely used mode of transnational corporation entry and expansion in virtually all industries. Indeed, they drove the FDI boom during the second half of the 1990s." (UNCTAD's WIR 2004, p. 111).[1] Moreover, there is considerable evidence that cross-border mergers tend to occur in waves (see, for instance, Gaughan (2002), Gugler *et al.* (2003) and UNCTAD's 2004 WIR (p. 142)).

Despite the obvious empirical relevance of cross-border mergers waves, previous literature has devoted very scarce attention to this topic.[2,3] In this paper, an international Cournot oligopoly model is used to study the interplay between trade policy and the way merger waves shape the industrial structure. In particular, we analyze how trade policy can influence firms' choice between domestic and cross-border mergers in a sequential merger formation game with cost synergies *à la* Perry and Porter (1985).

Apart from discussing the relationship between trade policy and merger formation, we regard the main contribution of this paper as being two-fold. First, while most of the existing models on mergers do not deal with the dynamics of the merger processes, as they simple compare the pre-merger situation with a post-merger situation,[4] this paper considers a sequential merger formation process which takes into account that a merger might trigger other mergers. This allows us to study the formation of merger waves. Second, and perhaps most importantly, we incorporate active Antitrust Authorities within our merger formation game. In particular, and consistent with what happens in most countries, we assume that whenever firms plan to be involved in a merger, they must notify the merger project to an Antitrust Authority (henceforth

[1] Gugler *et al.* (2003), in the largest cross-national comparison of the effects of mergers to date, analyze a total of 11574 worldwide merger deals during the period 1981 to 1998. They find that roughly one fifth of the deals are cross-border mergers (22%). In addition, their analysis shows that there is an upward trend in the percentage of mergers which are cross-border (this percentage rises from 21.2% in 1991-92 to 25.5% in 1997-98). Interestingly, this upward trend is particularly pronounced for EU countries, where the percentage of all mergers in the sample which were cross-border rose from 24.2% in 1991-92 to 39.8% in 1997-98.

[2] Two noteworthy exceptions are Neary (2004) and Salvo (2004).

[3] There exists, however, a strand of the literature on Multinational Enterprises (MNEs) that studies the choice between greenfield and acquisition FDI. See, for example, Caves (1996) and Nobäck and Persson (2002).

[4] Exceptions are Nilssen and Sorgard (1998), Gowrinsankaran (1999) , Fauli-Oller (2000), Macho-Stadler *et al.* (2002) and Salvo (2004).

AA), which can either authorize or block the merger.[5] The AA decision is taken in order to maximize total welfare, measured by the sum of consumers' and producers' surplus. In such a context, analyzing the optimal merger decisions involves not only a standard merger profitability analysis, but also a study of the strategic interaction between the merging firms and the AA which is called to take a decision on the merger proposal.

A relevant question that should be posed at this point is what should be the allocation of jurisdiction in merger control in our model. Shall a merger proposal be reviewed at the level of a supra-national AA (denoted SNAA) or should the merger proposal revision be conducted by a national AA (denoted NAA)? We assume that there exists a SNAA (say, a community-wide merger authority) in addition to two other NAAs, one for each (member) country. The SNAA examines merger proposals involving firms located in more than one country and maximizes total welfare, whereas NAAs examine merger proposals involving only firms from their specific country and maximize national welfare (the sum of consumers' and producers' surplus for *national* consumers and producers).[6]

We contrast two different games. In the first one, which we call the *laissez-faire* model, following Horn and Persson (2001), we analyze the role of national and cross-border mergers as determinants of market structure in an international Cournot oligopoly model. The analysis of the endogenous determination of mergers is only based on a profitability analysis and the merger formation game does not incorporate active Antitrust Authorities. We depart from Horn and Persson (2001), however, in the way the merger process is treated. While in Horn and Persson (2001) the merger process is treated as a (static) cooperative game of coalition formation, where the players are free to communicate and write binding agreements, in this paper the merger process is modelled as a sequential noncooperative game of coalition formation. The sequentiality which characterizes the merger formation will allow us to discuss not only whether mergers occur in waves in equilibrium, but also how equilibrium merger waves are formed. In the second game, we depart from the *laissez-faire* model in two ways. On the one hand, active AAs are explicitly modelled. On the other hand, we

[5] Antitrust merger policy and enforcement are very important determinants of the structure of industries. However, as highlighted by Besanko and Spulber (1993, p. 2), "the theoretical literature in economics has generally focused on the profit and welfare effects of horizontal mergers (e.g. Perry and Porter, 1986) and has not emphasized the policy-making and enforcement aspects of antitrust."

[6] In Europe, for example, the European Commission (EC) Merger Regulation makes a distinction between mergers that have and mergers that do not have a "Community dimension". Mergers that have a Community dimension involve large firms that operate in several Member States and must be notified to the EC in advance. Mergers that instead do not have a Community dimension are examined by the relevant Member State AA. This example is used to motivate our modelling strategy in the current paper. (see Council Regulation (EC) No 139/2004 of January 2004 on the control of concentrations between undertakings (the EC Merger Regulation), *Official Journal of the European Union* L24, 29.01.2004, pages 1-22.)

do not rule out by assumption the merger to complete monopoly, as it is standard in the previous literature. Given the presence of efficiency gains arising from the mergers, some mergers to monopoly turn out to be welfare enhancing and, therefore, end up being allowed by the AA which controls mergers.[7]

The analysis discloses that the equilibrium market structure depends heavily on: (*i*) the level of trade costs; and (*ii*) whether or not active Antitrust Authorities are incorporated within the sequential merger game. In addition, it is shown that whenever mergers occur in equilibrium, they occur in waves and the merger wave comprises at least one cross-border merger. Also, and perhaps most importantly, even though in the *laissez-faire* model the equilibrium outcome seems to offer some theoretical support for the observation that trade liberalization induces waves of cross-border mergers, the richer model where AAs are encompassed as active players of the merger formation game shows that *no* mergers (and, therefore, no cross-border merger waves) occur in equilibrium when trade physical costs are at a sufficiently low level.

To understand this last result we should point out that total welfare (the AA's objective function) is affected by a merger through three different channels. Firstly, there is the so called *tariff-jumping effect* of cross-border mergers; it stems from the fact that the international firm resulting from the merger is able to avoid paying the trade physical cost since it owns a plant in each country. Secondly, a merger in this setting gives rise to endogenous *efficiency gains* since it brings the individual capital of the merging firms under a single larger (and, hence, more efficient) resulting firm. These two first effects have a positive impact on welfare as they are increasing firms' profits. Lastly, there is an effect on prices: in this setting, a merger leads to an increase in the market price due to the output contraction by the merging parties and this has the well known negative effect on welfare, the so called *dead-weight loss*.[8]

It turns out that for sufficiently low values of the trade cost, the so called *tariff-jumping effect* of cross-border mergers plays no significant role in the welfare analysis of that merger and the positive efficiency gain effect is countervailed by the negative effect of increase in price, which in turn implies that any merger proposal is blocked by the relevant AA evaluating it.

[7] It is worth noting at this point that there is empirical evidence that mergers to monopoly indeed occurred and played a very important role in the shaping of the industry structure of advanced economies. According to Gaughan (2002), the first merger wave, which occurred in the period between 1897 and 1904, featured a transformation of the US economy from one of many small companies to larger companies, sometimes monopolistic firms dominating an industry. For that reason, it has been said that the first merger wave was a *merger toward monopoly* period.

[8] As noted by Perry and Porter (1985), mergers "result in an increase in price to consumers [...] because there are [now] fewer firms in the industry." (p. 225)

The paper continues as follows. Section 2 introduces the basic model, which is chosen as the simplest possible setting where the elements we are interested in could emerge. Section 3 analyzes the *laissez-faire* model where the merger formation game is only based on a merger profitability analysis. Section 4 analyzes the richer setting where active Antitrust Authorities are incorporated within the proposed merger formation game. In Section 5, we study some extensions to the model with active Antitrust Authorities. In particular, amongst other robustness checks, we study whether the full equilibrium outcome of the sequential merger game will result in the socially optimal market structure and analyze how the equilibrium market structures are affected by the presence of lobbying efforts. Finally, Section 5 concludes the paper by discussing the results obtained.

2 Basic model

We consider an international oligopoly with four ex-ante identical firms located in two countries, a national country A and a foreign country B. Firms 1 and 2 are located in country A, whereas firms 3 and 4 are located in country B.

The industry is assumed to be symmetric in terms of market demand. We adopt the segmented market hypothesis, where firms compete *à la* Cournot, maximizing profits by choosing sales in each market independently. Demand is assumed to be linear, with the inverse demand function in market j, $j = A, B$, given by

$$p^j\left(X^j\right) = a - X^j, \tag{1}$$

where p^j and X^j denote, respectively, price and total sales in country j, and $a > 0$ is a demand parameter.

Following Perry and Porter (1985), we assume that what distinguishes firms is the amount of capital they own. The total supply of capital in the industry is assumed to be fixed, which is normalized to be one.[9] Let k_i be the fraction of the industry capital stock owned by firm i. In addition, let x_i^j denote the quantity sold by firm i in market j. The cost function of a firm that produces x_i units of output, where $x_i = x_i^A + x_i^B$, and owns a fraction k_i of the capital stock is given by[10]

[9] As pointed out by Perry and Porter (1985), "this suppresses de novo entry into the industry" (p. 220).

[10] This is a special case of the cost structure proposed by Perry and Porter (1985). A similar cost structure was used by

$$C_i(x_i, k_i) = \frac{2(x_i)^2}{k_i}, \tag{2}$$

where $k_i \in \{1/4, 1/2, 3/4, 1\}$ and $\sum_i k_i = 1$. Notice that the marginal cost function is linearly increasing in output and rotates about the origin as the proportion of capital owned by firm i (k_i) increases or decreases. So, in this setting any merger gives rise to endogenous efficiency gains. A merger brings together the capital of the merging firms under a larger resulting firm whose marginal cost is lower than that of any of the merging parties for any positive given level of output.

Assume that firms play a sequential merger formation game before Cournot competition takes place in the oligopolistic international market. The game starts from a status quo symmetric industry structure where each of the four firms is endowed with 1/4 of the industry capital stock. Two types of firms can result from this game: national and international firms. A merged entity is national if it is composed of merging parties which all belong to the same country. A merged firm is instead international if it results from the combination of merging parties coming from both countries. Assume also that the physical trade costs associated with exporting one unit of output from one country to the other are exogenous and equal t, where $t < a$.

In what follows, we make the following assumptions.

Assumption 1 Assume that $a > 19t$.

Assumption 2 Only bilateral mergers can occur and each production plant continues to exist after a merger.

The first assumption is simply to ensure that at the status quo industry structure trade between countries takes place. With regards to the second assumption, two comments are in order. First, the fact that we restrict attention to bilateral mergers does not imply that merger waves are ruled out. It simply implies that merger waves must consist of a series of bilateral mergers. Second, the fact that each production plant continues to exist after a merger implies that in case there is a cross-border merger, the resulting international firm is able to serve the two markets without incurring any trade cost (this is the so called *tariff-jumping effect* of cross-border mergers).

Let us now introduce some notation regarding the identification of different market structures which

Vasconcelos (2005) to analyze the possible pro-collusive effects of a merger.

can result from the merger formation game. Let a market structure M_i be a partition of the set of firms $N = \{1, 2, 3, 4\}$ into coalitions. Due to the symmetry of the model, the feasible possible final market structures can be divided in the following nine categories of market structures:

1. No merger: $M_A = \{1, 2, 3, 4\}$.
2. One domestic national merger: $M_B = \{12, 3, 4\}$.
3. One foreign national merger: $M_C = \{1, 2, 34\}$.
4. One cross-border merger without bias: $M_D = \{13, 2, 4\}$.
5. Cross-border merger with a domestic bias: $M_E = \{123, 4\}$.
6. Cross-border merger with a foreign bias: $M_F = \{134, 2\}$.
7. Two national mergers: $M_G = \{12, 34\}$.
8. Two cross-border mergers: $M_H = \{13, 24\}$.
9. Complete Monopoly: $M_I = \{1234\}$.

In what follows, we study two distinct merger formation models. In the first one, in order for a merger to take place, it has to be desired by parties. So, the outcome of the merger formation game will depend only on a merger profitability analysis. In the second model, we study a richer (and more realistic) game where in order for a merger to go through, it has to be not only desired by parties, but also accepted by the relevant AA.[11] So, the outcome of the merger game depends both on a profitability analysis and on the strategic interaction between the merging parties and the AAs.

3 The *laissez-faire* model

In this section, we follow the previous literature where Antitrust Authorities are not incorporated in the merger formation game and merger to monopoly is ruled out by assumption (see, for instance, Horn and

[11] Some extensions to this richer model (e.g. the effect of lobbies) are studied in section 5.

Persson (2001)). In particular, we analyze a very simple sequential merger formation model where the merger process is fully endogenized.[12] In particular, starting from a situation with four ex-ante identical firms, any two firms merger is allowed and the merger process follows the following rules. In the first stage, firm 1 is given the opportunity to merge with its national rival firm 2 or with a foreign firm (say, firm 3). If firm 1 decides not to merge, product market competition takes place between the four firms in the status quo industry structure. If instead firm 1 does merge with a rival, then, in the second stage, one of the firms not involved in the first merger is given the opportunity to merge with any of its rivals. If the game arrives at the second stage, we let firm 2 be the firm which has the opportunity of merging at that stage in case it was not involved in the merger that took place in the first stage. Otherwise, firm 3 is the one which has the power to decide whether to merge with a rival in the second stage.

The game is illustrated in Figure 1, which presents the possible market structures that can arise when this merger formation game is played.

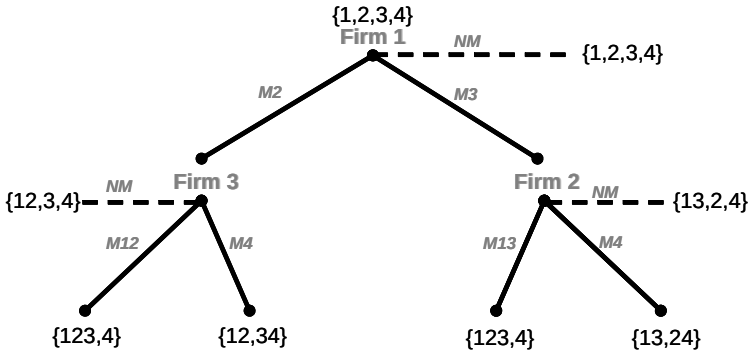

Figure 1: *Laissez-Faire* Merger Game

In the analysis that follows, we seek the subgame perfect Nash equilibrium (henceforth, SPNE) of this game in pure strategies, following the usual backward induction procedure.

Analysis of Stage 2 If the game arrives at the second stage, then a merger involving firm 1 has occurred at the first stage. In addition, the specific subgame which is played at the second stage depends

[12] Notice, however, that the way we model the merger process is different from Horn and Persson (2001). While in their paper, the merger process is treated as a (static) cooperative game of coalition formation, in the current paper it is modelled as a sequential noncooperative game of coalition formation.

obviously on which firm merged with firm 1 at that first stage of the game. Two different scenarios should be distinguished, which we discuss in turn.

Scenario 1: Merger Proposal by Firm 3

If firm 1 has merged with its national rival firm 2 at the previous stage, then, at the second stage, firm 3 has to decide between the following three different options: (i) do not merge (NM) and remain in the industry structure $M_B = \{12, 3, 4\}$; (ii) merge with the merged entity which resulted from the previous merger stage $(M12)$, inducing a final market structure of the type $M_E = \{123, 4\}$; and (iii) merge with firm 4 $(M4)$, the other outsider of the previous merger, leading to a final market structure of the type $M_G = \{12, 34\}$.

Some additional notation should be introduced at this point. Let Π_{i,M_K} denote the profit earned by firm i when the equilibrium market structure is M_K. We also assume that the profit of a merged entity is divided in proportion to the capital of its constituent firms. The following definition will play a central role in the identification of equilibrium market structures.

Definition 1 *Market structure M_K is said to be strictly preferred to market structure M_T by firm i, denoted $M_K \succ_i M_T$, if and only if $\Pi_{i,M_K} > \Pi_{i,M_T}$.*

Now, making use of the equilibrium profits presented in Appendix A, some algebra shows that:

- $M_B \succ_3 M_G$ if $a < 44.771t$,
- $M_E \succ_3 M_B$ if $a < 2937.035t$,
- $M_E \succ_3 M_G$ if $a < 1032.548t$.

Therefore, in case firm 3 is called to play at the second stage of the game, it will take the following decisions:

☐ If $19t < a < 1032.548t$, firm 3 will merge with the firm resulting from the merger at the previous stage $(M12)$, leading to the final market structure $M_E = \{123, 4\}$.

☐ If instead $a \geq 1032.548t$, firm 3 will decide to merge with firm 4, giving rise to a final market structure composed of two national monopolies, $M_G = \{12, 34\}$.

The intuition that underlies this result is as follows. The no merger decision is clearly a strictly dominated strategy for firm 3. In addition, when firm 3 compares Π_{3,M_E} with Π_{3,M_G}, there are two profit effects at work: the share effect and the magnitude effect.

Firm 3's share of the merged entity's profits is 1/2 in market structure M_G, whereas it is only 1/3 in case M_E occurs. However, the profit magnitude effect works in favour of market structure M_E. It is important to notice that this profit magnitude effect can be decomposed into three different sub-effects (and all these sub-effects benefit market structure M_E). First, there is the merged entity size sub-effect: in market structure M_E, the merged entity is larger than in M_G, which means that it is more efficient (see equation (2)); this in turn implies that the merged entity (aggregate) profits will be larger. Second, the profits of the merged firm will be enhanced by the tariff-jumping sub-effect if an international firm results from the merger, as it is the case when firm 3 merges with firm 12 and the induced market structure is M_E. Finally, the merged entity's profit level will be also affected by the outsiders' reaction - free riding sub-effect.[13] It is important to note that only the two last profit magnitude sub-effects depend on the level of trade costs t.

Consider first a given demand parameter a and take a low value for t (say, in the limit, zero); it turns out that the share effect dominates the magnitude effect and, therefore, firm 3 decides to merge with firm 4 and the resulting market structure is M_G. Now, as t increases, both the share effect and the merged entity size sub-effect are not affected. However, the tariff-jumping sub-effect and the free riding sub-effect become more and more relevant, making market structure M_E more and more attractive for firm 3. In particular in market structure M_E, as t increases, trade costs savings become more important and the outsider becomes weaker as it has to pay higher trade costs per unit of output exported to country A. So, when t is sufficiently high, the profit magnitude effect dominates the share effect and firm 3 opts for a merger with firm 12 (inducing a market structure M_E).

Scenario 2: Merger Proposal by Firm 2

If firm 1 opted for a cross-border merger (with firm 3) at the first stage, then the firm which has to take a merger decision at the second stage is firm 2. This firm can take three different decisions: (i) do not merge

[13] It is well known that in a Cournot oligopoly, merger profitability depends crucially on how aggressively non-participants respond to the merger (Salant, Switzer and Reynolds (1983)).

(NM) and remain at the market structure $M_D = \{13, 2, 4\}$; (ii) merge with the merged entity resulting from the merger at stage 1 $(M13)$, leading to the market structure $M_E = \{123, 4\}$; and (iii) merge with firm 4 $(M4)$, inducing a final market structure of the type $M_H = \{13, 24\}$.

Now, making use of the equilibrium profits presented in Appendix A, simple algebra shows that $M_H \succ_2 M_D$ for all parameter values. The no merger decision by firm 2 is a strictly dominated strategy. In addition, some algebra shows that $M_E \succ_2 M_H$ if $a < 46.703t$. Hence, the behavior of firm 2, when it is called to take a merger decision at the second stage, can be summarized as follows:

- If $19t < a < 46.703t$, firm 2 will merge with the merged entity resulting from the previous stage merger $(M13)$, leading to a final market structure $M_E = \{123, 4\}$.
- If instead $a \geq 46.703t$, then firm 2 will opt for a merger with firm 4, inducing a final market structure composed of two international firms which result from a wave of two cross-border mergers, $M_H = \{13, 24\}$.

Key to this result is again the comparison between the share and the profit magnitude effects induced by a merger. The share effect clearly favours market structure M_H, whereas the profit magnitude effect tends to benefit market structure M_E.

Consider first the case in which t is low. As in the previous scenario, the share effect dominates the magnitude effect and, therefore, firm 2 decides to merge with firm 4 and the resulting market structure is M_H. However, as t increases, only the free riding sub-effect is affected:[14] the outsider firm 4 in market structure M_E becomes weaker and weaker as it has to pay higher trade costs per unit of output exported to country A. So, when t is sufficiently high, the profit magnitude effect dominates the share effect and firm 2 opts for a merger with firm 13 (leading to a market structure M_E).

Analysis of Stage 1 At the first stage, firm 1 is given the opportunity to decide whether or not to merge.

[14] In the current scenario, both possible mergers would lead to the creation of an international firm and, therefore, the tariff-jumping sub-effect plays no role in firm 2's choice.

Simple algebra shows that, for all parameter values, $M_E \succ_1 M_A$ and $M_H \succ_1 M_A$ and, as explained above, either M_E or M_H is always the final equilibrium market structure when firm 2 is the firm taking a merger decision at the second stage (i.e., when firm 1 decides to merge with firm 3 at the first stage). In other words, the status quo market structure $M_A = \{1, 2, 3, 4\}$ will never prevail in equilibrium since no merger (NM) is a strictly dominated strategy for firm 1. Another interesting point disclosed by the equilibrium analysis of the first stage is that, for all parameter values, $M_H \succ_1 M_G$.[15]

Having said this, it is clear that firm 1's decision at the first stage will be between a merger inducing a final market structure $M_E = \{123, 4\}$ and an alternative merger leading a final market structure of the type $M_H = \{13, 24\}$. Very simple algebra shows that $M_E \succ_1 M_H$ if and only if $a < 46.703t$. Therefore, firm 1's decision at the first stage of the game can be summarized as follows:

□ If $19t < a < 46.703t$, firm 1 is indifferent between merging with firm 2 ($M2$) or with firm 3 ($M3$) since, in both cases, the ultimate market structure the merger will lead to is $M_E = \{123, 4\}$.

□ If instead $a \geq 46.703t$, then firm 1 will decide to merge with firm 3 at stage 1 ($M3$). This cross-border merger is going to be followed by a subsequent cross-border merger involving firms 2 and 4, and the final induced market structure is $M_H = \{13, 24\}$.

Figure 2 illustrates the full equilibrium outcome of this two stage game.

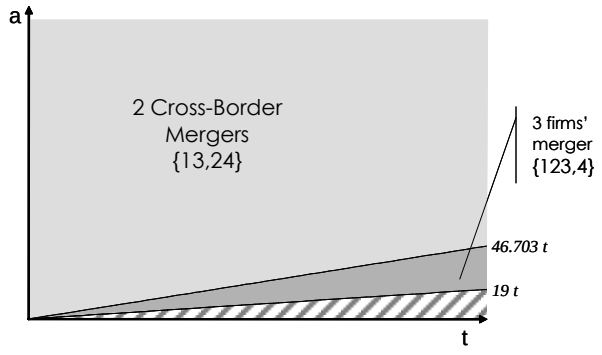

Figure 2: Equilibria of the *Laissez-Faire* Game

[15] In both market structures, firm 1 belongs to a merged entity owning 1/2 of the industry capital. However, in market structure M_H firm 1 is part of an international firm which avoids paying the export tariff by locating production behind the tariff wall.

Three notes are in order at this point. First, notice that a wave of mergers *always* occurs in equilibrium and the final equilibrium market structure induced by the merger wave crucially depends on the level of trade physical costs. Second, while cross-border mergers are always part of the merger wave that occurs along the equilibrium path, merger waves composed of two national mergers (leading to a final market structure $M_G = \{12, 34\}$) never constitute an equilibrium outcome.[16] Lastly, the equilibrium outcome of the game seems to provide a theoretical rationale for the observation that cross-border merger waves tend to be triggered by trade liberalization processes. Interestingly, however, this result will not anymore hold when we will enrich the merger formation process so as to encompass active AAs in the sequential merger game.

4 The model with active Antitrust Authorities

In this section, starting from the same status quo industry structure $M_A = \{1, 2, 3, 4\}$, our aim is to investigate how trade policy influences firms' choices between domestic and cross-border mergers in a situation where every merger proposal has to be submitted for approval to the relevant AA. So, in this context, the outcome of the merger formation game will depend not only on a merger profitability analysis, but also on the strategic interaction between potential merger parties and the AAs. Apart from incorporating AAs as active players of our sequential merger formation game, in this section we also change the sequential merger formation model presented in the previous section so as to allow firms to propose a merger leading to complete monopolization of the industry.

Two preliminary remarks are in order at this point. First, we assume that there are no administrative costs that firms must incur to submit a merger proposal to the relevant AA. Second, in the current section, both the SNAA and the NAAs are assumed to assess the merger according to the total welfare standard.[17]

Before Cournot competition takes place, firms play a six-stage game with the AAs, involving the following sequence of actions:

- In the *first stage*, firm 1 is given the opportunity to merge either with its national rival firm 2 or

[16] It worth remarking at this point that if the merger to monopoly was not *a priori* ruled out by assumption, then the final equilibrium outcome would be a monopoly market structure for all $a > 19t$.

[17] In section 5.1 we will allow the AAs to have a more general objective function, which can attribute different weights to profits and consumers' surplus.

with the foreign firm 3. In the former case, it will have to ask Country A NAA (denoted ANAA) for authorization. In the latter, it will have to ask the SNAA for authorization. If no merger is proposed, the game ends and Cournot competition tales place amongst the four firms.

- In the *second stage,* the relevant AA chooses whether to accept or to refuse the merger proposal. If it does not authorize it, then product market competition occurs between the four firms in the status quo industry structure; otherwise the game moves to the following stage.

- In the *third stage*, if the relevant AA has approved the merger at stage 2, then one of the firms not involved in the first merger is given the opportunity to propose another merger. We let firm 3 be the firm which has the opportunity to propose a new merger with one of the other two firms in the industry, in case it was not involved in the previous merger. Otherwise, firm 2 is the one which has the power to propose a new merger with one of the other two firms in the industry. If no merger is proposed, then the merger game stops and market competition occurs. If instead there is a merger proposal, that merger proposal has to be submitted to the relevant AA for authorization.

- In the *fourth stage*, the relevant AA decides whether to authorize the merger proposed in the previous stage. If it vetoes the merger, the merger game stops and product market competition occurs. Otherwise, the game moves to the following stage in which a last merger round takes place.

- In the *fifth stage*, the firm not involved in the (second) merger proposed in the third stage (and approved in the fourth stage by the relevant AA) is given the opportunity to seek a merger to complete monopoly. If this firm decides not to propose a merger to monopoly, the merger game stops and market competition takes place. Otherwise, it will have to ask the SNAA for authorization.

- In the *sixth stage*, the SNAA decides whether or not to authorize the merger to complete monopoly and, after its decision has been taken, product market competition occurs.

The possible market structures that can arise when this (richer) merger formation game is played are illustrated in Figure 3.

As in the previous section, we will seek the SPNE in pure strategies, so that we proceed by solving the game by backward induction.

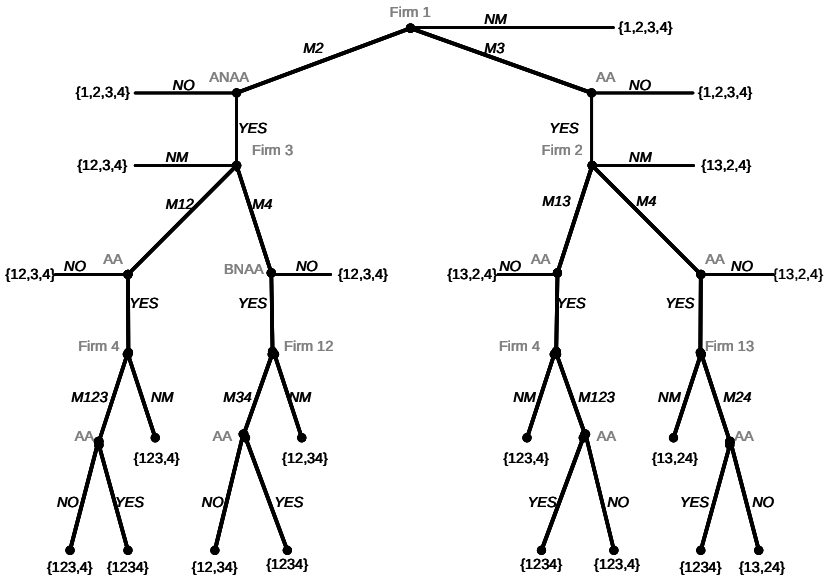

Figure 3: The Merger Game with Active AAs

Analysis of Stage 6 If the game arrives at the sixth stage, then the SNAA has to decide whether or not to allow a merger between the two remaining firms in the industry leading to a complete monopolization of the industry, $M_I = \{1234\}$.

We now need to introduce some additional notation. Let TW_{M_K} denote total welfare under market structure M_K. In addition, let W_{j,M_K}, where $j = A, B$, denote the country j national welfare (the sum of consumers' and producers' surplus for *national* consumers and producers).

Definition 2 *(i) Market structure M_K is said to dominate market structure M_T from the SNAA point of view, denoted $M_K >_{SN} M_T$, if and only if $TW_{M_K} > TW_{M_T}$; and (ii) Market structure M_K is said to dominate market structure M_T from the point of view of country j NAA, $j = A, B$, denoted $M_K >_j M_T$, if and only if $W_{j,M_K} > W_{j,M_T}$.*

Now, as illustrated in Figure 3, the SNAA can face a merger to monopoly proposal in three different situations, which we discuss in turn.

First, the SNAA might have to decide on a proposal by firm 4 to merge with firm 123. Since $M_I >_{SN} M_E$ only if $a < 27.98t$, the SNAA will authorize this merger if $a < 27.98t$ and will veto it otherwise.[18]

[18]It may not be completely clear why the AA could accept a merger proposal that would lead to the complete monopoly

Second, the SNAA might have to decide on a merger involving two national monopolists towards complete monopolization of the industry. Some algebra shows that $M_I >_{SN} M_G$ only when $a < 127.93t$. Hence, this merger to monopoly will be approved when $a < 127.93t$ and rejected otherwise.

Lastly, the SNAA might be called to decide on a merger between two international firms, resulting from two previous cross-border mergers. Some algebra shows, however, that, for all parameter values, the total welfare in the complete monopoly $M_I = \{1234\}$ is always lower than the total welfare associated with market structure $M_H = \{13, 24\}$, $M_H >_{SN} M_I$. Hence, after a wave of two cross-border mergers, the SNAA will *never authorize* a further merger to complete monopoly.[19]

Analysis of Stage 5 If the game arrives at the fifth stage, a duopolistic structure has emerged from the previous stages of the game, and the firm not involved in the most recent of the previous mergers has to decide whether or not to seek a merger to monopoly. We will again have to distinguish three cases.

First, if firm 4 was not involved in any of the previous mergers, then it can decide at this stage either not to propose any further merger, and remain at market structure $M_E = \{123, 4\}$, or to propose a merger with firm 123. Simple algebra shows that $M_I \succ_4 M_E$ if $a < 395.2195t$. However, from the previous analysis, the $SNAA$ will approve such a merger only if $a < 27.98t$. Hence, firm 4 will decide to propose a merger to monopoly if $a < 27.98t$ and will propose no merger otherwise.[20]

Second, if there was a wave of mergers creating two national monopolies, then firm 12 (the national monopoly created by the first merger) has to decide whether to seek a merger leading to a complete monopoly. It is easy to show that this firm always prefers to be in a complete monopoly market structure than in a market structure composed of two national monopolies, $M_I \succ_{12} M_G$ for all parameter values. However, firm 12 anticipates its merger proposal to monopoly will only be accepted by the SNAA if $a < 127.93t$. Hence,

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market structure M_I. The intuition for this result is as follows. In such a merger, we have different aspects affecting total welfare. On the one hand, there is a negative impact on welfare due to the fact that the merged entity contracts output so as to increase the market price, therefore reducing consumer surplus. On the other hand, welfare is enhanced because the resulting monopolist will be more efficient than the pre-existing firms and, if at least one merging party is a national firm, there are also gains stemming from tariff-jumping.

When $t = 0$, if there is a merger to complete monopoly, the unique welfare gain from this merger stems from the reduction in the merged entity costs due to fact that it operates with the *whole* industry capital. However, this efficiency gain is not enough to more than compensate the negative impact of the merger on consumer surplus. Now, as t increases, the gains from the merger are not only due to the efficiency gain, but also to the tariff jumping argument. So, for sufficiently high values of t, the SNAA realizes that a merger to complete monopoly is welfare enhancing.

[19] Notice, in particular, that the tariff-jumping argument does not apply to this specific merger since the two firms in market structure M_H are both international.

[20] We are assuming that whenever a firm anticipates that a proposal is going to be rejected, then it does not even make it.

the firm seeks a merger to complete monopoly only if $a < 127.93t$.

Lastly, if a wave of cross-border mergers occurred in the previous stages of the game, then the first international firm created by this wave - firm 13 - anticipates that the SNAA will never approve a further merger to complete monopoly. For this reason, firm 13 will not make any merger proposal.

Analysis of Stage 4 In the *fourth* stage, the relevant AA has to decide whether to accept a merger proposed by one of the outsiders to the first merger. Four different cases must be considered here: two cases in which the merger is proposed by firm 3 and two other cases in which the merger is proposed by firm 2. These cases are analyzed in the discussion that follows.

First, in case the outsider to the first merger is firm 3 and it proposed a merger with the merged entity which resulted from the previous merger ($M12$), then the merger proposal is reviewed by the SNAA. The SNAA anticipates that if it approves the merger proposal, then there are two different possible scenarios regarding the evolution of the merger formation process: (i) If $a < 27.98t$, then this merger will be followed by a subsequent merger leading to a complete monopoly market structure $M_I = \{1234\}$; and (ii) If instead $a \geq 27.98t$, then this merger will not be followed by another merger (and the induced market structure will therefore be $M_E = \{123, 4\}$). If the merger is not approved, the final market structure will be $M_B = \{12, 3, 4\}$. Now, some algebra shows that $M_E >_{SN} M_B$ if $a < 244.481t$ and $M_I >_{SN} M_B$ if $a < 107.09t$. So, the SNAA will decide to approve the merger if $a < 244.481t$ and to veto it otherwise.

Second, if the outsider to the first merger is firm 3 and it proposed to merge with firm 4 ($M4$), then the merger proposal should be reviewed by Country B NAA (denoted BNAA). If the merger is rejected, the final market structure will be $M_B = \{12, 3, 4\}$. If however the merger is approved, then BNAA anticipates that: (i) If $a < 127.93t$, this merger will be followed by a subsequent one leading to complete monopolization of the industry; and (ii) If instead $a \geq 127.93t$, then this merger will not be followed by other merger and the final industry structure will be composed of two national monopolies, $M_G = \{12, 34\}$. Simple algebra shows that $M_B >_B M_G$ for all parameter values and $M_I >_B M_B$ only if $a < 63.55t$. So, BNAA will decide to approve the merger (expecting that the merger process will end up in a complete monopoly ultimate market structure) if $a < 63.55t$ and reject the merger otherwise (in which case the final industry structure is $M_B = \{12, 3, 4\}$).

Third, in case the outsider to the first merger is firm 2 and it proposed to merge with the merged

entity resulting from the first merger ($M13$), then the SNAA is called to make a decision on this merger proposal. The SNAA knows that if it rejects the merger, the induced final market structure is going to be $M_D = \{13, 2, 4\}$. It also anticipates that when it accepts the merger, two different cases can occur: (i) If $a < 27.98t$, then the merger under analysis will be followed by a subsequent one leading to market structure $M_I = \{1234\}$; and (ii) If instead $a \geq 27.98t$, the merger will not be followed by a subsequent merger, which implies that the final market structure will be $M_E = \{123, 4\}$. Moreover, simple algebra shows that, for all parameter values, $M_D >_{SN} M_E$ and $M_D >_{SN} M_I$, which in turn implies that it is optimal for the SNAA is to (always) reject the merger proposal under analysis. A merger involving firms 13 and firm 2 would induce the creation a larger (and, hence, more efficient) international firm, but the resulting cost synergies wouldn't be sufficient to more than compensate the loss in consumers' surplus resulting from the output contraction (so as to raise price) by the merged entity.

Lastly, if the outsider to the first merger is firm 2 and if this firm proposed to merge with firm 4 ($M4$), then it is again the SNAA that has to make a decision on the merger proposal. The SNAA knows that if it accepts the merger, then the induced final market structure is $M_H = \{13, 24\}$, whereas if it rejects it the merger game stops and the equilibrium industry structure is $M_D = \{13, 2, 4\}$. Since $M_H >_{SN} M_D$ if $a < 479.34t$, the SNAA will approve the cross-border merger between firms 2 and 4 in this specific region of parameter values and will reject it otherwise.

Analysis of Stage 3 In the *third* stage, we have to check whether the outsider to the first merger will use the opportunity to propose a subsequent merger or not. We have to consider two different cases.

First, consider the case where a merger between firm 1 and 2 has previously occurred; firm 3 has now the opportunity to propose a new merger. Firm 3's preferences over the ultimate market structures its decision may lead to are as follows: (1) for all parameter values, $M_I \succ_3 M_B$ and $M_I \succ_3 M_E$ and (2) $M_E \succ_3 M_B$ if $a < 2937.035t$. Hence, firm 3, if called to play at stage 3, will take the following decisions:

□ If $a < 27.98t$, then firm 3 is indifferent between merging with firm 12 ($M12$) or merging with firm 4 ($M4$) since in both cases the ultimate market structure the merger will lead to is $M_I = \{1234\}$.

□ If $27.98t \leq a < 63.55t$, firm 3 decides to merge with firm 4 and the ultimate market structure this merger

will lead to is again the complete monopoly one, $M_I = \{1234\}$.

- If $63.55t \leq a < 244.481t$, then firm 3 decides to merge with the merged entity resulting from the previous merger round ($M12$) and the induced market structure is $M_E = \{123, 4\}$ since no further merger would be proposed along the equilibrium path.

- If instead $a \geq 244.481t$, then firm 3 anticipates that no merger would be approved by the relevant AA in the following stage of the game and, therefore, decides not to propose a merger at this stage, which in turn implies that the final market structure is $M_B = \{12, 3, 4\}$.

Second, let us consider the case a merger between firm 1 and 3 has occurred, then firm 2 has the opportunity to propose a merger. Notice that, as explained above, a merger with firm 13 ($M13$) would never be approved by the SNAA in the following stage of the game, which means that, at this stage, firm 2's decision amounts to a decision on whether or not to merge with firm 4. Simple algebra shows that, for all parameter values, firm 2 strictly prefers market structure M_H to market structure M_D, $M_H \succ_2 M_D$. As a result, it is very easy to conclude that firm 2 will only decide to propose a merger with firm 4 at stage 3 if $a < 479.34t$. This merger would not be followed by a subsequent merger to complete monopoly, which means that the final industry structure would be composed of two international firms with one half of the industry capital each (resulting from a wave of two cross-border mergers), $M_H = \{13, 24\}$.

Analysis of Stage 2 In the *second* stage, in case firm 1 decided to submit a merger at the previous stage, the relevant AA is called to make a decision on the merger proposal. Two separate cases should be considered, depending on whether firm 1 decided to propose a merger with its national rival firm 2 or with foreign firm 3.

First, in case firm 1 proposed a merger with firm 2, then ANAA is called to make a decision at stage 2. ANAA anticipates that if it approves the merger, then there are three possible induced final market structures this merger will lead to: $M_I = \{1234\}$ (for $a < 63.55t$), $M_E = \{123, 4\}$ (for $63.55t \leq a < 244.481t$), and $M_B = \{12, 3, 4\}$ (for $a \geq 244.481t$). Now, comparing each of these possible market structures with the initial one ($M_A = \{1, 2, 3, 4\}$) in terms of (country A) national welfare, one has that: (1) $M_A >_A M_B$ for all

parameter values; (2) $M_E >_A M_A$ if $34.27t < a < 93.65t$; and (3) $M_I >_A M_A$ if $23.29t < a < 84.50t$[21]. As a result, if called to play at stage 2, ANAA will decide as follows:

☐ Accept the merger if $23.29t < a < 93.65t$, where in anticipates that the ultimate market structure this merger will lead to is $M_I = \{1234\}$ when $23.29t < a < 63.55t$ and M_E when $63.55t < a < 93.65t$.

☐ Reject the merger otherwise.

Second, in case firm 1 proposed a merger with firm 3, then this merger is reviewed by the SNAA at stage 2. The SNAA anticipates that if it approves the merger, then this merger can induce two possible final market structures: $M_H = \{13, 24\}$ if $a < 479.34t$, or $M_D = \{13, 2, 4\}$ otherwise. Comparing now these two possible final market structures with the initial one ($M_A = \{1, 2, 3, 4\}$) in terms of total welfare, one may conclude that: (1) $M_H >_{SN} M_A$ if $a < 470.92t$; and (2) $M_D >_{SN} M_A$ if $a < 462.79t$. Hence, the SNAA will decide to approve the merger (anticipating that the ultimate market structure this merger will lead to is $M_H = \{13, 24\}$) if $a < 470.92t$ and will veto it otherwise.

Analysis of Stage 1 In the *first stage* of the game, firm 1 is given the opportunity to propose a merger either with its national rival firm 2 or with the foreign firm 3,or not propose any merger.

If firm 1 proposes a merger with firm 2, then it anticipates that there are three possible final induced market structures this merger will lead to: (1) $M_I = \{1234\}$ if $23.29t < a < 63.55t$, (2) $M_E = \{123, 4\}$ if $63.55t < a < 93.65t$ and (3) $M_A = \{1, 2, 3, 4\}$ otherwise. If instead firm 1 proposes a merger with firm 3, it anticipates that, as explained above, this merger will only be accepted by the SNAA if $a < 470.92t$ and it will be followed by a subsequent cross-border merger (by firms 2 and 4) leading to the final market structure $M_H = \{13, 24\}$.

[21] The intuition of why, for a given demand parameter a, the complete monopoly market structure M_I is not preferred to the status quo initial situation M_A is as follows. In any case, a merger to monopoly has the obvious implication that the merged entity will contract output so as to increase the market price, therefore reducing consumer surplus. Let us take a low value for the trade physical cost t (say, $t = 0$). When $t = 0$, if there is a merger to complete monopoly, the unique gain from this merger stems from the reduction in the merged entity costs due to fact that it operates with the *whole* industry capital (tariff-jumping arguments play no role in the analysis of the welfare effects of the merger). However, this efficiency gain is not enough to more than compensate the negative impact of the merger on consumers' surplus. Now, as t increases, the gains from the merger are not only due to the efficiency gain, but also to the tariff jumping argument of cross-border mergers. But, the higher the value of t is, the lower are firms exports at the initial market structure M_A. This in turn implies that for t sufficiently high, exports have very little relevance in the initial market structure and the tariff-jumping argument becomes not significantly important again (as it is the case for t sufficiently small).

Now, studying firm 1's preferences over the possible final induced market structures, one may conclude that: (1) for all parameter values, $M_E \succ_1 M_A$, $M_H \succ_1 M_A$ and $M_I \succ_1 M_H$; and (2) $M_H \succ_1 M_E$ if $a > 46.73$. Hence, one can summarize firm 1's optimal decisions at the first stage of the game as follows:

☐ If $19t < a < 23.29t$, firm 1 will decide to merge with firm 3 ($M3$) and the final induced market structure this merger will lead to is $M_H = \{13, 24\}$.

☐ If $23.29t \leq a < 63.55t$, firm 1 will opt for merging with firm 2 ($M2$) and the final induced market structure this merger will lead to is $M_I = \{1234\}$.

☐ If $63.55t \leq a < 470.92t$, firm 1 will decide to merge with firm 3 ($M3$) and the final induced market structure this merger will lead to is $M_H = \{13, 24\}$.

☐ If instead $a \geq 470.92t$, firm 1 will propose no merger (NM) since it anticipates that no merger would be accepted by the relevant AA in the following stage of the game.

This completes the analysis of the whole game, whose full equilibrium outcome is summarized in Figure 4.

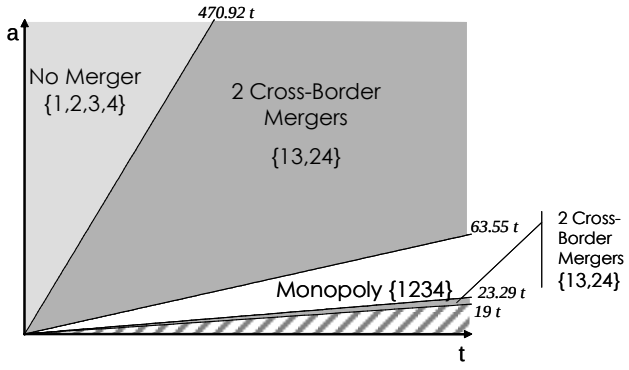

Figure 4: Equilibria of the Game with AAs

The results are very different from the ones regarding the benchmark *laissez-faire* model presented in the previous section. In particular, four important messages can be obtained from the analysis of Figure 4. Firstly, notice that whenever mergers occur in equilibrium, they occur in waves. Secondly, the equilibrium merger wave comprises at least one cross-border merger. Thirdly, for $23.29t \leq a < 63.55t$, a wave of three

mergers occurs in equilibrium leading to a complete monopolization of the industry. Lastly, and perhaps most importantly, the analysis reveals that no merger will occur for sufficiently low values of the trade physical cost t, which contrasts with the common wisdom that cross-border merger waves tend to be triggered by trade liberalization processes.

The intuition that underlies this last result is simple. When evaluating the welfare impact of a given merger at the second stage, the relevant AA takes into account the relative magnitude of the three following countervailing effects induced by the merger. First, since quantities are strategic substitutes, after the merger, the merging parties contract output. Each merging party internalizes the negative externality it inflicts on the other merger participants when it makes its output decision and, as a result, the combined output of the insiders decreases, leading to an increase in prices in market A for a national merger and to an increase in prices in both countries for a cross-border merger. Second, any merger gives rise to endogenous efficiency gains since it brings the individual capital of the merging firms under a single larger (and, hence, more efficient) resulting firm. Third, in case of a cross-border merger, there is the so called tariff-jumping effect of the merger, which stems from the fact that international firms are able to avoid paying the trade physical cost since they have a plant in each country. This gain is clearly reduced as the trade tariff falls.

Now, if we take the demand parameter a as given and consider a sufficiently low value for the trade cost t, then clearly the third effect plays no significant role in the welfare analysis performed by the relevant AA. In addition, it turns out that, for small values of the trade cost t, the positive efficiency gain effect is countervailed by the negative effect on consumers' surplus. This in turn implies that, starting from the no merger industry structure $M_A = \{1, 2, 3, 4\}$ and considering the cases in which the physical trade cost assumes sufficiently low values, any merger proposal will be blocked by the relevant AA at the second stage of the game.

5 Extensions

In this section, we present some extensions to the model with active Antitrust Authorities introduced in Section 4.

5.1 Lobbying

In this section, we study the effect of having an objective function for the AAs that may attribute different weights to consumers' surplus and firms' profits. In particular, country j NAA objective function is given by:[22]

$$U^j = \alpha \Pi^j + (1-\alpha)\, CS^j, \tag{3}$$

where Π^j denotes the profit of plants located in country j, CS^j represents the consumers' surplus regarding consumers in country j and $\alpha \in [0,1]$.[23]

The parameter α represents the AA's bias that can spring from lobbying activities by producers or by consumers:

- If $\alpha = 1/2$, then the authority is neutral and maximizes total welfare. So, this special case of the extended version of the model boils down to the case addressed in Section 4.
- If $\alpha > 1/2$, then the AA is more industry-oriented. Notice that in the extreme where $\alpha = 1$ the AA is solely interested in maximizing the level of profits.
- If instead $\alpha < 1/2$, then the AA has a pro-consumers bias (greater weight is given to consumers' surplus than to producers' surplus). Notice in particular that the extreme case where $\alpha = 0$ represents an AA that is only interested in maximizing consumers' surplus, regardless of the level of profits of the firms.

In what follows, for tractability reasons, we set $a = 1$ and, consequently, Assumption 1 implies that $t < 1/19 \simeq 0.052632$. The game we analyze in this section is the same six-stage game proposed in Section 4, but where now the AAs have the modified objective function described in eq. (3). From the analysis of the SPNE of this game, one can derive its full equilibrium outcome which is represented in Figure 5.

The intuition underlying this result is as follows. As the value of α increases, the AAs become more and more industry-friendly and the equilibrium outcome is a more and more concentrated market structure. In particular, three different subcases can be distinguished. First, for sufficiently low values of α, the AAs' and the firms' interests are not aligned. The latter are, as usual, concerned about their individual profits whereas

[22] This definition of the AAs'objective function resembles the one introduced by Barros and Hoernig (2004)
[23] Obviously, the SNAA objective function is equal to $U^A + U^B$.

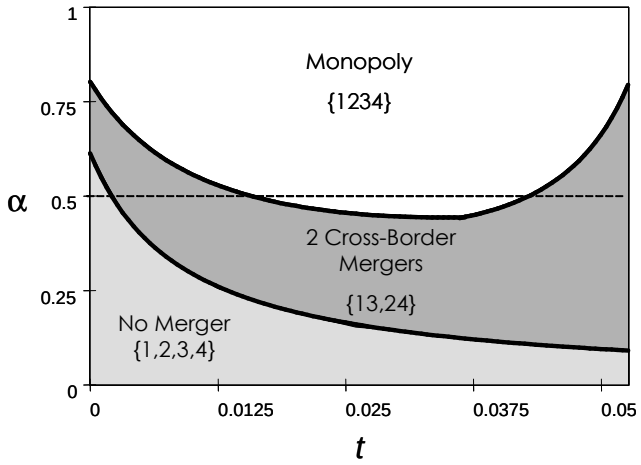

Figure 5: Equilibria of the Game with Lobbies

the former aim essentially at maximizing consumers' surplus. Now, since, as explained above, in this setting, any merger gives rise to a negative impact on consumer welfare, every merger proposal is going to be blocked by the relevant AA. Second, for $\alpha = 1/2$ the results are obviously qualitatively the same as the ones derived in Section 4.[24] Lastly, for sufficiently high values of α, the relative weight of consumers' surplus on the AAs objective function is limited, which implies that the AAs' and the firms' interests are closely aligned. As a result, the final equilibrium outcome is a completely monopolized industry.

5.2 Efficiency Levels

As mentioned above, our cost structure is a special case of the one proposed by Perry and Porter (1985). The cost function of a firm owning k_i units of capital is:

$$C_i\left(x_i, k_i, e\right) = \frac{e(x_i)^2}{2k_i}, \tag{4}$$

where $k_i \in \{1/4, 1/2, 3/4, 1\}$, $\sum_i k_i = 1$ and $e \geq 0$. In the previous analysis we have implicitly assumed that $e = 4$. So, the idea of this section idea is to test whether the results are robust to changes in the parameter

[24] The intuition behind the fact that, given an intermediate value of α, a merger to complete monopoly is only going to be allowed for values of t in a closed interval is the one explained in footnote 21.

e. Notice that from (4), simple algebra shows that

$$\frac{\partial^2 C_i}{\partial x_i \partial k_i}(x_i, k_i, e) = -\frac{e x_i}{k_i^2}. \tag{5}$$

So, e measures the level of endogenous efficiency gains induced by a merger. The higher the value of e, the larger the reduction in marginal costs resulting from a merger.

Analyzing the SPNE of the six-stage game presented in section 4 for different values of e, one may conclude that there are two different classes of equilibrium outcomes.

First, for $e = 0$ (constant marginal costs), $e = 1$ and $e = 2$ the results are qualitatively the same: given a demand parameter a, the equilibrium market structure is "no merger" for low values of the trade cost t and a wave of two cross-border mergers for t sufficiently high. The following figure illustrates the full equilibrium outcome of the merger game when $e = 2$.

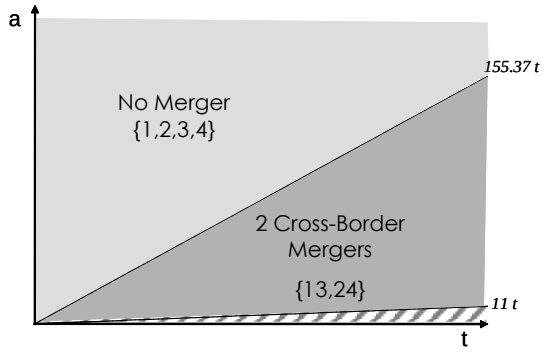

Figure 6: Equilibria of the Game with AAs ($e = 2$)

Second, for $e > 4$ we obtained an equilibrium outcome qualitatively equivalent to the one presented in Figure 4 ($e = 4$).

So, regardless of the value of e, we have that: (i) No mergers occur in equilibrium whenever the trade physical costs are sufficiently low; and (ii) whenever mergers occur in equilibrium, they encompass cross-border merger waves. In addition, when the level of endogenous efficiency gains e is sufficiently high, it may as well happen that the final equilibrium outcome of the merger game is a complete monopolized industry.

So, our qualitative results proved to be robust to changes in the level of efficiency.

5.3 Social Optimum Market Structures

In this section we investigate what would be, from an ex-ante point of view, the SNAA first-best choice if it could choose amongst all market structures that can result from the merger game. The outcome of this exercise is illustrated in Figure 7.

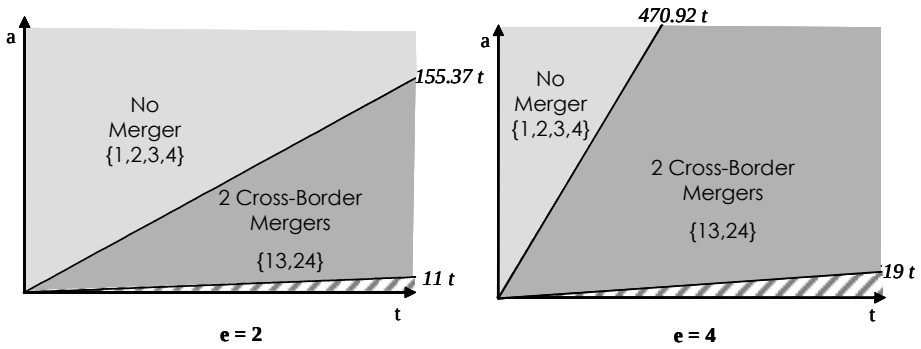

Figure 7: SNAA First-Best Market Structures

Now, comparing figures 4, 6 and 7, one concludes that when $e = 2$, our endogenous merger game always leads to *the* socially optimum market structure. However, if efficiency gains are sufficiently strong (say, $e \geq 4$), the proposed merger game introduces a distortion from the SNAA first-best scenario since, for some region of the parameter values, the resulting market structure is the complete monopoly (as explained in the previous section), which is never a socially optimal market structure.[25]

5.4 Myopic Antitrust Authorities

In the previous analysis it has been implicitly assumed that the AAs were forward looking, i.e., whenever faced with a merger proposal, the relevant AA was able to correctly anticipate the *ultimate* market structure this merger would lead to. So, it is natural to wonder what would be the equilibrium outcome of the proposed six-stage game if instead the AAs were myopic. By analyzing a modified version of our endogenous merger

[25] Even if complete monopolization of the industry is *a priori* forbidden, it is straightforward to show that there still exists a distortion from the SNAA first-best choice.

game where the AA which is called to decide upon a given merger proposal judges it without considering that further mergers might occur, one concludes that the full equilibrium outcome of this game is the one presented in Figure 8.

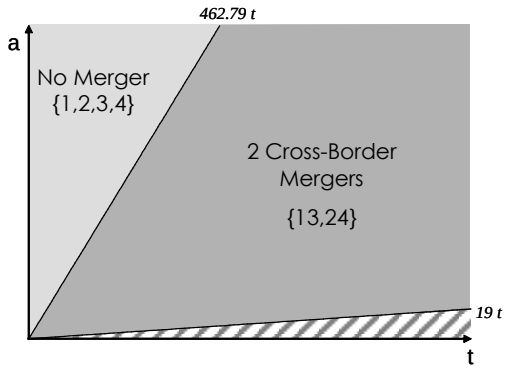

Figure 8: Equilibria of the Game with myopic AAs

Notice that this different assumption does not change the final results in a drastic way. It is worth remarking, however, that in Figure 8 there is no region of parameter values where the final equilibrium market structure is the complete monopoly. Remember that in Section 4 the merger wave leading to complete monopoly is always started with a national merger between firm 1 and 2. However, if this national merger proposal is submitted to a myopic ANAA, it will always be rejected. The reason is that the ANAA considers that the induced market structure would be $M_B = \{12, 3, 4\}$, which is always dominated by $M_A = \{1, 2, 3, 4\}$ from a total welfare point of view. ANAA fails to anticipate that this merger would be followed by subsequent ones and the resulting ultimate market structures obtained in this process could be preferred to the status quo industry structure $M_A = \{1, 2, 3, 4\}$.

6 Conclusion

In this paper we use an international Cournot oligopoly model to study the interplay between trade policy and the way merger waves shape the industrial structure. In particular, we analyze how trade policy can influence firms' choice between domestic and cross-border mergers in a sequential merger formation game with cost synergies *à la* Perry and Porter (1985).

Apart from discussing the relationship between trade policy and merger formation, our main contribution here probably lies in the attempt of going beyond a static setting when analyzing the effects of mergers, and in explicitly considering the role of Antitrust Authorities in a sequential merger game.

It is shown that the equilibrium market structure depends heavily on: (i) the level of trade costs; and (ii) whether or not active Antitrust Authorities are incorporated within the sequential merger game. In addition, we show that whenever mergers occur in equilibrium, they occur in waves and the merger wave comprises at least one cross-border merger. Also, and perhaps most importantly, in a model where AAs are encompassed as active players of the merger formation game, no mergers (and, therefore, no cross-border merger waves) occur in equilibrium when trade physical costs are at a sufficiently low level, which contradicts the common belief that trade liberalization induces waves of cross-border mergers.

We also identify conditions for the full equilibrium outcome of the sequential merger game to result in the socially optimal market structure and analyze how the equilibrium market structures are affected by the presence of lobbying efforts.

7 Appendix A: Equilibrium profits, quantities, and welfare

Market structure A

Profits

$$\Pi_{1,\,MA} := \frac{34}{1369}a^2 - \frac{34}{1369}a\,t + \frac{693}{1369}t^2 \qquad \Pi_{2,\,MA} := \frac{34}{1369}a^2 - \frac{34}{1369}a\,t + \frac{693}{1369}t^2$$

$$\Pi_{3,\,MA} := \frac{34}{1369}a^2 - \frac{34}{1369}a\,t + \frac{693}{1369}t^2 \qquad \Pi_{4,\,MA} := \frac{34}{1369}a^2 - \frac{34}{1369}a\,t + \frac{693}{1369}t^2$$

Welfare

$$CS_{A,\,MA} := \frac{2}{1369}(2\,a - t)^2 \qquad CS_{B,\,MA} := \frac{2}{1369}(2\,a - t)^2$$

$$W_{A,\,MA} := \frac{76}{1369}a^2 - \frac{76}{1369}a\,t + \frac{1388}{1369}t^2 \qquad W_{B,\,MA} := \frac{76}{1369}a^2 - \frac{76}{1369}a\,t + \frac{1388}{1369}t^2$$

$$TW_{MA} := \frac{152}{1369}a^2 - \frac{152}{1369}a\,t + \frac{2776}{1369}t^2$$

Market structure B

Profits

$$\Pi_{12,\,MB} := \frac{9801}{197192}a^2 - \frac{9801}{197192}a\,t + \frac{313013}{394384}t^2$$

$$\Pi_{3,\,MB} := \frac{4913}{197192}a^2 - \frac{4913}{197192}a\,t + \frac{113377}{394384}t^2 \qquad \Pi_{4,\,MB} := \frac{4913}{197192}a^2 - \frac{4913}{197192}a\,t + \frac{113377}{394384}t^2$$

Welfare

$$CS_{A,\,MB} := \frac{1}{2}\left(\frac{67}{628}a - \frac{28}{157}t\right)^2 \qquad CS_{B,\,MB} := \frac{1}{2}\left(\frac{67}{628}a + \frac{45}{628}t\right)^2$$

$$W_{A,\,MB} := \frac{43693}{788768}a^2 - \frac{13553}{197192}a\,t + \frac{319285}{394384}t^2 \qquad W_{B,\,MB} := \frac{43793}{788768}a^2 - \frac{16637}{394384}a\,t + \frac{455533}{788768}t^2$$

$$TW_{MB} := \frac{43743}{394384}a^2 - \frac{43743}{394384}a\,t + \frac{1094103}{788768}t^2$$

Market structure D

Profits

$$\Pi_{13,\,MD} := \frac{297}{98596}a\,t + \frac{9801}{197192}a^2 + \frac{9}{197192}t^2$$

$$\Pi_{2,\,MD} := -\frac{2601}{98596}a\,t + \frac{4913}{197192}a^2 + \frac{99973}{197192}t^2 \qquad \Pi_{4,\,MD} := -\frac{2601}{98596}a\,t + \frac{4913}{197192}a^2 + \frac{99973}{197192}t^2$$

Welfare

$$CS_{A,\,MD} := \frac{1}{2}\left(\frac{67}{628}a - \frac{17}{628}t\right)^2 \qquad CS_{B,\,MD} := \frac{1}{2}\left(\frac{67}{628}a - \frac{17}{628}t\right)^2$$

$$W_{A,\,MD} := \frac{43743}{788768}a^2 - \frac{10949}{394384}a\,t + \frac{400199}{788768}t^2 \qquad W_{B,\,MD} := \frac{43743}{788768}a^2 - \frac{10949}{394384}a\,t + \frac{400199}{788768}t^2$$

$$TW_{MD} := \frac{43743}{394384}a^2 - \frac{10949}{197192}a\,t + \frac{400199}{394384}t^2$$

Market structure E

Profits

$$\Pi_{123,\,ME} := \frac{124146}{1661521}a^2 + \frac{3762}{1661521}a\,t + \frac{831017}{14953689}t^2 \qquad \Pi_{4,\,ME} := \frac{41650}{1661521}a^2 - \frac{45220}{1661521}a\,t + \frac{3433508}{14953689}t^2$$

Welfare

$$CS_{A,\,ME} := \frac{1}{2}\left(\frac{134}{1289}a - \frac{697}{3867}t\right)^2 \qquad CS_{B,\,ME} := \frac{1}{2}\left(\frac{134}{1289}a + \frac{592}{3867}t\right)^2$$

$$W_{A,\,ME} := \frac{91742}{1661521}a^2 - \frac{85874}{4984563}a\,t + \frac{4781495}{89722134}t^2 \qquad W_{B,\,ME} := \frac{92010}{1661521}a^2 - \frac{52570}{4984563}a\,t + \frac{11657237}{44861067}t^2$$

$$TW_{ME} := \frac{183752}{1661521}a^2 - \frac{46148}{1661521}a\,t + \frac{9365323}{29907378}t^2$$

Market structure G

Profits

$$\Pi_{12,\,MG} := \frac{18}{361}a^2 - \frac{18}{361}a\,t + \frac{185}{361}t^2 \qquad \Pi_{34,\,MG} := \frac{18}{361}a^2 - \frac{18}{361}a\,t + \frac{185}{361}t^2$$

Welfare

$$CS_{A,\,MG} := \frac{1}{2}\left(\frac{2}{19}a - \frac{1}{19}t\right)^2 \qquad CS_{B,\,MG} := \frac{1}{2}\left(\frac{2}{19}a - \frac{1}{19}t\right)^2$$

$$W_{A,\,MG} := \frac{20}{361}a^2 - \frac{20}{361}a\,t + \frac{371}{722}t^2 \qquad W_{B,\,MG} := \frac{20}{361}a^2 - \frac{20}{361}a\,t + \frac{371}{722}t^2$$

$$TW_{MG} := \frac{40}{361}a^2 - \frac{40}{361}a\,t + \frac{371}{361}t^2$$

Market structure H

Profits

$$\Pi_{13,\,MH} := \frac{18}{361}a^2 \qquad \Pi_{24,\,MH} := \frac{18}{361}a^2$$

Welfare

$$CS_{A,\,MH} := \frac{2}{361}a^2 \qquad CS_{B,\,MH} := \frac{2}{361}a^2$$

$$W_{A,\,MH} := \frac{20}{361}a^2 \qquad W_{B,\,MH} := \frac{20}{361}a^2$$

$$TW_{MH} := \frac{40}{361}a^2$$

Market structure I

Profits

$$\Pi_{1234,\,MI} := \frac{1}{10}a^2$$

Welfare

$$CS_{A,\,MI} := \frac{1}{200}a^2 \qquad CS_{B,\,MI} := \frac{1}{200}a^2$$

$$W_{A,\,MI} := \frac{11}{200}a^2 \qquad W_{B,\,MI} := \frac{11}{200}a^2$$

$$TW_{MI} := \frac{11}{100}a^2$$

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