Merger, Product Differentiation, and Trade Policy

Michel Cavagnac

Toulouse School of Economics (LERNA)

Guillaume Cheikbossian*

Université Montpellier I & Toulouse School of Economics

TSE
Université des Sciences Sociales
Manufacture des Tabacs (Bâtiment S)
21 Allée de Brienne
31000 Toulouse, France
E-mail: guillaume.cheikbossian@tse-fr.eu

April 15, 2013

Abstract: In a two-stage game with three firms and two countries, we study the profitability of a domestic merger in the context of an international oligopoly game with differentiated products and in a strategic trade policy environment. In contrast to a completely unregulated economy, we show that the domestic merger under Cournot competition is always profitable to the host country irrespective of the degree of product differentiation. Furthermore, it is also profitable to the competing country – hosting one firm only – if products are sufficiently differentiated. Under Bertrand competition the merger is always profitable to both countries independently of the product range rivalry. But in a strategic trade environment it is more profitable to the country in which the merger occurs than to the other country.

Keywords: Merger; Product differentiation; Strategic trade policy; Cournot competition; Bertrand competition

JEL Classification: D43; F12; F13; L13

---

*Corresponding author

The usual disclaimer applies.

1 Introduction

This paper is about the profitability of mergers between firms producing differentiated products, and in a context where governments intervene to affect the competitiveness of their firms in international markets. An example that is often cited as a classic case for interventionist trade policy is the aircraft industry. Indeed, the U.S.-E.U. civil aircraft dispute concerning government support for (respectively) Boeing and Airbus – with both parties accusing each other of illegal and hidden export subsidies – is certainly one of the longest-running GATT/WTO dispute. At the same time, this duopoly in the market is the consequence of mergers within this specific industry. Airbus was formally created in 1970 and began as a consortium of European aerospace firms, whereas the American Boing took over its major competitor McDonnell Douglas in 1997. Another evidence of mergers in specific industries with active governments is given by the merger wave in the automotive industry in China, the world's largest automobile producer ahead of the United States. For example, Shanghai Automotive Industry Group (SAIC) acquired in 2007 Nanjing Automotive Group (NAC), and became the largest manufacturer in China with a consolidated annual production of 2.7 million units of vehicles.[1] This industry and the competition in export markets are also the subject of ongoing disputes between countries. For example, the Obama administration filed in September 2012 a trade case at the WTO against China, alleging that it has provided auto companies with at least $1 billion in illegal export subsidies between 2009 and 2011.[2] Finally, one can also mention the merger wave in the agricultural industry in the US or in the EU[3], bearing in mind that in both the US and the EU, the main export subsidy program is targeted to farm products – i.e. the Export Enhancement Program (EEP) in the US and the Common Agricultural Policy (CAP) in Europe.[4]

In this paper, we thus construct a very simple model to analyze whether mergers are profitable

[1] See, e.g., *Market Analysis Report: China's Automotive Industry*, prepared for Israel Export & International Cooperation Institute, November 2010.

[2] See, e.g., *The New York Times,* September 17, 2012.

[3] See, e.g., the *Report on competition law enforcement and market monitoring activities by European competition authorities in the food sector,* by the European Competition Network (ECN) Subgroup Food (May 2012), for a summary of antitrust cases in the food sector in Europe. For a brief summary of the merger waves in agricultural cooperatives in the US, see e.g. Hudson and Herndon (2000).

[4] For a comparison between US and EU agricultural policies see, e.g., A. Schmitz and T.G. Schmitz (2010).

or not in a strategic trade policy environment. More specifically, we consider a model with linear demand and costs, and with two firms in one country that are candidates to the merger and one firm in another country. All firms are assumed to compete in a third-country market. Furthermore, each firm produces a single product which is an imperfect substitute to the products of the other firms. In this context, we investigate optimal strategic trade policies under both Cournot and Bertrand competition, and in turn analyze the profitability of the domestic merger from each country welfare perspective.

Since governments act first and set their trade policies anticipating the behavior of both domestic and foreign firms, each country's trade policy can be viewed as a mean to induce domestic firms – in case there are many – to act as if they were a single firm. In other words, one might view trade policy as a substitute to merger(s). But, as it will be clear in this article, this is not the case. Indeed, a merger in one country changes the strategic interaction in the market in that it modifies the slope of the joint best-response function of the merging firms, and thus the behavior of all firms. This in turn modifies the strategic interaction between governments and so the best-response functions of *both* governments in the policy game. So, while the formal model is as simple as possible, the careful analysis of the impact of a merger on the interplay between the strategic interactions at the firm level and at the government level proved to be not as simple as one might have thought.

The results about the profitability of mergers in a strategic trade policy environment also differ significantly from those in a *laisser-faire* economy. In this latter case, it is generally felt that mergers give rise to a strategic advantage given to outsiders that may harm the firms involved in the merger. This is the so-called the 'merger paradox' identified by Salant, Switzer and Reynolds (1983). They indeed show – in the linear demand model with constant marginal costs and homogenous products – that mergers are not beneficial to the participating firms unless more than 80% of them collude. Still in the linear Cournot model but with the more realistic assumption of differentiated products, Lommerud and Sørgard (1997) find that a merger of two firms can be beneficial to them, provided products are not close substitutes.[5] In a strategic trade policy

[5] Mergers can also be profitable if Cournot competition is extended to include cost synergies (see, e.g., Perry and Porter, 1985), demand convexities (see, e.g., Faulí-Oller, 1997) or union-firm bargaining (see, e.g., Lommerud, Straume and Sørgard, 2008).

environment, we find that a domestic merger is always profitable to the host country irrespective of the degree of product differentiation. Furthermore, the merger can also be beneficial to the other country if product diversity is large enough. Under Bertrand competition, the classic result is that mergers are always beneficial to the merging parties and even more so to the outsider(s) (Deneckere and Davidson, 1985). When strategic trade policy is used, the merger benefits to both countries independently of the product range rivalry, but it benefits more to the country in which the merger occurs than to the other country. Overall our findings thus suggest that the persistence of strategic trade policies – including (hidden) export subsidies – can be a driving force behind the merger process since in most cases it benefits the host country and the competing country as well. In other words, interventionist trade policies might lead to industrial concentration, and to the detriment of consumers in export markets.

The question addressed in this paper is linked with both the literature on trade policy under imperfect competition in world markets and that on the profitability of mergers. Dixit (1984) analyzes separately import tariffs, export subsidies as well anti-trust policies in a general "reciprocal-markets" model where several firms in two countries compete in both markets. In particular, he shows that forming export (import) cartels – as reflected by a decrease in the exogenous number of firms – will be welfare enhancing (decreasing). Richardson (1999) and Horn and Levinsohn (2001) take a step towards and investigate situations where governments use both trade and competition policies, this last being reflected by the choice of market concentration. Richardson (1999) shows that trade liberalization leads to a tightening of the competition policies, while Horn and Levinsohn (2001) in a more general context show that this is not necessarily the case.

Our paper is most closely related to the work done by Huck and Konrad (2004). Following the standard literature on trade policies under oligopoly – and unlike the above mentioned analysis – they work with a two-stage model including two levels of strategic interactions: one between governments in the first stage, and the other between firms in the second stage. In a linear Cournot framework with several countries and firms producing a homogenous good at constant marginal cost, they investigate the profitability of domestic and international mergers. With profit being the objective function of the decision-makers in the first stage, they show that the results of Salant *et* al. (1983) are reversed for national mergers – in that mergers can be beneficial to participating firms but harm competitors in other countries – but not for international mergers. We assume just two countries and three firms but analyze the profitability of a domestic merger when products are not perfect substitutes so that – in contrast to Huck and Konrad – none of the merging firm is closed down. Furthermore, welfare – not profit – is the objective function of governments since they can supplement their strategic trade policies through lump-sum transfers to the firms – for example to balance the government's budget – without affecting their behaviors. Under Cournot competition, we then show that a national merger is always profitable to the host country, and can also be profitable to the competing country if products are not close substitutes. Unlike Huck and Konrad, we also investigate the case of Bertrand competition, and show that it reinforces the profitability of a domestic merger in that the two countries benefit from it independently of the product range rivalry. Huck and Konrad, though, develop a model with n firms located in k countries and also examine the profitability of international mergers.

The rest of the paper is set up as follows. We first analyze Cournot competition in Section II and then investigate the case of Bertrand competition in Section III. Section IV offers a brief conclusion. Finally, the different computations of the changes in each country's welfare due to the merger are gathered in the Appendix.

2 Cournot Competition

2.1 The basic framework

We consider a model with two countries, 1 and 2, and three firms A, B and C. Firm A is located and owned by the inhabitants of country 1, while firms B and C are located and owned by the inhabitants of country 2. In line with the literature on strategic trade policy, we assume that the three firms sell their products exclusively in a third-country market. We also assume that entry is prohibitively costly which can be justified by assuming that firm-specific fixed costs are sufficiently high to make entry on export markets unprofitable. Finally, as in Eaton and Grossman (1986), each government places equal weigh on the profit of the domestic firm(s) and on tax revenues (or subsidy costs) in evaluating social welfare. Its objective is therefore to maximize national product.

We have the following two-stage game. In the first stage, the government of each country decides independently of the other about the subsidy (or tax) per unit of production – or export.

In the second stage, firms compete either in quantities (*à la* Cournot) or in prices (*à la* Bertrand). The crucial feature of this article is that each firm produces a single product which is an imperfect substitute or complement for the output of its rivals, or partner in case of a merger. In other words, if there is a national merger in country 2, the two merging firms still produce two varieties after the merger[6]. Finally, each firm produces at a constant marginal cost normalized to 0.

We start by analyzing the case of Cournot competition. The inverse demand function for product i, for $i = A, B, C$, is linear and is given by

$$p_i(\mathbf{q}) = 1 - q_i - \theta q_{-i}, \tag{1}$$

where $\mathbf{q} \equiv (q_A, q_B, q_C)$, and where q_{-i} is the sum of output levels excluding output of firm i. The parameter $\theta \in (0, 1)$ captures the degree of substitutability between any two goods.

The profit of firm i located in country j – thus receiving the subsidy s_j – is thus given by

$$\Pi_i = q_i(1 - q_i - \theta q_{-i} + s_j). \tag{2}$$

Welfare in country 1 is given by $W_1 = \Pi_A - s_1 q_A$, or

$$W_1 = q_A p_A(\mathbf{q}). \tag{3}$$

Welfare in country 2 is given by $W_2 = \Pi_B + \Pi_C - s_2(q_B + q_C)$, or

$$W_2 = q_B p_B(\mathbf{q}) + q_C p_C(\mathbf{q}). \tag{4}$$

Subsidy payments net out in the equation determining a country's welfare.

We stress that – following a merger – we will focus exclusively on the change in each country's welfare, thus leaving aside the change in (joint) profits. The reason is the following. Each country could supplement its strategic trade policy through lump-sum (positive or negative) transfers to the firms, in particular to balance the government's budget. These transfers do not show up in the model because they do not affect firms' behaviors and so do not interfere with the strategic aspects of countries' policies. Therefore, when analyzing the profitability of a merger, attention

[6] This can be endogenized by assuming that there is a fixed *non-sunk* cost of marketing a brand, and that this fixed cost has 'intermediate values'. It cannot be too high otherwise the merged firm will withdraw a brand, and it cannot be too small otherwise the outsider will introduce a new brand in the post-merger situation. For details, see Lommerud and Sørgard (1997).

must be given to the change in total welfare in each country. In other words, analyzing the change in (joint) profits only (as defined in (2)) is not relevant in the present framework with government intervention because profits can be affected by the lump-sum transfers. And these transfers can be differentiated according to whether a merger occurs or not, which would be the case if the government's budget needed to be balanced.

2.2 The No–Merger Case

The best response of firm i located in country j to the output level q_{-i} is given by $r_i^{C(N)}(q_{-i}; s_j) = \max\{0, (1 + s_j - \theta q_{-i})/2\}$, where the subscript $C(N)$ denotes Cournot competition in the No-merger case. In the absence of regulation – i.e. $s_1 = s_2 = 0$ – the Cournot equilibrium with product differentiation yields $q_i^* = 1/(2 + 2\theta)$ for $i = A, B, C$. This leads to the following equilibrium profits (and welfare) $\Pi_i^* = 1/(2 + 2\theta)^2$ for $i = A, B, C$.

Given a couple of subsidies $\mathbf{s} \equiv (s_1, s_2) \neq (0, 0)$, the equilibrium quantities in the second stage of the game in the absence of a merger are given by

$$
\begin{aligned}
q_A^{C(N)}(\mathbf{s}) &= \frac{(2-\theta) + (2+\theta)s_1 - 2\theta s_2}{2(2+\theta-\theta^2)}, \\
q_j^{C(N)}(\mathbf{s}) &= \frac{(2-\theta) + 2s_2 - \theta s_1}{2(2+\theta-\theta^2)}, \quad j = B, C.
\end{aligned} \tag{5}
$$

Substituting into (1), (3) and (4) and calculating the first-order conditions for maximizing W_1 with respect to s_1 and W_2 with respect to s_2, yields the following governments' best-response functions in subsidies

$$
\begin{aligned}
R_1^{C(N)}(s_2) &= \frac{\theta^2 \left[(2-\theta) - 2\theta s_2\right]}{(2+\theta)(2+\theta-2\theta^2)}, \\
R_2^{C(N)}(s_1) &= \frac{\theta(1-\theta)\left[\theta s_1 - (2-\theta)\right]}{4(1+\theta-\theta^2)}.
\end{aligned} \tag{6}
$$

The best-response function of country 1 is downward sloping as it is typically the case in a Cournot oligopoly model of international trade *à la* Brander and Spencer (1985). In contrast the best-response function of country 2 is upward sloping. The explanation is the following. Suppose that country 1 increases its subsidy by ds_1. Then, the firm located in country 1 increases its production level while each firm located in country 2 decreases its production level (see eq. (5)). The key point is that the two firms of country 2 act independently of each other in the oligopoly game. Therefore, in order to induce the firms to take into account the positive spillover of a decrease in one's own production on one partner's marginal profit, country 2 best reacts to an increase in subsidy in country 1 by increasing its own subsidy.

Solving this system of best-response functions, we obtain the following equilibrium subsidies in the no-merger case

$$\begin{aligned} s_1^{C(N)} &= \frac{\theta^2(2-\theta^2)}{\Psi(\theta)}, \\ s_2^{C(N)} &= \frac{\theta(1-\theta)(3\theta^2-4)}{2\Psi(\theta)}, \end{aligned} \tag{7}$$

where $\Psi(\theta) = 4 + 6\theta - 4\theta^2 - 4\theta^3 + \theta^4 > 0$ for any $\theta \in (0,1)$.

Hence, we have $s_1^{C(N)} > 0$ while $s_2^{C(N)} \leq 0$ (despite the fact that $R_2^{C(N)}(s_1)$ is upward sloping). Country 1 has an incentive to subsidize production (or exports) of the firm located in its territory, i.e. firm A, so as to induce a decrease in exports of the competitors located in the other country, i.e. firms B and C. This is the strategic trade policy motive identified by Brander and Spencer (1985). This strategic motive is also present in country 2. But this last has also an incentive to use trade policy to regulate the competition between the firms located on its territory. This incentive calls for a tax instead of a subsidy and it turns out that this incentive is stronger than the strategic incentive. In case of homogenous products, i.e. $\theta = 1$, the two incentives cancel out and hence $s_2^{C(N)} = 0$ as in Huck and Konrad (2004).

This induces the following vector of equilibrium quantities $\mathbf{q}^{C(N)} = (q_A^{C(N)}, q_B^{C(N)}, q_C^{C(N)})$, with

$$\begin{aligned} q_A^{C(N)} &= \frac{(2+\theta)(2-\theta^2)}{2\Psi(\theta)}, \\ q_j^{C(N)} &= \frac{4-3\theta^2}{2\Psi(\theta)}, \quad j = B, C. \end{aligned} \tag{8}$$

Finally, equilibrium welfare are thus given by

$$\begin{aligned} W_1^{C(N)} &= \frac{(2+\theta)(2-\theta^2)^2(2+\theta-2\theta^2)}{[2\Psi(\theta)]^2}, \\ W_2^{C(N)} &= \frac{(4-3\theta^2)^2(1+\theta-\theta^2)}{2\,[\Psi(\theta)]^2}. \end{aligned} \tag{9}$$

2.3 Merger in Country 2

Suppose now that there is a national merger in country 2. The firms B and C of country 2 maximize $\Pi_B + \Pi_C$ given the subsidy received s_2 and given the output level of firm A of country 1. By symmetry, the two merging firms produce the same quantities – but still produce differentiated products – and hence the best response of any merging firm to the output level q_A is given by $r_j^{C(M)}(q_A; s_2) = \max\{0, (1 + s_2 - \theta q_A)/(2 + 2\theta)\}$, for $j = B, C$, where the subscript $C(M)$ denotes Cournot competition in the Merger case. The best response of firm A located in country 1 is the same as in the no-merger case, i.e. $r_A^{C(M)}(q_{-i}; s_1) = r_A^{C(N)}(q_{-i}; s_1)$. In a word, with a national merger in country 2, the equilibrium outcome in the second stage of the game is no longer a triopoly but a duopoly with one firm being a multiproduct firm.

In the absence of regulation – i.e. $s_1 = s_2 = 0$ – the Cournot equilibrium with product differentiation yields $\tilde{q}_A = 1/[2 + \theta(2 - \theta)]$ and $\tilde{q}_B = \tilde{q}_C = (2 - \theta)/[2(2 + \theta(2 - \theta))]$. This leads to the following equilibrium profits (and welfare) $\tilde{\Pi}_A = 1/\left[2 + 2\theta - \theta^2\right]^2$ and $\tilde{\Pi}_B = \tilde{\Pi}_C = (1 + \theta)(2 - \theta)^2/\left[2(2 + 2\theta - \theta^2)\right]^2$. In a completely unregulated economy, a merger is always profitable to the outsider – i.e. firm A – and profitable to the merging firms only if products are sufficiently differentiated – i.e. $\theta < 0.555$[7] – a result first shown by Lommerud and Sørgard (1997). The intuition is the following. The merging firms benefit from their cooperation but each looses market shares to the benefit of the outsider. However, the more differentiated the products are, the more limited will be the outsider's increase in export sales as a response to the merger. Since the outsider's response is harmful to the merging firms, the products must be sufficiently differentiated for the merger to be profitable to the participating firms. As shown below, the results in a strategic trade environment sharply contrast with those of a *laisser-faire* economy.

Given a couple of subsidies $\mathbf{s} \equiv (s_1, s_2) \neq (0, 0)$, the equilibrium quantities in the second stage of the game with a national merger in country 2 are given by

$$\begin{aligned} q_A^{C(M)}(\mathbf{s}) &= \frac{1 + (1 + \theta)s_1 - \theta s_2}{2 + 2\theta - \theta^2}, \\ q_j^{C(M)}(\mathbf{s}) &= \frac{(2 - \theta) + 2s_2 - \theta s_1}{2(2 + 2\theta - \theta^2)}, \quad j = B, C. \end{aligned} \tag{10}$$

Substituting into (1), (3) and (4) and calculating the first-order conditions for maximizing W_1 with respect to s_1 and W_2 with respect to s_2, yields the following best-response functions in

[7] The computations of the change in each country's welfare – due to the merger in country 2 – in a completely unregulated economy and in a strategic trade environment both under Cournot competition and Bertrand competition (leading to the statements in Propositions 1 and 2) are given in the Appendix.

subsidies

$$R_1^{C(M)}(s_2) = \frac{\theta^2(1-\theta s_2)}{2(1+2\theta-\theta^3)},$$
$$R_2^{C(M)}(s_1) = \frac{\theta^2(2-\theta-\theta s_1)}{4(1+\theta-\theta^2)}. \tag{11}$$

Observe that in contrast with the no-merger case, the best-response function of country 2 is downward sloping. Intuitively, the merger in country 2 restores the incentives to use trade policy for strategic reasons only, as in a standard analysis of strategic trade policy *à la* Brander and Spencer (1985).

Solving this system of best-response functions, we obtain the following equilibrium subsidies in the merger case

$$s_1^{C(M)} = \frac{\theta^2(2-\theta^2)}{\Phi(\theta)},$$
$$s_2^{C(M)} = \frac{\theta^2(2+\theta-2\theta^2)}{\Phi(\theta)}, \tag{12}$$

where $\Phi(\theta) = 4 + 8\theta - 2\theta^2 - 6\theta^3 + \theta^4 > \Psi(\theta) > 0$ for any $\theta \in (0,1)$.

In contrast to the no-merger case, both countries subsidize their firms. Moreover, comparing the subsidy rate with and without a merger in country 2, we can establish the following Lemma.

Lemma 1: *Under Cournot competition, we have that* $0 < s_1^{C(M)} < s_1^{C(N)}$ *and* $s_2^{C(M)} > 0 > s_2^{C(N)}$.

Proof: Decompose the change in subsidy rates induced by a merger into 'first-order' and 'second-order' adjustment processes as defined just below.[8] First, the merging firms internalize the quantity competition among them and hence decrease their production levels – i.e. $q_j^{C(M)}(\mathbf{s}) < q_j^{C(N)}(\mathbf{s})$ for $j = B, C$ and for any $\mathbf{s} \equiv (s_1, s_2)$, as one can see from (5) and (10). Therefore, given the couple of subsidy rates $(s_1^{C(N)}, s_2^{C(N)})$, $\mathbf{q}^{C(N)}$ is no longer the equilibrium outcome in the second stage of the game. But if country 1 maintains unchanged its subsidy rate at $s_1^{C(N)}$, the vector of output quantities $\mathbf{q}^{C(N)}$ still maximizes country 2's welfare. It follows that this last must accommodate its subsidy rate – and in this case increases its rate above $s_2^{C(N)}$ – to induce the merged entity to

[8] Obviously, these adjustment processes have no descriptive significance since the analysis is static. We use this kind of reasoning – inspired from Deneckere and Davidson (1985) but in an analysis of mergers in a completely unregulated economy – as a way to find the post-merger equilibrium, starting from the pre-merger equilibrium.

increase the production levels of the two (differentiated) goods. More specifically, this increased subsidy rate $\tilde{s}_2$ is such that $q_j^{C(M)}(s_1^{C(N)}, \tilde{s}_2) = q_j^{C(N)}$ (for $j = B, C$) i.e. – using (7), (8) and (10) – $\tilde{s}_2 = (4 - 3\theta^2)\theta^2 / [2\Psi(\theta)] > 0$. But then for country 1, the subsidy rate $s_1^{C(N)}$ is no longer welfare-maximizing. Hence, if a merger occurs in country 2, country 1 also accommodates its subsidy rate – and in this case decreases its rate below $s_1^{C(N)}$. Specifically, the best response $\tilde{s}_1$ of country 1 to a subsidy $\tilde{s}_2$ chosen by country 2 is such that $\tilde{s}_1 = R_1^{C(M)}(\tilde{s}_2)$ i.e. – using (11) – $\tilde{s}_1 = \left[(2 + 3\theta)(2 - \theta^2)^2\theta^2\right] / \left[4(1 + 2\theta - \theta^3)\Psi(\theta)\right] < s_1^{C(N)}$. Therefore, a merger in country 2 causes two 'first-order' adjustments on strategic trade policies: a (positive) subsidy – instead of (positive) tax – received by the two merging firms of country 2, and a lower subsidy received by the firm of country 1. In turn, the policy subsidy of country 2 and the less aggressive behavior of country 1 causes 'second-order' adaptations of trade policies. Specifically, starting from $(\tilde{s}_1, \tilde{s}_2)$, we have successively: $(\tilde{s}_1, R_2^{C(M)}(\tilde{s}_1))$, $(R_1^{C(M)}(R_2^{C(M)}(\tilde{s}_1)), R_2^{C(M)}(\tilde{s}_1))$, etc. With linear best-response functions in subsidies, the sequence converges to the unique equilibrium $(s_1^{C(M)}, s_2^{C(M)})$. Hence, country 1 has further decreased its subsidy – i.e. $s_1^{C(M)} < \tilde{s}_1 < s_1^{C(N)}$ – and country 2 has further increased its subsidy – i.e. $s_2^{C(M)} > \tilde{s}_2 > s_2^{C(N)}$ **Q.E.D.**

Intuitively, country 1 uses trade subsidy for strategic reasons only, i.e. to induce a decrease in exports of the firms located in country 2. When there is a merger in country 2 the effectiveness of trade policy of country 1 is reduced compared to the no-merger case because the two merging firms internalize their mutual responses to the increase in production of the firm located in country 1. We indeed have $\left|\partial q_j^{C(M)}(\mathbf{s})/\partial s_1\right| < \left|\partial q_j^{C(N)}(\mathbf{s})/\partial s_1\right|$ for $j = B, C$, as one can infer directly from (5) and (10). In other words, for country 1, the marginal social benefit of subsidizing its own firm is lower with a merger in country 2 than in the absence of it. It follows that with a merger, the subsidy rate maximizing country 1's welfare must be lower than $s_1^{C(N)}$. In country 2, a national merger removes the incentive to regulate the competition between the two firms. What remains is the strategic trade incentive. This leads this country to subsidize its firms at a positive rate, which is actually greater than that of country 1 (i.e. $s_2^{C(M)} > s_1^{C(M)} > 0$).

We can now determine the vector of equilibrium quantities $\mathbf{q}^{C(M)} = (q_A^{C(M)}, q_B^{C(M)}, q_C^{C(M)})$ in case of a merger in country 2. We have

$$\begin{aligned} q_A^{C(M)} &= \frac{(1+\theta)(2-\theta^2)}{\Phi(\theta)}, \\ q_j^{C(M)} &= \frac{2+\theta-2\theta^2}{\Phi(\theta)}, \quad j = B, C. \end{aligned} \tag{13}$$

Equilibrium welfare with a national merger are thus given by

$$\begin{aligned} W_1^{C(M)} &= \frac{(1+\theta)(2-\theta^2)^2(1+\theta-\theta^2)}{[\Phi(\theta)]^2}, \\ W_2^{C(M)} &= \frac{2(2+\theta-2\theta^2)^2(1+\theta-\theta^2)}{[\Phi(\theta)]^2}. \end{aligned} \tag{14}$$

2.4 The profitability of a domestic merger

Calculating for each country the welfare difference when the two firms of country 2 merge and when they do not yields the following result.

Proposition 1: *Under Cournot competition, a national merger in country* 2 *is always profitable for country* 2 *and profitable for country* 1 *if* $\theta < 0.556$.

Proof: Decompose the change in welfare induced by the merger in country 2 into two components: the price effect and the quantity effect. First, as shown by Lemma 1, the merger in country 2 leads to a lower subsidy for firm A (located in country 1), which in turn induces a lower production (or export) level, i.e. $q_A^{C(M)} < q_A^{C(N)}$. Specifically, letting $\Delta^C(q_j) \equiv q_j^{C(M)} - q_j^{C(N)}$ (for $j = A, B, C$) and using (8) and (13), we have for firm A

$$\Delta^C(q_A) = -\frac{\theta^3(2-\theta^2)(2+2\theta-\theta^2)}{2\Psi(\theta)\,\Phi(\theta)} < 0. \tag{15}$$

In country 2, with the merger, firms B and C receive a positive subsidy instead of being taxed. The merger then leads to an increase in the production (or export) level of each merging firm, i.e. $q_j^{C(M)} > q_j^{C(N)}$ for $j = B, C$. Still using (8) and (13), the difference in production levels for $j = B, C$ is given by

$$\Delta^C(q_j) = \frac{\theta^4(2-\theta^2)}{2\Psi(\theta)\,\Phi(\theta)} > 0. \tag{16}$$

One can observe that $\left|\Delta^C(q_A)\right| \geq 2\Delta^C(q_j)$. Hence, the decrease in the production of firm A is greater (in absolute value) than the increase in production of both firms B and C. Intuitively, compared to the pre-merger situation, the increase in production of firms B and C results only from the 'second-order' adaptations of trade policies – as defined in the proof of Lemma 1. The decrease in production of firm A is much more pronounced because it results both from the 'first-order' and 'second-order' adaptations in trade policies (see again the proof of Lemma 1). It follows that the price of each of the three products increases. Let $\Delta^C(p_j) \equiv p_j\left(\mathbf{q}^{C(M)}\right) - p_j\left(\mathbf{q}^{C(N)}\right)$ for $j = A, B, C$. From (1), we indeed have $\Delta^C(p_A) = -(\Delta^C(q_A) + 2\theta\Delta^C(q_j))$ (for $j = B$ or $j = C$), i.e.,

$$\Delta^C(p_A) = \left[\left(2 + 2\theta - 3\theta^2\right)/\theta\right]\Delta^C(q_j) > 0, \tag{17}$$

and $\Delta^C(p_j) = -(\theta\Delta^C(q_A) + (1+\theta)\Delta^C(q_j))$ (for $j = B$ or $j = C$), i.e.,

$$\Delta^C(p_j) = \left(1 + \theta - \theta^2\right)\Delta^C(q_j) > 0. \tag{18}$$

Thus, a national merger in country 2 increases both export quantities and export prices of the two firms involved in the merger. Country $2'$s welfare – that is the value of domestic exports – is thus necessarily higher in the merger case.

Country 1 benefits from an increase of its export price but suffer from a decrease of its export quantities. Therefore, country 1's welfare might be higher or lower in the merger case depending on the extent of product differentiation parameterized by θ. First, recall that in the pre-merger situation the equilibrium subsidy rates are given by the couple $(s_1^{C(N)}, s_2^{C(N)})$, which results in the vector of equilibrium quantities $\mathbf{q}^{C(N)}$. By definition, at this equilibrium point, the marginal social benefit of subsidizing its own firm for country 1 is nil. In the post-merger situation, and as discussed in the Proof of Lemma 1, the same vector of quantities $\mathbf{q}^{C(N)}$ could still be implemented with the couple of subsidies $(s_1^{C(N)}, \tilde{s}_2)$ – with $\tilde{s}_2 > s_2^{C(N)}$. But a merger in country 2 reduces the effectiveness of the trade policy of country 1 – i.e. $\left|\partial q_j^{C(M)}(\mathbf{s})/\partial s_1\right| < \left|\partial q_j^{C(N)}(\mathbf{s})/\partial s_1\right|$ for $j = B, C$. This leads country 1 to reduce the subsidy to its firm up to $\tilde{s}_1$ – such that $\tilde{s}_1 = R_1^{C(M)}(\tilde{s}_2)$ – which necessarily increases country 1's welfare. In other words, a lower subsidy received by firm A leads to lower export quantities and to a greater export price, this last effect being larger than the former in terms of welfare change. However, the merger also causes 'second-order' adaptations in governments' policies and this is the source of the negative impact of the merger on country 1's welfare. Specifically, from $(\tilde{s}_1, \tilde{s}_2)$, there is a further decrease of the subsidy in country 1 – i.e. $s_1^{C(M)} < \tilde{s}_1$ – and a further increase of the subsidy in country 2 – i.e. $s_2^{C(M)} > \tilde{s}_2$. Country 2 then registers a further increase in exports and country 1 registers a further decrease in exports, especially if products are close substitutes. If however products are sufficiently differentiated, then the negative effect due to the ‘second-order’ adaptations in governments’ policies does not offset the positive effect resulting from the ‘first-order’ adaptation in country 1’s policy (and so this country registers an increase in welfare) **Q.E.D.**

Hence, in a strategic trade policy environment, a merger is always profitable to the country of origin while in a completely unregulated world economy – as in Lommerud and Sørgard (1997) – it is profitable to the firms (and therefore to the country) only if products are not very close substitutes (that is if $\theta < 0.555$). Our result that country 2 always benefit from the merger of its firms extends that of Huck and Konrad (2004) in a similar model but with a homogenous good. The difference is that the merger can also be beneficial to the other country if products are sufficiently differentiated (that is if $\theta < 0.556$[9]). In any case, as specified in the Appendix, the country in which the merger occurs benefits more from it than the other country.

Intuitively, a merger between firms B and C increases country 2’s welfare since this allows it to use trade policy for one objective only (instead of two), that is shifting profits from the foreign firm to the domestic firms. The merger in country 2 may also increase country 1’s welfare. The intuition is that a merger in country 2 causes country 1 to reduce its export subsidy. This in turn improves its terms of trade but decreases the market share of its firm (to the benefit of the merged entity). When products are close substitutes, the export sales of firms B and C have a strong negative impact on those of firm A, and so a merger in country 2 causes welfare in country 1 to decrease. This is especially true for the case of homogenous products (as in Huck and Konrad, 2004). If however products are sufficiently differentiated, the increase in export sales of the merging firms has a limited impact on the market share of firm A, and so country 1’s welfare increases with the merger (in country 2) because of the terms of trade improvement.

3 Bertrand Competition

3.1 The Basic Framework

From (1) we can write direct demand function for product i for $i = A, B, C$,

[9] Surprisingly enough, this threshold value is very similar to that below which a merger is profitable to the *insiders* in a completely unregulated economy.

$$q_i(\mathbf{p}) = \frac{(1-\theta) - (1+\theta)p_i + \theta p_{-i}}{(1-\theta)(1+2\theta)}, \tag{19}$$

where $\mathbf{p} \equiv (p_A, p_B, p_C)$, and where p_{-i} is the sum of price levels excluding that of firm i.

The profit of firm i located in country j – thus paying the tax t_j[10] – is thus given by

$$\Pi_i = (p_i - t_j)q_i(\mathbf{p}), \tag{20}$$

Welfare in country 1 is given by $W_1 = \Pi_A + t_1 q_A(\mathbf{p})$, or

$$W_1 = p_A q_A(\mathbf{p}). \tag{21}$$

Welfare in country 2 is given by $W_2 = \Pi_B + \Pi_C + t_2(q_B(\mathbf{p}) + q_C(\mathbf{p}))$, or

$$W_2 = p_B q_B(\mathbf{p}) + p_C q_C(\mathbf{p}). \tag{22}$$

Again, tax payments net out in the equation determining a country's welfare, and we will focus precisely on the change in welfare in both countries induced by the merger in country 2.

3.2 The No-merger case

The best response of firm i located in country j – thus paying the tax t_j – to the sum of price levels p_{-i} is given by $r_i^{B(N)}(p_{-i}; t_j) = [(1-\theta) + (1+\theta)t_j + \theta p_{-i}] / [2(1+\theta)]$, where the subscript $B(N)$ denotes Bertrand competition in the No-merger case. In the absence of regulation – i.e. $t_1 = t_2 = 0$ – the Bertrand equilibrium with product differentiation yields $\bar{p}_i = (1-\theta)/2$ for $i = A, B, C$. This leads to the following equilibrium profits (and welfare), $\bar{\Pi}_i = (1-\theta^2)/(4+8\theta)$ for $i = A, B, C$.

Given a couple of tax rates $\mathbf{t} \equiv (t_1, t_2) \neq (0, 0)$, the equilibrium prices in the second stage of the game in the absence of a merger are given by

$$\begin{aligned} p_A^{B(N)}(\mathbf{t}) &= \frac{(1-\theta)(2+3\theta) + (2+3\theta+\theta^2)t_1 + 2\theta(1+\theta)t_2}{2(2+3\theta)}, \\ p_j^{B(N)}(\mathbf{t}) &= \frac{(1-\theta)(2+3\theta) + 2(1+\theta)^2 t_2 + \theta(1+\theta)t_1}{2(2+3\theta)}, \quad j = B, C. \end{aligned} \tag{23}$$

[10] In a standard model of strategic trade policy, a positive subsidy is used under Cournot behavior, while a positive tax is indicated when firms engage in Bertrand competition (see Eaton and Grossman, 1986). Therefore, to make the analysis more suitable, we now view trade policy as an export tax.

Substituting into (19), (21) and (22), calculating the first-order conditions for maximizing W_1 with respect to t_1 and W_2 with respect to t_2, yields the following best-response functions in tax rates

$$\begin{aligned} R_1^{B(N)}(t_2) &= \frac{\theta^2\left[2+\theta-3\theta^2+2\theta(1+\theta)t_2\right]}{(1+\theta)(2+\theta)(2+3\theta-\theta^2)}, \\ R_2^{B(N)}(t_1) &= \frac{\theta(1+2\theta)\left[2+\theta-3\theta^2+\theta(1+\theta)t_1\right]}{4(1+\theta)^2(1+\theta-\theta^2)}. \end{aligned} \tag{24}$$

Best-response functions in tax rates are upward sloping as it is typically the case in a Bertrand oligopoly model of international trade *à la* Eaton and Grossman (1986). However, one can easily verify that the slope of the best-response function of country 2 is steeper than that of country 1, i.e. $\partial R_2^{B(N)}(t_1)/\partial t_1 > \partial R_1^{B(N)}(t_2)/\partial t_2$. When country 1 increases its tax rate by dt_1, firm A raises its price, which in turn induces firms B and C to also raise their prices (see eq. (23)). But again, in the no-merger case, the two firms of country 2 act independently of each other. Hence, in order to induce each of its firms to take into account the positive spillover of one's own increase in price on one partner's marginal profit, country 2 best reacts to an increase in tax rate in country 1 by further increasing its own tax rate. This is because an increase in tax rate causes the marginal profit in price to raise. In other words, and in contrast to Cournot competition, the incentive to make domestic firms acting as if they were a single – but multiproduct – firm plays in the same direction than the strategic trade incentive.

Solving this system of best-response functions, we obtain the following equilibrium tax rates in the no-merger case

$$\begin{aligned} t_1^{B(N)} &= \frac{\theta^2(1-\theta)(2+4\theta+\theta^2)}{(1+\theta)\phi(\theta)}, \\ t_2^{B(N)} &= \frac{\theta(1-\theta)(1+2\theta)(4+8\theta+\theta^2)}{2(1+\theta)\phi(\theta)}, \end{aligned} \tag{25}$$

where $\phi(\theta) = 4+10\theta+2\theta^2-6\theta^3-\theta^4 > 0$ for any $\theta \in (0,1)$.

Hence, we have $t_2^{B(N)} > t_1^{B(N)} > 0$. Country 1 has an incentive to tax production (or exports) of the firm located in its territory, i.e. firm A, so as to induce an increase in its price and, consequently, an increase in the prices settled by its competitors located in the other country, i.e. firms B and C. This is the strategic trade policy motive identified by Eaton and Grossman (1986) for Bertrand competition. This strategic motive is also present in country 2. But, this last has also an incentive to use trade policy to lead its firms to internalize the strategic complementarity in prices between them, thus leading to a greater tax rate than in country 1 (i.e. $t_2^{B(N)} > t_1^{B(N)}$).

This induces the following vector of prices $\mathbf{p}^{B(N)} = (p_A^{C(N)}, p_B^{C(N)}, p_C^{C(N)})$, with

$$
\begin{aligned}
p_A^{B(N)} &= \frac{(1-\theta)(2+\theta)(2+4\theta+\theta^2)}{2\phi(\theta)}, \\
p_j^{B(N)} &= \frac{(1-\theta^2)(4+8\theta+\theta^2)}{2\phi(\theta)}, \quad j = B, C.
\end{aligned} \tag{26}
$$

Equilibrium welfare are given by

$$
\begin{aligned}
W_1^{B(N)} &= \frac{(1-\theta)(2+\theta)(2+3\theta-\theta^2)(2+4\theta+\theta^2)^2}{4(1+2\theta)\left[\phi(\theta)\right]^2}, \\
W_2^{B(N)} &= \frac{(1-\theta^2)(1+\theta-\theta^2)(4+8\theta+\theta^2)^2}{2(1+2\theta)\left[\phi(\theta)\right]^2}.
\end{aligned} \tag{27}
$$

3.3 Merger in Country 2

With a national merger in country 2, firms B and C maximize $\Pi_B + \Pi_C$ given the tax paid t_2 and given the price level of firm A of country 1. By symmetry, the two merging firms chose the same price for their respective products and hence the best response of any merging firm to the price level p_A is given by $r_j^{B(M)}(p_A; t_2) = [1-\theta+t_2+\theta p_A]/2$, for $j = B, C$, where $B(M)$ denotes Bertrand competition in the Merger case. The best response of firm A is the same as in the no-merger case, i.e. $r_A^{B(M)}(p_{-A}; t_1) = r_A^{B(N)}(p_{-A}; t_1)$. In the absence of regulation – i.e. $t_1 = t_2 = 0$ – the Bertrand equilibrium with product differentiation yields $\hat{p}_A = (1-\theta^2)/(2+2\theta-\theta^2)$ and $\hat{p}_B = \hat{p}_C = (2+\theta-3\theta^2)/\left[2(2+2\theta-\theta^2)\right]$. This yields the following equilibrium profits (and welfare) $\hat{\Pi}_A = (1-\theta)(1+\theta)^3/\left[(1+2\theta)(2+2\theta-\theta^2)^2\right]$ and $\hat{\Pi}_B = \hat{\Pi}_C = (1-\theta)(2+3\theta)^2/\left[4(1+2\theta)(2+2\theta-\theta^2)^2\right]$. In a completely unregulated economy with Bertrand competition, a merger is always profitable to the merging firms and it is even more so for the outsider, a result first shown by Deneckere and Davidson (1985) in a model with N firms. The key argument for this result is that firms' best-response functions are upward sloping. Our reading of their analysis is that a merger (without government intervention) has the same effect than a unilateral tax policy undertaken by one county in a strategic trade environment *à la* Eaton and Grossman (1986).

Given a couple of taxes $\mathbf{t} \equiv (t_1, t_2)$, the equilibrium prices in the second stage of the game, with a national merger in country 2, are given by

$$\begin{aligned} p_A^{B(M)}(\mathbf{t}) &= \frac{1-\theta^2+t_1(1+\theta)+\theta t_2}{2+2\theta-\theta^2}, \\ p_j^{B(M)}(\mathbf{t}) &= \frac{(1-\theta)(2+3\theta)+(1+\theta)(\theta t_1+2t_2)}{2(2+2\theta-\theta^2)}, \quad j=B,C. \end{aligned} \tag{28}$$

Substituting into (19), (21) and (22), calculating the first-order conditions for maximizing W_1 with respect to t_1 and W_2 with respect to t_2, yields the following best-response functions in tax rates

$$\begin{aligned} R_1^{B(M)}(t_2) &= \frac{\theta^2\left[1-\theta^2+\theta t_2\right]}{2(1+2\theta-\theta^3)}, \\ R_2^{B(M)}(t_1) &= \frac{\theta^2\left[(1-\theta)(2+3\theta)+\theta(1+\theta)t_1\right]}{4(1+2\theta-\theta^3)}. \end{aligned} \tag{29}$$

Solving this system of best-response functions, we obtain the following equilibrium tax rates in the merger case

$$\begin{aligned} t_1^{B(M)} &= \frac{\theta^2(1-\theta)(2+4\theta+\theta^2)}{(1+\theta)\Phi(\theta)}, \\ t_2^{B(M)} &= \frac{\theta^2(1-\theta)(2+3\theta-\theta^2)}{\Phi(\theta)}, \end{aligned} \tag{30}$$

where $\Phi(\theta)$, defined in the previous section, is positive.

Comparing the tax rates with and without a merger in country 2, we can establish the following Lemma.

Lemma 2: *Under Bertrand competition, we have that* $t_1^{B(M)} > t_1^{B(N)} > 0$ *and* $t_2^{B(N)} > t_2^{B(M)} > 0$.

Proof: Again, decompose the change in tax rates induced by a merger in country 2 into 'first-order' and 'second-order' adjustment processes as defined just below. First, the merging firms internalize the price competition among them and hence increase their price levels – i.e. $p_j^{B(M)}(\mathbf{t}) > p_j^{B(N)}(\mathbf{t})$ for $j=B,C$ and for any $\mathbf{t}\equiv(t_1,t_2)$, as it can be verified from (23) and (28). Therefore, given the couple of subsidy rates $(t_1^{B(N)}, t_2^{B(N)})$, $\mathbf{p}^{B(N)}$ is no longer the equilibrium outcome in the second stage of the game. But if country 1 maintains unchanged its tax rate at $t_1^{B(N)}$, the vector of prices $\mathbf{p}^{B(N)}$ still maximizes country 2's welfare. It follows that this last must accommodate its tax rate – and in this case must decrease its rate below $t_2^{B(N)}$ – to induce the merged entity to decrease the price of each of the two (differentiated) goods. More specifically, this lower tax rate $\tilde{t}_2$ is such that $p_j^{B(M)}(t_1^{B(N)}, \tilde{t}_2) = p_j^{B(N)}$ (for $j = B, C$) i.e. – using (25), (26) and (28) – $\tilde{t}_2 = \theta^2(1-\theta)(4+8\theta+\theta^2)/\left[2\phi(\theta)\right] < t_2^{B(N)}$. But then for country 1, the tax rate $t_1^{B(N)}$ is no longer welfare-maximizing. Hence, if a merger occurs in country 2, country 1 also accommodates its tax rate – and in this case must increase its rate above $t_1^{B(N)}$. More specifically, the best response $\tilde{t}_1$ of country 1 to a tax rate $\tilde{t}_2$ chosen by country 2 is such that $\tilde{t}_1 = R_1^{B(M)}(\tilde{t}_2)$ i.e. – using (29) – $\tilde{t}_1 = \theta^2(2-3\theta+\theta^2)(2+4\theta+\theta^2)^2/\left[4(1+2\theta-\theta^3)\phi(\theta)\right] > t_1^{B(N)}$. Therefore, a merger in country 2 causes two 'first-order' adjustments on strategic trade policies: a decrease in taxes paid by the two merging firms of country 2 and an increase in taxes paid by the firm of country 1. In turn, the more aggressive tax policy of country 1 and the less aggressive policy of country 2 cause 'second-order' adjustment processes of trade policies. Specifically, starting from $\left(\tilde{t}_1, \tilde{t}_2\right)$, we have successively: $(\tilde{t}_1, R_2^{B(M)}(\tilde{t}_1))$, $(R_1^{B(M)}(R_2^{B(M)}(\tilde{t}_1)), R_2^{B(M)}(\tilde{t}_1))$, etc. With linear best-response functions in tax rates, the sequence converges to the unique equilibrium $(t_1^{B(M)}, t_2^{B(M)})$. Hence, country 1 has further increased its tax rate – i.e. $t_1^{B(M)} > \tilde{t}_1 > t_1^{B(N)}$ – and country 2 has also increased its tax rate – i.e. $t_2^{B(M)} > \tilde{t}_2$ – but this does not compensate the decrease due to the 'first-order' adjustment, so that $\tilde{t}_2 < t_2^{B(M)} < t_2^{B(N)}$ **Q.E.D.**

Intuitively, country 1 uses tax policy to shift the best-response function of its firm upwards to higher price levels in order to induce an increase in the prices settled by the firms located in country 2. When there is a merger in country 2, the effectiveness of the trade policy of country 1 is increased compared to the no-merger case because the two merging firms internalize their mutual responses to the increase in price of the firm located in country 1. We indeed have $\partial p_j^{B(M)}(\mathbf{t})/\partial t_1 > \partial p_j^{B(N)}(\mathbf{t})/\partial t_1$ for $j = B, C$, as one can infer from (23) and (28). In other words, with a merger in country 2, the marginal social benefit of taxing its own firm is higher for country 1 than in the absence of a merger in the other country. It follows that the tax rate maximizing country 1's welfare when a merger occurs in country 2 must be higher than $t_1^{B(N)}$. In country 2, a national merger removes the incentive to use tax policy to internalize the strategic complementarity in price setting between the two domestic firms. There only remains the strategic trade incentive, so that this country still taxes the exports of its firms but at a lower rate than in the pre-merger situation.

Let $\mathbf{p}^{B(M)} = \left(p_A^{B(M)}, p_B^{B(M)}, p_C^{B(M)}\right)$ be the vector of equilibrium prices in case of a merger in country 2. We have

$$\begin{aligned} p_A^{B(M)} &= \frac{(1-\theta)(2+4\theta+\theta^2)}{\Phi(\theta)}, \\ p_j^{B(M)} &= \frac{(1-\theta^2)(2+3\theta-\theta^2)}{\Phi(\theta)}, \quad j=B,C. \end{aligned} \tag{31}$$

Equilibrium welfare with a national merger in country 2 are thus given by

$$\begin{aligned} W_1^{B(M)} &= \frac{(1-\theta)(1+\theta-\theta^2)(2+4\theta+\theta^2)^2}{(1+2\theta)\left[\Phi(\theta)\right]^2}, \\ W_2^{B(M)} &= \frac{2(1-\theta^2)(1+\theta-\theta^2)(2+3\theta-\theta^2)^2}{(1+2\theta)\left[\Phi(\theta)\right]^2}. \end{aligned} \tag{32}$$

3.4 The profitability of a domestic merger

Calculating for each country the welfare difference when the two firms of country 2 merge and when they do not yields the following result.

Proposition 2: *Under Bertrand competition, a national merger in country* 2 *is profitable to both countries independently of* $\theta \in (0,1)$.

Proof: Again, decompose the change in welfare induced by the merger in country 2 into two components: the price effect and the quantity effect. First, as shown by Lemma 2, the merger in country 2 leads to a higher tax rate for firm A (located in country 1), which in turn induces a greater export price for this firm, i.e. $p_A^{B(M)} > p_A^{B(N)}$. Specifically, letting $\Delta^B(p_j) \equiv p_j^{B(M)} - p_j^{B(N)}$ (for $j = A, B, C$) and using (26) and (31), we indeed have for firm A

$$\Delta^B(p_A) = \frac{\theta^3(1-\theta)(2+2\theta-\theta^2)(2+4\theta+\theta^2)}{2\Phi(\theta).\phi(\theta)} > 0. \tag{33}$$

With respect to firms B and C of country 2, they pay lower taxes after the merger, which would induce them to set lower export prices. But, as shown just above, the merger also leads firm A to set a higher export price because of the increased tax burden. Best-response functions being upward sloping, this provides incentives for firms B and C to raise their prices and this incentive is stronger than that due to the decrease in domestic tax rate. Indeed, the best-response function of each firm B and C is shifted towards higher prices because each merging firm now takes into account the impact of one's own increase in price on the marginal profit of its partner. As a result, the export price of each merging firm j (for $j = B, C$) is greater with the merger than in the absence of it, i.e.,

$$\Delta^B(p_j) = \frac{\theta^4(1-\theta^2)(2+4\theta+\theta^2)}{2\Phi(\theta).\phi(\theta)} > 0. \tag{34}$$

Note that $\Delta^B(p_A) > \Delta^B(p_j)$ since this inequality is verified if $\theta^3(1-\theta)(2+2\theta-\theta^2) > \theta^4(1-\theta^2)$, which reduced to $2(1-\theta^2)+\theta > 0$, this last being verified for any $\theta \in (0,1)$.

With respect to the export quantities, let $\Delta^B(q_j) \equiv q_j\left(\mathbf{p}^{B(M)}\right) - q_j\left(\mathbf{p}^{B(N)}\right)$ for $j = A, B, C$. From (19), we have $\Delta^B(q_A) = \left[-(1+\theta)\Delta^B(p_A) + 2\theta\Delta^B(p_j)\right] / [(1-\theta)(1+2\theta)]$ (for $j = B$ or $j = C$), i.e.,

$$\Delta^B(q_A) = -\frac{(2+2\theta-3\theta^2)\Delta^B(p_j)}{\theta(1+\theta-2\theta^2)} < 0, \tag{35}$$

and $\Delta^B(q_j) = \left[-\Delta_j^B(p_j) + \theta\Delta_A^B(p_A)\right] / [(1-\theta)(1+2\theta)]$ (for $j = B, C$), i.e.,

$$\Delta^B(q_j) = \frac{(1+\theta-\theta^2)\Delta^B(p_j)}{(1-\theta^2)(1+2\theta)} > 0. \tag{36}$$

Thus, a merger in country 2 increases both export quantities and export prices of the two firms involved in the merger. Country $2'$s welfare – that is the value of domestic exports – is thus necessarily higher in the merger case. Country 1 benefits from an increase in its export price but suffer from a decrease in its export quantities. However, the impact of the change in price is greater than that of the change in quantity for any value of $\theta \in (0,1)$, so that a merger in country 2 also raises country 1's welfare. This can be understood as follows. Country 1's welfare would be the same in the post- and pre-merger situation if tax rates where set at $(t_1^{B(N)}, \tilde{t}_2)$ leading to $\mathbf{p}^{B(N)}$ (see the proof of Lemma 2). However, the vector of equilibrium prices is now $\mathbf{p}^{B(M)}$, which corresponds to the following (equilibrium) tax rates $t_1^{B(M)} > t_1^{B(N)}$ and $t_2^{B(M)} > \tilde{t}_2$. Then starting from $\mathbf{p}^{B(N)}$, country 1's welfare raises for two reasons: an increase in the tax rate of country 2 (above $\tilde{t}_2$), and an increase in its own tax rate due to the greater effectiveness of its strategic trade policy **Q.E.D.**

With a merger between firms B and C, country 2 does no longer need to use tax policy to internalize the positive externality in price-setting between the two domestic firms. There only remains the strategic trade incentive so that the tax rate for firms B and C is lower than in the pre-merger situation. The merger in country 2 also reinforces the effectiveness of the strategic trade policy of country 1, thus leading this last to set a higher tax rate. Overall, these changes in tax rates result in higher prices for each of the three products. As a result, unlike Cournot competition, a merger in country 2 benefits both countries independently of the degree of product differentiation.

It is interesting to note that with a merger in country 2, firm A raises its price more than firms B and C do. Hence, by gross substitutability, these changes in prices shift market shares from the outsider to the insiders so that country 2 benefits more from the merger than country 1, as it is specified in the Appendix. In a completely unregulated world, the reverse holds in that the merger is more profitable to the outsider(s) than to the insiders (Deneckere and Davidson, 1985).

4 Conclusion

We have analyzed the profitability of mergers in a strategic trade policy environment both in quantity-setting and price setting games. We show that, under Cournot competition, a domestic merger is always profitable to the host country. It is also profitable to the other country, provided firms produce sufficiently differentiated products. These results strongly contrast with those obtained in a *laisser-faire* economy, and also extend the previous work of Huck and Konrad (2004) who consider the case of Cournot competition and homogenous products. The results are reinforced under Bertrand competition in that a domestic merger is profitable to both countries irrespective of the degree of substitutability between the goods.

It should be pointed out that we made the simplest assumptions about cost and demand, and about the number of countries and firms. Nonetheless, the analysis of the impact of mergers in a strategic trade environment with differentiated products proved that mergers cause intricate effects on governments' incentives. One might expect that these effects will carry over to more general functional forms and to larger number of firms and countries. Yet, a more systematic examination of the general conditions under which a domestic merger is profitable to all partners should be carried out.

Finally, our analysis could also be extended to address the profitability of international mergers and this would raise the question of the international ownership structure after the merger(s). For example, Huck and Konrad (2004) assumes 'full indigenization' of the merged entity, which means that the firm that exists after the merger is nationally owned (in the same way as for national mergers). This assumption is reasonable in a context where products are homogenous (and where the marginal cost of production is constant) because a merger between two firms is analytically equivalent to the closing down of one of the merging firm. With a fixed number of differentiated products, an international merger might very well result in a situation where for example the two merging firms belong to two different countries and therefore are subject to different policies. If it is the case, the country hosting one of the merging firm and the firm outside the merger may also find profitable to differentiate its trade policy towards the two firms. Clearly, more research on the profitability of mergers in a strategic trade policy environment is needed.

5 Appendix

5.1 Cournot Competition

In the absence of regulation, the difference in profits (or welfare) for country 1 with and without a merger in country 2 is

$$\tilde{\Pi}_A - \Pi_A^* = \frac{\theta^2(4+4\theta-\theta^2)}{\left[2(1+\theta)(2+2\theta-\theta^2)\right]^2} > 0. \tag{A1}$$

The difference in joint profit (or welfare) for country 2 when firms B and C merge and when they do not – i.e. $\Lambda(\theta) \equiv (\tilde{\Pi}_B + \tilde{\Pi}_C) - (\Pi_B^* + \Pi_C^*)$ – is given by

$$\Lambda(\theta) = \frac{\theta^2\left[1-\theta-2\theta^2+\theta^3\right]}{2(1+\theta)^2\left[2+2\theta-\theta^2\right]^2}, \tag{A2}$$

which is positive for $\theta > 0.555$.

In a strategic trade environment, the welfare difference when the two firms of country 2 merge and when they do not, is given by $\Delta^C(W_i) \equiv W_i^{C(M)} - W_i^{C(N)}$. For country 1, we then have

$$\Delta^C(W_1) = \frac{\theta^6(2-\theta^2)^2\Gamma_1(\theta)}{\left[2\Psi(\theta).\Phi(\theta)\right]^2}, \tag{A3}$$

where $\Gamma_1(\theta) = 4 - 16\theta^2 + 11\theta^4 - 2\theta^5 > (<) 0$ for $\theta < (>) 0.556$.

For country 2, we have

$$\Delta^C(W_2) = \frac{\theta^4(2-\theta^2)(1+\theta-\theta^2)\Gamma_2(\theta)}{2\left[\Psi(\theta).\Phi(\theta)\right]^2} > 0, \tag{A4}$$

where $\Gamma_2(\theta) = 32 + 64\theta - 40\theta^2 - 96\theta^3 + 22\theta^4 + 36\theta^5 - 7\theta^6 > 0$ for any $\theta \in (0,1)$.

We also have

$$\frac{\Delta^C(W_2)}{W_2^{C(N)}} - \frac{\Delta^C(W_1)}{W_1^{C(N)}} = \frac{4\theta^4(4-4\theta^2+\theta^3)\left[\Psi\left(\theta\right)\right]^2}{(4+4\theta-3\theta^2-2\theta^3)\left[(4-3\theta^2)\Phi\left(\theta\right)\right]^2} > 0. \tag{A5}$$

In other words, the rate of increase in welfare in country 2 is larger than that of country 1.

5.2 Betrand Competition

In the absence of regulation, the difference in profits (or welfare) for country 1 with and without a merger in country 2 is

$$\hat{\Pi}_A - \bar{\Pi}_A = \frac{\theta^2(1-\theta^2)(4+4\theta-\theta^2)}{4(1+2\theta)(2+2\theta-\theta^2)^2} > 0. \tag{A6}$$

The difference in joint profit (or welfare) for country 2 when firms B and C merge and when they do not – i.e. $\Gamma(\theta) \equiv (\hat{\Pi}_B + \hat{\Pi}_C) - (\bar{\Pi}_B + \bar{\Pi}_C)$ – is given by

$$\Gamma(\theta) = \frac{\theta^2(1-\theta)[1+4\theta+3\theta^2-\theta^3]}{2(1+2\theta)(2+2\theta-\theta^2)^2} > 0. \tag{A7}$$

Hence, a merger is profitable to both the insiders and the outsider.

In a strategic trade environment, the welfare difference when the two firms of country 2 merge and when they do not, is given by $\Delta^B(W_i) \equiv W_i^{B(M)} - W_i^{B(N)}$. For country 1, we then have

$$\Delta^B(W_1) = \frac{\theta^6(1-\theta)(2+4\theta+\theta^2)^2\xi_1\left(\theta\right)}{4(1+2\theta)\left[\phi\left(\theta\right).\Phi\left(\theta\right)\right]^2} > 0, \tag{A8}$$

where $\xi_1\left(\theta\right) = 4+20\theta+24\theta^2-8\theta^3-17\theta^4+\theta^5 > 0$ for any $\theta \in (0,1)$.

For country 2 we have

$$\Delta^B(W_2) = \frac{\theta^4(1-\theta^2)(1+\theta-\theta^2)(2+4\theta+\theta^2)\xi_2\left(\theta\right)}{2(1+2\theta)\left[\phi\left(\theta\right).\Phi\left(\theta\right)\right]^2} > 0, \tag{A9}$$

where $\xi_2\left(\theta\right) = 32+128\theta+120\theta^2-64\theta^3-90\theta^4+8\theta^5+3\theta^6 > 0$ for any $\theta \in (0,1)$.

We also have

$$\frac{\Delta^B(W_2)}{W_2^{B(N)}} - \frac{\Delta^B(W_1)}{W_1^{B(N)}} = \frac{4\theta^4(4+12\theta+8\theta^2-\theta^3)\left[\phi\left(\theta\right)\right]^2}{(4+8\theta+\theta^2-\theta^3)\left[(4+8\theta+\theta^2)\Phi\left(\theta\right)\right]^2} > 0. \tag{A10}$$

Again, the rate of increase in welfare in country 2 is larger than that of country 1.

References

[1] Brander, J.A. and B. Spencer, 1985, "Export Subsidies and International Market Share Rivalry," *Journal of International Economics* 18, pp. 83-100.

[2] Deneckere, R. and C. Davidson, 1985, "Incentives to Form Coalitions with Bertrand Competition," *Rand Journal of Economics* 16(4), pp. 473-486.

[3] Eaton, J. and G. M. Grossman, 1986, "Optimal Trade and Industrial Policy Under Oligopoly," *Quarterly Journal of Economics* 101(2), pp. 383-406.

[4] European Competition Network, ECN Subgroup Food, 2012, "Report on competition law enforcement and market monitoring activities by European competition authorities in the food sector," ECN Activities in the Food Sector.

[5] Faulí-Oller, R., 1997, "On Merger Profitability in a Cournot Setting," *Economic Letters* 54, 75-79.

[6] Horn, H., and J. Levinsohn, 2001, "Merger Policies and Trade Liberalization," *The Economic Journal* 111, 244-276.

[7] Huck, S. and K. Konrad, 2004, "Merger Profitability and Trade Policy," *Scandinavian Journal of Economics* 106(1), pp. 107-122.

[8] Hudson, D., and C.W. Herndon, 2000, "Mergers, Acquisitions, Joint Ventures, And Strategic Alliances In Agricultural Cooperatives," *Research reports* 15799, Mississippi State University, Department of Agricultural Economics.

[9] Lommerud, K.E., and L. Sørgard, 1997, "Merger and Product Range Rivalry," *International Journal of Industrial Organization* 16, 21-42.

[10] Lommerud, K.E., Straume, O. R. and L. Sørgard, 2008, "National Versus International Mergers in Unionized Oligopoly," *Rand Journal of Economics* 37(1), 212-233.

[11] Perry, M. and R. Porter, 1985, "Oligopoly and the Incentive for Horizontal Merger," *American Economic Review* 75, 219-227.

[12] Richardson, M., 1999, "Trade and Competition Policies: Concordia Discors?," *Oxford Economic Papers* 51(4), 649-64.

[13] Salant, S., Switzer, S., and R. Reynolds, 1983, "Losses from Horizontal Merger: The Effects of an Exogenous Change in Industry Structure on Cournot-Nash Equilibrium," *Quarterly Journal of Economics* 98(2), pp. 185-200.

[14] Schmitz A., and T.G. Schmitz, 2010, "US and EU Agricultural Policy: Divergence or Convergence," in V. Ball, E., Fanfani, R., and L. Gutierrez, eds, *The Economic Impact of Public Support to Agriculture: An International Perspective,* Springer.