National versus international mergers in unionised oligopoly: a welfare analysis

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Abstract

We analyse how the presence of trade union power affects the pattern of mergers in an international oligopoly and the welfare implications thereof. Using a model of endogenous merger formation we find that the equilibrium market structure, if it exists, always implies one or more international merger. Such mergers - which reduce union wages - may improve global welfare if products are not too differentiated. However, the equilibrium market structure coincides with the socially most preferred ownership structure only if products are close to homogeneous.

1 Introduction

International mergers increasingly shape the industrial structure of developed and developing economies alike. Gugler et al. (2003) identify five great merger waves during the past century and point out that the fraction of international mergers has steadily increased. As reported in UNCTAD (2000, 2002), in 1999 the total value of worldwide cross-border mergers and acquisitions amounted to more than 80 per cent of world FDI flows. In the same year, the share in all M&A that was cross-border, in value terms, reached nearly 31 per cent. Furthermore, about 70 per cent of all cross-border M&As are horizontal. In order to give an illustration of the increased importance of transnational corporations, foreign

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affiliates accounted for about 54 million employees worldwide in 2001, compared to 24 million in 1990. This is probably a natural development. At some stage domestic economies of scale are exhausted, so firms naturally look outside the borders of the domestic economy for growth. At the same time economic integration means that not only trade but also the market for corporate control is liberalised. The question remains, though, if private decisions made by firms about the choice between domestic and international mergers are 'correct' from the viewpoint of society.

There is a growing body of research about mergers and merger policy in open economies. Dixit (1984), Barros and Cabral (1994), Long and Vousden (1995), Head and Ries (1997), Richardson (1999), Horn and Levinsohn (2001), Collie (2003) and Neary (2003a, 2003b) are all examples in case. Several features distinguish the present paper. First of all, this is a paper about firms' *choice* between a domestic and a cross-border merger. Several of the above papers assume that the merger is domestic, but since the merger might have various spillovers on foreign agents, the question arises if a national competition authority would admit mergers that reduce world welfare. The answer to this question also depends on how a possible merger affects optimal trade policy in the involved countries, which is a point in much received literature. However, the focus of the present paper is on domestic and cross-border merger as alternative strategies.[1]

The natural starting point then is one of endogenous merger formation. Horn and Persson (2001a) suggest that cooperative game theory could be used to pinpoint which industry structure will materialise when many different mergers are possible. They themselves apply this to an international oligopoly situation in Horn and Persson (2001b).[2] Lommerud et al. (2002), Straume (2003), Huck and Konrad (2001), Saggi and Yildiz (2002) and Yildiz (2002) follow the same track. The advantage of Horn-Persson type models of endogenous mergers is that they predict which mergers will take place, and which will not, without specifying the market for corporate control in detail.[3]

[1] Some papers study how firms in one country may access the market in some other country. Cross-border mergers are studied as one alternative way of access, with greenfield investment and exports as alternatives. See Norbäck and Persson (2003), Bjorvatn (2003) and Bertrand (2003).

[2] The focus in Horn and Persson (2001b) is on how reduced trade costs influence merger patterns in an international oligopoly. More precisely, they suggest that lower trade costs tend to favour international mergers. As will become apparent, this is rather far removed from the points that are highlighted in the present paper.

[3] Theories of sequential mergers, as in Nilssen and Sørgard (1998), also picture mergers as alternatives to each other. A merger at a given point in time can be

The focus of this paper is on the interaction between market power in the product market and in the labour market. Already Dowrick (1989) suggested that oligopoly power in the product market might be an important reason why trade unions have the potential to influence wage setting, but the relationship to unionised labour is so far underresearched in the literature on open economy mergers. A core idea here is that an international merger can tilt the power balance between employers and workers. We will demonstrate that under certain conditions a situation with an international firm that faces two national unions will lead to lower wages than if national mergers had been chosen. Precisely for this reason, international mergers are typically preferred before national ones. But is this the correct choice from a domestic welfare viewpoint? Getting wages down is a transfer from workers to employers that does not increase social welfare. However, the power struggle between capital and labour could mean that the product market becomes more competitive, which would benefit consumers. The aim of this paper is to disentangle questions as these. In an extension to our model we further posit that mergers may also imply additional exogenous cost synergies, e.g. through rationalisation of operations, that increases the productivity of labour, and that this effect is larger for national than for international mergers. Would firms still prefer international mergers even when they are cost-inefficient? Would international mergers at least then be detrimental to welfare?

Our work is also related to the large literature on what world economic integration will imply for highly paid organised labour in the developed economies. Will our wages in the end be set in Beijing - as Freeman (1995) asked - or/and will the unskilled sector suffer massive job losses? The intuitive answer is that a more competitive world economy will punish anyone where rent capture is important for their wage level, but contrary views have been aired, for instance, by Naylor (1998).[4] This literature often studies the effect of *trade liberalisation*, in the sense what happens to wages or wage inequality as the unit cost of exporting products from one national market to another drops? The present work complements these studies by looking at the effect of an internationalised market for corporate control on the situation of organised labour and on the economies where these workers live. A full picture of the impact of globalisation on labour markets should of course ideally

profitable simply because it prevents some other merger at a later stage. This is, however, not models of endogenous mergers, as the merger candidates and the time sequence of possible mergers are exogenously assumed.

[4]Related work can be found in Munch and Skaksen (2002), Straume (2002, 2003), Lommerud et al. (2003) and Pflügler (2003). See also Neary (2002).

portray the combined effect of reduced marginal and fixed costs of trade, easier migration and easier international flow of capital and investments.

The remainder of this paper is organized as follows. In Section 2 we present the structural model and explain the merger formation process. The union wage effects of merger - the crucial feature of the model - are analysed and discussed in Section 3. The profitability of a single two-firm merger is briefly discussed in Section 4, followed by a presentation of the equilibrium market structure in Section 5. Implications for welfare - global and domestic - are discussed in Sections 6 and 7. In an extension of the model, the effects and implications of exogenous merger synergies in national mergers are discussed in Section 8, whereas, finally, some concluding remarks are offered in Section 9.

2 The model

Four ex ante identical firms (owners) are located in two countries, A and B. Owners 1 and 2 are located in country A, whereas owners 3 and 4 reside in country B. Ownership is connected (e.g. through patents) to the production of a specific brand of a differentiated product. Each brand is produced with labour as the only variable factor of production[5], and firms compete in Cournot fashion in a single integrated market.

The market clearing price of brand i is given by the following inverse demand function:

$$p_i = 1 - q_i - b\sum_j q_j, \quad i,j = 1,..,4, \quad i \neq j, \tag{1}$$

where q_i is produced quantity of brand i, and $b \in (0,1)$ represents the degree of product differentiation.[6] Following Singh and Vives (1984), this demand structure is derived from the maximisation problem of a representative consumer whose utility function is given by

$$U = \sum_i q_i - \frac{1}{2}\left(\sum_i q_i^2 + 2b\sum_i\sum_j q_i q_j\right), \quad i,j = 1,..,4, \quad i \neq j. \tag{2}$$

The production technologies are described by the following simple

[5] This means that we abstract from all questions about how unionised wage setting influences the use of capital. For example Staiger (1988) and Agell and Lommerud (1993) have emphasised that the capital movements that are set in motion by unionised wage setting need not be detrimental to unionised workers or the economies in which they operate, even in an open economy perspective.

[6] Lommerud and Sørgard (1997) use a similar demand system, but assume that there are fixed costs associated with establishing brands and that the number of brands is an endogenously determined choice variable.

production function for brand i:

$$q_i = a_i n_i, \tag{3}$$

where n_i is the amount of labour employed in the production of brand i and $a_i \geq 1$ is a measure of labour productivity.

Workers are organised in trade unions. A key assumption of the model is that workers are not able to organise across borders, nor are trade unions in different countries able credibly to coordinate their wage demands.[7] We thus make the assumption that workers are organised in country-specific industry-wide unions.

We adopt the monopoly union model, where wages in each country are unilaterally set by the respective trade unions. Union preferences are characterised by the following Stone-Geary utility functions for the trade unions in countries A and B, respectively:

$$V_A = (w_A - \overline{w})^{\theta} (n_1 + n_2)^{1-\theta}, \tag{4}$$

$$V_B = (w_B - \overline{w})^{\theta} (n_3 + n_4)^{1-\theta}, \tag{5}$$

where $w_A\,(w_B)$ is the wage set by the union in country $A\,(B)$, $\overline{w} < 1$ is the outside wage (that can be earned outside the oligopoly industry), assumed to be equal in both countries, and $\theta \in (0,1)$ represents the relative importance of wages and employment to the unions.

Profits associated with the sale of each particular brand are given by

$$\pi_i = p_i q_i - w_A n_i, \quad i = 1, 2, \tag{6}$$

$$\pi_j = p_j q_j - w_B n_j, \quad j = 3, 4. \tag{7}$$

The game is characterised by the following sequence of moves:

- Stage 1: The equilibrium ownership structure of the industry is determined through bargaining between the owners.
- Stage 2: The trade unions simultaneously and independently set wages.
- Stage 3: The firms simultaneously and independently set quantities.

[7] A model that studies possible collusion among trade unions can be found in Straume (2002).

2.1 Merger formation

The ownership structure of the industry is assumed to be formed through a cooperative game of coalition-formation. We make the assumption that only two-firm mergers are allowed.[8] Each production plant continues to exist after a merger, and it is not possible to move the production of one brand from one plant to another, so the quintessence of a merger is coordination on output decisions among the participating units. With two-firm mergers, we are left with 6 possible market structures, comprising a combined total of 10 possible ownership structures, that could emerge as an equilibrium outcome. Labelling country A as the 'domestic' country, we introduce the following notation to distinguish between the different market structures:

1. No merger: $M_0 = \{1, 2, 3, 4\}$
2. One national domestic merger: $M_N^d = \{12, 3, 4\}$
3. One national foreign merger: $M_N^f = \{1, 2, 34\}$
4. Two national mergers: $M_{2N} = \{12, 34\}$
5. One international merger: $M_I = \{13, 2, 4\}$, $M_I' = \{14, 2, 3\}$, $M_I'' = \{1, 23, 4\}$, $M_I''' = \{1, 24, 3\}$
6. Two international mergers: $M_{2I} = \{13, 24\}$, $M_{2I}' = \{14, 23\}$

The solution procedure is based on Horn and Persson (2001a), who treat the merger process as a cooperative game of coalition-formation, where the players are free to communicate and write binding contracts. Owners that agree on a merger can decide on any division of the firm's profits, but payments between coalitions are not allowed. The approach then involves a comparison of any two possible ownership structures M_i and M_j, where M_i is said to *dominate* M_j if the combined profits of the *decisive group* of owners are larger in M_i than in M_j. The *decisive group* of owners are the owners that are expected to be able to influence whether M_i will be formed instead of M_j, and vice versa. Given the above assumptions, owners belonging to *identical coalitions* in the two structures cannot affect whether M_j will be formed instead of M_i, but all remaining owners can influence this choice and are thus *decisive.*[9]

[8] It is straightforward but space-consuming to extend the model to allow for mergers that include three production units. Three-firm mergers are more likely to be blocked by competition authorites, and the present focus on two-firm mergers also makes the distinction between national and international merger more succint.

[9] See Horn and Persson (2001a) for a formal definition of *decisive owners.*

To give a brief illustration of the main ideas in the model, consider a comparison between the no-merger structure (M_0) and the market structure with one domestic merger (M_N^d). In this case owners 3 and 4 stand alone in both structures, so the decisive owners are the merger participants in M_0, i.e. owners 1 and 2, and dominance relation is determined by whether or not the merger is profitable for the participants. Now consider instead a comparison between a domestic and an international merger, say between M_N^d and M_I. For M_N^d to dominate M_I it is not enough that (the domestic) owners 1 and 2 prefer M_N^d over M_I. If owner 3 is adversely affected by the formation of M_N^d, this owner may want to persuade owner 1 to form M_I instead, by offering a large share of the surplus in this structure. Thus, three owners (1,2 and 3) are decisive, and the dominance relation is determined by a comparison of total profits for these three owners in the two ownership structures.

Finally, the solution concept is the *core*. Those structures that are in the core - i.e. the structures that are *undominated* - are defined as *Equilibrium Ownership Structures* (EOS), which then determine the *Equilibrium Market Structure* (EMS).

3 Market structures and union wages

The outcome of the bargaining game between the owners are highly dependent on the anticipated union wage responses. Assume for the time being that production technologies are identical. For simplicity, we set $a_i = 1$. We denote the equilibrium 'domestic' wage in market structure M_i by $w_A(M_i)$. By a comparison of equilibrium wage expressions for different market structures (see the appendix) we derive the following result:

Proposition 1 *(i)* $w_A(M_{2N}) > w_A\left(M_N^f\right) > w_A\left(M_N^d\right) > w_A(M_0)$
(ii) $w_A(M_0) > w_A(M_I) > w_A(M_{2I})$

We see that there exists an unambiguous ranking of market structures with respect to union wages. Furthermore, using the no-merger structure as a benchmark, a clear pattern arises: union wages are higher in any market structure involving national merger(s) only, whereas the opposite is true in market structures involving international merger(s).[10]

[10]These results are related to Lommerud et al. (2002), who discuss how downstream mergers might influence the prices charged by upstream firms with market power. A trade union can be seen as such an "upstream input supplier". In that paper we point out that the main results, broadly speaking, carries over to models with wage bargaining (rather than wage setting) and/or Bertrand competition. Even though there are differences between the models - the present one being made specif-

The intuition behind these results can be found through a more careful scrutiny of the unions' maximisation problem. The first-order condition for optimal wage setting by the trade union in country A is given by

$$\eta_A \left(\frac{w_A - \overline{w}}{w_A} \right) = \frac{\theta}{1-\theta}, \tag{8}$$

where η_A is the wage elasticity of the total demand for workers in country A, and given by

$$\eta_A = -\frac{\partial \left[n_1 \left(w_A, w_B \right) + n_2 \left(w_A, w_B \right) \right]}{\partial w_A} \frac{w_A}{n_1 \left(w_A, w_B \right) + n_2 \left(w_A, w_B \right)}. \tag{9}$$

Obviously, the first-order condition for wage setting in country B is completely equivalent.

>From (8) it is apparent that different market structures yield different union wages insofar as labour demand elasticities at a given wage level are different. More specifically, we have the standard negative relationship between η_A and w_A. In general, a merger will alter both the demand for labour at the pre-merger wage *and* the wage sensitivity of labour demand, and, as a result, wages will also change.

Consider first a national merger. Such a merger will reduce the degree of product market competition and thus cause labour demand to be less wage sensitive, since the equilibrium market shares of firms are less responsive to wage changes.[11] This implies that labour demand gets less elastic, which results in higher wages. Naturally, this effect is stronger in the market structure with two national mergers. In the case of just one national merger, Proposition 1 confirms that wages are lower in the country of the merger participants. This is due to the effect of the merger on total labour demand. At the pre-merger wages, the merged firm has an incentive to cut back on production, which implies a reduction of labour demand. The outside firms - being free-riders on the merger - have opposite incentives. This implies - as can be deduced from (9) - that labour demand is more elastic for the merged firm. Consequently, there is also a *raising rivals' costs* effect of a national merger in this case.

Now consider an international merger. The crucial feature of such a merger is that the merged firm is able to scale up production at one

ically to portray an international oligopoly - the main mechanisms of the models are similar, so we expect this to be true also in this framwork. Our earlier paper has no mention of welfare analysis, which is of central interest here.

[11] It is straightforward to derive this effect from the labour demand functions, which are suppressed from the analytical exposition due to space limitations. This effect of reduced product market competition on the wage sensitivity of labour demand is also identified by Dowrick (1989).

plant and down at the other, and the two plants involved rely on labour supply from different trade unions. This means that labour demand from each plant of the merged firm gets more responsive to wage differentials between the two trade unions, and thus more elastic. The strength of this effect depends on the substitutability of products in demand. The less differentiated the products are, the more intense is the merger-induced competition between the trade unions. In fact, if products are homogeneous all union rents will be competed away.[12] However, as long as the products are not perfect substitutes, wages will be even lower in the case of two international merger than with one. The intuition is quite straightforward: when only two of the firms merge internationally, the trade unions have weaker incentives to engage in wage undercutting, since labour demand from the non-merged firms are less responsive to wage differentials.

We can study the wage effects of mergers in more detail by looking at the comparative statics effects of changes in the parameters b and θ. Since the qualitatively important distinction is between national and international mergers, and not the number of such mergers, we will consider symmetrical market structures only, i.e. M_0, M_{2N} and M_{2I}. Defining $\Delta_N := w_i(M_{2N}) - w_i(M_0)$ and $\Delta_I := w_i(M_0) - w_i(M_{2I})$ we can use (A.2), (A.11) and (A.19) in the appendix to calculate

$$\frac{\partial \Delta_N}{\partial b} = \frac{\theta b (1-v)(1-\theta)(4+3b-4\theta b)}{(1+b-\theta b)^2 (2+b-2\theta b)^2} \tag{10}$$

$$\frac{\partial \Delta_I}{\partial b} = \frac{2\theta (1-\theta)\left(4+4b+b^2-6\theta^2 b^2\right)(1-v)}{(2\theta b-b-2)^2 (3\theta b-b-2)^2} \tag{11}$$

$$\frac{\partial \Delta_N}{\partial \theta} = \frac{\left(2+4\theta^2 b-6\theta b+3b-4\theta+\theta^2 b^2-2\theta b^2+b^2\right)(1-v)\, b^2}{(1+b-\theta b)^2 (2+b-2\theta b)^2} \tag{12}$$

$$\frac{\partial \Delta_I}{\partial \theta} = \frac{\left(4+4b-8\theta-8\theta b-\theta^2 b^2-2\theta b^2+b^2+10\theta^2 b\right)(1-v)\, b\,(2+b)}{(2+b-2\theta b)^2 (2+b-3\theta b)^2} \tag{13}$$

It is easily confirmed that $\frac{\partial \Delta_N}{\partial b} > 0$ and $\frac{\partial \Delta_I}{\partial b} > 0$, so the effect of product differentiation is unambiguous: less differentiated products will always increase the wage response to a merger. This illustrates the importance of the intensity of product market competition in explaining unions' wage responses to corporate mergers. For the case of international mergers, we have already explained the role of product differentiation, which determines the degree of post-merger inter-union competition. For the case of

[12] From (A.15) and (A.19) in the appendix it is easily confirmed that $b = 1$ yields $w_i = \overline{w}$, $i = A, B$, if firms merge internationally.

national mergers, on the other hand, the wage response is due to reduced product market competition, which makes labour demand less wage sensitive. Naturally, this effect - reduced product market competition - is stronger when products are closer substitutes in demand.

The effect of changes in the union preference parameter, θ, is generally ambiguous. From (12) and (13) we can easily derive that

$$\frac{\partial \Delta_N}{\partial \theta} > (<) \, 0 \quad if \quad \theta < (>) \, \frac{6b + 4 + 2b^2 - 2\sqrt{4 + 4b - b^2 - b^3}}{2b\,(4 + b)}$$

and

$$\frac{\partial \Delta_I}{\partial \theta} > (<) \, 0 \quad if \quad \theta < (>) \, \frac{(2 + b)\left(4 + 2b - 2\sqrt{4 - 6b + 2b^2}\right)}{2b\,(10 - b)},$$

which establishes a hump-shaped relationship between θ and post-merger wage responses. This is quite intuitive: a merger leads to wage changes to the extent that the merger alters the marginal trade-off between wages and employment at the pre-merger wage. This trade-off is of importance when both wages *and* employment matters for the unions, which is especially the case for medium values of θ.

4 Merger profitability

Before we solve for the equilibrium of the endogenous merger game, it is instructive to consider under which circumstances a merger is profitable. With exogenous (and linear) production costs we know that a certain degree of product differentiation is necessary in order to make a two-firm merger profitable (see e.g. Lommerud and Sørgard, 1997). In a Cournot model, a merger without cost savings will lead the merging parties to contract their output, while outsiders expand. The more differentiated products are, the less the merged unit looses market share to outsiders, and for sufficient differentiation a merger is profitable even in the Cournot case. However, when wages are endogenous, the profitability of a merger also depends on union preferences. Using the no-merger equilibrium as a point of comparison, the profitability of a single two-firm merger is illustrated in Figure 1. If the degree of product differentiation is sufficiently high both a national and an international merger is profitable (Area A). On the other hand, if products are closer substitutes a national merger is not profitable. In this case only an international merger is profitable, provided that unions put a sufficiently strong emphasis on wages (Area B). This is because international mergers bring wages down, and if this effect is strong enough, a merger will be profitable. However, if products are close substitutes and unions are highly

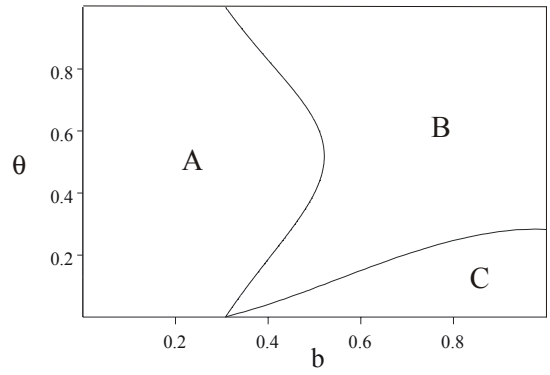

Figure 1: Merger profitability

employment oriented, then the aggressive responses from the outside firms outweigh the wage reduction in an international merger, implying that no merger is profitable (Area C). It is important to note that unions that care very much for employment, will set a wage not too different from the competitive wage level in any case. It is therefore limited how much an international merger can bring wages down. The resulting outcome is similar to what obtains with exogenously given wages.

5 The equilibrium market structure

Under the assumption of identical technologies, the outside wage plays no important role. The equilibrium outcome of the merger game depends on union preferences (θ) and the degree of product differentiation (b). In order to facilitate comparison with the subsequent welfare analysis, we will first consider the special case of rent-maximising unions, which implies $\theta = \frac{1}{2}$. A comparison of the relevant profit expressions along the line of the solution procedure sketched in Section 2.1 yields the following result:

Proposition 2 *With rent-maximising trade unions, the equilibrium market structure is two international mergers if* $b \leq 0.92$ *and one international merger if* $b > 0.92$.

The equilibrium market structure with rent-maximising unions always implies that at least two firms engage in an international merger. Due to the effect on union wages, two international mergers yields higher profits for the owners than no merger, and this structure also dominates any market structure involving national merger(s). However, if b is sufficiently high M_{2I} is dominated by M_I. In other words, given that two

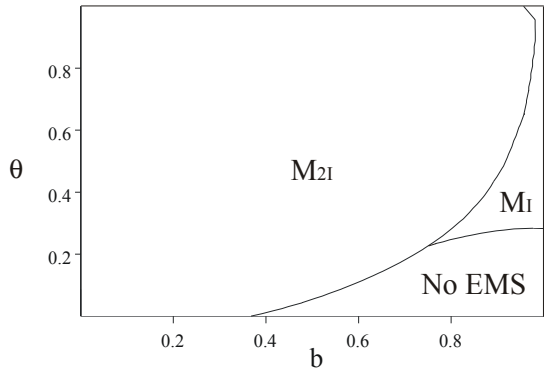

Figure 2: Equilibrium market structure

of the firms merge internationally, a merger between the remaining two owners is not profitable if products are sufficiently close substitutes.

For the general case, with Stone-Geary utility functions and for any value of θ, an analytical characterisation of the equilibrium is infeasible. Instead, the solution is graphically illustrated in Figure 2, which is constructed from plots of the relevant profit comparisons in the (b, θ) plane. The equilibrium market structure, if it exists, still always implies that at least two of the firms merge internationally. However, the combination of highly employment oriented unions (low θ) and products being close substitutes (high b) leads to a situation where no equilibrium ownership structure exists. If unions are relatively employment oriented a single international merger is not profitable, because the wage-reducing effect is not strong enough (cf. Figure 1). At the same time we know, from the argument above, that two international mergers are not an equilibrium structure either for high values of b, since such a market structure is dominated by one international merger. Furthermore, a no-merger structure is dominated by two international mergers. Thus, if the degree of product differentiation is sufficiently low and unions are sufficiently employment oriented, any ownership structure is dominated by at least one other structure and no equilibrium exists.

6 Global welfare

In regard to social welfare the analysis of the previous section immediately raises the following question: will the 'merger market forces' lead to socially desirable market structures? The answer to this question is obviously important in determining the optimal framing of merger policy in open economies, and in this section we will highlight the implications for *global* welfare - defined as the sum of consumers' surplus, profits

and union utility - by making a social ranking of market structures. In order to make consistent welfare comparisons, we use a monetary measure of union utility. More precisely, we consider the special case of rent-maximising unions, which means that global welfare is given by

$$W = U - \sum_{i=1}^{4} p_i q_i + (w_A - \overline{w})(n_1 + n_2) + (w_B - \overline{w})(n_3 + n_4) + \sum_{i=1}^{4} \pi_i \quad (14)$$

which simplifies to

$$W = U - \overline{w} \sum_{i=1}^{4} n_i. \quad (15)$$

Note that the welfare function weighs incomes of different groups in society equally. Wage payments and payments for goods therefore appear as mere transfers of money that do not influence social welfare. In consequence, welfare is decided solely by the value to consumers of the goods produced less the opportunity cost of the labour resource used as input. A straightforward comparison of welfare (using the equilibrium expressions reported in the appendix, with $\theta = \frac{1}{2}$) yields the following social ranking of market structures:

Proposition 3 *(i)* $M_0 \succ M_N \succ M_{2N}$ *for all* b
(ii) $M_I \succ M_{2I}$ *for all* b
(iii) $M_I \succ M_0$ *if* $b > 0.40$
(iv) $M_{2I} \succ M_0$ *if* $b > \frac{1}{2}$

The socially most preferred market structure, from a viewpoint of global welfare, is one international merger if the degree of product differentiation is sufficiently low. Otherwise, no merger is preferred. Comparing Propositions 2 and 3, we see that the merger process actually produces the socially most preferred ownership structure if products are very close substitutes. However, for a wide parameter space what society wants is one international merger but what it gets is two such mergers.

The reason why mergers can be socially optimal here while they would not be in a model with exogenous wages, is that the power struggle between labour and capital not only lower wages, but consumer prices may fall as a result. Since national mergers have no such effect on wages, rather the opposite, they will never be socially optimal. International mergers, though, have the desired effect on wages. However, there can be too much of a good thing. As the model is specified, one international merger brings wages and prices down in a socially preferred way. Yet another international merger will lower wages even more, but now the lack of competition in the output market becomes so acute that the

consumers lose out relative to the situation with only one international merger.

It can be difficult to enforce a competition policy that allows one international merger but not two, since these mergers supposedly are announced at the same time and completely symmetric. Would a no-merger policy be better than a policy that allows any international two-firm merger? Allowing any international merger improves global welfare if $b > \frac{1}{2}$, as is apparent from Proposition 3. The intuition is relatively straightforward: for mergers to improve welfare they must lead to reduced consumer prices, at least for some brands. Such price reductions can only occur if wages are sufficiently reduced as a result of the merger(s). From Proposition 1 we know that only cross-border mergers lead to lower wages, and the lower the degree of product differentiation, the higher the wage reduction due to an international merger.

7 Domestic welfare

The evaluation of different market structures from a perspective of *domestic* welfare may differ significantly from evaluations with respect to global welfare.[13] In order to analyse the impact of mergers on domestic welfare we make a couple of additional assumptions. First, we assume that domestic consumers' surplus constitutes a fraction $\alpha \in (0,1)$ of total consumers' surplus. Second, we assume that profits are divided evenly between the owners taking part in a merger. Due to the symmetry of the model, domestic welfare is given by

$$W^d = \pi_1 + \pi_2 + (w_A - \overline{w})(n_1 + n_2) + \alpha \left(U - \sum_{i=1}^{4} p_i q_i \right), \tag{16}$$

which simplifies to

$$W^d = \alpha \left(U - \sum_{j=3}^{4} p_j q_j \right) + \sum_{i=1}^{2} \left[(1-\alpha) p_i - \overline{w} \right] q_i. \tag{17}$$

Figure 3 depicts the pattern of the most preferred market structure in the (b, α) plane.

By comparing Figure 3 and Proposition 3 we see that there is no conflict between domestic and global interests, from a welfare point of view, as long as a sufficiently high share of consumers reside in the domestic

[13] Konrad and Lommerud (2001) warn that any preferential treatment of domestic firms can be manipulated in the following sense: foreign owners may sell their assets to domestic owners who then receive favourable treatment, but this only makes the domestic buyers willing to pay a higher price for the assets in question, so the real beneficiaries are the original foreign owners.

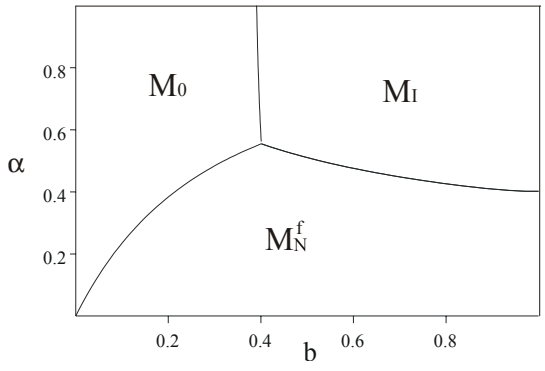

Figure 3: Domestically most preferred ownership structure

country. The outcome is then one international merger for b above 0.4, and no merger otherwise, precisely as a concern for global welfare would dictate. However, if α is sufficiently low the domestically most preferred market structure is a *foreign* national merger, which harms consumers, but benefits domestic firms and workers through higher wages, employment and profits.

Figure 3 illustrates a potential conflict, though, when it comes to coordination of domestic antitrust policies across different countries. Assume that a large share of the consumers, say $\alpha = 0.8$, reside in country A. In this case, the most preferred market structure for Country A is one international merger if products are not too differentiated, and no merger otherwise. However, if 80 per cent of consumers live in country A then at most 20 per cent of consumers in this market live in country B, and this country would consequently prefer a foreign national merger. From Figure 3 it can be seen that the two countries have corresponding interests only if (close to) all consumers in the market reside in either of the two countries and the division of consumers is (close to) 50/50.

Although the domestic welfare ranking of market structures is highly dependent on the importance of domestic consumers' surplus, we are able to derive an unambiguous, and perhaps surprising, result regarding the effect of national mergers on domestic welfare. Let $W^d(M_i)$ denote domestic welfare in market structure M_i. Using the equilibrium expressions presented in the appendix, with $\theta = \frac{1}{2}$, it is easily found that $W^d\left(M_N^d\right) < W^d(M_0)$ and $W^d(M_{2N}) < W^d\left(M_N^f\right)$, which form the basis of the following result:

Proposition 4 *With rent-maximising unions, a domestic merger is always detrimental to domestic welfare.*

This result implies that if national competition policy is governed by

considerations for domestic welfare, as defined by (16), the antitrust authorities should never allow a domestic merger. This holds even if $\alpha = 0$, which means that the proposed merger's effect on consumers' surplus is irrelevant for domestic welfare. Thus, even if a domestic merger is profitable, the decrease in domestic union rents, due to a loss of employment, more than outweighs the increase in profits.

This result contrasts with any idea that lax domestic merger policy can substitute for strategic trade policy or other activist industrial policies to build up national champions. Brander and Spencer (1988) pointed out that in a unionised oligopoly the incentives to use strategic trade policy can be much stronger than in a non-unionised model. Parts of any subsidy to domestic firms will be captured by the unions, so to achieve a given level of low marginal costs (to scare off foreign competitors), subsidies must be increased correspondingly. However, overt subsidies to domestic firms that compete for market shares in an oligopoly are now by and large forbidden by international agreements, and a lax merger policy presents itself as a more hidden way of supporting domestic industry. Proposition 4 highlights the problem with such a policy. Even with exogenous wages a domestic merger will lead to a contraction in production by the merged unit, and such a merger will only be profitable when brands are sufficiently differentiated. When we move to a unionised framework, the contraction in market share implies a loss of employment - and thus rents - for workers. Some of this employment loss is compensated for by higher union wages, but the overall loss to workers is so large that the merger is detrimental to welfare for any degree of product differentiation.

8 National merger synergies

The previous analysis was bad news for anyone wanting to argue that merger policy should be steered towards domestic rather than international mergers, even though the analysis also revealed that equilibrium outcomes only seldom coincide with welfare optimality (be it global or domestic welfare). We here extend the analysis to the case where merger synergies are larger when the merger is national than when it is international. We do this primarily to see if this strengthens the case for a nationally oriented merger policy, and if it does, under which circumstances? We also think it has intuitive appeal that mergers of units that are located geographically closer together also are the ones that can bring about the larger cost savings. Moreover, unions often approve of international mergers and not of domestic ones. An anecdotal example is the Norwegian financial industry, where it seems to be a rule almost without exception that unions prefer international mergers. This seems

hard to reconcile with a theory that predicts that international mergers undermine the bargaining power of labour. Can national merger synergies explain why unions sometimes prefer international mergers in spite of the fact that their power in wage setting is reduced?[14] [15]

We model national merger synergies as an increase in labour productivity. Specifically, for any market structure, let owners participating in national mergers be denoted by the index i, whereas owners participating in international mergers or standing alone are denoted by the index j. We then assume that $a_i = a > 1$ and $a_j = 1$.

How does increased labour productivity affect wages, profits and union utility? Consider the market structure with two national mergers. Using the equilibrium expressions reported in the appendix we can easily derive the following comparative statics results:

$$\frac{\partial w_i}{\partial a} = \frac{\theta}{1+b-\theta b} > 0, \tag{18}$$

$$\frac{\partial \pi_i}{\partial a} = \frac{(1+b)^3 (1-\theta)^2 (a-\overline{w})\,\overline{w}}{2a^3 (1+b-\theta b)^2 (1+2b)^2} > 0 \quad if \quad \overline{w} > 0, \tag{19}$$

$$\frac{\partial V_i}{\partial a} = (1+b)(1-\theta)\left(\frac{a^2(1+2b)\,\theta}{(1+b)(1-\theta)}\right)^{\theta}\left(\frac{2\overline{w}(1-\theta)+a(2\theta-1)}{(1+b-\theta b)(1+2b)\,a^3}\right). \tag{20}$$

An exogenous increase in labour productivity causes unions to increase their wage demands, so part of the productivity gain is offset by higher wages. Nevertheless, for any positive outside wage the firms always benefit from increased labour productivity. The effect on union utility, on the other hand, is ambiguous.[16] Increased labour productivity implies that higher wages is traded for a loss of employment, so whether or not the unions are better off depends on how this trade-off is evaluated. From (20) we find that

$$\frac{\partial V_i}{\partial a} > (<)\, 0 \quad if \quad \theta > (<)\, \overline{\theta} = \frac{a-2\overline{w}}{2(a-\overline{w})}. \tag{21}$$

Thus, an increase in labour productivity increases union utility if the

[14] Spillovers from a merged unit to other firms that are stronger from a domestic merger than an international one, would also make domestic authorities more prone to prefer a national solution. A recent contribution on the international competition for investment with spillovers is Olsen and Osmundsen (2003).

[15] Arguably, the economic theory of merger has focussed to little on the effect of mergers on internal organisation. Huck, Konrad and Müller (2003) is a first step in this direction.

[16] For a related discussion, see Dowrick and Spencer (1994).

unions are sufficiently wage oriented. Equivalently, unions prefer to be less productive if the fear of job loss is great enough.[17]

Without any exogenous synergies, the previous analysis showed that if the firms merge, they always merge internationally. However, if the exogenous synergies associated with national merger are sufficiently strong, firms may instead want to merge nationally. Consider M_{2N}, where all firms merge nationally, as a candidate equilibrium market structure. A necessary (but not sufficient) condition for this market structure to be an equilibrium is that it dominates the structure where all firms merge internationally, M_{2I}. The dominance relation in this case is determined by a comparison of total industry profits in the two market structures. Using (A.14) and (A.22) in the appendix it follows that

$$M_{2N} \quad dom \quad M_{2I} \quad if \quad a > \overline{a} = \frac{\overline{w}\,(1+b)\,(2+b-3\theta b)}{\overline{w}\,(2+b)\,(1+b-\theta b)-\theta b\,(1+2b)} \tag{22}$$

>From (22) we can further derive:

$$\frac{\partial \overline{a}}{\partial \overline{w}} = \frac{(1+b)\,(2+b-3\theta b)\,\theta b\,(1+2b)}{\left[\overline{w}\,(2+b)\,(1+b-\theta b)-\theta b\,(1+2b)\right]^2} < 0 \tag{23}$$

$$\frac{\partial \overline{a}}{\partial \theta} = \frac{b\overline{w}\,(1+2b)\,(2+b)\,(1+b)\,(1-\overline{w})}{\left[\overline{w}\,(2+b)\,(1+b-\theta b)-\theta b\,(1+2b)\right]^2} > 0 \tag{24}$$

$$\frac{\partial \overline{a}}{\partial b} = \frac{\overline{w}\theta\,(1-\overline{w})\,(2-3\theta b^2+5b^2+8b)}{\left[\overline{w}\,(2+b)\,(1+b-\theta b)-\theta b\,(1+2b)\right]^2} > 0 \tag{25}$$

We see that the synergy effect necessary to induce firms to merge nationally rather than internationally, is larger the more wage oriented the unions, and the less differentiated the products. Less differentiated products mean that the wage-reducing effect of international mergers is larger, and more wage oriented unions imply that the scope for wage reductions through international merger is also larger. In addition, more wage oriented unions also means that a larger part of the synergy effect in a national merger is offset by higher wages, which makes national mergers relatively less attractive to the firms. On the other hand, a higher outside wage implies that firms benefit more from increased labour productivity, which means that the synergy effect necessary for the firms to prefer national mergers is smaller.

Once more, a complete analytical characterisation of the equilibrium market structures is infeasible, so we resort to graphical illustrations. Let us first consider the case of rent-maximising unions. In Figures 4

[17]Since $\overline{\theta} < \frac{1}{2}$, a *rent-maximising* union would always approve of measures that improve labour productivity.

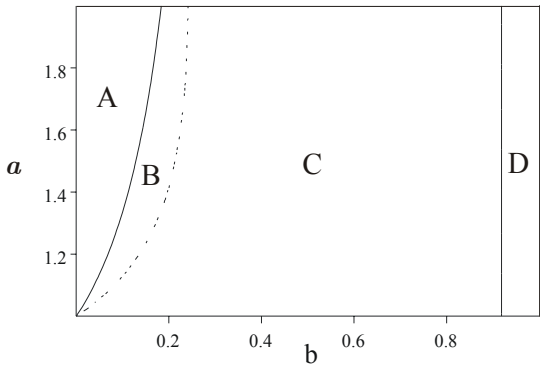

Figure 4: Equilibrium market structure with $\theta = \frac{1}{2}$ and $\overline{w} = \frac{1}{10}$.

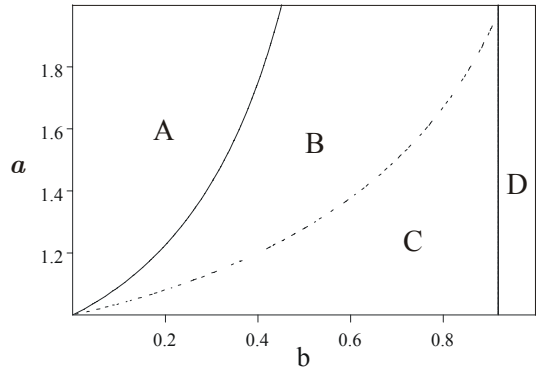

Figure 5: Equilibrium market structure with $\theta = \frac{1}{2}$ and $\overline{w} = \frac{1}{4}$.

and 5 we have illustrated the equilibrium outcome graphically in the (b, a) plane, for two different values of the outside wage. The solid lines indicate the equilibrium market structures: if the synergy effect is sufficiently strong and products are sufficiently differentiated (Area A) the equilibrium market structure is two national mergers, M_{2N}. On the other hand, if products are very close substitutes (Area D) the EMS is one international merger, M_I. Otherwise (i.e. Areas B and C) the EMS is two international mergers, M_{2I}. We see that a higher outside wage increases the scope for national mergers as the equilibrium outcome. Note that the results from Proposition 2 are replicated for $a = 1$.

We have also indicated some implications for global welfare in Figures 4 and 5. In the absence of any synergy effects (i.e. $a = 1$) we know from Proposition 3 that global welfare is always higher if the firms merge internationally, rather than nationally. In this respect, there is a positive correspondence between private and social merger incentives. However,

this result may be overturned when national synergies are present. A comparison of global welfare for the market structures M_{2N} and M_{2I} is indicated by the dotted lines, where $W(M_{2N}) > W(M_{2I})$ to the North-West of the dotted lines. An interesting feature of this variant of the model is the presence of the Area B, where the firms have incentives to merger internationally, but global welfare is higher if firms merge nationally instead. This indicates that the presence of national merger synergies could imply an increased conflict between private and social merger incentives. We also see that the size of Area B increases with the outside wage level.

8.1 Unions' merger preferences

Given that the owners are going to merge, will trade unions prefer the firms to merge nationally or internationally? In the absence of national merger synergies it is easily confirmed that the unions always prefer either no merger or national merger(s). In any case, national mergers is always preferred to international ones. Thus, firms and unions have conflicting interests with respect to the merger decisions. However, if there are any exogenous synergy effects associated with national mergers, such mergers will cause an extra loss of employment for the unions, which is detrimental to union utility if the unions are sufficiently employment oriented. Because of this, there may be situations where the unions would actually prefer the firms to merge internationally, rather than nationally, even though international mergers reduces the unions' power to capture oligopoly rents. This could be the case if the degree of product differentiation is sufficiently low, since international mergers are less effective as wage-reducing devices in this case.

An example of such a situation is illustrated in Figure 6, which indicates the equilibrium market structure in the (θ, a) plane, for $\overline{w} = \frac{1}{5}$ and $b = \frac{1}{4}$.[18] The solid line indicates the equilibrium market structures: if the synergy effect is sufficiently high *and* unions are sufficiently employment oriented (Areas A and B) the EMS is two national mergers. Otherwise (Areas C and D) the EMS is two international mergers. Union preferences for national versus international mergers are indicated by the dotted line, where $V_i(M_{2I}) > V_i(M_{2N})$ to the left of the dotted line. This establishes four different regimes. The firms and the unions have conflicting interests in Areas A and D: in the former regime the firms want to merger nationally, whereas the unions would prefer them to merge internationally instead. The opposite applies in the latter regime (Area D). On the other hand, the unions and the firms have coinciding

[18] We change the presentation from (b, a) plane to (θ, a) plane because θ now is a parameter of central interest.

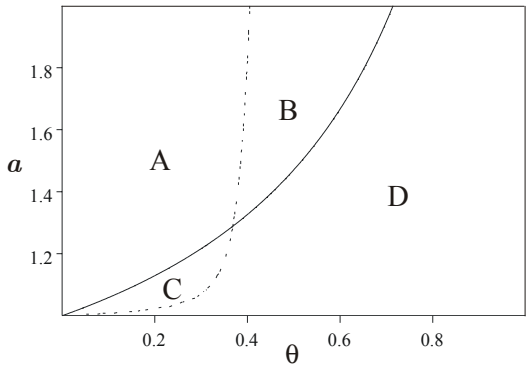

Figure 6: Equilibrium market structures with $\overline{w} = \frac{1}{5}$ and $b = \frac{1}{4}$.

interests in Areas B and C: national mergers are preferred in the former regime, whereas international mergers are preferred in the latter.

Perhaps Area A is especially interesting: we do not only have that unions want to merge internationally rather than domestically, even though this weakens their bargaining position. It might actually be that they want this in situations where the firms they work in want the opposite. Intuitively enough, the latter tends to happen for high values of a and low values of θ, that is, when the increase in labour productivity from a national merger is large - with the possibility of job losses being correspondingly high - and when the union is employment oriented (it wants to a high degree to avoid these job losses).

9 Concluding remarks

In this paper we have explored how the presence of trade union power is likely to affect the pattern of mergers in an international oligopoly. The analysis rests on the assumption that it is easier for workers to organise within, as opposed to across, national borders. For analytical simplicity we have taken this assumption to the extreme by supposing that workers are organised in industry-wide country-specific monopoly unions. In this setting an international merger works as a device to increase the degree of inter-union competition and thus leads to lower wages. National mergers, on the other hand, have the opposite effect on wages. In a framework of endogenous merger formation we have shown that these union wage responses lead firms to merge internationally, rather than domestically. Thus, we have identified the presence of strong trade unions as an independent factor in explaining the rationale behind cross-border merger.

A substantial part of the paper has been devoted to the analysis

of welfare implications of merger in a unionised international oligopoly. Since an international merger leads to lower wages, welfare may be improved if the wage reduction is sufficient to yield reduced consumer prices. On the other hand, since wage reductions make such mergers more profitable they may be undertaken to an excessive degree, from a welfare point of view. In a symmetric setting of four firms (owners), our analysis has shown that although international mergers improve social welfare for a large set parameter values, the equilibrium market structure coincides with the socially most preferred structure - in terms of global welfare - only if products are very close substitutes in demand. If we only compare market structures involving merger(s), global welfare is always higher if firms merge internationally, rather than nationally. In this respect there is a positive correspondence between private and social merger incentives. However, in an extended version of the model, we found that this was not always the case if there are some productivity-enhancing synergies associated with national merger.

Naturally, concerns for domestic welfare do not always coincide with global welfare interests. Our perhaps most noteworthy result regarding domestic merger policy is that a national merger always reduces domestic welfare. Surprisingly, this result holds even if no consumers reside in the domestic country, so that consumers' surplus is not an issue for domestic merger policy.

A Equilibrium employment, wages and profits

A.1 No merger (M_0)

Let $a_i = 1$ for all i. The equilibrium outcome is given by

$$n_i = \frac{(1-\theta)(1-\overline{w})(2+b)}{(2+3b)(2+b-2\theta b)}, \tag{A.1}$$

$$w_i = \frac{\theta(2-b)+\overline{w}(1-\theta)(2+b)}{2+b-2\theta b}, \tag{A.2}$$

$$\pi_i = \frac{(2+b)^2(1-\theta)^2(1-\overline{w})^2}{(2+3b)^2(2+b-2\theta b)^2}. \tag{A.3}$$

A.2 One national merger (M_N)

Consider a merger between owners 1 and 2. Let $a_1 = a_2 = a$ and $a_3 = a_4 = 1$. The equilibrium outcome is given by

$$n_1 = n_2 = \frac{(1-\theta)(b+2)\beta}{2a^2(2+3b-b^2)\left(2+3b+b^2-2\theta^2b^2\right)}, \tag{A.4}$$

$$n_3 = n_4 = \frac{(1-\theta)(1+b)\gamma}{a\left(2+3b+b^2-2\theta^2b^2\right)(2+3b-b^2)}, \tag{A.5}$$

$$w_A = \frac{\theta a(2+b+2\theta b-b^2)+\overline{w}(1-\theta)(1+b)(2+b+2\theta ba)}{2+3b+b^2-2\theta^2b^2}, \tag{A.6}$$

$$w_B = \frac{\theta a(2+b+2\theta b-\theta b^2)+\overline{w}(1-\theta)(b+2)(\theta b+ba+a)}{a\left(2+3b+b^2-2\theta^2b^2\right)}, \tag{A.7}$$

$$\pi_1 = \pi_2 = \frac{(2+b)^2(1-\theta)^2(1+b)\beta^2}{4a^2\left(2+3b+b^2-2\theta^2b^2\right)^2(2+3b-b^2)^2}, \tag{A.8}$$

$$\pi_3 = \pi_4 = \frac{(1+b)^2(1-\theta)^2\gamma^2}{a^2\left(2+3b+b^2-2\theta^2b^2\right)^2(2+3b-b^2)^2}, \tag{A.9}$$

where

$$\begin{aligned}\beta =& 2\theta ba+ba+2a+2ab\overline{w}-3b\overline{w}-2\overline{w}-2a\theta b^2\overline{w}\\ &-b^2a+2\theta b^2\overline{w}+2ab^2\overline{w}-b^2\overline{w}-2a\theta b\overline{w},\end{aligned}$$

and

$$\begin{aligned}\gamma =& -b^2a\theta+2a\theta b^2\overline{w}-\theta b^2\overline{w}-ab^2\overline{w}+b^2\overline{w}-2\theta b\overline{w}\\ &+2\theta ba+2b\overline{w}-3ab\overline{w}+ba+2a-2a\overline{w}.\end{aligned}$$

A.3 Two national mergers (M_{2N})

Let $a_i = a$ for all a. The equilibrium outcome is given by

$$n_i = \frac{(1-\theta)(a-\overline{w})(1+b)}{2a^2(1+b-\theta b)(1+2b)}, \tag{A.10}$$

$$w_i = \frac{\theta a+\overline{w}(1-\theta)(1+b)}{1+b-\theta b}, \tag{A.11}$$

$$\pi_i = \frac{(1+b)^3(1-\theta)^2(a-\overline{w})^2}{4a^2(1+b-\theta b)^2(1+2b)^2}. \tag{A.12}$$

A.4 One international merger (M_I)

Consider a merger between firms 1 and 3. Let $a_i = 1$ for all i. The equilibrium outcome is given by

$$n_1 = n_3 = \frac{(2-b)(1-\theta)(1-\overline{w})(8-4b-3b^2+b^3)}{2(2+3b-b^2)(8-4b-10\theta b-3b^2+10\theta b^2+b^3-2\theta b^3)}, \tag{A.13}$$

$$n_2 = n_4 = \frac{(1-\theta)(1-\overline{w})(8-4b-3b^2+b^3)}{(2+3b-b^2)(8-4b-10\theta b-3b^2+10\theta b^2+b^3-2\theta b^3)}, \tag{A.14}$$

$$w_i = \frac{\theta(1-b)(2-b)(4-b)+(1-\theta)\overline{w}(8-4b-3b^2+b^3)}{8-4b-10\theta b-3b^2+10\theta b^2+b^3-2\theta b^3}, \tag{A.15}$$

$$\pi_1 = \pi_3 = \frac{(8-4b-3b^2+b^3)^2(1-\theta)^2(1-\overline{w})^2(1+b)(2-b)^2}{4(2+3b-b^2)^2(8-4b-10\theta b-3b^2+10\theta b^2+b^3-2\theta b^3)^2}, \tag{A.16}$$

$$\pi_2 = \pi_4 = \frac{(8-4b-3b^2+b^3)^2(1-\theta)^2(1-\overline{w})^2}{(2+3b-b^2)^2(8-4b-10\theta b-3b^2+10\theta b^2+b^3-2\theta b^3)^2}. \tag{A.17}$$

A.5 Two international mergers (M_{2I})

Let $a_i = 1$ for all i. The equilibrium outcome is given by

$$n_i = \frac{(1-\theta)(1-\overline{w})(2+b)}{2(1+2b)(2+b-3\theta b)}, \tag{A.18}$$

$$w_i = \frac{2\theta(1-b)+\overline{w}(1-\theta)(2+b)}{2+b-3\theta b}, \tag{A.19}$$

$$\pi_i = \frac{(2+b)^2(1+b)(1-\theta)^2(1-\overline{w})^2}{4(1+2b)^2(2+b-3\theta b)^2}. \tag{A.20}$$

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