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National versus international mergers in unionised oligopoly*

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Abstract

We analyse how the presence of trade unions affects the pattern of mergers in an international oligopoly and the welfare implications thereof. We find that an international merger results in lower wages for all firms. A national merger results in higher wages, highest for the non-merging firms. Using a model of endogenous merger formation, we find that the equilibrium market structure, if it exists, always implies one or more international mergers. Unless products are close substitutes there are more mergers than socially preferred.

Keywords: Endogenous merger; Merger policy, Welfare; Trade unions

JEL Classification: J51, L13, L41

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1 Introduction

International mergers increasingly shape the industrial structure of developed and developing economies alike.¹ This is probably a natural development. At some stage domestic economies of scale are exhausted. In addition, economic integration means that not only trade but also the market for corporate control is liberalised. The question remains, though, if firms can have strategic reasons for choosing an international rather than a national merger. The purpose of this paper is to apply an international oligopoly model to analyse how the interplay between the labour market and the product market may affect firms' merger decisions. Could it be that firms merge internationally rather than nationally to curb the market power of trade unions? If so, will we observe more international mergers than what would be optimal seen from a welfare point of view, or other types of mergers than the optimal ones?

To analyse such questions, a natural starting point would be the existing models on mergers and merger policy in open economies.² However, most of the existing literature are about domestic mergers with spillovers on foreign agents, and often focusing on the interplay between merger policy and trade policy. In contrast, we focus on firms' *choice* between a domestic and a cross-border merger.³ 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.⁴ We apply this method to solve for the equilibrium market struc-

¹Gugler 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 affiliates accounted for about 54 million employees worldwide in 2001, compared to 24 million in 1990.

²See, e.g., Dixit (1984), Barros and Cabral (1994), Long and Vousden (1995), Head and Ries (1997), Sørsgard (1997), Richardson (1999), Horn and Levinsohn (2001), Collie (2003) and Neary (2003a, 2003b).

³Some 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).

⁴An alternative route is to model acquisitions, where firms behave non-cooperatively in a bidding game. See Kamien and Zang (1990) for such a model. Theories of sequential mergers, as in Nilssen and Sørsgard (1998), also picture mergers as alternatives to each other. A merger at a given point in time can be profitable simply because it prevents some other merger at a later stage. These are, however, not models of endogenous mergers, as the merger candidates and the time sequence

ture when we allow for two-firm mergers in a situation with four firms initially.⁵

The novel feature of the present work is the focus on the interaction between market power in the product market and in the labour market. Already Brander and Spencer (1988), Davidson (1988), Dowrick (1989) and De Fraja (1993) suggested that oligopoly power in the product market might be an important reason why trade unions have the potential to influence wage setting.⁶ Empirical studies suggest that mergers in the product market - which leads to higher concentration - may in fact influence wages. But the picture is mixed. Some studies find that a merger leads to higher wages, while others find the opposite result or no effect at all.⁷ Unfortunately, there are few theoretical studies that can guide us on how mergers are expected to affect wages. The present paper helps to fill this gap, by showing how different types of mergers have distinctly different effect on wages and in turn on profits and welfare.

A core idea in the present paper is that an international merger can tilt the power balance between employers and workers. We study an international Cournot oligopoly with two domestic and two foreign firms, where wages are set by monopoly trade unions. The analysis rests further on the assumption that it is easier for workers to organise within, as opposed to across, national borders.⁸ This notion is most conveniently implemented by letting trade unions be national by assumption: any firm operating in a given economy meets the wage claims of the relevant national union. As long as there are national unions - or at least that unions within a nation cooperate more easily than unions in different

of possible mergers are exogenously assumed.

⁵Horn and Persson (2001b) apply their own method to an international oligopoly situation. They show 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. Lommerud et al. (2003a), Straume (2003), Huck and Konrad (2003), Saggi and Yildiz (2002) and Yildiz (2002) also follow the endogenous merger track in international settings.

⁶For more recent work on unionised oligopoly, see Naylor (1998), Munch and Skaksen (2002), Lommerud et al. (2003b) and Pflügler (2003). See also Neary (2002).

⁷Brown and Medoff (1988), Cremieux et al. (1996) and Peoples et al. (1993) find support for a wage cut following a merger, while McGuckin and Nguyen (2001) find the opposite result. Hekmat (1995) finds no evidence of any link between mergers and wages, while Gokhale et al. (1995) find no or only a limited evidence of a link between takeovers and wages. Finally, Gugler and Yurtoglu (2003) find that mergers have no effect on employment in the US while it leads to lower employment in Europe, which might have to do with the degree of pre-merger wage flexibility.

⁸Formal union cooperation across national borders is indeed very rarely observed. In addition to historical, institutional and cultural explanations, this is probably also explained by the relatively high degree of cross-border immobility of labour.

countries - then an international merger, as opposed to a national one, will imply that the merged firm meets two uncoordinated unions.

Since we model market power both in the input (labour) and output market, a merger will change both output prices and wages. We find that a national merger leads to higher wages. Market shares are less sensitive to wage changes after a merger, and the union exploits this by raising wages. More interestingly, the wage increase is higher for the non-merging than for the merging firm. The driving force is the reshuffling of sales following a merger. Lower production by the merged firm and higher production by the non-merging firms encourages the union serving the non-merging firm to increase its wage more than what is optimal for the union serving the merging firm. Consequently, there is a *raising rivals' cost* effect of a national merger.

We find that an international merger has a distinctly different effect on the unions' wage setting. An international merger would imply that the merged firm is served by two different unions, each producing input to one of the merged firm's two products. Then the merged firm can partly replace sales of one of its products by increasing the sales of the other product. Since an international merger leads to such a flexibility, it triggers competition between the unions. As a result, the unions compete more fiercely and they set a lower wage.⁹

Since a national merger has a raising rivals' cost effect while an international merger leads to lower wages for all firms, it is *a priori* not clear what would be the equilibrium market structure. It turns out that, if there exists a stable equilibrium market structure, it involves either one or two international mergers. Firms merge internationally to trigger a reduction in wages, even though this wage reduction benefits the outsiders as well. We show that when the products are close substitutes there is only one international merger taking place. In such a case the wage reduction following a first international merger is substantial, and leaves only limited potential for a further wage reduction. Then a second international merger would be dominated by the disadvantageous output response from the outside firm, the traditional effect that make mergers unprofitable in Cournot markets.

While firms prefer to merge internationally, it is not obvious that this is the correct choice from a global or domestic welfare point of view. A wage reduction is a transfer from workers to employers that does not increase social welfare, all else equal. However, lower wages may in turn lead to lower product prices. If so, consumers benefit as well. We

⁹This could be called a "second source" argument, even though this is not second sourcing in a literal sense. The paper in the second source literature that is closest to our model (but still quite different) is Choi and Davidson (2003).

find that from a global welfare perspective one international merger is preferred if products are not very differentiated, and otherwise no merger is preferred. It follows that unless products are close substitutes there are more mergers than what is socially preferred. One international merger can be beneficial for society, because the first international merger has a substantial downward effect on wages, which in turn may be large enough to lower product prices as well. However, a second international merger will always have a more limited wage effect, and thus never lead to any benefits for consumers.

Many would argue that the aim of competition authorities is not to maximise global social welfare, but rather the domestic social welfare of one's own country. If a sufficiently small share of the consumers live in the domestic economy, the most preferred market structure is a *foreign* national merger, not one or two international ones. This would harm consumers, but benefit domestic firms and workers through higher wages, employment and profits. We also find that with rent-maximising unions, a domestic merger is always detrimental to domestic welfare. This goes against any idea that lax merger policy domestically, to build up a national champion, would be a good substitute for strategic trade policy.

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 if they are cost-inefficient? In this part of the paper we find that if the synergy effect from a national merger is sufficiently strong and products are sufficiently differentiated, one domestic and one foreign national merger is indeed the equilibrium market structure. We also investigate which type of mergers a union would prefer. The interest of the union is not necessarily well aligned with that of the firm. Perhaps the most interesting observation is the identification of situations where the firms want national mergers to reap the benefits of localised synergies, whereas the unions fear the job losses that is accompanied by the increase in labour productivity. Instead, the unions would prefer international mergers, even though this implies that their power partly is curbed.

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,¹⁰ 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:

$$p_i = 1 - q_i - b \sum_j q_j, \quad i, j = 1, \dots, 4, \quad i \neq j, \quad (1)$$

where q_i is produced quantity of brand i , and $b \in (0, 1)$ represents the degree of product differentiation.¹¹ Following Singh and Vives (1984), this demand structure is derived from the maximisation problem of a representative consumer whose utility function is given by

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

The production technologies are described by the following simple production function for brand i :

$$q_i = a_i n_i, \quad (3)$$

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

¹⁰This 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.

¹¹Lommerud and Sørgaard (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.

demands.¹² 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:

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

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

where w_A (w_B) is the wage set by the union in country A (B), $\bar{w} < 1$ 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.

This particular specification of union utility, where wages in each country are industry-specific rather than plant-specific, is most appropriate when workers in a certain industry are organised by the same industry-wide union *and* wage determination takes place at industry level. This corresponds well with the bargaining institutions in many European countries, where trade unions bargain for uniform wage increases across all firms at industry- or sectorial level.

Alternatively, an industry-wide union could target each firm in the industry separately, with the possibility of different wage settlements at different firms. Allowing for different wages at different plants within the same country would modify some of our results, but the main message of the paper does not qualitatively depend on this assumption. A further discussion of the importance of this assumption is presented in Appendix B.

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

$$\pi_i = p_i q_i - w_A n_i, \quad i = 1, 2, \quad (6)$$

$$\pi_j = p_j q_j - w_B n_j, \quad j = 3, 4. \quad (7)$$

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.

¹²A 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.¹³ 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*.¹⁴

¹³It 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 authorities, and the present focus on two-firm mergers also makes the distinction between national and international merger more succinct.

¹⁴See 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_N^d , *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 appendix A) we derive the following result:

Proposition 1 (i) $w_A(M_{2N}) > w_A(M_N^f) > w_A(M_N^d) > w_A(M_0)$
(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).¹⁵

¹⁵These results are related to Lommerud et al. (2003a), 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

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

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

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

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.¹⁶ 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 labour demand for the merging and non-merging firms, respectively. 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 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 framework. Our earlier paper has no mention of welfare analysis, which is of central interest here.

¹⁶It 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.¹⁷ 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

$$\frac{\partial \Delta_N}{\partial b} = \frac{\theta b (1 - \bar{w}) (1 - \theta) (4 + 3b - 4\theta b)}{(1 + b - \theta b)^2 (2 + b - 2\theta b)^2}, \quad (10)$$

$$\frac{\partial \Delta_I}{\partial b} = \frac{2\theta (1 - \theta) (4 + 4b + b^2 - 6\theta^2 b^2) (1 - \bar{w})}{(2\theta b - b - 2)^2 (3\theta b - b - 2)^2}, \quad (11)$$

$$\frac{\partial \Delta_N}{\partial \theta} = \frac{(2 + 4\theta^2 b - 6\theta b + 3b - 4\theta + \theta^2 b^2 - 2\theta b^2 + b^2) (1 - \bar{w}) b^2}{(1 + b - \theta b)^2 (2 + b - 2\theta b)^2}, \quad (12)$$

$$\frac{\partial \Delta_I}{\partial \theta} = \frac{(4 + 4b - 8\theta - 8\theta b - \theta^2 b^2 - 2\theta b^2 + b^2 + 10\theta^2 b) (1 - \bar{w}) b (2 + b)}{(2 + b - 2\theta b)^2 (2 + b - 3\theta b)^2}. \quad (13)$$

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

¹⁷>From (A.15) and (A.19) in the appendix it is easily confirmed that $b = 1$ yields $w_i = \bar{w}$, $i = A, B$, 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

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

and

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

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 in Cournot oligopoly profitable (see, e.g., Deneckere and Davidson, 1985, and Lommerud and Sørsgard, 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 loses 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

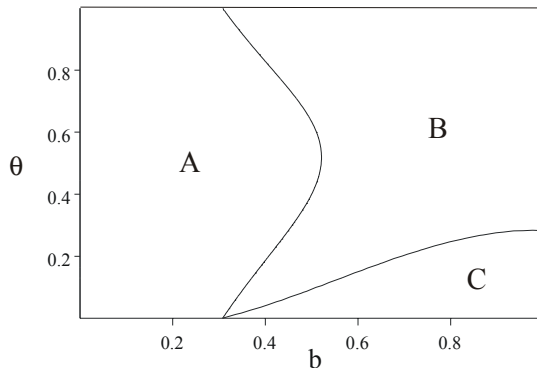


Figure 1: Merger profitability

strong enough, a merger will be profitable. However, if products are close substitutes and unions are highly 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. In such cases, the wage-reducing effect of an international merger is limited. The resulting outcome is similar to what obtains with exogenously given wages. Note also that the result in Salant *et.al.* (1983) is the specific point South East in the figure where $b = 1$ and $\theta = 0$.

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

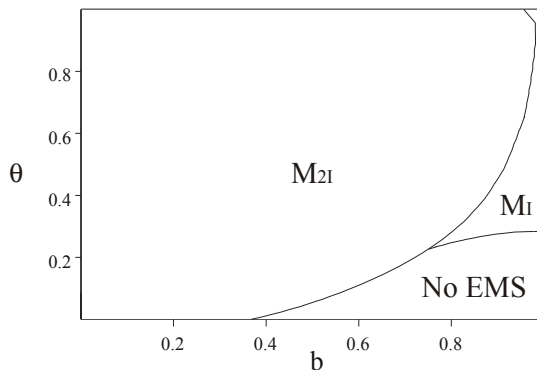


Figure 2: Equilibrium market structure

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 of the firms merge internationally, a merger between the remaining two owners is not profitable if products are sufficiently close substitutes. A large part of the potential wage reduction is exhausted after the first merger, and the main effect of a second merger is to trigger a disadvantageous response from the outsider.

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 for high values of b two international mergers are not an equilibrium structure either, 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

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

which simplifies to

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

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. 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. However, the wage effect of the second merger is typically more limited than the first one. In addition, 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.¹⁸ 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

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

which simplifies to

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

¹⁸Konrad 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.

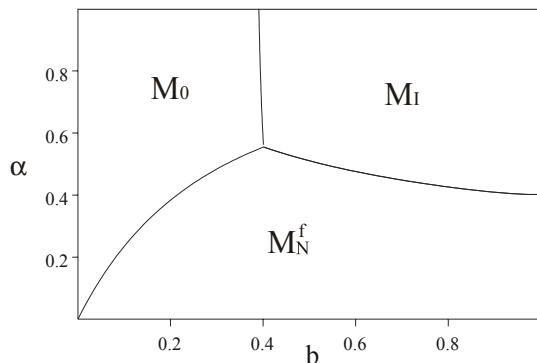


Figure 3: Domestically most preferred ownership structure

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 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 $W^d(M_N^d) < W^d(M_0)$ and $W^d(M_{2N}) < W^d(M_N^f)$, which form the basis

of the following result:

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

The Proposition 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 mirrors the result found in Brander and Spencer (1985). They found that a government should pay a subsidy to a domestic firm operating in a foreign Cournot market. The subsidy is a commitment device which helps the firm to behave more aggressively and shift profits to its own country. In our setting we found that a national merger resulted in higher wages, which is the opposite of paying a subsidy to the firm. This implies that the Cournot firm operating in a foreign market is committed to act less aggressively when it faces higher wages after the merger, thereby reducing the combined sum of profits and union rent. 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.

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. True or not, we want to investigate if this assumption leads to more national mergers. We also think it has some 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 sometimes 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 interna-

tional mergers in spite of the fact that their power in wage setting is reduced?^{19 20}

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:

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

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

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

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.²¹ 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

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

¹⁹Spillovers 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). Keller (2002) and Maurseth and Verspagen (2003) contain evidence that geographical proximity is positive for technological spillovers, which tallies broadly with the notion that national mergers have larger synergy effects than international ones.

²⁰Arguably, the economic theory of merger has focussed too little on the effect of mergers on internal organisation. Huck, Konrad and Müller (2003) is a first step in this direction.

²¹For a related discussion, see Dowrick and Spencer (1994).

Thus, an increase in labour productivity increases union utility if the unions are sufficiently wage oriented. Equivalently, unions prefer to be less productive if the fear of job loss is great enough.²²

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

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

>From (22) we can further derive:

$$\frac{\partial \bar{a}}{\partial \bar{w}} = \frac{(1+b)(2+b-3\theta b)\theta b(1+2b)}{[\bar{w}(2+b)(1+b-\theta b) - \theta b(1+2b)]^2} < 0 \quad (23)$$

$$\frac{\partial \bar{a}}{\partial \theta} = \frac{b\bar{w}(1+2b)(2+b)(1+b)(1-\bar{w})}{[\bar{w}(2+b)(1+b-\theta b) - \theta b(1+2b)]^2} > 0 \quad (24)$$

$$\frac{\partial \bar{a}}{\partial b} = \frac{\bar{w}\theta(1-\bar{w})(2-3\theta b^2+5b^2+8b)}{[\bar{w}(2+b)(1+b-\theta b) - \theta b(1+2b)]^2} > 0 \quad (25)$$

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.

²²Since $\bar{\theta} < \frac{1}{2}$, a *rent-maximising* union would always approve of measures that improve labour productivity.

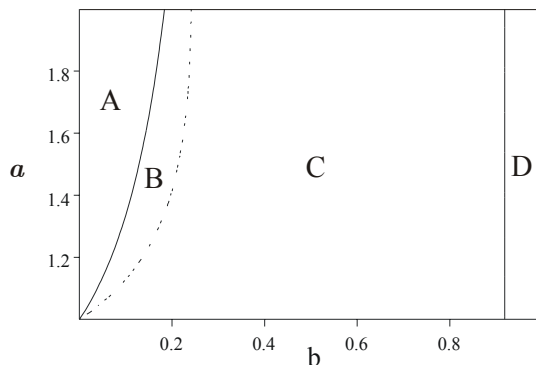


Figure 4: Equilibrium market structure with $\theta = \frac{1}{2}$ and $\bar{w} = \frac{1}{10}$.

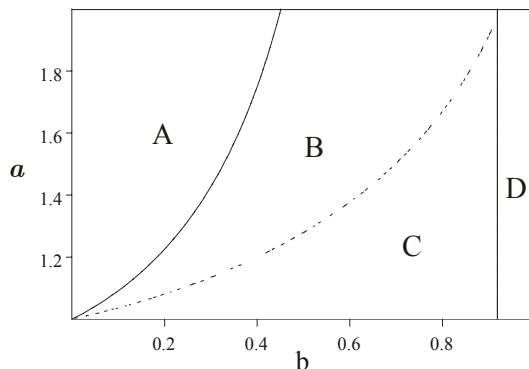


Figure 5: Equilibrium market structure with $\theta = \frac{1}{2}$ and $\bar{w} = \frac{1}{4}$.

Let us first consider the case of rent-maximising unions. In Figures 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. The merged firm does not take fully into account the synergy effect, because the union responds by setting higher wages.

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 $\bar{w} = \frac{1}{5}$ and $b = \frac{1}{4}$.²³ 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

²³We change the presentation from (b, a) plane to (θ, a) plane because θ now is a parameter of central interest.

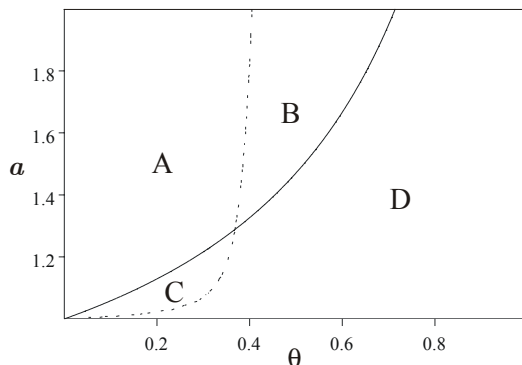


Figure 6: Equilibrium market structures with $\bar{w} = \frac{1}{5}$ and $b = \frac{1}{4}$.

(Area D). On the other hand, the unions and the firms have coinciding 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.

9 Some concluding remarks

In this paper we have explored how the presence of trade union power can affect the pattern of mergers in an international oligopoly. A core idea is that a merger triggers wage changes. Our model can then be seen as a merger model with endogenous costs. But in contrast to the received literature, a merger may affect costs for all firms in the industry.²⁴ While an international merger leads to lower wages for all firms, a national merger has the opposite effect and may even lead to different wages for different firms.

The fact that a merger affect wages for all firms in the industry has important implications for merger policy. As argued in Farrell and Shapiro (1990), a sufficient criterion for a merger to improve welfare is that it leads to lower product prices. They propose a simple criterion for

²⁴The first study that introduced internal cost savings following a merger was Perry and Porter (1985). A merger resulted in an internal change in how firms operated their crucial assets. It triggered lower marginal costs, but only for the merged firm.

when a merger results in lower product prices.²⁵ It specifies how large the reduction in the merging firm's marginal costs must be for consumer prices to fall. If the merging firm lowers product prices, the non-merging firm is expected to do the same. However, our results illustrate that such a criterion can be misguided, because marginal costs change for the non-merging firms as well. One cannot consider only the merging firm's pricing decision to tell whether consumers benefit or not. For example, with an international merger one could have that the merging firm sets a higher output price while the non-merging firm sets a lower output price. By using the Farrell and Shapiro criterion for that particular example one would predict that all prices would go up, while the non-merging firms' prices would actually fall. In fact, non-merging firms may change output prices even if the merging firm does not change its output prices.

According to our predictions, an international merger is expected to lead to lower wages, while a national merger is expected to have the opposite effect on wages. It is an empirical question whether this in fact happens. Unfortunately, there are no empirical studies that tests for the wage effect of an international versus a national merger. One recent study, though, can shed some light on this issue. Gugler and Yurtoglu (2003) test empirically how mergers affect employment. They found that in the UK a domestic merger reduces employment by much more than cross border deals made by UK acquiring firms. This is consistent with a prediction saying that national mergers are more wage-increasing than cross-border mergers. However, one should be careful with the interpretation of their results since their study is not tailored to test the predictions from our theory.²⁶ This calls for a more detailed empirical study. The structure of the labour market should be taken into account when testing directly for wage effects following different kinds of mergers. This is an issue for future research.

²⁵Farrell and Shapiro (1990) consider only an industry with identical products. Werden (1996) extends their criterion to the case of an industry with differentiated products.

²⁶There are some potential problems relating their study to our predictions. First, there are no direct link between employment effects and wage changes. For example, a cutback in employment can be a pure synergy effect and will not necessarily mirror a wage change. Second, in the empirical study there are no data to control for the structure of the labour market. Third, when comparing national and international mergers they do not distinguish between related and unrelated mergers. Only in the former we expect that market power in the product market matters. Note also that for Continental Europe they found only minor differences in the employment effect of national and international mergers.

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

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

$$w_i = \frac{\theta(2 - b) + \bar{w}(1 - \theta)(2 + b)}{2 + b - 2\theta b}, \quad (\text{A.2})$$

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

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

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

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

$$w_A = \frac{\theta a(2 + b + 2\theta b - b^2) + \bar{w}(1 - \theta)(1 + b)(2 + b + 2\theta b a)}{2 + 3b + b^2 - 2\theta^2 b^2}, \quad (\text{A.6})$$

$$w_B = \frac{\theta a(2 + b + 2\theta b - \theta b^2) + \bar{w}(1 - \theta)(b + 2)(\theta b + b a + a)}{a(2 + 3b + b^2 - 2\theta^2 b^2)}, \quad (\text{A.7})$$

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

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

where

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

and

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

B Plant-specific wages

What are the implications of allowing for the possibility of plant-specific wages? Consider the case of *rent-maximising* unions with the following utility functions:

$$V_A = (w_1 - \bar{w}) n_1 + (w_2 - \bar{w}) n_2, \quad (\text{B.1})$$

$$V_B = (w_3 - \bar{w}) n_3 + (w_4 - \bar{w}) n_4, \quad (\text{B.2})$$

where w_i is the wage paid to workers at plant i . This specification could also portray a situation where *plant-specific* unions cooperate in wage setting within each country, but not across borders. Due to the symmetry of the model, results will change only for market structures with one international merger. Consider a merger between owners 1 and 3, i.e., M_I . In this particular market structure, equilibrium wages and profits are given by

$$w_1 = w_3 = \frac{4(1-b)(2-b) + \bar{w}(8-3b^2)}{16-12b+b^2}, \quad (\text{B.3})$$

$$w_2 = w_4 = \frac{(4-3b)(2-b) + 2\bar{w}(4-b-b^2)}{16-12b+b^2}, \quad (\text{B.4})$$

$$\pi_1 = \pi_3 = \frac{(b+1)(8-b^2)^2(2-b)^2(1-\bar{w})^2}{4(2+3b-b^2)^2(16-12b+b^2)^2}, \quad (\text{B.5})$$

$$\pi_2 = \pi_4 = \frac{(4-b)^2(2-b^2)^2(1-\bar{w})^2}{(2+3b-b^2)^2(16-12b+b^2)^2}. \quad (\text{B.6})$$

One international merger implies that the wage elasticity of *plant-specific* labour demand differ across plants. Each union will consequently maximise total rents by setting a lower wage for the merged firm, i.e. $w_1 < w_2$. However, if we compare wages for other market structures it is easily confirmed that the wage responses to merger(s) are qualitatively the same as before. Compared with the case of no merger, one international merger will reduce wages at all plants, and more so for the plants of the merged firm, whereas a second international merger will lead to a further reduction in wages at all plants.

The equilibrium outcome of the full game is slightly modified, though. A comparison of equilibrium profits confirms that two international mergers now dominate all other market structures for every degree of product differentiation. The reason is that a second international merger always entails a larger wage saving gain when the unions are allowed to set plant-specific wages. Consequently, a second international merger is now profitable even if products are (close to) homogenous.

Implications for global welfare are also somewhat modified. By comparing global welfare across market structures it is straightforward to check that two international mergers are now the socially most preferred market structure if $b > 0.56$. The intuition is quite straightforward: with plant-specific wages there is a larger overall wage reduction associated with the second international merger, and this cost-saving effect outweighs the dampening-of-competition effect, leading to lower consumer prices. Thus, allowing for plant-specific wages leads to a somewhat stronger correspondence between private and social merger incentives.

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