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# Co-determination and Merger Incentives from Transfers of Wealth: Firm Owners vs. Workers

**M. Paz Coscollá*, Luis M. Granero****

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**Abstract** When workers can capture rents from their influence on corporate decisions, mergers can become a device to generate transfers of wealth. This paper examines the merger incentives from these transfers of wealth. It is found that worker influence increases merger profitability, in line with the owners' incentive to use mergers to reduce the rents captured by workers. In contrast, the workers' merger incentives are shown to be decreasing in their own degree of influence on the merger decision, in line with the view according to which workers can be used by incumbent managers as a defensive instrument in acquisitions.

**Keywords** Mergers, shareholders, stakeholders, worker influence, co-determination
**JEL classification** G34, J53, L41, P14

## 1. Introduction

Comparative studies suggest that differences in corporate governance may affect the incentives for merger (e.g., see Allen and Gale 2000). In some cases, owners decide on mergers on the grounds of their contribution to shareholder value, leading to shareholder-driven mergers, whereas in others the owners negotiate or at least take into account to some extent those decisions with stakeholders such as workers, leading to relatively stakeholder-driven mergers. Usually, these two situations yield different outcomes in a variety of dimensions, including performance and employment levels.[1] Previous work by Shleifer and Summers (1988), Pointiff et al. (1990), Rosett (1990), Chemla (2005), and Pagano and Volpin (2005), among others, suggests that some of those differences may reflect transfers of wealth: in shareholder-driven mergers the owners can reduce the initial rents captured by workers, whereas in relatively stakeholder-driven mergers the workers may be enabled to capture additional rents.

In this paper, we examine shareholder- and stakeholder-driven mergers in a context where labour influence is explicitly taken into account. Specifically, we consider that worker influence can affect employment and, if it is particularly intensive, merger decisions. On the one hand, labour influence on employment decisions allows for the

* University of Valencia, Economics Faculty, Department of Economic Analysis, Avda Tarongers s/n, 46022 Valencia, Spain. Phone +34 963828246, E-mail: paz.coscolla@uv.es.
** University of Valencia, Economics Faculty, Department of Economic Analysis, Avda Tarongers s/n, 46022 Valencia, Spain. Phone +34 963828246, E-mail: luis.m.granero@uv.es.
[1] See Allen and Gale (2000, ch. 12) and the references therein for evidence on the linkages between corporate governance and acquisitions in a variety of countries.

capture of rents by workers in the form of relatively high employment levels. On the other hand, labour influence on merger decisions affects the extent to which those rents can be altered by means of mergers. Our analysis reveals that these two effects interact in a relevant way and they both shape the competitive stance of the firms in the marketplace, the employment level per firm, and the incentives for merger.

In shareholder-driven mergers the firm owners can use mergers to reduce the rents captured by workers. In our setting, these rents take the form of relatively high levels of employment because worker influence yields employment levels beyond the profit-maximizing level. Since this reduces shareholder value in the margin, mergers based on profitability use to reduce the relative level of employment, which leads to a transfer of wealth that benefits firm owners. Based on that, our analysis reveals that, in general, the incentives for merger based on profitability tend to increase in the presence of worker influence.

This situation contrasts to the one in which owners take into account worker influence in their merger decision. Examples of this include the co-determination system in Austria and Germany, where worker influence is legally made explicit, or the relatively less explicit cases of other European countries and Japan. In the presence of worker influence on merger decisions, mergers arise as relatively stakeholder-based in the sense that they are not exclusively based on profitability. Under such circumstances, we find that the incentives for merger sharply decrease relative to the case of shareholder-based mergers. The reason is that the influence of trade unions on employment increases merger profitability because owners use mergers to reduce the rents captured by workers. Since this harms workers, the workers' incentive for merger turns out to be decreasing *in their own* control rights, which conforms to the view that worker influence can be used by incumbent managers as a defensive device in acquisitions.

On the grounds of these findings, we then consider two extensions. First, we deal with sequential bargaining along the lines of Manning (1987a,b) so that the agents are able to anticipate in their wage negotiations the impact of negotiated wages on subsequent employment levels. We find that here the incentives for shareholder-driven merger decrease and those for stakeholder-driven merger increase, relative to a situation without wage negotiations. Second, we examine how merger incentives can be affected by the anticipation by merging firms' workers that their plants may be closed down due to the merger. We show that this reduces the incentives for both shareholder- and stakeholder-based merger.

As in most of the literature on horizontal mergers (e.g., Salant et al. 1983; Kamien and Zang 1990; Lommerud et al. 2005), our setting leads to a free-rider effect in that merger outsiders benefit from the fall in competition caused by consolidations. Due to that, we depart from Horn and Wolisnsky (1988) in allowing for non-merging firms. Additionally, in line with González-Maestre and López-Cuñat (2001), we find that output/labour-oriented objectives enable firms to increase merger profitability. In our setting this occurs because firm owners use mergers to adjust employment and thus reduce the rents captured by workers even if the conventional free-rider problem in the literature limits the extent to which owners can use mergers to that end. In contrast to these shareholder-based mergers, we also find that labour influence actually reduces the

incentives for merger when that influence extends to the merger decision. In that case, in line with Pagano and Volpin (2005), worker influence tends to limit the incentives for merger. Here, worker influence combines with the free-rider problem in the literature in reducing merger incentives when the mergers are relatively stakeholder-based. More generally, as we have pointed out, this conforms to the viewpoint according to which worker control rights can be used as a defensive device in consolidations.

The rest of the paper is organised as follows. Section 2 introduces our basic setting, Section 3 deals with the results from that setting, Section 4 examines extensions to the basic setting, and Section 5 gathers our main conclusions.

## 2. Framework

Consider $n$ initial firms in an output market where they face an inverse demand given by $P = a - Q$, where $P$ is market price, $a > 0$ and $Q = \sum_i q_i$ is aggregate output. In the product market the firms compete à la Cournot. In order to produce a quantity $q_i$, each firm $i$ must use an amount of labour $L_i$ according to $q_i = L_i$. This production technology leads to a linear production cost, so that any merger of firms will be indifferent with respect to how to split its total production among the merger members. This allows us to focus on the effect of worker influence on the incentives for merger, and it also allows for considering mergers as behaving in a centralized manner.

Firm owners seek to maximize profits, and workers the wage bill. For simplicity, consider a perfectly elastic supply of labour at a unit cost $w$. Assuming $a > w$, this yields firm $i$'s profits as

$$\pi_i = P(Q)q_i - wL_i = (a - Q - w)q_i. \tag{1}$$

When workers are enabled to exert an influence on firm $i$'s output (employment) decision, this decision is considered to follow from

$$\Omega_i = (\pi_i)^{\beta}[(w - \delta)L_i]^{1-\beta}, \quad 0 < \beta \leq 1, \tag{2}$$

where $\beta$ and $1 - \beta$ denote the firm owners' and the trade union's relative bargaining powers, and $\delta$ denotes the reservation wage determined by the worker's marginal disutility of employment. In previous work, Kraft (2001) has shown that the adoption of expression (2) allows for capturing relevant aspects of the system of co-determination, where workers enjoy control rights by law. Formal versions of co-determination take place in Austria and Germany, and informal versions of it can be found in other European countries and Japan. In general, decision-making processes from expression (2) yield relatively labour-oriented firms. In our context, casual observation suggests that in a variety of sectors workers tend to be relatively more concerned on the consequences that mergers may have on employment than on wage rates.

Equation (2) has been previously argued in the literature beyond the axiomatic perspective by Nash (1950, 1953).[2] For instance, from a corporate governance perspective

[2] Further details on expression (2) can be found, for example, in Cahuc and Zylberberg (2004, ch. 7).

each firm's board can be considered as having an objective function balancing the interests of shareholders and workers according to their representation, degree of influence, or legal rights, among other aspects, because shareholders and workers may (directly or indirectly—turnover, strikes, etc.) affect the extent to which the board/manager's objectives are achieved. In these circumstances, the literature on interpersonal comparisons of weighted utility (e.g., Myerson 1991, ch. 8) has shown that the functional form in (2) can emerge when the payoffs of different parties, shareholders and workers in our case, are compared on some $\beta$-weighted utility scales.[3]

If $\beta = 1$, firms maximize profits. Then, each firm $i$ produces $q_i = (a-w)/(n+1)$, it obtains $\pi_i = [(a-w)/(n+1)]^2$, and the incentive for a merger with $m+1$ entities is determined by $f(n,m) = \pi(n-m) - (m+1)\pi(n) = (a-w)^2 F(n,m)$, where

$$F(n,m) = \frac{1}{(n-m+1)^2} - \frac{m+1}{(n+1)^2}. \tag{3}$$

Along the lines of Salant et al. (1983), a merger incentive arises in these circumstances when $f(n,m) > 0$, and thus when $F(n,m) > 0$.

Consider now labour influence along the lines of expression (2). When $\beta < 1$, each firm's output level is $q_i = (a-w)/(n+\beta)$ and its profit is $\pi_i = \beta[(a-w)/(n+\beta)]^2$. Then, if mergers are still based on profitability, the incentive for a merger with $m+1$ entities is determined by $g(n,m,\beta) = \beta(a-w)^2 G(n,m,\beta)$, with

$$G(n,m,\beta) = \frac{1}{(n-m+\beta)^2} - \frac{m+1}{(n+\beta)^2}, \tag{4}$$

where a merger incentive exists if $g(n,m,\beta) > 0$, and thus if $G(n,m,\beta) > 0$.

When $\beta < 1$ and workers are able to influence on the merger decision, we have that an analogous reasoning will lead to merger incentives as determined by[4] $h(n,m,\beta) = \beta^\beta (w-\delta)^{1-\beta}(a-w)^{1+\beta} H(n,m,\beta)$, where

$$H(n,m,\beta) = \frac{1}{(n-m+\beta)^{1+\beta}} - \frac{m+1}{(n+\beta)^{1+\beta}}, \tag{5}$$

and then a merger incentive exists if $h(n,m,\beta) > 0$, that is, if $H(n,m,\beta) > 0$.

Given that the functions $F(n,m)$, $G(n,m,\beta)$ and $H(n,m,\beta)$ are identical for $\beta = 1$, which corresponds to the situation examined in Salant et al. (1983), hereafter the particular case where $\beta = 1$ is considered as a benchmark.[5] In particular, the results below explore merger incentives determined by $G(n,m,\beta)$ and $H(n,m,\beta)$ relative to the merger incentives determined by $F(n,m)$. That is to say, the incentives for merger will be explored in the presence of transfers of wealth from worker influence (when $\beta < 1$) relative to the case in which that influence is absent (when $\beta = 1$).

[3] See Fehr and Schmidt (1999), and Granero (2006). Binmore et al. (1986) show that the asymmetric Nash bargaining solution (as in equation (2) above) can emerge as the limiting situation under sequential strategic bargaining when there is asymmetry in the bargaining procedure or in the parties' beliefs. Further non-cooperative support for that Nash bargaining solution can be found in Britz et al. (2008).

[4] Here it can seen that $\Omega_i = \beta^\beta (w-\delta)^{1-\beta}[(a-w)/(n+\beta)]^{1+\beta}$.

[5] The functions $f(n,m)$, $g(n,m,\beta)$ and $h(n,m,\beta)$ turn out to be identical for $\beta = 1$ as well.

## 3. Results

In the presence of labour influence (i.e., $\beta < 1$), we examine merger incentives when the mergers are based on profitability (expression (4) applies), and when they are not (expression (5) applies). In contrast to the former of these situations, in the latter workers have a say in the merger decision.

Consider first the case where merger incentives rest on profitability, which means that they are determined by $g(n,m,\beta)$, and thus by $G(n,m,\beta)$ as in (4). These mergers can be thought of as shareholder-driven because they are determined by their contribution to shareholder value.

The following result examines the role of labour influence on shareholder-driven merger incentives:

**Proposition 1.**

(i) *The greater the bargaining power of workers, the greater the incentives for shareholder-driven merger.*

(ii) *If a merger is profitable in the absence of worker participation, then it is also profitable in the presence of worker participation.*

**Proof.** Denote by $m^* + 1$ the minimal number of merger participants for the merger to be profitable for given $n$ and $\beta$. Since $g(n,\varepsilon,\beta) < 0$ and $\partial g(n,0,\beta)/\partial m < 0$ for any $n > 1$ and $\varepsilon,\beta \in (0,1)$, and $\partial^2 g(n,m,\beta)/\partial m^2 > 0$ for any $n > 1$, $m \in (1,n-1)$ and $\beta \in (0,1)$, it follows that a positive value of $m^*$ exists. In addition, $g(n,m,\beta) > 0$ if and only if $\underline{m} < m < \overline{m}$, where $\underline{m}$ and $\overline{m}$ are the lower and the upper roots to $g(n,m,\beta) = 0$, respectively. It can be seen that $\underline{m} > 0$ and $\overline{m} + 1 > n$, so that $m^*$ is unique. With $\beta = 1$ this gives way to an analogous reasoning for $f(n,m)$. Then, from equations (3) and (4) we can write $f(n,m) > 0$ if and only if $m+1 < (n+1)^2/(n+1-m)^2$, and $g(n,m,\beta) > 0$ if and only if $m+1 < (n+\beta)^2/(n+\beta-m)^2$. In order to use these facts, we now define the function $\psi(n,m,\beta) = (n+1-m)/(n+\beta-m)$. For $m = 0$ it turns out that no merger takes place, and then $\psi(n,0,\beta) = (n+1)/(n+\beta)$ and $f(n,0) = g(n,0,\beta)$. From that point, the greater the value of $m$, the larger the size of the merger. Therefore, the result follows from the fact that $\partial\psi/\partial m$ is positive and decreasing in $\beta$ for all $\beta < 1$. □

The economic intuition of this result relies on the transfers of wealth from mergers. In particular, when mergers are based on profitability, merger incentives are determined by the transfers of wealth from workers to the firm owners. In the current context, this takes the form of adjustments in employment. Specifically, shareholders can use mergers to reduce the total employment level of the merging entities due to the effect of mergers on output rates. A direct effect from mergers is that they increase the relative size of the firms that remain active (the number of firms falls), so that each remaining firm produces more in the post-merger situation than each firm individually produced before the merger. Since this is identical to all the firms, merger outsiders also benefit from the merger, and thus the entity resulting from the merger ends up producing an output level lower than the total level initially produced by all the merger insiders. Based on that, the firm owners can use mergers as a device to reduce the total

amount of labour in the merging firms. Given that the bargaining power of workers increases employment beyond the profit-maximizing level, it follows that the greater this bargaining power, the greater the merger incentive based on profitability because shareholders can use mergers as a device to compensate for the bargaining power of workers by reducing the total amount of labour in the merging entities, which in turn contributes to shareholder value.

**Table 1.** Merger profitability in the absence of worker influence versus the cases with worker influence: numerical examples

| $n$ | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 50 | 100 | 500 | 1000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\beta = 1.0$ | 100 | 100 | 100 | 80 | 83 | 86 | 88 | 89 | 90 | 90 | 92 | 96 | 97 |
| $\beta = 0.9$ | 100 | 100 | 100 | 80 | 83 | 86 | 88 | 89 | 90 | 90 | 92 | 96 | 97 |
| $\beta = 0.8$ | 100 | 100 | 100 | 80 | 83 | 86 | 88 | 89 | 80 | 90 | 92 | 96 | 97 |
| $\beta = 0.7$ | 100 | 100 | 75 | 80 | 83 | 86 | 88 | 89 | 80 | 90 | 92 | 96 | 97 |
| $\beta = 0.6$ | 100 | 100 | 75 | 80 | 83 | 86 | 88 | 78 | 80 | 88 | 91 | 96 | 97 |
| $\beta = 0.5$ | 100 | 100 | 75 | 80 | 83 | 86 | 88 | 78 | 80 | 88 | 91 | 96 | 97 |
| $\beta = 0.4$ | 100 | 67 | 75 | 80 | 83 | 86 | 75 | 78 | 80 | 88 | 91 | 96 | 97 |
| $\beta = 0.3$ | 100 | 67 | 75 | 80 | 83 | 86 | 75 | 78 | 80 | 88 | 91 | 96 | 97 |
| $\beta = 0.2$ | 100 | 67 | 75 | 80 | 83 | 71 | 75 | 78 | 80 | 88 | 91 | 96 | 97 |
| $\beta = 0.1$ | 100 | 67 | 75 | 80 | 83 | 71 | 75 | 78 | 80 | 88 | 91 | 96 | 97 |

Note: $n$ is the initial number of firms.

The values in Table 1 illustrate Proposition 1. It shows the minimal number of merger participants for a merger to be profitable, $m^* + 1$ with $m^* = m^*(\beta)$, for different values of $\beta$ and $n$ (in percentage). Compared with the case where workers exert no influence on corporate decisions ($\beta = 1$), the presence of worker influence leads to some remarkable differences. First, instead of the 80 percent rule necessary for a merger to be profitable in Salant et al. (1983), here a lower percentage is enough. Second, the specific percentage necessary for a merger to be here profitable is decreasing in the bargaining power of workers. These features reflect that worker participation tends to increase the incentives for shareholder-based merger because these mergers can be used as a device to reduce employment levels and thus transfer wealth from workers to shareholders by moving employment levels nearer to the profit-maximizing level.

Now consider worker influence on the merger decision, so that merger incentives are determined by $h(n,m,\beta)$, and thus by $H(n,m,\beta)$ as in (5). These mergers can be thought of as relatively stakeholder-driven in the sense that they are not only based on their contribution to shareholder value but also on their contribution to the workers' interests. In this context, the following result examines the incentives for stakeholder-based merger:

**Proposition 2.**

(i) *The greater the bargaining power of workers, the lower the incentives for stakeholder-based merger.*

(ii) *If a merger is not profitable in the absence of worker participation, then there are no incentives for stakeholder-based mergers in the presence of worker participation.*

**Proof.** The proof is analogous to that of Proposition 1. Specifically, from (3) and (5) we have $f(n,m) > 0$ if and only if $m+1 < (n+1)^2/(n+1-m)^2$, and $h(n,m,\beta) > 0$ if and only if $m+1 < [(n+\beta)/(n+\beta-m)]^{1+\beta}$. Define $\phi(n,m,\beta) = (n+1-m)^2/(n+\beta-m)^{1+\beta}$. Then $\phi(n,0,\beta) = (n+1)^2/(n+\beta)^{1+\beta}$ and $f(n,0) = h(n,0,\beta)$, and thus the result follows from the fact that $\partial\phi/\partial m$ is negative and increasing in $\beta$ for all $\beta < 1$. □

The explanation of this result is as follows. In the presence of labour influence on output (employment) decisions, Proposition 1 shows that the profitability of mergers increases on the grounds of the owners' incentive to use mergers in order to reduce the rents captured by workers. Since this harms workers, it reduces the workers' incentives for merger. As a consequence, if owners negotiate merger decisions with workers to some extent, the second effect limits the merger incentive from the first effect. In that context, Proposition 2 shows that the second effect dominates, reducing the overall incentives for merger based on negotiations between owners and workers. The reason is that labour influence induces an employment level beyond the profit-maximizing level, and this makes marginal profit to be negative when the workers' marginal utility of income is still positive. Hence, Proposition 2 suggests that workers lose more rents, at least in the margin, than owners gain from mergers in the face of an employment fall, making the workers' lower incentive for merger to prevail.

**Table 2.** Merger profitability in the absence of worker influence versus the cases with worker influence: numerical examples

| $n$ | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 50 | 100 | 500 | 1000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\beta = 1.0$ | 100 | 100 | 100 | 80 | 83 | 86 | 88 | 89 | 90 | 90 | 92 | 96 | 97 |
| $\beta = 0.9$ | 100 | 100 | 100 | 100 | 83 | 86 | 88 | 89 | 90 | 92 | 93 | 97 | 98 |
| $\beta = 0.8$ | 100 | 100 | 100 | 100 | 100 | 86 | 88 | 89 | 90 | 92 | 94 | 97 | 98 |
| $\beta = 0.7$ | 100 | 100 | 100 | 100 | 100 | 100 | 88 | 89 | 90 | 94 | 95 | 98 | 99 |
| $\beta = 0.6$ | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 89 | 90 | 96 | 96 | 98 | 99 |
| $\beta = 0.5$ | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 96 | 97 | 99 | 99 |
| $\beta = 0.4$ | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 98 | 98 | 99 | 100 |
| $\beta = 0.3$ | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 98 | 99 | 100 | 100 |
| $\beta = 0.2$ | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| $\beta = 0.1$ | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Note: $n$ is the initial number of firms.

Table 2 illustrates the qualitative features from this proposition, where mergers are negotiated with workers. It shows the minimal number of merger participants for negotiated merger incentives to arise, $m^{**}+1$ with $m^{**} = m^{**}(\beta)$, for different values of $\beta$ and $n$ (in absolute terms and percentage). Compared with the case where workers

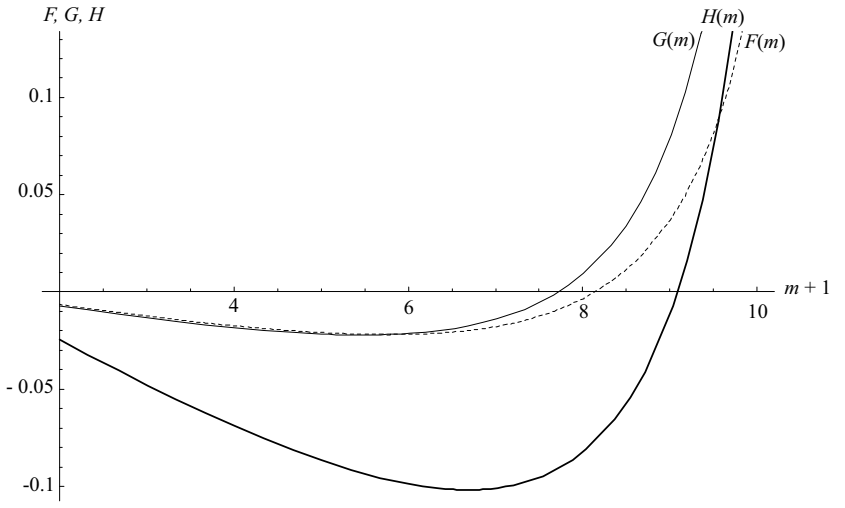


**Figure 1.** Comparing merger decisions. An example: $n = 10$, $\beta = 0.5$.

exert no influence on corporate decisions ($\beta = 1$), worker influence at the level of the merger decision reduces the incentives for merger. First, instead of the 80 percent rule necessary for a merger to be profitable in Salant et al. (1983), here a greater percentage tends to be required. Second, the specific percentage necessary for a merger incentive to arise here is increasing in the bargaining power of workers.

These qualitative features contrast to those from Proposition 1 in Table 1. Figure 1 graphically illustrates this for a parameterization with 10 initial firms and $\beta = 0.5$. With $m+1$ merging firms a merger incentive exists when $F(m) > 0$ in the case of shareholder-based mergers without worker participation (benchmark), when $G(m) > 0$ in the case of shareholder-based mergers with worker participation, and when $H(m) > 0$ in the case of stakeholder-based, negotiated mergers. Given that $F(m) = 0$ for a value of $m$ greater than that for which $G(m) = 0$, Figure 1 reveals that a lower percentage of merger participants is required for the merger to be profitable in the presence of worker influence. Analogously, given that $F(m) = 0$ for a value of $m$ lower than that for which $H(m) = 0$, a higher percentage of merger participants is required for merger incentives to arise when the merger is a stakeholder-based, negotiated merger. In fact, a general property in negotiated mergers ensures that if the bargaining power of workers is sufficiently large (recall that this is summarized by $1-\beta$), then there are no merger incentives beyond the monopoly merger in which all the firms merge to monopolize the market:

**Proposition 3.** *Given an initial number of firms $n > 1$, there exists a positive threshold value of $\beta$, denoted by $\beta^*$, such that for all $\beta < \beta^*$ there are no merger incentives for any stakeholder-based merger with $m+1 < n$ merging firms.*

**Proof.** Making use of equation (5), we can write $h(n,m,\beta) = 0$ if and only if it holds that $m+1 = [(n+\beta)/(n+\beta-m)]^{1+\beta}$. Given that $m+1$ stands for the number of merger participants, the latter equation yields $\beta^*$ implicitly as a function of $n$ for $m+1 = n$ because then Proposition 2 implies that no merger incentive can arise for any $\beta < \beta^*$, whence $\beta^*$ is determined by $n = [(n+\beta^*)/(1+\beta^*)]^{1+\beta^*}$. □

This proposition suggests that an increase in the number of firms reduces the extent to which merger incentives arise when the mergers are negotiated, and that this occurs to an extent such that no incentives for merger do arise (except for a degenerate monopoly merger) when the bargaining power of workers is relatively large. This means that worker influence can give rise to a relevant defensive instrument to discourage acquisitions. Degenerate monopoly mergers aside, Table 2 shows for example that with 5, 10 and 100 initial firms no incentives for negotiated merger arise when the bargaining power of workers is greater than 0.1, 0.5 and 0.8, respectively.

## 4. Extensions

### 4.1 Bargaining over wages

A natural extension to the framework above is to allow for wage negotiations. In order to examine this extension, we consider a version of the sequential bargaining in Manning (1987a,b) with an initial stage in which a bargaining over wages takes place. This timing allows for exploring strategic effects based on the extent to which wage negotiations anticipate strategically the impact of wages on subsequent employment levels (the wage negotiated in a firm influences not only this firm's subsequent employment/output level but also its competitors employment/output levels). In order to examine this extension, consider for the sake of simplicity the same relative bargaining power in this stage and in the stage in which the employment/output level is negotiated.

Solving the model backwards, firm $i$'s output follows from the maximization of

$$\Omega_i = (\pi_i)^{\beta}[(w_i-\delta)L_i]^{1-\beta}, \quad 0 < \beta \leq 1,$$

given the output of the firm's competitors. It is easy to check that, in equilibrium, this yields $q_i = [a\beta - (n+\beta+1)w_i + \sum_{j\neq i} w_j]/[\beta(n+\beta)]$, from where each firm's profit can be written as $\pi_i = [a\beta - (n+\beta+1)w_i + \sum_{j\neq i} w_j]^2/[\beta(n+\beta)^2]$.

Taking the outcome from this stage into account, let us now consider wage setting. The wage negotiated in each firm $i$ follows from the maximization of

$$\Omega_i = (\pi_i)^{\beta}[(w_i-\delta)L_i]^{1-\beta} = \frac{(w_i-\delta)^{1-\beta}}{\beta}\left[\frac{a\beta-(n+\beta+1)w_i+\sum_{j\neq i} w_i}{n+\beta}\right]^{1+\beta}.$$

For each $i$, this leads to $w_i = w = \delta + (a-\delta)\beta(1-\beta)/[n(1+\beta)-1+\beta]$ as the symmetric equilibrium wage. Then, we can compute the symmetric equilibrium output level as $q_i = q = (a-\delta)[n(1+\beta)-1+\beta^2]/(n+\beta)[n(1+\beta)-1+\beta]$, which yields the equilibrium profits as $\pi_i = \pi = \beta(a-\delta)^2[n(1+\beta)-1+\beta^2]^2/\left[(n+\beta)\left(n(1+\beta)-1+\beta\right)\right]^2$ for any $0 < \beta < 1$.

From the equilibrium profit level, $\pi$, if mergers rely on profitability the incentive for a merger with a total number of $m+1$ merging entities is determined by $\hat{g}(n,m,\beta) = \pi(n-m) - (m+1)\pi(n) = \beta(a-\delta)^2\hat{G}(n,m,\beta)$, where

$$\hat{G}(n,m,\beta) = \left[\left(\frac{\alpha(n,m,\beta)}{n-m+\beta}\right)^2 - (m+1)\left(\frac{\gamma(n,\beta)}{n+\beta}\right)^2\right], \tag{6}$$

and

$$\alpha(n,m,\beta) = \frac{(n-m)(1+\beta)-1+\beta^2}{(n-m)(1+\beta)-1+\beta}, \quad \gamma(n,\beta) = \frac{n(1+\beta)-1+\beta^2}{n(1+\beta)-1+\beta}. \tag{7}$$

Here a merger incentive exists if $\hat{g}(n,m,\beta) > 0$, and thus if $\hat{G}(n,m,\beta) > 0$. By comparing this with the model without wage negotiations we obtain:

**Proposition 4.** *The incentives for merger based on profitability are lower in the presence of wage negotiations (previous to employment/output negotiations) than in the absence of wage negotiations.*

**Proof.** From equation (7), we have that $\gamma(n,\beta) > \alpha(n,m,\beta)$ if and only if $[n(1+\beta)-1+\beta^2][(n-m)(1+\beta)-1+\beta] > [n(1+\beta)-1+\beta][(n-m)(1+\beta)-1+\beta^2]$, and this holds for all $\beta \in (0,1)$. Therefore, for $n > 1$ and $m < n-1$ we can write $[\gamma(n,\beta)/\alpha(n,m,\beta)]^2 > 1$ for all $\beta \in (0,1)$. From (4) we have that $G(n,m,\beta) > 0$ if and only if $(n+\beta)^2 > (m+1)(n-m+\beta)^2$. From (6) we have that $\hat{G}(n,m,\beta) > 0$ if and only if $(n+\beta)^2 > (m+1)(n-m+\beta)^2[\gamma(n,\beta)/\alpha(n,m,\beta)]^2$. Hence, for $0 < \beta < 1$ it follows that if $\hat{G}(n,m,\beta) > 0$ then $G(n,m,\beta) > 0$, whereas there are values of $n > 1$ and $m < n-1$ such that $G(n,m,\beta) > 0$ and $\hat{G}(n,m,\beta) < 0$. □

This proposition suggests that wage negotiations tend to reduce the incentives for merger when those negotiations anticipate the impact of wages on output. Specifically, wage negotiations in a firm anticipate not only the impact of the negotiated wage in the firm's output but also in the rivals' output. While the output of a firm is decreasing in its own wage, the output of the firm's competitors is increasing in the firm's wage. This leads to two effects. First, there is a direct effect due to the very presence wage negotiation: given a workers' bargaining power, the negotiated wage in each firm becomes higher than in the absence of wage negotiations, which reduces employment and thus output. Second, there is a strategic effect under plant-versus-plant negotiations: each firm has an incentive to reduce its negotiated wage in order to induce lower subsequent levels of employment and thus output by its rivals, which allows the firm to capture a higher market share. In equilibrium, the first effect dominates, then industry output falls under wage negotiations, and thus the output level becomes closer to the monopoly output level, thereby making less attractive mergers as a way to achieve configurations closer to the monopoly configuration.[6]

[6] Industry-wide wage negotiations would eliminate the strategic effect because wage negotiations at the sector level would internalize that plant-versus-plant effect. In that case, the negotiated wage would be higher than without negotiation (because of the workers' bargaining power) and also higher than with plant-

Consider now worker influence, so that merger incentives are determined by $\hat{h}(n,m,\beta) = \Omega(n-m) - (m+1)\Omega(n) = \beta^{\beta}(a-\delta)^{1+\beta}\hat{H}(n,m,\beta)$, where in equilibrium

$$\begin{aligned}\hat{H}(n,m,\beta) &= \left[\left(\frac{\alpha(n,m,\beta)}{n-m+\beta}\right)^{1+\beta}\left(\frac{(a-\delta)\beta(1-\beta)}{(n-m)(1+\beta)-1+\beta}\right)^{1-\beta} - \right. \\ &\quad \left. -(m+1)\left(\frac{\gamma(n,\beta)}{n+\beta}\right)^{1+\beta}\left(\frac{(a-\delta)\beta(1-\beta)}{n(1+\beta)-1+\beta}\right)^{1-\beta}\right], \qquad (8)\end{aligned}$$

and a merger incentive exists if $\hat{h}(n,m,\beta) > 0$, and thus if $\hat{H}(n,m,\beta) > 0$. By comparing this with the model without wage negotiations we obtain the following result:

**Proposition 5.** *The incentives for stakeholder-based merger are greater in the presence of wage negotiations (previous to employment/output negotiations) than in the absence of wage negotiations.*

**Proof.** From (7) we define the following function:

$$\begin{aligned}\Gamma(n,m,\beta) &= \left(\frac{\gamma(n,\beta)}{\alpha(n,m,\beta)}\right)^{1+\beta}\left(\frac{(n-m)(1+\beta)-1+\beta}{n(1+\beta)-1+\beta}\right)^{1-\beta} = \\ &= \left(\frac{n(1+\beta)-1+\beta^2}{(n-m)(1+\beta)-1+\beta^2}\right)^{1+\beta}\left(\frac{(n-m)(1+\beta)-1+\beta}{n(1+\beta)-1+\beta}\right)^{2}\end{aligned}$$

Given $n > 1$ and $m < n-1$, this function has the following properties: (i) $\Gamma(n,m,0) = (n-m-1)/(n-1) < 1$; (ii) $\Gamma(n,m,1) = 1$; (iii) $\partial\Gamma/\partial\beta$ is positive when it is evaluated at $\beta = 0$; (iv) there is only one real root $\hat{\beta}$ to $\partial\Gamma/\partial\beta = 0$, where $\hat{\beta} = -(n-m-1)/(n-m+1)$, so that $\hat{\beta} \in (-1,0)$. Consequently, given $n > 1$ and $m < n-1$, $\Gamma(\cdot)$ is increasing in $\beta$ for all the values of $\beta \in (0,1)$ where $\Gamma(\cdot)$ is defined on the reals, and thus $\Gamma(n,m,\beta) < 1$ for all those values of $\beta \in (0,1)$. The values of $\beta \in (0,1)$ for which $\Gamma(\cdot)$ is not defined on the reals are irrelevant, so that we can exclude them to conclude that $\Gamma(n,m,\beta) < 1$ for all $\beta \in (0,1)$. Next, from (5) we have $H(n,m,\beta) > 0$ if and only if $(n+\beta)^{1+\beta} > (m+1)(n-m+\beta)^{1+\beta}$, and from (8) we have $\hat{H}(n,m,\beta) > 0$ if and only if $(n+\beta)^{1+\beta} > (m+1)(n-m+\beta)^{1+\beta}\Gamma(n,m,\beta)$. Therefore, for $0 < \beta < 1$ it follows that if $H(n,m,\beta) > 0$ then $\hat{H}(n,m,\beta) > 0$, whereas there are values of $n > 1$ and $m < n-1$ such that $\hat{H}(n,m,\beta) > 0$ and $H(n,m,\beta) < 0$. □

This proposition shows that wage negotiations increase the workers' incentives for merger, relative to situations without wage bargaining, because mergers reduce the number of active firms and thus increase the firms' market power, which in turn leads to higher negotiated wages after the merger.

specific negotiations (because of the absence of strategic effects), so that merger incentives decrease even more under industry-wide wage negotiations in the face of a lower resulting industry output. Formally, it can be seen that the industry-wide negotiated wage, $w = \delta + (a-\delta)(1-\beta)/2$, is greater than the symmetric firm-specific negotiated wage, $w = \delta + (a-\delta)\beta(1-\beta)/[n(1+\beta)-1+\beta]$, for all $\beta < 1$ and all $n > 1$.

### 4.2 Anticipation of merging plant closure

We now extend the model by examining the extent to which the incentives for merger are affected by the fact that workers can anticipate that mergers may lead to the firm's closure. Under such circumstances, the exit of plants in the merger is taken into account by those plants' workers in the formulation of their objectives. In order to isolate the effects from this aspect, we go back to the basic framework in Section 2, and we introduce that workers anticipate that their firm may be closed down after the merger. Specifically, consider a merging firm $i$. If the workers' firm is not closed down after the merger, they receive a total payment of $wL_i$; but if the firm is closed down, the workers receive their reservation wage plus a redundancy pay of $\theta wL_i$, $0 < \theta < 1$. The value of $\theta$ depends on legal and institutional items that vary from country to country, and usually it is such that the redundancy pay consists of a number of working days, so that $\theta < 1$.

With $m+1$ merging firms, the proportion of cases in which a merging firm $i$ is closed down is $m/(m+1)$, and the proportion of cases in which it is not closed down is $1/(m+1)$. In former case the firm bears the redundancy pay, and in the latter it obtains profits $\pi_i$. Therefore, by taking into account both possibilities, we can write merging firm $i$'s net profits that its shareholders expect to obtain from the merger as

$$\Pi_i = \frac{1}{m+1}\pi_i - \frac{m}{m+1}\theta wL_i, \tag{9}$$

and similarly the total payment that this firm's workers expect to obtain as

$$W_i = \frac{1}{m+1}wL_i + \frac{m}{m+1}(\delta L_i + \theta wL_i) = \widehat{w}L_i, \tag{10}$$

where $\widehat{w} = [w + m(\delta + \theta w)]/(m+1)$.

For the workers to obtain a lower payoff if their firm is closed down it is further required that $\theta < 1 - \delta/w$, where $w > \delta$. This means that the "wage counterpart" in the event of firm closure, $\delta + \theta w$, is lower than the wage obtained when the firm is not closed down, $w$.

With (9) and (10), $\Omega_i = \Pi_i^{\beta}[(\widehat{w} - \delta)L_i]^{1-\beta}$ yields the Nash maximand whose maximization leads to merging firm $i$'s output level, given its competitors' output.

From each firm's employment/output negotiation, we have that merging firm $i$'s equilibrium output level follows as $q_i = q_M = [\beta(a-w) - m(n+\beta-m-1)\theta w]/[\beta(n+\beta)]$, and non-merging firm $j$'s as $q_j = q_{NM} = [\beta(a-w) + m(m+1)\theta w]/[\beta(n+\beta)]$. Thus, $\Pi_i = \Pi_M = \beta q_M^2/(m+1)$ and $W_i = W_M = \widehat{w}q_M$ for each merging firm $i = 1,\ldots,m+1$; $\Pi_j = \Pi_{NM} = \beta q_{NM}^2$ and $W_j = W_{NM} = wq_{NM}$ for each non-merging firm $j = m+2,\ldots,n$; and then the equilibrium value of each firm's Nash maximand is, respectively, $\Omega_i = \Omega_M = [\beta q_M/(m+1)]^{\beta}(\widehat{w} - \delta)^{1-\beta}q_M$ and $\Omega_j = \Omega_{NM} = \beta^{\beta}(w - \delta)^{1-\beta}q_{NM}^{1+\beta}$.

Here, if mergers rely on profitability the incentive for a merger with $m+1$ merging

entities is determined by

$$\begin{aligned}\tilde{g}(n,m,\beta,\theta) &= \Pi(n-m)-(m+1)\Pi(n)= \\ &= \frac{\beta}{m+1}q_M(n,m,\beta,\theta)^2-(m+1)\beta\left(\frac{a-w}{n+\beta}\right)^2 \qquad (11)\end{aligned}$$

and a merger incentive exists if $\tilde{g}(n,m,\beta,\theta)>0$.

By comparing this with the basic model in Section 2 we obtain that the incentives for merger decrease because the eventual closure of the merging firm leads to a cost in the form of redundancy pay that reduces the firm's output level at the same time that, as a best response, it increases the output level of the firm's non-merging competitors. Due to that, merger profitability decreases with the redundancy pay and it becomes more profitable to be a merger outsider. The following result summarizes this finding:

**Proposition 6.** *The incentives for merger based on profitability are lower when workers anticipate that mergers may force their firm to close down, relative to the situation where they do not anticipate it.*

**Proof.** Recall that $q_M=[\beta(a-w)-m(n+\beta-m-1)\theta w]/[\beta(n+\beta)]$. From equation (11), this implies that at $\theta=0$ we have

$$\tilde{g}(n,m,\beta,0)=\beta\left(\frac{a-w}{n+\beta}\right)^2\left(\frac{1}{m+1}-m-1\right)<0,$$

and given that $\tilde{g}(\theta,\cdot)$ is decreasing in $\theta$, the result is shown. □

Consider now that workers can influence on the merger decision. Then, merger incentives are determined by

$$\begin{aligned}\tilde{h}(n,m,\beta,\theta,\delta) &= \Omega(n-m)-(m+1)\Omega(n)= \\ &= \left(\beta\frac{q_M(n,m,\beta,\theta)}{m+1}\right)^\beta(\widehat{w}-\delta)^{1-\beta}q_M(n,m,\beta,\theta)- \\ &\quad -(m+1)\beta^\beta(w-\delta)^{1-\beta}\left(\frac{a-w}{n+\beta}\right)^{1+\beta} \qquad (12)\end{aligned}$$

and an incentive for merger exists if $\tilde{h}(n,m,\beta,\theta,\delta)>0$.

By comparing this with the basic model in Section 2 we find that, again, merger incentives decrease when the firm's eventual closure due to the merger is anticipated before the merger takes place. Since merging plants reduce their output levels, merging firms reduce their employment levels. This aspect reinforces the fact that workers obtain a lower "wage counterpart" in case of firm closure, which harms workers and thus their incentives for merger end up decreasing. This is summarized in the following proposition:

**Proposition 7.** *The incentives for stakeholder-based merger are lower when workers anticipate that mergers may force their firm to close down, relative to the situation where they do not anticipate it.*

**Proof.** From (12) we can compute

$$\frac{\partial \ln \tilde{h}}{\partial \theta} = (1+\beta)\frac{1}{q_M}\frac{\partial q_M}{\partial \theta} + \frac{(1-\beta)mw}{(1+m\theta)w-\delta},$$

where ln stands for natural log, and

$$\frac{1}{q_M}\frac{\partial q_M}{\partial \theta} = -\frac{mw(n+\beta-m-1)}{\beta(a-w)-m\theta w(n+\beta-m-1)} < 0.$$

In absolute value, this expression turns out to be increasing in $\theta$. In addition, $(1-\beta)mw/[(1+m\theta)w-\delta]$ is positive and decreasing in $\theta$. Hence, the less likely situation for $\partial \ln \tilde{h}/\partial \theta$ to be negative is $\theta = 0$. At $\theta = 0$ we have

$$\left.\frac{\partial \ln \tilde{h}}{\partial \theta}\right|_{\theta=0} = -\frac{mw(1+\beta)(n+\beta-m-1)}{\beta(a-w)} + \frac{(1-\beta)mw}{w-\delta},$$

which is decreasing in $n$. At $n = 2$ we have that this expression becomes

$$\left.\frac{\partial \ln \tilde{h}}{\partial \theta}\right|_{\theta=0,\ n=2} = -\frac{w(1+\beta)}{a-w} + \frac{w(1-\beta)}{w-\delta},$$

and thus $(\partial \ln \tilde{h}/\partial \theta)|_{\theta=0,\ n=2}$ is negative or positive as $a$ is, respectively, less or greater than $w+(1+\beta)(w-\delta)/(1-\beta)$. Consequently, in general there exists a value of $a$ denoted by $a^*(n,m,\beta,\theta,\delta,w)$ such that $\partial \ln \tilde{h}/\partial \theta$ is negative or positive as $a < a^*$ or $a > a^*$, respectively. Let us consider both of these two cases in turn.
(i) Consider first $a < a^*$. At $\theta = 0$ we have

$$\tilde{h}(n,m,\beta,0,\delta) = \beta^{\beta}(m+1)^{-1}\left(\frac{a-w}{n+\beta}\right)^{1+\beta}(w-\delta)^{1-\beta}[1-(m+1)^2],$$

which is negative for all $m > 0$ and given that $\tilde{h}(\theta,\cdot)$ is decreasing in $\theta$ when $a < a^*$, the result follows for all $a < a^*$.
(ii) Next, consider $a > a^*$. At $\theta = 1$ and $\delta = 0$ we get

$$\tilde{h}(n,m,\beta,1,0) = (m+1)^{-\beta}(n+\beta)^{-(1+\beta)}w^{1-\beta}\lambda(n,m,\beta,a,w),$$

where

$$\begin{aligned}\lambda \quad &= \quad [\beta(a-w)-m(n+\beta-m-1)]^{\beta}[\beta(a-w)-m(n+\beta-m-1)]- \\ &\quad -(m+1)^{1+\beta}\beta^{\beta}(a-w)^{1+\beta},\end{aligned}$$

and thus we have that $\tilde{h}(n,m,\beta,1,0)$ is negative or positive as $\lambda(n,m,\beta,a,w) < 0$ or $\lambda(n,m,\beta,a,w) > 0$, respectively. Since $\lambda(n,m,\beta,a,w)$ is decreasing in $n$, and the value of $\lambda(n,\cdot)$ is negative at $n = 2$, it follows that $\lambda(n,m,\beta,a,w) < 0$ and consequently $\tilde{h}(n,m,\beta,1,0) < 0$. Therefore, given that $\tilde{h}(\theta,\delta,\cdot)$ is increasing in both $\theta$ and $\delta$ when $a > a^*$ and given also that $a^*$ is decreasing in $\delta$, the result follows for all $a > a^*$, which completes the proof. □

## 5. Conclusions

We have examined merger incentives in the case where mergers are based on profitability, so that they are shareholder-driven, and in the case where they take place under worker influence, so that they are relatively stakeholder-driven. Our results suggest that merger incentives are affected to a relevant extent by the transfers of wealth between shareholders and workers that arise from the mergers. On the one hand, when worker influence places employment beyond the profit-maximizing level, the profitability of mergers increases because shareholders can use mergers to reduce the total amount of labour in the merging entities, increasing shareholder value. Due to that, the greater the influence of workers, the greater the merger incentives based on profitability. On the other hand, workers value relatively more the firms in which their influence is higher because those firms are characterized by higher employment levels. As a consequence, an increase in worker influence tends to reduce the incentives for merger when workers can affect the merger decision. This contrasts to the case of mergers exclusively based on shareholder value, suggesting that trade union bargaining power can be used by incumbent managers as a defensive device. Finally, by extending our basic setting we find that wage negotiations tend to reduce the incentives for shareholder-based merger and increase the incentives for stakeholder-based merger, whereas the anticipation by negotiating agents of an eventual merging plant closure due to the merger reduces the incentives for both types of merger.

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