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# On the social desirability of centralized wage setting when firms are run by biased managers

Nicola Meccheri\*

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## Abstract

This paper compares the welfare outcomes obtained under alternative unionization regimes (decentralized vs. centralized wage setting) in a duopoly market, in which shareholders delegate strategic decisions to biased (overconfident or underconfident) managers. In such a framework, the common tenet that consumer surplus and overall welfare are always higher under decentralized wage setting is completely overturned. Indeed, since in the presence of centralized unionization (industry-wide union) firms' shareholders always prefer to hire more aggressive or less conservative managers, output (consumer surplus) and overall welfare are larger in a centralized wage setting structure. This result holds true independently of the degree of product differentiation and the weight attached by unions to wages with respect to employment. Moreover, it also proves to be largely robust relative to the competition regime (quantity or price) in the product market.

**JEL codes:** J51; L13; L22.

**Keywords:** unionization structure; strategic delegation; biased managers; social welfare.

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# 1 Introduction

A widespread tenet as regards labour market policy is that the greater rigidities associated with centralized wage setting are detrimental, such that any move towards a more decentralized structure is commonly considered as good for consumers and overall social welfare (OECD, 2004, 2016).<sup>1</sup> The theoretical rationale underlying this view is that a centralized (industry-wide) union, representing all workers in a given industry, can avoid inter-union competition and is generally able to exploit its central and stronger bargaining position to set higher wages, which in turn drives firms to reduce output and employment (Horn and Wolinsky, 1988; Davidson, 1988). As a consequence, whilst (employed) workers prefer centralized wage setting, profits, consumer surplus and overall welfare are lower in a centralized structure.

Whilst the received literature analysing the social desirability of alternative (centralized vs. decentralized) unionization structures has referred to firms as a unit profit-maximizing decision makers, an important feature of modern economies is represented by the separation of ownership from management, especially in large corporations (Berle and Means, 1932; Williamson, 1985). Referring to imperfectly competitive (oligopolistic) product markets, a well-established strand of the Industrial Organization literature explains the choice by shareholders to delegate strategic decisions to professional managers, driving them not to maximize profits by means of (observable) incentive contracts, as a commitment device to a given level of production with a view to altering product market competition (Vickers, 1985; Fershtman and Judd, 1987; Sklivas, 1987). More recently, starting from Szymanski (1994), the effects of managerial delegation contracts on the firm-union wage bargaining process have been also investigated (see Meccheri, 2022, for a survey).

This paper analyses the role of the separation of ownership from management (or, in other words, managerial delegation), commonly observed in corporations, in affecting the social

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<sup>1</sup>At an empirical level, although centralized unions representing all workers in an industry are widespread in Continental Europe, firm-specific unions and decentralized wage settings are largely predominant in the UK, North America, and Japan (e.g., Boeri and van Ours, 2021).

desirability of alternative unionization structures. However, in contrast with the earliest strategic delegation literature, it will be considered that firms’ owners commit themselves not through managerial incentive contracts, but by hiring a biased (overconfident or underconfident) manager (see, in particular, Englmaier and Reisinger, 2014; Nakamura, 2019; Meccheri, 2021).<sup>2</sup> In this context, it is shown that the choice of the manager by firms’ owners, as well as its impact on the wage bargaining process strongly depend on the structure of unionization. In particular, since wages set by firm-specific unions are more sensitive (flexible) to changes in the manager’s type, firms have greater incentives to hire less aggressive managers—who correspond to less (resp. more) overconfident (underconfident) managers when product competition is in quantities, and *vice versa* whether it is in prices—in order to commit to lower output and employment and, as a consequence, contain the unions’ wage claims. Instead, under centralized unionization (industry-wide union), wages are less responsive or “stickier” with respect to the manager’s type, hence owners have more incentives to hire more aggressive managers in order to get a competitive advantage in the product market over the rival firm. In turn, this implies that the equilibrium output chosen by (more aggressive) managers under centralized wage setting is always (i.e., independently of the unions’ preferences over wages with respect to employment, as well as the degree of product differentiation/substitution between firms’ goods) larger than that set by (less aggressive) managers under decentralized wage setting, leading to a complete reversal of the common tenet that consumer surplus and overall welfare are higher in a decentralized structure. Moreover, this effect and the resulting outcomes prove to be largely robust relative to the competition regime (quantity or price) in the product market.

This work relates to the recent literature which aims at challenging the common tenet

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<sup>2</sup>As pointed out by Englmaier and Reisinger (2014, p. 351), considering biased managers instead of incentive contracts as a commitment device “avoids the well-known problem of the classic literature on strategic delegation that common knowledge of the employed incentive contracts is necessary to allow strategic commitment”. Instead, in imperfectly competitive markets with only few firms, assuming common knowledge of managers’ type is a more natural assumption “since there are only few potential managers whose characteristics are presumably well-known”.

about the preferred unionization structure in the presence of strategic competition in the (oligopolistic) product markets. Bárcena-Ruiz (2003) shows that, in an oligopoly with part foreign-owned firms, a (weighted) welfare maximizing government may prefer a centralized wage setting structure but only whether the proportion of shares owned by domestic shareholders is low (lower than 15%), hence the utility of unions has a greater weight in social welfare than the profits of firms that accrue to domestic shareholders. Haucap and Wey (2004) analyse the relative performance of alternative unionization regimes as measured by their impact on firms' innovation incentives and overall industry employment, pointing out that a trade-off does exist between wage setting structures: in a centralized structure, investment incentives are larger but industry employment (hence, output and consumer surplus) is lower (see also Mukherjee and Pennings, 2011; Mukherjee and Suetrong, 2012). Fanti and Meccheri (2017) compare welfare outcomes under different unionization regimes when firms may strategically choose their production capacity, showing that the level of capacity is generally more efficient in a centralized structure and consumer surplus and overall welfare may also be higher but only for a small range of the unions' preferences, that is, provided that unions are strongly oriented towards employment. This work differs from those since it introduces the separation of ownership from management into the analysis. Furthermore, relative to the reversal of the classic unionization ordering in terms of social desirability, a broader result is obtained since, in the presence of biased managers, such reversal realizes independently of the presence of foreign-owned firms and regardless the unions' preference towards wages with respect to employment.

The remaining part of the paper is organized as follows. Section 2 introduces the basic framework and presents the main outcomes relative to the alternative unionization structures. In Section 3, welfare outcomes obtained under alternative unionization regimes are compared. In Section 4, the robustness of the previous results, obtained with quantity competition, is assessed by considering price competition in the product market. Finally, Section 5 concludes, whilst further details are presented in the final Appendix.

## 2 Model

### 2.1 Basic framework

Consider a duopolistic market where two firms produce a differentiated product and face a linear (inverse) demand given by:<sup>3</sup>

$$p_i = 1 - q_i - \gamma q_j \quad (1)$$

where  $p_i$  denotes the price of variety  $i$ ,  $q_i$  and  $q_j$  the outputs by the two firms (with  $i, j = 1, 2$  and  $i \neq j$ ), and  $\gamma \in (0, 1)$  represents the degree of product differentiation or substitutability between products (the higher  $\gamma$ , the higher the degree of substitutability).

Both firms use only labour to produce according to a one-to-one production technology, hence  $q_i = l_i$ , where  $l_i$  is the employment level of the firm  $i$ . Accordingly, its profits are given by:

$$\pi_i = (p_i - w_i)q_i \quad (2)$$

where  $w_i < 1$  is the wage per worker.

Each firm is run by a manager who is potentially biased in the sense that he/she may evaluate the size of the market incorrectly (Englmaier and Reisinger, 2014; Nakamura, 2019; Meccheri, 2021).<sup>4</sup> In particular, if the firm  $i$  hires a manager of type  $k_i$ , this manager believes that the inverse demand function of firm  $i$  is given by:

$$\hat{p}_i = k_i - q_i - \gamma q_j. \quad (3)$$

Accordingly,  $k_i > 1$  corresponds to the case of an “overconfident” manager, that is, a

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<sup>3</sup>This represents a normalised version of the demand system originally adopted by Dixit (1979) and Singh and Vives (1984).

<sup>4</sup>See also, in a slightly different framework, Englmaier, 2010, 2011; Yu, 2014; and Nakamura, 2014, 2015. Whilst all those works consider managers’ biased expectations about the market size, or consumers’ demand, Pasquier and Toquebeuf (2022) refer instead to manager’s biased beliefs relative to a supplier’s strategy.

manager supposing that the market is larger than its correct size, whereas for  $k_i < 1$ , the manager is “underconfident”, since he/she believes the market to be too small.<sup>5</sup> Moreover, managers, by means of incentive contracts, are driven to maximise profits and are constrained to their reservation utility that, for simplicity, is normalised to zero.

The following three-stage game is analysed: at the first-stage, firms’ owners decide the type  $k_i$  of manager to be hired; at the second-stage, wages for rank-and-file workers are determined; at the final-stage, firms’ managers, according to their types, choose output in the product market. As usual, the three-stage game is solved according to the backward induction logic.

At the final stage, manager  $i$  maximises his/her firm’s profit but considering (3) instead of (1). Taking into account that the manager of the firm  $j$  behaves symmetrically, we can obtain firm  $i$ ’s output, for given wages and managers’ types, as:

$$q_i(w_i, w_j, k_i, k_j) = \frac{2k_i - \gamma k_j - 2w_i + \gamma w_j}{4 - \gamma^2} \quad (4)$$

where  $\partial q_i / \partial k_i > 0$  and  $\partial q_i / \partial k_j < 0$ . An overconfident manager overestimates the size of the market and, as first highlighted by Englmaier and Reisinger (2014), this leads him/her to produce a larger quantity. Moreover, hiring an overconfident or aggressive manager has also an intimidating effect on the rival firm’s manager, who will react by reducing his/her own output. This also implies that each firm’s shareholders have a motive to hire an overconfident manager in order to get a competitive advantage against the rival firm.

At the second-stage, wages are set. In particular, in what follows two alternative wage setting (or unionization) structures are analysed: wage setting decentralization and wage

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<sup>5</sup>This definition is consistent with that by Malmendier and Tate (2005, 2008) and Galasso and Simcoe (2011), where overconfidence is considered as a subjective belief about good future outcomes that is higher than an objective belief. For a survey of the literature which indicates that many top-executives’ decisions are typically biased by overconfidence see, e.g., Malmendier and Tate (2015). However, as documented by Moore and Cain (2007), there are also a number of different domains in which top-executives are systematically underconfident, especially when they have to deal with difficult tasks (see also Bennet et al., 2017; Huffman et al., 2019).

setting centralization.

## 2.2 Decentralized wage setting

In the presence of wage setting decentralization, unionization is decentralized at the firm level. For simplicity, a monopoly union model of wage determination is here adopted, with firm-specific (symmetric) unions that simultaneously set wages for their own workers. Unions have weighted preferences over wages and employment (e.g., Oswald, 1985; Pencavel, 1984, 1985; Dowrick and Spencer, 1994) and, in particular, the utility of the firm  $i$ 's union is given by:

$$V_i = w_i^\theta l_i^{1-\theta} \quad (5)$$

where  $\theta \in (0, 1)$  is the relative weight placed by unions on wages with respect to employment. In particular, for  $\theta >$  (resp.  $<$ ) 0.5 unions have preferences relatively more wage-oriented (employment-oriented), while  $\theta = 0.5$  refers to the special case of total wage bill-maximising unions.<sup>6</sup>

Unions maximise their objective functions with respect to wages, taking firms' output decision given by (4) into account, which leads to the following best-reply function in wages of the union-firm pair  $i$ :

$$w_i(w_j) = \frac{\theta(2k_i - \gamma k_j + \gamma w_j)}{2}. \quad (6)$$

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<sup>6</sup>A more general expression for the unions' utility function would be  $V_i = (w_i - \bar{w})^\theta l_i^{1-\theta}$ , which also includes the workers' reservation wage  $\bar{w}$ . Since the final results would not change qualitatively,  $\bar{w}$  is omitted to streamline the exposition. Moreover, consider also that, with some caveats,  $\theta$  could be interpreted as the relative bargaining power of the union in a Right-to-Manage model where wages, instead of being monopolistically set by the union, are bargained between the union and the firm, the latter retaining the right to choose employment afterwards (e.g., Oswald, 1985). Indeed, as pointed out, e.g., by Lommerud and Straume (2012, p. 184), if we refer to the Nash bargaining solution and denote the relative bargaining power of the union by  $\beta$ , it is easy to show that  $\theta$  and  $\beta$  enter the Nash (generalized) product in a mathematically similar way, hence producing the same effects on the bargained wage.



Solving the system composed by (6) and its counterpart for  $j$ , we obtain the sub-game perfect equilibrium wage, for given managers' types:

$$w_i(k_i, k_j) = \frac{\theta [(4 - \theta\gamma^2)k_i - 2\gamma(1 - \theta)k_j]}{4 - \theta^2\gamma^2}. \quad (7)$$

According to (7), we get that  $\partial w_i / \partial k_i > 0$ : more overconfident the manager hired by firm  $i$ , the higher the wage set by its union. This is because an overconfident manager is more aggressive in the product market, hence he/she chooses higher output and therefore higher employment. This reduces labour demand elasticity and, as a consequence, leads the union  $i$  to increase wages.<sup>7</sup> Moreover, this effect is increasing in  $\theta$ . Indeed, a more wage-oriented union will set the wage on a part of the labour demand curve, where  $w_i$  is higher relative to  $l_i$ , hence the reduction of labour demand elasticity, due to an increase of employment, is more sizable. Thus, the higher the union orientation towards wages, the larger the reduction in labour demand elasticity due to a marginal increase in employment, determining a larger wage increase. This also implies that, in order to dampen the unions' wage claims, firms have an incentive to hire less overconfident or even underconfident (conservative) managers. Taking into account that, in order to get a competitive advantage in the product market, firms prefer to hire overconfident managers, this gives rise to a trade-off in their choice of the manager type.

At the first stage, firms' owners simultaneously choose their managers' type to maximise their own profits. By maximising (2) with respect to  $k_i$  taking (7) and (4) into account and solving the system of (symmetric) firms' reaction functions in manager's types space leads to the following sub-game perfect Nash equilibrium (SPNE) manager type, chosen by the owners (or shareholders) of firm  $i$ :

$$k_i = k_j = k^D = \frac{(4 - \theta\gamma^2)(4 - 2\theta\gamma - \theta\gamma^2 + 2\gamma)}{2A} \quad (8)$$

where the superscript  $D$  recalls that it is obtained under a decentralized wage setting struc-

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<sup>7</sup>From Eq. (5), we can note that the first-order condition for the optimal wage set by union  $i$  leads to  $\eta_i = \frac{\theta}{1-\theta}$ , where  $\eta_i \equiv -\frac{\partial l_i}{\partial w_i} \cdot \frac{w_i}{l_i}$  is the wage elasticity of the firm  $i$ 's labour demand.

ture and  $A \equiv (\gamma^4\theta^2 + \gamma^3\theta^2 - \gamma^3\theta - 4\gamma^2\theta^2 - 2\gamma^2\theta - 2\gamma^2 - 4\gamma\theta + 4\gamma + 8\theta + 8) > 0$ , for any  $\theta, \gamma \in (0, 1)$ .

According, to Eq. (8), we can notice that the following applies:

$$k^D \gtrless 1 \Leftrightarrow \theta \lesseqgtr \frac{2 \left( 4 + \gamma^2 - \sqrt{\gamma^6 - 7\gamma^4 + 8\gamma^2 + 16} \right)}{\gamma^2(8 - \gamma^2)}. \quad (9)$$

Under decentralized wage setting, firm's owners prefer to hire overconfident managers only when unions are not wage-oriented, that is, when  $\theta$  is low. Furthermore, the threshold for  $\theta$ , below which firms hire overconfident managers, is increasing in the degree of product substitutability between the competing firms. This makes sense. Hiring overconfident (more aggressive) managers, on the one hand, permits firms to get a competitive advantage in product market competition, which becomes more important as competition is tougher (higher  $\gamma$ 's values). On the other hand, as above explained, hiring conservative (less aggressive) managers permits firms to dampen the unions' wage claims, which assumes greater importance especially when unions are sufficiently wage-oriented (higher  $\theta$ 's values).

Then, by substituting the SPNE manager type back, we get the following SPNE wages, output and profits in the presence of decentralized wage setting:

$$w_i = w_j = w^D = \frac{\theta(4 - \theta\gamma^2)(4 - \gamma^2)}{2A} \quad (10)$$

$$q_i = q_j = q^D = \frac{(1 - \theta)(4 - \theta\gamma^2)}{A} \quad (11)$$

$$\pi_i = \pi_j = \pi^D = \frac{(1 - \theta)(4 - \theta\gamma^2)(\theta^2\gamma^4 - 6\theta^2\gamma^2 + 2\theta\gamma^2 - 4\gamma^2 + 8\theta + 8)}{2A^2}. \quad (12)$$

## 2.3 Centralized wage setting

Now we consider the case of centralized wage setting, in which an industry-wide union chooses a single wage for all workers in the industry ( $w_i = w_j = w$ ) to maximise:

$$V = w^\theta (l_i + l_j)^{1-\theta}. \quad (13)$$

By substituting (4) and the corresponding equation of firm  $j$  (with  $w_i = w_j = w$ ) in (13) and maximising with respect to  $w$ , we get:

$$w(k_i, k_j) = \frac{\theta(k_i + k_j)}{2}. \quad (14)$$

Similarly to the case with decentralized wage setting, the wage set by the industry-wide union positively depends on the degree of managers' overconfidence or aggressiveness in the product market. However, when firm  $i$  hires a more overconfident manager, the resulting positive effect on *overall* employment is softened by the fact that firm  $j$  reacts by reducing its output and employment. Since the industry-wide union is concerned with industry employment as a whole, this implies that, for any given value of labour demand elasticity (or  $\theta$ ), the positive effect on wages due to managerial overconfidence is lower than in a decentralized wage setting structure, in which (firm-specific) unions are only concerned with their own employment.<sup>8</sup> In other words, under centralized wage setting, wages are always “stickier” (i.e., less responsive to managerial biases) than under decentralized wage setting, hence firms have less incentives to hire more conservative managers to contrast the (industry-wide) union's wage claim.

Again, by substituting (14) in (4) and (2), maximising with respect to  $k_i$  and solving the system of reaction functions in the manager's types space, we obtain the SPNE manager type under centralized wage setting:

$$k_i = k_j = k^C = \frac{(2 + \gamma)(4 - 2\theta + \theta\gamma)}{B} \quad (15)$$

where the superscript  $C$  recalls that it is obtained under a centralized wage setting structure and  $B \equiv (3\gamma^2\theta + 2\gamma\theta^2 - 2\gamma^2 - 2\gamma\theta - 4\theta^2 + 4\gamma + 8) > 0$ , for any  $\theta, \gamma \in (0, 1)$ .

Then, by substituting back, the following SPNE wages, output and profits are obtained for this case with centralized wage setting:

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<sup>8</sup>This can be formally checked by noting that the derivative of wages with respect to  $k_i$  in (7) is always greater than in (14).

$$w_i = w_j = w^C = \frac{\theta(2 + \gamma)(4 - 2\theta + \theta\gamma)}{B} \quad (16)$$

$$q_i = q_j = q^C = \frac{(1 - \theta)(4 - 2\theta + \theta\gamma)}{B} \quad (17)$$

$$\pi_i = \pi_j = \pi^C = \frac{(1 - \theta)(4 - 2\theta + \theta\gamma)(2\theta\gamma^2 + \theta^2\gamma - 2\gamma^2 - \theta\gamma - 2\theta^2 - 2\theta + 4)}{B^2}. \quad (18)$$

According to Eq. (15), we can notice that the following applies:

$$k^B \underset{\leq}{\geq} 1 \Leftrightarrow \theta \underset{\geq}{\leq} \frac{\gamma^2}{2 - \gamma}. \quad (19)$$

For the same reasons, already above discussed, the behaviour of  $k^B$  relative to the structural parameters is similar to that of  $k^D$ . However, due to the fact that wages are stickier with respect to the manager types under centralized wage setting and, as a consequence, shareholders have lower incentives to hire underconfident managers to contrast the union's wage claim, the set of combinations between  $\theta$  and  $\gamma$ , as reported in Figure 1, for which shareholders opt for overconfident managers (i.e., the area B + C), is broader than that in which this applies under decentralized wage setting (i.e., the area C).<sup>9</sup> More in general, as shown by Figure 2,  $k^C$  is always higher than  $k^D$ , meaning that, under centralized wage setting, managers are more aggressive (or less conservative) than in the presence of a decentralized unionization structure. As a consequence, they are *ceteris paribus* more inclined to choose higher output and employment.

Accordingly, the following result can be stated:

**PROPOSITION 1.** *Under centralized wage setting, firms hire overconfident (aggressive) managers for a broader set of parameters as regards union's preference towards wages with respect to employment and product differentiation. Moreover, firms always choose to hire either more overconfident or less underconfident managers when unionization is centralized.*

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<sup>9</sup>In particular, notice that when products are perfect substitutes ( $\gamma = 1$ ) and competition is fierce, owners always (i.e., independently of the union's orientation towards wages with respect to employment) choose an overconfident manager under centralized wage setting whilst, under decentralized wage setting, this only occurs whether unions are less oriented towards wages.

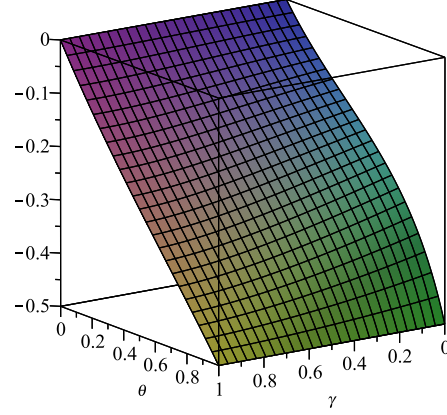
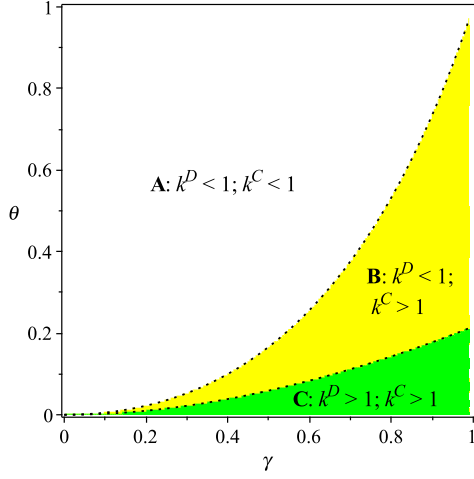


Figure 1: manager's type according to  $\theta$  and  $\gamma$       Figure 2:  $(k^D - k^C)$  according to  $\theta$  and  $\gamma$

### 3 Unionization structure and welfare

Referring to the findings pointed out in the previous section, we can now assess whether, when shareholders hire biased managers as a commitment device, the common tenet, i.e., in the presence of centralized wage setting only workers are better off whilst firms' owners, consumers and the society as a whole are worse off, is preserved.<sup>10</sup>

In particular, consumer surplus and overall welfare are here defined as, respectively:

$$CS = \frac{(1 + \gamma)(q_i^2 + q_j^2 + 2q_i q_j)}{4}; \quad W = CS + \pi_i + \pi_j + w_i q_i + w_j q_j. \quad ^{11}$$

By comparing equilibrium outcomes under alternative unionization structures, the fol-

<sup>10</sup>As shown in the final Appendix, this common tenet holds true when firms are unit profit-maximizing decision makers. In fact, in such case, also workers considered as a class may prefer decentralized wage setting since under a strongly wage-oriented industry-wide union the level of employment is too low.

<sup>11</sup>Following other works in the literature (e.g., Brander and Spencer, 1988; Mezzetti and Dinopoulos, 1991; Zhao, 2001), social welfare includes the total wage bill instead of the union utility. This can be explained by the fact that unions' members are also final good consumers. Alternatively, since in our case the wage bill also corresponds to the union's rent, it can be considered as a part of the producer surplus (Bughin and Vannini, 1995). However, considering unions' utility in the welfare function does not modify the orderings of consumer surplus and overall welfare between unionization regimes.

lowing result derives:

**PROPOSITION 2.** *For all  $\theta, \gamma \in (0, 1)$ , the orderings of wages, output, profits, consumer surplus and overall welfare under alternative wage setting structures is as follows:*

$$w^D < w^C; q^D < q^C; \pi^D > \pi^C; CS^D < CS^C; W^D < W^C.$$

In the presence of biased managers, the rationale for which wages are higher under centralized wage setting is twofold. In addition to the traditional reason that the industry-wide union is able to exploit its pivotal role in wage setting avoiding inter-union competition, also shareholders prefer to hire more overconfident managers when unionization is centralized. Since overconfident (aggressive) managers aim at increasing output and employment, this leads to a further increase of the industry-wide union's wage claim.

Moreover, this also gives rise to a novel result with respect to the received literature: although wages are higher under centralized wage setting, more aggressive (or less conservative) managers, who are hired in such regime, always choose to expand output and employment more than those hired in the presence of decentralized wage setting. Obviously, since both wages and output (employment) are higher in a centralized structure, consumer surplus (which is proportional to output) and total wage bill are greater too. As a consequence, both workers and consumers are better off and, even if shareholders are worse off since their profits are lower, overall welfare is *always* larger in the presence of centralized wage setting, which completely overturns the common tenet by the received literature.

## 4 Extension: price competition

In this section, the qualitative robustness of the above results is assessed in relation to the competition regime in the product market. Indeed, in contrast with the case of quantity competition, under price competition an overconfident manager sets higher prices, hence lower quantity, which makes him/her unaggressive (conservative). The opposite for an underconfident manager, who is therefore aggressive in the product market.

When firms compete in prices instead of in quantities, by inverting the demand system (3), considering that at the final stage the manager  $i$  sets  $p_i$  to maximise (biased) profits and that the manager of firm  $j$  behaves symmetrically (e.g., Englmaier and Reisinger, 2014), we obtain firm  $i$ 's price, for given wages and managers' types, as:

$$p_i(w_i, w_j, k_i, k_j) = \frac{(2 - \gamma^2)k_i - \gamma k_j + 2w_i + \gamma w_j}{4 - \gamma^2} \quad (20)$$

and, by using the demand function, the corresponding output:

$$q_i(w_i, w_j, k_i, k_j) = \frac{(1 - \gamma)(4 - \gamma^2) - 2k_i + \gamma(3 - \gamma^2)k_j - (2 - \gamma^2)w_i + \gamma w_j}{(1 - \gamma^2)(4 - \gamma^2)}. \quad (21)$$

Hence, by repeating the same passages of the quantity competition framework, we can get wages (as a function of managers' types) at the second-stage under alternative unionization regimes (decentralized and centralized, respectively):

$$w_i(k_i, k_j) = \frac{\Psi - \theta(\gamma^4\theta - 3\gamma^2\theta - 2\gamma^2 + 4)k_i - \theta(2\gamma\theta - \gamma^5 + 5\gamma^3 - 6\gamma)k_j}{\gamma^4 - \gamma^2\theta^2 - 4\gamma^2 + 4} \quad (22)$$

$$w(k_i, k_j) = \frac{2\theta(2 - \gamma) - \theta(1 - \gamma)(k_i + k_j)}{2} \quad (23)$$

where  $\Psi \equiv (\theta^2(\gamma^4 - \gamma^3 - 4\gamma^2 + 4\gamma) - \theta(\gamma^5 - \gamma^4 - 6\gamma^3 + 6\gamma^2 + 8\gamma - 8))$ .

From (22) and (23), it is important to point out that, in contrast to the case of quantity competition, there exists a negative relationship between wages and the degree of overconfidence by managers. This is because a more overconfident manager (with higher  $k_i$ ) sets a higher price which, in turn, will lead to lower output and labour demand, driving unions to reduce their wage claims. Moreover, it is worth noting that, on the one hand, the (negative) effect of  $k_i$  on wages reduces as  $\gamma$  increases under centralized wage setting (tending to zero as  $\gamma$  tends to one) whilst, on the other hand, it amplifies with  $\gamma$  in the presence of decentralized wage setting and inter-union competition.<sup>12</sup>

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<sup>12</sup>By considering Eqs. (14) and (23), as regards wages under centralized unionization, also notice that, unless managers are unbiased ( $k_i = k_j = 1$ ), the well-known “wage rigidity result” due to Dhillon and Petrakis (2002) does not apply: even if wage setting is centralized at the industry level, wages modify according to the competition regime in the product market.

Solving for the Nash equilibrium in the first-stage yields the manager's type chosen by shareholders. Then, by substituting back, we get the SPNE wages, output and profits, as well corresponding consumer surplus and overall welfare outcomes under alternative wage setting structures and price competition in the product market. Whilst the equilibrium outcomes for the price competition case are all cumbersome high-degree polynomials, which are omitted for sake of space,<sup>13</sup> Figure 3 parallels Figure 1 of the quantity competition case, showing the equilibrium manager's type (i.e., overconfident or underconfident) according to  $\theta$  and  $\gamma$  under alternative unionization regimes. It provides an intuition of the mechanism determining the welfare outcomes' differentials between alternative unionization regimes in the presence of price competition, which are largely in line with those obtained when firms compete in quantities. More specifically, with price competition in the product market, the following results apply:

**PROPOSITION 3.** *Under price competition in the product market, the orderings of wages, output, profits, consumer surplus and overall welfare under alternative wage setting structures basically confirm those obtained under quantity competition. Indeed, they are as follows:*

- $w_p^D < w_p^C$ , for any  $\theta, \gamma \in (0, 1)$ ;
- $q_p^D \leq q_p^C$ , for any  $\theta \in (0, 1)$  and  $\gamma \leq 0.73$ ;
- $\pi_p^D > \pi_p^C$ , for any  $\theta, \gamma \in (0, 1)$ ;
- $CS_p^D \leq CS_p^C$ , for any  $\theta \in (0, 1)$  and  $\gamma \leq 0.73$ ;
- $W_p^D \leq W_p^C$ , for any  $\theta \in (0, 1)$  and  $\gamma \leq 0.73$ .

As above pointed out, firms should refer to underconfident managers to obtain aggressive behaviour in a market displaying price competition. As a result, in order to contrast the union's wage claim, shareholders have a motive to hire overconfident managers. However, when a firm hires an overconfident manager, this has an intimidating effect on the rival who

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<sup>13</sup>They are all available from the author upon request.



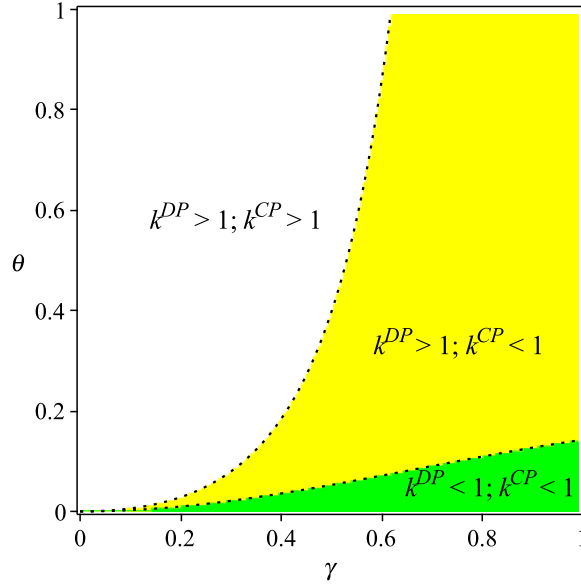


Figure 3: manager's type according to  $\theta$  and  $\gamma$  (price competition)

will react by reducing its price, hence increasing its own output and employment. In turn, this softens the negative effect on industry employment, making the wage set by an industry-wide union less responsive to the manager's type chosen by firms. As a consequence, as shown by Figure 3, firms have lower incentives to hire overconfident managers when unionization is centralized and, since those managers set higher prices, not only wages but also output (consumer surplus) and overall welfare will be generally larger in a centralized wage setting structure.

Indeed, only when competition is very tough (i.e.,  $\gamma$  sufficiently close to one) output, consumer surplus and overall welfare become larger under decentralized wage setting. This is because, in a decentralized wage setting structure (and in contrast with what occurs in the presence of an industry-wide union), tougher competition between firms also translates in stronger competition between unions, leading to a sharp fall in wages (indeed, independently of  $\theta$ , equilibrium wages set by firm-specific unions tend to zero as  $\gamma$  tends to one). Due to price competition, also equilibrium prices strongly reduce with wages, which drives to a remarkable increase of output and employment. Whilst this effect is mitigated in the

presence of an industry-wide union interested to overall employment, it is instead magnified in a decentralized structure,<sup>14</sup> hence leading to higher output, consumer surplus and, as a consequence, overall welfare.

## 5 Conclusion

This paper has challenged the common tenet that a centralized wage setting structure, involving an industry-wide union, is always dominated by a decentralized structure, with firm-specific unions, in terms of consumer surplus and overall social welfare in related (imperfectly competitive) product markets. However, whilst the received literature analysing the social desirability of alternative unionization structures referred to firms as a unit profit-maximizing decision makers, this paper has focalized on the role of the separation of ownership from management commonly observed in large corporations and, in particular, on the fact (also confirmed by most recent behavioural literature) that shareholders may have a strategic motive to delegate firms' decisions to biased managers, that is, managers who are overconfident or underconfident, being more or less aggressive in the product markets.

In this context, the choice of the manager by firms' owners, as well as its impact on the wage bargaining process strongly depend on the structure of unionization. Specifically, since wages are less responsive or "stickier" with respect to the manager's type under centralized wage setting, in this latter regime owners have more incentives to hire more aggressive managers in order to get an advantage in the product market. As a consequence, output chosen by (more aggressive) managers under centralized wage setting is always larger than that set by (less aggressive) managers under decentralized wage setting. Similarly, when competition is in prices, more aggressive managers generally set lower prices in the presence of an industry-wide union. As a result, when competition is in quantities, the common tenet, that consumer surplus and overall welfare are higher in a decentralized structure, proves to be

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<sup>14</sup>From Eq. (20), notice that as  $\gamma$  increases, prices become much more sensitive to wages than to manager's type.

completely overturned: welfare outcomes are higher in a centralized structure independently of the degree of product differentiation and the unions' preferences over wages with respect to employment. Furthermore, a reversal of the common tenet generally applies also when competition is in prices, unless the degree of product differentiation is high, hence firms' goods are strict substitutes.

## Appendix. Common tenet with firms as unit profit-maximizing decision makers

In this section, it is shown that when firms are unit profit-maximizing decision makers, that is, strategic decision about output is not delegated to biased managers,<sup>15</sup> the common tenet holds true, i.e., on the one hand, workers are better off under centralized wage setting whilst, on the other hand, firms, consumers and the society as a whole are better off under decentralized wage setting.

In order to get SPNE outcomes for this (benchmark) case in the presence of decentralized wage setting, we can use Eqs. (7) and (4) with  $k_i = k_j = 1$ , which leads to:

$$\begin{aligned} w_i = w_j = \tilde{w}^D &= \frac{\theta(2 - \gamma)}{2 - \theta\gamma} \\ q_i = q_j = \tilde{q}^D &= \frac{2(1 - \theta)}{(2 + \gamma)(2 - \theta\gamma)} \\ \pi_i = \pi_j = \tilde{\pi}^D &= \frac{4(1 - \theta)^2}{(2 + \gamma)^2(2 - \theta\gamma)^2} \\ \tilde{W}^D &= \frac{4(1 - \theta)(3 + \theta - \theta\gamma - \theta\gamma^2 + \gamma)}{(2 + \gamma)^2(2 - \theta\gamma)^2}. \end{aligned}$$

Similarly, in order to get SPNE outcomes in the presence of centralized wage setting, we can use Eqs. (14) and (4) with  $k_i = k_j = 1$ , which leads to:

$$w_i = w_j = \tilde{w}^C = \theta$$

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<sup>15</sup>The same qualitative results apply if the strategic decision refers to price.

$$\begin{aligned}
q_i &= q_j = \tilde{q}^C = \frac{1 - \theta}{2 + \gamma} \\
\pi_i &= \pi_j = \tilde{\pi}^C = \frac{(1 - \theta)^2}{(2 + \gamma)^2} \\
\tilde{W}^C &= \frac{(1 - \theta)(3 + \theta + \theta\gamma + \gamma)}{(2 + \gamma)^2}.
\end{aligned}$$

By comparing equilibrium outcomes under decentralized and centralized wage setting, and considering that consumer surplus is proportional to output, the common tenet holds true since, for any  $\theta, \gamma \in (0, 1)$ , we get:

$$\tilde{w}^D < \tilde{w}^C; \tilde{q}^D > \tilde{q}^C; \tilde{\pi}^D > \tilde{\pi}^C; \tilde{C}S^D > \tilde{C}S^C; \tilde{W}^D > \tilde{W}^C.$$

Also notice that relative to the total wage bill, it is greater in a centralized structure unless unions are distinctly oriented towards wages, that is, for any  $\theta < \frac{2 - \sqrt{4 - 2\gamma}}{\gamma}$ .<sup>16</sup> For instance, when  $\theta = 1/2$ , i.e., unions attach the same weights to wages and employment, the total wage bill is always (i.e., for any  $\gamma \in (0, 1)$ ) larger in a centralized structure.

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<sup>16</sup>Otherwise, also the total wage bill is larger in a decentralized structure, since the industry-wide union sets a very high wage and, as a consequence, the resulting employment is too low.

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