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**Abstract.** In this paper, we present a simple model in which a unionized and non-unionized firm optimally make investment decisions given their labor productivity. By allowing workers' organizations to have positive effects on labor effort, we find that the classic hold-up problem does not necessarily survive. We also derive conditions under which rent-seeking by unions may actually encourage firms' investments.

**Keywords.** Labor Unions · Rent seeking · Workers' effort · Firms' investments · Hold-up

**JEL.** J51 · O31 · O32

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## 1. Introduction<sup>1</sup>

The effect that WO have on investments is a debated topic, and it has been conjectured as either benign—the voice face of WO (Freeman and Medoff, 1984)—or adverse—the rent-seeking (Grout, 1984), the Luddist and the monopoly face of WO (Lindblom, 1948). Concerns on the sign of the WO-I correlation have been raised also in the field of strategic R&D (Beath et al., 1989). Moreover, once wages are allowed into the picture with positive feedbacks on productivity (Solow, 1979), rent-seeking may even foster investments. Addison and Teixeira (2019: 111) have indeed recalled that «*unions may generate worker cooperation [...] However, the threat of credible punishment implies bargaining power and in turn implies rent-seeking behavior*». In this view, rent-seeking prevents employers to hold-up employees, who may be thus induced to reciprocate and augment their effort. Similarly, if WO play a role in affecting the non-monetary components of job-satisfaction—e.g. by favouring practices that increase workers' well-being—the feedback effect on productivity may be further enhanced.

This seems actually to be the case. Cotti et al. (2014) show indeed that unions enhance workers' well-being, while Antonioli et al. (2011) find a positive effect of cooperative IR and organizational innovations on employees' satisfaction<sup>2</sup>. The latter is then positively correlated with productivity (Böckerman and Ilmakunnas, 2012; Bryson et al., 2017; DeNeve et al., 2019) and with practices emphasizing flexibility and autonomy (Holm and Lorenz, 2014). In addition, personnel psychologists and HR management scholars have long insisted on the importance of getting the right fit between individual and job characteristics (Kristof-Brown et al., 2005; Felstead et al., 2015). This may either occur because higher satisfaction associates with higher morale (Strauss, 1968) or because employees are more confident in performing tasks they feel compatible with their abilities (Bénabou and Tirole, 2003). It is our contention that WO may play a positive role in both mechanisms, as they may either improve work morale by promoting long-term contracts, higher occupational standards and the likes, or may bargain to introduce organizational innovations that correlates positively with workers' well-being.

These arguments may be further reinforced in the case innovations and other firms' investments are associated with on-the job training, whose amount cannot be contracted because of the unverifiable nature of firms-specific human capital accumulation (Hashimoto,

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<sup>1</sup> Abbreviations: *N* (non-unionized); *U* (unionized); *WO* (workers' organizations); *WO-I* (workers' organizations and investments); *IR* (industrial relations); *HR* (human resources).

<sup>2</sup> The meta-regression analysis in Laroche (2016) supports the opposite hypothesis, i.e., that unions and job-satisfaction are negatively correlated, although the result seems to be biased by unsolved endogeneity issues.

1981; Hashimoto and Yu, 1980). In this context, the presence of WO may reduce the moral hazard problem in financing training by reducing inefficient job destruction and, then, favoring optimal level of firms' investment—given the complementarities between on the job training and innovations—i.e leading to social efficiency.

The character of IR plays also a crucial role. More conflictual systems of industrial relation have been theorized to worsen the hold-up problem, as firms are likely to diminish (increase) their investments when they expect their labor force to oppose (favour) the introduction of new technologies (Menezes-Filho and Van Reenen, 2003). WO with little bargaining power thus, may find strategical to mitigate the industrial conflict and improve the non-monetary facets of job-satisfaction, thus stimulating investments via the feedback effect mentioned above. Addison and Teixeira (2019), for instance, found that work councils reduce strikes incidence only when they are not dominated by unions. This suggests that the WO bargaining power has a major effect on the character of the IR.

This lack of theoretical consensus has been nurtured by the mixed empirical evidence. Although most studies suggest that rent-seeking depresses firms' investments—see Card et al. (2016)—both Machin and Wadhvani (1991) and Addison et al. (2007) find no support to this hypothesis. The divide emerges even more clearly investigating the effect of WO on R&D. With few exceptions (Walworth, 2010), the WO-R&D correlation appears negative for North-America, and either neutral or slightly negative—but often lacking statistical significance—for the EU. Commentators have explained this “Atlantic divide” in institutional terms—see Menezes-Filho and Van Reenen (2003). Recent support comes from Addison et al. (2016) and Bradley et al. (2016).

In this paper, we study a theoretical model where WO affect firms' investments through an indirect effect on labor productivity. The idea is simple: if WO have positive repercussions on workers' well-being who reciprocate by exerting higher efforts, investment returns may be higher in unionized than in non-unionized firms. By allowing utility-maximizing workers to choose their effort for a given wage and effort cost, we not only account for the possibility that higher wages may translate in higher participation, but also that a relative increase (decrease) in the cost of effort due to the presence of WO may translate in lower (higher) participation levels. The character of the IR is key to this mechanism. Under given combinations of the union's bargaining power and the character of the IR, we find that the traditional hold-up view no longer survives, and WO foster rather than inhibit investments.

We hence provide a conceptual contribution—see Klein and Potosky (2019)—to the debate on the desirability of WOs as a mediating body within HR relationships, in at least three

ways: first, we provide a *critical analysis* of WOs as we challenge the conventional wisdom that they have a negative effect upon employers' willingness to invest. Second, we do this by combining existing theories within a *unique framework* for the analysis. Third, through the combination of different theories we are also able to obtain a *refinement* of the overall analytical picture, inasmuch as we clearly identify the conditions—in terms of WOs' power and industrial relations climate—when workers' organizations favour the employers' willingness to invest.

## 2. A unified view

In the economy there are two firms, a  $U$ - and a  $N$ - firm. Both employ a single unit of labor and optimally make investment decisions given labor productivity. Investment returns are given by  $f(I)$  weighted by worker's effort  $0 \leq e \leq 1$ . According to standard assumptions,  $f'(I) > 0$  and  $f''(I) < 0$ . Moreover,  $f(0) = 0$ .

Following Stark and Hyll (2001), we model the worker's behavior through a "reaction function" that determines the optimal effort for a given wage. Both firms pay their worker an exogenously given fraction  $0 < x < 1$  of their returns<sup>3</sup>. In addition, WO transfer an extra share  $0 < y < 1 - x$  of the rent to the  $U$ -worker, thus reducing investments returns. As such,  $y$  is a measure of the union's bargaining power. We then define  $w_N = xf(I)$  and  $w_U = (x + y)f(I)$ . The workers' problem writes:

$$\max_{1 \leq e \leq 0} U_i = w_i e - h_i e^2, i = U, N \quad (1)$$

where  $h_i > 0$ ,  $i = U, N$  measures the firm-specific effort cost. As is common, we assume the disutility of working to be increasing and convex in  $e$  (Stark and Hyll, 2001; Swank, 2016).

Plugging  $w_N$  and  $w_U$  in (1), we obtain the workers' optimal efforts:

$$e_U^* = \frac{(x + y)f(I)}{2h_U} \quad (2)$$

$$e_N^* = \frac{xf(I)}{2h_N} \quad (3)$$

The profit-functions of the  $U$ - and of the  $N$ -firm are given by:

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<sup>3</sup> We keep  $x$  exogenous to allow for external factors, such as labor market institutions, to determine sub-optimal wages.

$$\Pi_U = e_U(1 - x - y)f(I) - CI \quad (4)$$

$$\Pi_N = e_N(1 - x)f(I) - CI \quad (5)$$

where  $C > 0$  is the unitary investment costs. Plugging (2) into (4) and (3) into (5), we derive the f.o.c. for optimal investments:

$$\frac{x + y}{2h_U}(1 - x - y)\frac{\partial f^2(I)}{\partial I} = C \quad (6)$$

$$\frac{x}{2h_N}(1 - x)\frac{\partial f^2(I)}{\partial I} = C \quad (7)$$

where  $\frac{\partial f^2(I)}{\partial I} > 0$  and  $\frac{\partial^2 f^2(I)}{\partial^2 I} < 0$  by assumption<sup>4</sup>. By assuming that an interior solution to (6) and (7) exists, we denote by  $I_U$  and  $I_N$  the arguments that maximise (4) and (5) respectively. To assess the effect of WO on firm's investments, we equalize the l.h.s. of (6) and (7) and derive the threshold level in the WO's bargaining power for which  $I_U = I_N$ , which is the value of  $y$  that solves:

$$-y^2 + (1 - 2x)y + (x - x^2)(1 - h) = 0 \quad (8)$$

where  $h \equiv h_U/h_N$ . Logically, if the WO's bargaining power is higher than the threshold,  $I_U < I_N$ , while, if it is lower,  $I_U > I_N$ <sup>5</sup>. However, since  $h_U$  may be either equal, larger or smaller than  $h_N$ , the solution of (8) vary with the value of  $h$ . Taking  $h$  as a proxy for the character of the IR, we say that IR are cooperative if  $h < 1$ , that are neutral if  $h = 1$ , that are conflictual if  $h > 1$ . By focusing on the cases for which  $I_U > I_N$ , we can provide with a unified view on the WO-I correlation, which is summarized in the following Proposition:

**PROPOSITION 1**—*When unions bargain higher wages and employees reciprocate by exerting higher efforts, unionized firms may invest more than their non-unionized competitors. This*

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<sup>4</sup> This amounts to assuming that  $f(I)$  is "concave enough". A functional form of  $f(I)$  for which  $\frac{\partial f^2(I)}{\partial I} > 0$  and  $\frac{\partial^2 f^2(I)}{\partial^2 I} < 0$  would be, for instance,  $f(I) = I^\beta$ , assuming  $0 < \beta < 1/2$ , so that  $f^2(I) = I^{2\beta}$ , with  $\frac{\partial f^2(I)}{\partial I} = 2\beta I^{2\beta-1} > 0$  and  $\frac{\partial^2 f^2(I)}{\partial^2 I} = 2\beta(2\beta - 1)I^{2\beta-2} < 0$ .

<sup>5</sup> An alternative proof of the sufficient condition for  $I_U > I_N$  appears in the Appendix.

occurs when the losses from rent-seeking are more than compensated by the workers' higher participation, which in turn requires that union's power is not too high. In particular:

$$\delta_I > 0: \begin{cases} \text{if } h < 1, 0 \leq y < \frac{1-2x+[1-4h(x-x^2)]^{1/2}}{2} \\ \text{if } h = 1, 0 < y < 1 - 2x \text{ and } x < 1/2 \\ \text{if } h > 1, \frac{1-2x-[1-4h(x-x^2)]^{1/2}}{2} < y < \frac{1-2x+[1-4h(x-x^2)]^{1/2}}{2}, x < 1/2 \text{ and } h < \frac{1}{4(x-x^2)} \end{cases} \quad (9)$$

From Proposition 1, the following Remarks are worth drawing:

- (i) Since  $\frac{1-2x+[1-4h(x-x^2)]^{1/2}}{2} \Big|_{h>1} < 1 - 2x < \frac{1-2x+[1-4h(x-x^2)]^{1/2}}{2} \Big|_{h<1}$ , the less conflictual the system of IR, the wider the range of the union's bargaining power which fosters firm's investments;
- (ii)  $\max_{0 < y < 1-x} \delta_I$  yields  $y^* = \frac{1-2x}{2}$ , which is the degree of union power which maximizes the difference between the  $U$  and the  $N$ -investments. Since  $\frac{1-2x-[1-4h(x-x^2)]^{1/2}}{2} < \frac{1-2x}{2} < \frac{1-2x+[1-4h(x-x^2)]^{1/2}}{2} \Big|_{h>1}$ , unions may have a positive but sub-optimal effect on firm's investments in all three regimes of IR;
- (iii) Cooperative systems of IR foster firm's investments even when the union's bargaining power is null. In this case, WO devoid of bargaining power—e.g., work councils—may foster firms' investments.
- (iv) Conflictual systems of IR foster firm's investments if the union's bargaining power is neither too high nor too low. In this case, rent-seeking acts as an investment-enhancing device.

To derive further insights from our model, we compare the workers' well-being across the  $U$  and the  $N$  settings. By plugging (2) and (3) into (1), we obtain the equilibrium levels of the worker's utility, which are given, respectively, by  $U_U = \frac{(x+y)^2}{4h_U} f^2(I)$  and  $U_N = \frac{x^2}{4h_N} f^2(I)$ . The utility differential writes:

$$\delta_U = y^2 + 2xy + x^2(1 - h) \quad (10)$$

Imposing  $\delta_U > 0$  and solving for  $y$ , we see that:

## PROPOSITION 2

- (i) *If IR are either cooperative or neutral, unionization fosters workers' well-being regardless of the unions' bargaining power;*
- (ii) *if IR are conflictual, unionization fosters workers' well-being if:*

$$y > x(h^{1/2} - 1) \text{ and } h < \frac{1}{x^2} \quad (11)$$

Results from Propositions 1 and 2 are combined in Table 1.

**Table 1. When unions raise investments and utility**

	$\delta_I > 0$	$\delta_U > 0$
$0 < h \leq 1$	$\begin{cases} 0 \leq y < \frac{1}{2}\{1 - 2x + [1 - 4h(x - x^2)]^{1/2}\} \\ 0 \leq x \leq 1 \end{cases}$	Always
$h = 1$	$\begin{cases} 0 < y < 1 - 2x \\ 0 \leq x < 1/2 \end{cases}$	Always
$1 < h < \frac{1}{4(x-x^2)}$	$\begin{cases} y > \frac{1}{2}\{1 - 2x - [1 - 4h(x - x^2)]^{1/2}\} \\ y < \frac{1}{2}\{1 - 2x + [1 - 4h(x - x^2)]^{1/2}\} \\ 0 \leq x < 1/2 \end{cases}$	Always
$\frac{1}{4(x-x^2)} \leq h < \frac{1}{x^2}$	Never	$y > x(h^{1/2} - 1)$
$h \geq \frac{1}{x^2}$	Never	Never

## 3. Conclusions

In this paper, we provide a theoretical explanation to the mixed evidence on the WO-I correlation. By allowing WO to have indirect effects on productivity, we find that the hold-up problem does not necessarily survive and that rent-seeking by unions may even encourage firms' investments. This possibility crucially depends on the climate of IR: the more conflictual it is, the lower the possibility that rent-seeking by unions may even encourage investments. The character of the IR, in turn, has a positive effect in our model, as it favorably impact both investments returns and on-the-job well-being.



The policy implications are of primary relevance, as it is not a matter of *whether* mediating bodies such as workers' organizations favor firms' profitability and workers' well-being or not—a view that during the last decades mirrored into a declining role for unions (e.g. Bennett and Kaufman, 2006) also motivated by their supposed negative effect on HR management (Verma, 2006)—but rather a matter of *when*. Investing in a better IR climate—both at the macro (IR in a more traditional sense) and the micro (HR management) levels—is what our unified view suggests. Whether this implies a higher share of unionized workers—such as, e.g., in Freeman and Rogers (1999)—is beyond the scope of the present contribution.

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## Appendix: a sufficient condition for $I_U > I_N$

We have seen that the f.o.c. for optimal investments in U- and N-firms respectively read:

$$\frac{x+y}{2h_U}(1-x-y)\frac{\partial f^2(I)}{\partial I} = C \quad (1A)$$

$$\frac{x}{2h_N}(1-x)\frac{\partial f^2(I)}{\partial I} = C \quad (2A)$$

From the assumptions that  $\frac{\partial f^2(I)}{\partial I} > 0$  and that  $\frac{\partial^2 f^2(I)}{\partial I^2} < 0$ , and imposing that  $I_U > I_N$ , the following condition follows:

$$\frac{\partial f^2(I_U)}{\partial I} < \frac{\partial f^2(I_N)}{\partial I}$$

As f.o.c. (1A) and (2A) must hold also at optimal investments  $I_U$  and  $I_N$ , it must be that:

$$\frac{x+y}{2h_U}(1-x-y) > \frac{x}{2h_N}(1-x)$$

from which:

$$-y^2 + (1-2x)y + (x-x^2)(1-h) > 0$$

as suggested in the main text.