# Dare to be different: Compensation schemes and strategic competition

*By* FERNANDEZ, Daniel*

*This paper proposes a principal-multi-agent model that integrates in a single framework both product market competition and delegation of decision making. I found that the equilibrium behaves like an asymmetric "chicken game" when the number of workers is high enough. Furthermore, the minimum number of workers needed to achieve the asymmetric equilibrium depends on: the productivity of the firm, the worker's marginal production cost, and the sensitivity of prices to demand.*
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Performance-based compensation schemes have been widely adopted in the workplace. While team-strategies have become increasingly popular in the US and other countries (Che and Yoo, 2001), Berger, Herbertz and Sliwka (2011) show that several firms have adopted compensation schemes that measure performance at firm or individual level. Furthermore, the prominence of compensation schemes varies among different types of industries, i.e., while nearly 90% of variable wage components in public administration are individual performance-based, this value is less than 40% on business and construction, where firm performance-based components reach 45%.

According to the authors, individual performance-based compensation schemes prevail in the majority of industries. This supports the traditional statement that piece-rate is the most efficient mechanism to reward variable wage components because firms can capture an important fraction of workers' productivity gains and avoid enforcement problems of fixed wages (Seiler, 1984; Shearer, 2004). However, the prevalence of other performance-based compensation schemes in some industries weakens the belief that they are merely a result of failed attempts to install piece-rate (see Baker, 1992).

In fact, the literature on incentives (see Groves, 1973; Holmstrom, 1982) has described many factors why firms diversify how they paid workers, e.g., information asymmetries, legal restrictions, externalities, or effort complementarity; though, Gibbons (1987) argues that no compensation scheme is capable of solv-

* CEMFI, Casado del Alisal 5, Madrid, Spain (e-mail: daniel.fernandez@cemfi.edu.es). I thank Joaquín Coleff and Walter Cont for supervising the writing process of my master's thesis and Cecilia Avramovich for numerous comments that helped improve my work. This paper has also benefited from comments by Juan Ivars, Lian Allub, Guillermo Alves, Lucila Berniell, Pablo Brassiolo, Dolores De la Mata, Ricardo Estrada, Matías Italia, and Federico Juncosa.

ing all this difficulties at the same time. In this paper, I explore an alternative hypothesis. As suggested in Güth, Pull and Stadler (2015), the adoption of different performance-based compensation schemes could be related with the degree of competition on each industry.

As far as I know, the relation between product market competition and compensation schemes has been slightly discussed. While traditional literature on industrial organization has studied interfirm competition, the theory of agency has focused mostly on the intrafirm competition. Here, I propose that non individual performance-based compensation schemes emerge as strategic decisions when we acknowledge both intrafirm and interfirm competition, which is reasonable for three precedents.

First, the relationship between competition and efforts in the workplace has been previously stated. While some studies (see Beiner, Schmid and Wanzenried, 2011; Cuñat and Guadalupe, 2009) empirically show a positive association, other papers (see Raith, 2003; Schmidt, 1997) suggest that the results are ambiguous. Compensation schemes affecting efforts differently through incentives could be the missing key.

Second, every decision made by a firm is oriented to achieve a strategic advantage or a certain goal (Boyd and Salamin, 2001; Alonso, Dessein and Matouschek, 2015), which has been discussed in many papers, such as Miller and Pazgal (2002), where firms opt between different types of manager, or Ishibashi (2001), where firms decide on quality.

Third, a greater competition encourages firms to delegate production decisions to workers (Bloom, Sadun and Van Reenen, 2010; Alonso, Dessein and Matouschek, 2015), which justifies to simultaneously analyze both product market competition and delegation of decision making in a single framework. Moreover, as Sengul, Gimeno and Dial (2012) set forth, firms also delegate decision making as a strategic tool that enables external commitments that cannot be credibly made with subordinate decision making.

This paper extends previous work by Güth, Pull and Stadler (2011, 2012, 2015) of how workers' compensation is affected by interfirm competition. Unlike the aforementioned publications, this paper presents a model where firms have to choose between two compensation schemes, which enables them to reduce interfirm while increasing intrafirm competition. This represents the main contribution of this paper, as firms tend to adopt different compensation schemes when product market competition, depicted as productivity, is high enough.

The remainder of the paper is structured as follows: Section 1 introduces the model and the compensation schemes, while Section 2 reports the sub-game perfect states of equilibrium solved by computer and describes the main results. Finally, Section 3 presents comparative statics and discusses the limitations of this work.

## I. The model

I consider an homogeneous product market with two firms, each producing a perfect substitute good. The inverse demand function is specified by

$$p(q_1, q_2) = A - b(q_1 + q_2),$$

where $Q = q_1 + q_2$ is the aggregate output in the market and $p$ is the price for both firms. $A$ and $b$ parametrizes market's size and price's sensitivity to demand, respectively.

The only production input is the effort $e_{i,k}$ of the $n$ workers in each firm $i = 1, 2$, so that the output of firm $i$ amounts to

$$q_i = \beta \sum_{k=1}^{n} e_{i,k},$$

where $\beta$ is the productivity of the firm and $\beta e_{i,k}$ is the individual output of worker $k$ in firm $i$. Here, I assume that the total supply of $2n$ workers is equally distributed among the two firms, so them both confront symmetric conditions in a three-stage delegation game.

In the first stage, firms $i = 1, 2$ simultaneously choose between two compensation schemes: piece-rate and revenue-sharing, which are described below. Firms' revenue thus depend on the selected compensation scheme and the agent's decisions through all three stages, so firms must anticipate these to maximize their profits.

Next, firms simultaneously write observable contracts with their workers where they specify a wage rate $w_i$ per effort unit (if they choose piece-rate) or a share $s_i$ of their revenue (if they choose revenue-sharing). Firms observe the remuneration systems selected in the previous stage, but must anticipate both workers and competing firm best responses in order to maximize their profits.

At last, each worker sees the offered contracts by both firms and simultaneously chooses the observable effort $e_{i,k}$. The agents are risk neutral and their net utilities depend on the contracts signed in the previous stage and the quadratic effort cost of producing

$$c(e_{i,k}) = \alpha \frac{e_{i,k}^2}{2} \quad i = 1, 2 \quad k = 1..n,$$

where $\alpha$ parametrizes the marginal cost of production of each worker. These decisions determine the number of goods produced by firm $i = 1, 2$, market price $p$, profits $\pi_1$ and $\pi_2$, and workers' net utilities $U_{1,k}$ and $U_{2,k}$.

Thereby, in order to solve the model and attain the sub-game perfect equilibrium, I use backward induction. As a result, the following subsections describe the optimal decisions of each agent by using this logic.

### A. Piece-rate

Here, the firm $i$ offers a wage rate $w_i$ and receives a price $p$ for each unit produced, thus earning profits equal to

$$\pi_i(w_i, q_i, q_{-i}) = (A - b(q_i + q_{-i}) - w_i)q_i,$$

where $q_{-i}$ is competing firm's output. Similarly, the $k$-th worker of firm $i$ gets a wage rate $w_i$ for each unit produced and attains a net utility of

$$U_{i,k}(w_i, e_{i,k}) = w_i e_{i,k} - \alpha \frac{e_{i,k}^2}{2}.$$

In the last stage, workers simultaneously maximize their net utility by choosing the effort $e_{i,k}$ that satisfies the first order condition $e_{i,k}^{PR}(w_i) = e_i^{PR}(w_i) = \frac{w_i}{\alpha}$. Since workers' effort solely depends on the firm-specific wage rate $w_i$, neither intrafirm nor interfirm interaction is taking place between agents.

By anticipating this behavior, in the second stage the firm maximizes profits

$$\pi_i(w_i, q_{-i}) = (A - (\tfrac{b\beta n}{\alpha} + 1)w_i - bq_{-i})\tfrac{\beta n w_i}{\alpha},$$

with respect to wage rate $w_i$, so that

$$w_i^{PR}(q_{-i}) = \frac{\alpha(A - bq_{-i})}{2(b\beta n + \alpha)}$$

satisfies the first order condition.

Therefore, the reaction function of the firm $i$ can be stated as

$$q_i^{PR}(q_{-i}) = \frac{\beta n(A - bq_{-i})}{2(b\beta n + \alpha)},$$

regardless of the compensation scheme selected by the competing firm. Thus, despite the lack of intrafirm competition in piece-rate, interfirm competition is taking place at the firm level, where the principal just watches for the output of the competing firm.

### B. Performance-based revenue share

Here, the firm $i$ chooses a revenue share $s_i \in [0, 1]$, thereby attaining profits equal to

$$\pi_i(s_i, q_i, q_{-i}) = (1 - s_i)(A - b(q_i + q_{-i}))q_i.$$

Thereafter, workers get a fraction of the transferred share according to their relative output performance $\frac{\beta e_{i,k}}{q_i}$, so that their net utility amounts to

$$U_{i,k}(s_i, e_{i,k}, q_i, q_{-i}) = s_i \frac{\beta e_{i,k}}{q_i} q_i (A - b(q_i + q_{-i})) - \alpha \frac{e_{i,k}^2}{2}.$$

When maximizing the net utility of the worker $k$, the output $q_i$ can be replaced by the sum of the individual outputs $\beta e_{i,k}$ and $\beta(n-1)e_{i,-k}$, where $e_{i,-k}$ is the individual effort of the $n-1$ remaining workers.

Thus, workers in the last stage simultaneously maximize net utilities by choosing the effort $e_{i,k}$ that satisfies the first order condition

$$e_{i,k}^{RS}(s_i, e_{i,-k}, q_{-i}^*) = \frac{\beta(A - b\beta(n-1)e_{i,-k} - bq_{-i}^*)s_i}{2b\beta^2 s_i + \alpha},$$

which illustrates how each worker's effort depends not only on the firm-specific share $s_i$ but also on the output of the competing firm $q_{-i}^*$ and the individual effort of the remaining workers $e_{i,-k}$; thereby, both intrafirm and interfirm interaction is taking place between agents. Notice I am using $q_{-i}^*$ to point out that workers under revenue-sharing act differently provided the compensation scheme adopted by the competing firm, as they realize that the incentives derived from that decision and the reaction of the opposing workers differ.

Due to workers being symmetric, the firm anticipates $e_i = e_{i,k} = e_{i,-k}$, so that

$$e_i^{RS}(s_i, q_{-i}^*) = \frac{\beta(A - bq_{-i}^*)s_i}{s_i b\beta^2(n+1) + \alpha}.$$

Further interfirm competition is taking place not only due to product market competition but through workers incentives, and as a result the firm's best response depends on the compensation scheme adopted by the competing firm during the first stage.

Therefore, in the second stage the firm maximizes profits

$$\pi_i(s_i, q_{-i}^*) = (1 - s_i)(A - b(\beta n e_i^{RS}(s_i, q_{-i}^*) + q_{-i}^*))\beta n e_i^{RS}(s_i, q_{-i}^*)$$

with respect to share $s_i$, so that first order condition is a polynomial equation with an unique solution in the interval $[0, 1]$, and the reaction function of the firm $i$ is equal to

$$q_i^{RS}(s_i(q_{-i}^*), q_{-i}^*) = \frac{\beta^2 n(A - bq_{-i}^*)s_i(q_{-i}^*)}{s_i(q_{-i}^*)b\beta^2(n+1) + \alpha},$$

where $s_i$ hinges on the compensation scheme adopted and the output expected from the competing firm, which could also be stated as two different reaction functions: one for each possible decision of the rival firm.

### C. Solving the model

In the first stage, firms acknowledge reaction functions and aim to maximize profits by choosing the compensation scheme that best replies the competing firm's decision, thereby resulting in one or more[1] sub-games perfect states of equilibrium from among four possible candidates: two symmetric ones, where both firms adopt piece-rate or revenue-sharing; and two identical non symmetric ones, where firms choose different compensation schemes.

The remainder of the paper drops algebra because $s_i$ expression is not straightforward, hindering the possibility of presenting the solution algebraically; in consequence, best responses cannot be compared with a general approach if any of the firms adopts revenue-sharing. Instead, I present several numerical exercises in which I solve stages two and three by computer, calculating firms' profits for a number of workers $n = 2, ..., 10$ in all four scenarios and repeating this process for different parameters settings. This allows me to generalize agent's behavior and visually present the sub-game perfect states of equilibrium.

Due to firms being symmetric, the equilibrium can be inferred from the best response of any of the firms during the first stage. Thus, for simplicity, I describe the analysis only from the point of view of firm 1. Therefore, if a compensation scheme is the best response to itself, then there is an unique symmetric equilibrium; if both compensation schemes are best response to each other, then there are two asymmetric states of equilibrium.

## II. Results

I found that if the amount of workers is high enough, i.e., $n \geq \overline{n}$, firms adopt opposing compensation schemes, thereby implying two sub-game perfect states of equilibrium:

$$(CS_1^*, CS_2^*, r_1^*, r_2^*, e_1^*, e_2^*)_{n \geq \overline{n}} = \left\{ \begin{matrix} (PR, RS, w_{PR}^{PR-RS}(n), s_{RS}^{PR-RS}(n), e_{PR}^{PR-RS}(n), e_{RS}^{PR-RS}(n)) \\ (RS, PR, s_{RS}^{PR-RS}(n), w_{PR}^{PR-RS}(n), e_{RS}^{PR-RS}(n), e_{PR}^{PR-RS}(n)) \end{matrix} \right\},$$

both asymmetric but identical to each other. While this result withstands through different parameters settings, the sub-game perfect states of equilibrium vary when the number of workers is below $\overline{n}$, as they depend on the productivity of the firm, the worker's marginal cost of production, and the sensitivity of prices to demand; although, they are unrelated with the size of the market.

Figure 1 shows an example of this finding. As you can see, the symmetric adoption of revenue-sharing fails as candidate for equilibrium because this compensation scheme is not a best response to itself (Figure 1b). On the other hand,

[1]Notice that agents have symmetric payouts, which guarantees always at least one equilibrium.

(a) Best response when $CS_2 = PR$ (b) Best response when $CS_2 = RS$

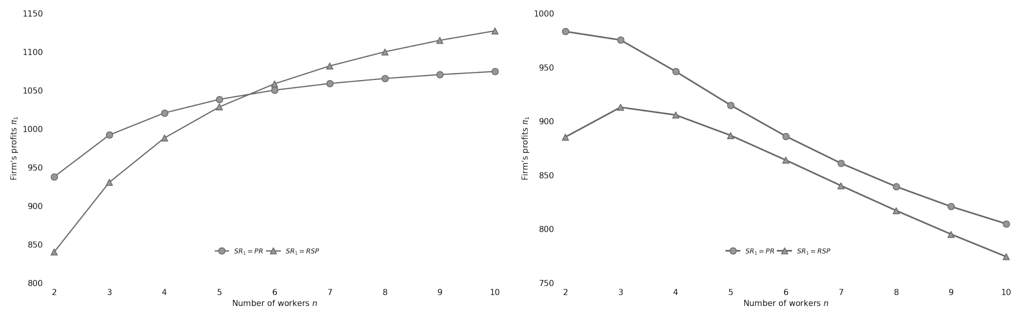


Figure 1. : Example of sub-game perfect states of equilibrium

*Note:* Profits $\pi_1$ were calculated for parameters $\beta = 1$, $\alpha = 1$, and $b = 1$ for each number of workers. $PR$ = piece-rate. $RS$ = revenue-sharing.

piece-rate is a best response to itself when the number of workers $n$ is below the threshold $\overline{n} = 6$, so that the unique sub-game perfect state of equilibrium comes forth as

$$(CS_1^*, CS_2^*, r_1^*, r_2^*, e_1^*, e_2^*)_{n<\overline{n},\beta=1,\alpha=1,b=1} = \\ (PR, PR, w_{PR}^{PR-PR}(n), w_{PR}^{PR-PR}(n), e_{PR}^{PR-PR}(n), e_{PR}^{PR-PR}(n)).$$

However, both compensations schemes are best responses to each other when the number of workers $n$ is at least equal to the threshold $\overline{n} = 6$ (Figure 1a), and thus the sub-game perfect states of equilibrium become asymmetric.

### A. *The story behind the results*

To delve deeper into the results, I untangle the several components involved in decision making by splitting them into three different partial effects and presenting them individually: average cost component (ACC) compares unit cost of production between compensation schemes by measuring the change on profits $\pi_1$ when firm 1 shifts from piece-rate to revenue sharing but both firms' output decisions remain constant, i.e., $\pi_1(RS, \overline{q_1}, \overline{q_2}) - \pi_1(PR, \overline{q_1}, \overline{q_2})$; marginal cost component (MCC) compares the cost of increasing effort between compensation schemes by measuring the change on profits $\pi_1$ when only competing firm's output decisions remain fixed, i.e., $\pi_1(RS, q_1(\overline{q_2}), \overline{q_2}) - \pi_1(RS, \overline{q_1}, \overline{q_2})$; and interfirm competition component (ICC) tells how costly is to counter the rival's strategy by measuring the change on profits $\pi_1$ when they both can adjust their decisions, i.e., $\pi_1(RS, q_1(q_2), q_2) - \pi_1(RS, q_1(\overline{q_2}), \overline{q_2})$.

ACC and MCC are independent of the compensation scheme adopted by the competing firm, implying the sign of both components stays the same across Figures 2 and 3. ACC is negative (Figures 2a and 3a) because firm 1 pays less to induce effort when it adopts piece-rate; however, its magnitude is decreasing with respect to $n$ because revenue-sharing intensifies intrafirm competition as the number of workers grows, which bolsters effort even when share $s_i$ is low. MCC is positive and increasing with the amount of workers (Figures 2b and 3b) because revenue-sharing eases firm 1 to raise output just by exploiting intrafirm competition.

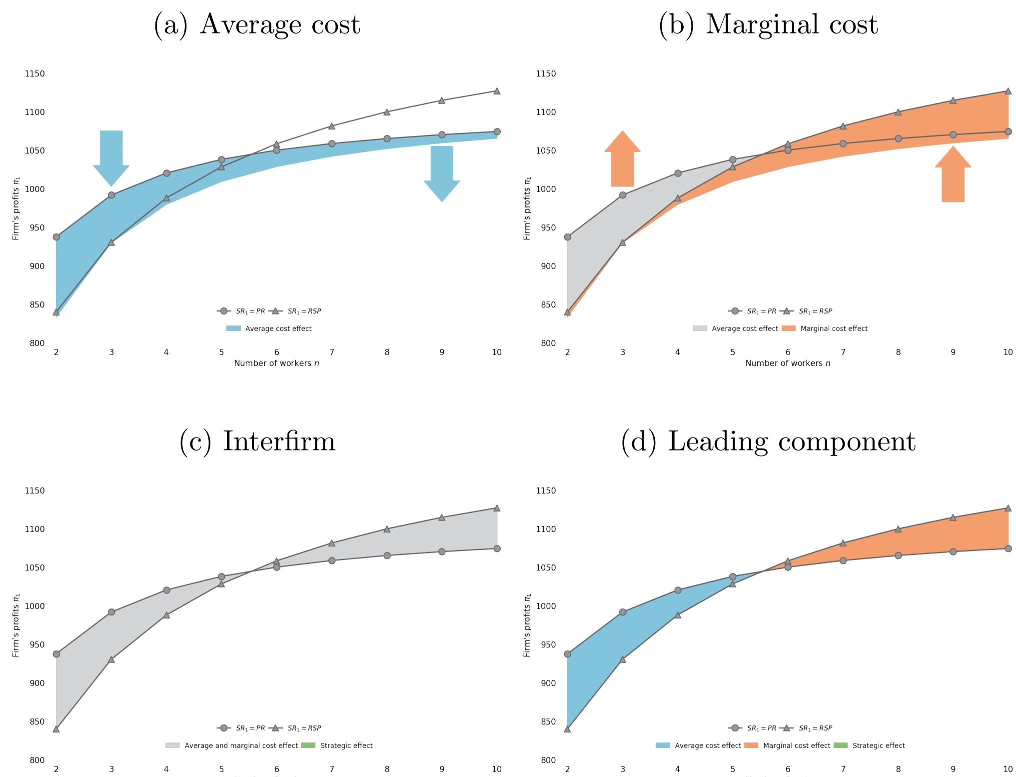


Figure 2. : Best response's components and leading effect when firm 2 adopts piece-rate

*Note:* Profits $\pi_1$ were calculated for parameters $\beta = 1$, $\alpha = 1$, and $b = 1$ for each number of workers when firm 2 adopts piece-rate.

On the other hand, ICC does differ according to the compensation scheme adopted by the competing firm, and thus it comes forth as the key component in explaining the asymmetric states of equilibrium. First, ICC is null when firm 2 adopts piece-rate (Figure 2c) because their workers do not react to the compensation scheme shift. Thus, once firm 1 has adjusted their incentives to the new situation, their workers are the ones competing against firm 2, and share $s_1^*$ is optimal to any wage $w_2$.

However, when firm 2 adopts revenue-sharing, ICC is negative (Figure 3c) because now firm 2 reacts to the compensation scheme shift, and both firms have to raise shares $s_1$ and $s_2$ to maintain output levels. Notice that shares depend on each other because workers at both firms keep an eye on the compensation scheme adopted by the rival firm, and the simultaneous implementation of revenue-sharing traps them in a costly competition, where they have to aggressively remunerate their workers in order to not lose their market share against the competing firm. Moreover, as the amount of workers $n$ increases, the more relevant ICC becomes, because the higher intrafirm competition leads also to a higher interfirm competition due to a lower cost of effort.

(a) Average cost (b) Marginal cost

(c) Interfirm (d) Leading component

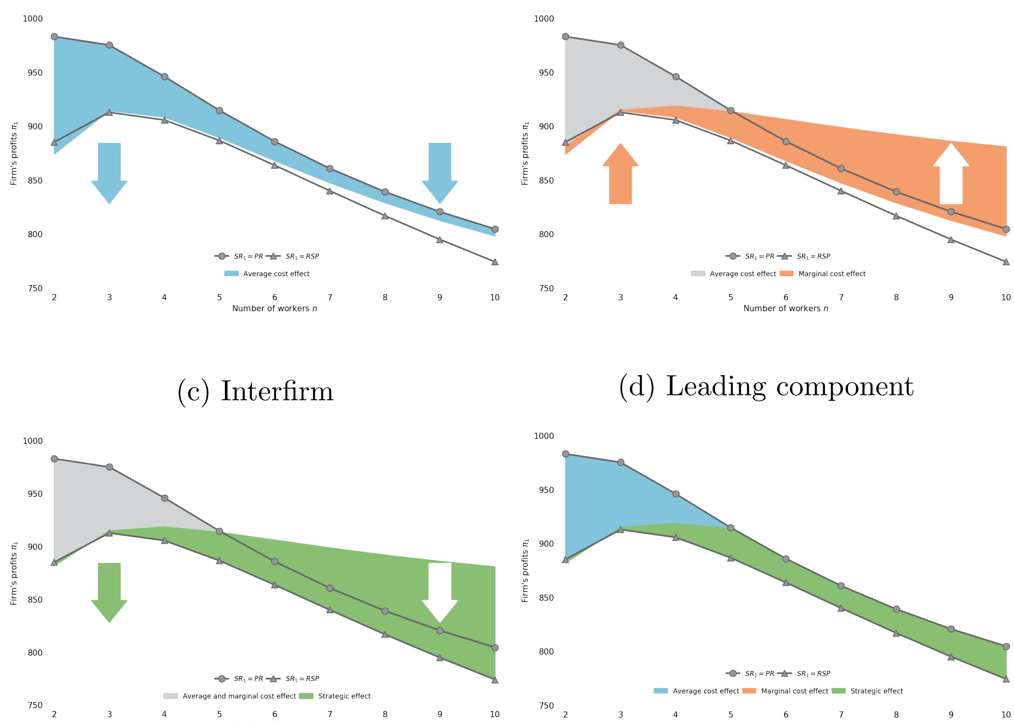


Figure 3. : Best response's components and leading effect when firm 2 adopts revenue-sharing

*Note:* Profits $\pi_1$ were calculated for parameters $\beta = 1$, $\alpha = 1$, and $b = 1$ for each number of workers when firm 2 adopts revenue-sharing.

As a result, MCC drives firms to shift towards revenue-sharing when the amount $n$ of workers is high enough (Figure 2d), but ICC keeps them away from simultaneously selecting revenue-sharing (Figure 3d), even if the firm adopting piece-rate attains lower profits than their rival, due to the fact that a higher interfirm competition represents the menace ofeven lower profits for that firm.

## III. Comparative statics and discussion

As described above, sub-game perfect states of equilibrium are asymmetric when the amount of workers is high enough, i.e., $n \geq \overline{n}$. While I found this is always true, it does not mean best responses at the first stage can be generalized for every parameter setting: threshold $\overline{n}$, and optimal decisions when the amount of workers is below this value, may vary with productivity. In the same way, the asymmetric equilibria may not be attained when the assumption that workers are equally distributed among both firms is abadoned.

### *A. Market size*

Optimal compensations schemes in equilibrium are independent of market size. The model uses a lineal inverse demand function, so that $e_i^*$ is an homogeneous function of degree one with respect to $A$, i.e., $e_i^*(A) = Ae_i^*(1), \forall A > 0$. Therefore, all variables are homogeneous functions of degree zero (such as $s_i^*(e_i^*)$), degree one (such as $q_i^*(e_i^*)$, $p_i^*(e_i^*)$, or $w_i^*(e_i^*)$), or degree two (such as $U_i^*(e_i^{*2})$ and $\pi_i^*(e_i^{*2})$), so best responses in the first stage remain the same despite changes in market size $A$.

### *B. Productivity*

Productivity affects product market competition through the remaining parameters. For a start, both a higher productivity of the firm $\beta$ and a lower worker's marginal cost of production $\alpha$ boost output, so that the price goes down. In addition, a higher sensitivity of prices to demand $b$ pushes the price further down, even for the same output level.

Thus, it is possible to extrapolate any parameter setting by analyzing how results change upon variations on productivity parameter $\beta$. In fact, according to the patterns found, these configurations can be classified as low, intermediate and high productivity, each one showing a particular behavior regarding states of equilibrium. Hence, since the previous section describes a low productivity scenario, below I am focusing on the remaining configurations.

An intermediate level of productivity, i.e., roughly $1.2 < \beta < 1.5$, implies that intrafirm competition strengthens, because of the larger output per worker, and ACC decreases. Accordingly, Figure 4a shows that a lesser amount of workers now induce firms to shift from piece-rate towards revenue-sharing when the competing

(a) Best response when $CS_2 = PR$ (b) Best response when $CS_2 = RS$

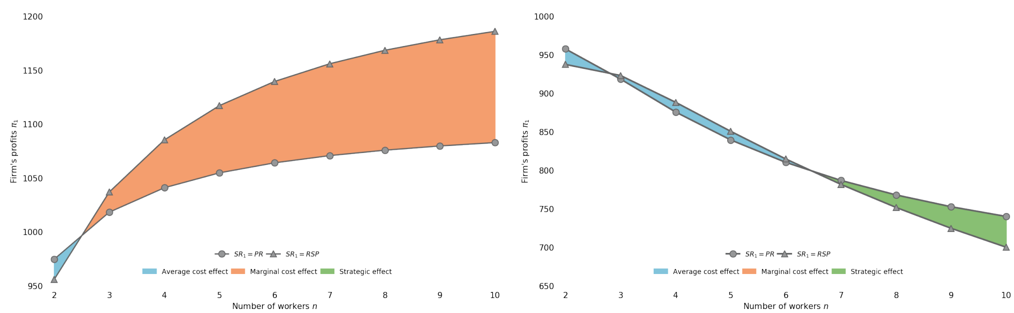


Figure 4. : Best responses' leading effects for medium productivity

*Note:* Profits $\pi_1$ were calculated for parameters $\beta = 1.3$, $\alpha = 1$, and $b = 1$ for each number of workers. $PR$ = piece-rate. $RS$ = revenue-sharing.

firm adopts piece-rate; however, this same effect modify firm's incentives when its rival chooses revenue-sharing.

Following Figure 4b example, for a small number of workers, $n \leq 3$, a soft intrafirm competition is taking place, so that ACC drives firms to implement piece-rate, and the state of equilibrium results in the symmetric adoption of this compensation scheme. However, when the amount of workers rises, $3 < n \leq 6$, intrafirm competition intensifies and ACC becomes positive, so that revenue-sharing becomes the best response to itself, and the state of equilibrium arises as the symmetric adoption of this compensation scheme. Finally, when the amount of workers is high enough, $n > 6$, ICC becomes large enough to yield asymmetric states of equilibrium.

Along with this, a higher productivity, i.e., roughly $\beta \geq 1.5$, represents an even more intense intrafirm competition, so that revenue-sharing becomes cheaper than piece-rate and ACC turns to be positive. Thus, now both ACC and MCC explain that the best response to the competing firm's adoption of piece-rate is to adopt revenue-sharing, as shown in Figure 5a. This same logic explains why revenue-sharing is the best response to itself when the amount of workers is low ($n \leq 6$ in the example depicted in Figure 5b), and thus the state of equilibrium displays the symmetric adoption of revenue-sharing. However, when the amount of workers increases and ICC becomes large enough, the asymmetric states of equilibrium emerge again as a result.

Notice how firms always adopt different compensation schemes when the amount of workers is above $\overline{n}(\beta, \alpha, b)$, despite the fact that this threshold value may vary for each scenario. In fact, it is non-monotonic decreasing respect with the level of productivity.

On the other hand, when the amount of workers is below $\overline{n}$, equilibria depend

(a) Best response when $CS_2 = PR$ (b) Best response when $CS_2 = RS$

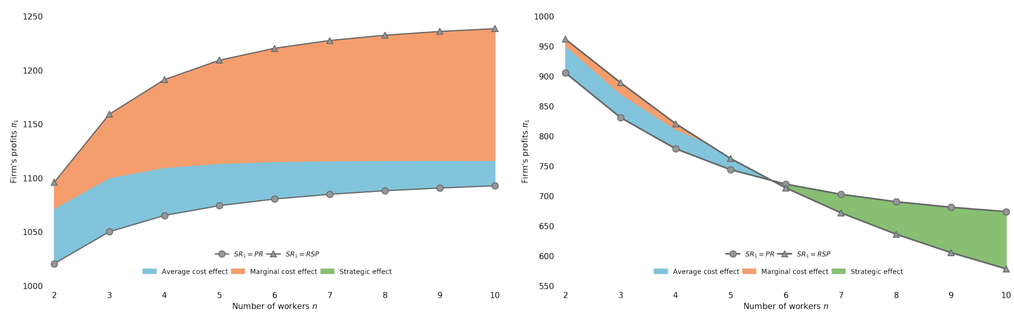


Figure 5. : Best responses' leading effects for high productivity

*Note:* Profits $\pi_1$ were calculated for parameters $\beta = 2$, $\alpha = 1$, and $b = 1$ for each number of workers. $PR$ = piece-rate. $RS$ = revenue-sharing.

on the parameters selected. In particular, it displays any combination of compensations schemes when the productivity level is intermediate, although being symmetric for the remaining instances: both firms adopt revenue-sharing when the productivity level is high, and they adopt piece-rate when it is low.

### *C. Worker's distribution among firms*

The main restriction of this framework has been the assumption that workers are equally distributed among both firms. This is worth to mention because empirical studies describe circumstances where nothing enforce workers to stay at the same firm they currently are.

Any attempt to address this flaw requires adjustments of the timing in the model by introducing a new stage, where workers decide which firm to join. However, equilibria are sensitive to the chosen specification, and it is hard to argue that one of them is more representative than the rest. For example, workers could be choosing between firms before they even know the compensation schemes adopted by each firm, once compensation schemes are known but before firms offer them a particular contract, or after firms have made an offer.

Moreover, worker's decisions could be simultaneous in this stage. Thus, each one of them would have to anticipate, with a certain probability, how the remaining workers could distribute among firms, so that only mixed strategies are equilibrium candidates. On the other hand, consecutive decisions, where workers pick a firm to join one at the time, guarantees at least one pure strategy sub-game perfect equilibrium.

Nonetheless, when firms adopt the same compensation scheme, both are prone to hire the highest possible amount of workers, independently of the decisions of the competing firm, so that they both offer workers the same contracts and the symmetry assumption is easily justifiable (Güth, Pull and Stadler, 2011). Güth, Pull and Stadler (2015) propose a model where both firms adopt the same exogenously-defined compensation scheme, thereby using this same argument to support that states of equilibrium are not sensitive to the endogenous or exogenous determination of the amount of workers hired by each firm. However, they conclude that if the focus were the endogenous determination of the amount of workers they would recommend a different framework, such as Das (1996).

I explored different configurations and arrived to the conclusion that timing affects bargaining power, which is ultimately the key element to understand how results may vary. For example, when the setup gives an edge in bargaining to firms[2], they end up offering identical contracts, and thus workers equally distribute among firms.

When the setup hinders firms bargaining position, one of them can end up hiring more workers than its rival, thereby hindering ICC because revenue-sharing needs to remunerate more aggressively to their workers in order to be attractive enough for them to accept its offer. Therefore, sub-game states of equilibrium turn out to be symmetric while timing ends up affecting which compensation schemes firms are adopting. For instance, if workers have to pick between two known contracts, both firms adopt piece-rate, but if workers have to anticipate the contracts that will be offered to them, both firms adopt revenue-sharing.

In conclusion, this framework illustrates a possible mechanism for the results founded by the empirical studies described above. If it was necessary to withdraw the assumption that workers equally distribute among firms, it seems to be important to define a specification ad-hoc to the context covered by the study. In this way, the model guarantees that the results are suitable for the problem under study.

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[2]There are several examples of this type of situations: firms sequentially offer *take it or leave it* contracts and workers accept every time they expect a greater gain than a certain reservation utility; contracts ties the remuneration to the amount of workers that finally accept the contract; firms can withdrawn any job offer; among others.

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