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Fairness, Adverse Selection, and Employment Contracts

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**GOVERNANCE AND THE EFFICIENCY
OF ECONOMIC SYSTEMS
GESY**

Discussion Paper No. 58
**Fairness, Adverse Selection, and
Employment Contracts**
Ferdinand von Siemens*

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Fairness, Adverse Selection, and Employment Contracts*

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Abstract

This paper considers a firm whose potential employees have private information on both their productivity and the extent of their fairness concerns. Fairness is modelled as inequity aversion, where fair-minded workers suffer if their colleagues get more income net of production costs. Screening workers with equal productivity but different fairness concerns is shown to be impossible if both types are to be employed, thereby rendering the optimal employment contracts discontinuous in the fraction of fair-minded workers. As a result, fairness might influence the employment contracts of all workers although only some are fair-minded, and identical firms facing very similar pools of workers might employ very different remuneration schemes.

JEL: C70, D21, D42, D63, D82, J31

Keywords: Fairness, Employment Contracts, Adverse Selection, Screening, Heterogeneity in Organizational Form.

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“All textbooks on compensation consider it self-evident that the most important aspect of a compensation scheme is its accordance with workers’ conceptions of equity.”

Akerlof and Yellen (1988), page 45.

1 Introduction

Motivation

Numerous surveys and empirical studies suggest that fairness concerns have an enormous impact on firms’ employment decisions and remuneration schemes. Moreover, the literature on management and organizational behavior stresses the impact of social comparisons on the composition of a firm’s internal pay structure.¹ But even though various experiments support the view that many individuals strongly care for the perceived fairness of the payoff distribution, the same experiments show that individuals differ widely in their preferences, where actually quite a few seem to be exclusively driven by their own self-interest.² Yet if only a fraction of the workforce has equity concerns, how can fairness have such a seemingly disproportional impact on employment contracts? Furthermore, if employment contracts are primarily determined by the workers’ fairness concerns, why do there exist such very different “corporate cultures” among identical firms facing a very similar pool of potential employees?

Summary of the Model

The experiments just mentioned are characterized by frequent bargaining breakdowns, which indicates that preferences are probably private information. The present paper therefore proposes an answer to the above questions based on asymmetric information on each worker’s fairness concerns. More specifically, the model considers a firm facing a continuum of potential employees who differ in both their productivity and the extent of their fairness concerns. Fairness is modelled as inequity aversion in the sense of Fehr and Schmidt (1999). In particular, a fair-minded worker is taken to suffer a utility loss if some

¹See, for example, Blinder and Choi (1990), Bewley (1995), Campbell and Kamlani (1997), Bewley (1999), and Rotemberg (2002).

²Güth, Schmittberger, and Tietz (1990), Kagel and Roth (1995), Camerer and Thaler (1997), and Fehr and Schmidt (2003) provide excellent surveys of the relevant literature.

of his colleagues receive a higher rent defined as income minus production costs. Both a worker's productivity and his fairness concerns are unobservable to the firm, which must consequently use an incentive compatible menu of contracts to elicit this information. The analysis of the optimal screening contracts generates the following results.

Most importantly, screening workers of equal productivity but different fairness concerns is impossible within the firm. In addition to its direct positive effect, a high rent reduces or avoids the suffering from unfavorable rent inequality. Just as purely selfish workers, fair-minded workers thus always prefer the contract giving them the highest rent. However, the firm can exclude unproductive and fair-minded workers by using employment contracts that do not offer a compensation for any rent inequality within the firm. Essentially, the firm thus faces two alternatives: either it excludes workers with fairness concerns and low productivity, or it employs all types of workers. If the latter alternative is optimal, the firm's employment contracts are as if all workers were fair-minded. The paper thus offers an explanation for a seemingly disproportional impact of fairness concerns on employment contracts even if a potentially large fraction of workers is purely selfish. Moreover, the firm's production function and the fraction of fair-minded workers in the work force has a discontinuous impact on optimal contracts. Consequently, very similar firms might end up with very different internal pay structures. The paper might therefore hint at an explanation for the emergence of very different corporate cultures among firms acting as local monopolists.

The above results are driven by the interaction between fairness concerns on the one hand, and asymmetric information and incentives on the other hand. If productivity is observable, workers of all types get zero rent, and fairness concerns are thus irrelevant. However, if productivity is unobservable, highly productive workers must be given an information rent in order to induce a truthful revelation of their type. Since fair-minded workers with low productivity get no rent, incentive compatible screening contracts generate a rent inequality within the firm. If they are to accept employment, fair-minded workers with low productivity must be compensated for their suffering. The arising costs can only be diminished by reducing the information rent for highly productive workers, but - as in standard mechanism design - this requires a reduction of the unproductive workers' production. Fairness concerns thus aggravate the distortions caused by asymmetric information. Moreover, even though lowering

the production of the unproductive workers allows the firm to lower the income of all workers, the income of the unproductive workers falls most sharply as their compensation for both rent inequality and production costs may be reduced. Somewhat counter-intuitively fairness concerns thus increase income differences within the firm.

Related Literature

The present paper is closest in spirit to Sappington (2004), who considers a firm facing a finite number of inequity averse workers with unobservable productivity. In his very general setting - heterogeneous equity concerns and private information on the latter can be easily incorporated - it can thus happen by chance that all workers are equally productive. Sappington (2004) focuses on the conditions under which all inequity can be avoided at no costs by shifting the provision of incentives to these coincidental instances. The present paper, however, investigates the impact of fairness concerns on optimal contracts whenever avoiding inequity is not costless. Indeed, in the setting under consideration equity concerns must constrain the firm as with a continuum of workers it can never happen that all are equally productive. In a situation of moral hazard Demougin, Fluet, and Helm (2005) investigate the impact of inequity aversion on wage differences caused by an interaction of equity concerns and incentives similar to the present paper.³ They consider a firm that employs two risk-neutral and inequity averse workers. Whereas the effort of the one worker is observable, the other worker must be given an incentive contract and, due to limited liability, thus receives a rent. As in the present paper the arising rent inequality causes the firm extra costs if the inequity averse workers are to be employed, but even though Demougin, Fluet, and Helm (2005) allow for heterogeneous equity concerns, they take the workers' preferences to be observable. Contrary to their analysis the present paper focuses exactly on asymmetric information with respect to the workers' fairness concerns.

Moreover, the present paper is related to the seminal work of Akerlof (1982) and Akerlof and Yellen (1990). Akerlof (1982) assumes that if a firm offers its workers a gift - for example paying wages above the market-clearing wage - workers reciprocate by increasing their effort provision. In a similar way Akerlof and Yellen (1990) argue that workers reduce their effort

³Among the growing number of other less related papers analyzing inequity aversion in cases of moral hazard see, for example, Englmaier and Wambach (2005), Itoh (2004), and Bartling and von Siemens (2004).

whenever they are paid less than a “fair” wage. In either case the workers’ reaction to wage cuts can actually increase the marginal costs of effective labor. In this case firms might refrain from lowering wages such that involuntary unemployment can arise. However, in both articles asymmetric information and incentives are assigned no major role even though the arguments are implicitly based on a moral hazard problem.⁴ However, the present paper shows that the interaction of fairness concerns and incentives increases income differences within the firm. Depending on the definition of “wages” and “income” this stands in striking contrast to Akerlof and Yellen (1990), who argue that fairness concerns cause a wage compression. Neglecting the interdependence of fairness concerns and incentives might thus be problematic.

Last but not least, the present paper adds to the literature on the heterogeneity of incentive provision among firms. In his seminal work, Hermalin (1994) considers ex-ante identical firms engaging in product-market competition. If some firms induce their management to exert high effort, these are more likely to have lower production costs. As they thus produce more, prices fall, which reduces the benefits from lowering production costs for the other firms. If in addition the assumed principal-agent relationship between firms and their management renders the firm’s indirect effort cost function non-convex, all pure-strategy equilibria might be asymmetric in the sense that some firms provide strong, whereas the remaining firms provide weak incentives. In the present paper, however, the reason for differing incentive provision does not stem from competition among firms, but the interaction of workers within firms. The argument is thus more similar to Rob and Zemsky (2002), who consider a firm whose workers decide on the extent to which they exert individual and cooperative effort. In their dynamic model they assume that the workers’ propensity to cooperate increases with past cooperation. Cooperation is very efficient, but due to a moral hazard problem the firm can induce high total effort and thus high profit today only at the expense of current and therefore future cooperation. Solving this dynamic trade-off, firms that differ only slightly in the initial cooperation among their workers can develop very different incentive schemes over time. However, in the present model contracts do not serve to induce effort or cooperation. Instead, similar firms might use very heterogeneous incentive schemes as the optimal screening mechanism is discontinuous in the fraction of fair-minded workers among the potential employees.

⁴If effort was contractable, workers could be prevented from responding reciprocally to wage cuts.

2 The Model

Types and Information

A single firm faces a continuum of workers with mass normalized at unity. The economic variables governing the relationship between firm and a worker can be summarized by the vector (e, q, t) . The element e describes the firm's employment decision, where e is unity if the worker is employed and zero otherwise. If the worker is employed, the remaining parameters (q, t) can be considered an *employment contract* specifying a production quantity q the worker has to produce, and an income t the firm has to pay.

Producing q causes the worker costs $\theta c(q)$, where c is strictly increasing, strictly convex, twice differentiable, and satisfies the Inada conditions $\lim_{q \rightarrow 0} c'(q) = 0$ and $\lim_{q \rightarrow \infty} c'(q) = +\infty$ to ensure inner solutions. Workers differ in their type-dependent productivity θ where a worker has either or high production costs. For expositional simplicity these workers are called good and bad. Moreover, some workers care for fairness while others do not. Formally, let $\Theta = \{\theta_{gf}, \theta_{gs}, \theta_{bf}, \theta_{bs}\}$ denote the type space, where subscripts g and b indicate the worker's productivity - he is either good or bad - and subscripts f and s indicate his concerns for fairness - he is either fair-minded or selfish. A worker's productivity is independent of his fairness concerns, that is $\theta_{if} = \theta_{is}$ for $i = g, b$. As suggested by their name, good workers have lower production costs than bad workers, $\theta_{gj} < \theta_{bj}$ for both $j = f, s$. Each worker's type is private information, but it is common knowledge that every worker is of type θ with prior probability $p(\theta)$. Productivity and fairness concerns are independent, each worker is good with probability $\pi \in]0, 1[$ and fair-minded with probability $\gamma \in]0, 1[$.

Preferences

Suppose there are $k = 1, \dots, K$ contracts (e_k, q_k, t_k) characterizing the relationships between the workers and the firm. In all the definitions below consider a worker of type θ who is assigned contract (e_k, q_k, t_k) . If the worker is employed, define his rent as

$$u(\theta, e_k, q_k, t_k) = t_k - \theta c(q_k). \quad (1)$$

Whereas an employed selfish worker exclusively cares for the above rent, an employed fair-minded worker is taken to compare his rent with the rents of all the other employed

workers. Fairness concerns are modelled as self-centered inequity aversion in the spirit of Fehr and Schmidt (1999). In particular each employed fair-minded worker is assumed to suffer a utility loss whenever he receives a lower rent than his colleagues.

Suppressing the dependence on the other workers' rents for notational simplicity, let

$$S(\theta, q_k, t_k) = \alpha(\theta) \sum_{j=1}^K \sum_{\theta' \in \Theta} \eta_{j\theta'} \max \left\{ u(\theta', q_j, t_j) - u(\theta, q_k, t_k), 0 \right\} \quad (2)$$

denote the suffering of the worker. The parameter $\alpha(\theta)$ measures the worker's intensity of fairness concerns. Irrespectively of the worker's productivity this parameter $\alpha(\theta)$ is zero for selfish workers and equal to some constant α strictly larger than zero for fair-minded workers. Moreover, the worker's suffering depends on the mass of employed workers with a higher rent. Since the colleagues' types are private information, the worker's utility depends on his belief $\eta_{j\theta'}$ over the fraction of employed workers of type θ' satisfying employment contract (q_j, t_j) . Note that in the Bayesian equilibria that will be considered this belief will be correct. Finally, let

$$U(\theta, e_k, q_k, t_k) = e_k \left[u(\theta, q_k, t_k) - S(\theta, q_k, t_k) \right] \quad (3)$$

denote the overall utility of a worker of type θ with contract (e_k, q_k, t_k) . All types of workers thus get a utility of zero if they are not employed.

Apart from assuming workers to compare rents, the above definition of fairness is based on the following considerations.⁵ The first concerns the workers' reference group. There seems to be a common understanding among psychologists and behavioral economists that individuals mostly compare themselves with individuals perceived as 'equal' or working in similar jobs.⁶ The reference group of employed workers is thus restricted to all the other workers employed within the same firm, and the reference group of unemployed workers to all the other unemployed workers. Moreover, no worker compares himself with the firm. As the utility of an unemployed worker is independent of what the employed workers get, the outside option of all workers can and hereby is normalized to zero for all workers. The second consideration concerns the workers' propensity for compassion. Both the most prominent

⁵See the conclusion for a discussion of the workers' reference point.

⁶Festinger (1954) and Williams (1975) provide prominent examples.

theories of inequity aversion, Fehr and Schmidt (1999) and Bolton and Ockenfels (2000), assume that altruistic motivations or compassion are dominated by envy. For simplicity the present paper focuses exclusively on envy, and thus assumes that workers dislike being worse but not being better off than their colleagues.

3 The Firm's Maximization Problem

Optimal Mechanisms

The firm would like to exploit its monopolistic position by giving each worker an income just sufficient to make him accept work. Each worker's acceptance decision depends on the promised income, his type-dependant production costs, and - if the worker is fair-minded - his expected suffering from getting less rent than his colleagues. Since types are private information, the firm must use a mechanism to extract this information. As usual the revelation principle allows to restrict attention to direct revelation mechanisms since it allows an agent's utility to depend on the entire allocation - for example, on the pollution permit given to another car driver - and on the other agents' types - for example in a common value auction.⁷ Moreover, each worker's type is private information and types are independent, thus the firm cannot learn anything about one worker from the announcements of the others. As in addition the fraction of workers of a certain type is fixed by a law of large numbers, the paper restricts attention to deterministic, direct revelation mechanisms which assign each worker a contract $(e, q, t)(\theta)$ depending exclusively on his announced type θ .

The optimal mechanism is required to be Bayesian incentive compatible, that is, every worker reveals his true type when expecting the other workers to do the same. The following notation greatly simplifies the exposition. Given some mechanism consider a worker of type θ who announces to be of type $\hat{\theta}$ and is thus assigned contract $(e, q, t)(\hat{\theta})$. Let

$$u(\theta, \hat{\theta}) = t(\hat{\theta}) - \theta c(q(\hat{\theta}))$$

denote this worker's rent. Since he expects the other workers to reveal their type truthfully, the expected mass of workers announcing to be of type θ is $p(\theta)$, and the expected mass of

⁷See, for example, Myerson (1979).

employed workers is $\eta = \sum p(\theta) e(\theta)$. Thus, let

$$S(\theta, \hat{\theta}) = \sum_{\theta' \in \Theta} \frac{p(\theta') e(\theta')}{\eta} \max \left\{ u(\theta', \theta') - u(\theta, \hat{\theta}), 0 \right\}$$

denote the worker's expected suffering. Finally, let

$$U(\theta, \hat{\theta}) = e(\hat{\theta}) [u(\theta, \hat{\theta}) - \alpha(\theta) S(\theta, \hat{\theta})]$$

denote the workers overall expected utility. Each worker maximizes expected utility. Workers of mass η who produce q and get income t generate profit $\eta(q - t)$ for the firm. The optimal mechanism thus maximizes the firm's expected profit.

$$R = \sum_{\theta \in \Theta} p(\theta) e(\theta) [q(\theta) - t(\theta)] \quad (4)$$

with respect to $(e, q, t)(\theta)$ for all $\theta \in \Theta$ under the constraints

$$\begin{aligned} (PC) \quad & e(\theta) [u(\theta, \theta) - \alpha(\theta) S(\theta, \theta)] \geq 0 \\ (IC) \quad & e(\theta) [u(\theta, \theta) - \alpha(\theta) S(\theta, \theta)] \geq e(\hat{\theta}) [u(\theta, \hat{\theta}) - \alpha(\theta) S(\theta, \hat{\theta})] \end{aligned}$$

for all $\theta, \hat{\theta} \in \Theta$. The first set of constraints, the participation constraints, ensure that all workers participate in the mechanism. The second set of constraints, the incentive constraints, make it optimal for all workers to reveal their type truthfully. A mechanism is *incentive compatible* if it satisfies all incentive constraints. It is *incentive feasible* if it satisfies all incentive and all participation constraints.

The Fair Wage-Effort Hypothesis

In the above maximization problem fairness affects the firm only as far as fair-minded workers do not accept employment unless they receive an income premium compensating them for any rent inequity within the firm. One could, however, reinterpret the model in the spirit of Akerlof and Yellen (1990). According to their "fair wage-effort hypothesis" workers reduce their effort provision - and thus increase the marginal costs of effective labor - if their wage falls below some fair reference wage. In this sense let q not denote output, but hours worked at the firm. Moreover, working q hours only produces output q if the worker adds some non-contractable effort. Suppose that selfish workers always do, whereas fair-minded workers of type θ only exert effort if they receive an income premium of $\alpha S(\theta, \theta)$. With this formalization of the fair wage-effort hypothesis, the firm's maximization problem is identical to the above.

First-Best Benchmark Case

There is the following benchmark result, where superscript FB stands for first-best.

Proposition 1 (First-Best Contracts) *Suppose the workers' types are observable. Then it employs all types of workers and extracts all rents. Optimal contracts are characterized by $e^{FB}(\theta) = 1$, $c'[q^{FB}(\theta)] = 1/\theta$, and $t^{FB}(\theta) = \theta c[q^{FB}(\theta)]$ for all $\theta \in \Theta$. Fairness concerns thus have no impact on first-best contracts.*

The following intuitive argument replaces the very simple formal proof. First, due to the assumptions on the cost function c the firm can always make some strictly positive profit by employing only one type of worker under a contract as specified in the proposition. Thus, making zero profit by not employing any workers cannot be optimal. Second, if some types of employed workers get a strictly positive rent, the firm can lower their income levels by an equal amount, thereby reducing inequity within the firm and facilitating participation for all types of workers. As expected income payments are thus lowered while production is kept unchanged, this increases profits and the firm optimally extracts all rents from all the employed workers. Finally, since no employed worker gets a positive rent, the firm can increase profits by employing previously unemployed types with a contract as characterized in the proposition. Optimal production quantities follow from maximizing profit for each type of worker.

In Proposition 1 both fair-minded and selfish workers of identical productivity are employed under the same employment contract. However, if separation with respect to fairness concerns is not desired in case of observable preferences, the same holds true in case they are unobservable. Thus, the following proposition holds.

Proposition 2 (Only Productivity Observable) *Suppose the workers' productivity levels are observable, but not their fairness concerns. Then the firm offers the same menu of contracts as in Proposition 1, and fairness concerns have no impact on optimal contracts.*

Summarizing, if the firm can observe each worker's productivity, it can extract all rents. Since all employed workers then receive an equal rent of zero, there is no inequity and fairness has no impact on the optimal contracts.

4 Fairness, Asymmetric Information, and Screening

Screening Workers with respect to Fairness Concerns

However, if a worker's productivity is private information, good workers must be given an information rent in order to induce truthful revelation of their type. If employed bad workers get no rent, asymmetric information causes a rent inequality within the firm for which bad-fair-minded workers must be compensated if they are to be employed. The firm would like not to pay this extra compensation to the bad-selfish workers who do not suffer from inequity. This makes separation of workers with respect to their fairness concerns desirable. The following proposition, however, shows that separation within the firm is impossible.

Proposition 3 (Screening with respect to Fairness Concerns) *Suppose the firm cannot observe the workers' types. Consider workers of equal productivity $i = g, b$ but different fairness concerns. Then $u(\theta_{is}, \theta_{is}) \neq u(\theta_{if}, \theta_{if})$ and $e(\theta_{is}) = e(\theta_{if}) = 1$ cannot be incentive compatible.*

In addition to its direct benign effect, a higher rent reduces or avoids unfavorable inequality. Fair-minded workers thus have an even stronger interest in getting a high rent than selfish workers. Since otherwise both types strictly prefer the contract giving them the higher rent, employed fair-minded and selfish workers of equal productivity must get contracts giving them the same rent. Optimally, they are then given the same employment contract. If, however, there is a rent inequality within the firm, the firm can employ selfish workers of a certain productivity while excluding fair-minded workers of equal productivity. This is done with the help of an employment contract that while reimbursing the production costs offers no compensation for any suffering from rent inequality, and is thus rejected by fair-minded workers.

The Firm's Remaining Alternatives

Proposition 3 greatly reduces the firm's set of incentive feasible mechanisms. The following argument shows that most of the remaining alternatives cannot be optimal. First, not employing any type of worker is clearly not optimal. Second, employing only bad workers or bad workers and some good workers is not incentive compatible: unemployed good workers get a rent of zero, but a strictly positive rent by pretending to be bad. Thirdly, employing

only one of the good types is not optimal as the firm can increase its profit by also employing the other good type with the same contract. Finally, note that if only good workers are employed, the firm can in addition employ bad-selfish workers by offering them a “null employment contract” of the form $(e, q, t)(\theta_{bs}) = (1, 0, 0)$. As this causes no costs, employing only the good types is at least weakly dominated by employing the good and the bad-selfish workers. There thus remain only two alternatives: either to employ all types of workers, or to employ all but the bad-fair-minded workers.

Alternative 1: Employing All but the Bad Fair-Minded Workers

Interestingly, fairness concerns have a very limited impact on incentives. As an example consider good-selfish and good-fair-minded workers. A good-selfish worker prefers his contract to the contract of, say, the bad-selfish workers if his contract yields him a higher rent. Since he is equally productive, a good-fair-minded worker also gets a higher rent when announcing to be good-selfish than when announcing to be bad-selfish. Since fair-minded workers are ultimately interested in a high rent, they will thus never announce to be bad-selfish. Consequently, the incentive constraint preventing them from pretending to be bad-selfish is implied by the corresponding incentive constraint of the good-selfish workers.

If the workers’ types are unobservable and the firm wants to employ all but the bad-fair-minded workers, the above and a standard argument imply that the incentive constraints of the good-fair-minded and the bad workers can be ignored. As they are not employed, the bad-fair-minded workers get their outside option by definition. Thus, only the participation constraint of the bad-selfish and the incentive constraint of the good-selfish workers restrict the firm. Optimal contracts are then characterized as follows, where superscript E stands for optimal second-best contracts excluding the bad-fair-minded workers.

Proposition 4 (Excluding the Bad Fair-Minded Workers) *Suppose the workers' types are unobservable and the firm wants to employ all but the bad-fair-minded workers such that $e(\theta_{bf}) = 0$ and $e(\theta) = 1$ for all $\theta \neq \theta_{bf}$. For $i = s, f$ the optimal employment contracts are then characterized by the production quantities*

$$c'[q^E(\theta_{gi})] = \frac{1}{\theta_{gi}} \quad \text{and} \quad c'[q^E(\theta_{bs})] = \left[\theta_{bs} + \frac{\pi(\theta_{bs} - \theta_{gi})}{(1 - \pi)(1 - \gamma)} \right]^{-1}$$

and income levels

$$t^E(\theta_{gi}) = \theta_{gi} c[q^E(\theta_{gi})] + (\theta_{bi} - \theta_{gi}) c[q^E(\theta_{bs})]$$

$$t^E(\theta_{bs}) = \theta_{bs} c[q^E(\theta_{bs})].$$

Thus, good-selfish and good-fair-minded workers get the same employment contract, and contracts are independent of the level α of fairness concerns.

By the above argument fairness can thus influence optimal contracts only via the participation constraints of the fair-minded workers. Because of asymmetric information the good workers must be given an information rent which causes a rent inequality within the firm. However, participation of the good-fair-minded workers is never an issue because of their low production costs and incentive compatibility. Moreover, the bad-fair-minded workers do not compare themselves with the employed workers and require no extra compensation if they are not employed. In this case fairness concerns are irrelevant.

Alternative 2: Employing All Types of Workers

However, if the bad-fair-minded workers are to be employed, they compare themselves with the good workers. Their participation then requires an additional compensation for the rent inequality arising from asymmetric information, and fairness concerns do affect optimal employment contracts. As separation is impossible, bad-selfish workers get the same employment contract as bad-fair-minded workers. Since the former do not suffer from inequity, their participation constraint can be ignored. Essentially the same arguments as in the previous section imply that only the incentive constraint of the good and the participation constraint of the bad-fair-minded workers need to be considered. The optimal contracts characterized in Proposition 5 take these extra costs into account, where superscript A stands for optimal second-best contracts employing all workers.

Proposition 5 (Employing All) *Suppose the workers' types are unobservable and the firm wants to employ all workers such that $e(\theta) = 1$ for all $\theta \in \Theta$. For $i = s, f$ the optimal employment contracts are then characterized by the production quantities*

$$c'[q^A(\theta_{gi})] = \frac{1}{\theta_{gi}} \quad \text{and} \quad c'[q^A(\theta_{bi})] = \left[\theta_{bi} + (\theta_{bi} - \theta_{gi}) \left[\frac{\pi(1 + \alpha)}{1 - \pi} \right] \right]^{-1}$$

and income levels

$$t^A(\theta_{gi}) = \theta_{gi} c[q^A(\theta_{gi})] + (1 + \pi \alpha)(\theta_{bi} - \theta_{gi}) c[q^A(\theta_{bi})]$$

$$t^A(\theta_{bi}) = \theta_{bi} c[q^A(\theta_{bi})] + \pi \alpha(\theta_{bi} - \theta_{gi}) c[q^A(\theta_{bi})].$$

Thus, selfish and fair-minded workers of equal productivity get the same employment contract, the income difference between good and bad workers is increasing in the level α of fairness concerns, and contracts are independent of the fraction γ of fair-minded workers.

Inspection of the optimal income levels shows that participation of the bad-fair-minded workers is very costly. First, the production advantage and incentive constraints of the good workers imply that these receive the bad-fair-minded worker's compensation for rent inequality as an additional rent. Moreover, the bad-selfish workers get the same contract as the bad-fair-minded workers. Since they do not suffer from inequity, they also receive a rent. Optimal contracts account for these extra costs by lowering the bad workers' production quantity in order to reduce the good workers' information rent and thus the rent inequality. Fairness concerns thus aggravate the distortions caused by asymmetric information.

Optimal Second-Best Contracts

To determine which of the above alternatives is optimal, consider a firm excluding the bad-fair-minded workers by using the optimal employment contracts as in Proposition 4. Suppose the firm now wants to employ the bad-fair-minded workers in addition. As the good workers must be given a strictly positive rent in order to prevent them from mimicking the bad-selfish workers, the bad-fair-minded workers have to receive a compensation for the rent inequality within the firm even if they are not required to produce anything. Including the bad-fair-minded workers thus involves some fixed costs, which might make an exclusion of this type desirable even though the cost function c satisfies the Inada conditions. Depending on the fraction γ of fair-minded workers, the optimal second-best contracts are thus given by

Proposition 6 (Second-Best Contracts) *Suppose the workers' types are unobservable. Then there exists a cutoff $\tilde{\gamma}$ such that*

- 1. for all $\gamma \leq \tilde{\gamma}$ it is optimal for the firm to exclude the bad-fair-minded workers. Optimal contracts are then as characterized in Proposition 4.*
- 2. for all $\gamma \geq \tilde{\gamma}$ it is optimal for the firm to employ all types of workers. Optimal contracts are then as characterized in Proposition 5.*

Since the firm cannot screen employed workers according to their preferences, fairness has a discontinuous impact on optimal employment decisions and contracts. If relatively few workers are fair-minded, the bad-fair-minded workers are excluded in order to avoid the extra costs and distortions caused by their fairness concerns. In this case, all employed workers receive contracts as if all workers were selfish. If, however, the fraction of fair-minded workers exceeds the threshold $\tilde{\gamma}$, it becomes too costly to exclude the bad-fair-minded workers. In this case, fairness suddenly affects the employment contracts of all workers even though a potentially large fraction of the workforce has no fairness concerns at all.

5 Discussion and Summary

Fairness and Corporate Culture

For simplicity the present model only considers a monopolistic firm. However, if results carry over to the case of competing firms or firms act as local monopsonists, the impossibility to screen employed workers with respect to their fairness concerns has the following implications. Each firm's optimal remuneration scheme depends on its production technology and the fraction of fair-minded workers. Since the optimal employment contracts are discontinuous in the fraction of fair-minded workers, two identical firms facing slightly different pools of workers - one with a fraction of fair-minded workers just above, the other with a fraction of fair-minded workers just below the threshold $\tilde{\gamma}$ - choose radically different remuneration schemes. Thus, if the pool of potential employees is similar for firms within a certain sector of the economy, but sufficiently different across sectors, there will arise a sector-specific use of incentive schemes. Equally, if firms have slightly different production technologies - for example different fixed cost or production complementarities - very similar firms within a sector might use very heterogeneous remuneration schemes. Moreover, Roth, Prasnikar,

Okuno-Fujiwara, and Zamir (1991) suggest that individual fairness concerns are influenced by the cultural background. The present paper thus offers an explanation for the apparent existence of highly different remuneration schemes or “corporate cultures” across and within sectors of the world economy.

Fairness and Wage Compression

The analysis has shown that if the bad-fair-minded workers are to be employed, the firm reduces the arising extra cost by reducing the production quantity of the bad workers. As the information rents of the good workers can then be lowered, this allows the firm to decrease the income levels of all workers. However, inspection of Proposition 5 shows that the income of the bad workers falls most sharply as not only their compensation for production costs, but also the bad-fair-minded workers’ income premium for rent inequality may be reduced. In the present model fairness concerns thus increase the income difference between good and bad workers. This seems in striking contrast to Akerlof and Yellen (1990), where fairness concerns are used to explain the empirically observed compression of wages relative to productivity differences.⁸ However, “income” and “wages” do not necessarily have the same meaning in the models under consideration. In particular the present paper does not imply that fairness increases the wage difference if wages are defined as income divided by production. Nevertheless, the analysis suggests that abstracting from the interaction of fairness concerns and incentives could be problematic.

The Importance of the Reference Point

The results of the present paper depend on the assumption that workers compare rents. If, for example, workers compare income, the following two contracts can separate employees with equal productivity but different concerns for fairness. These contracts are chosen such that the first grants a relatively high rent and a low income, whereas the second yields a relatively low rent and a high income. Selfish agents only care for their rent, and thus choose the first contract. If, however, the firm also offers a third contract with a very high income, fair-minded workers - even though they then get a lower rent - might prefer the second contract in order to reduce the income inequality.

⁸See, for example, Frank (1984).

There are, however, good reasons to assume that workers compare rents. Social psychologists like Festinger (1957) and Adam (1963) argue that workers desire a fair relation between inputs and outcomes or - in this setting - production costs and income. Moreover, ignoring production costs seems absurd when taken to extremes. As an illustration consider a worker who receives 2000 Dollar per month and in turn has to spend 1 hour a day at work. If production costs were not incorporated, this worker would envy another worker who receives 2001 Dollar per month but has to spend 10 hours a day at work. Still, the determination of the workers' precise reference point is an empirical questions that deserves further investigation.⁹

Summary

There seems to be a common notion in labor economics and organizational behavior that fairness concerns play an important role in the relationship between worker and firm. Investigating the impact of fairness in an adverse selection setting, the present paper shows that fairness concerns strongly interact with asymmetric information and aggravate inefficiency despite the use of optimal incentive contracts. Most importantly, separation of workers with equal productivity but different fairness concerns turns out to be impossible if both types are to be employed. Therefore, it is optimal for a firm to either exclude less productive and fair-minded workers, or to use a fair remuneration scheme for its entire workforce even though only a fraction of the workers has indeed fairness concerns. Moreover, the discontinuity of the optimal employment contracts in the fraction of fair-minded workers hints at reasons for the existence of very different corporate cultures among identical firms facing slightly different pools of potential employees.

⁹In most of the existing experiments concerning fairness and incentives, effort costs are translated into monetary costs. It is then impossible to distinguish between individuals comparing monetary payoffs and rents.

Appendix

Proof of Proposition 3

Suppose $u(\theta_{is}, \theta_{is}) \neq u(\theta_{if}, \theta_{if})$ but $e(\theta_{is}) = e(\theta_{if}) = 1$ for given $i \in \{g, b\}$. The incentive constraints guaranteeing separation of these two types then imply

$$u(\theta_{is}, \theta_{is}) > u(\theta_{is}, \theta_{if}) \quad (5)$$

$$u(\theta_{if}, \theta_{if}) - \alpha S(\theta_{if}, \theta_{if}) \geq u(\theta_{if}, \theta_{is}) - \alpha S(\theta_{if}, \theta_{is}) \quad (6)$$

where the strict inequality in (5) follows from $u(\theta_{is}, \theta_{is}) \neq u(\theta_{if}, \theta_{if})$. Both types have the same productivity, thus $u(\theta_{if}, \hat{\theta}) = u(\theta_{is}, \hat{\theta})$ for all $\hat{\theta}$. Repeatedly using this equality, (5) implies that (6) holds true if and only if $S(\theta_{if}, \theta_{is}) > S(\theta_{if}, \theta_{if})$. This is incompatible with $u(\theta_{if}, \theta_{is}) > u(\theta_{if}, \theta_{if})$ from (5) as a strictly higher rent implies an at least weakly lower suffering form rent inequality. *Q.E.D.*

Proof of Proposition 4

A) By Proposition 3 all good workers get the same employment contract. Thus, good workers have no incentives to mimic other good workers with different fairness concerns. Since $e(\theta_{bf}) = 0$ the participation constraint of the bad-fair-minded workers is satisfied. Assume all incentive constraints concerning imitation of or imitation by the bad-fair-minded workers not to be binding. Equally, assume the incentive constraint preventing the bad-selfish workers from pretending to be good is not binding.

B) Consider the remaining incentive constraints. It is optimal for good workers not to pretend to be bad-selfish if and only if

$$u(\theta_{gs}, \theta_{gs}) \geq u(\theta_{gs}, \theta_{bs}) \quad (7)$$

$$u(\theta_{gf}, \theta_{gf}) - \alpha S(\theta_{gf}, \theta_{gf}) \geq u(\theta_{gf}, \theta_{bs}) - \alpha S(\theta_{gf}, \theta_{bs}). \quad (8)$$

All good workers get the same employment contract such that $u(\theta_{gs}, \theta_{gs}) = u(\theta_{gf}, \theta_{gf})$. Moreover, $u(\theta_{gs}, \theta) = u(\theta_{gf}, \theta)$ for all θ , (7), and $\theta_{gf} < \theta_{bs}$ imply $u(\theta_{gf}, \theta_{gf}) \geq u(\theta_{bs}, \theta_{bs})$. Together with $e(\theta_{bf}) = 0$ this implies $S(\theta_{gf}, \theta_{gf}) = 0$. As $S(\theta_{gf}, \theta_{bs}) \geq 0$, (7) implies (8) which can thus be ignored.

C) Consider the remaining participation constraints. It is optimal for good and bad-selfish workers to participate if and only if

$$u(\theta_{gi}, \theta_{gi}) \geq 0 \quad (9)$$

$$u(\theta_{bs}, \theta_{bs}) \geq 0 \quad (10)$$

for $i = s, f$. $u(\theta_{gi}, \theta_{bs}) \geq u(\theta_{bs}, \theta_{bs})$ for $i = s, f$ and (7) imply that (9) is not binding. Inequality (10), however, must be binding as the firm could otherwise increase its profit by lowering $t(\theta_{bs})$ without harming incentives for the good workers.

C) By the above argument (7) must be binding as the firm could otherwise increase its profit by lowering $t(\theta_{gs})$ and $t(\theta_{gf})$. Doing so does not aggravate participation of the bad-selfish workers while the non-binding participation constraints of the good workers can be ignored. Maximization of the firm's profit with only (7) and (10) binding yields the contracts as characterized in Proposition 4.

E) Given contracts as characterized in Proposition 4 consider the incentive constraints that were assumed to be non-binding in part A) of this proof. First, $U(\theta, \theta_{bf}) = 0$ for all θ since $e(\theta_{bf}) = 0$. Thus, no type has incentives to falsely pretend to be bad-fair-minded. Second, it is optimal for the bad workers not to pretend to be good if and only if

$$0 \geq u(\theta_{bs}, \theta_{gi}) \quad (11)$$

$$0 \geq u(\theta_{bf}, \theta_{gi}) - \alpha S(\theta_{bf}, \theta_{gs}) \quad (12)$$

for $i = s, f$. Since $S(\theta_{bf}, \theta_{gs}) \geq 0$ and $u(\theta_{bs}, \theta_{gi}) = u(\theta_{bf}, \theta_{gi})$ for $i = s, f$ inequality (11) implies (12). However, (11) is satisfied as the quantities in Proposition 4 fulfil $q_{gi}^E \geq q_{bs}^E$ by the strict convexity of c . Finally, a bad-fair-minded worker has no incentives to pretend to be bad-selfish as $u(\theta_{bf}, \theta_{bs}) = 0 - S(\theta_{bf}, \theta_{bs}) \leq 0$. *Q.E.D.*

Proof of Proposition 5

A) First, by Proposition 3 workers of equal productivity get the same employment contract. Thus, they have no incentives to mimic each other. Second, by the same argument as for Proposition 4 a good-fair-minded worker has no incentives to pretend to be a bad worker whenever the same holds true for a good-selfish worker. Thirdly, since a

bad-selfish worker does not suffer from inequality, he gets a weakly higher utility than a bad-fair-minded worker and his participation constraint is not binding. Finally, by the same argument as for Proposition 4 the participation constraint of the good workers is not binding.

B) Assume that the incentive constraints preventing the bad workers from mimicking the good workers are not binding. The remaining constraints, that is the incentive constraint of the good-selfish worker and the participation constraint of the bad-fair-minded worker, are

$$u(\theta_{gs}, \theta_{gs}) - u(\theta_{gs}, \theta_{bi}) \geq 0 \quad (13)$$

$$u(\theta_{bf}, \theta_{bf}) - \alpha S(\theta_{bf}, \theta_{bf}) \geq 0 \quad (14)$$

for $i = s, f$. (14) must be binding as the firm can otherwise increase its profit by lowering $t(\theta_{bf})$ without harming incentives for the good workers. (13) must be binding as the firm can otherwise increase its profit by lowering $t(\theta_{gs})$ and $t(\theta_{gf})$, where lowering $u(\theta_{gi}, \theta_{gi})$ decreases the rent inequality within the firm, thus increases the utility of employed bad-fair-minded workers, and consequently even facilitates participation of the bad-fair-minded workers. The non-binding participation constraints of the good workers can be ignored.

C) Since (13) and $\theta_{gi} < \theta_{bj}$ imply $u(\theta_{gi}, \theta_{gi}) > u(\theta_{bj}, \theta_{bj})$ for all $i, j = s, f$ and all good workers get the same employment contract, the suffering of the bad workers is $S(\theta_{bf}, \theta_{bf}) = \pi\alpha [u(\theta_{gs}, \theta_{gs}) - u(\theta_{bf}, \theta_{bf})]$. Maximization of the firm's profit with only (13) and (14) binding yields the contracts as characterized in Proposition 5.

D) Given contracts as characterized in Proposition 5 consider the incentive constraints that were assumed not to be binding in part B) of this proof. For $i = s, f$ these are

$$u(\theta_{bs}, \theta_{bs}) \geq u(\theta_{bs}, \theta_{gi}) \quad (15)$$

$$u(\theta_{bf}, \theta_{bf}) - \alpha S(\theta_{bf}, \theta_{bf}) \geq u(\theta_{bf}, \theta_{gi}) - \alpha S(\theta_{bf}, \theta_{gi}). \quad (16)$$

By the same argument as in Proposition 4 inequality (15) is satisfied as the strict convexity of c implies $q^A(\theta_{gi}) > q^A(\theta_{gi})$ for both $i = s, f$. Since all bad workers get the same employment contract and $u(\theta_{bs}, \theta_{gi}) = u(\theta_{bf}, \theta_{gi})$ for $i = s, f$, (15) implies $u(\theta_{bf}, \theta_{bf}) \geq u(\theta_{bf}, \theta_{gi})$, thus $S(\theta_{bf}, \theta_{gi}) \geq S(\theta_{bf}, \theta_{bf})$, and consequently (16).

E) Finally, the income difference between good and bad workers is given by

$$t^A(\theta_{gi}) - t^A(\theta_{bi}) = \theta_{gi} \left[c[q^A(\theta_{gi})] - c[q^A(\theta_{bi})] \right]$$

for $i = s, f$. Since $q^A(\theta_{gi}) > q^A(\theta_{bi})$ for all α the income difference is always positive. Since $q^A(\theta_{gi})$ is independent of α whereas $q^A(\theta_{bi})$ is strictly decreasing in α , the income difference is strictly increasing in α . *Q.E.D.*

Proof of Proposition 6

A) Let $R^A(\alpha)$ and $R^E(\gamma)$ denote the firm's maximum profit when employing all and when excluding the bad-fair-minded workers, respectively. Thus,

$$\begin{aligned} R^A(\alpha) &= \pi[q^A(\theta_{gi}) - t^A(\theta_{gi})] + (1 - \pi)[q^A(\theta_{bi}) - t^A(\theta_{bi})] \\ R^E(\gamma) &= \pi[q^E(\theta_{gi}) - t^E(\theta_{gi})] + (1 - \pi)(1 - \gamma)[q^E(\theta_{bs}) - t^E(\theta_{bs})] \end{aligned}$$

for $i = s, f$ with quantities and income levels as characterized in Proposition 4 and 5.

B) Consider $R^E(\gamma)$. Substitution of the income levels and the envelope theorem imply $\frac{d}{d\gamma} R^E(\gamma) = -(1 - \pi) [q^E(\theta_{bs}) - \theta_{bs} c[q^E(\theta_{bs})]]$. As $q^E(\theta_{bs}) < q^{FB}(\theta_{bs})$ holds true for all γ , $q^E(\theta_{bs}) - \theta_{bs} c[q^E(\theta_{bs})]$ is strictly positive. Thus, R^E is strictly decreasing in γ .

C) Consider $R^A(\alpha)$. Substitution of the income levels and the envelope theorem imply $\frac{d}{d\alpha} R^A(\alpha) = -(\theta_{bi} - \theta_{gi}) \pi c[q^A(\theta_{bi})]$. Since $q^A(\theta_{bi}) > 0$ holds true for finite α , R^A is strictly decreasing in α .

D) Consider the limit $\gamma \rightarrow 0$. Proposition 4 and 5 then yield $\lim_{\gamma \rightarrow 0} R^E(\gamma) = \lim_{\alpha \rightarrow 0} R^A(\alpha)$. As R^A is strictly decreasing in α , this implies $\lim_{\gamma \rightarrow 0} R^E(\gamma) > R^A(\alpha)$ for all $\alpha > 0$.

E) Consider the limit $\gamma \rightarrow 1$. The properties of c then imply $\lim_{\gamma \rightarrow 1} q^E(\theta_{bs}) = 0$ and $\lim_{\gamma \rightarrow 1} t^E(\theta_{gi}) = \theta_{gi} c[q^E(\theta_{gi})]$. Thus, $\lim_{\gamma \rightarrow 1} R^E(\gamma)$ equals the firm's profit if all workers are employed and the bad-fair-minded workers get contract $(e, q, t)(\theta_{bf}) = (1, 0, 0)$. Once employed, however, the firms profit is strictly increasing in the bad-fair-minded workers' production quantity as $\lim_{q \rightarrow 0} c'(q) = 0$. Thus, $R^A(\alpha) > \lim_{\gamma \rightarrow 1} R^E(\gamma)$.

F) Since $R^A(\alpha)$ and $R^E(\gamma)$ are continuous, $R^A(\alpha)$ is independent, and $R^E(\gamma)$ is strictly decreasing in γ , the intermediate value theorem and part D) and E) of this proof imply Proposition 6. Q.E.D.

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