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Screening, Competition, and Job Design

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Screening, Competition, and Job Design:*
Economic Origins of Good Jobs

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Abstract:
In recent decades, many firms offered more discretion to their employees, often increasing the productivity of effort but also leaving more opportunities for shirking. We show experimentally that complementarities between high effort discretion, rent-sharing, screening opportunities, and competition are important driving forces behind these "high-performance work systems." We document the endogenous emergence of two fundamentally distinct employment strategies. If employers cannot screen employees, a control strategy prevails, while the possibility of screening renders a trust strategy profitable. The introduction competition substantially fosters the trust strategy, reduces market segmentation, and leads to a large welfare gain for both employers and employees.

Keywords: job design, high-performance work systems, screening, reputation, competition, trust, control, social preferences, complementarities
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1 Introduction

"Trust is good, control is better." This famous quote attributed to Lenin refers to a fundamental question in any principal-agent relationship: To what extend should the principal leave discretion to the agent? Standard principal-agent theory suggests that discretion should be limited as much as possible; otherwise the agent will either exploit his freedom to shirk or he will have to be offered expensive monetary incentives to choose actions that are in the principal's interest.[1] Similarly, Taylorism, the dominant paradigm of scientific workplace organization in the first two-thirds of the 20th century, is based on the assumption that workers will always work at the slowest rate that goes unpunished. Standardization of the production process is therefore essential, so that that the workers' efforts can be effectively monitored and controlled.

More recent human resource management theories, however, stress the cost of control. A worker who has to follow strict and tightly controlled rules cannot use his private information and ingenuity to solve problems "on the floor", and his productivity decreases because he cannot adapt his actions to changes in his environment. Modern "high-performance work systems" decentralize the gathering and processing of information and grant authority to employees to act on this information as they see fit in order to solve the problems that arise.[2] This strategy reduces the cost of control, but it makes the company vulnerable. It remains at the employee's discretion whether to use his authority to benefit his company or to shirk.

In this paper, we address the fundamental trade-off between efficiency of effort and control of effort that underlies the different forms of work organization. We show experimentally that offering discretion to an agent is not profitable on its own. However, if offering discretion improves the agent's flexibility and productivity in addition to being combined with high fixed wages that offer a rent to the agent, and if the principal can screen agents based on their past behavior, this combined strategy then becomes profitable. It induces the agents to work much harder than if their discretion is restricted and they are paid low wages and low rents. Put differently, we show that offering discretion, paying high wages, and screening are complements.

[1] If the agent has fewer actions to choose from, there are fewer incentive compatibility constraints that have to be satisfied. Thus, the implementation of an action becomes cheaper if the agent has less discretion. Furthermore, Grossman and Hart (1983) show that having a more informative signal about the agent's action reduces the implementation cost. Thus, having additional information through more monitoring and control, i.e. less discretion, is always beneficial.

[2] See, e.g., Osterman (1994a), Lawler, Mohrman and Ledford (1995), Appelbaum, Bailey, Berg, and Kalleberg (2000), and Ichniowski and Shaw (2003) for an overview of the different forms that these work systems can take.

Complementarities imply that different components of a strategy reinforce each other and therefore lead to a bundling or clustering of these components.

We document experimentally the endogenous emergence of two distinct clusters of job characteristics based on two fundamentally distinct strategies – a *control strategy* and a *trust strategy*. Under the control strategy, the experimental employers offered jobs characterized by limited effort discretion, low wages, a low requested effort, and a low rent. Under the trust strategy, the employers offered jobs with high effort discretion and high wages, they requested a high effort, and the overall compensation package involved substantial rents.[3] In other words, the trust strategy is to offer "good" jobs, while the control strategy is associated with "bad" jobs.[4] While the trust strategy is clearly beneficial for employees, it requires a considerable amount of trust on the part of the employer: He pays a higher wage but – due to the greater effort discretion – he risks increased employee shirking. Thus, if the agent is not trustworthy, the employer incurs a significant loss, which raises the question how the trust strategy can be viable at all.

Our experimental treatments identify key economic conditions under which the trust strategy is superior to the control strategy. We show, in particular, that opportunities to screen employees based on signals about past performance are decisive for the viability of the trust strategy. In the absence of such screening opportunities – in our base treatment – the large majority of employees shirked and the employers predominantly implemented the control strategy. In contrast, the screening treatment provided an imperfect signal about employees' past performance, and many employers in this treatment conditioned their job offers on this signal. Employees with a signal indicating high past performance obtained good jobs in the majority of cases, while almost all employees with low signals received bad job offers. The employers' screening behavior generated incentives for the employees to increase effort in order to improve their reputations, which led to a substantial increase in employees' average effort in the screening treatment compared to the base treatment.

It is important, however, to point out that the reputation formation opportunities in the screening treatment did not induce employees to provide high effort *per se*. Employees with a

[3] This finding accords to McGregor's (1960) theories "X" and "Y", describing two very different attitudes toward workforce motivation. He claimed that employers follow either one or the other approach.

[4] The two distinct types of jobs can legitimately be termed "good" and "bad" jobs because the high wage offered under the trust strategy contained a large rent component, i.e. the higher wage *over*compensated the employees for their higher effort, implying that their total compensation exceeded their supply price. Under the control strategy, the experimental employers typically paid just enough to induce acceptance of the job offer.

high performance signal tended to reciprocate reliably high wages with a high level of effort, but they withdrew their effort if they received a low wage offer, even if this hurt their reputation and lowered their expected future payoffs. This behavior forced principals to pay high wages if they wanted to elicit high effort. However, by offering high wages only to high-reputation employees, employers could limit the risk associated with paying the high wage upfront. Thus, the screening possibility rendered high wages and job rents profitable.

Although the possibility of screening employees leads to an increase in the provision of good jobs and higher effort, it does not suffice for bringing the market to the efficiency frontier, as a significant fraction of employers only used the control strategy. These employers never learned that paying high wages to high reputation agents pays off because *all* employees respond to a low wage with low effort. Thus, these employers experienced that employees with a high reputation provided low effort, which reinforced their use of the control strategy. There is also a non-negligible minority of employees who *always* shirked even though investing in a good reputation would have been profitable. Similar to employers who never trust, these employees never learned that reciprocating to high wage offers by choosing high effort levels increases future income.

This interaction of heterogeneous employees and employers gives rise to a segmentation of the labor market. In the screening treatment, some employees work hard, acquire a good reputation, and tend to be offered good jobs. Other employees shirk, are left with a poor reputation, and get stuck with bad jobs. Our results show that in an environment where screening and reputation building is possible, employees who only consider their narrow, short-term self-interest are more likely to end up in work environments that are tightly controlled and leave no rents on the table, while employees who behave reciprocally (for intrinsic or strategic reasons) are more likely to get good jobs that leave them more discretion and offer higher rents.[5]

What determines the relative size of these two segments in the labor market? We implemented competition among employers and employees in a third treatment. We show that competition among employers for high-reputation employees and among employees for generous

[5] The simultaneous existence of poorly paid jobs with limited effort discretion for the employees and well paid jobs with a high rent and a high discretion in effort choices is reminiscent of the literature on segmented labor markets (Doeringer and Piore 1971, Edwards, Reich and Gordon 1975). This literature documented the existence of low and high pay segments of the labor market with little mobility between the segments. We find a similar segmentation pattern in our experimental labor market because the low reputation employees are trapped in the poorly paid segment of the market.

job offers increases the incentives for agents to acquire a high reputation and for principals to condition job offers on past performance, and it fosters learning such that most market participants behave (close to) optimally. Employers realize that they will not be able to hire employees with good track records by offering bad jobs. Employees realize that they will be left behind if they do not have a good reputation. As a result, the fraction of good jobs increases significantly while the fraction of bad jobs diminishes, and both employers and employees profit from the introduction of competition.

A key result of our experiment is the bundling of job characteristics into good and bad jobs. This result suggests that one should observe a positive correlation between wages and effort discretion in naturally occurring field data if the forces present in the experiment generalize to the field. Likewise, there should be a positive correlation between job satisfaction and effort discretion in field data because higher effort discretion is predicted to be associated with higher job rents. We examine these questions using representative data for Germany (the Socio-Economic Panel; SOEP). Both correlations are supported at high significance levels, even if we control for a host of factors such as education, tenure, gender, occupation, and industry, suggesting that our experimental results may also capture relevant forces in the field. These findings lend support to the generalizability of our experimental results to the field.[6]

Our paper is related to the theoretical and empirical literature on reputation formation (e.g., Fama 1980, Kreps et al. 1982, Malcomson and MacLeod 1998, Holmström 1999, MacLeod 2007, Bolton, Katok and Ockenfels 2004, Brown, Falk and Fehr 2004, Cabral and Hortacsu 2006, Huck, Lünser and Tyran 2006, Brown and Zehnder 2007).[7] The empirical literature has documented the efficiency enhancing effect of reputational incentives in a variety of contexts such as labor, credit, and goods markets. However, none of these papers investigated the role of screening and competition based on past performance signals for the employer's decision to give effort discretion to employees. In other words, these papers did not examine the optimal solution to the fundamental trade-off between efficiency of effort and control of effort that underlies different forms of work organization such as Taylorist or high-performance work systems.

[6] In a related paper, Green (2008) shows that British workers that are classified as loyal by their company enjoy higher effort discretion, a result that is also consistent with the notion that employers screen their employees according to their loyalty (reputation) and offer the loyal employees better jobs.

[7] Our data support, for example, the prediction of Holmström's model (1999) that employees work hard in equilibrium if the market infers their productivity from past performance. Although our set-up differs in various ways from his model, our data corroborate the model's key prediction that reputational incentives enhance effort provision even in one-shot interactions.

Our paper is also related to the literature on complementarities in the organization of the workplace. Milgrom and Roberts (1990, 1995), Kandel and Lazear (1992), Baker, Gibbons, and Murphy (1994), and Holmström and Milgrom (1994) have shown theoretically that important complementarities between technology, strategy, and incentive systems may exist. Ichniowski, Shaw and Prennushi (1997), MacLeod and Parent (1999), and the work summarized in Ichniowski and Shaw (2003) provide empirical evidence that complementarities between job characteristics, different human resource management practices, and the form of compensation exist.[8] These empirical studies, however, did not explicitly identify the *causal* factors behind the actual implementation and the viability of a set of complementary job characteristics. In fact, one of the enduring puzzles in this literature is why only some firms implement innovative workplaces with higher effort discretion, as this enhanced productivity in the cases that were studied (see MacDuffie 1995, Ichniowski et al. 1997, Appelbaum et al. 2000, Ichniowski and Shaw 2003). Our experiments provide additional useful insights because the data enable us to identify screening opportunities, reputation formation, and competition as key causal forces behind optimal job design.

Our findings also have a bearing on the discussion about the sources of segmented labor markets where good and bad jobs coexist with little mobility of workers across job types (Doeringer and Piore 1971, Edwards, Reich and Gordon 1975, Cain 1976). The experimental results suggest that workers and firms behave sub-optimally without sufficient labor market competition, which may be a reason for segmentation. However, if competition is strong enough, suboptimal behavior is largely removed and the segmentation tends to vanish. This finding indicates that the extent of individual rationality may not just be a personal trait, but may also be affected by the degree of competition in a market.

Finally, our paper is related to the literature on the impact of control and extrinsic incentives on intrinsic motivation and voluntary cooperation (for example, Frey 1997, Gneezy and Rustichini 2000, Frey and Jegen 2001, Fehr and Rockenbach 2003, Benabou and Tirole 2006, Falk and Kosfeld 2006, Sliwka 2007, Ellingsen and Johannesson 2008). In particular, Falk and Kosfeld (2006) show experimentally that fair-minded agents may reduce voluntary effort

[8] For example, MacLeod and Parent (1999) show that jobs with high-powered explicit incentives in the form of piece rate or commission rate contracts tend to be associated with more workplace autonomy. They show, however, that contracts with these explicit incentives are rare and that the vast majority of workers are compensated with hourly wages and salaries.

provision if the principal chooses to control them. These "hidden costs of control" may, therefore, diminish the principals' incentive to control the agents even in the absence of screening opportunities. Although our data are consistent with the existence of hidden costs of control, they also suggest that these costs are not sufficiently high (in our setting) to induce the employers to forgo their control option: in the absence of screening opportunities, the vast majority of the employers converge towards the control strategy because it is more profitable.

The remainder of the paper is organized as follows. Section 2 outlines the experimental design and procedural details. In Section 3, we discuss the behavioral implications for our set-up if (i) all subjects are self-interested, (ii) a non-negligible share of the subjects also has a preference for fairness and (iii) if hidden costs of control exist. Section 4 presents and discusses the experimental results on the bundling of job attributes, the employers' actual and optimal strategies, the existence of suboptimal employers and employees in the screening treatment, and the resulting segmentation of the labor market. In this section we also analyze the effects of competition. In Section 5 we compare our experimental results to field data. Section 6 concludes.

2 Experimental Design and Procedures

Consider an employer who hires an employee for production. The employee generates a monetary gross profit $b \cdot e$ if he expends effort e. The parameter $b > 1$ reflects the employee's efficiency. Gross profits accrue directly to the employer, while the employee incurs private effort costs $c(e) = e$, measured in monetary terms. Thus, the employer wants the employee to choose high effort levels, but the employee prefers low effort.

The employer can offer an employment contract to the employee that specifies a fixed wage w and a requested, non-binding, effort level $\tilde{e}$. The wage must at least cover the costs of the requested effort. The contract can neither be conditional on effort, effort costs, nor gross profits. These variables are observable by both parties, but they cannot be verified by the courts. If the employee rejects the contract offer, no wage is paid, no effort is exerted, and both parties receive their reservation utilities of 0. If the employee accepts, the employer must pay the offered wage, irrespective of the actual effort the employee chooses. Payoffs are given by $\Pi = b \cdot e - w$ for the employer and $U = w - e$ for the employee.

There are two types of contracts that the employer can offer: a *contract with full discretion* and a *contract with limited discretion*. These contract types differ in two dimensions:

1. *Minimum effort level*: In a contract with full discretion, the employee can choose any effort level between 1 and 10, whereas he must choose an effort level of at least 3 in a contract with limited discretion, given he accepts the contract.
2. *Efficiency*: The effort efficiency of the relationship is characterized by $b = 5$ in a contract with full discretion, while the efficiency parameter is only $b = 4$ in a contract with limited discretion.

This experimental design captures the fundamental trade-off between efficiency of effort and control of effort described in the human resource management literature.[9] Limiting discretion forces employees to obey some minimum standards, which is reflected in the higher minimum effort level. But limiting discretion also restricts employees' ability "to work more smartly," that is, to react in a flexible and efficient way to a changing environment. For example, the employer can establish strict production procedures to tightly govern the employee's actions, regulate working hours by using time cards to monitor attendance, or impose reporting obligations to better assess performance. However, regulated working hours force the employee to work when he might not be most productive, reporting obligations absorb the employee's time and attention, and strict production procedures forfeit other, possibly more efficient practices. The harder the employee works, the more costly restricting his actions becomes. This is reflected by the reduction of the efficiency parameter *b*. Table 1 summarizes the differences between contracts with full and limited discretion, and the employer's and employee's payoff functions.

We started out with two treatments, the *base treatment* and the *screening treatment*. Each treatment lasted for 15 periods and involved 18 employers and 18 employees per session. In each period, an employer was randomly matched with a new employee to eliminate repeated game

[9] The efficiency gains from higher task discretion and lower control are vividly described in Walton (1985, p. 77) who writes that "workers respond best – and most creatively – not when they are tightly controlled by management, placed in narrowly defined jobs, and treated like an unwelcome necessity, but, instead, when they are given broader responsibilities, encouraged to contribute, and helped to take satisfaction in their work." In broadly defined jobs, employees can play, in particular, "a significant role in solving problems and improving methods" which is thought to "boost in-plant quality, lower warranty cost, cut waste, raise machine utilization and total capacity with the same plant and equipment, reduce operating and support personnel, reduce turnover and absenteeism, and speed up implementation of change" (Walton 1985, p. 81). Note that many of the factors mentioned by Walton involve a higher productivity of effort, i.e. a given effort level generates higher value for the firm if effort can be exerted in broadly defined jobs and if employees are free to decide how they perform their tasks. The more recent literature on high-performance work systems (e.g., Ichniowski et al.1997, Appelbaum et al. 2000, Osterman 2006) confirms that not only technology and skill but also the organization of the workplace (e.g., information sharing, allocation of substantial decision rights, careful recruiting, training and development of people) affects employees' productivities. On the downside, high-performance work systems impede the effective control of employees; in the words of Osterman: "employees gain the capacity to, in a sense, hold the firm hostage" (2006, p. 190).

TABLE 1—Contracts and Payoff Functions in Each Period

	Contract with Full Discretion	Contract with Limited Discretion
feasible effort levels	$e \in \{1,...,10\}$	$e \in \{3,...,10\}$
efficiency parameter	$b = 5$	$b = 4$
payoffs if contract is accepted	$\Pi = 5 \cdot e - w$ $U = w - e$	$\Pi = 4 \cdot e - w$ $U = w - e$
payoffs if contract is rejected	$\Pi = U = 0$	$\Pi = U = 0$

effects. In the base treatment, the employer did not receive any information about his current employee, while he received an imperfect signal about his current employee's track record in the screening treatment: he was informed about his current employee's effort choices in the last three periods.[10] Note that an employer neither observed the contract types, the wage offers, nor the requested effort levels that his current employee faced in the last three periods. The employers were thus not perfectly informed about their employees; a low effort choice, for example, could either indicate an untrustworthy employee (who was potentially offered a high wage) or a reciprocal employee who was offered a low wage. Employees knew that future employers would be able to observe their current effort choices. Apart from the information given to the employers in the screening treatment, the two treatments were identical.

The screening treatment reflects the fact that employers sometimes have the opportunity to receive information about an employee's past performance before the time of hiring. For example, the employer may see letters of reference, he may have talked to a previous employer about the employee, or he may have observed the employee directly in his previous position. This information, however, is typically incomplete. Even if the employer receives an accurate signal about the employee's previous performance, he does not observe which contract induced the observed behavior and how well the employee was treated. This is reflected in our experimental design where the employer observes the employee's actions but not the contracts he was offered. Note that the baseline treatment and the screening treatment can be considered as treatments with two extreme versions of screening costs. Screening costs in the baseline treatment can be thought of as being infinite, rendering any screening unprofitable, while the

[10] If the employee did not choose an effort level in one of the past three periods because he rejected a contract, the principal received this information. In periods 1-3, a principal could only be informed about the effort levels that were available so far.

screening costs are zero in the screening treatment because the employers do not have to pay for the information about past performance. The human resource management literature (e.g., Ichniowski and Shaw 2003) stresses that careful screening activities are an important component of the cluster of job attributes that constitute high-performance work systems. However, pinning down the causal role of this factor with field data has proven to be extremely difficult. To our knowledge, no study shows the causal role of screening opportunities for job attributes. The comparison between the baseline and the screening treatments enables us to do exactly this and to identify the extent to which screening is an indispensable feature of organizational practices associated with high effort discretion.

We conducted three sessions of the base treatment and three sessions of the screening treatment with 36 participants in each session. We implemented two matching groups in each session, so we had six matching groups for each treatment. Upon arrival at the lab, half of the subjects were randomly and anonymously assigned the role of an employer, the other half the role of an employee. The experiment was framed as an employment relationship.[11] We used no value laden terms like full or limited discretion, control, trust, or efficiency. We also conducted another two sessions of a *competition treatment* with 32 participants each, where we implemented, in addition to the screening opportunity, competition between employers for employees and between employees for employers with attractive job offers. The competition treatment is described in more detail and analyzed in Section 4.

Sessions lasted about 2½ hours and took place at the Institute for Empirical Research in Economics at the University of Zurich. [12] Subjects were students from the University of Zurich and the Swiss Federal Institute of Technology in Zurich. On average, subjects earned about CHF 46 (US $ 45.20), which includes a show-up fee of CHF 15 (US $ 14.70).

3 Behavioral Predictions

A central question the experiments address is whether there are complementarities between different attributes of a job such as the wage level, requested effort, effort discretion, and job

[11] We implemented both treatments in each experimental session. After the subjects had participated in the base or the screening treatment, we conducted the respective other treatment with the same subjects. There was no role reversal, i.e. subjects in the role of an employer (employee) remained in that role throughout the session. We only use the data from the second treatment in each session in the Appendix, where we characterize the employees' types.
[12] All experiments were computerized with the software z-Tree (Fischbacher 2007). The recruitment was done with the software ORSEE (Greiner 2004).

rents, whether this leads to distinct bundles of job attributes, and if so, which attributes are bundled together. In addition, we want to isolate the causal forces that render one or the other bundle profit-maximizing and compare them with the bundles the employers actually chose. Different behavioral approaches suggest different answers to these questions.

3.1 Self-interest model

The standard neoclassical approach assumes that all people are fully rational and only interested in maximizing their own material payoffs. In this case, the (second best) optimal contract is straightforward. In the base treatment, the employee always chooses the effort level that minimizes his cost, which is $e = 1$ in a contract with full discretion and $e = 3$ in a contract with limited discretion. Furthermore, he accepts all contract offers that yield a non-negative payoff. Therefore, the employer offers a wage that holds the employee down to his reservation payoff of *0*. The contract that maximizes the employer's profit is thus a contract with limited discretion and a wage of $w = 3$. This yields profit $\Pi = 4 \cdot 3 - 3 = 9$. Offering a contract with full discretion and a wage of $w = 1$ only yields a profit of $\Pi = 5 \cdot 1 - 1 = 4$. This prediction holds for both the base and the screening treatments. In the last period of the screening treatment, employees have no reputation to lose and will thus choose the minimum effort level. Employers anticipate this and offer a contract with limited discretion and with wage $w = 3$. By backward induction, this outcome is also the unique prediction for all previous periods.

The self-interest model thus implies that the control strategy prevails in both the base and the screening treatment. Employers will always offer a low wage job with limited discretion that just covers the effort cost of the requested low effort level, and employees always choose the minimal effort level of $e = 3$.

3.2 Social preferences

Models of social preferences (e.g. Rabin 1993, Fehr and Schmidt 1999, Dufwenberg and Kirchsteiger 2004, Falk and Fischbacher, 2006) predict that some employees are "fair" and reciprocate high wages with high effort levels, while other employees are mainly self-interested.[13] These models also predict that controlling an employee does not reduce his effort as

[13] See Sobel (2005) or Fehr and Schmidt (2006) for a survey of this literature.

long as he is offered a fair wage.[14] If the employer cannot observe the employee's past record, her optimal contract offer depends on the share of "fair" employees in the population. If we assume that about 60 percent of the population is selfish and 40 percent is fair, then contracts with limited discretion and low wages are optimal in the base treatment.[15] However, wages have to be sufficiently high to induce employees to accept them. A contract with limited discretion and a wage of 7 splits the surplus (almost) equally if the employee chooses the minimum effort of 3. Thus wages above 7 should always be accepted.

How does the possibility of building a reputation affect this prediction? With reputation, there exists an efficient equilibrium along the lines of Kreps, Milgrom, Roberts, and Wilson (1982).[16] In this equilibrium, all employers offer employees with a high reputation generous contracts with full discretion in all but the last few periods, and contracts with limited discretion and low wages to those with a low reputation. Fair employees with a high reputation (or, in period 1, with no reputation yet) accept generous contracts with full discretion and work hard for them in all periods. They reject contracts with limited discretion and those with full discretion combined with low wages. Selfish employees mimic fair employees in all but the last few periods where they start to randomize between spending a high effort of 10 and a low effort of 1. Once they have lost their good reputations, selfish employees shirk forever.[17]

To summarize, we expect employers in the base treatment to predominantly implement the control strategy, i.e. they offer contracts with limited discretion and low wages, which induces

[14] The reason is that fairness (or kindness) is evaluated only by payoff consequences in all these models. Also in models of intention based reciprocity such as Rabin (1993) the fairness of certain actions is evaluated by the payoff actually given to the other player relative to the set of feasible payoffs that could have been given to the other player. Thus, if the wage is fair, controlling the employee has no impact on the perceived fairness of the situation.

[15] The assumption of 60 percent selfish and 40 percent fair types is a simplification of the distribution in Fehr and Schmidt (1999). This simplified distribution was used in several other papers; e.g. Fehr, Klein and Schmidt (2007).

[16] This game differs in several respects from KMRW (1982). First, each employee in our game interacts with each principal only once; if he deviates, the next employers will punish him. Second, only the current employee observes the contract a principal offers. The principal could thus offer a low wage hoping that the employee will work hard nevertheless in order to keep his good reputation. This deviation is deterred in equilibrium because fair minded employees will reject such a contract, and a rejection does not affect their reputation. Third, there is not a small probability of a "commitment type" but rather a distribution of types whose fairness concerns differ. Nevertheless, the construction of the equilibrium follows similar lines as KMRW (1982).

[17] This equilibrium is, of course, only one of many possible equilibria in the screening treatment. The multiplicity of equilibria is a typical feature of games in which reputation matters; it renders unique predictions impossible. However, the beliefs and behaviors associated with the equilibrium we considered seem plausible; they are based on the intuition that employers benefit from the screening opportunity by conditioning their job offers on the available performance signal which then generates reputational incentives for the employees to provide high effort levels in response to generous job offers. Therefore, we use this equilibrium as a heuristic tool for the generation of behavioral conjectures.

employees to choose an effort level close to $e = 3$. In the screening treatment, employers will condition their job offers on the available signals about past performance: they use the trust strategy for employees with a high signal, i.e. offering contracts with full discretion and high wages, while they use the control strategy for employees with a low signal, i.e. providing contracts with limited discretion and low wages. The resulting incentive for reputation formation will induce employees to choose higher effort levels than in the base treatment. The joint effect of high performance signals and the conditioning of job offers on high performance signals are expected to lead to a prevalence of the trust strategy in the screening treatment.

3.3 Hidden costs of control

Fehr and Rockenbach (2003) and Falk and Kosfeld (2006) show experimentally that controlling agents may crowd out voluntary effort provision. Falk and Kosfeld (2006) called this the "hidden costs of control," and Ellingsen and Johannesson (2008) provide a formal model that rationalizes this behavioral pattern. There might be two forces at work in our set-up. First, control reduces the shirking of the selfish employees who are forced to work harder. Second, fair-minded employees, who are willing to provide effort above the minimally enforceable level if they are offered high wages and full discretion, reduce their voluntary effort provision if they are controlled. Note that if there are no hidden costs of control, the average effort would have to be higher under limited discretion because only the first effect is operative. We can thus identify the existence of hidden costs of control in our experiment by comparing the average effort levels across discretion regimes for given wages: if – conditional on wages – the average effort under a limited discretion contract is not higher than the average effort under a full discretion contract, hidden costs of control exist. If the high hidden costs of control are sufficiently high, they may render contracts with full discretion more profitable than contracts with limited discretion because the latter inhibits high effort levels of reciprocal employees. In this case, the contracts with full discretion may even prevail in the base treatment where the employers have no information about their employees.

4 Results

In Section 4.1, we first discuss the employers' clustering of job attributes (i.e. job design) and the optimality of these clusters in the different situations. We then explain the pattern of profit-maximizing clusters of job attributes in terms of employees' effort behavior and discuss the

question whether hidden costs of control affect this pattern in Section 4.2. Section 4.3 examines whether employers offer the optimal clusters of job characteristics in the different situations and how the deviations from optimality are associated with labor market segmentation. In Section 4.4, we study the impact of competition on the employees' effort choices, the employers' strategies, market segmentation, and overall surplus.

4.1 Job Design and the Optimality of Different Clusters of Job Attributes

Our experimental design allows for a large number of combinations of contracts with full and limited discretion, wages and rents, and requested effort levels. However, we observe two very distinct clusters of job characteristics in the experiment, which we summarize as

Result 1 (dichotomy of job design): *The employers rely predominantly on two fundamentally distinct strategies in both the base and the screening treatment, i.e. they offer two types of jobs that differ in all dimensions. They offer either a job with full discretion, high wages, a high requested effort level, and a large rent for the employee (trust strategy), or they offer a job with limited discretion, low wages, a low requested effort level, and a low rent (control strategy).*

Support for Result 1 is provided by Figure 1, which shows average wages, average requested effort levels, and the average offered rent for both treatments. The average offered rent is defined as the employee's income if he satisfies the requested effort the employer stipulates (given the stipulated wage). The figure shows the same clustering of job characteristics for both treatments. For example, if the employer offers a job with full discretion, average wages are higher than 20 in both treatments, while average wages are below 10 for job offers with limited discretion. Likewise, the average requested effort level is roughly $\tilde{e} = 8$ in case of a job with full discretion, while the employer only asks for approximately $\tilde{e} = 5$ under limited discretion. Note also that despite the higher requested effort levels under full discretion, the employees are offered a much higher rent in these jobs because the higher wage over-compensates the higher (requested) effort cost.[18] We also depicted the standard errors in Figure 1; they indicate that the

[18] The observed differences in job characteristics are not a phenomenon that is only perceived at the level of averages. Rather the whole distribution of job characteristics differs fundamentally in full and in limited discretion jobs. In the base treatment, e.g., about three-quarters of the wages under full discretion are above w=15 while about three-quarters of the wages under limited discretion are below w=10. A similar picture emerges for the requested effort levels in the base treatment: effort levels in about three-quarters of the full discretion jobs are at or above $\tilde{e} =$

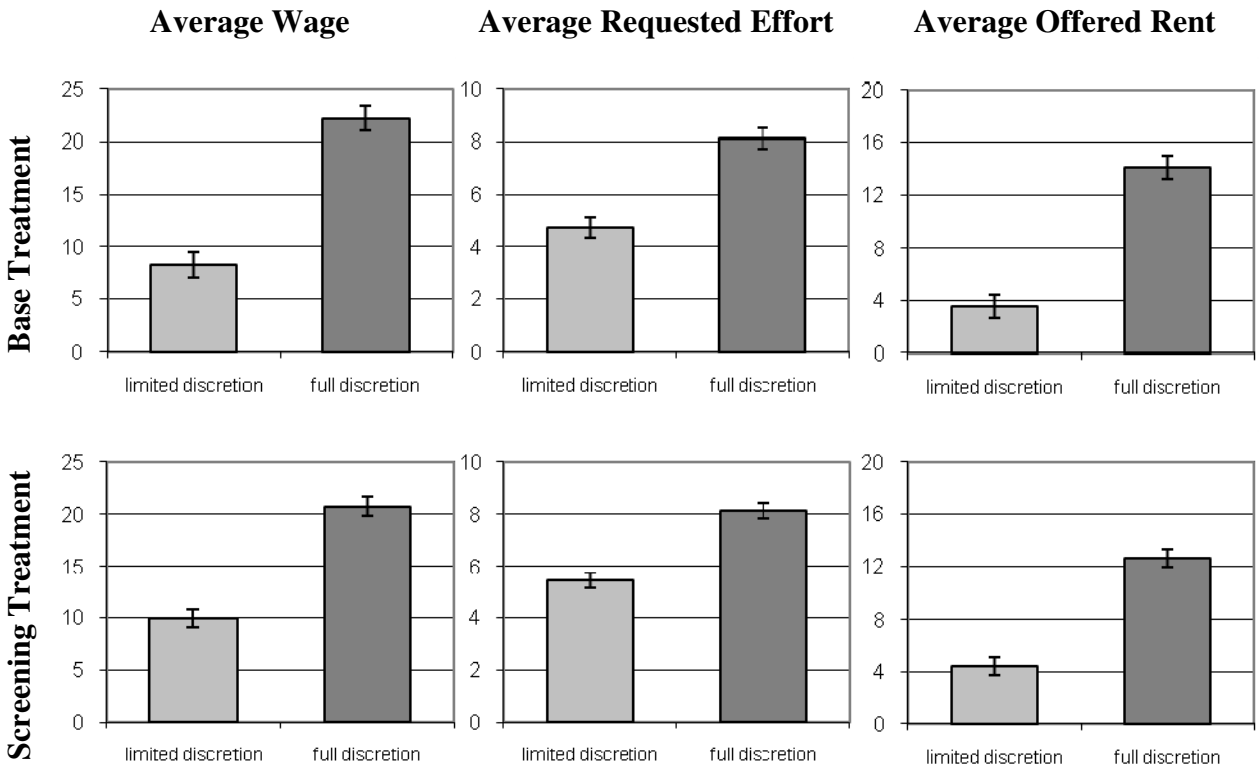

FIGURE 1.—**Dichotomy of Job Design**. In both the base and the screening treatments, employers use two fundamentally different strategies in designing jobs. Either they offer contracts with full discretion, high wages, high requested effort, and a high rent for the employee, or they offer contracts with limited discretion, low wages, low requested effort, and a low rent. The standard errors control for individual fixed effects and clustering on individual employers.

differences in job characteristics across full discretion and limited discretion jobs are highly significant in all cases (two-sided t-tests, controlling for individual fixed effects and clustering on employers, $p \leq 0.001$ for each of the six tests implicit in Figure 1).

Result 1 suggests that job offers with full discretion are based on a *trust strategy* that attempts to appeal to the employees' fairness, while jobs offering limited discretion implement a *control strategy* that limits the employee's shirking opportunities and the losses the employer can incur. The employers seem to appeal to the employee's fairness and reciprocity by offering a relatively high rent and demanding a high effort level. As Figure 1 shows, the offered rent in jobs with full discretion is above 12, about three times more than that in jobs with limited discretion.

Result 1 provides no information about the frequency with which the employers rely on the two different strategies, nor does it tell us which strategy is optimal. However, a main

7, while about three quarters of them obey the inequality $\tilde{e} \leq 5$ in limited discretion jobs. The distributions of job characteristics in the screening treatment are similarly distinct across the different types of jobs.

purpose of our study is to identify the conditions under which one strategy or the other is optimal for the employer. The next result provides this information.

Result 2 (optimality of different clusters of job characteristics): *The control strategy is optimal for the employer in the base treatment even though limiting discretion reduces efficiency, while conditioning the strategy on the employees' track records is optimal in the screening treatment. In particular, implementing the trust strategy is optimal if the employee has a medium or high reputation, while the control strategy is better if the employee has a low reputation.*

Figure 2 provides support for Result 2. The figure shows the employers' average profits conditional on wages and the discretion level of the job and thus enables us to identify the optimal clusters job characteristics. The first observation is that either the trust or the control strategy is optimal in the respective cases, meaning there is no situation in which a third strategy (e.g. a job design with full discretion but low wage offers) is optimal.

In the base treatment, the highest profit level is achieved if the employer offers a job with limited discretion and pays wages below w=10. For wages in this interval (w<10) the employer earns significantly more compared to a job that implements full discretion (two-sided t-test, $p \leq 0.001$). In fact, the employer incurs losses on average for job offers with full discretion. For jobs with limited discretion, a low wage (w<10) strategy is also significantly more profitable than a medium wage ($10 \leq w < 20$) strategy (two-sided t-test, $p \leq 0.001$).

We observe very different profit patterns in the screening treatment, depending on whether the employer faces an employee with a low reputation (average effort in accepted contract offers in the previous three periods, denoted by r, is below 3.5) or an employee with a medium ($3.5 \leq r < 6.5$) or a high reputation ($r \geq 6.5$). Interestingly, the profit pattern in case of a low reputation employee is very similar to that in the base treatment: Job offers involving full discretion are associated with negative profits or profits close to zero, while low wage offers involving limited discretion generate the highest profits. Thus, if the employer offers a job with limited discretion and pays low wages, profits are significantly higher compared to a low wage offer with full discretion (two-sided t-test, $p \leq 0.001$). A low wage strategy is also significantly more profitable than a medium wage strategy (two-sided t-test, $p \leq 0.001$) for jobs with limited discretion.

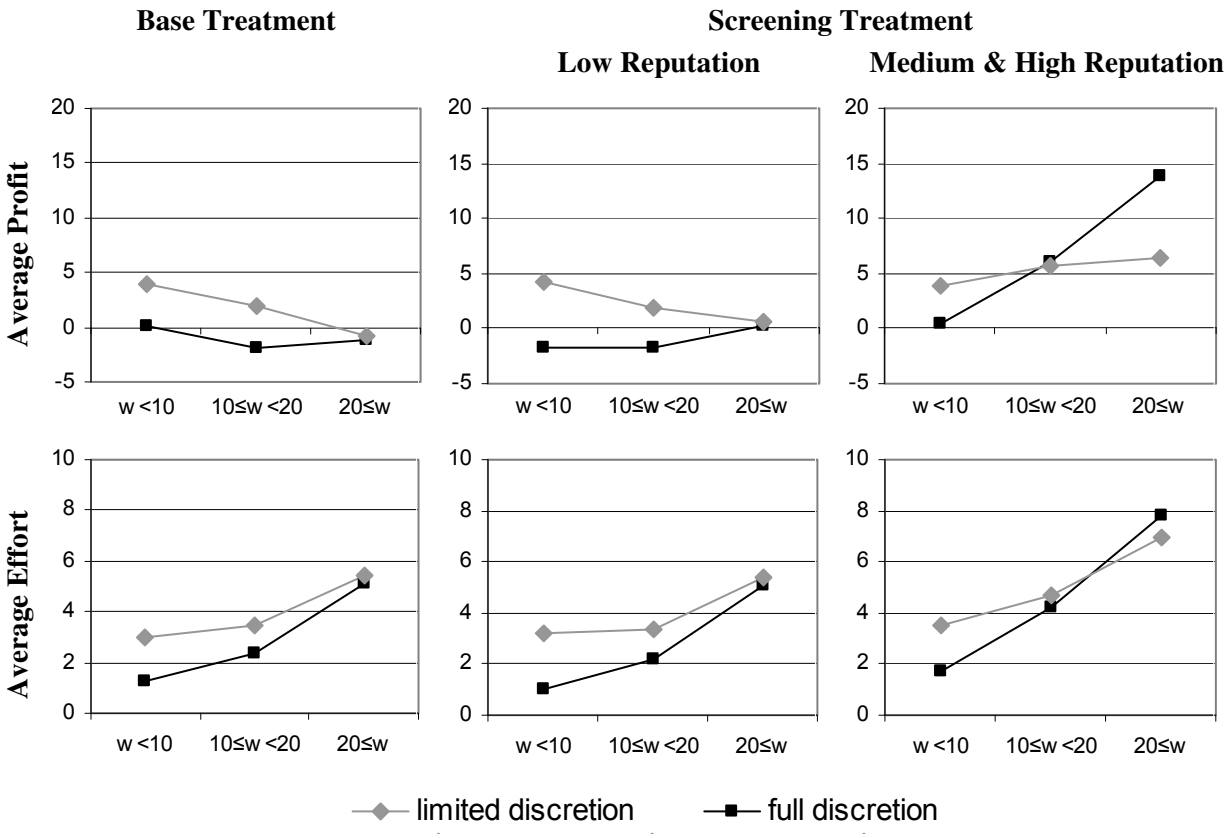

FIGURE 2.—**Optimal Job Offers and Wage-Effort Relation**. In the base treatment and in the screening treatment with low reputation employees, employers' profits are highest when they offer contracts with limited discretion and pay low wages. The wage-effort relation is relatively flat in these cases. In the screening treatment with medium and high reputation employees, employers' profits are highest when they offer contracts with full discretion and pay high wages. The wage-effort relation is much steeper, rendering the payment of efficiency wages profitable in these cases.

However, if the employer faces an employee with a medium or a high reputation, the profit pattern is radically different. For jobs with full discretion, profits are on average steeply increasing in wage levels and the highest profits can be achieved by offering wages in the highest wage interval (20≤w). In fact, if the employers pay high wages, their profits are significantly higher if they offer a job with full rather than a job with limited discretion (two sided t-test, $p \leq 0.001$). Furthermore, within the class of full discretion jobs, paying high wages rather than those in the medium interval is significantly more profitable (two sided t-test, $p \leq 0.001$).[19]

[19] Tables 2 and 3 below provide regression analyses of employers' profits in the base and the screening treatment confirming the results on optimal contract choices.

4.2 The Employees' Effort Choices

Result 2 raises the question why relying on the control strategy is optimal in the base treatment and in the screening treatment with low reputation employees, while the trust strategy is optimal in the screening treatment when employees have a medium or high reputation. Since the profit pattern observed in Figure 2 is shaped by the employees' effort choices, we examine the employees' behavior next:

Result 3a (employees' effort responses in the base treatment): *The employees respond to higher wages with higher average effort levels in the base treatment, but the slope of the wage-effort relation is too small to render a high wage policy profitable. In addition, employees provide considerably higher effort at low wages when they are offered a job with limited discretion rather than a job with full discretion, which renders the control strategy optimal.*

Support for Result 3a is provided by the corresponding graphs in Figure 2 and in the regressions in Table 2. The effort graph for the base treatment shows that on average, higher wages are reciprocated with higher effort levels both for jobs with limited and for jobs with full discretion. However, this efficiency wage effect is too small to render a high wage policy optimal. This can be inferred from the profit graph for the base treatment in Figure 2, which shows that average profits are declining with wages in jobs with limited discretion. The wage-profit relation is fairly flat in jobs with full discretion, and always results in negative profits.

Figure 2 and the regressions (1) – (3) in Table 2 show that effort is higher at low wages in jobs with limited discretion, but that the wage effort relation is significantly smaller. We control for individual fixed effects and cluster on individual employees in all three regression models. In all cases, the wage coefficient for a full discretion job, which is the omitted category in the regressions, is approximately 0.2. As the productivity of effort is b=5, this coefficient implies that a wage increase by 10 units raises effort by roughly 2 units which in turn increase revenue by 5×2=10 units, implying a flat wage-profit relation for jobs with full discretion. However, since the interaction between limited discretion and the wage is significantly negative in all regressions, the wage coefficient for jobs with limited discretion is lower and amounts to approximately 0.14. A wage increase by 10 units thus only increases effort by 1.4 units which – in combination with the lower effort productivity of b=4 – increases revenue only by 4×1.4=5.6

TABLE 2—Determinants of Effort and Employers' Profits in Base Treatment

	(1) effort	(2) effort	(3) effort	(4) profit
wage	0.207***	0.203***	0.202***	-0.07
	(0.030)	(0.026)	(0.033)	(0.105)
limited × wage	-0.072**	-0.074**	-0.071**	-0.263**
	(0.032)	(0.030)	(0.032)	(0.127)
limited	2.731***	2.748***	2.722***	6.535***
	(0.432)	(0.439)	(0.446)	(1.766)
requested effort	—	0.017	0.022	—
		(0.052)	(0.056)	
period dummies	—	—	yes	—
constant	-0.517	-0.569	-0.879	-1.307
	(0.482)	(0.506)	(0.547)	(1.691)
observations	658	658	658	810
adj. R^2	0.474	0.473	0.470	0.063

Notes: The table reports coefficients of OLS regressions. Robust standard errors are reported in parentheses. The effort regressions cluster at 54 employees and allow for individual fixed effects. Only accepted contracts are considered in the effort regressions because no effort is chosen if a contract is rejected. All contracts are included in the profit regression; a contract may be rejected at low wages, which reduces the average profitability of low wage offers. "Limited" is a dummy variable that takes on value 1 if a contract with limited discretion is offered.
*** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent.

units, implying that the wage-profit relation is negative. Moreover, the dummy for limited discretion ("limited") is significantly positive in all regressions, indicating that the effort is significantly higher at low wage levels in jobs with limited discretion than in jobs with full discretion. This effort advantage at low wage levels reflects the fact that an employee must at least provide an effort of 3 under limited discretion, which outweighs the lower efficiency of these jobs. The higher profit for low wage jobs with limited discretion is also indicated by the coefficient on "limited" in regression (4) where the employers' profit is the dependent variable.[20]

Taken together, the data indicate that in the base treatment, a high-wage policy is neither profitable for jobs with limited nor for those with full discretion. In addition, the effect that

[20] Figure 2 and Table 2 raise the question whether employers' expected profits are maximized by offering the lowest possible wage or whether they should rather leave some rent to employees. A closer look at the low wage interval ($w<10$) reveals that holding employees down to their reservation utility is not optimal because such offers are rejected with a very high probability. In particular, wages of 3, 4, 5 and 6 are rejected in 88, 83, 39 and 30 percent of the cases, respectively, while offers of 7 are only rejected in 13 percent of the cases. Job offers with higher wages are almost never rejected. Offering wages below 7 is thus not optimal.

employees are forced to provide more effort under limited discretion outweighs the productivity disadvantage of limited discretion, thus rendering a control strategy optimal in the base treatment.

The next question is how the employees' effort pattern in the screening treatment shaped the optimal job offers described in Result 2, which brings us directly to

Result 3b (employees' effort responses in the screening treatment):

> **(i)** *In the screening treatment, the effort response of the employees with a low reputation is very similar to their response in the base treatment, which renders the control strategy optimal for these employees.*
>
> **(ii)** *The wage-effort relation for employees with a medium or high reputation is steep enough to render the payment of high wages that elicit high effort levels profitable. Moreover, the higher efficiency of full discretion is particularly advantageous at high effort levels, inducing the employers to offer this kind of job.*

This result is supported by the corresponding graphs in Figure 2 and by the regressions displayed in Table 3. A first salient characteristic of the effort pattern of employees with a low reputation is that it very closely resembles that in the base treatment, i.e. employees with a low reputation in the screening treatment act as if there were no reputational incentives. The wage-effort relation is positively sloped for both job offers involving full and for those involving limited discretion. However, this slope is insufficiently steep to render a high wage policy profitable for employers. As the respective profit graph in Figure 2 indicates, the effort pattern generates a negatively sloped wage-profit relation for jobs with limited discretion and a rather flat slope for jobs with full discretion. This result is also supported by the regressions in Table 3. As in Table 2, the effort regressions in Table 3 control for individual fixed effects and cluster on individuals. While regressions (1) – (2) in Table 3 display a relatively large coefficient for "wage", regressions (3) – (5) show that the size of the wage coefficient decreases considerably if we control for the employees' reputations and the interaction between reputation levels and wage. Note that the omitted category in regressions (3) – (5) is a job with full discretion offered to a low reputation employee, meaning that the wage coefficient in these regressions captures the wage-effort relation for exactly these employees. The wage coefficient is about 0.19 in these cases, which is very similar to that in the base treatment, implying a flat wage-profit relation.

TABLE 3—Determinants of Effort and Employers' Profits in Screening Treatment

	(1) effort	(2) effort	(3) effort	(4) effort	(5) effort	(6) profit
wage	0.273***	0.295***	0.187***	0.188***	0.187***	0.065
	(0.021)	(0.022)	(0.049)	(0.051)	(0.051)	(0.185)
limited × wage	-0.147***	-0.157***	-0.105***	-0.105***	-0.101**	-0.478***
	(0.039)	(0.033)	(0.038)	(0.039)	(0.038)	(0.112)
limited	2.894***	3.230***	2.478***	2.474***	2.417***	6.870***
	(0.562)	(0.522)	(0.571)	(0.576)	(0.559)	(1.772)
medium-reputation	—	-0.233	-1.560***	-1.559***	-1.515***	-1.048
		(0.216)	(0.537)	(0.537)	(0.540)	(1.800)
high-reputation	—	-0.272	-2.493***	-2.488***	-2.468***	-4.725**
		(0.323)	(0.737)	(0.751)	(0.761)	(1.928)
medium-reputation × wage	—	—	0.102**	0.102**	0.099**	0.424**
			(0.043)	(0.043)	(0.044)	(.1767)
high-reputation × wage	—	—	0.143***	0.143***	0.142***	0.722***
			(0.050)	(0.050)	(0.051)	(.1769)
requested effort	—	—	—	-0.004	-0.004	—
				(0.058)	(0.058)	
other period dummies	—	—	—	—	yes	—
last period	-1.959***	-2.025***	-1.933***	-1.933***	-1.829***	-7.038***
	(0.404)	(0.414)	(0.419)	(0.418)	(0.510)	(1.839)
constant	0.233	-0.032	1.442**	1.455*	1.369*	0.110
	(0.410)	(0.490)	(0.719)	(0.733)	(0.787)	(2.230)
observations	711	655	655	655	655	745
adj. R^2	0.649	0.661	0.676	0.675	0.671	0.301

Notes: The table reports coefficients of OLS regressions. Robust standard errors are reported in parentheses. The effort regressions cluster at 54 employees and control for individual fixed effects. Only accepted contracts are considered in the effort regressions because no effort is chosen if a contract is rejected. All contracts are included in the profit regression; a contract may be rejected at low wages, clearly affecting profits. In columns (2) - (6) we only consider observations with at least one previous effort choice because an employee's reputation cannot be classified otherwise. "Limited" is a dummy variable that takes on value 1 if a contract with limited discretion is offered. "Medium-reputation" and "high-reputation" are dummy variables that take on value 1 if r is in [3.5,6.5) or [6.5,10], respectively. "Last period" is a dummy variable that takes on value 1 for observations in period 15.
*** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent.

Moreover, the profit regression (6) in Table 3 reveals that the interaction between limited discretion and wages is significantly negative, while the dummy for "limited discretion" is high and significantly positive. Thus, as in the base treatment, the employers can earn the highest profits if they pay low wages and offer a job with limited discretion whenever they face an employee with a low reputation.[21]

Figure 2 further shows that employees with a medium or high reputation display a much steeper wage-effort relation than those with a low reputation. The steeper slope translates into a steep wage-profit relation, providing the highest profits for wages of w=20 or higher. The regressions in Table 3 statistically support this effort and profit pattern. A particularly interesting aspect concerns the specific role of employees with a medium or high reputation. Regression (2) shows that these employees do not provide a higher effort level *per se* – the coefficient on medium and high reputation is small and insignificant in this regression. Rather, these employees tend to supply the same low effort level as low reputation employees if offered a low wage, but they provide a much higher effort if offered a high wage. This fact is revealed by regressions (3) – (5) which show that the medium/high reputation employees display a smaller intercept (because the coefficient on medium and high reputation is significantly negative) and a larger slope in the wage-effort space than the low reputation employees (because the interaction between wages and medium/high reputation is significantly positive). The slope effect, in particular, is large and quantitatively important because it generates an incentive for the employers to pay high wages to these employees.[22] The profit regression (6) corroborates these findings and indicates that the effort behavior of medium and high reputation employees causes a sizeable efficiency wage effect that renders the trust strategy optimal.[23]

Taken together, the evidence unambiguously indicates that conditioning the job offer on the employees' reputation is profit maximizing. Employers can elicit high effort in highly

[21] Similar to the base treatment, we may ask which of the wages in the low wage interval maximizes the employers' profits. Rejection rates for wages offers of 3, 4, 5, 6 and 7 are 100, 59, 50, 39 and 4 percent, respectively, while wages above 7 are basically never rejected. Hence, wage offers between 7 and 9 were most profitable for the employers.

[22] For an employee with a medium reputation, the slope of the wage-effort relation in a job with full discretion is roughly 0.19+0.10=0.29, implying that a wage increase by 10 units causes a revenue increase by 5×2.9=14.5 units. Likewise, the slope is 0.19+0.14=0.33 for an employee with a high reputation, implying that a wage increase of 10 units generates a revenue increase by 5×3.3=16.5 units.

[23] The question of which wage above 20 is optimal for the employers if they face an employee with a medium or high reputation remains open. It turns out that the average effort of these employees lies at 6.2 units if offered w = 20, 8.8 units at a wage of 25, and 9.0 units if they are offered a wage of 30 in a job with full discretion. On average, it thus does not pay to offer wages above 25 because of the ceiling effects that occurs at high effort levels.

productive jobs with a limited risk of shirking if they offer high wages and full discretion only to employees with a good reputation. In contrast, employees with a low reputation should receive only a low wage and be forced to provide at least an effort level of 3.

In Section 3 we discussed the potential role of hidden costs of control in our setting. The previous results on the employees' effort behavior also shed light on the extent to which hidden costs of control affected optimal job offers. Figure 2 and the regressions in Tables 2 and 3 show that (potential) hidden costs of control are not sufficiently large to render job offers with full discretion optimal, neither in the base treatment nor for low reputation employees in the screening treatment. Moreover, it is possible to show that (potential) hidden costs of control are not a necessary prerequisite for the optimality of job offers with full discretion for medium and high reputation employees.[24] Hidden costs of control thus do not play a prominent role in the choice of the optimal employment strategy in our setting.

Note that these findings do not imply that there are no hidden costs of control. In fact, the observation that average effort for high wages is not higher under contracts with limited discretion (see Figure 2 and the regression results in Tables 2 and 3) is consistent with the existence of hidden costs. If discretion is limited, agents who would otherwise choose the minimum effort level of one are now forced to choose the minimum effort level of three. If no crowding out of voluntary effort provision takes place, average effort should thus increase.

4.3 Actual Job Offers, Labor Market Segmentation, and Total Surplus

The previous results inform us about the conditions under which and the reasons why the trust and the control strategy are optimal, but we have not yet reported whether the employers chose the corresponding optimal employment strategy. The next result addresses this question.

Result 4 (employers' actual job offers):

(a) *In the base treatment, the large majority of employers converges towards optimal behavior and implements the control strategy.*

[24] To see this, consider the relevant wage interval ($20 \leq w$) for high reputation employees. In this interval, the average effort for jobs with full discretion is about 8, yielding revenue of about $5 \times 8 = 40$. Now consider jobs with limited discretion and *assume* that hidden costs of control are completely absent. This implies that average effort increases because none of the employees reduces his effort relative to the full discretion case. Assume further, for the sake of the argument, that limiting discretion increases *every* employee's effort by 2 (minimum effort increases from 1 to 3). Average effort would then be 10, yielding revenue of $4 \times 10 = 40$, which just matches revenue under full discretion. Clearly, limiting discretion would raise average effort by less than 2 (e.g. only some agents are below the threshold of $e=3$). Limited discretion jobs were thus still not more profitable than full discretion jobs, even under a complete absence of hidden costs. These costs, therefore, cannot the reason for the optimality of full discretion contracts.

(b) *In the screening treatment, employers behave optimally in the majority of cases and condition their strategy on the employees' reputation, i.e. if they face low reputation employees, they use the control strategy in the large majority of cases, while they utilize the trust strategy in more than half of the cases if they face medium or high reputation employees.*

To support Result 4, we report the relative frequency of jobs with full discretion in the different conditions. We know from Result 1 that a job with full discretion is associated with the trust strategy, while a job with limited discretion is associated with the control strategy. The overall share of the trust strategy is about 30 percent in the base treatment, but this share declines to 19 percent in periods 10-14, indicating that some employers needed some time to learn the optimal strategy.[25] A similar picture emerges in the screening treatment if the employer faces an employee with a low reputation. In this case, the overall share of the trust strategy is 22 percent, declining to 16 percent in periods 10-14. A Fisher exact test indicates that the employers choose on average the same strategy in the base treatment (239 out of 810 cases) and in the screening treatment with low reputation employees (48 out of 172 cases; $p=0.791$). However, employers implement the trust strategy much more frequently for employees with a medium or high reputation. The overall share of trust strategies is 55 percent and remains the same in periods 10-14. The share of trust strategies is significantly higher for medium and high reputation employees (290 out of 525 cases), compared to low-reputation employees and compared to the base treatment; Fisher exact texts, $p \leq 0.001$.[26]

Although employees with a medium or high reputation faced a trust strategy in a majority of cases, they also faced non-optimal job offers with limited discretion in 45 percent of the cases. This raises the question about the sources of this sub-optimality, a topic to which we turn next.

Result 5 (suboptimal behavior and labor market segmentation):

(a) *The frequency of optimal behavior is lower in the screening treatment than in the base treatment because a significant minority of employers do not condition their job offer on the employees' reputation but always follow the control strategy.*

[25] We choose periods 10-14 and excluded period 15 because in the final period the incentive for reputation formation is completely absent, while this incentive still exists in period 14.

[26] We have three sessions with 18 employers each that offer contracts in 15 periods, so there are 810 observations in each treatment. Since we can only classify the employees' reputation if there is at least one previous effort choice, the number of relevant observations in the screening treatment is only 525+172=697.

(b) *A significant share of narrowly self-interested employees does not reciprocate high wages with high effort in the screening treatment, implying that they are permanently stuck with bad jobs with limited discretion.*

Result 5a highlights that the incidence of optimal job offers is higher in the base treatment than in the screening treatment. The main reason for this difference is the existence of a sizable share of employers who did not condition their strategies on the employees' reputation. Almost 17 percent of employers (9 out of 54) always opted for the control strategy in the screening treatment. Another 4 percent (2 out of 54) chose the trust strategy only once. A closer look at the data shows the non-responsive employers did not face a worse distribution of employees than the responsive employers: those who always chose the control strategy had employees with an average reputation index of 5.25, while the overall average of the reputation index was 5.24. These non-responsive employers might have had very pessimistic beliefs about their employees' effort choices or they might have been highly risk or betrayal averse. Because they did not condition their strategy on employees' reputation, they made significantly lower average profits (4.13) than employers who responded to their employees' past behavior (7.16; two-sided t-test, $p=0.004$).

Employers who never trust and always implement the control strategy induce employees who would have worked hard for a generous wage to provide low effort. Furthermore, the incentives for employees to acquire a good reputation are diminished since not all employers condition their job offers on reputation. However, acquiring a good reputation remains profitable: employees with a low reputation have an average income of 6.66, while employees with a high reputation have a significantly higher income of 12.14 (two-sided t-test, $p\leq0.001$). Nevertheless, Result 5b shows that a significant fraction of the employees always chose low effort levels in the screening treatment – even when they were offered high wages. We show in the appendix that these employees also chose low effort levels in the base treatment regardless of the offered wage; they can therefore be classified as narrowly self-interested employees, and account for about 20 percent of the employees.[27] We also report in the appendix that roughly 30 percent of the subjects are reciprocal types because they respond to generous wages with high effort levels both in the screening treatment and the base treatment. The remaining 50 percent of

[27] To derive the behavioral types we use the fact that all subjects participated in the base and the screening treatment.

the individuals can be classified as strategic types because they only reciprocate generous wages with high effort levels in the reputation treatment, but not in the base treatment.

Result 5 explains why a substantial fraction of both good and bad jobs co-exist in the screening treatment. A sizeable group of employers only offers bad jobs regardless of the employees' reputations, and an equally large group of employees does not respond to the prevailing incentives for reputation formation. These employees only consider their narrow, short-term self-interest and are thus more likely to end up in jobs that are tightly controlled and leave no rents on the table, while employees who behave reciprocally are more likely to get better jobs that leave more discretion and offer higher rents. In addition, the non-responsive employers dilute the incentives for reputation formation and the narrowly self-interested employees reduce the opportunity for employers to offer good jobs.

The co-existence of good and bad jobs is reminiscent of the literature on dual labor markets (e.g., Doeringer and Piore 1971, Edwards, Reich and Gordon 1975) that provides a stylized description of actual labor markets in terms of a primary and a secondary market. In the primary market, employees enjoy higher wages and job security, while low wages, high turnover, and low job security prevail in the secondary sector. Bulow and Summers (1986) and Saint-Paul (1997) link the description of dual labor markets with efficiency wage theories based on differences in monitoring costs or employment adjustment costs across the two sectors. In these models, technological factors are the source of dual labor markets. In our experiment, however, all employers have the same job creation technology available. Our findings, therefore, suggest that sub-optimal choices by the employers and individual characteristics of the employees (their reciprocal, strategic, or narrowly self-interested behavior) may also contribute to the segmentation of the labor market.

Despite the existence of a substantial minority of sub-optimal employers and employees, however, the screening treatment provides incentives for higher effort and the provision of more jobs with full discretion. This leads to

Result 6 (screening and total surplus): *The screening opportunity causes a strong increase in the total surplus which is primarily reaped by the employers.*

The impact of the screening treatment on the employers' and employees' average income can be inferred from Figure 3. The figure shows that both employers and employees benefit on

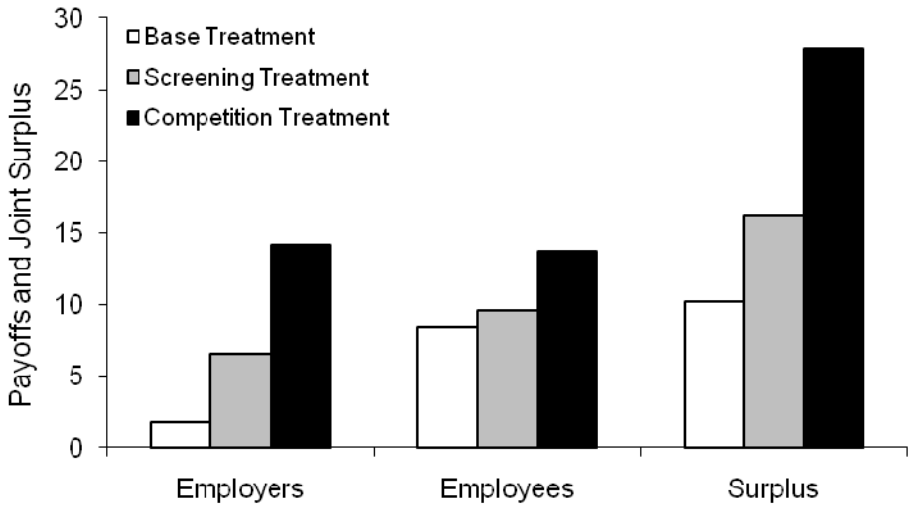

FIGURE 3.—Employers' profits, employees' incomes, and surplus in the different treatments.

average from the screening opportunities. For the employers, the increase in average income is significant (Mann-Whitney test based on matching group averages, p=0.004), while the null hypothesis of equal incomes across treatments cannot be rejected for the employees (Mann-Whitney test on matching group averages, p=0.200). Overall, the total surplus is 58 percent higher in the screening treatment – a difference that is highly significant (Mann-Whitney test on matching group averages, p=0.007). This increase in the total surplus has two sources – the higher share of jobs with full discretion (documented in Result 4) and the higher average effort of the employees. In fact, we observe a significant increase in average effort from 3.00 in the base treatment to 4.48 in the screening treatment (Mann-Whitney test on matching group averages, p=0.007).[28]

This effort increase represents the joint effect of employers' and employees' behavior in the screening treatment. Because the employers condition their strategy on the performance signals, the employees have an incentive to provide high effort in response to high wages. And because a good reputation is a reliable signal for the willingness to reciprocate generous wages with high effort, the employers need not fear shirking if they pay high wages and offer full discretion jobs. Thus, the actions of the responsive employers' and the reciprocating employees' mutually reinforce each other and lead to the provision of high effort levels and a majority of good jobs with full discretion, both of which increase the total surplus.

[28] In this test, we assigned an effort of zero to rejected contracts. If only accepted contracts are considered, average effort increases from 3.70 in the base treatment to 5.10 in the screening treatment; the difference is significant (Mann-Whitney test on matching group averages, p=0.004).

4.4 Competition

Our screening treatment identifies the causal impact of screening opportunities in a bilateral bargaining environment. In most labor markets, competition and screening interact in intricate ways. Since they almost always exist simultaneously it is difficult to identify how competition shapes the employers' screening activities and employees' reputation formation behavior in field data. Our laboratory setting enables us to study this question cleanly by conducting an additional treatment that introduces competition among the employees for good job offers and among employers for good employees. The competition treatment also allows us to answer the question whether competition renders the control strategy or the trust strategy more efficient.

Our competition treatment has the following features. At the beginning of each of the 15 periods, groups with four randomly selected employers and four randomly selected employees are matched. Each employer observes all four employees' performance signals, and then must make a contract offer to each of the four employees. Because an employer can only employ one employee, the employers also specify the order in which the 4 employees receive their respective offers. There are four matching rounds in every period in order to match the employers to the employees. In the first round, each employer's most preferred employee receives the offer, meaning that any one employee might receive several offers (up to four), just one offer, or none. The employees who received offers in this round then decide whether to accept any of these offers, but may not accept more than one. Once an employee accepts an offer, he or she is then matched with the corresponding employer and both players are not involved in the subsequent matching rounds. Employers whose offers are rejected and employees who did not receive or accept an offer enter the second round. In this round, the remaining employers' second preferred employees receive an offer. This process continues in rounds 3 and 4.[29]

As in the previous treatments, employees do not observe the offers the other employees receive. However, an employee may have to wait until the second, third, or even fourth round of offers before getting his first offer, in which case he may conclude that he is no employer's first choice. Similarly, as in the previous treatments, employers do not observe the contract offers other employers make. However, if an employer's offers are frequently not accepted during the early matching rounds, he may conclude that other employers offered more attractive contracts.

[29] We introduced competition only in the screening treatment and not in the base treatment because competition cannot make any difference in the latter. All employees look identical without performance signals, and employers cannot discriminate between them.

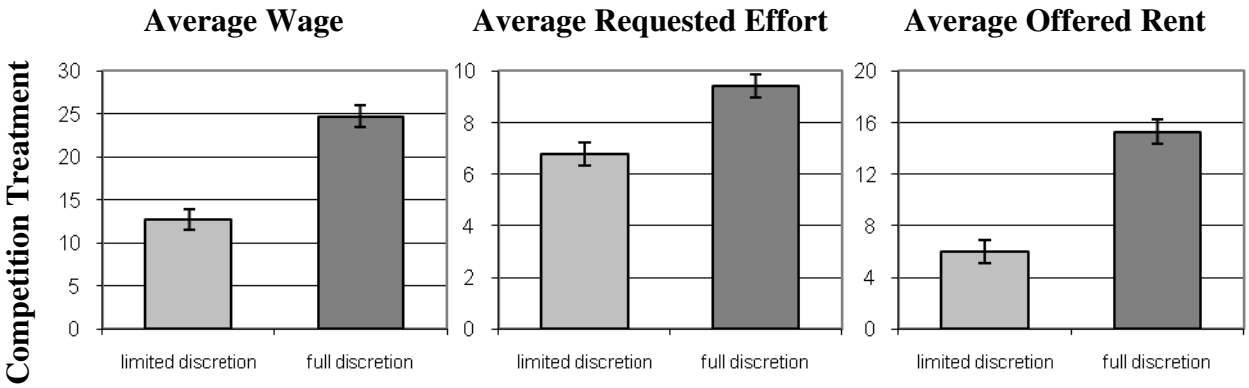

FIGURE 4.—**Dichotomy of Job Design in Competition Treatment**. As in the base and screening treatments, employers use two fundamentally different strategies in job design. Either they offer contracts with full discretion, high wages, high requested effort, and a large rent, or they offer contracts with limited discretion, low wages, low requested effort, and a low rent. The standard errors control for individual fixed effects and clustering on individual employers.

Both effects foster learning. Note that this learning opportunity captures a feature of most labor markets in the field because employees with a low reputation presumably also have more difficulties finding a job in these markets, and employers who offer less attractive jobs have to wait longer to fill their vacancies.

We showed in Section 4.1 that the employers offer two very distinct bundles of job characteristics both in the base and in the screening treatment. Figure 4 shows the same dichotomy of job characteristics in the competition treatment: Contracts with full discretion are associated with much higher wages, higher requested effort levels, and a significantly higher job rent. Figure 4 also depicts standard errors; they indicate that the differences in job characteristics across contracts with full and limited discretion are significant in all cases (two-sided t-tests, controlling for individual fixed effects and clustering on employers, $p \leq 0.001$ for each of the three tests implicit in Figure 4).[30] The bundling of distinct job characteristics into good and bad jobs is thus a robust phenomenon that occurs under all treatment conditions.

Figure 4, however, does not inform us about the optimality of the different types of job offers. It turns out that the qualitative pattern of payoffs is very similar to the screening treatment. Profits are declining in wages for the low-reputation employees, while profits are

[30] As in the base and the screening treatments, the dichotomy of job characteristics is not just a phenomenon at the level of averages; instead, the whole distribution of job characteristics is fundamentally different across jobs with full and limited discretion. In full discretion jobs, e.g., 90 percent of all wages are higher than 15, while roughly half of all wages are equal or less than 10 in limited discretion jobs. A similar dichotomy is also present for requested effort levels. In full discretion jobs, 95 percent of the job offers involve a requested effort level of $\tilde{e} \geq 7$, while almost 50 percent of all job offers are associated with a requested effort of $\tilde{e} < 7$ in limited discretion jobs.

maximized with medium and high reputation employees if they are offered high wages and jobs with full discretion.

To what extent did the employers implement the optimal trust strategy in the competition treatment? Result 7a shows that this occurred to a much larger degree than in the screening treatment.

Result 7 (competition substantially increases the share of good jobs):

(a) *In the competition treatment, almost all high reputation employees receive good job offers and almost all low reputation employees get bad job offers.*

(b) *The large majority of employees works hard and acquires a high reputation.*

Result 7a is supported by the left graph of Figure 5, which illustrates the share of job offers with full discretion that employees with different reputations face in the screening and the competition treatments. The figure shows that the higher an employee's reputation in the screening treatment, the more often he receives a job offer with full discretion (in 17, 38, and 52 percent of the cases, respectively). The competition treatment strongly reinforces this pattern. Employees with a high reputation are now considerably more likely to receive offers with full discretion (in roughly 80 percent of the cases), while employees with a medium or low reputation receive fewer such offers than in the screening treatment (only in 27 percent and 6 percent of the cases, respectively). The treatment differences in shares of contract offers are significant in all three reputation classes (Fisher exact-tests, $p=0.024$ for low reputation and $p\leq 0.001$ for medium and high reputation).

The stronger conditioning of job offers on employees' reputations has important consequences for their incentives to form a good reputation. Because jobs with full discretion are associated with higher rents, the employees in the competition treatment have a stronger incentive to form a good reputation. This effect is indicated in the right graph of Figure 5 which depicts the employees' average income from a trade as a function of their reputation. This graph mimics the qualitative pattern of the left graph because the increase in income from building a high instead of just a medium or low reputation is much larger in the competition treatment than in the screening treatment.

Did the employees' respond to these stronger incentives by acquiring higher reputation levels? Result 7b shows that this was indeed the case. In Figure 6 we display the distribution of

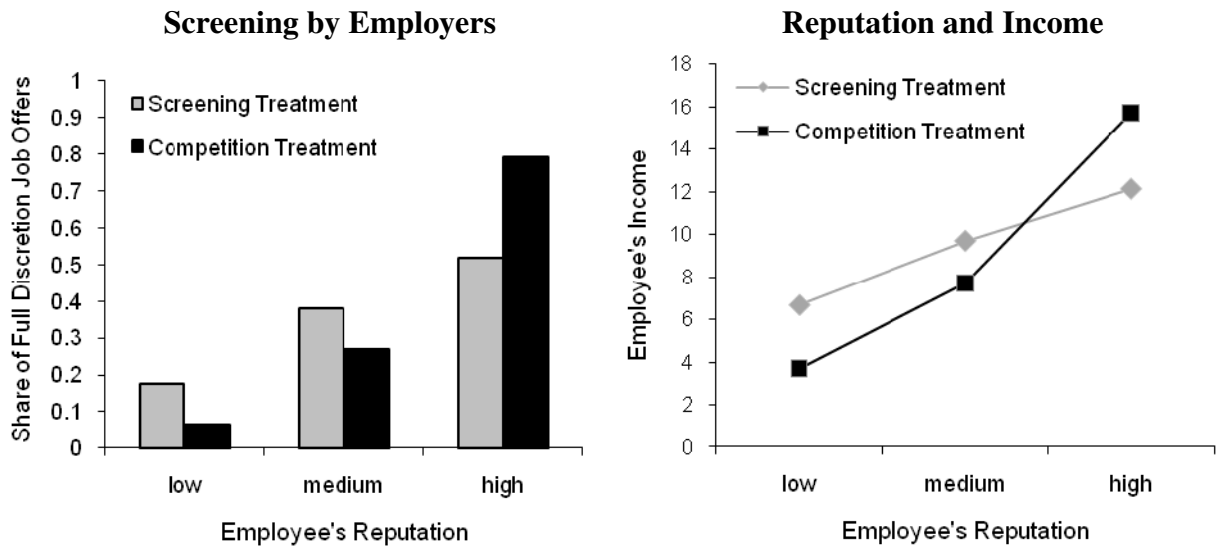

FIGURE 5.—Employers' sorting behavior across the reputation and competition treatment (left graph) and the consequences for employees' incentives for reputation formation (right graph).

individual employees' average reputation indices in the screening and the reputation treatments.[31] The figure shows that the reputation indices in the competition treatment are very different from those in the screening treatment – a difference that is highly significant according to a Kolmogorov-Smirnov test ($p \leq 0.001$). For example, more than 80 percent of the employees in the competition treatment have on average a reputation index exceeding $r=6.5$ ("high reputation"), while only 30 percent of the employees in the screening treatment acquire on average a high reputation. In addition, almost none (3 percent) of the employees in the competition treatment displays on average a low average reputation (i.e. $r<3.5$) while about a quarter of the employees in the screening treatment fall into this category. This finding also indicates that the competition treatment almost completely removes narrowly self-interested strategies from the employees. Therefore, when competition complements screening opportunities, the segmentation of the labor market greatly decreases. The overall share of jobs with full discretion is now 77 percent; in periods 10-14, when reputation incentives still exist and subjects had time to learn the mechanisms of reputation formation under competitive conditions, this share even reaches 82 percent.

The increased sorting and the steeper reputational incentives have a strong impact on the employers' and the employees' average income and total surplus. This is summarized in

[31] Recall that the reputation level is given by the effort levels in the previous three periods. Thus, they closely reflect the employees' effort choices.

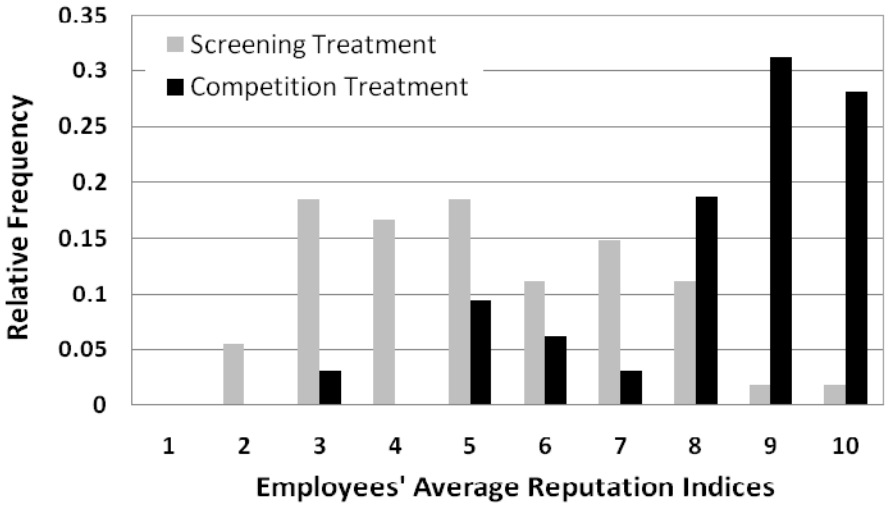

FIGURE 6.—Distribution of employees' reputation indices.

Result 8 (competition and total surplus): *The introduction of competition in addition to screening opportunities causes a substantial increase in total surplus. Both sides of the market, employers and employees, significantly benefit from competition.*

Evidence for the last result comes from Figure 3. Both the employers' average profit and the employees' average income are higher in each of the four matching groups of the competition treatment than in all six matching groups of the screening treatment (Mann-Whitney tests on matching group averages yield p=0.011). Overall, the total surplus is 72 percent higher in the competition treatment than in screening treatment and 172 percent higher than in the base treatment; the differences are again significant (Mann-Whitney tests on matching group averages, p=0.011). The increase in total surplus is also driven by a significant increase in average effort which amounts to 7.27 in the competition treatment.[32] The differences to the base (3.00) and the screening treatment (4.48) are again significant (Mann-Whitney tests on matching group averages, p=0.011).

5 Field Evidence

One of our main results concerns the endogenous clustering of job attributes in two distinct bundles of job characteristics. In particular, we observe a positive correlation between wages, job rents, and effort discretion. This raises the question whether we can observe qualitatively similar

[32] If only accepted contracts are considered, average effort amounts to 8.02 in the competition treatment.

correlations in field data. We examined this question on the basis of data from the German Socio-Economic Panel (SOEP). The SOEP is a representative annual panel survey for the resident population of Germany that collects information on a wide range of personal and household characteristics, including earnings, job satisfaction, education, work experience, and occupation.[33] The 2001 wave of the survey, which covers 22,351 individuals from 11,947 households, also contains a set of questions on work conditions, two of which have a direct bearing on the level of discretion at the workplace: 1) "Can you decide yourself how to complete your work tasks?" 2) "Is your work performance strictly monitored?"

Respondents who were employed at the time of the survey could answer each question by indicating either "applies completely" or "applies partly" or "does not apply at all." The answers to these questions provide a measure of effort discretion because granting discretion on how to complete tasks obviously influences how employees allocate their effort, and strict performance monitoring reduces the shirking opportunities.

Using these two measures, we find a positive, highly significant correlation between job discretion and wages. The dependent variable in the regressions in columns (1) – (3) of Table 4 is the log of gross monthly wages (in Euro). "Some Autonomy" ("Full Autonomy") is a dummy variable indicating that a respondent answered "applies partly" ("applies completely") to the task discretion question; "Some Monitoring" ("No Monitoring") is a dummy variable indicating the answer "applies partly" ("does not apply at all") to the performance monitoring question. Respondents who stated the respective third options serve as baseline.[34] Columns (1) and (2) show raw correlations: absent any controls both job discretion measures are highly significantly associated with higher earnings. For example, a job with full autonomy pays 35 percent higher wages than one without autonomy on task completion. Similarly, employees who are not monitored at all earn 12 percent more than employees whose work performance is strictly monitored. We account for a large number of control variables in the regression in column (3) because we want to analyze whether *ceteris paribus* wages are higher in jobs with more discretion. To control for worker heterogeneity and differences in occupations and industries, we account for occupation (390 categories), industry (62 categories), education (5 categories), labor

[33] The initial wave of the survey was conducted in 1984. The territory of the former German Democratic Republic has been included in the survey since 1990. For more detailed information, see http://www.diw.de/en/soep.

[34] Our sample consists of all individuals who were employed fully or part-time at the time of the interview; apprentices and the self-employed were excluded.

TABLE 4—The Impact of Job Discretion on Wages and Job Satisfaction in the SOEP

dependent variable:	Log Gross Monthly Wage			Standardized Job Satisfaction		
	(1)	(2)	(3)	(4)	(5)	(6)
some autonomy	0.235***		0.042***	0.095***		0.071**
	(0.019)		(0.012)	(0.033)		(0.036)
full autonomy	0.353***		0.057***	0.336***		0.281***
	(0.019)		(0.012)	(0.034)		(0.038)
some monitoring		0.083***	0.033***		0.160***	0.142***
		(0.019)	(0.011)		(0.033)	(0.034)
no monitoring		0.125***	0.047***		0.352***	0.295***
		(0.019)	(0.012)		(0.034)	(0.036)
control variables	no	no	yes	no	no	yes
observations	7770	7770	7770	7710	7710	7710
adj. R^2	0.041	0.005	0.695	0.017	0.016	0.049

Notes: The table reports coefficients of OLS regressions. Robust standard errors are reported in parentheses. "Some autonomy," "full autonomy," "some monitoring," and "no monitoring" are dummy variables indicating the degree of job discretion. Experience, tenure, education, firm size, gender, region, actual work hours per week including overtime, temporary employment, job categories, and industry categories are included as additional controls in regressions (3) and (6). *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent.

market experience, tenure at current employer, gender, firm size, region, hours of work, and temporary or permanent employment. Controlling for these factors reduces the size of the coefficients of the job discretion measures, but both remain highly significant. The regression reveals that jobs with full discretion (full autonomy and no monitoring) are associated with more than 10 percent higher wages than jobs in the base line category with no discretion (no autonomy and full monitoring).[35]

In our experimental data, jobs with full discretion are not only associated with higher wages but also with higher job rents, i.e. higher wages overcompensate the employees for the cost of higher effort requirements. Thus, these jobs yield higher utility for the employees. We consider *job satisfaction* as a proxy for the overall utility derived from the job. The SOEP

[35] The existence of a positive correlation between wages and effort discretion has previously been documented by Osterman (1994b) for the US. He also used "levels of supervision" and "levels of discretion" as measures of high-performance work systems and showed that both measures are significantly correlated with employers' policies to pay above-market wages. In their meta-study of 26 papers that analyze the effect of different forms of high-performance work systems on employees' wages, Handel and Levine (2004) conclude that the "average effect is somewhere between 0 and 5 percent, although larger effects have been found in a small number of cases" (p. 35). In an empirical test of efficiency wage theory, Rebitzer (1995) analyzes wages of contract maintenance workers in the petrochemical industry and finds that high levels of supervision are associated with lower wage levels.

measures job satisfaction with the following question: "How satisfied are you with your job?" Respondents can answer on a scale from 0 to 10, where 0 means totally unsatisfied and 10 means completely satisfied. A well known theoretical results says that job rents are absent in the equilibrium of a competitive labor market because the wage compensates workers for all non-pecuniary job characteristics (Rosen 1987). Thus, if performance monitoring or task discretion have non-pecuniary attributes (or pecuniary correlates that cannot be controlled by the econometrician) that affect workers' utilities, wages will vary in such a way that job satisfaction (utility) is kept constant at the equilibrium utility level. This means that if the data from the SOEP reflect competitive labor market outcomes, task discretion and monitoring should have no effect on job satisfaction if one does *not* control for individuals wages, i.e., if wages can adjust to compensate for uncontrolled non-pecuniary or pecuniary characteristics. In contrast, if higher task discretion and less monitoring exhibit a positive correlation with job satisfaction, we can take this as evidence that wages do not compensate fully for the utility relevant characteristics of the job. Therefore, the higher job satisfaction associated with more task discretion and less monitoring can be taken as an indication of a job rent.

The dependent variable in the regressions in columns (4) – (6) of Table 4 is the normalized job satisfaction measure. Columns (4) and (5) show raw correlations: absent any controls both effort discretion measures are highly significantly associated with higher job satisfaction. Jobs with full autonomy or without any monitoring are associated with levels of job satisfaction that are about a third of a standard deviation higher than the satisfaction of the comparison groups. In the regression in column (6), we account for same set of personal and labor market characteristics as in the regression in column (3) and find that both effort discretion measures remain highly significant. Workers who can decide themselves how to complete a task have a job satisfaction that is 0.28 standard deviations higher than those who have no task discretion, and workers who say that their performance is not at all strictly monitored have a 0.3 standard deviation higher job satisfaction than those who are strictly monitored. Thus, the job satisfaction data also lend support to the generalizability of our results to the field.

6 Conclusions

Lenin is right – up to a point: Offering discretion to an agent invites shirking and is not profitable on its own. However, if offering discretion is combined with paying more generous wages that

offer a rent to the agent, if discretion improves the agent's productivity, and if the principal can screen agents based on past behavior, this combined strategy can be both profitable and can outperform control. Our experimental results show that offering discretion, paying high wages, and screening are complements that reinforce each other and yield a clustering of job attributes into "good" and "bad" jobs. The ability to screen agents is a necessary condition for the viability of good jobs. However, even if employers can screen employees by past performance, not all of them offer good jobs. A significant minority of employers and employees do not trust each other (even though this would be profitable), which leads to a segmented labor market. Competition largely removes suboptimal behavior and causes a considerable increase in the share of good jobs. This results in large welfare gains for both employers and employees.

Our results indicate the existence of two distinct clusters of job attributes in all treatments, that is, regardless of the existence of screening opportunities or whether competition prevails. The clustering of job attributes suggest that both workers' autonomy on the job and the absence of monitoring are positively correlated with wages and job rents. Field data from the German Socio-economic panel indeed confirm these correlations. They are highly significant and substantial in size, even if we control for a wide range of socio-demographic and job characteristics.

The results of the base treatment where employers could not screen employees and where the control strategy prevailed are consistent with both the self-interest model and models of social preferences. Pure self-interest alone, however, cannot explain the results of the screening and competition treatment. We identify a significant minority of employees who are prepared to reciprocate high wages with high effort. Since employees can build a reputation, this is sufficient to induce strategic employees to mimic the reciprocal employees, which in turn renders the trust strategy of paying high wages and leaving discretion to employees profitable. This is consistent with models of social preferences. The data are also consistent with the existence of hidden costs of control, but these costs turn out to be small in our experiment.

Our experiments not only offer an explanation for the viability of "high-performance work systems" that grant much effort discretion to the employees, but also suggest why these innovative human resource management practices are not universally adopted. First of all, our findings point towards the importance of inexpensive screening opportunities. If screening employees is impossible or very costly, the trust strategy is likely to fail. Second, there must be a

productivity advantage for giving discretion to employees. If discretion does not affect the employee's productivity, the control strategy is more likely to be optimal. Finally, and perhaps most surprisingly, labor market competition strongly favors the trust strategy. Competition induces employers to condition their job offers more strongly on the employees' track record which causes large increases in employees' incentives for reputation formation. As a consequence, employees provide much higher effort levels which, together with the stronger screening activities, cause a large increase in the prevalence of the trust strategy.

Our results and our experimental design give rise to many new, interesting questions. For example, an employer in our setting can design the job after observing the employee's reputation. In reality, however, the employer often has to commit to a job design when he decides in which kind of production technology to invest, i.e. before he gets to know his employees. If the employer believes that employees cannot be trusted, he may choose a high-monitoring and control technology, involving only limited task discretion and depriving him of the potential productivity gains from high effort discretion. Under these circumstances, the employers' incentives to elicit high effort via efficiency wages are diluted and, in the presence of low wages, employees will provide low effort levels. Thus, the employers' initial pessimistic expectations regarding effort will be confirmed, providing little reason to change the overall job design. A widespread implementation of innovative human resource practices may therefore be considerably more difficult to achieve in the presence of an ex-ante commitment for a particular technology – a conjecture that could be tested by varying our experimental design.

Furthermore, it would be interesting to know how the existence of explicit screening costs affects the prevalence of good jobs. If the employers' have to pay for information regarding an employee's track record, their willingness to pay depends on their beliefs about the distribution of employee types. If all employees are believed to have a bad track record, investing in screening is not profitable, inducing the employer to offer bad jobs. However, employees will not work hard when offered bad jobs, confirming the initial belief that they have a bad track record. Thus, the existence of explicit screening costs could lead to yet another vicious circle that would render the widespread implementation of innovative human resource management practices difficult – although these practices offer, in principle, the prospect of a Pareto-improvement.

Finally, a fundamental question in human resource management research is how to transform a firm with a long-established corporate culture of control into a high-performance workplace. This question cannot be addressed in our current experimental design because new, "greenfield" firms are established in each period. An experimental design that permits for the endogenous emergence of "brownfield" establishments before new forms of work practices can be adopted would permit studying the sources of transition costs and the optimal implementation of organizational change. Thus, there is no shortage of fascinating questions for future research that could be tackled with the use of suitable variations of our experimental design.

References

Appelbaum, Eileen, Thomas Bailey, Peter Berg, and Arne L. Kalleberg (2000), *Manufacturing Advantage: Why High-Performance Work Systems Pay Off*, Ithaca, N.Y.

Baker, George, Robert Gibbons, and Kevin Murphy (1994), "Subjective Performance Measures in Optimal Incentive Contracts," *Quarterly Journal of Economics*, Vol. 109(4), 1125-56.

Benabou, Roland, and Jean Tirole (2006), "Incentives and Prosocial Behavior," *American Economic Review*, Vol. 96(5), 1652-78.

Bolton, Gary, Elena Katok, and Axel Ockenfels (2004), "How Effective are Electronic Reputation Mechanisms? An Experimental Investigation," *Management Science*, Vol. 50(11), 1587-602.

Brown, Martin, Armin Falk, and Ernst Fehr (2004), "Relational Contracts and the Nature of Market Interactions," *Econometrica,* Vol. 72(3), 747-80.

Brown, Martin, and Christian Zehnder (2007), "Credit Registries, Relationship Banking and Loan Repayment," *Journal of Money, Credit and Banking*, Vol. 39(8), 1883-918.

Bulow, Jeremy I., and Lawrence H. Summers, (1986), "A Theory of Dual Labor Markets with Applications to Industrial Policy, Discrimination and Keynesian Unemployment," *Journal of Labor Economics*, Vol. 4(3), 376-414.

Cabral, Luis, and Ali Hortacsu (2006), "Dynamics of Seller Reputation: Theory and Evidence from eBay," *Journal of Industrial Economics*, forthcoming.

Cain, Glen G. (1976), "The Challenge of Segmented Labor Market Theories to Orthodox Theory: A Survey," *Journal of Economic Literature*, Vol. 14(4), 1215-57.

Doeringer, P.B., and Michael J. Piore (1971), *Internal Labor Markets and Manpower Analysis*, Heath: Lexington, Mass.

Dufwenberg, Martin, and Georg Kirchsteiger (2004), "A Theory of Sequential Reciprocity," *Games and Economic Behavior*, Vol. 47, 268-98.

Edwards, R. C., M. Reich, and D. M. Gordon (1975), *Labor Market Segmentation*, D.C. Heath, Lexington.

Ellingsen, Tore, and Magnus Johannesson (2008), "Pride and Prejudice: The Human Side of Incentive Theory," *American Economic Review*, Vol. 98(3), 990-1008.

Falk, Armin, and Urs Fischbacher (2006), "A Theory of Reciprocity," *Games and Economic Behavior*, Vol. 54(2), 293-315.

Falk, Armin, and Michael Kosfeld (2006), "The Hidden Costs of Control," *American Economic Review*, Vol. 96(5), 1611-30.

Fama, Eugene F. (1980), "Agency Problems and the Theory of the Firm," *Journal of Political Economy*, Vol. 88, 288-307.

Fehr, Ernst, Alexander Klein, and Klaus M. Schmidt (2007), "Fairness and Contract Design," *Econometrica*, Vol. 75(1), 121-54.

Fehr, Ernst, and Bettina Rockenbach (2003), "Detrimental Effects of Sanctions on Human Altruism," *Nature*, Vol. 422, 137-40.

Fehr, Ernst, and Klaus M. Schmidt (1999), "A Theory of Fairness, Competition, and Cooperation," *Quarterly Journal of Economics*, Vol. 114, 817-68.

Fehr, Ernst, and Klaus M Schmidt (2006), "The Economics of Fairness, Reciprocity and Altruism - Experimental Evidence and New Theories," in: *Handbook on the Economics of Giving, Reciprocity and Altruism, Vol. 1*, Serge-Christophe Kolm and Jean Mercier Ythier (ed.), Amsterdam: Elsevier, 615–91.

Fischbacher, Urs (2007), "z-Tree: Zurich toolbox for ready-made economic experiments," *Experimental Economics*, Vol. 10, 171-78.

Frey, Bruno S. (1997), "On the relationship between intrinsic and extrinsic work motivation," *International Journal of Industrial Organization*, Vol. 15, 427-39.

Frey, Bruno S., and Reto Jegen (2001), "Motivation Crowding Theory," *Journal of Economic Surveys,* Vol. 15, 589–611.

Gneezy, Uri, and Aldo Rustichini (2000), "Pay Enough or Don't Pay at All," *Quarterly Journal of Economics*, Vol. 115(3), 791-810.

Green, Francis (2008), "Leeway for the loyal: A model of employee discretion," *British Journal of Industrial Relations*, Vo. 46(1), 1-32.

Greiner, Ben (2004), "An Online Recruitment System for Economic Experiments," in: *Forschung und wissenschaftliches Rechnen 2003*, Kurt Kremer and Volker Macho (ed.), GWDG Bericht 63, Göttingen, Ges. für Wiss. Datenverarbeitung.

Grossman, Sanford, and Oliver Hart (1983), "An Analysis of the Principal-Agent Problem," *Econometrica*, Vol. 51(1), 7-46.

Handel, Michael J., and David I. Levine (2004), "The Effects of New Work Practices on Workers," *Industrial Relations*, Vol. 43(1), 1-43.

Holmström, Bengt (1999), "Managerial Incentive Problems: A Dynamic Perspective," *Review of Economic Studies*, Vol. 66, 169-82.

Holmström, Bengt, and Paul Milgrom (1994), "The Firm as an Incentive System," *American Economic Review*, Vol. 84(4), 972-91.

Huck, Steffen, Gabriele K. Lünser, and Jean-Robert Tyran (2006), "Competition Fosters Trust," CEPR Discussion Paper No. 6009.

Ichniowski, Casey, Kathryn Shaw, and Giovanna Prennushi (1997), "The effects of human resource practices on manufacturing performance: A study of steel finishing lines," *American Economic Review*, Vol. 87(3), 291-313.

Ichniowski, Casey, and Kathryn Shaw (2003), "Beyond Incentive Pay: Insiders' Estimates of the Value of Complementary Human Resource Management Practices," *Journal of Economic Perspectives*, Vol. 17(1), 155-80.

Kandel, Eugene, and Edward Lazear (1992), "Peer Pressure and Partnerships," *Journal of Political Economy*, Vol. 100(4), 801-17.

Kreps, David, Paul Milgrom, John Roberts, and Robert Wilson (1982): "Rational Cooperation in the Finitely Repeated Prisoners' Dilemma," *Journal of Economic Theory*, Vol. 27(2), 245-52.

Lawler, E.E. III, S.A. Mohrman, and G.E. Ledford (1995), *Creating High Performance Organizations: Employee Involvement and Total Quality Management*, Jossey-Bass, San Francisco, CA.

MacDuffie, John Paul (1995), "Human Resource Bundles and Manufacturing Performance: Organizational Logic and Flexible Production Systems in the World Auto Industry," *Industrial and Labor Relations Review*, Vol. 48(2), 197-221.

MacLeod, Bentley (2007), "Reputations, Relationships and Contract Enforcement," *Journal of Economic Literature*, Vol. 45(3), 597-630.

MacLeod, Bentley, and James Malcomson (1998), "Motivation and Markets," *American Economic Review*, Vol. 88(3), S. 388 - 402.

MacLeod, Bentley and Daniel Parent (1999), "Job Characteristics and the Form of Compensation," *Research in Labor Economics*, Vol. 18, 177-242.

McGregor, Douglas (1960), *The Human Side of Enterprise*, New York: McGraw Hill.

Milgrom, Paul, and John Roberts (1990), "The Economics of Modern Manufacturing: Technology, Strategy and Organization," *American Economic Review*, Vol.80 (3), 511-28.

Milgrom, Paul, and John Roberts (1995), "Complementarities and Fit: Strategy, Structure and Organizational Change in Manufacturing," *Journal of Accounting and Economics*, Vol. 19(2-3), 179-208.

Osterman, Paul (1994a), "How Common is Workplace Transformation and Who Adopts it?" *Industrial and Labor Relations Review*, Vol. 47(2), 173-88.

Osterman, Paul (1994b), "Supervision, Discretion, and Work Organization," *American Economic Review*, Vol. 84(2), 380-84.

Osterman, Paul (2006), "The Wage Effects of High Performance Work Organization in Manufacturing," *Industrial and Labor Relations Review*, Vol. 59(2), 187-204.

Rabin, Matthew (1993), "Incorporating Fairness into Game Theory and Economics," *American Economic Review*, Vol. 83, 1281-302.

Rebitzer, James B. (1995), "Is there a trade-off between supervision and wages? An empirical test of efficiency wage theory," *Journal of Economic Behavior and Organization*, Vol. 28, 107-29.

Rosen, Sherwin (1987), "The theory of equalizing differences," in: O. Ashenfelter & R. Layard (ed.), *Handbook of Labor Economics*, Edition 1, Vol. 1, Chapter 12, 641-92, Elsevier.

Saint-Paul, Gilles (1997), *Dual Labor Markets*, Boston: MIT-Press.

Sliwka, Dirk (2007), "Trust as a Signal of a Social Norm and the Hidden Costs of Incentive Schemes," *American Economic Review*, Vol. 97(3), 999-1012.

Sobel, Joel (2005), "Interdependent Preferences and Reciprocity," *Journal of Economic Literature,* Vol. 43, 392–436.

Walton, Richard E. (1984), "From control to commitment in the workplace," *Harvard Business Review*, Vol. 63(2), 77-84.

Appendix: Behavioral Types among the Employees

In Result 5b, we claim that there were narrowly self-interested types among the employees who did not reciprocate generous wages with high effort levels. We will document the different types of the employees in this appendix. Note that we only use the data of the second treatment within a session for this appendix, as we need individual observations from both the base and the screening treatments in order to characterize the prevailing types. To determine the different employee types, we compute the following reciprocity index for each employee in the base and in the screening treatments.

$$\alpha_i = \sum_{t=1}^{N_i} \frac{e_i^t - e_0^t}{e^{*t} - e_0^t} \Big/ N_i$$

The actual effort in period t is denoted by e_i^t, the minimum effort employee i could choose in period t is denoted by e_0^t (which is 1 if a trust contract was offered and 3 if a control contract was offered), and e^{*t} denotes the fair effort for employee i in period t. The fair effort is the effort level that equalizes the employee's and employer's payoffs given the contract the employer offers, i.e., $b \cdot e^{*t} - w = w - e^{*t}$, rounded to the next integer (since only integer values were allowed as effort choices). We only consider cases where the wage was high enough so that e^{*t} exceeded e_0^t; N_i denotes the number of such periods for employee i (we have at least one such period for each employee in each treatment). Thus, an employee who always chooses the fair effort level e^{*t} has a reciprocity index of 1, while an employee who always chooses the minimum effort has a reciprocity index of 0. We have a reciprocity index for each employee in both the base and in the screening treatments.

The left panel of Figure A1 plots the reciprocity indices for each employee in the base and the screening treatments against each other. We round these indices to natural numbers in the right panel. Three large clusters of employees arise on the basis of the reciprocity index:[36]

[36] Note that there is only one employee with an index of one in the base treatment and of zero in the screening treatment, i.e. we only have a single agent that acts reciprocally in the base but selfishly in the screening treatment.

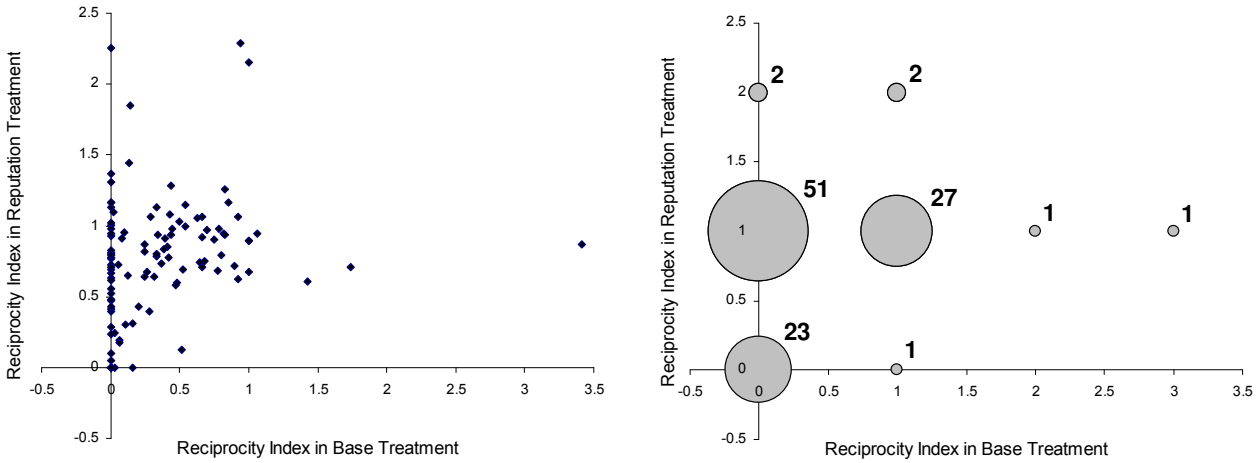

FIGURE A1.—Classification of employees' types. In the left panel, each dot represents one employee. In the right panel, we round the reciprocity indices to natural numbers illustrating our classification of employees' types. The size of the bubbles is proportional to the number of employees in each category.

Narrowly self-interested types: About 20 percent of the employees (23 out of 108) have a reciprocity index close to zero in both the screening and the base treatments. These employees do not reciprocate high wages with high effort in either treatment, even though this would be profitable in the screening treatment.[37] Their average payoff in the base treatment is 7.37, a little above the overall average of 6.95. In the screening treatment, however, these employees are stuck with a low reputation because they are offered few jobs with full discretion (only in 25 percent of the cases); as a consequence, their average income is only 7.35, considerably less than the overall average income of 9.51.

Reciprocal types: About 30 percent of the employees (31 out of 108) have a reciprocity index close to one (or larger) in both treatments. These employees always reciprocate high wages with high effort. They choose an average effort of 4.71 in the base treatment and earn an average payoff of only 6.70. This is a little less than the overall average, but these employees voluntarily choose to sacrifice some of their own payoff in order to reciprocate high wage offers. They spend an average effort of 5.96 in the screening treatment and acquire a medium or high reputation. They are therefore offered more job offers with full discretion (in 46 percent of the cases) and attain an average income of 9.33.

[37] They choose an average effort of 2.78 in the base treatment and of 3.35 in the screening treatment.

Strategic types: About 50 percent of the employees (53 out of 108) have a reciprocity index close to zero in the base treatment and close to one (or larger) in the screening treatment. These employees act strategically and reciprocate if their performance record is observed, but do not reciprocate if future employers are unable to detect low effort. They look like the narrowly self-interested types in the base treatment: They choose an average effort of 3.08, and their average income is 6.85. In the screening treatment, however, they closely approximate the reciprocal types. They choose an average effort of 5.97, acquire a medium or high reputation and are offered jobs with full discretion in the majority of the cases (52 percent). As a result, they receive a high average income (10.60).