

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 workers, thereby increasing effort productivity but also shirking opportunities. We show experimentally that complementarities between effort discretion, rent-sharing, and screening render such high-performance work systems viable. In our experiments, two fundamentally distinct job designs emerge endogenously. Employers either implement a control strategy, with low effort discretion and little rent-sharing, or a trust strategy with high discretion and substantial rent-sharing. If employers cannot screen employees, the control strategy prevails, while screening renders the trust strategy profitable. The introduction of labor market competition substantially fosters the trust strategy and reduces market segmentation.

Keywords: job design, high-performance work systems, screening, competition, work ethic, reputation, trust, control, 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 extent 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 (HRM) 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” (HPWS) decentralize the gathering and processing of information and grant authority to workers 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 and increases productivity, but it makes the company vulnerable. It remains at the worker'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 productivity in addition to being combined with high fixed wages that offer a high share of the surplus to the agent, and if the principal can screen agents based on their past behavior, this combined strategy then becomes profitable. Put differently, we show that offering discretion, paying high wages, and screening are complements. Complementarities imply that

¹ If the agent has fewer actions to choose from, fewer incentive compatibility constraints 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., 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.

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

In our experiments, we document 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 employers offer jobs characterized by limited effort discretion, a low requested effort, and low wages that grant only a low share of the surplus. Under the trust strategy, the employers offer jobs with high effort discretion, they request a high effort, and they pay high wages that grant a high share of the surplus. In other words, the trust strategy is to offer “good” jobs, while the control strategy is associated with “bad” jobs. 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 and – due to the greater effort discretion – he risks increased employee shirking. Thus, if the employee is not trustworthy, the employer incurs a significant loss, which raises the question how the trust strategy can be viable.

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 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.

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 employees pays off. 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.

What determines the relative size of these two segments in the labor market? To address this question, we implemented a third treatment that adds labor market competition to the screening treatment. We show that competition among employers for high reputation employees and among employees for good job offers increases the incentives for employees to acquire a high reputation and for employers 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.

Our paper contributes to the economics, HRM, and industrial relations literatures that analyze the determinants and effectiveness of different forms of workplace organization (see,

e.g., Appelbaum et al. 2000 and Ichniowski and Shaw 2003). This literature has shown empirically³ and theoretically⁴ that strong complementarities between different HRM practices exist. In particular, various practices that tend to give more discretion to workers, such as broad job definitions, granting authority to workers to solve problems independently, team work, and job rotation, are strongly correlated with high wages or profit-sharing plans, and with careful screening and selection of employees. This literature finds that HPWS tend to be more productive and more profitable than more traditional job designs. However, one of the enduring puzzles in this literature is why only some firms implement HPWS while others do not (see, e.g., Osterman 1994; Ichniowski and Shaw 1995, 2003; Ichniowski et al. 1997; Pfeffer 2007; Liu, Guthrie, Flood and MacCurtain 2009).

Our experiments confirm the clustering of job attributes and point to a new explanation for the coexistence of “good” and “bad” jobs that does not rely on technological differences but rather on individual characteristics of employers and employees. Good jobs require that employers trust employees to work hard even if they are not controlled, and that employees are trustworthy. If some employees consider only their narrow short-term self interest, and if employers are betrayal averse, good jobs do not arise. Moreover, our experiments highlight the importance of screening and labor market competition for the viability and dissemination of good jobs. Interestingly, it is screening for work attitude and work ethic rather than for technical skills that is important. This is confirmed by a recent empirical study of Huang and Cappelli (2010) who find that screening for work ethic is associated with more worker authority, less monitoring, higher productivity and higher wages via rent-sharing, while screening for more traditional human capital measures such as education and experience is not.

The empirical literature shows that the above mentioned HRM practices are correlated, but it finds it difficult to establish causality. As Huang and Cappelli (2010, p. 218), put it:

“In future research, it would be interesting to examine the causality in these relationships as well as the factors that may cause them to vary, such as whether higher dismissal costs lead to greater screening of all kinds and how screening for different attributes might vary with labor market conditions.”

In our experimental study we vary screening opportunities exogenously and show that they are a *causal* factor for the viability and dissemination of good jobs. Moreover, by

³ See, e.g., Ostermann (1994), Ichniowski, Shaw and Prennushi (1997) and Huang and Cappelli (2010).

⁴ See, e.g., Milgrom and Roberts (1990), Kandel and Lazear (1992), Baker, Gibbons, and Murphy (1994), and Holmström and Milgrom (1994).

exogenously varying the degree of labor market competition we can show that competition is a catalyst for the effectiveness of screening that fosters the adoption of HPWS. The identification of causal mechanisms by way of conducting controlled laboratory experiments is the most important contribution of our paper to this literature.

Our paper is also related to the theoretical and empirical literature on reputation formation (e.g., Fama 1980; Kreps et al. 1982; Holmström 1999; MacLeod 2007; Brown, Falk and Fehr 2004; Huck, Lünser and Tyran 2006; Brown and Zehnder 2007).⁵ 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 an employer's 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 HPWS.

Moreover, our findings 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 (e.g., Doeringer and Piore 1971). Bulow and Summers (1986) and Saint-Paul (1997) link the description of dual labor markets to technological factors that determine, for example, monitoring costs. Since “technology” is constant across our treatments, our findings suggest that sub-optimal choices by employers and narrowly self-interested behavior of employees also contribute to segmentation. The experimental results show that many participants behave sub-optimally without sufficient labor market competition. But if competition is strong enough, sub-optimal behavior is largely removed and the labor market 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; Fehr and Rockenbach 2003; Falk and Kosfeld 2006; Ellingsen and Johannesson 2008). In particular, Falk and Kosfeld (2006) show experimentally that fair-minded agents may reduce voluntary effort

⁵ 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.

provision if the principal chooses to control them. These “hidden costs of control” may, therefore, diminish the principals’ incentive to limit the agents’ discretion, i.e. to control them, 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 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 clustering of job attributes, the employers’ optimal and actual 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 labor market competition. Section 5 discusses the empirical relevance of our experiment and its relation to other explanations of HPWS. 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, $b \cdot e$, accrue directly to the employer. The employee incurs private effort costs $c(e)$ measured in monetary terms, with $c(e) = e$. 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} .⁶ The wage must at least cover the costs of the requested effort and cannot exceed $\bar{w} = 50$. The contract can neither be conditional on effort,

⁶ The purpose of the requested effort level is to coordinate expectations. The principal can communicate what he considers to be an adequate effort choice for the offered wage. From a game-theoretic perspective the requested effort level is just cheap talk. However, the literature on HRM and HPWS emphasizes the importance of extensive labor-management communications (see e.g. Ichniowski and Shaw (2003, p. 164). One of the HRM practices that are considered in Ichniowski et al. (1997) explicitly measures whether efforts were made “to set clear expectations about required work behaviors of the new workers” (p. 294).

effort costs, nor gross profits. These variables are observable by both parties, but they cannot be contracted upon. 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 by $U = w - e$ 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.⁷
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 and control described in the HRM literature.⁸ 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

⁷ Effort levels have to be natural numbers.

⁸ 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 "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 HPWS (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, and training) affects productivity. On the downside, HPWS 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).

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. All employers and employees know the payoff functions and which contracts can be offered.

We start out with two treatments, the *base treatment* and the *screening treatment*. Each treatment involves 15 periods. In each period, an employer is randomly matched with a new employee to eliminate repeated game effects. In the base treatment, the employer does not receive any information about his current employee, while he receives an imperfect signal about his current employee's track record in the screening treatment: he is informed about his current employee's effort choices in the last three periods.⁹ Note that an employer neither observes the contract types, the wage offers, nor the requested effort levels that his current employee faced in the last three periods. The employers are thus not perfectly informed about their employees; a low effort choice, for example, can either indicate an untrustworthy employee (who was potentially offered a high wage) or a reciprocal employee who was offered a low wage. Employees know that future employers will be able to observe their current effort choices. Apart from the information given to the employers in the screening treatment, the two treatments are 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 are infinite in the baseline treatment, rendering any screening unprofitable, while the screening costs are zero in

⁹ 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.

TABLE 1—Contracts and Payoff Functions in Each Period

	Contract with Full Discretion	Contract with Limited Discretion
feasible effort levels	$e \in \{1, \dots, 10\}$	$e \in \{3, \dots, 10\}$
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	$\Pi = U = 0$	$\Pi = U = 0$

the screening treatment because the employers do not have to pay for the information about past performance. The HRM literature (e.g., Ichniowski and Shaw 2003) stresses that careful screening activities are an important component of the cluster of job attributes that constitute HPWS. 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.¹⁰ 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. We used no value laden terms like full or limited discretion, control, trust, or efficiency.¹¹ 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 in Section 4.

¹⁰ With 15 periods and matching groups of 9 employers and 9 employees some of the subjects interacted with the same opponent twice. However, subjects did not know that they were divided in two matching groups, nor did they know whether and if so with whom they would interact for a second time. Thus, for all practical purposes repeated games effects can be ruled out.

¹¹ A translation of the experimental instructions can be found in Section A4 of the supplementary appendix.

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. Payoffs were measured in experimental points that were exchanged into CHF at the end of the experiment. 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 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.¹³

¹² All experiments were computerized with the software z-Tree (Fischbacher 2007).

¹³ This equilibrium outcome is unique if wages and effort levels are continuous variables. We are grateful to a referee for pointing out that there exists a second equilibrium in the one-shot game if wages and effort levels are discrete: "Employers offer contracts with limited discretion and a wage of 4. All employees accept and choose the

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 (for a survey see, e.g. Sobel 2005 or Fehr and Schmidt 2006). These models also predict that controlling an employee does not reduce his effort as 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. For example, the Fehr and Schmidt (1999) model predicts that if there are “fair” employees (who reciprocate high wages with an effort level that equalizes payoffs) and “selfish” employees (who always choose the minimal effort level) then contracts with limited discretion and low wages are optimal in the base treatment if the fraction of fair employees is smaller than 62.5 percent.¹⁵ The model also predicts that contracts with limited discretion and wages greater or equal than 7 will be accepted with probability one because they give at least half of the surplus to the employee. If more than 44 percent of the employees are “fair-minded” (and reject wages below 7), a wage of 7 is optimal.¹⁶

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

minimum effort level of 3. Wages smaller than 4 are rejected.” Even though the two equilibria of the one-shot game are very similar and differ only in that the wage is either 3 or 4, they can be used to construct multiple equilibria in the screening treatment. For example, in the second to last period the worker can be induced to choose an effort of 4 by offering a contract with limited discretion and a wage of 4. On the equilibrium path the employee chooses $e=4$ and is rewarded by the continuation equilibrium where the next employer offers a wage of 4 in the last period. If the employee deviates and chooses $e=3$ the continuation equilibrium changes and he will now be offered $w=3$ by the next employer. However, these equilibria require that employers can perfectly coordinate their behaviors.

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 In Section A1 of the supplementary appendix we show that in the base treatment about 70 percent of our subjects can be classified as selfish and 30 percent as “fair.” This is well below the required threshold of 62.5 percent.

¹⁶ With about 30 percent of the subjects being fair, the expected payoff difference between offering a wage of 7 and the minimum wage of 3 is very small.

(1982).¹⁷ 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 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.¹⁸

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 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

¹⁷ Our 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).

¹⁸ 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, this is the most efficient equilibrium, and the beliefs and behaviors associated with it 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.

this behavioral pattern. In our set-up, hidden costs of control would arise if 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. However, there are two additional effects of a limited discretion contract that point in the opposite direction. First, limiting discretion reduces the shirking of selfish employees who are forced to work harder. Second, limiting discretion reduces the efficiency parameter from $b=5$ to $b=4$. The Fehr-Schmidt (1999) model predicts that for any given wage an inequality averse employee will react to limited discretion with a weakly higher effort level to compensate for the lower efficiency of effort.¹⁹ These two latter effects may outweigh the hidden cost of control effect. However, if – conditional on wages – the average effort under limited discretion contracts is strictly smaller than under full discretion contracts, then we can unambiguously conclude that hidden costs of control exist. Furthermore, if these costs are sufficiently high, they may render full discretion contracts more profitable than limited discretion contracts even in the base treatment where the employers have no information about their employees.

4 Results

In Section 4.1, we first discuss the employers’ job strategies, i.e. their clustering of job attributes. Section 4.2 analyzes the optimality of these clusters in the different treatments. In Section 4.3, we explain the pattern of profit-maximizing clusters of job attributes in terms of employees’ effort behavior and discuss whether hidden costs of control affect this pattern. Section 4.4 examines whether employers offer the optimal clusters of job characteristics in the different treatments and how the deviations from optimality are associated with labor market segmentation. In Section 4.5, we study the impact of labor market competition on the employers’ job strategies, the employees’ effort choices, market segmentation, and overall surplus.

4.1 Dichotomy of Job Design

Our experimental design allows for a large number of combinations of contracts with full and limited discretion, wages, requested effort levels, and offered shares of the surplus. However, we observe two very distinct clusters of job characteristics:

¹⁹ An inequality averse employee chooses e to equalize payoffs, i.e. $w-c(e)=be-w$ which implies $e(w)=2w/(b+1)$.

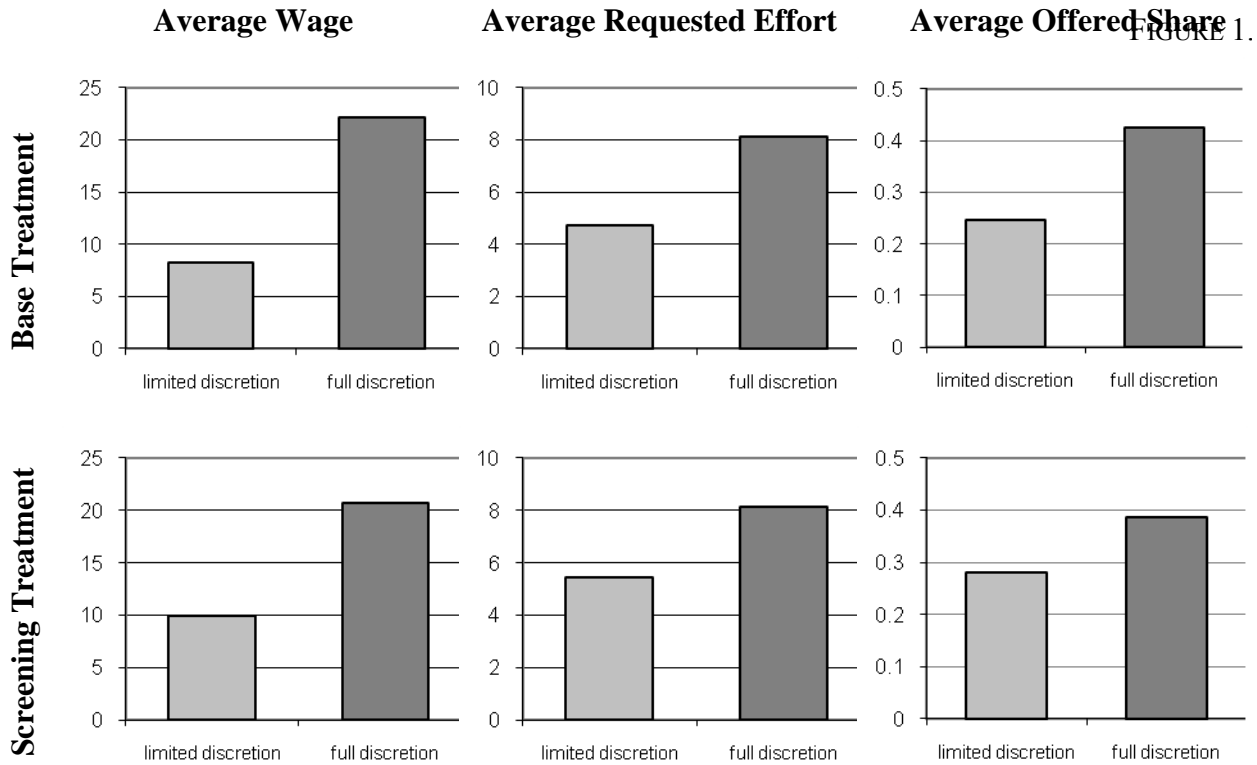
Result 1 (dichotomy of job design): *The employers rely predominantly on two fundamentally distinct strategies in both the base and the screening treatment, i.e. they offer two types of jobs that differ in all dimensions. They offer either a job with full discretion, high wages, a high requested effort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

Support for Result 1 is provided by Figure 1, which shows average wages, average requested effort levels, and the average offered share of the surplus for both treatments.²⁰ 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. Finally, the employees are offered about 40 percent of the surplus in jobs with full discretion but below 30 percent in jobs with limited discretion. All these differences in job characteristics across full and limited discretion jobs are highly significant (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).²¹

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. Those employers who appeal to the employee's fairness and reciprocity offer a relatively high share of the surplus and demand a high effort level. The higher share of the surplus translates into an average offered rent of 14.1 and 12.6 in jobs with full discretion in the base and the screening treatment, respectively. This is about three times higher than in jobs with limited discretion, where the offered average rent is 3.5 and 4.5, respectively.

²⁰ The offered share of the surplus is determined by the requested effort level, which determines a requested surplus, and by the offered wage, which determines the split, given this requested surplus. In very few cases, the offered wage was so high that more than the entire requested surplus was offered to the agent. In these cases, the share is set to one. This however happened in only 12 out of 1620 contract offers.

²¹ The observed differences in job characteristics are not only perceived at the level of averages. See Section A2 of the supplementary appendix for a more detailed analysis. In Section A3 of the supplementary appendix we also show that the clustering is stable over time.



4.2 Optimality of Different Clusters of Job Attributes

Result 1 provides no information about the frequency with which the employers rely on the two job strategies, nor does it tell us which strategy is optimal. 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. In the screening treatment it is optimal to condition on the employee's track record. If the employee has a medium or high reputation the trust strategy is optimal, while the control strategy is better if the employee has a low reputation.*

An employee has a low reputation if his average effort in the previous three periods, denoted by r , is below 3.5, a medium reputation if $3.5 \leq r < 6.5$, and a high reputation if $r \geq 6.5$.²² Figure 2 provides support for Result 2. 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.²³ In contrast, in the screening treatment with medium and high reputation employees profits are highest when contracts with full discretion and high wages are offered.²⁴ Note that either the trust or the control strategy maximizes profits, but there is no situation in which some other possible job design (e.g. full discretion combined with low wage offers) is optimal. 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.

4.3 Employees' Effort Choices

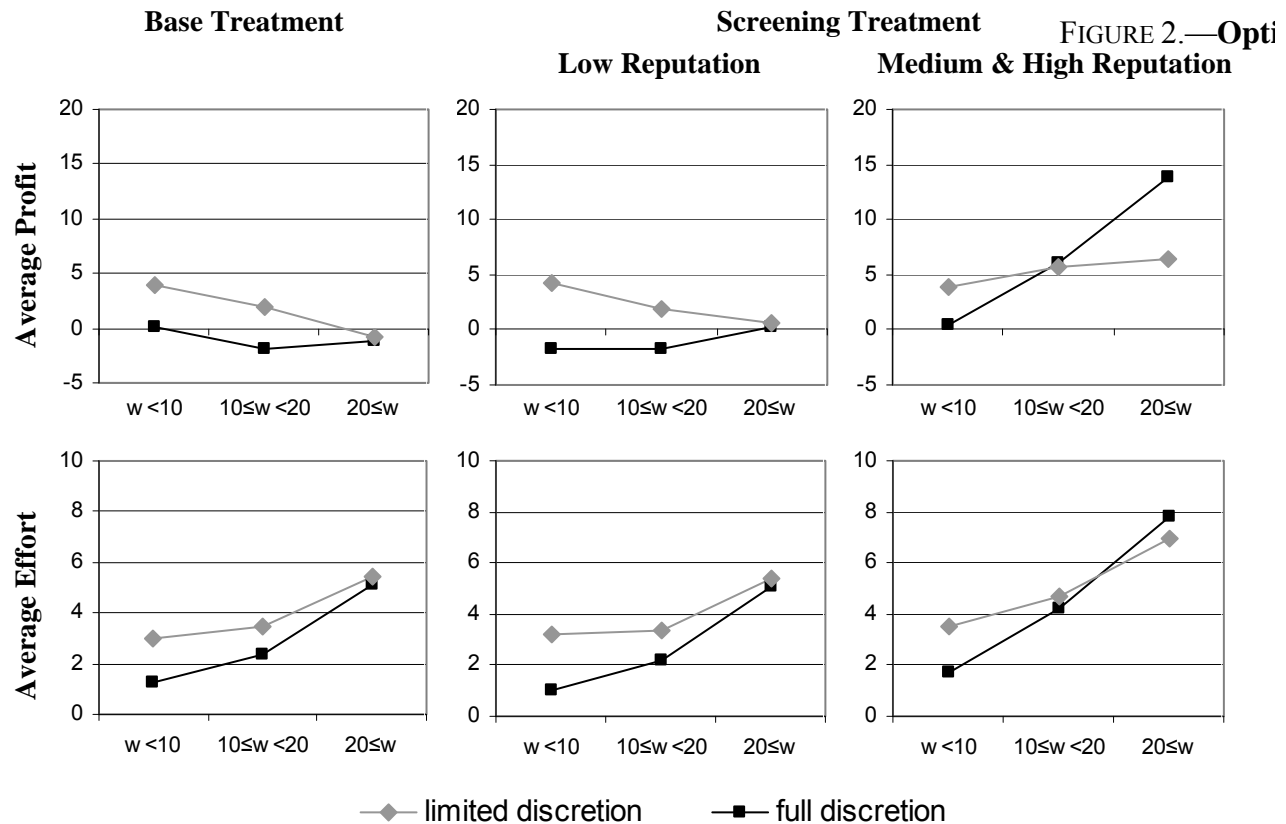
Result 2 raises the question why the control strategy is optimal in the base treatment and in the screening treatment with low reputation employees, while the trust strategy is optimal in the screening treatment when employees have a medium or high reputation. Since the profit pattern is shaped by the 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 strategy profitable. In addition, employees provide considerably higher effort at low wages when they are offered a job with limited discretion than when they have full discretion. This renders the control strategy optimal.*

²² In the second and third period the reputation index r uses the information of one period (two periods, respectively) only. If a contract was rejected in a period, this period was not considered for the computation of r . In the first period employees had no reputation and the reputation index is not defined.

²³ In the base treatment, employers who offer contracts with limited discretion and low wages ($w \leq 10$) earn significantly more than employers offering jobs with full discretion (two-sided t-test, $p \leq 0.001$) and employers offering medium wages ($10 < w \leq 20$, two-sided t-test, $p \leq 0.001$). In fact, employers who offer full discretion contracts incur losses on average. In the screening treatment the profit pattern in case of low reputation employees is remarkably similar to the base treatment. Again, offering a contract with limited discretion and low wages is significantly better (two-sided t-test, $p \leq 0.001$) than any other strategy.

²⁴ 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 rather than medium wages is significantly more profitable (two sided t-test, $p \leq 0.001$).



Support for Result 3a is provided by the corresponding graphs in Figure 2 and the regressions in Table 2. The left bottom graph of Figure 2 shows that in the base treatment higher wages are reciprocated with higher average effort levels both for jobs with limited and jobs with full discretion. However, the effect is too small to render a high wage strategy optimal, which can be seen in the corresponding profit graph. Moreover, at low wages, effort is much higher in jobs with limited than in jobs with full discretion, which renders – despite the efficiency loss of limiting discretion – the control strategy optimal.

The regressions in Table 2 confirm these findings. In effort regression (1), the wage coefficient for a full discretion job, which is the omitted category in the regression, is about 0.2. As the productivity of effort is $b=5$, this coefficient implies that a wage increase of 10 raises effort by roughly 2, which in turn increase revenue by $5 \times 2 = 10$, implying a flat wage-profit relation for jobs with full discretion. This is confirmed by the profit regression (3), where the wage coefficient is close to zero and insignificant. Since the interaction between the dummy for limited discretion (“limited”) and wage is significantly negative in the effort regression, the wage

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

	(1) effort	(2) effort	(3) profit
wage	0.207*** (0.030)	0.202*** (0.033)	0.007 (0.105)
limited	2.731*** (0.432)	2.722*** (0.446)	6.535*** (1.766)
limited×wage	-0.072** (0.032)	-0.071** (0.032)	-0.263** (0.127)
requested effort	—	0.022 (0.056)	—
period dummies	—	yes ²⁵	—
constant	-0.517 (0.482)	-0.879 (0.547)	-1.307 (1.691)
observations	658	658	810
adj. R ²	0.474	0.470	0.063

Notes: The table reports coefficients of OLS regressions. Robust standard errors are reported in parentheses. The effort regressions cluster by employees, control for individual fixed effects, and consider only accepted contracts as no effort is chosen if a contract is rejected. All contracts are included in regression (3) to capture the effect of rejections on profits.

*** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent.

coefficient for jobs with limited discretion is lower and amounts to about 0.14. A wage increase of 10 thus only increases effort by 1.4, which – in combination with the lower effort productivity of $b=4$ – increases revenue only by $4 \times 1.4 = 5.6$, implying that the wage-profit relation is negative. This is again confirmed by the profit regression (3), where the corresponding coefficient is negative and significant. Moreover, the “limited” dummy is significantly positive in the effort regression, indicating that at low wage levels effort is higher in jobs with limited than in jobs with full discretion. This effort advantage at low wage levels reflects the fact that employees must at least provide an effort of 3 under limited discretion. The large and highly significant coefficient of “limited” in the profit regression (3) indicates that the higher effort levels outweigh the lower efficiency of these jobs. The reason is that reducing the efficiency of effort is relatively

²⁵ There is no time trend or end-game effect. Only the period 3 and 7 dummies are significant at the 10 and 5 percent level, respectively.

inexpensive if employees choose low effort levels. The effort regression (2) finally shows that controlling for requested effort and for period effects does not affect the results.²⁶

Taken together, the data indicate that in the base treatment, a high wage strategy is not profitable. In addition, the effect that employees are forced to provide more effort under limited discretion outweighs the productivity disadvantage of limited discretion, thus rendering a control strategy optimal.

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

(i) In the screening treatment, the effort responses of the employees with a low reputation are very similar to their responses in the base treatment, which renders the control strategy optimal.

(ii) The wage-effort relation for employees with a medium or high reputation is steep enough to render the payment of high wages profitable. Moreover, the higher efficiency of full discretion is particularly advantageous at high effort levels, rendering the trust strategy optimal.

This result is supported by the corresponding graphs in Figure 2 and the regressions in Table 3. A first salient characteristic of the effort pattern of low reputation employees is that it very closely resembles that in the base treatment (compare the left and the middle bottom graph of Figure 2). Low reputation employees in the screening treatment act as if there were no reputational incentives. Thus, as in the base treatment, the control strategy is optimal, which can be seen in the corresponding profit graph. The right bottom graph of Figure 2 shows that employees with a medium or high reputation display a much steeper wage-effort relation than those with a low reputation. The corresponding profit graph reveals that the steeper wage-effort relation translates into a positive wage-profit relation, especially under more efficient full discretion jobs. This renders the trust strategy optimal.

²⁶ Figure 2 and Table 2 raise the question whether employers' expected profits are maximized by offering the lowest possible wage or whether they should leave some rent to employees. A closer look at the low wage interval ($w < 10$) reveals that holding employees down to their reservation utilities 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.

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*** (0.021)	0.295*** (0.022)	0.187*** (0.049)	0.201*** (0.048)	0.200*** (0.050)	0.065 (0.185)
limited	2.894*** (0.562)	3.230*** (0.522)	2.478*** (0.571)	2.783*** (0.570)	2.693*** (0.545)	6.868*** (1.772)
limited × wage	-0.147*** (0.037)	-0.157*** (0.033)	-0.105*** (0.038)	-0.107** (0.040)	-0.103** (0.041)	-0.478*** (0.118)
medium reputation	—	-0.233 (0.216)	-1.560*** (0.537)	-0.949 (0.655)	-0.936 (0.657)	-1.048 (1.800)
high reputation	—	-0.272 (0.323)	-2.493*** (0.737)	-2.191*** (0.780)	-2.241*** (0.815)	-4.725** (1.928)
medium reputation × wage	—	—	0.102** (0.043)	0.080* (0.045)	0.078* (0.046)	0.424** (0.177)
high reputation × wage	—	—	0.143*** (0.050)	0.132*** (0.048)	0.134*** (0.049)	0.722*** (0.177)
medium reputation × limited	—	—	—	-0.495 (0.420)	-0.467 (0.430)	—
high reputation × limited	—	—	—	-0.232 (0.516)	-0.164 (0.518)	—
requested effort	—	—	—	—	-0.005 (0.058)	—
non-final period dummies	—	—	—	—	yes ²⁷	—
final period dummy	-1.959*** (0.404)	-2.025*** (0.414)	-1.933*** (0.419)	-1.932*** (0.420)	-1.822*** (0.510)	-7.038*** (1.839)
constant	0.233 (0.410)	-0.032 (0.490)	1.442** (0.719)	1.068 (0.678)	1.028 (0.737)	0.110 (2.231)
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. Effort regressions cluster by employees, control for individual fixed effects, and consider only accepted contracts as no effort is chosen if a contract is rejected. All contracts are included in the regression (6) to capture the effect of rejections on profits. Regressions (2)-(6) consider observations with at least one previous effort choice only as an employee’s reputation cannot be classified otherwise.

*** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent.

²⁷ All non-final period dummies are insignificant.

The regressions in Table 3 confirm these findings.²⁸ While the effort regressions (1) and (2) 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, wage, and limited discretion.²⁹ Note that the omitted category in regressions (3) – (6) 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 in the effort regressions is about 0.2 in these cases, which is very similar to that in the base treatment, implying a flat wage-profit relation. This is confirmed in the profit regression (6). Moreover, the regressions reveal that the interactions between limited discretion and wages are significantly negative, while the “limited” dummies are large and highly significant. Thus, as in the base treatment, the employers can earn the highest profits if they use the control strategy whenever they face an employee with a low reputation.³⁰

Turning to medium and high reputation employees, 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 much higher effort levels if offered a high wage. This fact is revealed by regression (3), which shows that the medium and high reputation employees display a smaller intercept (the coefficient on medium and high reputation is significantly negative) and a larger slope in the wage-effort space than the low reputation employees (the interaction between wage and 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, especially if discretion is not limited.³¹ The profit regression (6) corroborates these findings and indicates that the effort behavior of medium and high reputation employees causes a sizeable

²⁸ All non-final period dummies are insignificant.

²⁹ “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. These dummies are functions of past effort choices; hence the strict exogeneity assumption that ensures the consistency of fixed effects estimators is violated. However, the bias in fixed effects models with a lagged dependent variable is of order $1/T$ (see Hsiao, 2003, section 8.1) and our game is played for 15 periods.

³⁰ 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. Offering wages below 7 is thus again not optimal.

³¹ For a medium reputation employee, the slope of the wage-effort relation under full discretion is roughly $0.19 + 0.10 = 0.29$, implying that increasing the wage by 10 increases revenue by $5 \times 2.9 = 14.5$. Likewise, the slope is $0.19 + 0.14 = 0.33$ for a high reputation employee, thus increasing the wage by 10 increases revenue by $5 \times 3.3 = 16.5$.

efficiency wage effect that renders – in combination with the higher efficiency of granting full discretion – the trust strategy optimal.³² The regressions also reveal that there is a large and highly significant last period effect. In the final period there is no reputational incentive to exert effort any longer. Effort and thus profits are therefore much lower. Finally, regressions (4) and (5) show that including interactions between reputation and limited and controlling for requested effort and for all non-final periods does not affect the results.

Taken together, the evidence unambiguously shows that conditioning the job offer on the employees' reputation is profit maximizing. Employers can elicit high effort in highly 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 predictions of the self-interest model and models of social preferences. The results of our base treatment are consistent with both the self-interest model and models of social preferences. Pure self-interest alone cannot explain the results of the screening treatment. However, if there are some fair-minded employees who are willing to reciprocate high wages with high effort, then selfish employees have an incentive to mimic this behavior and to build up a reputation for being fair-minded in order to get better job offers in the future. It is this reputation building of strategic employees that renders the trust strategy profitable.

In Section 3 we also discussed the potential role of hidden costs of control. Our results are consistent with the existence of hidden costs. In particular, the fact that the slope of the wage-effort relation is smaller in contracts with limited discretion than in contracts with full discretion indicates that voluntary effort provision is withdrawn if discretion is limited. However, the average effort under limited discretion is not smaller than under full discretion, so we cannot unambiguously confirm the existence of hidden costs of control.³³ However, our results do show

³² 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.

³³ In regression (4) of Table 3 we also investigate whether employees with a good reputation reacted differently to being controlled than low reputation employees. Employees with a good reputation might react especially averse to limited discretion. However, the coefficients of the interactions between medium and high reputation and limited are both small and insignificant. Finally, we investigate whether hidden costs of control show up on the level of contract rejections. We run a regression of the employees' acceptance decisions on the value of a contract offer (defined as the difference between wage offer and the cost of the minimum effort level) and the limited dummy. It turns out that

that (potential) hidden cost 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 in our setting (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.³⁴ Hidden costs of control thus do not play a decisive role in the choice of the optimal employment strategy in our setting.

4.4 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 choose their employment strategies optimally. The next result addresses this question.

Result 4 (employers' actual job offers):

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

(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 job offers 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. Figure 3 shows the share of full discretion job offers over time. In the base treatment, the share

the dummy is insignificant both in the base and the screening treatment (and that the coefficient is positive in both cases).

³⁴ 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 be the reason for the optimality of full discretion contracts.

of contract offers with full discretion starts out at 50 percent, but falls quickly to less than 20

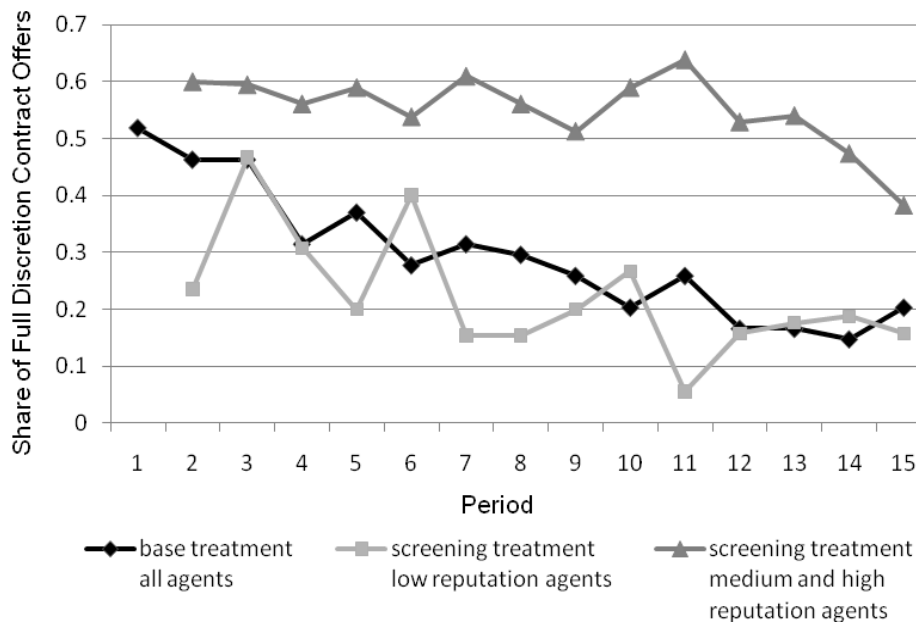


FIGURE 3.—Share of Full Discretion Contract Offers over Time.

percent indicating that many employers experimented with the trust strategy but learnt over time that this strategy is not profitable. Figure 3 shows that a very similar picture emerges in the screening treatment if employers face low reputation employees. However, employers offer full discretion contracts much more frequently to employees with a medium or high reputation. The overall share of job offers with full discretion is 55 percent and it falls below 50 percent only in the last two periods. The share of full discretion job offers is significantly higher for medium and high reputation employees (290 out of 525 cases), compared to low reputation employees (48 out of 172 cases) and compared to the base treatment (239 out of 810 cases); two-sided Fisher exact tests, $p \leq 0.001$.³⁵

Although employees with a medium or high reputation face the trust strategy in the majority of cases, they are also offered non-optimal contracts with limited discretion in 45 percent of the cases. This raises the question about the sources of this sub-optimality.

³⁵ 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 $525+172=697$.

Result 5 (suboptimal behavior and labor market segmentation):

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

(b) A significant share of narrowly self-interested employees do 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 is supported by the fact that almost 17 percent of employers (9 out of 54) always opt for the control strategy in the screening treatment and another 4 percent (2 out of 54) choose the trust strategy only once.³⁶ These non-responsive employers may have had very pessimistic beliefs about their employees' effort choices or they may have been highly risk or betrayal averse. Because they do not condition their strategy on employees' reputation, they make significantly lower average profits (4.13) than employers who respond 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, $p\leq 0.001$). Nevertheless, Result 5b shows that a significant fraction of the employees always choose low effort levels in the screening treatment – even when they are offered high wages.³⁷

Result 5 explains why a substantial fraction of both good and bad jobs co-exist in the screening treatment. A sizeable group of employers offer only bad jobs regardless of the employees' reputations, and an equally large group of employees do not respond to the prevailing incentives for reputation formation. These employees consider only their narrow,

³⁶ 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.

³⁷ In Section A1 of the supplementary appendix we show that about 20 percent of the employees can be classified as narrowly self-interested because they do not reciprocate to high wages in the screening treatment even though this would be profitable.

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, which provides a stylized description of actual labor markets in terms of a primary and a secondary market (e.g., Doeringer and Piore 1971). 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) explain the existence 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, there are no technological differences. Our findings suggest that individual characteristics of employers and employees (their willingness to trust and to behave trustworthily) may also contribute to the segmentation of the labor market.

Despite the existence of a substantial minority of employers and employees behaving sup-optimally the screening treatment provides incentives to spend high effort and to offer jobs with full discretion. Both, employers and employees benefit from screening:

Result 6 (screening and total surplus): *The screening opportunity causes a strong increase in 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 4. The figure shows that both employers and employees benefit on 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 and the higher average effort of the employees. In fact,

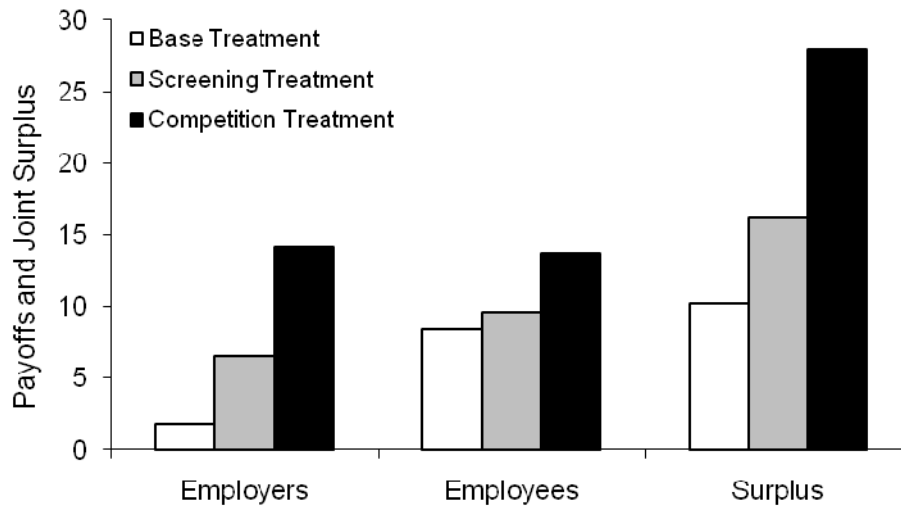


FIGURE 4.—Employers’ profits, employees’ incomes, and surplus in the different treatments.

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, $p=0.007$).³⁸

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 total surplus.

4.5 Labor Market 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

³⁸ 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, $p=0.004$).

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 nobody may accept more than one. 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 4.³⁹

As in the previous treatments, employees do not observe the offers received by the other employees. However, an employee may have to wait until the second, third, or even fourth round before getting his first offer, from which he may conclude that he is no employers' 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. 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. The same dichotomy of job characteristics prevails in the competition treatment: Contracts with full discretion are associated

³⁹ 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.

with much higher wages (24.7 vs. 12.8), higher requested effort levels (9.4 vs. 6.8), and significantly higher shares of the surplus (0.40 vs. 0.31). The differences in job characteristics across contracts with full and limited discretion are significant in all three dimensions (two-sided t-tests, controlling for individual fixed effects and clustering on employers, $p \leq 0.001$). The bundling of distinct job characteristics into good and bad jobs is thus a robust phenomenon that occurs under all treatment conditions. This finding, 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. For low reputation employees low wages and limited discretion are optimal, while for medium and high reputation employees profits are maximized by offering high wages and full discretion.

To what extent do the employers choose the optimal strategy in the competition treatment? Result 7a shows that this is done 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 receive in the screening and the competition treatments. 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).⁴⁰

⁴⁰ To account for the order of contract offers in each period of the competition treatment, we consider only the offers that were received by the employees. If an employer is matched with an employee prior to the final matching round,

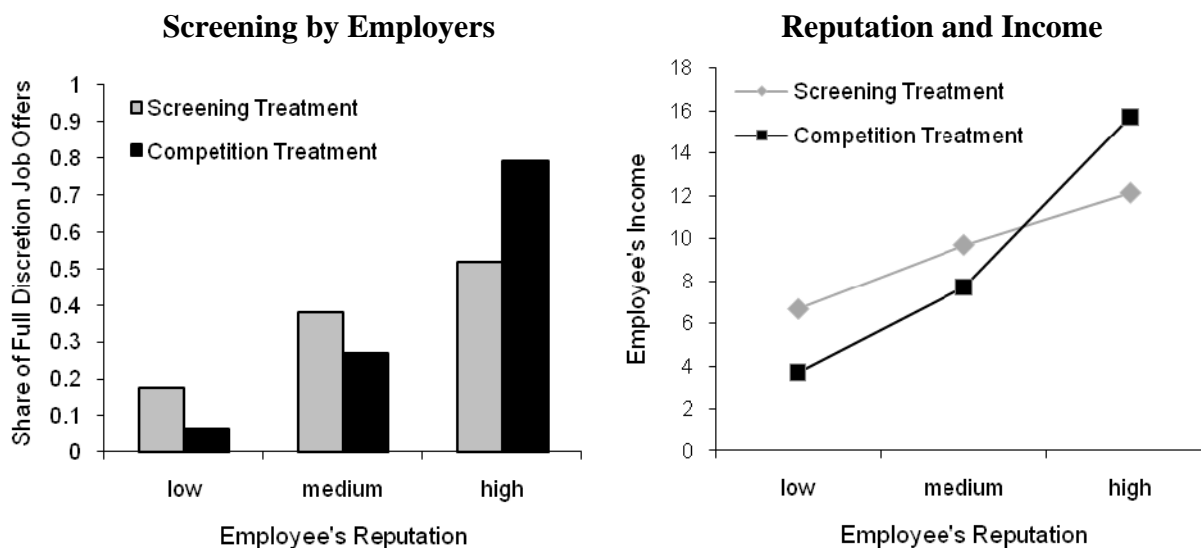


FIGURE 5.—Employers’ sorting behavior across the reputation and competition treatment (left graph) and the consequences for employees’ incentives for reputation formation (right graph).

The stronger conditioning of job offers on employees’ reputations has important consequences for their incentives to build a good reputation. Because jobs with full discretion are associated with higher rents, the employees in the competition treatment have a stronger incentive to acquire 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. The treatment differences in employees’ incomes are significant in all three reputation classes (two-sided t-test, $p=0.036$, $p=0.017$, and $p\leq 0.001$ for low, medium, and high reputation, respectively).

Did the employees’ respond to these stronger incentives by acquiring higher reputation levels? Result 7b shows that this is indeed the case. The average reputation of an employee is 5.26 in the screening treatment and 8.32 in the competition treatment (two-sided t-test; $p\leq 0.001$) For example, more than 80 percent of the employees (26 out of 32) in the competition treatment have on average a reputation index exceeding $r=6.5$ (“high reputation”), while only 30 percent of the employees (16 out of 54) in the screening treatment acquire on average a high reputation (two-sided Fisher exact-test; $p=0.013$). In addition, only one of the 32 employees in the

then his offers for the remaining matching rounds are not accounted for. In Section A3 of the supplementary appendix we show that the pattern of contract offers in the competition treatment is stable over time.

competition treatment displays on average a low average reputation (i.e. $r < 3.5$) while about a quarter of the employees (13 out of 54) in the screening treatment fall into this category (two-sided Fisher exact-test; $p=0.031$).

Results 7a and 7b show that the competition treatment induces employers to rely more on the trust strategy and employees to behave more trustworthily. This significantly reduces the secondary sector of the labor market. When competition complements screening opportunities, the overall share of jobs with full discretion increases to 77 percent (333 out of 435 concluded contracts) from 51 percent in the screening treatment (363 out of 711); 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 (119 out of 146) compared to 49 percent in the screening treatment (115 out of 237). These treatment differences are highly significant (two-sided Fisher exact-tests; $p \leq 0.001$ and $p=0.003$, respectively).

Result 8 (competition and total surplus): *The introduction of competition in addition to screening 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 4. 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.⁴¹ The differences to the base (3.00) and the screening treatment (4.48) are again significant (Mann-Whitney tests on matching group averages, $p=0.011$).

⁴¹ If only accepted contracts are considered, average effort amounts to 8.02 in the competition treatment.

5 Discussion

There are three important implications of our experiments: (i) the clustering of job attributes, (ii) the role of screening as a necessary condition for the viability of “good jobs” and (iii) the role of labor market competition as a catalyst fostering the adoption of HPWS. The roles of screening and competition are of particular interest because they are treatment variables in our experiment. Thus, our experiments not only show that screening and job-market competition are positively correlated with HPWS. They show in addition that these variables are *causal* factors.⁴² In the following we discuss the empirical relevance of our results and what distinguishes them from alternative explanations for the viability and dissemination of new HRM practices.

(i) Clustering of job attributes: Our experiments show that certain elements of HPWS, such as offering discretion, requesting high effort, paying generous wages and sharing rents with employees are highly correlated. There is a broad consensus in the empirical literature that these instruments – together with some other instruments not captured by our experiments such as training and employment security – are indeed complements that are typically used together. Furthermore, the literature shows that HPWS improve productivity and profitability as compared to more traditional job designs with narrowly defined jobs and little worker involvement (e.g., Ichniowski, Shaw and Prennushi 1997; Osterman 2006; Oyer and Schaefer 2010). However, not all jobs are turned into HPWS. Good jobs and bad jobs coexist, sometimes within the same industry.

There are other possible explanations for these complementarities and for the viability of good jobs. Most of these explanations point to technological factors. For example, efficiency wage theory predicts wage premia and less supervision (“good jobs”) if monitoring costs are high, while no wage premia will be paid and little discretion granted (“bad jobs”) if monitoring costs are low. This explanation is certainly important, but it cannot explain why good and bad jobs sometimes coexist in the same industry with no apparent technological differences.⁴³ Our experiments point to a different mechanism: the role of generous wages to induce higher voluntary effort provision. This mechanism requires trusting and trustworthy behavior that are

⁴² In a recent survey on personnel economics Lazear and Shaw (2007, p. 92) emphasize the importance of “econometrics and experimental design to identify *causal* relationships” (emphasis added).

⁴³ For example, there do not seem to be any technological differences between Costco and Wal Mart’s Sam’s Club, but Costco pays 40 percent higher wages, it offers much more generous benefits, training on the job and more job security. For other examples see Osterman (2009, p. 29) and the references cited there.

individual characteristics of employers and employees. Thus, the coexistence of good and bad jobs in the same technological environment may be due to endogenous sorting of different types of employers and employees.⁴⁴ This explanation complements the theories that are based on technological differences.

(ii) *Screening*: The importance of screening for the viability of good jobs is emphasized by many empirical studies,⁴⁵ but most of them do not distinguish between screening for skills and screening for work attitude. There are a few notable exceptions, though. Using a national sample of US employers Huang and Cappelli (2010) analyse how firms screen applicants for work ethic as well as for skills and work experience. Work ethic is defined as the ability of an employee to work hard independent of monitoring or rewards. Huang and Cappelli (2010, p. 214) find that

“...employers who screen applicants more intensively for factors that should predict work ethic are able to use less expensive monitoring of employees. They are also able to make greater use of teamwork, an approach to organizing work that uses less supervision and gives employees greater autonomy, which otherwise creates greater opportunity for shirking. This screening is associated with higher employee productivity, lower involuntary turnover rates, and higher wages via rent-sharing. Screening for other attributes, in contrast, such as more traditional human capital measures, does not produce these results.”

Thus, it is screening for “work ethic” rather than the screening for specific skills that is highly correlated with HPWS. However, Huang and Cappelli (2010, p. 216) caution that “(t)he fact that our data are cross-sectional limits the ability to make causal arguments.” Causality is always difficult to establish in empirical research. An important advantage of our experimental method is that we can show that screening for work ethic is indeed a causal factor for the viability of HPWS.⁴⁶

⁴⁴ In a related paper, Cabrales, Miniaci, Piovesan and Ponti (2010) show how social preferences affect sorting in an experimental labor market. In their set-up, there is a trade-off between fairness and robustness to strategic uncertainty. They find that while strategic uncertainty aversion is a stronger determinant of choices than fairness, agents prefer to work for principals with similar distributional concerns.

⁴⁵ See the excellent surveys by Ichniowski and Shaw (2003) and Oyer and Schaefer (2010).

⁴⁶ Another important paper that analyzes the importance of screening for personality traits is Ichniowski et al (1997) who studied the use of different HRM practices in 36 homogenous steel production lines in the US. One of their questions was the following: “Was an extensive selection procedure used to hire new workers, including tests for personality traits needed for cooperative team environments and efforts to set clear expectations about required work behaviors of the new workers?” This screening variable is highly correlated with all other HRM practices that are used in high performance work systems. Furthermore, Ichniowski et al. (1997) report that the isolated effect of screening on firm productivity is small, but in conjunction with complementary HRM practices such as training, team work, flexible job assignments and employment security it has a large impact.

Additional evidence on the importance of screening for personality traits is provided by the literature on referrals. Referrals can be an important source of information in the hiring process, and many firms encourage their employees to recommend applicants. If an employee worked with an applicant on a previous job, if he was a classmate in school or college, or if he lives in the same neighbourhood, then the employee may have private information about the job candidate that is very valuable to the firm. There are several papers showing that individuals hired by employee referral earn higher wages and are more productive. For example Kugler (2003) reports that individuals hired by employee referral earn higher wages and that high wage sectors tend to rely more on referral-based hiring. This observation is consistent with our hypothesis, but it could also be driven by various forms of firm-level heterogeneity. More conclusive micro evidence is provided by Antoninis (2006) who studied the personnel records of an Egyptian manufacturing firm. Controlling for experience and education he finds that workers hired on the recommendation of someone who knows them well earned significantly higher wages, and that this effect was larger for employees hired for higher skilled jobs. However, workers hired on the recommendation of friends or family did not get a wage premium because in these cases the referral is likely to be biased.⁴⁷

Finally there are very interesting case studies on the implementation of HPWS in individual companies such as NUMMI, the joint venture between Toyota and General Motors, or Southwest Airlines. All of them emphasize the importance of thorough employee screening for personality traits.⁴⁸

(iii) Labor Market Competition: There is also some empirical support for our hypothesis that competition on the labor market fosters the adoption of good jobs. Unions tend to restrict competition on the labor market, in particular when a closed shop system prohibits the firm to employ non-union members or if the union enforces inside hiring based on seniority rather than merit based promotions. In this case the firm has less choice which employees to hire and the

⁴⁷ Oyer and Schaefer (2010, p. 33, 35-36, 43) review several other papers that analyze the relationship of referrals and HRM practices.

⁴⁸ For example, O'Reilly and Pfeffer (2000) find that Southwest Airlines is "extraordinarily selective in recruiting" (p. 31). "The company does not use personality tests, but instead emphasizes previous actual behavior" (p. 38). It relies on peer recruiting, i.e. baggage handlers screen baggage handlers, and pilots screen pilots, because "(t)hey can get far more information in a phone call to the chief pilot of another airline than anyone else" (p. 37). As CEO Herb Kelleher puts it: "We draft great attitudes. If you don't have a good attitude, we don't want you, no matter how skilled you are. We can change skill levels through training. We can't change attitude" (p. 38). This is exactly what our experiment is about.

employees have a lower incentive to invest in a good reputation. Thus, our model predicts that firms that are unionized will be slower in adopting HPWS. In fact, Ichniowski et al. (1997) report that unionization is highly negatively correlated with all other innovative HRM practices in the steel industry.⁴⁹ Liu et al. (2009) conduct a multi-industry survey in Ireland and find that an increase in union representation leads to a significant decrease in the use of HPWS.⁵⁰ However, the empirical literature does not explain why this is the case. Our experiments suggest that the reduced competition between workers for jobs reduces the incentives to invest into a reputation for trustworthy behavior, which in turn makes it less attractive for firms to rely on the trust strategy. It would be very interesting to explore this hypothesis empirically by having a closer look at how different union activities (rather than unionization per se) affect competition on the labor market and how they are related to the adoption of HPWS.

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 improves the agent’s productivity, if it is combined with paying a high wage that grants a substantial rent, and if the principal can screen the agent based on past behavior and restrict such job offers to agents with good reputations, this combined trust strategy becomes profitable and outperforms a job strategy based on control. Our experiments show that offering discretion, paying high wages, and screening are complements that reinforce each other. This leads to an endogenous clustering of job attributes into “good jobs,” which are characterized by high effort discretion, high effort demands, high wages, and a high share of the surplus, and “bad jobs,” which are characterized by low effort discretion, low effort demands, low wages, and a low share of the surplus.

The opportunity for employers to screen employees and for employees to build a reputation is a treatment variation in our experiments. This enables us to show that screening and reputation formation opportunities are causal for the viability of good jobs. However, even if employers can screen employees, not all of them offer good jobs to employees with a good reputation – even though this would increase their profits. Also, not all employees acquire a good

⁴⁹ The correlation table is provided in the working paper version of this paper, Ichniowski et al. (1995, Table 2).

⁵⁰ Liu et al. (2009) offer an extensive survey on the literature on unions and HPWS. There are also some papers arguing that unions and HPWS need not be opposed to each other, and that unions may play a beneficial role, once HPWS have been implemented.

reputation – even though this would increase their overall incomes. The interaction of heterogeneous employers and employees leads to a segmented labor market. Our second treatment variation shows that if screening is complemented by labor market competition, suboptimal behavior is largely removed, which causes a considerable increase in the share of good jobs. This results in large welfare gains for both employers and employees.

Our experimental results complement the empirical literature by showing that screening and competition are causal factors for the viability and dissemination of “good jobs”. We hope that our paper stimulates new empirical research. For example, it would be very interesting to better understand how firms screen employees. What is the importance of technical skills as compared to soft skills (reliability, trustworthiness, intrinsic motivation, etc.)? How do firms use reference letters, employee referrals, interviews, and tests to evaluate the personality traits of an applicant? Are personal recommendations and letters of reference more reliable in small communities, where firms are more likely to know each other than in large metropolitan areas? What determines the intensity of screening? How does the thickness of the relevant labor market affect the dissemination of HPWS? Is this effected by legal constraints, such as non-compete agreements, or other barriers to labor mobility? These are important and fascinating questions for future research.

References

- Antoninis, M (2006), “The wage effects from the use of personal contracts as hiring channels,” *Journal of Economic Behavior and Organization*, Vol. 59, 133-46.
- 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.
- 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.
- Cabrales, Antonio, Raffaele Miniaci, Marco Piovesan, and Giovanni Ponti (2010), "Social Preferences and Strategic Uncertainty: An Experiment on Markets and Contracts," *American Economic Review*, forthcoming.
- 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.
- 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, 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.
- Grossman, Sanford, and Oliver Hart (1983), "An Analysis of the Principal-Agent Problem," *Econometrica*, Vol. 51(1), 7-46.

- 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.
- Hsiao, Cheng (2003), *Analysis of Panel Data*, Cambridge, UK: Cambridge University Press.
- Huang, Fali, and Peter Cappelli (2010), "Applicant Screening and Performance-Related Outcomes," *American Economic Review*, Vol. 100(2), 214-18.
- Huck, Steffen, Gabriele K. Lünser, and Jean-Robert Tyran (2006), "Competition Fosters Trust," *CEPR Discussion Paper No. 6009*.
- Ichniowski, Casey and Kathryn Shaw (1995), "Old Dogs and New Tricks: Determinants of the Adoption of Productivity-Enhancing Work Practices," *Brookings Papers on Economic Activity: Microeconomics*, 1-65.
- Ichniowski, Casey, Kathryn Shaw, and Giovanna Prennushi (1995), "The effects of human resource practices on productivity," *NBER Working Paper No. 5333*.
- 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.
- Kugler, Adriana (2003), "Employee Referrals and Efficiency Wages," *Labour Economics*, Vol. 10(5), 531-556.
- 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.
- Lazear, Edward and Paul Oyer (2010), "Personnel Economics," forthcoming in: *Handbook of Organizational Economics*.

- Lazear, Edward P. and Kathryn L. Shaw (2007), "Personnel Economics: The Economist's View of Human Resources," *Journal of Economic Perspectives*, Vol. 21(4), 91-114.
- Liu, Wenchuan, James P. Guthrie, Patrick C. Flood and Sarah MacCurtain (2009), "Unions and the adoption of high-performance work systems: Does employment security play a role?" *Industrial and Labor Relations Review*, Vol. 63(1), 109-27.
- MacLeod, Bentley (2007), "Reputations, Relationships and Contract Enforcement," *Journal of Economic Literature*, Vol. 45(3), 597-630.
- Milgrom, Paul, and John Roberts (1990), "The Economics of Modern Manufacturing: Technology, Strategy and Organization," *American Economic Review*, Vol.80 (3), 511-28.
- Osterman, Paul (1994), "How Common is Workplace Transformation and Who Adopts it?" *Industrial and Labor Relations Review*, Vol. 47(2), 173-88.
- Osterman, Paul (2006), "The Wage Effects of High Performance Work Organization in Manufacturing," *Industrial and Labor Relations Review*, Vol. 59(2), 187-204.
- Osterman, Paul (2009), "Institutional Labor Economics, the New Personnel Economics and Internal Labor Markets: A Reconsideration," *mimeo*, MIT Sloan School of Management
- O'Reilly, Charles A. and Jeffrey Pfeffer (2000), *Hidden Value: How great companies achieve extraordinary results with ordinary people*, Harvard Business School Press, Boston, MA.
- Oyer, Paul and Scott Schäfer (2010), "Personnel Economics: Hiring and Incentives," forthcoming in: *Handbook of Labor Economics*.
- Pfeffer, Jeffrey (2007), "Human Resources from an Organizational Behavior Perspective: Some Paradoxes Explained," *Journal of Economic Perspectives*, Vol. 21(4), 115-34.
- Rabin, Matthew (1993), "Incorporating Fairness into Game Theory and Economics," *American Economic Review*, Vol. 83, 1281-302.
- Saint-Paul, Gilles (1997), *Dual Labor Markets*, Boston: MIT-Press.
- 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.