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Screening, Competition, and Job Design: Economic Origins of Good Jobs[†]

By Björn Bartling, Ernst Fehr, and Klaus M. Schmidt*

High-performance work systems give workers more discretion, thereby increasing effort productivity but also shirking opportunities. We show experimentally that screening for work attitude and labor market competition are causal determinants of the viability of high-performance work systems, and we identify the complementarities between discretion, rent-sharing, and screening that render them profitable. Two fundamentally distinct job designs emerge endogenously in our experiments: "bad" jobs with low discretion, low wages, and little rent-sharing, and "good" jobs with high discretion, high wages, and substantial rent-sharing. Good jobs are profitable only if employees can be screened, and labor market competition fosters their dissemination. (*JEL* D12, D82, J24, J31, J41, M12, M54)

"Trust is good, control is better." This famous quote, attributed to Vladimir 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 twentieth 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 the workers' efforts can be effectively monitored and controlled.

[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.

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. 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, however, and if the principal can screen agents based on their past behavior, this combined strategy becomes profitable. Put differently, we show that offering discretion, paying high wages, and screening are complements. Complementarities imply that 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—risks increased employee shirking. Thus, if the employee is not trustworthy, the employer incurs a significant loss, which raises the question of 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, an imperfect signal about employees' past performance was provided in our screening treatment, 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. By offering high wages only to high-reputation employees, however, employers could limit the risk associated with paying the high wage up front.

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 because a significant fraction of employers used only the control strategy. These employers never experienced that paying high wages to high-reputation employees pays off. There is also a nonnegligible 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 consider only 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, and both employers and employees benefit 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. The theoretical literature (Milgrom and Roberts 1990, 1995; Kandel and Lazear 1992; Baker, Gibbons, and Murphy 1994; Holmström and Milgrom 1994) suggests that important complementarities between technology, strategy, and incentive systems exist. Ichniowski, Shaw, and Prennushi (1997), the work summarized in Ichniowski and Shaw (2003), and MacLeod and Parent (1999) provide evidence consistent with the view that there are complementarities between job

characteristics, different HRM practices, and the form of compensation. In addition, there is convincing evidence (reviewed in Ichniowski and Shaw 2003) that HPWS are frequently more productive than more traditional job designs. To the best of our knowledge, however, the previous empirical literature did not explicitly identify the *causal* factors behind the actual implementation and the viability of HPWS.[3] In fact, one of the enduring puzzles in this literature is why only some firms implement HPWS, despite the prospect of productivity gains, while others do not (see, e.g., Osterman 1994; Ichniowski and Shaw 1995, 2003; Ichniowski, Shaw, and Prennushi 1997; Pfeffer 2007; Liu et al. 2009). Our experiments show that, first, opportunities to screen employees for work attitude and second, labor market competition, are key causal forces behind the prevalence and viability of the trust strategy. In addition, we identify the mechanisms through which these causal forces exert their influence.

Our data allow, in particular, a clean identification of the complementarities between high efficiency wages, effort discretion, and screening; i.e., we can explicitly document that interactions between these variables have large effects on profits. We show, first, that the marginal profit of a wage increase is negative in the absence of screening opportunities but positive in the screening treatment if the employer restricts the payment of efficiency wages to medium- and high-reputation employees. Second, we show that the marginal profit of a wage increase for employees with a medium or high reputation is much higher under full discretion than under limited discretion. Third, our data indicate that effort discretion and screening are complements because full discretion has a negative (or zero) impact on profits in the absence of screening opportunities, while full discretion has a large positive impact in the screening treatment if employers limit it to medium- and high-reputation employees who receive high efficiency wages. Taken together, these complementarities explain why employers bundle the job attributes in two fundamentally distinct job designs; i.e., why they rely either on the control strategy or on the trust strategy. Moreover, the data also indicate that the screening opportunity and competition are complements because competition strengthens both employers' incentives for conditioning job design on employees' reputation and employees' incentives to acquire a good reputation.

The HRM and industrial relations literature often points out that screening is correlated with HPWS (see, e.g., Ichniowski and Shaw 2003). Our findings suggest that screening for a particular employee characteristic—namely, the willingness to provide high effort—is key. A recent paper by Huang and Cappelli (2010) indeed shows that "screening for work attitude" is associated significantly with important components of HPWS such as low monitoring, high wages, and team work, while screening for skills and work experience is not. Likewise, a paper by Green (2008) shows that British workers whom their company classifies as loyal enjoy higher effort discretion, a result also consistent with the notion that employers screen their employees according to their loyalty (reputation) and offer the loyal employees better jobs.

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[3] Huang and Cappelli (2010), who document interesting correlations between the intensity of firms' screening for employees with a high work morale and other job characteristics, write, "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" (p. 218).

Our paper is also related to the theoretical and empirical literature on reputation formation (e.g., Fama 1980; Kreps et al. 1982; MacLeod and Malcomson 1998; Holmström 1999; Brown, Falk, and Fehr 2004; Huck, Lünser, and Tyran 2006; MacLeod 2007), gift exchange (e.g., Fehr, Kirchsteiger, and Riedl 1993; Charness, Fréchette, and Kagel 2004) and screening (e.g., Cabrales et al. 2010). Our data support, for example, the prediction of the Holmström model (1999) that employees work hard in equilibrium if the market infers their productivity from past performance. Although our setup differs from his model in various ways, our data corroborate the model's key prediction that reputational incentives enhance effort provision, even in one-shot interactions. None of the above papers, however, investigates 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 Taylorism or HPWS.[4]

Our findings also have a bearing on the sources of segmented labor markets—as described, for example, in Doeringer and Piore (1971)—and suggest a new reason for the coexistence of good and bad jobs. Bulow and Summers (1986) and Saint-Paul (1997) link the existence of dual labor markets to technological factors that determine, for example, monitoring costs. Since "technology" is constant across our treatments, our findings suggest that employers' suboptimal choices and employees' narrowly self-interested behavior also contribute to segmentation. A nonnegligible minority of the employees behaved in a narrowly self-interested way in the screening treatment because they did not reciprocate high wages with high effort, even though this damaged their reputations and future incomes. In addition, a substantial minority of employers did not condition job design on employees' track records, although this would have been more profitable. If competition prevails, however, suboptimal behavior is largely removed and labor market segmentation tends to vanish. This finding further indicates that the extent of individual rationality may not just be a personality 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 (e.g., Frey 1997; Fehr and Rockenbach 2003; Falk and Kosfeld 2006; Ellingsen and Johannesson 2008). In particular, Falk and Kosfeld show experimentally that some agents reduce voluntary effort 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 toward the control strategy because it is more profitable.

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[4] The study of Cabrales et al. (2010) has a rather different focus. In their setup, 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.

The remainder of the paper is organized as follows. Section I outlines the experimental design and procedural details. In Section II, 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) hidden costs of control exist. Section III 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 IV discusses the empirical relevance of our experiment and its relation to other explanations of HPWS. Section V concludes. An online Appendix contains additional analyses and the experimental instructions.

I. 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 $c(e) = e$, but receives a wage w from the employer. Payoffs are thus given by $\Pi = b \cdot e - w$ for the employer and by $U = w - e$ for the employee. There is a conflict of interest as the employer prefers high effort and low wages while the employee prefers low effort and high wages.

The employer can offer an employment contract to the employee that specifies a fixed wage w and a requested, nonbinding, effort level $\tilde{e}$.[5] The wage must at least cover the costs of the requested effort and cannot exceed $\overline{w} = 50$. The contract can neither condition on effort, or effort costs, nor on gross profits. If the employee rejects the contract offer, no wage is paid, no effort is exerted, and both parties receive their reservation patoffs of 0. If the employee accepts, the employer must pay the offered wage, irrespective of the actual effort the employee chooses.

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:

(i) *Feasible effort levels*: In a contract with full discretion, the employee can choose any effort level between $e \in \{1, 2, \ldots, 10\}$, whereas he must choose an effort level of at least 3 in a contract with limited discretion, i.e., $e \in \{3, 4, \ldots, 10\}$, given he accepts the contract.

(ii) *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.

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[5]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. The literature on HRM and HPWS, however, 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, Shaw, and Prennushi (1997) explicitly measures whether efforts were made "to set clear expectations about required work behaviors of the new workers" (p. 294).

This experimental design captures the fundamental trade-off between efficiency and control described in the HRM literature.[6] Limiting discretion forces employees to obey some minimum standards, which is reflected in the higher minimum-effort level. But limiting discretion also restricts the 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. Regulated working hours, however, force the employee to work when he might not be most productive, reporting obligations absorb the employee's time and attention, and strict production procedures forfeit other, possibly more efficient practices. The harder the employee works, the more costly restricting his actions becomes. This is reflected by the reduction of the efficiency parameter b.

All employers and employees know the payoff functions, the set of feasible contracts, and hence the efficiency implications of limited discretion.

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 one of the employees to preclude 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.[7] 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 indicate an untrustworthy employee who was 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

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[6] 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, Shaw, and Prennushi 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).

[7] 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.

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 the screening treatment because the employers do not have to pay for the information about past performance.

We conducted 3 sessions of the base treatment and 3 sessions of the screening treatment with 36 participants in each session. We implemented two matching groups in each session, so we have six matching groups for each treatment.[8] 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." We also conducted two sessions of a *competition treatment*, where we implemented, in addition to the screening opportunity, competition between employers for employees with a good reputation and between employees for employers with attractive job offers. In each session we had 32 participants who were divided into 2 matching groups. The competition treatment is described in more detail in Section III. All experimental instructions are in Section A6 of the online Appendix.

Sessions lasted about two hours in the base and screening treatment and three hours in the competition treatment and took place at the Institute for Empirical Research in Economics at the University of Zurich. Subjects were students from the University of Zurich and the Swiss Federal Institute of Technology in Zurich. All experiments were computerized with the software z-Tree (Fischbacher 2007). Payoffs were measured in experimental points that were exchanged into Swiss Francs at the end of the experiment. On average, subjects earned about CHF 43 ($35 US at the time of the experiments).

II. 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.

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[8] With 15 periods and matching groups of 9 employers and 9 employees, some of the subjects interacted with the same opponent more than once. Subjects did not know that they were divided in two matching groups, however; nor did they know whether, and, if so, with whom they would interact more than once. Thus, repeated games effects are very unlikely.

A. *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 nonnegative 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 treatment. 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 a wage of three. By backward induction, this outcome is also the unique prediction for all previous periods.[9]

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 $e = 3$.

B. *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.[10] 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

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[9] This equilibrium outcome is unique if wages and effort levels are continuous variables. We are grateful to a referee for pointing out that a second equilibrium exists 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 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, the employee can be induced to choose an effort of 4 in the second-to-last period by offering a contract with limited discretion and a wage of 4. On the equilibrium path the employee chooses $e = 4$ and is rewarded in 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 the next employer will now offer him $w = 3$. These equilibria require, however, that employers can perfectly coordinate their behaviors.

[10] 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.

optimal in the base treatment if the fraction of fair employees is smaller than 60 percent.[11] The model also predicts that contracts with limited discretion and wages greater or equal than seven will be accepted with probability one because they give at least half of the surplus to the employee. If less than 44 percent of the employees are fair (and reject wages below 7), selfish employers will offer a wage of 3 while fair employers will offer a wage of 7.

How does the possibility of building a reputation affect this prediction? With reputation, there exists an efficient equilibrium along the lines of Kreps et al. (1982). 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 ten and a low effort of one. Once they have lost their good reputations, selfish employees shirk forever.[12]

To summarize, the model of inequity aversion predicts that employers in the base treatment predominantly implement the control strategy; i.e., that 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 good job offers on high performance signals are predicted to lead to a prevalence of the trust strategy in the screening treatment.

C. *Hidden Costs of Control*

Fehr and Rockenbach (2003) and Falk and Kosfeld (2006) show experimentally that controlling agents may crowd out voluntary effort provision. Falk and Kosfeld (2006) called this the "hidden costs of control," and Ellingsen and Johannesson (2008) provide a formal model that rationalizes this behavioral pattern. In our setup, hidden costs of control would arise if fair employees, who are willing to provide effort above the minimally enforceable level if they are offered high

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[11] In Section A1 of the online 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 60 percent. In Section A2 we derive the optimal contract and the predicted behavior of employers and employees as a function of the fraction of fair subjects in a simple model with inequity aversion.

[12] 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. This is the most efficient equilibrium, however, 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.

wages and full discretion, reduce their voluntary effort provision if they are controlled. There are, however, 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 $b = 4$, which may increase effort if some employees are inequity averse. The model by Fehr and Schmidt (1999) 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.[13] These two latter effects may outweigh the hidden cost of control effect. If, however—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.

III. Results

In Section IIIA, we discuss the employers' job strategies; i.e., their clustering of job attributes. Section IIIB analyzes the optimality of these clusters in the different treatments. In Section IIIC, 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 IIID 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 IIIE, we study the impact of labor market competition on the employers' job strategies, the employees' effort choices, market segmentation, and overall surplus.

A. *Dichotomy of Job Design*

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

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

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[13] An inequality-averse employee chooses e to equalize payoffs, i.e., $w - c(e) = be - w$, which implies $e(w) = 2w/(b + 1)$.
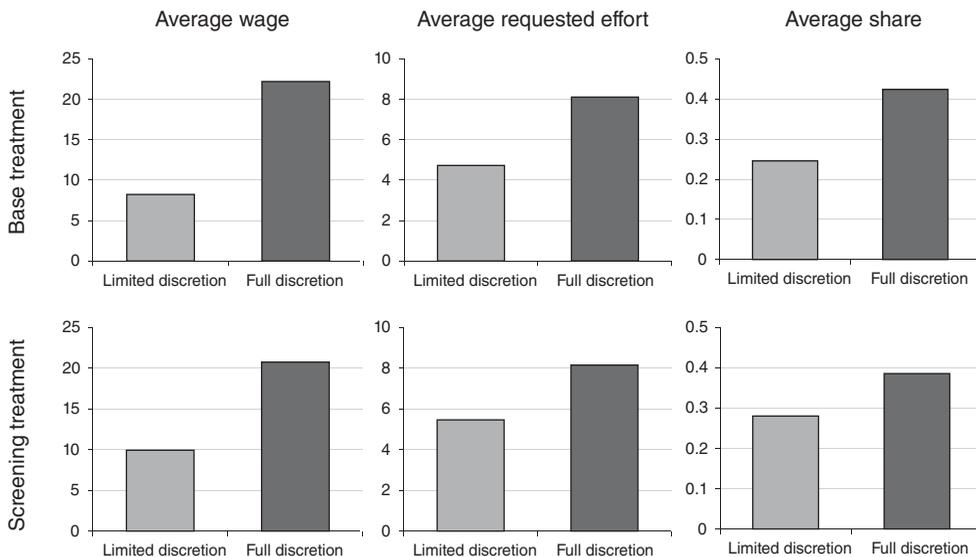
FIGURE 1. DICHOTOMY OF JOB DESIGN

treatments. The offered share of the surplus is defined as $\min\{(w - c(\tilde{e}))/(b\tilde{e} - c(\tilde{e})), 1\}$; i.e., given the contract type it is determined by the wage w and the requested effort level $\tilde{e}$. 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,[14] controlling for individual fixed effects and clustering on employers, $p \leq 0.001$ for each of the six tests implicit in Figure 1).[15] Result 1 suggests that job offers with full discretion are based on a *trust strategy* that attempts to appeal to the employees' fairness by offering a generous share of the surplus, while jobs offering limited discretion implement a *control strategy* that limits the employee's shirking opportunities and the losses the employer can incur.

B. *Profitability of Different Clusters of Job Attributes*

Result 1 raises the question of which strategy is more profitable. The next result provides this information.

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[14] All tests reported in this paper are two sided.

[15] The observed differences in job characteristics are not only perceived at the level of averages. See Section A3 of the online Appendix for more detailed information. In Section A4 of the online Appendix we also show that the clustering is stable over time.
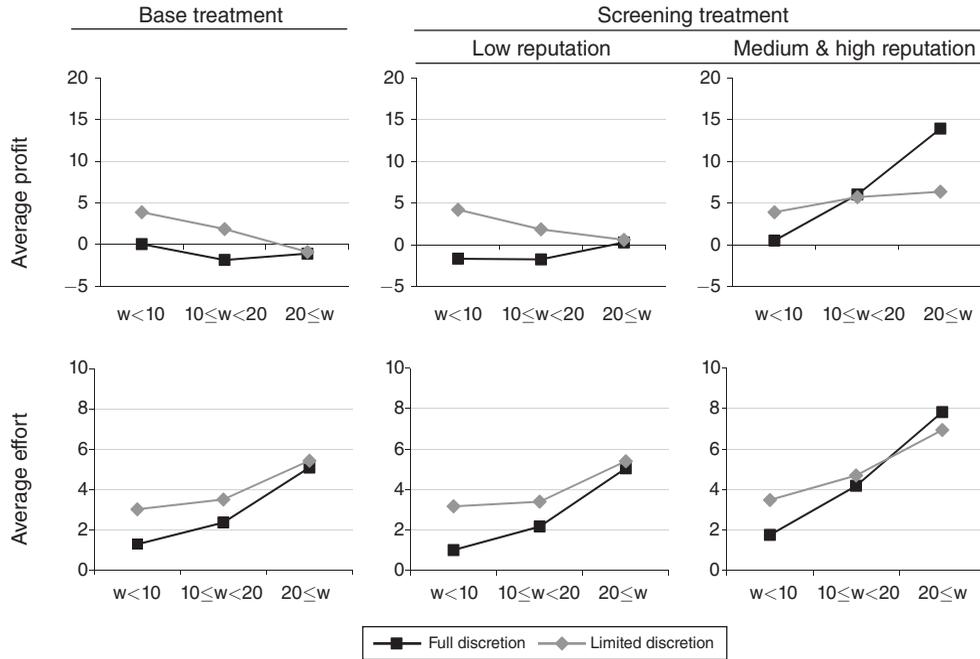
FIGURE 2. OPTIMAL JOB OFFERS AND WAGE-EFFORT RELATION

Notes: The average effort is computed for accepted contracts only, the average profit for all contracts. Rejection rates are reported in footnote 17 below.

RESULT 2 (Optimality of Different Clusters)*: 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 is assigned to the low reputation category if his average effort in the previous three periods, denoted by r, is below 3.5; he has a medium reputation if $3.5 \leq r < 6.5$, and a high reputation if $6.5 \leq r$.[16] The graphs in the upper row of Figure 2 provide support for Result 2. In the base treatment, employers who offer contracts with limited discretion and low wages ($w < 10$) earn significantly more than employers offering jobs with full discretion and low wages (*t*-test, $p \leq 0.001$) and employers offering contracts with limited discretion and medium wages ($10 \leq w < 20$; *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 the 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 than full discretion and low wages or limited discretion and medium wages (*t*-tests, $p \leq 0.001$). Thus, in the base

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[16] In the first period, an employee has no reputation and the reputation index is not defined. In the second and third periods, the reputation index r uses the information of only one and two periods, respectively. If a contract was rejected in a period, this period was not considered for the computation of r.

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. This contrasts sharply with the screening treatment with medium- and high-reputation employees, where profits are highest when contracts with full discretion and high wages ($20 \leq w$) are offered. If employers pay high wages, their profits are significantly higher if they offer a job with full discretion rather than a job with limited discretion; and given a full-discretion job offer, paying high wages is more profitable than paying medium wages (*t*-tests, $p \leq 0.001$). Note that in all cases either the trust or the control strategy maximizes profits; there is no situation in which some other possible job design (e.g., full discretion combined with low wage offers) is optimal. Tables 1 and 2 below provide regression analyses of employers' profits in the base and the screening treatment confirming the results on optimal contract choices.

C. *Employees' Effort Choices*

Result 2 raises the question of 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.*

Support for Result 3A is provided by the corresponding graphs in Figure 2 and the regressions in Table 1. The left graph in the bottom row of Figure 2 shows that in the base treatment higher wages are reciprocated with higher average-effort levels both for jobs with limited discretion and jobs with full discretion. The effect is too small to render a high wage strategy optimal, however, which can be seen in the corresponding profit graph. Moreover, at low wages, effort is much higher in jobs with limited discretion than in jobs with full discretion, which renders the control strategy optimal despite the efficiency loss of limiting discretion.

The regressions in Table 1 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 increases 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 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 by only $4 \times 1.4 = 5.6$,

Table 1—Determinants of Effort and Employers' Profits in the Base Treatment

	Effort (1)	Effort (2)	Profit (3)
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	—
Constant	−0.517 (0.482)	−0.879 (0.547)	−1.307 (1.691)
Observations	658	658	810
Adjusted 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. In regression (2), only the period dummies 3 and 7 are significant at the 10 and 5 percent level, respectively, i.e., there is no time trend or end game effect. The profit regression (3) is robust to the inclusion of the full set of set of period dummies, too (not shown here).

***Significant at the 1 percent level.
**Significant at the 5 percent level.

implying that the wage-profit relation is negative. This is also 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 discretion than in jobs with full discretion. This effort advantage at low-wage levels reflects the fact that employees must provide an effort of at least three 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 inexpensive if employees choose low effort levels. The effort regression (2) shows, finally, that controlling for requested effort and for period effects does not affect the results.[17]

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. The next result shows how the employees' effort choices in the screening treatment change this pattern.

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[17] Figure 2 and Table 1 raise the question whether employers' expected profits with limited-discretion contracts 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 payoffs 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, 84, 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.

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 2. 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 graph in the bottom row 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 graph in the bottom row 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.

The regressions in Table 2 confirm these findings. 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.[18] 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 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" dummy has a large and highly significant coefficient. 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.[19]

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,

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[18] "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. The bias in fixed effects models with a lagged dependent variable, however, is of order $1/T$ (see Hsiao 2003, section 8.1). In our experiments we have $T = 15$, so the bias should be rather small.

[19] Similar to the base treatment, one may ask which wage in the low wage interval maximizes the employers' profits under limited discretion. Rejection rates for wages offers of 3, 4, 5, 6, and 7 are 100, 59, 46, 39, and 4 percent, respectively, while wages above 7 are almost never rejected. Offering wages below 7 is thus again not optimal.

Table 2—Determinants of Effort and Employers' Profits in the Screening Treatment

	Effort (1)	Effort (2)	Effort (3)	Effort (4)	Effort (5)	Profit (6)
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	—
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
Adjusted 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 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. All non–final period dummies in regression (5) are insignificant. The profit regression (6) is robust to the inclusion of the full set of period dummies, too (not shown here).

　　***Significant at the 1 percent level.
　　**Significant at the 5 percent level.
　　*Significant at the 10 percent level.

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. The profit regression (6) corroborates these findings and indicates that the effort behavior of medium- and high-reputation employees causes a sizeable efficiency wage effect that renders—in combination with the higher efficiency of granting full discretion—the trust strategy optimal. The regressions also reveal that there is a large and highly significant last

period effect. In the final period there is no longer a reputational incentive that lowers effort and thus profits. Finally, regressions (4) and (5) show that including interactions between reputation and limited discretion, controlling for requested effort, and including dummies for all nonfinal periods does not affect the results.

Taken together, the evidence shows unambiguously 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 medium or high 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 three.

In Section II we discussed the predictions of the self-interest model and models of social preferences. The prevalence of bad jobs in the base treatment is consistent with both the self-interest model and models of social preferences, but pure self-interest alone cannot explain the results of the screening treatment. If there are some fair employees who are willing to reciprocate high wages with high effort, however, then selfish employees have an incentive to mimic this behavior and to build up a reputation for being fair in order to get better job offers in the future. It is this reputation building of strategic employees that renders the trust strategy profitable.

We also discussed the potential role of hidden costs of control in Section II. If—conditional on wages—average effort is strictly lower under limited discretion than under full discretion, then there is unambiguous evidence for hidden costs of control. Figure 2 shows, however, that effort under limited discretion is not lower than effort under full discretion—except for medium- and high-reputation employees in the screening treatment who receive high wages. This effort difference is, however, explained by the higher average wage under contracts with full discretion within this wage interval.[20] Thus, our results do not unambiguously confirm the existence of hidden costs of control, but they do not rule out their existence either. It is possible that some employees reduce effort under limited discretion while others increase effort, either because they are forced to do so by the higher minimum-effort level or because they are inequity-averse and spend more effort to compensate for the lower effort productivity. These effects could cancel each other out.[21] The data do show, however, that in our setting hidden costs of control are not sufficiently large to render job offers with full discretion optimal, neither in the base treatment nor for low-reputation employees in the screening treatment. Moreover, in our setting, hidden costs of control are not a necessary prerequisite for the optimality of job offers with full discretion for medium- and high-reputation employees.[22]

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[20] The average wage is 25.3 under full and 21.4 under limited discretion. The highest wage under limited discretion is 27. If we consider only the interval $w \in [20, 27]$, then the average wage under full discretion falls to 22.2 and the average effort to 7.1. This is close to the average effort of 6.9 under limited discretion and not significantly different (t-test, controlling for individual fixed effects and clustering on employees, $p = 0.487$). In the other two high-wage cases (base treatment and screening treatment with low reputation employees) the average wage is also not higher under limited discretion. Hence, differences in average wages cannot explain the identical average-effort levels in these cases.

[21] In regression (4) of Table 2, 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. The coefficients of the interactions between medium- and high-reputation and limited discretion are both small and insignificant, however.

[22] To see this, consider the relevant wage interval ($20 \leq w$) for medium- and 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

D. *Actual Job Offers*, *Labor Market Segmentation*, *and Total Surplus*

The previous results show the conditions under which either the trust or the control strategy is profit maximizing, and also the reasons for the respective optimal job design. 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 toward 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 of contract offers with full discretion starts out at 50 percent, but falls to less than 20 percent over time, indicating that many employers experimented with the trust strategy but learned 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. Employers, however, 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 for these employees and it falls below 50 percent only in the last 2 periods. According to a Fisher exact test, the share of full-discretion job offers is significantly higher for medium- and high-reputation employees compared to low-reputation employees ($p \leq 0.001$), and compared to the base treatment ($p \leq 0.001$).

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

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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 two (minimum effort increases from one to three). Average effort would then be ten, yielding revenue of $4 \times 10 = 40$, which just matches revenue under full discretion. Clearly, limiting discretion would raise average effort by less than two because with an average effort of eight, only some employees can choose an effort below the threshold of $e = 3$ (there might, however, be a small positive effect of inequity aversion on effort). Limited-discretion jobs would thus still not be more profitable than full-discretion jobs, even under the complete absence of hidden costs. Hence, these costs are not a necessary prerequisite for the optimality of full-discretion jobs in our experimental setting.
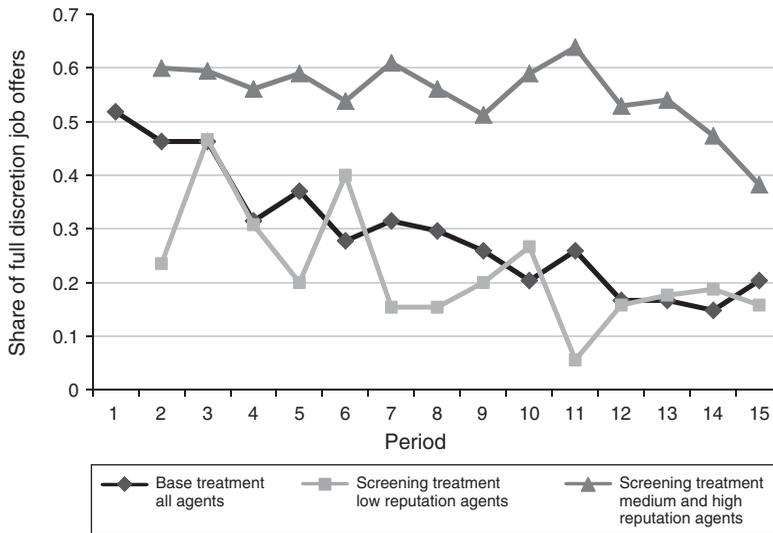
FIGURE 3. SHARE OF FULL DISCRETION JOB OFFERS OVER TIME

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 offers 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.[23] These nonresponsive employers may have had very pessimistic beliefs about their employees' effort choices or they may have been highly risk- or betrayal-averse. Since they do not condition their strategy on employees' reputation, their average profits are 42 percent lower than the profits of employers who respond to their employees' past behavior—a difference that is highly significant (*t*-test, clustering on employers, $p \leq 0.001$).

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 the employers condition their job offers on reputation. Acquiring a good reputation remains profitable, however: employees with a high reputation earn,

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[23] A closer look at the data shows that nonresponsive employers did not face a worse distribution of employees than the responsive employers: the nonresponsive employers faced, on average, employees with a reputation index of 5.25, while the responsive employers faced, on average, employees with an index of 5.23.

on average, 82 percent more than employees with a low reputation and 25 percent more than employees with a medium reputation (*t*-tests, clustering on employees, $p \leq 0.001$). Support for Result 5B is provided in Section A1 of the online Appendix, where we show that about 20 percent of the employees did not reciprocate to high wages in the screening treatment even though this would have been profitable; i.e., these employees can be characterized as "narrowly self-interested."

Result 5 explains why a substantial fraction of both good and bad jobs coexist in the screening treatment. This finding 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 suboptimally, the screening treatment provides incentives to spend high effort and to offer jobs with full discretion. Therefore, total surplus is affected positively by the screening opportunity, which is stated as the next result.

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 per-period income is highly significant (rank-sum test on matching group averages, $p = 0.004$; recall that both in the base and in the screening treatment, we have six matching groups), while the null hypothesis of equal incomes across treatments cannot be rejected for the employees (rank-sum test on matching group averages, $p = 0.200$). Overall, the average per-period total surplus is 58 percent higher in the screening treatment—a difference that is highly significant (rank-sum test on matching group averages, $p = 0.007$). This increase in the total surplus has two main sources—the higher share of jobs with full discretion and the higher average effort of the employees. In fact, in accepted contracts we observe a significant increase in average effort from 3.70 in the base treatment to 5.10 in the screening treatment (rank-sum test on matching group averages, $p = 0.004$).[24]

The effort increase represents the joint effect of employers' and employees' behavior in the screening treatment. Since the majority of employers condition their strategy on the performance signals, the employees have an incentive to provide

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[24] Moreover, the fraction of accepted contracts is slightly higher in the screening treatment than in the base treatment (0.88 versus 0.81; rank-sum test on matching group averages, $p = 0.077$).
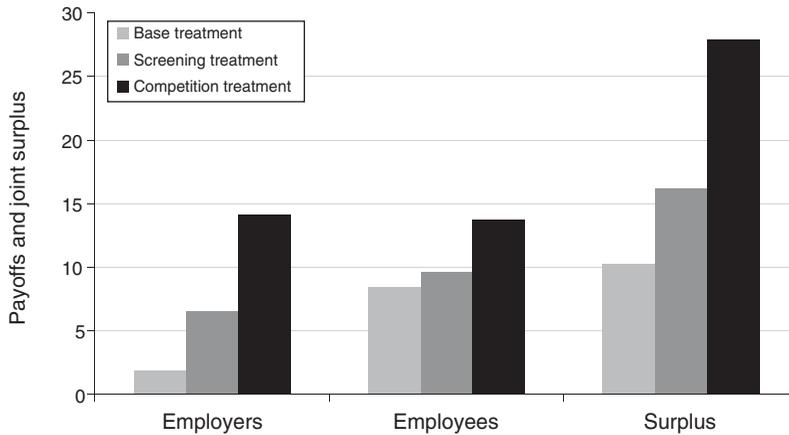
FIGURE 4. EMPLOYERS' PROFITS, EMPLOYEES' INCOMES, AND SURPLUS IN THE DIFFERENT TREATMENTS

high effort in response to high wages. And since a good reputation is a reliable signal of 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 reinforce each other mutually and lead to the provision of higher effort levels and a majority of jobs with full discretion, which both increases total surplus.

E. *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 treatment that introduces competition among employees for good job offers and among employers for good employees. The competition treatment also allows us to answer the question of 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 4 randomly selected employers and 4 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. Since an employer can only employ one employee, the employers also specify the order in which the four employees receive their respective offers. There are four matching rounds in every period in order to match employers to 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 three and four, ensuring that each employee receives at least one offer.[25]

As in the previous treatments, employees do not observe the offers received by the other employees. An employee may have to wait, however, until the second, third, or even fourth round before getting his first offer, from which he may conclude that he is no employer's first choice. Similarly, as in the previous treatments, employers do not observe the contract offers other employers make. If an employer's offers are frequently not accepted during the early matching rounds, however, 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, and employers who offer less attractive jobs have to wait longer to fill their vacancies.

We showed in Section IIIA 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. Contract offers with full discretion are associated with much higher wages (24.7 versus 12.8), higher requested-effort levels (9.4 versus 6.8), and significantly higher shares of the surplus (0.40 versus 0.31). The differences in job characteristics across contracts with full and limited discretion are highly significant in all three dimensions (*t*-tests, controlling for individual fixed effects and clustering on employers, $p \leq 0.002$). The bundling of distinct job characteristics into good and bad jobs is thus a robust phenomenon that occurs under all treatment conditions. In addition, the profit-maximizing job design is as in the screening treatment. In accepted contracts, with low-reputation employees profits are highest with low wages and limited discretion, while with medium- and high-reputation employees profits are highest with 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, the large majority of high-reputation employees receive "good" job offers and almost all low-reputation employees receive "bad" job offers.*

(B) *The large majority of employees work hard and acquire high reputations.*

Result 7A is supported by the left graph of Figure 5, which illustrates the share of job offers with full discretion for employees with different reputations in the

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[25] We introduced competition only in the screening treatment and not in the base treatment because competition cannot make any difference in the latter. All employees look identical without performance signals, and employers cannot discriminate between them.
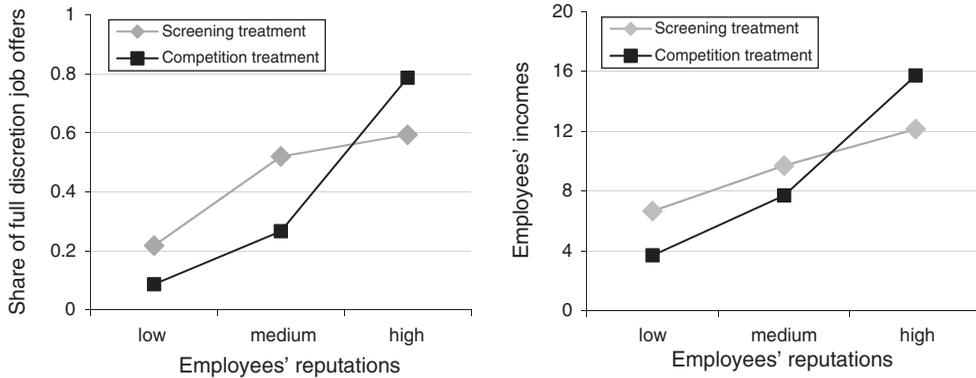
FIGURE 5. EMPLOYERS' SCREENING BEHAVIOR IN THE REPUTATION AND THE COMPETITION TREATMENT (*left graph*)
AND THE CONSEQUENCES FOR EMPLOYEES' INCENTIVES FOR REPUTATION FORMATION (*right graph*)

screening and the competition treatments.[26] The higher an employee's reputation in the screening treatment, the more often he receives a job offer with full discretion (in 21, 52, and 59 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 79 percent of the cases), while employees with a low or medium reputation receive fewer such offers than in the screening treatment (only in 8 and 27 percent of the cases, respectively).[27] The treatment differences in the share of full-discretion contracts are highly significant for medium- and high-reputation employees (Fisher exact-test, $p \leq 0.001$) but not for low-reputation employees ($p = 0.180$).[28] One reason for the higher frequency of good job offers for high-reputation employees in the competition treatment is that the acceptance probability decreases by more than 50 percent when a contract with limited discretion instead of a contract with full discretion is offered to a high-reputation employee. In the screening treatment, where employees never have a choice between different contract offers, the decrease is less than 20 percent. A rank-sum test on the percentage probability decrease in matching groups shows that the difference is significant ($p = 0.055$; recall that we have only four matching groups in the competition treatment). Competition thus increases the employers' incentives to offer full-discretion rather than limited-discretion jobs to attract high-reputation employees. Moreover, given that an offer is accepted, in the competition treatment employers realize 27 percent higher profits with full-discretion contracts and high-reputation employees compared to the screening treatment (rank-sum test on matching group averages, $p = 0.019$).

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[26] In the competition treatment, we consider only offers that employees actually received because this accounts for the order in which employers made their offers to the employees. If an employer had a match in an early matching round, his contract offers for the remaining matching rounds are not taken into account. Similarly, if an employee accepted an offer in an early matching round, the offers that he might have received in later matching rounds are also not taken into account.

[27] Section A4 of the online Appendix further shows that the pattern of contract offers in the competition treatment is stable over time.

[28] There are few observations with low-reputation employees in the competition treatment; only in 2 out of 23 cases a low reputation employee received a job offer with full discretion.

The stronger dependence of job offers on employees' reputations has important consequences for the employees' incentives to build good reputations. Since jobs with full discretion are associated with higher rents, the employees in the competition treatment have stronger incentives to acquire good reputations. This effect is indicated in the right graph of Figure 5, which depicts the employees' average per-period income as a function of their reputations. The graph mimics the qualitative pattern of the left graph because the increase in income from building a high reputation instead of just a medium or a low reputation is much larger in the competition treatment than in the screening treatment. The treatment differences in employees' incomes are significant in each of the three reputation classes (t-tests, $p = 0.036$, $p = 0.017$, 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 5.24 in the screening treatment and 8.31 in the competition treatment (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 (Fisher exact-test; $p \leq 0.001$). In addition, only 1 of the 32 employees in the competition treatment displays, on average, a low 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 (Fisher exact-test; $p = 0.014$).

The above results show that labor market competition increases the employers' incentives to offer full-discretion contracts to high-reputation employees, which in turn strengthens the employees' incentives to acquire high reputations. Therefore, the competition treatment induces employers to rely more on the trust strategy and employees to behave more trustworthily. This largely reduces the secondary sector of the labor market. With regard to the provision of good jobs, screening and competition can therefore be viewed as complements: competition reinforces the incentives for screening, which ultimately causes a much higher share of good jobs.

When competition is added to the screening opportunities, the overall share of jobs with full discretion increases to 77 percent relative to the 51 percent in the screening treatment; 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 compared to 49 percent in the screening treatment. These treatment differences are highly significant (Fisher exact-tests; $p \leq 0.001$) and lead to a substantial increase in welfare.

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 per period are higher in each of the four matching groups of the competition treatment than in all six matching groups of the screening treatment (rank-sum tests on matching group averages yield $p = 0.011$). Overall, the total per-period surplus is 72 percent higher in the

competition treatment than in screening treatment, and 172 percent higher than in the base treatment. The increase in total surplus is also driven by a significant increase in average effort in accepted contracts, which amounts to 8.02 in the competition treatment. The differences to the base (3.70) and the screening treatment (5.10) are again significant (rank-sum tests on matching group averages, $p = 0.011$).

IV. Discussion

There is a large empirical literature in industrial relations and personnel economics documenting the prevalence and profitability of HPWS in many industries (e.g., Osterman 1994; Ichniowski and Shaw 2003; Lazear and Paul Oyer forthcoming). This literature identifies empirical characteristics of HPWS, of the firms that are using them, and of the industries they are operating in. It is still not fully understood why and under what conditions HPWS are viable, however. Why are HPWS more common in some industries than in others? Why do HPWS and more traditional forms of workplace organization sometimes coexist in the same industry? The empirical literature shows that certain workplace and industry or firm characteristics are highly correlated. With field data, however, it is difficult to show the causal links between these factors.

The most important contribution of our experimental analysis is the identification of *causal* determinants of good jobs that pay high wages and provide full effort discretion. By exogenously changing the screening opportunities of firms and the degree of labor market competition and by assigning subjects randomly to the different treatment conditions, we can show that these factors cause the emergence of good jobs. In addition, our data allow us to identify *explicitly* the complementarities between screening, efficiency wages, and effort discretion as the pathway through which the screening opportunity and labor market competition exert their causal effects. This sheds new light on the fundamental questions raised above. In this section we relate our experimental results to the existing empirical evidence on HPWS, pointing out the new insights that we obtain, but also the limitations of our analysis.

Our analysis shows that screening, efficiency wages, and effort discretion are positively correlated *because* they are complements. Figure 2 shows that there are two local profit maxima in the space of job characteristics. It is a local profit maximum if firms pay low wages ($w < 10$), limit discretion, and do not screen workers. Given that wages are low, profits are substantially higher with limited discretion than with full discretion, a fact that holds for all types of employees regardless of their reputation levels. Since all employees behave similarly under low wages, screening workers provides no benefits. If firms do not screen, paying higher wages to all employees is unprofitable because most employees shirk. Thus, any local deviation from this bundle of job characteristics reduces profits. There is a second local profit maximum, however, if firms screen employees *and* offer full discretion to employees with a good reputation only *and* pay them high wages. Given that wages are high ($20 \leq w$), profits are substantially lower if discretion is limited. Profits are also reduced if the employer does not screen workers but offers high wages to all of them. Furthermore, if full discretion and high wages are offered to employees with a good reputation, profits are reduced if the

employer cuts their wages because these employees reciprocate by exerting less effort. Again, any local deviation from this bundle of job characteristics reduces profits. Our results thus indicate that job discretion is profitable only if firms are willing to pay high efficiency wages and vice versa—a finding that strengthens our confidence that the positive correlation between wages and HPWS found in many studies (e.g., Osterman 2006) is caused by the complementarity between high wages and HPWS.

In our experiment, the global maximum is the one where good jobs are offered. It is difficult for subjects to figure this out, however. Several authors in the HRM literature (e.g., Pil and MacDuffie 1996) have pointed out that employers may limit their search for better solutions to merely local improvements over their current HRM system. But, as the previous paragraph documents, local search, and the associated marginal changes, will not be profitable; as a consequence, employers may completely refrain from moving towards HPWS. In this case, the spreading of HPWS will be driven by entry of new firms using innovative work systems and exit of traditional firms. This implication is consistent with the pattern that HPWS are common in "greenfield" and "reconstituted" sites but not in "brownfield" sites (Ichniowski and Shaw 2003).

A prominent alternative theory that explains the correlation between high wage rents and high discretion (i.e., little monitoring) is based on differences in monitoring costs and uses a variant of efficiency wage theory (e.g., Akerlof and Yellen 1986). If monitoring costs are high, it is more profitable for firms to rely on wage rents and the firing threat as a worker discipline device, which implies that jobs are characterized by high wages and little monitoring. In contrast, if monitoring costs are low, it is more profitable to pay low wages and to discipline workers via monitoring. This means that there is also a bundling of job attributes that may lead to the coexistence of good and bad jobs, but this heterogeneity requires variations in monitoring technology. The empirical evidence, however, suggests that good and bad jobs coexist in the same industry despite the absence of apparent technological differences.[29] Our approach is capable of explaining these differences because it relies on a very different mechanism. In our setup, employers have to trust their employees to provide high effort and employees have to be trustworthy either for intrinsic or for strategic reasons. Employers who do not trust their employees will not provide good jobs, and employees who are narrowly self-interested will not invest in reputation formation. Hence, differences in personal characteristics of employers and employees (their willingness to trust and to behave trustworthily) are sufficient to generate the coexistence of good and bad jobs in our setting.

Many empirical studies stress the importance of screening for the viability of good jobs (see, e.g., the literature discussed in Ichniowski and Shaw 2003 and Oyer and Schaefer 2010). These studies typically do not distinguish between screening for skills and screening for personal characteristics. Our results suggest, however, that it is the screening for "work attitude" or "work ethic" that is a key causal

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[29] 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, offers much more generous benefits, on-the-job training, and more job security. Taking employee productivity into account (sales per employee), however, Costco's labor costs are lower than those of Sam's Club. Furthermore, if anything, Costco seems to be somewhat more profitable than Sam's Club. See Cascio (2006) for a detailed case study. For other examples, see Osterman (2011) and the references cited therein.

determinant for the viability of good jobs. Recent findings by Huang and Cappelli (2010) support our results and interpretations of screening. Using a national sample of US employers, they examine the extent to which firms screen applicants for work ethic as well as for skills and work experience. In particular, screening for work ethic is associated with greater employee autonomy, which results in increased opportunities for shirking, less supervision of employees, and higher rent-sharing. In contrast, screening for more traditional human-capital measures does not produce these correlations. Thus, it is screening for "work ethic" rather than screening for specific skills that is highly correlated with HPWS. Huang and Cappelli acknowledge, however, that their data do not permit causal inferences because they are cross sectional.[30]

Our paper also suggests that variation in the intensity of labor market competition for workers is an important determinant of the viability of HPWS. Industrial relations that prevent employers from selecting workers according to information about work attitude are an obstacle for the introduction of HWPS. If unions enforce closed shops that prohibit firms from employing nonunion members, or if they enforce inside hiring based on seniority rather than merit, HPWS may be discouraged. If the firm's selection of employees is constrained, employees have lower incentives to invest in a good reputation. This is consistent with the empirical evidence reported in Ichniowski, Shaw, and Prennushi (1997), showing that unionization is highly negatively correlated with all other innovative HRM practices in the steel industry,[31] and with Liu et al. (2009), who conduct a multi-industry survey in Ireland, finding that an increase in union representation leads to a significant decrease in the use of HPWS. These papers, however, do not identify the causal mechanism that drives this effect. Our findings suggest that it is not unionization per se but particular interventions in the hiring or promotion process that inhibit the introduction of HWPS. This may explain why unionization displays no negative impact on the adoption of HPWS in some studies (e.g., Osterman 1994). Future work will thus benefit from information about how exactly unions and other stakeholders affect the screening, hiring, and promotion processes in firms.

The main limitation of our empirical study is that it is restricted to two causal factors (screening and competition) among many potential factors that may affect the viability and dissemination of HPWS. The empirical literature has pointed to many other factors such as firm size, monitoring cost, the extent of integration in international markets, whether firms primarily compete by reducing cost or by increasing product quality, the skill requirements of technology, whether it operates

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[30] The importance of screening for work attitude is also shown by case studies on the implementation of HPWS in individual companies such as, e.g., Southwest Airlines. O'Reilly and Pfeffer (2000) report that the Southwest Airlines CEO explains his company's recruitment strategy as follows: "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). Ichniowski, Shaw, and Prennushi (1997) also stress the importance of screening for personality traits. Their study includes the following question: "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 used in HPWS. Furthermore, the authors report that the "isolated" correlation between screening and productivity is small, but large in conjunction with complementary HRM practices such as training, team work, flexible job assignments, and employment security.

[31] The correlation table is provided in Table 2 of the working paper version of this paper (Ichniowski, Shaw, and Prennushi 1995).

in a high-profit industry, whether firm owners put special weight on employee welfare, and the degree to which firms' output relies on computer technologies (see Osterman 1994; Ichniowski and Shaw 2003; and Lazear and Oyer forthcoming and the references therein). An experimental study will never be able to fully address all these factors. It may, however, be very useful to single out specific factors, to test whether they have a causal impact, and to analyze the pathway by which they affect the functioning of HPWS.

V. Conclusions

Lenin is right—up to a point: offering discretion to an agent invites shirking and is not profitable on its own. If, however, 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. Even if employers can screen employees, however, 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 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 and the share of employees with a good reputation. 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 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 employers 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 affected by legal constraints, such as noncompete agreements, or other barriers to labor mobility? These are important and fascinating questions for future research.

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