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Munich Discussion Paper No. 2012-28

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Online at <http://epub.ub.uni-muenchen.de/14193/>

# Discretion, Productivity, and Work Satisfaction

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July 27, 2012

*Abstract:* In Bartling, Fehr and Schmidt (2012) we show theoretically and experimentally that it is optimal to grant discretion to workers if (i) discretion increases productivity, (ii) workers can be screened by past performance, (iii) some workers reciprocate high wages with high effort and (iv) employers pay high wages leaving rents to their workers. In this paper we show experimentally that the productivity increase due to discretion is not only sufficient but also necessary for the optimality of granting discretion to workers. Furthermore, we report representative survey evidence on the impact of discretion on workers' welfare, confirming that workers earn rents.

*JEL:* M5, J3

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## *1 Introduction*

High-performance work systems (HPWS) is a summary label for a wide range of modern work practices including employee involvement, team work, job rotation, training, and screening. Three central features of HPWS are (i) that workers are granted discretion on how to conduct their work and how to solve problems on their own, (ii) that little monitoring and control is imposed on them and (iii) that relatively high wages are paid.<sup>1</sup> From the perspective of standard contract theory the success of HPWS is puzzling because a rational and self-interested worker who is not monitored will use his discretion to shirk at the detriment of his employer. In Bartling, Fehr and Schmidt (2012, in the following BFS) we show theoretically and experimentally that it is indeed optimal to give discretion to a worker if discretion increases productivity, if the employer can screen workers by past performance, if some workers are willing to reciprocate high wages with high effort and if the employers pay high wages leaving rents to their workers. By changing the screening possibilities and the degree of competition exogenously between treatments and assigning subjects randomly, we show that screening possibilities and competition have a causal effect on the viability and dissemination of HPWS.

In this paper we extend the results in BFS in two dimensions. First we show experimentally that the productivity increase due to discretion is not only sufficient but also necessary for the emergence of HPWS. Without the effect on productivity it does not pay off to offer discretion and employers do indeed shy away from it. Furthermore, we show that in our experimental setting offering discretion on its own has no motivational effect and does not increase voluntary effort provision. Thus, if giving discretion to workers does not increase workers' productivity it is unlikely that HPWS will emerge.

Second, we report survey evidence on the impact of HPWS on worker's welfare by using a representative survey study of the German population. The data show that indicators of modern work organization such as work autonomy and little monitoring are significantly associated with higher wages and higher job satisfaction. This indicates that HPWS not only increases profits but also increases the welfare of employees.

The Human Resource Management (HRM) literature documents a puzzling clustering of job attributes giving rise to different types of jobs - often within the same industry. A prominent example is the difference in HRM practices between Costco and Sam's Club, the two largest retail warehouse clubs in the US. Sam's Club, a subsidiary of WalMart, pays

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<sup>1</sup> See, e.g., Lawler, Mohrman and Ledford (1995), Appelbaum, Bailey, Berg, and Kalleberg (2000), and Ichniowski and Shaw (2003) for an overview of different forms of HPWS.

minimum wages to almost all of its workers on the floor, it does not offer health insurance, it does leaves little discretion to workers how to execute their tasks, it does not carefully screen job applicants, and it has a high turnover rate. Costco offers very different jobs. It pays 40 percent higher wages, it offers health insurance to 85 percent of its employees, workers have considerable discretion how to do their jobs and how to solve problems on their own or in teams, the company screens job applicants intensively, and the turnover rate is very low. Both companies compete in the same industry since 1983.

The HMR literature calls the jobs offered by Sam's Club "traditional" jobs. This is the type of jobs that is predicted by neoclassical contract theory and recommended by Taylorism. According to the standard moral hazard model, a principal should use every opportunity to monitor and control the agent and hold down the agent's wage to his reservation utility. Offering discretion to the agent invites shirking and makes incentive provision more difficult. Paying higher wages has no effect on productivity and reduces profits. Similarly, Taylorism, the dominant HMR paradigm in most of the 20<sup>th</sup> century, predicts that workers will use every opportunity to slack that goes unpunished, and that production processes should be standardized so as to achieve effective monitoring and control.

While it is straightforward to rationalize the existence of traditional jobs as observed at Sam's Club, it is much more difficult to explain the success of HPWS as used by Costco. In BFS we show that paying high wages and leaving discretion to workers are complements. High wages induce more effort that is more productive if workers have discretion. Thus, if workers are given discretion it becomes more attractive to pay higher wages and if workers are paid high wages it becomes more profitable to give discretion to them. This explains the observed clustering of job attributes.

Our argument rests on the assumption that workers are more productive if they have discretion. It is well documented in the empirical literature that workers who are given more discretion are indeed more productive.<sup>2</sup> However, there is an obvious selection problem. If employers grant discretion only in those jobs where discretion increases productivity, then we do not observe those jobs in which discretion does not increase productivity. In order to test whether increased productivity is not only a sufficient but also a necessary condition for giving discretion to workers we conduct a control experiment in this paper. In the control experiment, the productivity of the worker is not affected by the decision of the employer whether or not to grant discretion. In the control treatment, we observe the same clustering of job attributes that we found in the original BFS experiments. But now we observe very few

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<sup>2</sup> This literature is reviewed and summarized in Ichniowski and Shaw (2003).

cases in which the employer leaves discretion to the worker. This suggests that the productivity increase is indeed necessary for the viability of HPWS.

In the second part of this paper, we try to assess how workers are affected by HPWS using field data. In the experiments we find that employers who leave discretion to workers pay wages that leave significant rents to workers, and workers' utility is significantly higher than their reservation utilities. It is well documented in the empirical literature that HPWS pay higher wages than traditional jobs. In a recent survey, Handel and Levine (2004) conduct a meta study of 26 papers and find that the average effect of HPWS on wages "is between 0 and 5 percent" (p. 38). However, it is not clear whether these high wages are a mere compensation for the higher effort spent by workers, or whether they leave a rent on the table and thereby increase workers' welfare. A better proxy for welfare is "job satisfaction". Unfortunately, there is very little work on the effects of HPWS on job satisfaction. Exceptions include Freeman and Kleiner (2000) who find a positive effect of employee involvement on job satisfaction and Batt (2004) who reports a positive effect of working in self-managed teams, except for supervisors.

Our paper provides new evidence on the impact of HPWS on wages and job satisfaction. While most existing studies use establishment level data, we report data from the German Socio-Economic Panel (GSOEP), a representative annual survey of the German population. We find that two indicators of HPWS, work autonomy and the absence of monitoring, are associated with higher wages and higher job satisfaction. Both correlations are supported at high significance levels, even if we control for a host of factors such as education, tenure, gender, occupation, and industry.

The remainder of the paper is organized as follows. Section 2 describes the experiment of BFS and our control treatment. Section 3 reports the experimental results and shows that an increase in productivity is indeed necessary for the viability of HPWS. Section 4 documents the field data of the GSOEP and reports our survey results on wages and job satisfaction. Section 5 concludes.

## *2 Experimental Design and Procedures*

We consider an employer who hires a worker to carry out a productive task. The worker has to choose an effort level  $e \in \{1, \dots, 10\}$  that generates a monetary gross profit  $b \cdot e$ . The parameter  $b > 1$  reflects the worker's efficiency. Gross profits,  $b \cdot e$ , accrue directly to the employer. The worker incurs private effort costs  $c(e)$  measured in monetary terms, with

$c(e) = e$ , and receives a fixed wage  $w$ . Payoffs are given by  $\Pi = b \cdot e - w$  for the employer and by  $U = w - e$  for the worker. Thus, the employer wants the worker to choose high effort levels, but the worker prefers low effort.

The employer can offer a contract to the worker that specifies a fixed wage  $w$  and a requested, non-binding, effort level  $\tilde{e}$ .<sup>3</sup> The wage must at least cover the costs of the requested effort and cannot exceed  $\bar{w} = 50$ . The contract can neither condition on effort, nor on effort costs, nor on gross profits. If the worker rejects the contract offer, no wage is paid, no effort is exerted, and both parties receive their reservation utilities of 0. If the worker accepts, the employer must pay the offered wage, irrespective of the actual effort the worker chooses.

There are two types of contracts that the employer can offer: a *contract with full discretion* and a *contract with limited discretion*. In a contract with full discretion, the worker can choose any effort level  $e \in \{1, 2, \dots, 10\}$ , whereas he must choose an effort level of at least 3 in a contract with limited discretion, i.e.,  $e \in \{3, 4, \dots, 10\}$ , given he accepts the contract.

The experiment lasts for 15 periods. In each period each employer is randomly matched with a new worker. At the beginning of each period the employer receives an imperfect signal about his current worker's track record: he is informed about his current worker's effort choices in the last three periods. If the worker did not choose an effort level in one of the past three periods because he rejected a contract, the employer received this information. In periods 1-3, an employer could only be informed about the effort levels that were available so far.

Note that an employer neither observes the contract types, nor the wage offers, nor the requested effort levels that his current worker faced in these periods. Thus, the employers are not perfectly informed about their workers; a low effort choice, for example, can either indicate an untrustworthy worker who was potentially offered a high wage or a reciprocal worker who was offered a low wage. Workers know that future employers will be able to observe their current effort choices.

This experimental design reflects the fact that employers often receive an imperfect signal about an employee's past performance before signing the contract. For example, the

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<sup>3</sup> The purpose of the requested effort level is to coordinate expectations. The employer can communicate what he considers to be an adequate effort choice for the offered wage. From a game theoretic perspective the requested effort level is just cheap talk. However, the literature on HRM and HPWS emphasizes the importance of extensive labor-management communications (see, e.g., Ichniowski and Shaw 2003, p. 164). One of the HRM practices that are considered in Ichniowski et al. (1997) explicitly measures whether efforts were made "to set clear expectations about required work behaviors of the new workers" (p. 294).

employer may see letters of reference, he may have talked to a previous employer about the employee, or he may have observed the employee directly in his previous position. This information, however, is typically incomplete. Even if the employer receives an accurate signal about the employee's previous performance, he does not observe which contract induced the observed behavior and how well the employee was treated.

We conducted two experimental treatments:

1. In the "Enhanced Productivity Treatment" (EPT) the worker's productivity depends on the discretion he is left with. If the worker's discretion is limited his productivity is  $b = 4$ , if he is given full discretion, his productivity increases to  $b = 5$ .
2. In the "Constant Productivity Treatment" (CPT) the worker's productivity is  $b = 4$  and is independent of whether the worker is offered a contract with limited discretion or a contract with full discretion.

The EPT captures the fundamental trade-off between efficiency and control described in the HRM literature. Limiting discretion forces workers to obey some minimum standards, which is reflected in the higher minimum effort level. But limiting discretion also restricts workers' 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 worker's actions, regulate working hours by using time cards to monitor attendance, or impose reporting obligations to better assess performance. However, regulated working hours force the worker to work when he might not be most productive, reporting obligations absorb the worker's time and attention, and strict production procedures forfeit other, possibly more efficient practices. The harder the worker works, the more costly restricting his actions becomes. This is reflected by the reduction of the efficiency parameter  $b$ . All employers and workers know the payoff functions, and hence, the efficiency implications of limited discretion, and which contracts can be offered. The results of the EPT have been reported in BFS (2012) already.<sup>4</sup> In the current paper we compare these results to the results of the CPT in order to see whether enhanced productivity is not only sufficient but also necessary for the viability of HPWS.

We conducted three EPT and three CPT sessions with 36 participants in each session. We implemented two matching groups in each session, so we had six matching groups for

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<sup>4</sup> In BFS (2012) the EPT is called the "Screening Treatment".

each treatment.<sup>5</sup> 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 a worker. The experiment was framed as an employment relationship. We did not use value laden terms like full or limited discretion, control, trust, or efficiency.<sup>6</sup> Sessions took place at the Department of Economics at the University of Zurich.<sup>7</sup> Subjects were students from the University of Zurich and the Swiss Federal Institute of Technology in Zurich. Payoffs were measured in experimental points that were exchanged into CHF at the end of the experiment. On average, subjects earned about CHF 46 (US \$ 45.20).

### 3 Experimental Results

#### 3.1 Clustering of Job Attributes

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. However, we observe only two very distinct clusters of job characteristics.

RESULT 1 (CLUSTERING OF JOB ATTRIBUTES): In both treatments we observe a clustering of job attributes. Employers 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, lower wages, a lower requested effort level, and a lower share (control strategy). There is hardly any difference in the trust strategy between treatments. However, the control strategy is associated with significantly higher wages, a higher requested effort level, and a higher share of the surplus in CPT than in EPT.

Figure 1 shows the average wages, average requested effort levels, and the average share of the surplus for both treatments. The offered share of the surplus is defined as  $[w - c(\tilde{e})]/[b\tilde{e} - c(\tilde{e})]$ , i.e., it is determined by the wage and the requested effort level. The figure shows a similar clustering of job characteristics in EPT and CPT. For example, if the employer offers a job with full discretion, average wages are above 20 in both treatments, while average wages

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<sup>5</sup> With 15 periods and matching groups of 9 employers and 9 workers some of the subjects interacted with the same opponent twice. However, subjects did not know that they were divided in two matching groups, nor did they know whether and if so with whom they would interact for a second time. Thus, repeated game effects are very unlikely.

<sup>6</sup> A translation of the experimental instructions can be found in the appendix.

<sup>7</sup> All experiments were computerized with the software z-Tree (Fischbacher 2007).



are below 10 for job offers with limited discretion in EPT and about 15 in CPT. Likewise, the average requested effort level is roughly two units higher in case of a job with full discretion than in a job with limited discretion. Finally, the employees are offered about 10 percentage points more of the surplus in jobs with full discretion than in jobs with limited discretion. These differences in job characteristics across full and limited discretion jobs are highly significant ( $p < 0.001$ ) in EPT and significant at the 5 percent level in CPT (two-sided  $t$ -tests, controlling for individual fixed effects and clustering on employers). However, while the trust strategy is virtually identical across treatments,<sup>8</sup> employers using the control strategy are significantly more generous and more demanding in CPT than in EPT ( $p \leq 0.002$ ).

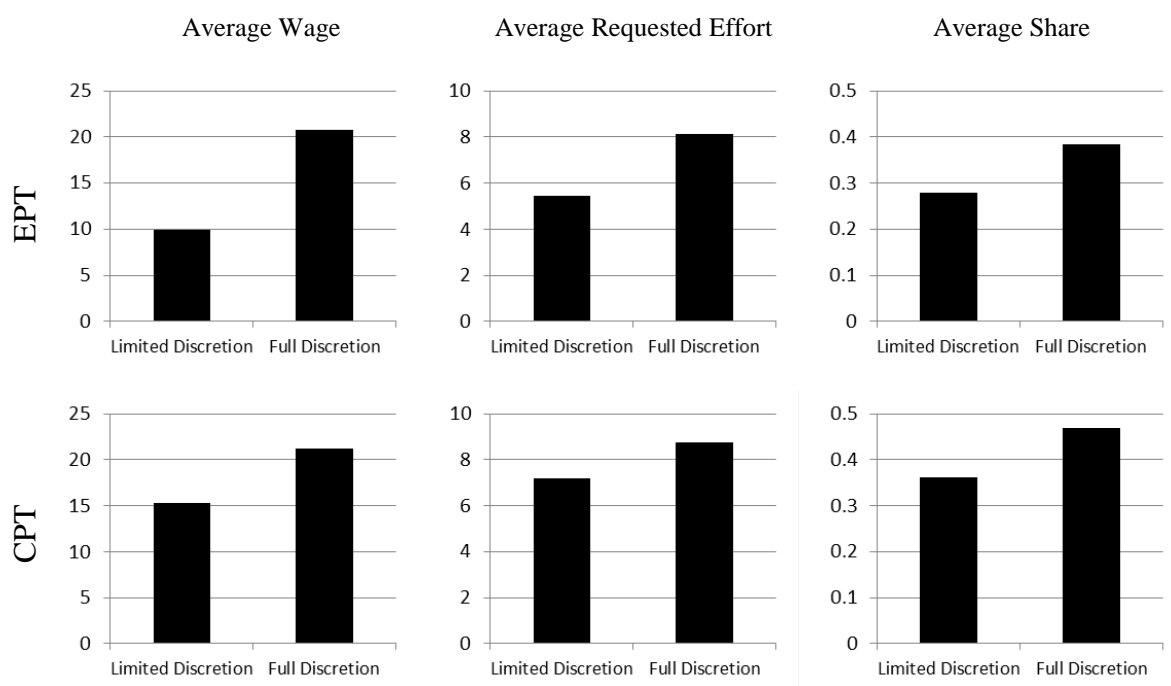


FIGURE 1.—CLUSTERING OF JOB ATTRIBUTES

### 3.2 The Wage-Effort Relation

The literature on gift exchange (see, e.g., Fehr, Kirchsteiger and Riedl, 1993) shows that higher wages induce higher effort levels of experimental workers. In our experiments we also find this pattern in both treatments. However, our experiments address two additional questions. First do employees who chose low effort levels in the past behave differently than employees who chose high effort levels? To answer this question we distinguish between

<sup>8</sup> There is no statistically significant difference in wages and requested effort levels for full discretion contracts across treatments, but the offered share of the surplus is eight percent higher in CPT than in EPT (which is significant at the five percent level). This is mainly due to the lower productivity parameter with full discretion in CPT which implies a lower surplus as compared to EPT. Thus, in CPT the same wages in full discretion contracts translate into a higher share of the surplus.

employees with low, medium, and high 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  $r \geq 6.5$ .<sup>9</sup> Second, do contracts with full discretion induce different effort choices than contracts with limited discretion?

**RESULT 2 (EMPLOYEES' EFFORT RESPONSES IN EPT AND CPT):**

- a) *In both treatments employees respond to higher wages with higher average effort levels, but the slope of the wage-effort relation is significantly smaller for employees with a low reputation than for employees with a medium or high reputation.*
- b) *For low wages ( $w < 10$ ) employees provide considerably higher effort when they are offered a job with limited discretion than when they have full discretion.*
- c) *Offering full discretion has no motivational effect on its own in the experiment, but if combined with higher productivity it does induce workers to be significantly more responsive to higher wages.*

Support for Result 2 is provided by Figure 2 and the regressions in Table 1. Figure 2 shows that in both treatments the wage-effort relation looks very similar across treatments and that the slope of this relation is much smaller for workers with a low reputation than for workers with a medium or high reputation. The one exception is the effort provided by low reputation workers in CPT, but we have only seven observations for this case (and no observation with low wages).

Low Reputation

Medium & High Reputation

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<sup>9</sup> In the second and third period the reputation index  $r$  uses the information of one or two periods, respectively, only. If a contract was rejected in a period, this period was not considered for the computation of  $r$ . In the first period employees had no reputation and the reputation index is not defined.

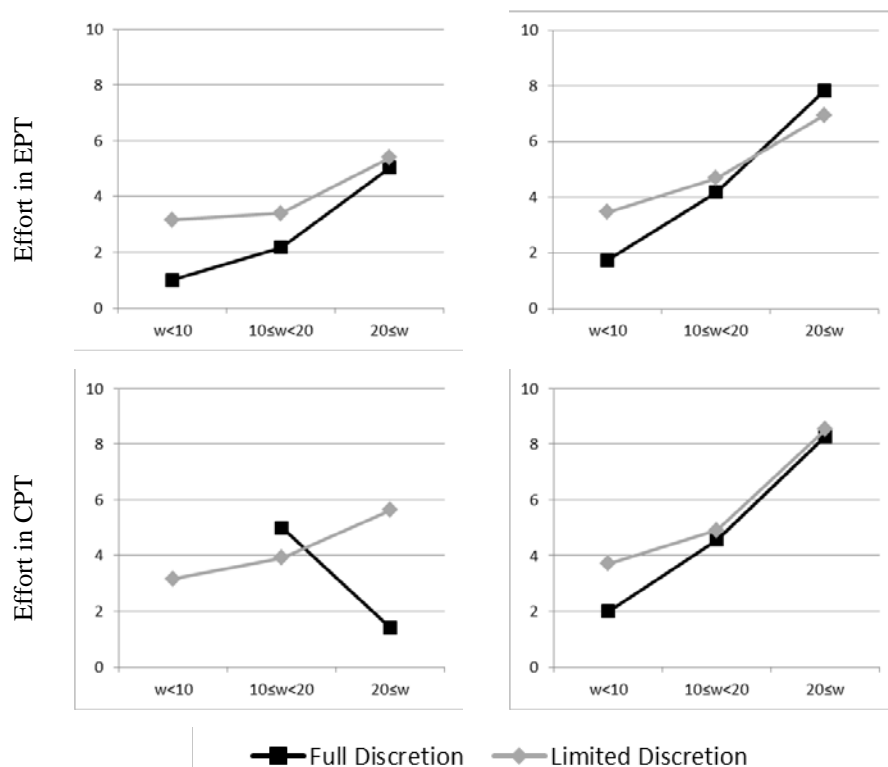


FIGURE 2.—WAGE-EFFORT RELATION

This pattern is confirmed by regressions (1) and (2) in Table 1. If a low reputation worker is paid 10 points more his effort increases by 0.8 units in EPT and 1.2 units in CPT. This effect is significantly stronger for a medium or high reputation worker. For example, if a high reputation worker is paid 10 points more, he increases his effort by 2.25 units in EPT and even by 2.91 units in CPT.

TABLE 1.—DETERMINANTS OF EFFORT AND EMPLOYERS' PROFITS IN EPT AND CPT

	(1) Effort in EPT	(2) Effort in CPT	(3) Profit in EPT	(4) Profit in CPT
wage	0.082** (0.037)	0.122*** (0.039)	-0.414*** (0.135)	-0.416*** (0.136)
medium reputation	-1.560*** (0.537)	-1.659** (0.709)	-1.048 (1.800)	-4.639*** (1.518)
high reputation	-2.493*** (0.737)	-2.300*** (0.801)	-4.725** (1.928)	-6.619*** (1.688)
medium reputation × wage	0.102** (0.043)	0.141*** (0.042)	0.424** (0.177)	0.635*** (0.152)
high reputation × wage	0.143*** (0.050)	0.169*** (0.047)	0.722*** (0.177)	0.905*** (0.149)
full discretion	-2.478*** (0.571)	0.472 (1.202)	-6.868*** (1.772)	-2.803 (2.834)
full discretion × wage	0.105*** (0.038)	-0.074 (0.055)	0.478*** (0.118)	-0.065 (0.144)

final period dummy	-1.933*** (0.419)	-1.879*** (0.372)	-7.038*** (1.839)	-5.736*** (1.322)
constant	3.921*** (0.454)	3.669*** (0.620)	6.978*** (1.164)	7.833*** (1.123)
Observations	655	664	745	746
adj. $R^2$	0.676	0.735	0.301	0.298

*Notes:* The table reports coefficients of OLS regressions. Robust standard errors are reported in parentheses. Effort regressions (1) and (2) cluster by employees, control for individual fixed effects, and consider only accepted contracts as no effort is chosen if a contract is rejected. All contracts are included in the profit regressions (3) and (4) to capture the effect of rejections on profits. All regressions consider observations with at least one previous effort choice only as an employee's reputation cannot be classified otherwise.

\*\*\* Denotes significance at the 1 percent level, \*\* at the 5 percent level, and \* at the 10 percent level.

Figure 2 also shows that for low wages ( $w < 10$ ) employees spend more effort if they are offered a contract with limited discretion than a contract with full discretion. This holds in both treatments for employees with a low reputation as well as for agents with a high reputation.<sup>10</sup> The obvious reason is that at low wages almost all workers choose the minimum effort level which is  $e=1$  with full discretion and  $e=3$  with limited discretion. Thus, limiting discretion forces workers to spend two additional units of effort. This is nicely reflected in regression (1) where full discretion reduces the average effort by roughly 2.5 units in EPT. Regression (1) also shows that if higher wages are offered, workers react significantly more strongly if these wages are combined with full discretion than if they come with limited discretion. This suggests that offering high discretion in combination with high wages may have a motivational effect. However, in EPT full discretion contracts are accompanied with higher productivity, so it is unclear whether this effect is due to more discretion as such or to the increase in productivity. In CPT productivity is held constant. Regression (2) shows that the effect of full discretion and the interaction of full discretion and wage are not significant. Thus, in our experimental setup we do not find a motivational effect of full discretion on its own.

To test whether the effect of discretion on effort is significantly different in the two treatments, we conducted a pooled regression analysis where we interact all our explanatory variables with a treatment dummy, but that is otherwise identical to the effort regressions in Table 1. We find that the interaction of the treatment dummy with “full discretion” and with “full discretion  $\times$  wage” is significant at the 5 percent and the 1 percent level, respectively. The interaction of all other explanatory variables with the treatment dummy is insignificant.

<sup>10</sup> Note, however, that we do not have a single observation of a full discretion contract offer with low wages to a low reputation worker in CPT.

Note that we cannot include the non-interacted treatment dummy in our regression as the treatment level effect is absorbed by the individual fixed effects.

Regressions (1) and (2) also report a highly significant and large last period effect. Effort drops by almost two points in both treatments in the final period. This is clear evidence that many workers behave strategically. They spend high effort in order to maintain a good reputation in the beginning of the game. In the last period the concern for a good reputation disappears and many (but not all) workers reduce their efforts considerably.

### 3.3 *Optimal and Actual Job Offers*

Given the workers' behavior as analyzed in the previous section, what contracts should employers offer?

**RESULT 3 (OPTIMAL JOB OFFERS):** *Employers should make contract offers conditional on the reputation of their workers. If a worker has a low reputation, it is optimal to offer him a contract with limited discretion and a low wage in both treatments. If a worker has a medium or high reputation, it is optimal to offer a contract with full discretion and high wages in EPT. In CPT paying high wages to employees with a good reputation is also optimal, but there is no significant difference in the performance of contracts with full and limited discretion.*

Support for Result 3 is given by the profit regression (3) and (4) in Table 1. Consider the low reputation workers first. We know already that they do spend more effort if they are offered higher wages, but the slope of the wage-effort relation is small. This is why it does not pay off to offer them generous wages. In fact, the negative coefficient of wages for low reputation workers in profit regressions (3) and (4) is highly significant for both treatments.

Consider now workers with a medium or high reputation. We know from Result 2 that the slope of the wage-effort relation for these workers is much steeper, which makes it more attractive to pay high wages. Furthermore, job offers with high wages are considerably less likely to be rejected.<sup>11</sup> In fact, regressions (3) and (4) show that for medium and high reputation workers profits increase significantly with wages in both treatments.

Giving full discretion to employees is optimal in EPT but not in CPT for two reasons. First of all, giving full discretion in EPT increases the productivity of effort from  $b=4$  to  $b=5$ ,

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<sup>11</sup> The rejection rates in both treatments are very similar. Contract offer with high wages ( $20 \leq w$ ) never got rejected in either treatment. The rejection rate for medium wages ( $10 \leq w < 20$ ) was 5.1 percent in EPT and 3.7 percent in CPT. Low wages ( $w < 10$ ) got rejected in 37.1 percent of the cases in EPT and in 38.3 percent in CPT.

while there is no difference in productivity in CPT. Second, offering discretion increases the slope of the wage-effort relation in EPT but not in CPT. Both effects make full discretion profitable in EPT if combined with high wages.<sup>12</sup>

Figure 1 shows that the average effort for high wages ( $20 \leq w$ ) is almost the same for full discretion and limited discretion in both treatments. Thus, without enhanced productivity limited discretion and full discretion are about equally profitable, but giving full discretion is more risky for the employer. This is reflected in actual contract choices.

#### RESULT 4 (ACTUAL JOB OFFERS):

- (a) *Wages*: In both treatments, medium and high reputation employees are paid significantly higher wages than low reputation employees.
- (b) *Contract Types*: In EPT employers offer full discretion contracts in 55.2 percent of all cases to employees with a medium or high reputation but only in 21.8 percent to employees with a low reputation. In CPT, however, full discretion contracts are offered in less than 10 percent of all cases even to high and medium reputation agents (9.2 percent), and only in 5.2 percent to low reputation agents.

Figure 3A provides evidence for Result 4(a). In both treatments employers make their wage offers conditional on the workers' reputations. Workers with a low reputation are paid wages around 10 on average, while medium or high reputation workers are paid wages roughly between 16 and 18. The profit regressions (3) and (4) reported in Table 1 show that it would have been profitable to pay higher wages to workers with a medium or high reputation. Many employers did this, but there is also a significant fraction of employers who do not trust their workers and always paid low wages, independent of the reputation of the worker.

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<sup>12</sup> To test whether the effect of discretion on profits is significantly different in the two treatments, we conducted a pooled regression analysis where we fully interact all variables with a treatment dummy, but that is otherwise identical to the profit regressions in Table 1. We find that the interaction of the treatment dummy with "full discretion  $\times$  wage" is significant at the 1 percent while the interaction with "full discretion" is insignificant. All other interaction terms and the treatment dummy itself are insignificant.

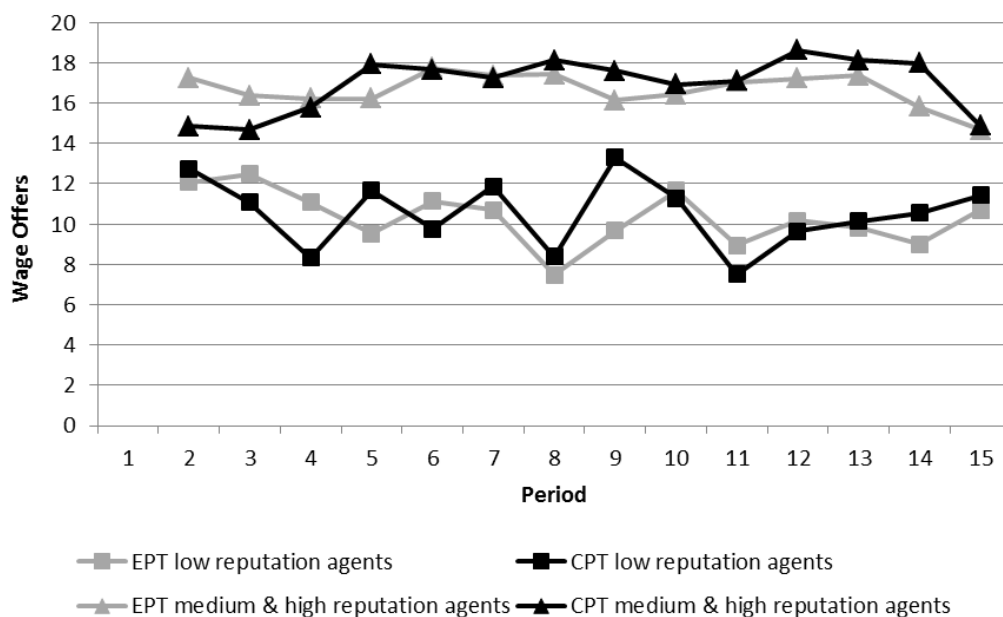


FIGURE 3A.—Actual Job Offers: Wages

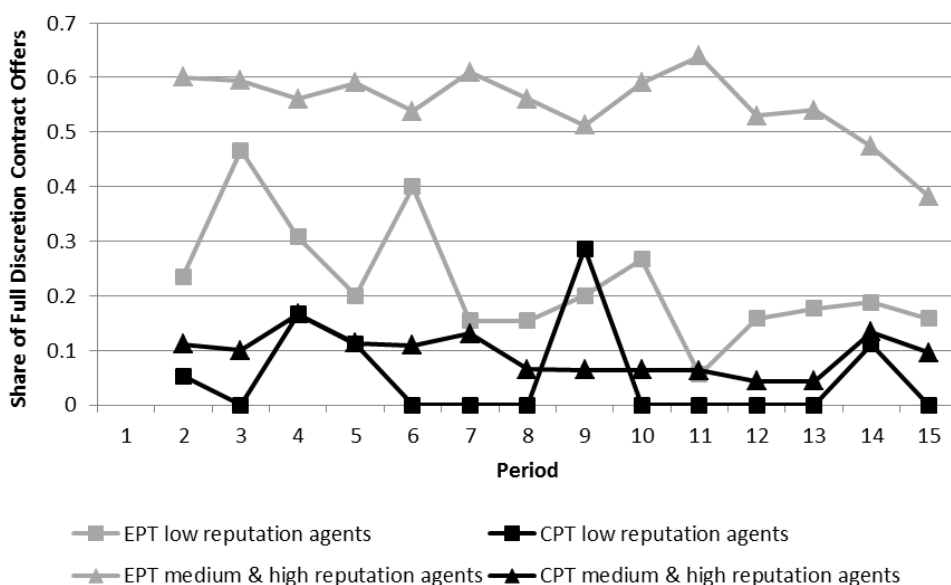


FIGURE 3B.—Actual Job Offers: Contract Types

Figure 3B provides evidence for Result 4(b). The figure shows the evolution of job offers with full discretion over time. In EPT employers learn over time that it does not pay to offer full discretion to workers with a low reputation. The share of full discretion contracts for low reputation workers falls over time and is less than 20 percent in the last five periods. Medium and high reputation workers are offered full discretion in 50 to 60 percent of all cases in EPT. This share is stable until the last two periods. Note that in EPT offering full discretion to medium and high reputation workers is profitable. So those employers who do not offer full

discretion to medium and high reputation workers do not maximize profits. In BFS we explain in more detail that this is due to the fact that some employers do not trust and offer limited discretion (in low wages) independently of the reputation of the employees. Here we are mainly interested in whether full discretion contracts are also offered if they do not have a productivity advantage. The answer is clearly negative. Very few employers offer full discretion contracts and the share of full discretion contracts remains at roughly ten percent over all periods. Not offering full discretion is optimal, because full discretion does not induce more effort, it only exposes the employer to a higher risk of shirking. Thus, the experiment shows that higher productivity of discretion is not only sufficient but also necessary for discretion to be granted to workers.

#### *4 Do Employers Leave Rents on the Table in HPWS?*

In this section we use field data of the German Socio-Economic Panel (GSOEP) to address the question whether HPWS do indeed increase the wages and the welfare of employees, as suggested by our experiments. The GSOEP collects information on a wide range of personal and household characteristics, including, e.g., earnings, job satisfaction, education, work experience, and occupation.<sup>13</sup> The 2001 wave of the survey, which covers 22,351 individuals from 11,947 households, contains, in addition, the following two questions on work conditions: “*Can you decide yourself how to complete your work tasks?*” and “*Is your work performance strictly monitored?*” These questions refer directly to the two central indicators of HPWS, work autonomy and the absence of monitoring.

Respondents who were employed at the time of the survey could answer each question by indicating either “applies completely” or “applies partly” or “does not apply at all.” As we would expect, the two measures are negatively correlated, that is more autonomy is correlated with less monitoring.<sup>14</sup> Our sample contains all individuals who were fully employed or worked part-time for at least 8 hours a week and earned at least 200 Euros per month; apprentices and the self-employed are excluded.

We find a positive, highly significant correlation between the two indicators of HPWS and wages. The dependent variable in regressions (1)–(3) of Table 2 is the log of gross monthly wages (in Euro). “Some Autonomy” (“Full Autonomy”) is a dummy variable indicating that a respondent answered “applies partly” (“applies completely”) to the task discretion question. “Some Monitoring” (“No Monitoring”) is a dummy variable indicating

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<sup>13</sup> For more information on the GSOEP, see <http://www.diw.de/en/soep>.

<sup>14</sup> The correlation is highly significant at the 1 percent level, the correlation coefficient is -0.25.



the answer “applies partly” (“does not apply at all”) to the monitoring question. Respondents who stated the respective third options (“no autonomy” and “full monitoring”) serve as baseline. Columns (1) and (2) show raw correlations: absent any controls both indicators of HPWS are highly significantly associated with higher earnings. For example, a job with full autonomy pays 35% higher wages than one without autonomy on task completion. Similarly, employees who are not monitored at all earn 14% more than employees whose work performance is strictly monitored.

TABLE 2— THE IMPACT OF HPWS ON WAGES AND JOB SATISFACTION IN THE GSOEP

	Log Gross Monthly Wage			Standardized Job Satisfaction		
	(1)	(2)	(3)	(4)	(5)	(5)
Some Autonomy	0.228*** (0.018)		0.037*** (0.011)	0.096*** (0.033)		0.073** (0.036)
Full Autonomy	0.348*** (0.019)		0.056*** (0.012)	0.335*** (0.034)		0.282*** (0.038)
Some Monitoring		0.085*** (0.018)	0.033*** (0.011)		0.161*** (0.033)	0.141*** (0.034)
No Monitoring		0.135*** (0.019)	0.051*** (0.011)		0.350*** (0.034)	0.293*** (0.036)
Experience			0.034*** (0.004)			-0.012 (0.011)
Experience <sup>2</sup> /100			-0.110*** (0.016)			0.045 (0.051)
Experience <sup>3</sup> /1000			0.010*** (0.002)			-0.007 (0.007)
Tenure			0.014*** (0.001)			-0.024*** (0.004)
Tenure <sup>2</sup> /100			-0.024*** (0.004)			0.057*** (0.012)
Lower Secondary			0.050*** (0.012)			0.070* (0.039)
Upper Secondary			0.099*** (0.019)			-0.001 (0.061)
Higher Vocational			0.137*** (0.017)			-0.058 (0.054)
Higher Education			0.221*** (0.016)			0.006 (0.052)
Male			0.196*** (0.010)			0.032 (0.032)
Firm Size 5-19			0.157*** (0.017)			0.040 (0.056)
Firm Size 20-99			0.234*** (0.017)			0.015 (0.055)
Firm Size 100-199			0.286*** (0.019)			0.050 (0.062)
Firm Size 200-1999			0.329*** (0.018)			0.068 (0.057)
Firm Size ≥2000			0.366*** (0.018)			0.026 (0.058)
East Germany			-0.241*** (0.009)			-0.083*** (0.029)
Hours of Work			0.025*** (0.000)			-0.004*** (0.001)
Temporary Job			-0.096*** (0.015)			-0.198*** (0.048)
Constant	7.356***	7.501***	5.500***	-0.168***	-0.207***	0.134

	(0.016)	(0.016)	(0.398)	(0.028)	(0.028)	(0.985)
Occupation and Industry dummies	no	no	yes	no	no	yes
observations	7731	7731	7731	7676	7676	7676
adj. $R^2$	0.044	0.007	0.697	0.017	0.016	0.049

*Notes:* OLS estimates. Standard errors in parentheses; \*\*\*, \*\*, and \* indicates significance at 1, 5, and 10% level, respectively. Some Autonomy, Full Autonomy, Some Monitoring, and No Monitoring are dummy variables indicating the degree of job discretion. No autonomy and full monitoring serve as baseline. Experience indicates years in labor market. Tenure indicates years with current employer. Education dummies correspond to levels 3 to 6 of the International Standard Classification of Education; level 2 and school drop outs serve as baseline. Firm size is controlled by five dummy variables; firms with less than 5 employees serve as baseline. Job categories correspond to the International Standard Classification of Occupations (4-digit ISCO-88 code; 390 categories). Industry categories correspond to the classification of economic activities of the European Community (NACE code; 62 categories). East Germany is a dummy indicating employment in the territory of the former GDR. Hours of Work are actual work hours per week including overtime. Temporary Job is a dummy variable indicating temporary employment.

In regression (3) we account for a large number of control variables because we want to analyze whether *ceteris paribus* wages are higher in jobs that have the two measured features of HPWS. To control for worker heterogeneity and differences in occupations and industries, we account for occupation (390 categories), industry (62 categories), education (5 categories), labor market experience, tenure at current employer, gender, firm size, region, hours of work, and temporary or permanent employment. Controlling for these factors reduces the size of the coefficients of the HPWS indicators but both remain highly significant. The regression reveals that jobs with full autonomy and no monitoring are associated with about 11% higher wages than jobs in the base line category with no autonomy and full monitoring. Table 3 shows summary statistics of all our variables.

TABLE 3—SUMMARY STATISTICS OF THE GSOEP DATA

variable	mean	standard deviation	min	max
Gross Income (Euros/month)	2277	1219	204	15330
Job Satisfaction	7.15	1.96	0	10
Some Autonomy	0.47	0.50	0	1
Full Autonomy	0.37	0.48	0	1
Some Monitoring	0.45	0.50	0	1
No Monitoring	0.39	0.49	0	1
Experience (years)	22.8	10.70	0	64
Tenure (years)	10.5	9.58	0	49
Lower Secondary	0.51	0.50	0	1
Upper Secondary	0.06	0.23	0	1
Higher Vocational	0.09	0.29	0	1
Higher Education	0.21	0.41	0	1
Male	0.58	0.49	0	1
East	0.23	0.42	0	1
Hours of Work (per week)	39.9	10.29	8	80
Temporary Job	0.07	0.26	0	1
Firm Size 5 to 19	0.16	0.37	0	1

Firm Size 20 to 99	0.21	0.41	0	1
Firm Size 100 to 199	0.10	0.30	0	1
Firm Size 200 to 1999	0.23	0.42	0	1
Firm Size 2000 or larger	0.24	0.42	0	1

*Notes:* The number of observations is 7731 except for Job Satisfaction where we have 7676 observations only.

We now turn to the effect of HPWS on job satisfaction, which we consider as a proxy for the overall utility derived from a job. The GSOEP measures job satisfaction with the following question: “*How satisfied are you with your job (if applicable)?*”

Respondents can answer on a scale from 0 to 10, where 0 means totally unsatisfied and 10 means completely satisfied. A well-known theoretical results says that job rents are absent in a competitive labor market equilibrium because wages compensate workers for all non-pecuniary job characteristics (Rosen 1987). Thus, if HPWS have non-pecuniary attributes affecting workers’ utilities, then wages will vary such that job satisfaction is kept constant at the equilibrium level. Hence, if the data reflect competitive labor market outcomes, autonomy and monitoring should have no effect on job satisfaction if one does *not* control for wages, i.e., if wages can adjust to compensate for uncontrolled characteristics. If however job satisfaction is positively associated with our indicators of HPWS, this can be taken as evidence for job rents.

The dependent variable in regressions (4)–(6) of Table 2 is the standardized job satisfaction measure. Columns (4) and (5) show raw correlations: absent any controls both HPWS indicators are highly significantly associated with higher job satisfaction. Jobs with full autonomy or without monitoring are associated with levels of job satisfaction that are about a third of a standard deviation higher than baseline job satisfaction. In regression (6), we account for same set of personal and labor market characteristics as in regression (3). We find that both HPWS indicators remain highly significant (only “Some Autonomy” is significant at the 5% level only) and the effect size does not decrease much. Workers with full autonomy have a job satisfaction that is 0.28 standard deviations higher than those with no task discretion, and workers who are not monitored have a 0.29 standard deviation higher job satisfaction than those who are strictly monitored.

## 5 Conclusions

Our results extend the literature on HPWS in two dimensions. First, we show experimentally that the productivity increase due to granting discretion to workers is not only sufficient but also necessary for the emergence and viability of HPWS. Our experiment shows that if

discretion is not associated with higher productivity, then it has no motivational effect on its own. Thus, it does not pay for employers to offer discretion to workers, and very few employers offer it. On the other hand, if discretion increases productivity, offering discretion is highly profitable and many employers offer it. Thus, the increase in productivity causes the dissemination of jobs with full discretion. We conclude that the empirical fact that HPWS are characterized by a higher productivity than traditional jobs is most likely due not only to a motivation effect but also to a selection effect. Only those jobs in which discretion enhances employee performance will be transformed into HPWS. In future research, it would be very interesting to look for additional empirical evidence for this hypothesis.

Second we provide survey evidence that HPWS have positive welfare effects for employees. The analysis of a large, representative sample of German employees shows that work autonomy and the absence of monitoring, two central indicators of HPWS, are significantly associated with higher wages and higher job satisfaction – even when we control for a wide range of personal, occupational, and industry characteristics. This suggests that higher wages do not only compensate employees for higher effort and/or more stressful working conditions, but that HPWS have a positive effect on the welfare of employees. The higher degree of job satisfaction suggests that higher wages and working conditions generate rents for employees. This is consistent with our experimental results in Bartling, Fehr and Schmidt (2012) where we show that offering discretion to employees and paying high wages/rents are complementary human resource management strategies that should be used together.

Our results show that the combination of experimental data and field data can be very fruitful. While the high degree of control and the random assignment of subjects to treatments allows for causal interpretations of the results, it is often unclear how the experimental results extend from the lab to the field. The survey data collected in the field is less conclusive because it allows us to derive correlational evidence only. However, it clearly demonstrates the external validity of our laboratory result that HPWS should be associated with rents for workers.

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