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Abstract

We conduct a field experiment where we vary both the presence of a gift exchange wage and the effect of the worker's effort on the manager's payoff. The results indicate a strong complementarity between the initial wage gift and the agent's ability to "repay the gift". We collect information on ability to control for differences and on reciprocal inclination to show that gift exchange is more effective with more reciprocal agents. We present a simple principal-agent model with reciprocal subjects that motivates our empirical findings. Our results offer an avenue to reconcile the recent conflicting evidence on the efficacy of gift exchange outside the lab; we suggest that the significance of gift exchange relations depends on details of the environment.

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1 Introduction

Firms must frequently address the problem of providing incentives to employees when actions are not at all or hardly contractible. The standard approach in economics has been to focus on analyzing the optimal explicit incentive schemes - tying the level of the worker's compensation to the amount of output produced, which serves as a (noisy) measure of employee effort.[1] However, the importance of fairness and social preferences, especially for the work relation, has long been documented. Starting with Akerlof (1982) a literature has developed that considers gift exchange as an alternative source of incentives in the workplace as (some) workers respond to generous treatment by the firm (i.e. generous wage levels) by exerting above minimal effort.

Recently there have been conflicting results on the significance of gift exchange as a motivating force outside of the lab. The varying effectiveness of gift exchange in different settings suggests that the efficacy of gift exchange incentives depends on details of the environment. We add to this research by providing results that suggest an avenue to reconcile those findings. In our field experiment we do not find evidence for an overall positive effort response merely from an initial wage gift. However, the gift's efficacy is substantially improved if the manager benefits more strongly from a worker's high effort. That is, gift exchange can induce effort if workers are able to repay the gift to the manager. Moreover, we document that gift exchange works more effectively with subjects that we classify as reciprocal via a personality test, and that the efficacy of gift exchange does not dissipate over the course of the experiment. We conclude from our results that while gift exchange may not be effective as an incentive in all settings, it can be a powerful incentive device in the proper job context, such as in our setting when managers have performance-related incentives, and when it is directed to the right employees, who are most likely to be reciprocal.

For our field experiment we hired temporary workers for a data entry job. The workers entered historical data from the 1849 Prussian Census. In total we had 59 workers entering data during a 5 hour shift in the Harvard Business School computer lab where the data entry took place. The job was advertised to the worker by a temp worker agency at the standard hourly wage of \$13, however for 30 of the workers we increased it to \$18 upon their arrival. We explained to them that we were hired by two professors to organize the entry of these data. For 15 workers in each the \$13 and the \$18 group we emphasized the importance of them working hard for us by explaining that we would receive a bonus of 50% if the job was done 'by the end of the week' (*Bonus* treatment). For the 'control' groups in both the \$13 and the \$18 conditions we did not inform the workers of this bonus (*No Bonus* treatment).

[1] An extensive theoretical literature, e.g. Holmström (1979) or Grossman and Hart (1983), has emphasized the importance of strong monetary incentives to induce effort.

We also asked the workers to fill out a short version of the Big 5 personality test, to give us a measure of non-cognitive skills.

In line with previous field experiments, we do not find an effort increase in response to the higher wage in the *No Bonus* treatment. However, for the workers in the *Bonus* treatment, a higher wage leads to a significant increase in worker output. Hence, there is a strong complementarity between the wage gift and the resulting payoff for the manager.[2] Furthermore, when we separate workers based on their *agreeableness* (a personality trait associated with standard lab measures of reciprocity), we find that the positive effect of high wages on effort is driven entirely by highly agreeable (strong positive reciprocity) workers, with low reciprocity workers showing either a zero or a negative response to a higher wage. We consider the finding that the strength of gift exchange is positively correlated with measures of reciprocal inclination as absolutely necessary to lend credibility to gift exchange based explanations of motivation in the labor market. Though apparently obvious, to the best of our knowledge this has not been documented previously in the field. We also examine the strength of the gift exchange response over time. In contrast to other studies, e.g. Gneezy and List (2006), we find no weakening of positive responses to wage gifts over time. To the contrary, any negative effects of the wage gift disappear in the later stages of the task and we find an overall strongly positive effect of our treatment manipulations in the second half of the experiment.

We use two different measures of effort in our analysis: gross data entered and an error corrected measure of data entered. The estimates derived from these two measures are qualitatively and quantitatively very similar, suggesting that any effort responses work along the quantity margin only, leaving the quality margin of effort unaffected.[3]

We can rationalize these results with an agency model capturing reciprocal preferences where we show that there is complementarity between gift and ability to repay the gift. In the model a risk neutral firm hires a risk averse worker to exert non-verifiable effort. The novel feature of the model is that the worker is reciprocal - i.e. the worker's utility increases in the principal's profit whenever the worker receives a rent in excess of his outside option. Thus, when the firm is generous to the worker by giving him additional compensation, the worker desires to provide in turn something of value to the firm. The worker's reciprocal attitude can now be used by the firm to align the worker's preferences with those of the firm, thus generating intrinsic motivation. The comparative statics show that ceteris paribus the worker's optimal effort choice increases in the initial wage gift and his ability to repay the gift. The corresponding cross derivative is also positive, indicating the complementarity of

[2]This results is akin to the findings summarized in Ichniowsky and Shaw (2003) on the complementarities between various HR policy instruments.

[3]This is in contrast to Kim and Slonim (2009) who find gift exchange mainly along the quality margin.

the instruments.

An extensive body of evidence has developed, demonstrating reciprocal behavior and gift exchange in laboratory experiments. Fehr and Falk (2008) summarize results from earlier studies and highlight several key results: **i)** Average wages in the experiments are above the minimal wages and leave workers with rents. **ii)** There is a positive wage-effort relationship. **iii)** These results are robust to various institutions, to competition, and to high stakes[4]. Two recent laboratory experiments are closely related to our paper. Hennig-Schmidt et al. (2010) present a real-effort laboratory experiment and show that a positive wage-effort relation as implied by gift exchange only prevails if information on the manager's surplus is provided to the experimental workers. This indicates, as predicted by our model, that the manager's surplus is an important determinant of the effectiveness of gift exchange relations. Note, however, that Hennig-Schmidt et al. (2010) do not vary the surplus accruing to the manager nor do they collect the additional information necessary to test our hypotheses. Englmaier and Leider (2009) also analyze the importance of the ability of the worker to "repay the gift" to the manager and conduct a real-effort laboratory experiment where they vary the wage and the effect of the worker's effort on the manager's payoff. They are able to confirm predictions about which is the marginal worker (in terms of ability) affected by their experimental variation and how different types of individuals, selfish and reciprocal, react to it.

Recently there has been a controversial discussion about the validity of the lab results for gift exchange in the field. We take the mixed findings of these studies as evidence that the efficacy of gift exchange depends on subtle details of the field situation. While Falk (2007) finds strong evidence for gift exchange in a field experiment with charitable donations, Gneezy and List (2006) have recently argued that the effect of gift exchange in the field is only minor, fast disappearing and overall not a viable employment strategy. In Gneezy and List students are hired for a day job in a library and half of them get a surprise rise of their hourly pay. Gneezy and List document that, other than in our field experiment, there is only a short lived effect of this gift on the students' effort. Overall the 'firm' would have fared better hiring more students for the lower wage rate.[5] Kube et al. (2007) replicate the Gneezy and List study and also find no effect of a wage gift but document a strong negative effect in response to a wage cut. In a comparable design, Kube et al. (2011) document a strong positive effect of non-monetary gifts on students' effort. Note that in neither of these cases the subjects were given any indication that the manager who provided the higher wage would benefit directly from increased productivity

[4]For further reference see also Fehr and Gächter (2000) or Fehr and Schmidt (2003) and the references therein.

[5]Gneezy and List (2006) find very similar results for a fund raising task.

and the performed jobs were not ones where an employee would expect such a compensation structure. Bellemare and Shearer (2009) analyze gift exchange within a real firm (where the value of output is clear to the workers). In their study, there is a surprise bonus for the workers in a tree planting firm in British Columbia. Their results indicate a 10% increase in worker productivity on average which slowly dwindles down. Moreover the effect of the gift is more marked if the worker has been with the firm for longer. Hence, Bellemare and Shearer argue that spot market field experiments only establish a lower bound of the effects of gift exchange in real firms that are characterized by longstanding and ongoing relations that amplify the effects. Analyzing representative survey data, Leuven et al. (2005) document that firms with a more reciprocal work force (as measured within the survey) are more likely to provide their workers with general training as they deem it more likely that this gift will be repaid within an ongoing relation. Finally, Kim and Slonim (2009) run a hybrid lab-field experiment where participants entered survey data for a well-known charitable organization. Workers received either a high or low fixed wage framed as either fair or unfair. While the fairness manipulation did not affect the quantity or quality of work, the wage gift had an effect on the quality of the work but not the quantity. These results are in contrast to ours as we find an effect of our manipulations on the quantity but not the quality margin.

The rest of the paper is structured as follows. The next section describes the design of the field experiment. Section 3 derives the theoretical predictions and Sections 4 and 5 present and discuss the results. Section 6 concludes. The Appendix contains derivations and illustrations.

2 Experimental Design

The field experiment took place on the premises of the CLER lab at Harvard Business School where we provided subjects with computer work stations. We ran four sessions in September 2007. Though subjects were situated within one room, the lay out was such that they could not monitor each others' work progress. Moreover, though we did not formally forbid communication, we did not note any signs of more than casual communication. Hence we conclude that there is only very limited scope for peer effects affecting our results. In total we had 59 participants, each of them working for approximately five hours on a single day. The participants were hired via a temp worker agency that regularly works with Harvard Business School[6]. We told the temp workers that we have been hired to organize a data

[6]Atrium Staffing of Boston, *http://www.atriumstaff.com/*, describes their services as follows: "Since 1995, Atrium's Office Support Practice has been the firm's stronghold. Our team of skilled recruiters, who themselves draw from diverse career backgrounds, are experts in identifying administrative talent and understanding client needs. Our thorough screening processes ensure that we know our Associates well. Our

entry project. These workers frequently work on similar data entry projeccts, hence there is no reason to believe that they suspected they were participating in a field experiment. Their job was to enter data from the 1849 Prussian Census into an Excel template.[7]

We created four treatment cells (*Low Wage/No Bonus, High Wage/No Bonus, Low Wage/Bonus, High Wage/Bonus*) based on the wage level and the bonus information. Workers were either payed the standard wage ($13/hr) as advertised by the temp agency, or were "surprised" with a higher wage ($18/hr). In the baseline *No Bonus* treatments, we told the participants only that we were hired "by two professors to organize the entry of these data". In the *Bonus* treatment groups we additionally inform the temps that we get a substantial "completion bonus" if enough work gets done.[8] These "bonus" treatments indicate whether the value of effort to the manager matters.

From the temp agency we get demographic information on the workers which we use as controls. Most importantly we have a measure of the workers' typing speed (*Typing Score*) which we use to control for the temp workers' differing typing ability, a key determinant for productivity in this task. The final payment of the temp workers was done in cash directly at the end of each entry session.

Given that there are no previous papers using this task or treatment variation, we were not able to calibrate the magnitude of the pay rise and the completion bonus in order to find the optimal combination to maximize gift exchange - as such our results should not be seen as an upper bound on the efficacy of reciprocal incentives. However, we are fairly certain that all participants considered pay rise and completion bonus as "substantial"

3 A Model of Reciprocal Motivation

Our experiment is not designed to differentiate exactly between different models of social preferences. Hence we do not interpret our findings as a strict test of our model, but rather consider the model to be a valuable frame within which to organize the data. We consider a simplified version of the model in Englmaier and Leider (2011) where we solve the full moral hazard problem and derive the structure of the optimal contract in a standard principal agent problem with reciprocal agents. To lay out our model, we assume there is a risk neutral manager who wants to maximize expected profits and one risk averse worker who

customized approach to client searches results in impressive hire retention rate of over 93%. We staff direct hire, temp-to-hire and temporary administrative roles in a variety of companies."

[7] An example from the 1849 Prussian Census can be found in Figure 2 in Appendix C.

[8] In order to not deceive the subjects on this issue we arranged with one of the providers of the Prussian Census Data, Sascha Becker, to put such a pay scheme in place. Our actual "completion bonus" came in the form of free lunch and was worth roughly $10.

cares about reciprocity. The worker can take an action (effort) $a \geq 0$ with corresponding costs of effort $c(a)$ with $c'(a) > 0, c'(0) = 0,$ and $c''(a) > 0$.

The actions imply a respective expected return for the manager $ER(a)$ with $ER'(a) > 0, ER''(a) \leq 0$. In order to capture our experimental variation we introduce the scalar M which reflects the monetary value of output, i.e. $M \cdot ER(a_i)$ is the expected monetary gross return for the manager from action a_i.

A contract $(w, \hat{a})$ is a fixed wage payment w, as well as an unenforceable request for an action $\hat{a}$. In a real world context we could think of $\hat{a}$ as an informal job description or a code of conduct. In the experiment we will interpret $\hat{a}$ as an exogenously given and commonly understood norm. Given our focus here on *changes in behavior* these details are not key to our results. While $\hat{a}$ is not binding, it serves to fix the worker's beliefs about the manager's intended generosity (since the expected utility of a contract depends on the worker's action).

The worker's inherent concern for reciprocity is measured by $\eta \in [0, +\infty)$. The worker's utility function given that he takes action a, under the contract $(\tilde{w}, \hat{a})$, is given by

$$U(\tilde{w}, a, \hat{a}) = u(\tilde{w}) - c(a) + \eta\,(u(\tilde{w}) - c(\hat{a}) - \bar{u}) \cdot M \cdot (ER(a) - \tilde{w})$$

where $\bar{u}$ is the worker's outside option in the labor market. The utility function captures, albeit in a simplistic form, the core idea of reciprocal motivation: If an individual has been treated kindly, he will want to reciprocate in kind.[9] The function consists of three parts: i) utility from the monetary wage payment $u(\tilde{w})$, ii) effort costs $c(a)$, and iii) reciprocal utility $\eta\,(u(\tilde{w}) - c(\hat{a}) - \bar{u})\, M \cdot (ER(a) - \tilde{w})$ where η measures the intensity of the reciprocal preferences.

A "generous" contract is one that provides a rent to the worker, i.e. an expected monetary utility in excess of the worker's outside option. A more generous contract will induce the worker to feel more reciprocal, which here means that he will derive greater marginal and absolute utility from the manager's profit. Assuming that the contract is generous, the worker's optimal effort choice a^* for a given contract is implicitly defined by the first order condition

$$\frac{\partial U(\tilde{w}, a, \hat{a})}{\partial a} = -c'(a^*) + \eta\,(u(\tilde{w}) - c(\hat{a}) - \bar{u})\, M \cdot ER'(a^*) = 0.$$

Applying the implicit function theorem we can derive the relevant comparative statics w.r.t. $\tilde{w}$ and M which are positive as is the cross partial w.r.t. $\tilde{w}$ and M, indicating that they are complements[10]. Note, as M and η, the concern for reciprocity, always appear together, the

[9] Rabin (1993), for simultaneous move games, and Dufwenberg and Kirchsteiger (2004) and Falk and Fischbacher (2006), for sequential games, have developed powerful and very general models of reciprocal preferences.

[10] See Appendix A for the derivations and a parameterized example.

effect of varying η is the same as the effect of varying M. The following Lemma 1 summarizes these results.

Lemma 1 (Reciprocity) *For a generous contract,* $(u(\tilde{w}) - c(\hat{a}) - \bar{u}) > 0$*, the worker's optimal action* a^* *is implicitly defined by the first order condition*

$$\frac{\partial U\left(\tilde{w}, a, \hat{a}\right)}{\partial a} = -c'(a^*) + \eta\left(u(\tilde{w}) - c(\hat{a}) - \bar{u}\right) \cdot M \cdot ER'(a^*) = 0.$$

It is increasing in $\tilde{w}$*, i.e.* $\frac{\partial a^*}{\partial \tilde{w}} > 0$*, increasing in* M*, i.e.* $\frac{\partial a^*}{\partial M} > 0$*, increasing in* η*, i.e.* $\frac{\partial a^*}{\partial \eta} > 0$*, and* $\tilde{w}$ *and* M *are complements, i.e.* $\frac{\partial^2 a^*}{\partial \tilde{w} \partial M} > 0$.

The intuition for the complementarity is fairly straightforward from the utility function. Increasing the wage leaves a larger rent to the worker and increases the weight he gives to the managers welfare. Due to the multiplicative structure, the worker finds it more attractive to work harder when he has a stronger impact on the manager's surplus.

Contrasting this with the standard model of preferences, $\eta = 0$, the first order condition simplifies to

$$\frac{\partial U\left(\tilde{w}, a, \hat{a}\right)}{\partial a} = -c'(a^*) < 0$$

which is always negative as obviously with flat wages the worker's utility unambiguously decreases in his effort choice and his optimal action $a^*_{standard}$ is trivially given by $a^*_{standard} = 0$. Increasing M or $\tilde{w}$ does have no effect on $a^*_{standard} = 0$. This is summarized in Lemma 2.

Lemma 2 (Standard Preferences) $a^*_{Standard} = 0$ *and the corresponding comparative statics are trivially given by*

$$\frac{\partial a^*_{standard}}{\partial M} = 0, \quad \frac{\partial a^*_{standard}}{\partial \tilde{w}} = 0, \quad \frac{\partial^2 a^*_{standard}}{\partial M \partial \tilde{w}} = 0.$$

Summarizing the results from our model we can formulate the following predictions that we try to validate in our experimental analysis. The first three follow directly from Lemma 1:

Prediction 1 *Effort is increasing in wage* $\tilde{w}$.

Prediction 2 *Effort is increasing in managerial payoff* M.

Prediction 3 *Managerial payoff and wage are complementary in their effect on effort,* $\frac{\partial a^{*2}}{\partial \tilde{w} \partial M} > 0$.

The next prediction is straightforward: reciprocal incentives via gift exchange work better for more reciprocally inclined subjects. In particular, low reciprocity individuals should be

Table 1: Means - Data Entry Rate (Chars/min) by Treatment

Employee Wage	Manager Bonus	Data Entry Rate			Accuraccy Corrected Rate			# of Obs.
		Mean	Median	St. Dev.	Mean	Median	St. Dev.	
\$13/hour	No	29.71	25.52	16.12	28.02	23.65	15.32	14
\$18/hour	No	23.47	19.83	11.47	21.92	19.42	10.57	15
\$13/hour	Yes	24.38	23.40	9.21	23.06	22.09	9.11	15
\$18/hour	Yes	28.36	29.25	8.42	26.72	27.48	8.24	15

The table shows the average data entry rate, measured as characters/minute (Data Entry Rate) or as correct characters/minute (Accuracy Corrected Rate), as well as the median rate and the standard deviation broken up by treatment.

unlikely to exhibit a positive response to high wages, as their utility from providing effort for the principal is very low compared to their cost of effort. High reciprocity individuals, however, are more likely to have a sufficiently strong utility benefit from returning the gift to induce effort.

Prediction 4 *The positive effort response to a wage gift or a manager bonus is more pronounced for more reciprocally inclined (higher η) subjects.*

4 Experimental Results

Our main performance measure is subjects' data entry rate, i.e. the number of characters of data entered per minute.[11] As a robustness check, in our regressions we also report the accuracy corrected data entry rate.[12] In Table 1 we present the mean and median entry rates for the whole shift. Subjects' overall productivity suggests that offering a high wage in the *No Bonus* treatments had a negative impact on effort while it had a positive effect in the *Bonus* treatments. We test this effect statistically in the analysis that follows.

[11]The Prussian Census has two volumes which differ slightly in their content, in particular in the number of cells/line and the average number of characters/cell. To control for these differences we convert the number of cells (which is our basic measure of performance) into characters entered by weighing cells with the average number of characters/cell in the respective volume. Alternatively, we can also directly control for the Volume by adding a dummy variable and keeping cells as the measure. These results are quantitatively and qualitatively similar and are available upon request.

[12]To construct this measure we repeat the exercise used to construct the data entry rate, i.e. we convert the number of correctly entered cells into characters entered by weighing cells with the average number of characters/cell in the respective volume.

Table 2: Means - Typing Score

Employee Wage	Manager Bonus	Typing Score			# of Obs.
		Mean	Median	St. Dev.	
\$13/hour	No	57,93	52,50	17,46	14
\$18/hour	No	48,80	46,00	13,97	15
\$13/hour	Yes	48,27	48,00	14,35	15
\$18/hour	Yes	56,20	53,00	16,83	15

The table shows the average Typing Score as provided by the temp agency, as well as the median rate and the standard deviation broken up by treatment.

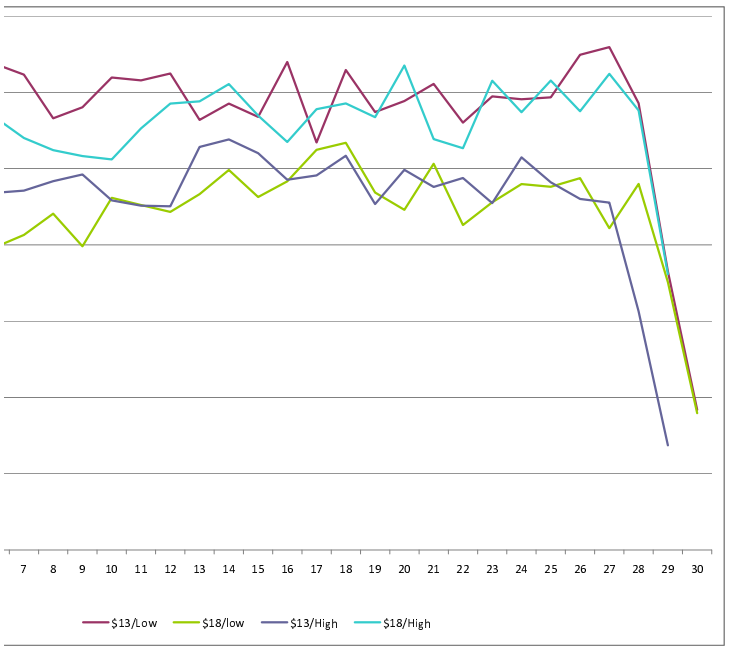
Figure 1 shows how productivity, measured in 10 minute intervals, evolves over time in the four treatment conditions. Though the levels differ, there seems to be no difference in the time trend. There is learning in all four treatments for the first hour, then productivity is fairly flat until the very end where there is a steep drop in all treatments. This drop is mostly 'technical': subjects finished a line and did not start a new one that they were unlikely to finish before the end of their shift.

As can be seen in Table 2 there are considerable differences in underlying ability (i.e. typing speed score) between treatments. Hence, a direct comparison of the overall productivity between treatments is somewhat misleading. We address this below by directly controlling for ability in our main regressions.

Regression Analysis of Treatment Effects

Our sample size in terms of participating subjects is only somewhat bigger than in previous studies, e.g. Gneezy and List (2006) or Bellemare and Shearer (2009), but importantly, our design allows us to use detailled additional information to more precisely estimate the treatment effects. Most importantly we have a measure of data entry ability from the temp agency. The agency has temp workers take a typing speed test upon hiring, and they made this information, as well as additional demographic information, available to us. Since Table 2 indicates substantial heterogeneity in the underlying ability distribution across treatments we proceed by including controls for worker ability. Additionally, we have worker productivity at 10 minute and 30 minute intervals. We will use the 10 minute data as units of observation in the paper. The results for the 30 minute data are quantitatively similar

Figure 1: Performance over Time



The y-axis shows the average data entry rates (characters/minute) by treatment for the 10min sub-periods. *$13/Low* refers to the *13$ Wage/No Bonus* treatment., *$18/Low* refers to the *18$ Wage/No Bonus* treatment, etc.

but less precisely estimated and are available upon request.[13] Table 3 presents the results of a GLS estimate with a heteroskedastic panel structure and AR(1) errors. A Wooldridge test for serial correlation finds significant autocorrelation ($p > 0.001$) while a Likelihood Ratio test suggests panel heteroskedasticity ($p < 0.001$).

The two alternate effort measures presented in specifications (1) and (2) in Table 3 give qualitatively and quantitatively very similar estimates, suggesting that the response to the treatment variations does not affect quality but only influences the quantity margin. Contrary to the fundamental gift exchange intuition, we find a significant and negative effect of the wage gift on effort and no significant effect of the manager bonus. However, the interaction *High Wage X Manager Bonus* is significantly positive and large in size, resulting in overall positive gift exchange in the *Bonus* treatment. That is, the effect of a wage gift depends importantly on the characteristics of the job context, and there is a strong

[13] Gneezy and List (2006) and Kim and Slonim (2009) use the same units of observation. Our performance measure is constructed from information when whole lines of the census were finished. These lines took several minutes to be completely entered. To smooth our data, we proceed as follows: If a line was started x minutes before the end of the n-th 10 minute subperiod and finished in the y-th minute of the (n+1)-th 10 minute subperiod, we account x/(x+y) of the characters of this line to the n-th and y/(x+y) of the characters of this line to the (n+1)-th 10 minute subperiod.

Table 3: Regression: Performance (10 min. Periods)

	(1)	(2)
VARIABLES	Data Entry Rate	Accuracy Corrected Rate
Typing Speed Test Score	0.220***	0.203***
	(0.0272)	(0.0259)
Temps Paid High Wage	-3.531***	-3.355***
	(1.118)	(1.063)
Manager Bonus	-1.526	-0.994
	(1.357)	(1.303)
High Wage X Manager Bonus	6.456***	5.824***
	(1.731)	(1.665)
Period	0.105***	0.0700**
	(0.0359)	(0.0344)
Demographic Controls	YES	YES
Constant	17.46***	11.71**
	(5.266)	(5.006)
Observations	1628	1628
Number of subject	57	57
Total Effect: High Wage & Manager Bonus	**2.925****	**2.469****
	(1.214)	(1.168)

We report cross-sectional time-series FGLS regression with heteroskedastic panel structure and AR(1) correlation. Demographic Controls include dummy variables for gender, race, age, work experience, and student status. Standard errors are reported in parentheses. Significance is denoted: *** p <0.01, ** p <0.05, * p <0.1

complementarity between the wage gift and the magnitude of the managerial payoff.[14]

Treatment Effects by Agreeableness

As we have information on workers' scores in a Big 5 personality test, we can analyze how effects vary along this dimension. In particular, we identify subjects who score highly on the trait "agreeableness", which has been shown experimentally to relate to standard lab measures of reciprocity (see Ben-Ner et al. 2004, Ashton et al. 1997).[15] As opposed to the trust game or other lab measures of reciprocity, personality tests like the Big 5 are quite common in the hiring practices of firms. In particular, high agreeableness corresponds with one of the criteria Autor and Scarborough (2008) identify in the hiring practice of the firm they study.[16]

Separating our subjects along the agreeableness (reciprocity) dimension allows us to examine whether our effects are in fact driven by the reciprocal subjects, as suggested by our model. Note that there is no correlation between our agreeableness measure and the Typing Speed Test Score (Spearmen $\rho = 0.0482$, $p = 0.7170$). Table 4 shows our basic regression analysis for the sample split into highly agreeable (strongly reciprocal; top third) and low agreeable (weakly reciprocal; bottom two thirds) workers.[17] Again, there are substantial differences in the response to the treatment variation across the agreeableness dimension. The negative response to the wage gift in the *No Bonus* treatment is driven entirely by the low agreeableness workers. Additionally, the low agreeableness workers have no overall response to the wage gift in the *Bonus* treatment. However, high agreeableness workers have a neutral response to the wage gift in the *No Bonus* treatment, and a signifiantly positive response in the *Bonus* treatment (indicated by the significant total effect reported at the bottom of Table 4.) As such, our results are consistent with our model that response to a wage gift should come primarily from reciprocal workers. What remains puzzling is the strong negative effect of the wage gift among the low agreeable subjects. We will return to

[14]Relaxing our specification by allowing for non-linear effects of ability, we estimate a specification with separate dummies for the lowest, middle and highest terciles of ability. We find very similar coefficients that can be found in Table 6 in Appendix B. Note that the results in Table 6 indeed suggest non-linear effects of ability with the middle tercile not being different from the top tercile but the bottom tercile being significantly slower.

[15]While Ben-Ner et al. (2004) and Ashton et al. (1997) also find some evidence that "openness" and "emotional stability" may relate to reciprocity as well, the relationship between reciprocity and agreeableness was most robust across specification and sample. The results in Englmaier and Leider (2009) also show this correlation.

[16]The firm gave hiring preference to applicants with positive z-scores for agreeableness, conscientiousness, and extroversion.

[17]The qualitative results are robust to using different cut offs for classifying subjects as highly agreeable.

Table 4: Regression: Performance (10 min. Periods) by Agreeableness Score

	Data Entry Rate		Accuracy Corrected Rate	
	Low Agr.	High Agr.	Low Agr.	High Agr.
VARIABLES	(1)	(2)	(3)	(4)
Typing Speed Test Score	0.226***	0.0590	0.188***	0.0770
	(0.0502)	(0.0531)	(0.0490)	(0.0500)
Temps Paid High Wage ($18/hr)	-4.142**	2.392	-4.294***	2.159
	(1.681)	(2.675)	(1.614)	(2.535)
Manager Bonus	-0.377	4.856	-0.167	4.224
	(1.799)	(3.004)	(1.745)	(2.870)
High Wage X Manager Bonus	5.380**	2.041	5.222**	1.332
	(2.495)	(2.676)	(2.408)	(2.562)
Period	0.0819*	0.134**	0.0522	0.0898*
	(0.0433)	(0.0553)	(0.0419)	(0.0527)
Demographic Controls	YES	YES	YES	YES
Constant	16.94**	67.05***	12.65*	58.30***
	(7.113)	(14.76)	(6.775)	(13.93)
Observations	1059	569	1059	569
Number of subject	37	20	37	20
Total Effect: High Wage & Manager Bonus	**1.237**	**4.433****	**0.927**	**3.491***
	(1.598)	(2.165)	(1.560)	(2.058)

Highly Agreeable subjects are those with an agreeableness score in the top 33%. We report cross-sectional time-series FGLS regression with heteroskedastic panel structure and AR(1) correlation. Demographic Controls include dummy variables for gender, race, age, work experience, and student status. Standard errors are reported in parentheses. Significance is denoted: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

this topic in Section 5.

Treatment Effects over Time

Finally, we consider the question of how productivity evolves over time. As Gneezy and List (2006) document a fast disappearing gift exchange pattern, we are in particular interested in how the effects of the treatment variations evolve over the course of the experiment. We split our data into first and second half observations and report in Table 5 the base regressions

separately. Again, the qualitative results are robust to different divisions of the data.[18] For both treatments the effect of a wage gift has in fact a *more positive* effect in the second half of the experiment. The negative response to the wage in the *No Bonus* treatment only exists in the first half, disappearing in the second half. Similarly, the positive effect in the *Bonus* treatment is present only in the second half of the experiment. However, the strong complementarity between the instruments, *High Wage X Manager Bonus*, is very stable over time. This suggests that the positive response to gift exchange does not have to be a short-lived phenomenon.

5 Discussion of Results

Previous field experiments studying gift exchange in the field have a variety of job situations (e.g. one-time jobs vs. ongoing jobs), job tasks (e.g. data entry, fund raising, and tree planting) and worker pools (e.g. students vs. full-time employees). Our results suggest that it may not be surprising that the observed effect of surprise wage increases varies across the studies. We demonstrate that a positive gift exchange can exist, but that its presence depends on the characteristics of the job - therefore we should not expect gift exchange to be present in all job settings. In particular, the results from our field study suggest that the extent to which the manager will directly benefit when subordinates produce high output plays an important role for the efficacy of reciprocity and gift exchange in the field. We therefore anticipate that gift exchange should be most prominent in settings where managers have a strong direct benefit from employee effort, e.g. if they have performance-based monetary incentives.

The negative effect on effort in our *No Bonus* treatment is admittedly puzzling. It is possible that absent an indication that high effort is important to the manager the surprise high wage appears wasteful. Subjects might interpret the out-of-context wage increase as a mistake on our side, casting doubt on our managerial aptitude. From this they might have downwards updated also our ability or willingness to "monitor their work". Indicating that the manager has incentives related to output may put the decision to offer a higher wage into context and avoid this negative updating on aptitude.[19]

While we did not *ex ante* predict that the effect of a gift would get stronger over time, a few explanations are possible. First, we observe some level of learning in all treatments. It may take some time before workers learn their cost of effort, which determine how willing they are to exert effort to provide a return gift to the principal. Additionally, perhaps gift exchange

[18] E.g., performing an hourly based analysis gives similar results.

[19] Moreover, Englmaier and Leider (2009) also find a negative response to a wage gift for low productivity workers in their real effort lab experiment.

Table 5: Regression: Performance (10 min. Periods) by 1st/2nd half

	Data Entry Rate		Accuracy Corrected Rate	
	1st Half	2nd Half	1st Half	2nd Half
VARIABLES	(1)	(2)	(3)	(4)
Typing Speed Test Score	0.216***	0.258***	0.200***	0.241***
	(0.0320)	(0.0360)	(0.0299)	(0.0341)
Temps Paid High Wage ($18/hr)	-4.795***	-1.527	-4.319***	-1.581
	(1.226)	(1.521)	(1.183)	(1.423)
Manager Bonus	-0.572	-1.249	-0.429	-0.460
	(1.407)	(1.856)	(1.371)	(1.778)
High Wage X Manager Bonus	5.249***	5.406**	4.823***	4.531**
	(1.902)	(2.334)	(1.823)	(2.237)
Period	0.578***	-0.372***	0.532***	-0.430***
	(0.0656)	(0.0984)	(0.0630)	(0.0930)
Demographic Controls	YES	YES	YES	YES
Constant	15.91***	25.27***	10.67*	17.19**
	(5.914)	(7.458)	(5.673)	(7.022)
Observations	855	773	855	773
Number of subject	57	57	57	57
Total Effect: High Wage & Manager Bonus	**0.453**	**3.878****	**0.504**	**2.949***
	(1.324)	(1.623)	(1.287)	(1.537)

We report cross-sectional time-series FGLS regression with heteroskedastic panel structure and AR(1) correlation. Demographic Controls include dummy variables for gender, race, age, work experience, and student status. Standard errors are reported in parentheses. Significance is denoted: *** p <0.01, ** p <0.05, * p <0.1

raises productivity by increasing persistence, rather than maximal effort. As previously mentioned, we see no treatment effect on quality, suggesting that workers need not improve on all dimensions of effort. Lastly workers may have been waiting to see if another surprise was coming before completely determining their effort level.

As in previous experiments, we do not find that the increase in worker wages "pays for itself" in increased productivity - the 40% increase in wage only garnered a 10% increase in productivity. However, we were using completely flat wages to pay the workers. The theoretical model in Englmaier and Leider (2011) suggests that the level of reciprocity needed to induce effort under a flat wage is generally larger than the amount of reciprocity that can reduce agency costs when paired with explicit monetary incentives. A flat wage is generically far from the optimal contract, and so it is quite possible that this level of reciprocity could be much more powerfully leveraged with a more sophisticated incentive scheme. Bellemare and Shearer (2007) find that a fixed gift of \$80 (40% of earnings) on top of the standard piece rate increased productivity by an amount worth \$40. As in our study the size of the gift was chosen arbitrarily, hence fine tuning the mix of gifts and explicit incentives is likely to be critical.

6 Conclusion

The importance of fairness and social preferences especially for the work relation has long been documented in the lab. However, a number of recent studies have highlighted that the empirical importance of reciprocity as a motivating force in the field crucially depends on details of the environment. The wage gift has to stand in the proper context to unfold a motivating effect. Based on a principal-agent model of reciprocal motivation we argue that a key determinant of the efficiency of reciprocal motivation is the ability of an agent to repay a gift, i.e. the benefit accruing to the principal from high effort.

Our results confirm the importance of the specific characteristics of the job setting in generating gift exchange-based incentives. If the manager stands to benefit much from additional effort there is a strong positive effort response while in the absence of the managerial benefit we find no or even a negative response to the wage gift. This indicates a strong complementarity between the wage gift and the managerial payoff in generating incentives for employee effort. Additionally, we find that the positive response to high wages comes primarily from high reciprocity workers (as identified by a personality test), while the negative response comes from low reciprocity workers. We find no weakening of positive responses to wage gifts over time. To the contrary, any negative effects of the wage gift disappear in the later stages of the task and we find an overall strongly positive effect of our treatment manipula-

tions.

Our study indicates that employing agents' reciprocity as a part of a firms personnel policy is a viable alternative and can be successfully done. However, as highlighted by e.g. Ichniowski and Shaw (2003) or Bartling et al. (2011), it is important that various complementary parts of the firms compensation and HR policy are coordinated to maximize the effect of reciprocity. For example, firms wishing to employ reciprocal incentives may want to select for reciprocal motivations during hiring. An interesting implication of our study is that performance related pay for middle management should be part of a remuneration policy even absent moral hazard problems on that hierarchy level.

Our results suggest several avenues for future research. Further empirical work could identify the optimal magnitude of the gift and the proper mix between reciprocal and explicit motivation to maximize the profitability of gift exchange. Similarly, other experiments could examine other characteristics of the work setting that determine the effectiveness of reciprocity-based incentives.

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A Derivations

A.1 Comparative Statics

Assuming that the contract is generous, the worker's optimal effort choice a^* for a given contract is implicitly defined by the first order condition

$$\frac{\partial U\left(\tilde{w}, a, \hat{a}\right)}{\partial a} = -c'(a^*) + \eta\left(u(\tilde{w}) - c(\hat{a}) - \bar{u}\right) M \cdot ER'(a^*) = 0.$$

Applying the implicit function theorem we can derive the relevant comparative statics w.r.t. $\tilde{w}$ and M:

$$\begin{aligned}
\frac{\partial^2 U\left(\tilde{w}, a, \hat{a}\right)}{\partial a^2} &= -c''(a^*) + \eta\left(u(\tilde{w}) - c(\hat{a}) - \bar{u}\right) M \cdot ER''(a^*) < 0 \\
\frac{\partial^2 U\left(\tilde{w}, a, \hat{a}\right)}{\partial a \partial M} &= \eta\left(u(\tilde{w}) - c(\hat{a}) - \bar{u}\right) ER'(a^*) > 0 \\
\frac{\partial^2 U\left(\tilde{w}, a, \hat{a}\right)}{\partial a \partial \tilde{w}} &= \eta M \cdot u'(\tilde{w}) \cdot ER''(a^*) > 0
\end{aligned}$$

Hence it follows that

$$\frac{\partial a^*}{\partial M} = -\frac{\frac{\partial^2 U(\tilde{w}, a, \hat{a})}{\partial a \partial M}}{\frac{\partial^2 U(\tilde{w}, a, \hat{a})}{\partial a^2}} > 0, \qquad \frac{\partial a^*}{\partial \tilde{w}} = -\frac{\frac{\partial^2 U(\tilde{w}, a, \hat{a})}{\partial a \partial \tilde{w}}}{\frac{\partial^2 U(\tilde{w}, a, \hat{a})}{\partial a^2}} > 0, \qquad \text{and} \qquad \frac{\partial^2 a^*}{\partial M \partial w} > 0.$$

A.2 A simple Example

To provide a concrete example assume that

$$ER(a) = a, \qquad u(\tilde{w}) = \tilde{w}, \qquad \text{and} \qquad c(a) = \frac{a^2}{2}.$$

Then the worker's utility can be written as

$$U\left(\tilde{w}, a, \hat{a}\right) = \tilde{w} - \frac{a^2}{2} + \eta\left(\tilde{w} - \frac{\hat{a}^2}{2} - \bar{u}\right) M\left(a - \tilde{w}\right),$$

the first order condition is given by

$$-a + \eta\left(\tilde{w} - \frac{\hat{a}^2}{2} - \bar{u}\right) M = 0,$$

and can be rearranged to explicitly define a^*

$$a^* = \eta\left(\tilde{w} - \frac{\hat{a}^2}{2} - \bar{u}\right) M.$$

Now taking explicit derivatives gives

$$\frac{\partial a^*}{\partial M} = \eta\left(\tilde{w} - \frac{\hat{a}^2}{2} - \bar{u}\right) > 0, \qquad \frac{\partial a^*}{\partial \tilde{w}} = \eta M > 0, \qquad \text{and} \qquad \frac{\partial^2 a^*}{\partial M \partial \tilde{w}} = \eta > 0.$$

B Additional Tables

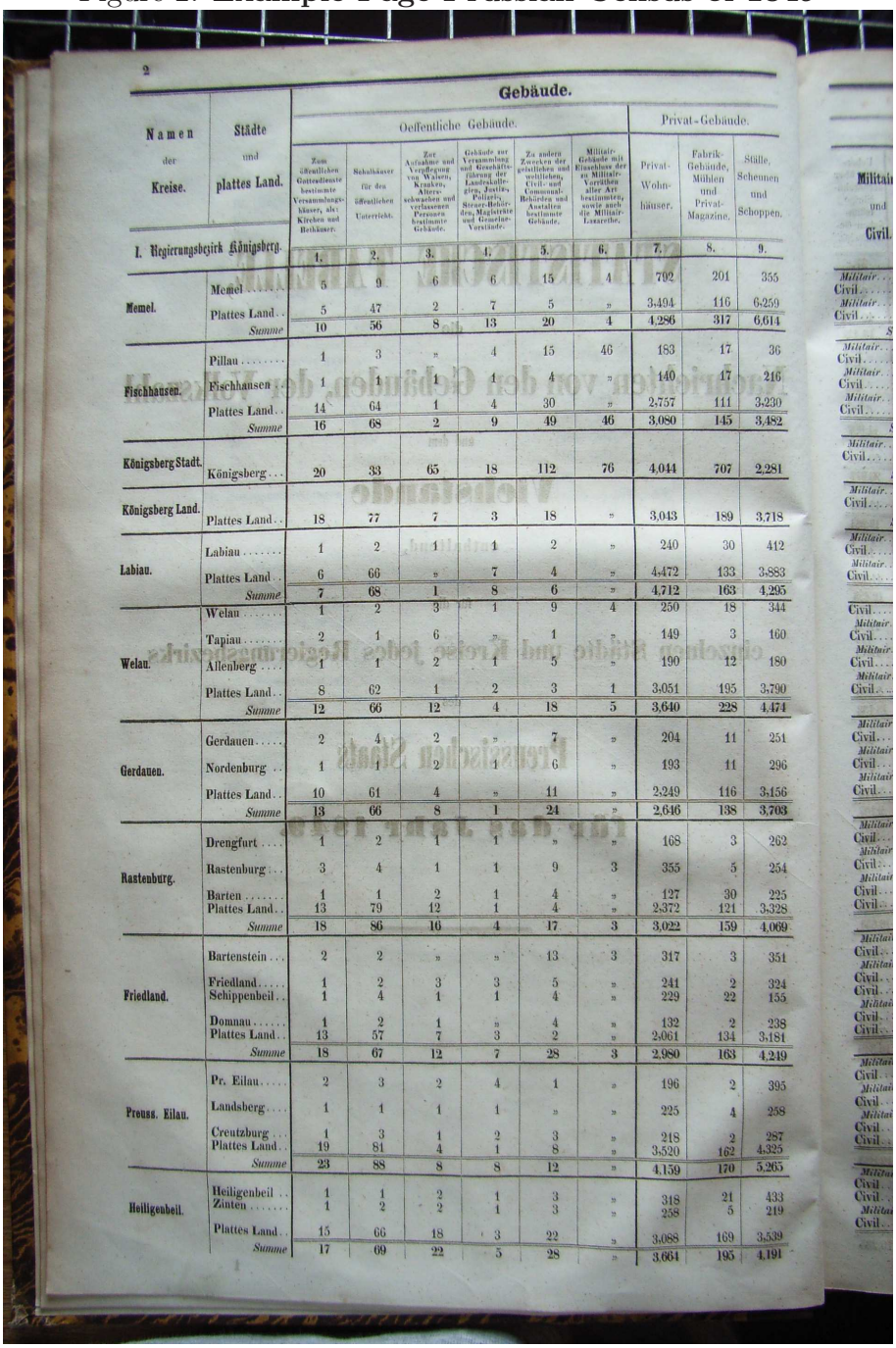
Table 6: Regression: Performance (10 min. Periods) incl. Ability Dummies

	(1)	(2)
VARIABLES	Data Entry Rate	Accuracy Corrected Rate
Slowest Third	-5.451***	-4.836***
	(0.987)	(0.945)
Fastest Third	-0.407	-0.191
	(1.075)	(1.038)
Temps Paid High Wage	-3.541***	-3.324***
	(1.131)	(1.074)
Manager Bonus	-2.506*	-1.875
	(1.340)	(1.294)
High Wage X Manager Bonus	7.853***	7.048***
	(1.700)	(1.633)
Period	0.122***	0.0867**
	(0.0369)	(0.0354)
Demographic Controls	YES	YES
Constant	15.94***	10.35**
	(5.488)	(5.236)
Observations	1628	1628
Number of subject	57	57
Total Effect: High Wage & Manager Bonus	**4.312*** **	**3.724** **
	(1.215)	(1.177)

We report cross-sectional time-series FGLS regression with heteroskedastic panel structure and panel-specific AR(1) correlation. Demographic Controls include dummy variables for gender, race, age, work experience, and student status. Standard errors are reported in parentheses. Significance is denoted: *** p <0.01, ** p <0.05, * p <0.1

C Additional Material

Figure 2: **Example Page Prussian Census of 1849**



2

Namen der Kreise.	Städte und plattes Land.	Gebäude. Oeffentliche Gebäude. Zum öffentlichen Gottesdienste bestimmte Versammlungshäuser, als: Kirchen und Bethäuser.	Schulhäuser für den öffentlichen Unterricht.	Zur Aufnahme und Verpflegung von Waisen, Kranken, Alters- schwachen und verlassenen Personen bestimmte Gebäude.	Gebäude zur Versammlung und Geschäftsführung der Landräthlichen, Justiz-, Polizei-, Steuer-Behörden, Magistrate und Gemeinde-Vorstände.	Zu andern Zwecken der gesellschaftlichen und wohlthätigen, Civil- und Communal-Behörden und Anstalten bestimmte Gebäude.	Militair-Gebäude mit Einschluss der zu Militair-Vorräthen aller Art bestimmten, sowie auch die Militair-Lazarethe.	Privat-Gebäude. Privat-Wohnhäuser.	Fabrik-Gebäude, Mühlen und Privat-Magazine.	Ställe, Scheunen und Schoppen.
I. Regierungsbezirk Königsberg.		1.	2.	3.	4.	5.	6.	7.	8.	9.
Memel.	Memel	5	9	6	6	15	4	792	201	355
	Plattes Land	5	47	2	7	5	»	3,494	116	6,259
	Summe	10	56	8	13	20	4	4,286	317	6,614
Fischhausen.	Pillau	1	3	»	4	15	46	183	17	36
	Fischhausen	1	1	1	1	4	»	140	17	216
	Plattes Land	14	64	1	4	30	»	2,757	111	3,230
	Summe	16	68	2	9	49	46	3,080	145	3,482
Königsberg Stadt.	Königsberg	20	33	65	18	112	76	4,044	707	2,281
Königsberg Land.	Plattes Land	18	77	7	3	18	»	3,043	189	3,718
Labiau.	Labiau	1	2	1	1	2	»	240	30	412
	Plattes Land	6	66	»	7	4	»	4,472	133	3,883
	Summe	7	68	1	8	6	»	4,712	163	4,295
Welau.	Welau	1	2	3	1	9	4	250	18	344
	Tapiau	2	1	6	»	1	»	149	3	160
	Allenberg	1	1	2	1	5	»	190	12	180
	Plattes Land	8	62	1	2	3	1	3,051	195	3,790
	Summe	12	66	12	4	18	5	3,640	228	4,474
Gerdauen.	Gerdauen	2	4	2	»	7	»	204	11	251
	Nordenburg	1	1	2	1	6	»	193	11	296
	Plattes Land	10	61	4	»	11	»	2,249	116	3,156
	Summe	13	66	8	1	24	»	2,646	138	3,703
Rastenburg.	Drengfurt	1	2	1	1	»	»	168	3	262
	Rastenburg	3	4	1	1	9	3	355	5	254
	Barten	1	1	2	1	4	»	127	30	225
	Plattes Land	13	79	12	1	4	»	2,372	121	3,328
	Summe	18	86	16	4	17	3	3,022	159	4,069
Friedland.	Bartenstein	2	2	»	»	13	3	317	3	351
	Friedland	1	2	3	3	5	»	241	2	324
	Schippenbeil	1	4	1	1	4	»	229	22	155
	Domnau	1	2	1	»	4	»	132	2	238
	Plattes Land	13	57	7	3	2	»	2,061	134	3,181
	Summe	18	67	12	7	28	3	2,980	163	4,249
Preuss. Eilau.	Pr. Eilau	2	3	2	4	1	»	196	2	395
	Landsberg	1	1	1	1	»	»	225	4	258
	Creutzburg	1	3	1	2	3	»	218	2	287
	Plattes Land	19	81	4	1	8	»	3,520	162	4,325
	Summe	23	88	8	8	12	»	4,159	170	5,265
Heiligenbeil.	Heiligenbeil	1	1	2	1	3	»	348	21	433
	Zinten	1	2	2	1	3	»	258	5	219
	Plattes Land	15	66	18	3	22	»	3,088	169	3,539
	Summe	17	69	22	5	28	»	3,664	195	4,191