The Hidden Cost of Training*

Lea M. Petters†

This version: July 1, 2019

Abstract

Firms invest in training to increase the skills and, through this, the productivity of their employees. We argue that because of the increased productivity potential, employees hold higher fair wage expectations after receiving training. We present evidence from an employer-employees matched dataset documenting the positive relationship of training participation and employees' wage expectations. Consistent with the field data, we find in a laboratory experiment that receiving training increases employees' fair wage perceptions. If the actual wage thereby falls below what is considered fair, employees reduce their effort levels. Our results indicate that fairness concerns could alleviate the positive productivity effects of training and thus lead to lower human capital investments by firms.

Keywords: Human capital, training, fairness, wages, gift exchange
JEL Classification: C91, J24, J31, M52, M53

*This study is registered in the AEA RCT Registry and can be found under: AEARCTR-0002711. We thank the Center for Social and Economic Behavior (C-SEB) through the C-SEB Junior Start-up Grant and the German Research Foundation (DFG) through priority program SPP 1764 (SL 46/2-1) and the research unit "Design and Behavior – Economic Engineering of Firms and Markets" (FOR 1371) for financial support. We thank the audience at the C-SEB workshop 2018, Lenzerheide Winter School 2018 and research seminars at the University of Cologne, Monash University and the Düsseldorf Institute for Competition Economics (DICE) as well as especially Dirk Sliwka, Andreas Leibbrandt, Matthias Heinz, Marina Schröder and Florian Englmaier for helpful comments and suggestions. We thank Ruth Neeßen for excellent support in programming and conducting the experiment.

†University of Cologne, Seminar of Personnel Economics and Human Resource Management; Albertus-Magnus-Platz, 50923 Köln, email: lea.petters@uni-koeln.de.

"Human capital itself is not enough in order to make workers productive, because skills are embodied in humans."

Jörn-Steffen Pischke (2005)

1 Introduction

Skilled labor is an important driver of innovation and thus economic growth (Lucas 1988; Black and Lynch 1996; Fernald and Jones 2014). Especially in developed economies, tasks are becoming more skill intensive (Acemoglu and Pischke 1999; Autor and Handel 2013). One way for employers to boost labor productivity is to invest in training to enhance the individual's skill set, i.e., human capital, and thereby increase the productivity potential of the respective employee (Becker 1962). A recently published training industry report surveying a representative sample of organizations with 100 or more employees in the United States, finds that training expenditures increased to a total of 90.6 billion US Dollars (*Training Industry Report* 2017). OECD (2011) estimates that an individual spends on average 715 hours in job-related non-formal education over the course of a working life.

Previous research has tried to pin down the returns of training both for the employer in form of productivity gains, and for the employee in form of higher wages. However, as training can take many different forms and is mostly a result of non-exogenous processes, estimating its effects poses an ambitious research endeavour (Pischke 2005; Heckman 2000). Thus, it is not surprising that depending on the estimation strategy and the specific dataset, the estimated training effects vary widely (see Bassanini et al. 2007, for an overview). With respect to the productivity effect of training, the literature is relatively scarce since productivity is inherently hard to measure and often not comparable across different organizations. Therefore, this strand of literature mostly relies on firm-level data and estimates productivity gains ranging between 5% and 20% (e.g. Mincer 1962; Holzer et al. 1993; Dearden, Reed, and Van Reenen 2000; De Grip and Sauermann 2011; Adhvaryu, Kala, and Nyshadham 2018). With respect to the effect of training on wages, the literature finds very high effect sizes as well as insignificant and close to zero effects (e.g. Lynch 1992; Booth 1993; Veum 1995; Blundell et al. 1999; Parent 1999; Pischke 2001; Frazis and Loewenstein 2005). However, selection bias and the resulting heterogeneity between trained and untrained workers might lead to overestimating the training effects. Those studies with cleaner identification strategies consistently find lower effect sizes (e.g. Blundell et al. 1999; Leuven and Oosterbeek 2004; Leuven and Oosterbeek 2008; Adhvaryu, Kala, and Nyshadham 2018).

In this paper, we formalize a theoretical framework that acknowledges the fact that the production function of human labor is more complex compared to other input factors as it might be subject to behavioral responses to the environment. We argue that, additional to the effect of training on the skill level of an

employee (Becker 1964), training might also affect wage expectations of the respective employee.[1] In other words, training increases the "fair wage" as coined by Akerlof and Yellen (1990). According to their fair wage-effort hypothesis, the employee evaluates his actual wage against this "fair wage", which if below results in a feeling of being underpaid and unfairly treated. To compensate for this perceived loss, Akerlof and Yellen (1990) predict a reduction of employee's effort. When we understand labor productivity as a function of skills and effort, and apply our argument based on the fair wage-effort hypothesis, training can, ceteris paribus, generate two effects affecting productivity in different directions: a direct positive effect on skills, and an indirect negative effect on effort, which works through a shift in wage expectations. However, which of the two countervailing effects of training dominates, ulimately poses an empirical question. Additionally, the specific size of the two effects might vary between individuals and with the specific environment in which training is provided.

We use field and experimental data to study the relationship between training participation and fair wage expectations as well as the behavioral consequences following from this. First, we use an extensive matched employer-employee dataset on vocational training from Germany to provide first evidence on the positive relationship between training participation and wage expectations. Second, in order to explore the different behavioral channels, we develop a novel experimental design which allows us to induce our treatment variations in a controlled environment and to specifically measure the variables of interest. We apply an employer-employee gift-exchange setting, in which employees work for a fixed wage on a real-effort decoding task for the benefit of the employer. In a two-by-two design we exogenously assign training and wage increases and measure how employees respond with respect to measures for the fair wage, effort and overall productivity. The experimental results strengthen the hypothesized relationship between training participation and higher fair wage expectations. Furthermore, we find that training can be ineffective in increasing overall productivity. Even though training increases the skills and thus productivity potential in our experiment, the employee's potential might not be realized because of lower efforts on the intensive and extensive margin. Additional analyses of heterogenous effects suggest that fairness considerations are the driving mechanism for this result.

Numerous studies have emphasized the importance of fairness in economic decision making in general (e.g. Kahneman, Knetsch, and Thaler 1986; G. E. Bolton and Ockenfels 2000; Fehr and Schmidt 1999) and reciprocal behavior in particular (see Fehr, Goette, and Zehnder 2009, for an overview). Mas (2006) for example presents field evidence from police officers in New Jersey showing that the distance from the subjective fair wage affects police performance. Ockenfels, Sliwka, and Werner (2014) find similar results for managers in a large

[1] Our proposed mechanism is in line with the findings by G. Bolton and Werner (2016), who show that higher productivity leads to higher entitlements and thus wage demands (also compare Gächter and Riedl 2005). Similarly we argue that the increase in skills related to training might come along with a feeling of being entitled to a higher wage which results in adapted wage expectations.

company when bonus payments fall short of expectations. While Cohn, Fehr, and Goette (2015) show in a field experiment that only workers that felt underpaid before react with increased efforts after having received a pay raise. The results obtained by Abeler et al. (2010) in a laboratory study imply that only equity-based wages related to individual productivity are being perceived as fair. If this fairness norm is violated by paying equal wages, they observe substantially lower efforts. Similarly, Breza, Kaur, and Shamdasani (2018) show in a field experiment with Indian manufacturing workers that pay disparity among a group of seemingly similar co-workers results in lower output, higher absenteeism and lower group cohesion. This effect vanishes once these differences in wages are justified by differences in productivity.

This project contributes to the existing literature in several ways. We present a theoretical framework as well as empirical evidence, using both field and experimental data, for a behavioral mechanism that might impair the returns to training. In particular, we show that skill enhancing training leads to higher wages being perceived as fair, which if not paid accordingly results in a reduction of effort. Therefore, efficiency gains related to training might not necessarily translate into higher productivity. As a result, the effectiveness of training might be underestimated by firms and institutions and thus lead to lower training investments.

The remainder of the paper is structured as follows. In Section 2, we introduce the theoretical framework and derive our research hypotheses. Section 3 presents evidence from field data on the relationship between training participation and future wage expectations. In the following section, we introduce our experimental design and show the results. Section 5 discusses the presented evidence, and Section 6 concludes.

2 Theoretical Framework and Hypotheses

To illustrate the main idea, we develop a theoretical framework which includes training as an additional factor in the productivity of labor function. We model productivity of labor Y_L as a function of effort e and skills s: $Y_L = F(e, s)$ which is increasing in both arguments, i.e. $\frac{\partial Y_L}{\partial e} > 0$ and $\frac{\partial Y_L}{\partial s} > 0$. Training then serves as a mean to increase the current skill level of the trained employee, i.e. $s(t)$ with $\frac{\partial s}{\partial t} > 0$.

In line with the fair wage-effort-hypothesis as stated by Akerlof and Yellen (1990), we model effort as a function of the wage w relative to some fair wage w^*. The wage which is considered as fair, however, might as well depend on the acquired skill level as it is directly related to the employee's productivity potential, i.e. $w^*(s(t))$ with $\frac{\partial w^*}{\partial s} > 0$. Hypothesis 1 follows.

Hypothesis 1: Training participation increases expectations towards a fair wage.

Following Akerlof and Yellen (1990), we assume that $e = min(\frac{w}{w^*(s(t))}, 1)$ with $\frac{\partial e}{\partial w} \geq 0, \frac{\partial e}{\partial w^*} \leq 0$. Thus, if the actual wage falls below the fair wage, effort is

adjusted accordingly and only a fraction of "normal effort" (normalized to 1) is provided. Given Hypothesis 1, our model also predicts a negative effort response related to training participation (if the actual wage lies below what would be considered fair).

Hypothesis 2: Training participation decreases effort provision.

As in the standard model, our model integrates a gift-exchange setting and thus predicts that a higher wage evokes more reciprocal behavior by the employee in the form of increased effort (in case "nomal effort" was not yet provided).

Hypothesis 3: A higher wage increases effort provision.

When training is combined with a higher wage, the effect on effort is ambiguous since both affect effort provision in different directions.

Integrating the adapted skill and effort functions, we can derive a productivity of labor which takes training as an additional argument:

$$Y_L = F(e(min(\frac{w}{w^*(s(t))}, 1)), s(t))$$

This revised productivity of labor function indicates that training has two potentially countervailing effects. On the one hand, training has a direct effect on skills, which in turn should positively affect overall productivity of labor, i.e. $\frac{\partial F}{\partial s}\frac{\partial s}{\partial t} > 0$. On the other hand, training has an effect on the fair wage, which indirectly affects productivity of labor negatively through its effect on effort, i.e. $\frac{\partial F}{\partial e}\frac{\partial e}{\partial w^*}\frac{\partial w^*}{\partial s}\frac{\partial s}{\partial t} \leq 0$.

In a first step, we study the relationship between training and wage expectations (Hypothesis 1) using an extensive field dataset. This hypothesis constitutes the core novelty of our approach and serves as the underlying assumption for our revised version of the productivity of labor function. In a next step, we test all hypotheses derived from our theoretical framework (Hypotheses 1-3) in a laboratory experiment. The experimental setting allows us to exogenously assign trainig and wages and to investigate the specific mechanisms with respect to skills, effort and overall productivity in a controlled environment.

3 Evidence from Field Data

We begin by presenting evidence of the relationship between training participation and future wage expectations based on a linked employer-employee survey dataset. We use the German dataset WeLL (Further training as a part of lifelong learning), which was collected by the Research Data Centre of the Federal Employment Agency at the Institute for Employment Research (FDZ) in four consecutive years from 2007 to 2010. The questionnaire specifically focuses on employees' training activities (see Bender et al. 2009, for detailed information on the dataset). Furthermore, we link this dataset to administrative records of the Institute for Employment Research (IAB) to be able to control for observed

wages, employment experience and tenure.[2] We limit the sample to full-time workers covered by social security, for whom we have information on all variables used in our estimations. This leaves us with a total of 2,274 employees employed in 143 different establishments[3] and a total of 3,592 observations.

The main outcome variable to address the first part of our research question relates to the survey question: *"Assuming you are employed in 12 months from now. What is the minimum/maximum monthly income (taxes and social security contritbutions already deducted), you will earn in total given your current assessment?"*. The mean of the minimum and the maximum monthly expected income stated in this questions serves as our proxy for fair wage expectations. General training participation is captured with the following survey question: *"Did you particpate in any seminars, lectures, courses or trainings of professional development within the time span of January [previous year] through today?"*.

To account for the potential unobserved heterogeneity between the group of trained and untrained employees and thus potentially biased estimates, we create an alternative control group following previous approaches in the training literature (e.g. Leuven and Oosterbeek 2008; Dietz and Zwick 2016). We use the information of already scheduled training activities that have been cancelled because of reasons beyond the employees' control, i.e. cancellations by the organizer or because of a job at work with high priority. With this, we address the selection bias into training by using a control group which intended to participate in training, but was not able to because of exogenous reasons. Table 5 in Appendix A provides summary statistics for all variables used in our estimations.

To analyze the relationship between wage expectations and training participation, we regress expected monthly income in Euros on a training dummy, which constitutes our main explanatory variable (see Table 1). The dummy variable equals one if the employee participated in training and zero if the employee had scheduled a training but could not participate because of exogenous reasons. We estimate our results using ordinary least squares regressions. In specification (1), we only include year fixed effects to control for the economic situation in that year. Specification (2) additionally controls for employee characteristics, which capture age, education, occupational status, firm tenure and labor market experience. We follow a lagged dependent variable approach in specification (3) and include mean expected monthly income in Euros in the previous year as an additional variable, in order to control for unobserved fac-

[2]Data access was provided via on-site use at the Research Data Centre (FDZ) of the German Federal Employment Agency (BA) at the GESIS – Leibniz Institute for the Social Sciences as well as remote data access.

[3]The sample selection followed a two-step procedure. First, the sample of establishments was drawn from the IAB Establishment Panel and stratified according to establishment size, sector, location, further training activities and investment activities. Second, a sample of employees where drawn from the total of employees employed in these establishments. Therefore, the sample is not representative of German establishments in general, but for the purpose of studying in-firm further training activities focuses on establishments which support employee training.

tors which might affect wage expectations such as, for example, general career aspirations. Specification (4) additionally includes establishment characteristics and establishment fixed effects.

Table 1 gives an overview of the regression results. In specification (1), we find a highly significant and sizeable positive relationship between training participation and expected monthly income. Employees who have been trained in the previous year on average expect to earn a monthly income which is around 300 Euros higher compared to employees in our control group. Specification (2), however, shows that even though we apply the restriction of exogenous non-participation in already scheduled training to the control group, the two groups still differ with respect to individual characteristics. When we include individual controls, the coefficient substantially drops, but remains highly statistically significant. Including the wage expectations from the previous year as an additional control reduces the estimated coefficient further to around 51 Euros (compare specification (3)). Also in the last specification, which contains establishment fixed effects, we find a significant effect of training participation on the expected monthly income. The average difference in expected earnings between training participants and exogenous non-participants estimated in specification (4) amounts to around 53 Euros. Given that employees in the dataset on average stated an expected monthly income of around 2,434 Euros, this equals an expected increased pay of 2.2% following training participation.

In line with our hypothesis, we find that employees adjust their expectations about future earnings when they participated in training. Thus, the field results provide empirical support for Hypothesis 1.

Table 1: Training and wage expectations

Dependent variable: Mean expected monthly income in Euros	(1)	(2)	(3)	(4)
Training	299.890***	115.846***	50.948**	53.300**
	(49.591)	(39.322)	(23.928)	(25.330)
Lagged mean expected monthly income in Euros			0.672***	0.624***
			(0.126)	(0.136)
Constant	2,167.732***	-462.113	-89.300	-279.803
	(49.833)	(420.094)	(191.392)	(262.775)
Employee controls	No	Yes	Yes	Yes
Establishment controls & FE	No	No	No	Yes
Observations	3,592	3,592	3,592	3,592
# of clusters	2,274	2,274	2,274	2,274
R-squared	0.009	0.364	0.719	0.736

Notes: Linear regression with robust standard errors clustered on individuals in parentheses. All specifications include year fixed effects. Employee controls include: gender, age, age (squared), secondary education, occupational status, tenure, tenure (squared), labor market experience, labor market experience (squared). Establishment controls include: establishment location (east/west), establishment size, industry.
***p<0.01, **p<0.05, *p<0.1.

4 Experimental Evidence

While our results from the WeLL dataset provide support for the prediction that training participation affects fair wage expectations, factors such as the great variety of contents and types of trainings and the potentially very different reasons behind training participation (career incentives, outside options, new job requirements, job security) could bias our estimates from field data. Even though we use an alternative control group of exogenous non-participants to address selection into training, we can not fully eliminate any potential endogeneity concerns. Additionally, to test all of our research hypotheses related to the specific behavioral mechanisms behind training participation, we need reliable and comparable productivity measures with respect to the task addressed within the training, as well as measures for skills and effort. Therefore, we designed a laboratory experiment in which we, as a first step, aim to replicate our results from the field and, as a second step, test the hypothesized mechanisms in a controlled environment.

4.1 Experimental Setup

We introduce a novel experimental design to study the causal effect of training participation on the perceived fair wage and its consequences for effort and final productivity outcomes in a gift-exchange setting. In the experiment, we exogenously vary whether an employee (i) participates in a skill-enhancing training and whether he (ii) receives a wage increase afterwards. In addition to productivity measures, we elicit a measure of the norm with respect to fair wages in order to be able to analyze whether this is the relevant channel for the hypothesized effects.

The experiment consists of five incentivized parts and a questionnaire after the conclusion of the experiment. Upon arrival, participants are randomly seated and receive general instructions about the experiment (see Appendix D for the experimental instructions), which are also read aloud by the experimenter. In order to make sure that the general conditions of the experiment are well understood, participants have to pass a number of control questions before being able to start the main part of the experiment. The experiment is framed as an employer-employee setting in which four employees are matched to one employer. Employees are paid a fixed wage and asked to work on a real-effort decoding task which benefits the employer. The employer only plays a limited role in the experiment, however, she is the one who implements our treatment variations by determining which two of the four employees are trained and which two of the four employees receive a wage increase.

The chronological structure of the experiment is as follows (see Figure 1 for an overview of the general structure of the experiment). Employees start with working for ten minutes on the real-effort task (first working phase). Subsequently, the first fair wage norm elicitation takes place. At the same time, the employer determines whether the respective employee will participate in training or can enjoy free time and use the internet for ten minutes. After the conclusion

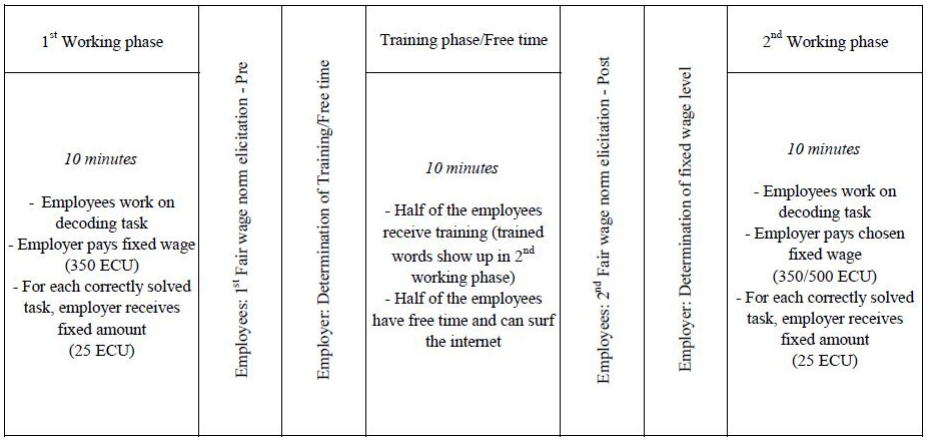


Figure 1: Experimental structure

of this phase, the second fair wage norm elicitation takes place. Again, simultaneously the employer determines the respective wage levels. Following this, the employees are informed about their wage for the second working phase and the second working phase starts, which again lasts for ten minutes.

The experiment was conducted in February and June 2018 at the Cologne Laboratory for Economic Research (CLER). A total of 480 subjects (96 employers and 384 employees) took part in 16 experimental sessions. During the experiment, earnings were denoted in experimental currency units (ECU) and only converted into Euros at the end of the experiment (exchange rate: 100 ECU = 1 Euro). Average earnings for participation in the experiment amounted to 17.70 Euros for an approximate total duration of 75 minutes. Participants were recruited through the online recruitment software ORSEE (Greiner 2015) and the experiment was programmed using Java and oTree software (Chen, Schonger, and Wickens 2016).

4.1.1 Real-Effort Decoding Task

In each of the two working phases, employees work for ten minutes on a real-effort decoding task similar to the encoding task used by Erkal, Gangadharan, and Nikiforakis (2011). Employees are given a seven-digit sequence of numbers and a decoding table that enables them to decode the sequence into a meaningful word. For an examplary screen see Figure 2, which shows the seven-digit sequence of 26 29 6 11 20 5. Given the decoding table in the lower part of the screen, we find that 26 = S, 29 = T, 6 = A, 11 = I, 20 = O, and 5 = N, and can derive that the corresponding word is "station". All employees are presented the same sequences of numbers and decoding tables in the same predefined order. Once a word is correctly decoded and the solution is sent, the next screen with a new decoding task appears. For each working phase the employees receive a fixed wage, which amounts to 350 ECU in the first working phase, and 350 ECU

or 500 ECU respectively in the second working phase. At the same time the employer receives 25 ECU for each correctly decoded word by her employees. Employees are informed at all times of their respective fixed wage for the current working phase, the number of correctly decoded words and the resulting payoff they generated for their respective employer (see Figure 2). It is common information that neither the employer nor the employees receive information about the (other) employees' performance at any point in the experiment. Therefore, we can rule out any social comparison or reputation effects as an explanation of our treatment effects. Since the experiment resembles a gift-exchange setting, the employees can freely choose how much time they spend on working on the task itself and how much time they take for each task during the working phases of 10 minutes. But in any case they have to sit in front of the screen and are required not to engage in any other unrelated activities, such as using their phone or reading.

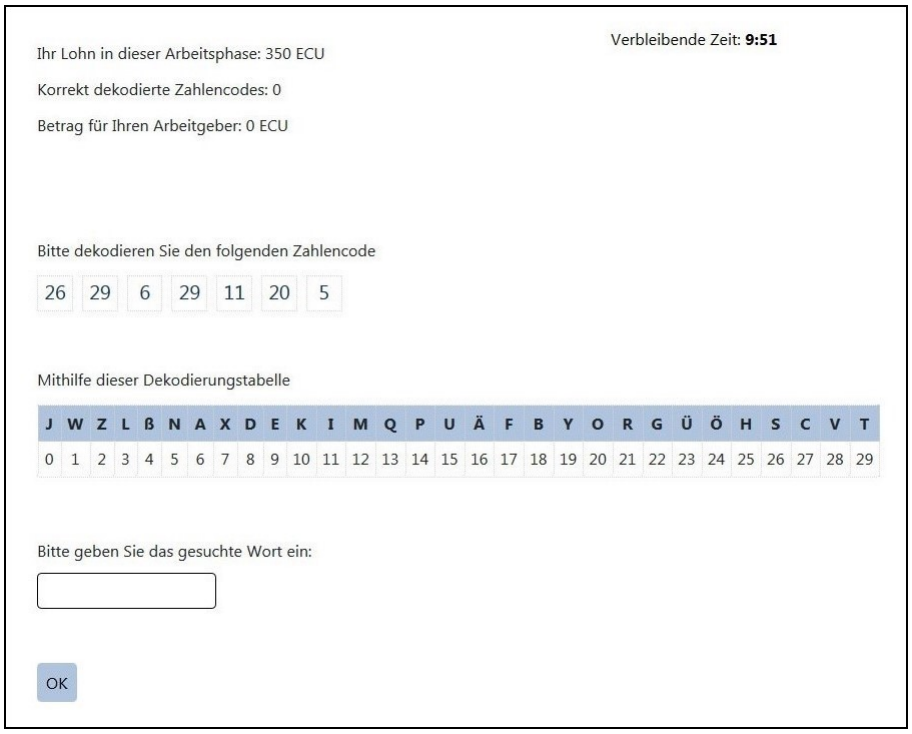


Figure 2: Screenshot real-effort decoding task

4.1.2 Fair Wage Norm Elicitation

We use a mechanism adapted from Krupka and Weber (2013) to elicit the social norm with respect to the fair wage. We ask employees for their expected fairness response of comparable employees, i.e. employees that have passed through

the same phases as they did. For this, employees have to rate each of the respective wage levels for the second working phase on a scale of "very unfair", "somewhat unfair", "somewhat fair" to "very fair" (see Figure 4 in Appendix D for an exemplary screen). This fairness measurement is elicited for 16 different wage levels between "less than 50 ECU " and "more than 700 ECU". We use the wage level at which employees change their evaluation from "somewhat fair" to "very fair" as a proxy for the fair wage in our later analyses.[4] The elicitation is incentivized with a small additional bonus of 50 ECU that employees receive if they correctly stated the modal fairness response for a randomly chosen wage level.[5] We elicit this measure twice. The first elicitation takes place after the first working phase is concluded. Given that our randomization into treatments worked, we should not find any differences between the different treatments. Therefore, the first measurement mainly serves as an additional control variable to reduce noise as it is highly correlated with the second elicitation. The second elicitation takes place after the training phase is concluded and before the wage for the second working phase is announced.

4.1.3 Training/Free Time

Between the two working phases, employees either participated in a training phase (called "trained employees" in the following) or enjoyed free time in which they were given the possibility to surf the internet (called "untrained employees" in the following). In the training phase, employees were shown similar screens as before, but in this phase a short animation showed them the decoding of the numbers into letters up to the point where the correct solution was visible (see Figure 5 in Appendix D for an exemplary screen). Then the animation stopped and employees were asked to type in the correct word themselves. If this was not done within 15 seconds, the next screen with a new task was shown. It was common information for employees that took part in the training phase, that every second decoding task in the second working phase will consist of a task that was already practiced in the training phase. Since the solutions to the decoding tasks were actual words, trained employees should be able to remember those words and therefore decode the respective words faster. Thus, the training should enable the trained employees to decode more words in the second working phase compared to untrained employees.

[4] This means that we potentially lack this measurement for agents that never evaluated any wage level as "very fair". However using alternative measures as robustness checks, e.g. the mean fairness evaluation or the wage level that was first considered as "somewhat fair", does not change the results.

[5] While the social norm with respect to the fair wage offers the convenience of being incentivizable, it might at the same time be only a noisy measure for the individual fairness perception. To account for this, we also elicited the non-incentivized version in a pilot study (N=21) and found that both measures are highly correlated (Pearson-correlation: 0.66, $p<0.01$). Therefore, we henceforth use the social norm as a proxy for individual fairness perceptions.

4.1.4 Treatments

Our treatment variations consist of whether an employee participates in training and whether he receives a wage increase in the second working phase (which is only announced after the second fair wage norm elicitation) (see Figure 3 for an overview). Unlike in most experimental studies, our treatments take place simultaneously within one session and the assignment of employees to treatment groups is implemented over the course of the experiment (see Figure 1 for the chronological structure of the experiment). Both the training decision as well as the decision on the wage level for the second working phase are determined by the employer. As the employer has no information about the performance or any other characteristics of her employees and can only choose between two (for her) arbitrary options, i.e. giving training to employee 1 and 2 or employee 3 and 4 and giving a wage increase to employee 1 and 3 or employee 2 and 4, the treatments are exogenous. Hence, treatments are randomly assigned while at the same time the chosen procedure ensures that subjects in the role of the employees perceive that employers have an impact on their training participation and wages.

Figure 3 summarizes the four different treatments and the number of independent observations from employees[6], which form the data basis for the following analysis. Treatment group T0 forms our control group, which receives no training and no wage increase in the second working phase, i.e. 350 ECU as in the first working phase. Employees in treatment group T1 receive no training, but a wage increase in the second working phase, i.e. 500 ECU, while in treatment group T2 they receive training, but no wage increase in the second working phase, i.e. 350 ECU as in the first working phase. Finally, when in treatment group T3, employees receive both training and a wage increase in the second working phase, i.e. 500 ECU.

After the experiment is concluded, subjects in the role of employees are paid their respective wages for both working phases as well as any additional bonuses resulting from the fair wage norm elicitations. Only one of the two working phases is randomly chosen for the payout of subjects in the role of the employer in order to avoid employees hedging working efforts between the two working phases. On top of their generated payments, all subjects receive a show-up fee for participation in the experiment.

4.2 Results

In this section, we present evidence from our experimental data to test the predictions from our theoretical framework. First, we focus on the effect of training participation on fair wage expectations (Hypothesis 1). Second, we study the effect of training and wages on our measure of effort (Hypotheses 2 and 3). In our analyses, we additionally study the role of fairness perceptions by analyzing

[6] Nine observations had to be discarded because of technical problems during the experiment.

	No Wage Increase	Wage Increase
No Training	**T0** No Training & No Wage Increase N=93	**T1** No Training & Wage Increase N=95
Training	**T2** Training & No Wage Increase N=94	**T3** Training & Wage Increase N=93

Figure 3: Treatments

heterogenous effects on subgroups with different fair wage expectations. Finally, we analyze how training participation affects realized productivity.

4.2.1 Fair Wage Norm (Hypothesis 1)

We use the elicited fair wage norm as a proxy for fair wage expectations. Descriptively we find that untrained employees report on average a fair wage norm of about 482 ECU for the second working phase (see Table 7 in Appendix F for the complete summary statistics). Trained employees state a significantly higher level of 530 ECU as fair ($p<0.01$, Mann-Whitney test, two-sided). In Table 2 we present the corresponding regression analysis with the fair wage norm as elicited in the second elicitation as the dependent variable and a training dummy as the independent variable. At the point of the second fair wage norm elicitation our treatment variations with respect to wages have not become effective yet, which is why we group both treatments with training (T2 and T3) together and compare them against the baseline of no training (T0 and T1). In specification (1) we only control for the fair wage norm as elicited before the training or free time respectively, specification (2) includes additional control variables such as session fixed effects, gender and measures for envy, competitiveness, guilt and reciprocity as elicited from the post-experimental questionnaire.

We find that employees that received the training state a significantly higher fair wage norm, which exceeds that of untrained employees by around 50 ECU, i.e. 10%. The result is robust to including additional control variables.

Result 1: Trained employees state significantly higher fair wage expectations compared to untrained employees.

The findings support the conjecture that an increased productivity potential

as a result of skill-enhancing training[7] comes along with higher expectations of what consitutes a fair wage.[8] Therefore, the results we found in our field data can also be replicated in a laboratory setting which provides further evidence in favor of Hypothesis 1.

Table 2: Fair wage norm

Dependent variable:		
Fair wage norm	(1)	(2)
Training	47.934***	49.237***
	(13.069)	(13.045)
Fair wage norm - pre training/free time	0.788***	0.779***
	(0.053)	(0.061)
Constant	58.852**	71.389
	(29.521)	(43.787)
Additional controls	No	Yes
Observations	356	352
R-squared	0.379	0.403

Notes: Linear ordinary least squares regression with robust standard errors in parentheses. Additional control variables include: session fixed effects, gender, questionnaire measures for envy, competitiveness, guilt, and reciprocity. ***p<0.01, **p<0.05, *p<0.1.

4.2.2 Time Invested (Hypotheses 2 and 3)

We analyze the time invested as a proxy for effort on the extensive margin. Since time working on the task is not contracted in our experimental setting, employees can freely choose for how long they are willing to work on the task within the time frame of ten minutes. Table 3 shows a linear regression with the time

[7] See Table 8 in Appendix G for the effect of training on the time needed to correctly decode a word as a proxy for skills. While, to some extent, this measure also captures effort on the intensive margin, our training intervention constitutes a skill shock only for those words that have been shown in the previous training phase. We find that those employees that received training (T2 and T3) are significantly faster in decoding the trained words. However, only for employees that received a wage increase in addition to training (T3), this also leads to an overall decrease in average decoding time.

[8] Given the previous literature on entitlements related to higher productivity potential (e.g. G. Bolton and Werner 2016; Gächter and Riedl 2005) and the salience of the productivity effect of our training intervention (i.e. the words shown in the training are known to appear in the second working phase again), we focus on this channel. However, we acknowledge that additional factors, such as the (perceived) investment of time and effort within the training, might play a role as well by affecting the size of the former effect. We find suggestive evidence for this relationship. For example, it seems to be of relevance how enjoyable agents found the training. Those who reported to have enjoyed participating in the training more, stated a significantly lower fair wage norm after the training compared to agents who did not enjoy the training to the same extent ($p<0.1$, t-test, two-sided).

invested, i.e. the point in time at which the respective employee decoded his last word, as the dependent variable and dummies for each treatment group as independent variables. We also control for the time invested in the first working phase. As before, we show specifications without and with additional controls for the fair wage norm as elicited before the training/free time, session fixed effects, gender and measures for envy, competitiveness, guilt and reciprocity as elicited from the post-experimental questionnaire. In specification (1) and (2), we analyze all employees in one model. According to the theoretical framework, however, effort provision is determined by whether the wage falls below what is perceived as fair or not. For this reason, we additionally analyze heterogenous effects of our treatment interventions by splitting the sample into subgroups of employees that stated a fair wage norm below or equal to 500 ECU (specifications (3) and (4)) and employees that stated a fair wage norm of above 500 ECU (specifications (5) and (6)). 500 ECU corresponds to the wage level employees were paid when they received a wage increase.[9]

Overall (specifications (1) and (2)), we only find suggestive evidence ($p<0.15$, t-test, two-sided) for a negative effect of training on the time invested for the group of employees who only received training (T2). These employees reduce the time invested to work on the task by around 0.4 minutes (24 seconds), which is significantly less compared to employees that did not receive training but a wage increase (T1) ($p<0.05/0.07$, Wald test, two-sided). We do not find any significant effects for employees that received only a wage increase (T1), nor for employees that received training combined with a wage increase (T3). When we, however, split the sample according to whether the stated fair wage norm lies below (or is equal to) or above 500 ECU, we find strong heterogeneities between the two groups.

For the group of employees who stated a fair wage norm below or equal to 500 ECU (specification (3) and (4)), we find no significant negative effects of training on effort provision. A wage increase that pays a wage that the respective employee stated as fair (T1), seems to have a (weakly) positive effect on effort provision.

When we, however, focus on the group of employees that are paid below what they stated as fair, a wage increase (T1) has no significant on the time invested to work on the task. With respect to training, we find a significant negative effect on effort provision - even when employees received a wage increase (T2 and T3). In both treatments employees significantly reduce the time invested to work on the task by around 0.7 minutes (42 seconds).[10]

[9] We split the sample by this fixed cutoff of 500 ECU (instead of using whether the actual wage falls below the stated fair wage norm) in order to create a more comparable control group (i.e. employees that perceive 350 ECU as fair might be inherently different (e.g. very altruistic) to employees that perceive 500 ECU as fair). Additionally, with this we divide the data into more similar subgroups with respect to sample size. The alternative specifications, however, provide qualitatively similar results (see Appendix G).

[10] These results are also similar to findings reported in Sauermann (2019). In the field experiment with agents in a call center, trained agents increase their performance on a single task, i.e. the handling time of a customer call. However, at the same time they significantly decrease the number of hours worked and show a higher number of absence days. These

Result 2: Only if employees are paid below what they perceive as fair, training reduces effort provision.

Our results show that our predicted effects highly depend on whether the respective employee perceives the paid wage as fair. For employees that stated a fair wage norm below or equal to 500 ECU only, we find suggestive evidence for a positive effort effect of a wage increase as outlined in Hypothesis 3. For this group, we also do not find any negative effort response to training. However, for the group of employees with a fair wage norm above 500 ECU, which means they fall below their fair wage in all treatments, we find a negative effect of training on effort provision, which provides support for Hypothesis 2.

results, while interpreted in a different manner, are in line with the theoretical framework and experimental results presented in this paper.

Table 3: Time invested

Dependent variable:	All		Fair wage norm $\leq$ 500 ECU		Fair wage norm $>$ 500 ECU	
Time invested (min.)	(1)	(2)	(3)	(4)	(5)	(6)
T1 - No Training & Wage Increase	0.118	0.021	0.458*	0.447	-0.274	-0.419
	(0.201)	(0.198)	(0.267)	(0.295)	(0.268)	(0.301)
T2 - Training & No Wage Increase	-0.362	-0.410	-0.126	-0.226	-0.655*	-0.685*
	(0.249)	(0.250)	(0.316)	(0.269)	(0.371)	(0.403)
T3 - Training & Wage Increase	-0.222	-0.290	0.274	0.319	-0.659**	-0.717**
	(0.231)	(0.241)	(0.271)	(0.286)	(0.326)	(0.333)
Time invested (min.) 1st working phase	0.862***	0.863***	0.742***	0.772***	0.930***	0.935***
	(0.096)	(0.095)	(0.192)	(0.183)	(0.100)	(0.101)
Constant	1.161	0.575	2.168	1.955	0.712	-0.014
	(0.927)	(1.124)	(1.845)	(1.685)	(1.018)	(1.536)
Additional controls	No	Yes	No	Yes	No	Yes
Observations	375	370	174	172	201	198
R-squared	0.472	0.490	0.441	0.501	0.497	0.519

Notes: Linear ordinary least squares regression with robust standard errors in parentheses. Additional control variables include:
Fair wage norm - pre training/free time, session fixed effects, gender, questionnaire measures for envy, competitiveness, guilt, and reciprocity.
Specifications (1) and (2) include all employees, specifications (3) and (4) the subgroup of employees that stated a fair wage norm $\leq$500 ECU,
and specifications (5) and (6) the subgroup of employees that stated a fair wage norm $>$ 500 ECU. ***p<0.01, **p<0.05, *p<0.1.

4.2.3 Decoded Words

In this section, we study the effect of training and wage increase on the overall productivity of labor. In the context of our experimental task, the number of decoded words constitutes our measure of productivity. As before, we use a linear regression analysis with the number of decoded words in the second working phase as the dependent variable and treatment group dummies as independent variables. Since the number of decoded words in the first working phase is highly predictive of the number of words decoded in the second working phase, we control for this in all specifications. As in the previous analyses, we include further control variables such as the fair wage norm elicited before the training/free time, session fixed effects, gender and measures for envy, competitiveness, guilt and reciprocity as elicited from the post-experimental questionnaire in a second stage. Again, we first analyze all observations in one model (specification (1) and (2)), and then study potential heterogenous effects by splitting the sample into employees that state a fair wage norm below (or equal to) 500 ECU (specification (3) and (4)) and above 500 ECU (specification (5) and (6)). Table 4 gives an overview of the results.

Overall, we find that both treatment groups that received a wage increase, i.e. T1 and T3, are significantly more productive compared to the baseline group T0, which neither participated in training, nor received a wage increase. These employees decode on average 1.6 (1.7) and 1.9 (2.0) respectively more compared to the baseline. This corresponds to an overall productivity increase of 6.1% (6.4%) and 7.2% (7.6%). Training alone (T2), however, does not lead to a significant increase in the number of decoded words. Also, the difference in productivity between T1 and T3 is not statistically significant ($p>0.74$, Wald test, two-tailed).

Once we split the sample, we find that the overall positive productivity effects are solely driven by the group of employees which state a fair wage norm below or equal to 500 ECU (specification (3) and (4)). In this group, we find that employees who receive a wage increase only (T1) decode on average 2.5 (2.7) words more, which amounts to an increase of 9.5% (10.2%) compared to the baseline. Additionally, we find suggestive evidence that, for this group, also training alone (T2) has a positive productivity effect, showing that trained employees on average decode 2.3 (1.7) words more, which corresponds to a productivity increase of about 8.7% (6.4%) compared to the baseline. For employees who received training combined with a wage increase that pays a wage they consider as fair (T3), the positive productivity effect is especially pronounced. This group decodes on average 4.0 (4.4) words more compared to the baseline, which constitutes an increase in productivity of 15.2% (16.7%). Additionally, we find suggestive evidence that the combination of training with a wage increase is also more effective than either training or a wage increase alone ($p<0.19$ for comparison T1 and T3 and $p<0.07$ for comparison T2 and T3, Wald test, two-tailed).

For employees that are paid below what they stated as a fair wage norm, we do not find any significant productivity effects of the wage increase, the training,

nor the combination of both (specification (5) and (6)).[11]

Result 3: Only if employees perceive their wage as fair, training also leads to higher productivity.

We interpret the findings as follows. It seems that the distance between the perceived fair wage and the actual wage is of high importance for determining whether or not the respective employee is willing to release his productivity potential. If this gap is (almost) closed, both higher wages and training are effective means to increase productivity. Paying a higher wage targets the effort channel of labor productivity by evoking reciprocal behavior on the side of the employee. Training an employee focuses on the skill channel of productivity of labor as it increases the employee's productivity potential. By paying a wage that is perceived as fair (even after being trained), the employer can prevent a negative effort response and thus effectively increase productivity through the skill channel. When, however, the employee's pay falls below what he perceives as fair, neither training nor higher wages are effective for increasing labor productivity.

[11] Even though we also find a training effect with respect to the decoding time of trained words for this group of employees (see Table 9 in Appendix G).

Table 4: Decoded words

Dependent variable:	All		Fair wage norm $\leq$ 500 ECU		Fair wage norm $>$ 500 ECU	
# decoded words	(1)	(2)	(3)	(4)	(5)	(6)
T1 - No Training & Wage Increase	1.613**	1.699**	2.508**	2.653**	0.504	0.875
	(0.794)	(0.817)	(1.054)	(1.172)	(1.202)	(1.381)
T2 - Training & No Wage Increase	0.558	0.583	2.253*	1.685	-1.007	-1.111
	(0.956)	(0.959)	(1.205)	(1.236)	(1.485)	(1.580)
T3 - Training & Wage Increase	1.850**	1.960**	4.018***	4.376***	0.132	0.110
	(0.851)	(0.872)	(1.091)	(1.174)	(1.296)	(1.323)
# decoded words 1st working phase	1.094***	1.073***	1.043***	1.106***	1.136***	1.166***
	(0.045)	(0.052)	(0.087)	(0.093)	(0.048)	(0.060)
Constant	1.657	4.024	2.476	10.821**	1.195	2.698
	(1.184)	(3.199)	(2.294)	(4.836)	(1.305)	(4.488)
Additional controls	No	Yes	No	Yes	No	Yes
Observations	375	364	174	170	201	194
R-squared	0.652	0.670	0.639	0.682	0.673	0.687

Notes: Linear ordinary least squares regression with robust standard errors in parentheses. Additional control variables include:
Fair wage norm - pre training/free time, session fixed effects, gender, questionnaire measures for envy, competitiveness, guilt, and reciprocity.
Specifications (1) and (2) include all employees, specifications (3) and (4) the subgroup of employees that stated a fair wage norm $\leq$500 ECU,
and specifications (5) and (6) the subgroup of employees that stated a fair wage norm $>$ 500 ECU. ***p<0.01, **p<0.05, *p<0.1.

5 Conclusion

Much research has been devoted to examining the effect of training on productivity and wages. We add to this literature by challenging the approach to consider the two effects independently from each other. Instead, we propose an additional behavioral mechanism according to which the wage the employee considers fair is shifted as a response to training. In turn, these increased wage expectations might affect the productivity enhancing effect of training if the higher productivity potential is not compensated appropriately.

We find support for the hypothesized relationship between training participation and fair wage expectations both in field and laboratory settings. Additionally, our experimental results give insight into the specific behavioral mechanisms following training participation. While training can be effective in increasing the skills and thus productivity potential of an employee, our results indicate that this does not translate into productivity gains per se. Instead, a reduction of the time invested in working on the task, i.e. effort on the extensive margin, hinders the realization of the full productivity potential.[12] Only when combined with a wage increase that is considered fair will higher skills also lead to higher productivity.

It seems that, as suggested by the theoretical framework, only when the gap between the fair wage and the actual wage is closed, the employee is willing to release his productivity potential. Otherwise the increased skills might be substituted for effort. This implies that employers who want to effectively turn training investments into higher productivity, need to let their employees participate in the gains from training in a way that agents perceive as fair. Previous literature on the relationship between training and wages, as presented in Section 1, however suggests that employees in many cases benefit from training, i.e. increased wages, only to a very limited extent. Thus, firms might not be aware of the relationship between training and wage expectations. Not sharing the potential gains could leave a significant fraction of output potential in an economy untapped.

Our research adds an important behavioral factor to the cost-benefit analysis of firms and institutions when deciding whether or not to invest in training. We find empirical evidence for a trade-off between an increased skill level and higher wage demands, which can lead to subsequent negative effort responses. Therefore, returns on investment for firms might be lower than expected and in turn might lead to lower human capital investments by firms.

[12] Withdrawing effort can take various forms in the work environment. Similar to what we observe in our experiment, employees could increase shirking by, for example, taking longer breaks, distracting themselves with private affairs or slacking off when doing their work tasks. An increased efficiency resulting from higher skills also allows employees to finish their regular workload faster and thus to work less overtime and leave the office earlier. This would therefore be another way to recoup their share of the gains from training and would not result in a productivity gain per se.

References

Abeler, Johannes et al. (2010). "Gift Exchange and Workers' Fairness Concerns: When Equality Is Unfair". In: *Journal of the European Economic Association* 8.6, pp. 1299–1324.

Acemoglu, Daron and Jörn-Steffen Pischke (1999). "Beyond Becker: Training in Imperfect Labour Markets". In: *The Economic Journal* 109, pp. 112–143.

Adhvaryu, Achyuta, Namrata Kala, and Anant Nyshadham (2018). "The Skills to Pay the Bills: Returns to On-the-job Soft Skills Training". NBER Working Paper No. 24313.

Akerlof, George A. and Janet L. Yellen (1990). "The Fair Wage-Effort Hypothesis and Unemployment". In: *The Quarterly Journal of Economics* 105.2, pp. 255–283.

Autor, David H. and Michael J. Handel (2013). "Putting Tasks to the Test: Human Capital, Job Tasks, and Wages". In: *Journal of Labor Economics* 31.S1, S59–S96.

Bassanini, Andrea et al. (2007). "Workplace Training in Europe". IZA Discussion Paper No. 1640.

Becker, Gary S. (1962). "Investment in Human Capital: A Theoretical Analysis". In: *Journal of Political Economy* 70.5, pp. 9–49.

— (1964). *Human Capital: A Theoretical and Empirical Analysis, with special Reference to Education*. New York: National Bureau of Economic Research.

Bender, Stefan et al. (2009). "WeLL - Unique linked employer-employee data on further training in Germany". In: *Schmollers Jahrbuch. Zeitschrift für Wirtschafts- und Sozialwissenschaften* Jg. 129.H. 4, pp. 637–643.

Black, Sandra E. and Lisa M. Lynch (1996). "Human-Capital Investments and Productivity". In: *The American Economic Review* 86.2, pp. 263–267.

Blundell, Richard et al. (1999). "Human Capital Investment: The Returns from Education and Training to the Individual, the Firm and the Economy". In: *Fiscal Studies* 20.1, pp. 1–23.

Bolton, Gary E. and Axel Ockenfels (2000). "ERC: A theory of equity, reciprocity, and competition". In: *American Economic Review* 90.1, pp. 166–193.

Bolton, Gary and Peter Werner (2016). "The influence of potential on wages and effort". In: *Experimental Economics* 19.3, pp. 535–561.

Booth, Alison L. (1993). "Private Sector Training and Graduate Earnings". In: *The Review of Economics and Statistics* 53, pp. 281–294.

Breza, Emily, Supreet Kaur, and Yogita Shamdasani (2018). "The Morale Effects of Pay Inequality". In: *The Quarterly Journal of Economics* 133.2, pp. 611–663.

Chen, Daniel L., Martin Schonger, and Chris Wickens (2016). "oTree - An open-source platform for laboratory, online, and field experiments". In: *Journal of Behavioral and Experimental Finance* 9, pp. 88–97.

Cohn, Alain, Ernst Fehr, and Lorenz Goette (2015). "Fair Wages and Effort Provision: Combining Evidence from a Choice Experiment and a Field Experiment". In: *Management Science* 61.8, pp. 1777–1794.

De Grip, Andries and Jan Sauermann (2011). "The Effects of Training on Own and Co-Worker Productivity: Evidence from a Field Experiment". In: *The Economic Journal* 122.560, pp. 376–399.

Dearden, Lorraine, Howard Reed, and John Van Reenen (2000). "Who gains when workers train? Training and corporate productivity in a panel of British industries". The Institute for Fiscal Studies Working Paper No. 00/04.

Dietz, Daniel and Thomas Zwick (2016). "The Retention Effect of Training â Portability, Visibility, and Credibility". Centre for European Economic Research Discussion Paper No. 16-011.

Erkal, Nisvan, Lata Gangadharan, and Nikos Nikiforakis (2011). "Relative earnings and giving in a real-effort experiment". In: *American Economic Review* 101.7, pp. 3330–3348.

Fehr, Ernst, Lorenz Goette, and Christian Zehnder (2009). "A Behavioral Account of the Labor Market: The Role of Fairness Concerns". In: *Annual Review of Economics* 1.1, pp. 355–384.

Fehr, Ernst and Klaus Schmidt (1999). "A theory of fairness, competition, and cooperation". In: *The quarterly journal of economics* 114.3, pp. 817–868.

Fernald, John G. and Charles I. Jones (2014). "The Future of US Economic Growth". In: *American Economic Review: Papers & Proceedings* 104.5, pp. 44–49.

Frazis, Harley and Mark A. Loewenstein (2005). "Reexamining the Returns to Training: Functional Form , Magnitude , and Interpretation". In: *Journal of Human Resources* 40.2, pp. 453–476.

Gächter, Simon and Arno Riedl (2005). "Moral Property Rights in Bargaining with Infeasible Claims". In: *Management Science* 51.2, pp. 249–263.

Greiner, Ben (2015). "Subject pool recruitment procedures: organizing experiments with ORSEE". In: *Journal of the Economic Science Association* 1, pp. 114–125.

Heckman, James J. (2000). "Policies to foster human capital". In: *Research in Economics* 54.1, pp. 1–48.

Holzer, Harry J. et al. (1993). "Are Training Subsidies for Firms Effective? The Michigan Experience". In: *Industrial and Labor Relations Review* 46.4, pp. 625–636.

Kahneman, Daniel, Jack L. Knetsch, and Richard Thaler (1986). "Fairness as a constraint on profit seeking: Entitlements in the market". In: *American Economic Review* 76.4, pp. 728–741.

Krupka, Erin L. and Roberto A. Weber (2013). "Identifying social norms using coordination games: Why does dictator game sharing vary?" In: *Journal of the European Economic Association* 11.3, pp. 495–524.

Leuven, Edwin and Hessel Oosterbeek (2004). "Evaluating the Effect of Tax Deductions on Training". In: *Journal of Labor Economics* 22.2, pp. 461–488.

— (2008). "An Alternative Approach to Estimate the Wage Returns to Private-Sector Training". In: *Journal of Applied Econometrics* 23.4, pp. 423–434.

Lucas, Robert E. (1988). "On the Mechanics of Economic Development". In: *Journal of Monetary Economics* 22.1, pp. 3–42.

Lynch, Lisa M. (1992). "Private-Sector Training and the Earnings of Young Workers". In: *The American Economic Review* 82.1, pp. 299–312.
Mas, Alexandre (2006). "Pay, Reference Points, and Police Performance". In: *Quarterly Journal of Economics* 121.3, pp. 783–821.
Mincer, Jacob (1962). "On-the-Job Training: Costs, Returns, and Some Implications". In: *Journal of Political Economy* 70.5, pp. 50–79.
Ockenfels, Axel, Dirk Sliwka, and Peter Werner (2014). "Bonus payments and reference point violations". In: *Management Science* 61.7, pp. 1496–1513.
OECD (2011). *Education at a Glance 2011: OECD Indicators*.
Parent, Daniel (1999). "Wages and Mobility: The Impact of Employer Provided Training". In: *Journal of Labor Economics* 17.2, pp. 298–317.
Pischke, Jörn-Steffen (2001). "Continuous training in Germany". In: *Journal of Population Economics* 14.3, pp. 523–548.
— (2005). *Comments on "Workplace Training in Europe" by Bassanini et al.*
Sauermann, Jan (2019). "Worker Reciprocity and the Returns to Training: Evidence from a Field Experiment".
Training Magazine (2017). *Training Industry Report*.
Veum, Jonathan R. (1995). "Sources of Training and Their Impact on Wages". In: *Industrial and Labor Relations Review* 48.4, pp. 812–826.

Appendices

Appendix A: Summary Statistics WeLL

Table 5: Summary statistics WeLL

	All		Training participants		Ex. non-participants	
	Mean	SD	Mean	SD	Mean	SD
Mean expected monthly income in Euros	2,434	1,196	2,482	1,215	2,185	1,062
Monthly income in Euros	2,631	844	2,671	832	2,425	872
Age	46	9.33	45.9	9.33	46.7	9.33
Female (1/0)	0.27	0.44	0.27	0.45	0.22	0.41
Secondary Education:						
Certificate of Secondary Education (1/0)	0.15	0.36	0.13	0.34	0.25	0.44
General Cert. of Secondary Education (1/0)	0.40	0.49	0.40	0.49	0.41	0.49
Adv. Technical College Entrance Qual. (1/0)	0.43	0.50	0.45	0.50	0.32	0.47
Other (1/0)	0.02	0.13	0.02	0.13	-	-
Occupational status:						
Low-skilled worker (1/0)	0.11	0.31	0.09	0.29	0.20	0.40
Skilled worker (1/0)	0.21	0.41	0.20	0.40	0.28	0.45
Master craftsman (1/0)	0.03	0.16	0.03	0.16	-	-
Clerical worker (1/0)	0.66	0.48	0.69	0.46	0.49	0.50
Tenure (years)	14.2	8.56	14.1	8.58	14.6	8.43
Labor market experience (years)	19.4	8.05	19.3	8.07	20.1	7.94
Establishment located in East Germany (1/0)	0.42	0.49	0.42	0.49	0.38	0.49
Establishment size:						
100 - 199 employees	0.13	0.34	0.12	0.33	0.19	0.39
200 - 499 employees	0.24	0.43	0.23	0.42	0.27	0.45
500 - 1,999 employees	0.63	0.48	0.64	0.48	0.53	0.50
Industry:						
Manufacturing (1/0)	0.52	0.50	0.49	0.50	0.69	0.46
Service (1/0)	0.48	0.50	0.51	0.50	0.31	0.46
N	3,592		3,010		582	

Appendix B: Additional Regressions WeLL

Table 6: Training and wage expectations (alternative specification)

Dependent variable: Mean expected monthly income in Euros	(1)	(2)	(3)	(4)
Training	303.569***	92.953***	35.83	47.858*
	(38.157)	(29.745)	(26.091)	(27.203)
Lagged monthly income in Euros			0.858***	0.911***
			(0.038)	(0.055)
Constant	1,988.295***	-930.362***	272.693	744.345**
	(38.986)	(294.628)	(233.398)	(310.076)
Employee controls	No	Yes	Yes	Yes
Establishment controls & FE	No	No	No	Yes
Observations	7,681	7,681	7,681	7,681
# of clusters	4,322	4,322	4,322	4,322
R-squared	0.009	0.323	0.490	0.521

Notes: Linear regression with robust standard errors clustered on individuals in parentheses. All specifications include year fixed effects. Employee controls include: gender, age, age (squared), secondary education, occupational status, tenure, tenure (squared), labor market experience, labor market experience (squared). Establishment controls include: establishment location (east/west), establishment size, industry. ***p<0.01, **p<0.05, *p<0.1.

Appendix C: Experimental Instructions

Instructions

Welcome to this experiment!

Please read the following instructions carefully. Do not hesitate to ask any questions. If you have any question, please, raise your hand. We will approach you and answer your question in private.

All your decisions remain anonymous. Communication with other participants during the whole experiment is not allowed. Please remove all items you brought with you from the table, switch off your phone and store the phone in your bag.

For showing up, you receive a show-up fee of 4 Euros. In the following experiment you can earn more money.

The money, you earn during the experiment, will be expressed in ECU (=Experimental Currency) and will be converted into Euros at the end of the experiment. The exchange rate is as follows, for **100 ECU** you will be paid **1 Euro** at the end of the experiment.

There are two different roles within this experiment: **Employer** and **Employees.** At the beginning of the experiment you will be randomly assigned to either one of these roles. The role assigned to you, will be shown on your screen at the beginning of this experiment and will **remain** the same for the **whole experiment**.

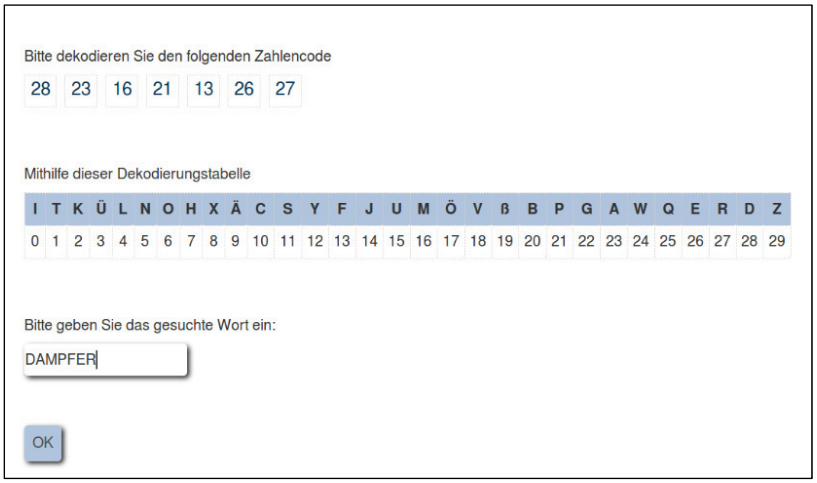
Every **employer** will be matched with **four employees**. You will neither during nor after the experiment know who was in the role of the employer or the employee, nor which employees were assigned to which employer.

Every **employee** participates in two working phases, with **each** having a **duration of 10 minutes**. During each working phase the employee is asked to work on a decoding task, where the employee is asked to translate numerical codes into words benefiting the employer.

Decoding task:

Within the decoding task **numerical codes** should be translated into **words**. To solve this task there is a **decoding table** beneath the numerical code, which **matches each number with a letter** (Please see example on page 2). With the aid of this decoding table the numerical code can be translated into a word.

Example:



In the decoding table it is shown, that 28=D, 23=A, 16=M, 21=P, 13=F, 26=E, 27=R. Therefore, the word that is searched for is **DAMPFER.**

Only if the numerical code is **correctly decoded**, you can approach the **next numerical code**. Each numerical code consists of a new numerical combination and each time there is a **new decoding table** shown. **Each word** only **appears once** during each working phase.

At the top on the left hand side of the window, the employee is able to see the **wage** for the particular working phase, the amount of **correctly decoded words**, as well as the **resulting amount of money** for the **employer**. At the top on the right hand side, the employee is able to see the **remaining time** for the particular working phase.

The **employer** will **neither during nor after the experiment be informed** about the amount of correctly decoded numerical codes by each employee.

Employees' pay-out

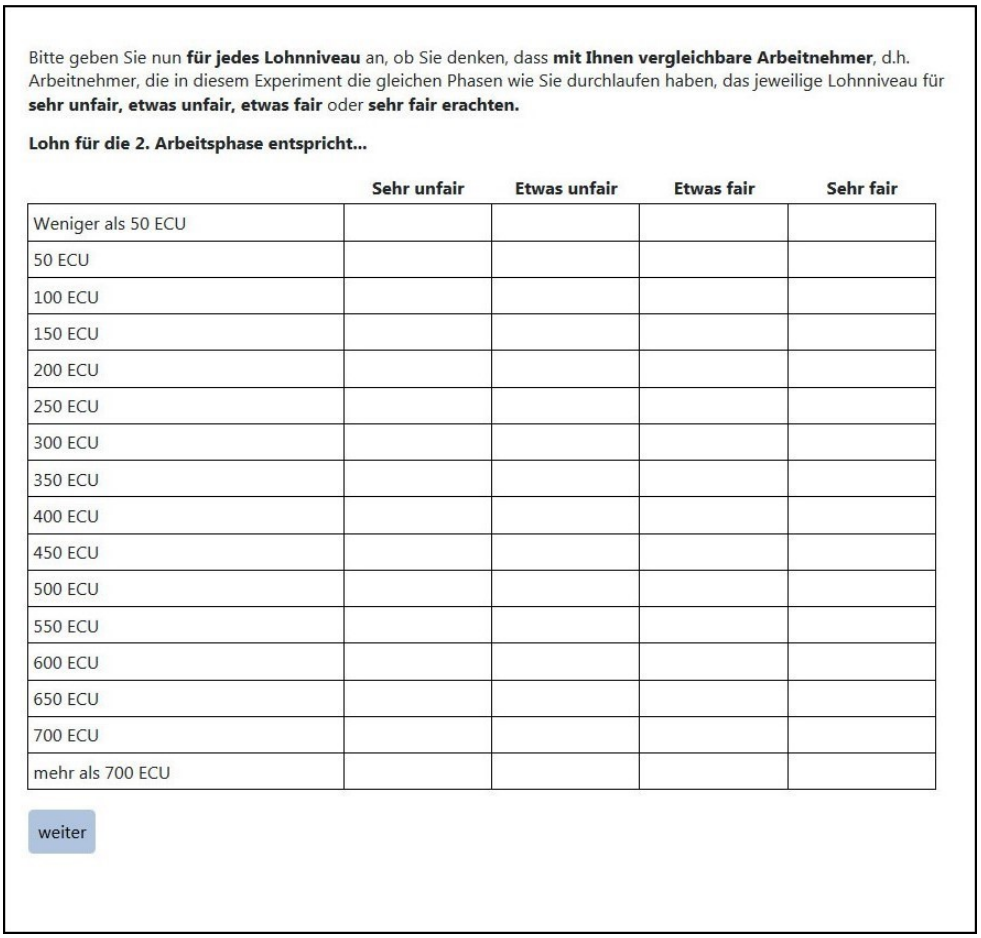
The particular employee receives a **fixed wage for each of the two working phases**. This wage will be paid to the employee by the **assigned employer independently of the number** of correctly coded words.

Employers' pay-out

One working phase will be randomly determined to be **relevant** for the employer's **pay-out.**

For **each numerical code**, that was **correctly decoded** by the particular employee in this **particular working phase**, the **employer** receives a **fixed amount of money**.

Appendix D: Screenshots Experiment



Bitte geben Sie nun **für jedes Lohnniveau** an, ob Sie denken, dass **mit Ihnen vergleichbare Arbeitnehmer**, d.h. Arbeitnehmer, die in diesem Experiment die gleichen Phasen wie Sie durchlaufen haben, das jeweilige Lohnniveau für **sehr unfair, etwas unfair, etwas fair** oder **sehr fair erachten.**

Lohn für die 2. Arbeitsphase entspricht...

	Sehr unfair	**Etwas unfair**	**Etwas fair**	**Sehr fair**
Weniger als 50 ECU				
50 ECU				
100 ECU				
150 ECU				
200 ECU				
250 ECU				
300 ECU				
350 ECU				
400 ECU				
450 ECU				
500 ECU				
550 ECU				
600 ECU				
650 ECU				
700 ECU				
mehr als 700 ECU				

weiter

Figure 4: Screenshot fair wage elicitation

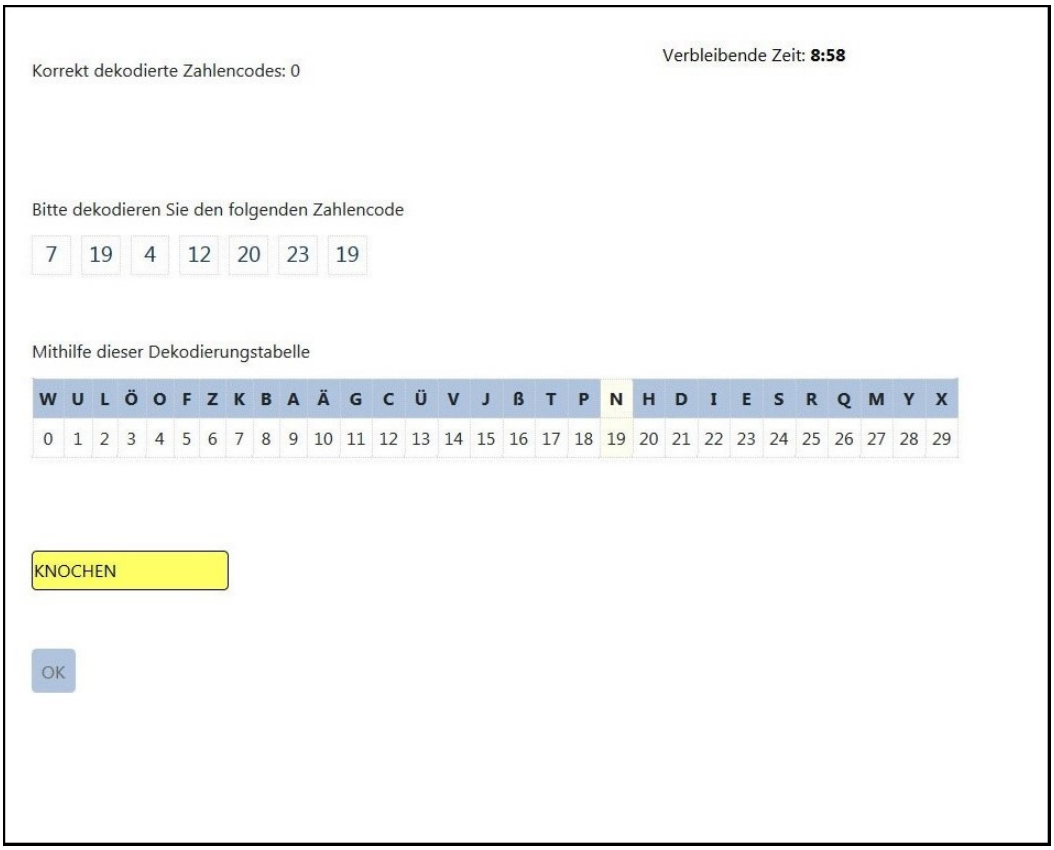


Figure 5: Screenshot training

Appendix E: Post-experimental Questionnaire

Cabin-No.: _____

Questionnaire

Please, answer the following questions while we prepare the pay-out.
Thank you!

1. What is your gender?	Female ☐	Male ☐
2. How old are you?		
3. How many siblings do you have?		

Please, answer the following questions using the given scale.

4. How satisfied are you with the experiment overall?

Not at all satisfied				Very satisfied
☐	☐	☐	☐	☐

5. How much would you like to participate again in an experiment like this one?

Not at all				Very much
☐	☐	☐	☐	☐

6. How likely is it that you would recommend to participate in an experiment like this one to a friend?

Not likely at all				Very much
☐	☐	☐	☐	☐

In case you were assigned to the role of an **employee**, please **answer** the **following questions**.

In case you were assigned to the role of an **employer**, we **do not need any further information**. Thank you very much for your participation.

7. How much did you enjoy the decoding task?				
Not at all				Very much
☐	☐	☐	☐	☐
8. How tedious did you find the decoding task?				
Not tedious at all				Very tedious
☐	☐	☐	☐	☐
9. How fair, do you think, was the wage in the **first working phase**?				
Not fair at all				Very fair
☐	☐	☐	☐	☐
10. Did you feel disadvantaged or advantaged by the wage in the **first working phase**?				
Very disadvantaged				Very advantaged
☐	☐	☐	☐	☐
11. What do you think, how was your performance in the **first working phase** compared to other participants in this room?				
Below average				Above average
☐	☐	☐	☐	☐
12. How fair, do you think, was the wage in the **second working phase**?				
Not fair at all				Very fair
☐	☐	☐	☐	☐

13. Did you feel disadvantaged or advantaged by the wage in the **second working phase**?

Very disadvantaged				Very advantaged
☐	☐	☐	☐	☐

14. What do you think, how was your performance in the **second working phase** compared to other participants in this room?

Below average				Above average
☐	☐	☐	☐	☐

15. Did you decode more, about the same or fewer numerical codes in the second working phase compared to the first working phase?

More	About the same	Fewer
☐	☐	☐

16. For what reason did you decode more, about the same or fewer numerical codes in the second working phase compared to the first working phase?

For the success of this study, it is very crucial, that we understand why you decoded more, about the same or fewer numerical codes in the second working phase. Please, answer as precise and detailed as possible. Thank you very much.

Answer:

Did you participate in a training phase before the second working phase?

Yes	No
☐	☐
	In case the answer is no, please skip this page and continue on the next page.

17. How much did you enjoy the training phase?

Not at all				Very much
☐	☐	☐	☐	☐

18. How tedious did you find the training phase?

Not tedious at all				Very tedious
☐	☐	☐	☐	☐

19. Do you believe that the training has enabled you to correctly decode more numerical codes in the second working phase?

Not at all				Very much
☐	☐	☐	☐	☐

20. Do you believe that your employer had an advantage in the second working phase, because you participated in the training phase?

Not at all				Very much
☐	☐	☐	☐	☐

21. Why (not)?

Answer:

22. Are you of the opinion that the participation in the training phase should go along with a higher wage in the second working phase?

Not at all				Very much
☐	☐	☐	☐	☐

For the following questions please indicate to what extend the statements apply to you.
1. It annoys me when others are undeservedly better off than I am.
Does not apply at all ☐ ☐ ☐ ☐ ☐ Applies very much
2. I feel guilty when I am undeservedly better off than others.
Does not apply at all ☐ ☐ ☐ ☐ ☐ Applies very much
3. If someone harms me on purpose, I will try to repay that person with the same coin, even if it costs me something.
Does not apply at all ☐ ☐ ☐ ☐ ☐ Applies very much
4. If someone does me a favour, I am willing to reciprocate it.
Does not apply at all ☐ ☐ ☐ ☐ ☐ Applies very much
5. I like to compete with others.
Does not apply at all ☐ ☐ ☐ ☐ ☐ Applies very much
6. Generally, it is important to me to be the best.
Does not apply at all ☐ ☐ ☐ ☐ ☐ Applies very much

If you have any further comments on this experiment, do not hesitate to note it here:

Thank you very much for your time and participation!

Appendix F: Summary Statistics Experiment

Table 7: Summary statistics experiment

First working phase

	T0			T1			T2			T3		
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Fair wage in ECU	92	521	136	92	541	116	93	531	139	92	539	106
Average decoding time (min.)	92	.442	.192	95	.475	.271	93	.462	.269	92	.442	.225
Minutes worked	93	9.07	1.85	95	9.12	1.73	94	9.01	1.78	93	9.14	1.61
# decoded words	93	22.6	7.01	95	22.3	7.96	94	22.7	8.19	93	22.8	6.82
# decoded words/minute worked	92	2.47	.572	95	2.41	.682	93	2.48	.694	92	2.47	.549

Second working phase

	T0			T1			T2			T3		
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Fair wage in ECU	86	468	175	90	496	158	90	518	155	93	541	119
Average decoding time (min.)	91	.424	.422	93	.376	.217	92	.442	.551	89	.324	.0644
Minutes worked	93	8.98	2.07	95	9.14	1.81	94	8.56	2.58	93	8.82	2.27
# decoded words	93	26.4	9.56	95	27.7	8.87	94	27.1	12.3	93	28.5	9.72
# decoded words/minute worked	91	2.89	.782	93	2.99	.747	92	3.09	1.01	89	3.21	.629

Explanation of treatments: T0 - No Training & No Wage Increase, T1 - No Training & Wage Increase,
T2 - Training & No Wage Increase, T3 - Training & Wage Increase

Appendix G: Additional Regressions Experiment

Table 8: Decoding time

Dependent variable:	Trained words		Untrained words		Overall	
Decoding time (min.)	(1)	(2)	(3)	(4)	(5)	(6)
T1 - No Training & Wage Increase	-0.010	-0.006	-0.013	-0.006	-0.011	-0.006
	(0.012)	(0.013)	(0.012)	(0.012)	(0.011)	(0.011)
T2 - Training & No Wage Increase	-0.050***	-0.046***	0.011	0.017	-0.019	-0.014
	(0.013)	(0.013)	(0.014)	(0.015)	(0.012)	(0.013)
T3 - Training & Wage Increase	-0.055***	-0.050***	-0.004	0.008	-0.029***	-0.021**
	(0.011)	(0.012)	(0.011)	(0.010)	(0.010)	(0.010)
Mean decoding time (min.)	-0.016**	-0.015**	-0.041**	-0.030**	-0.029**	-0.023**
1st working phase	(0.007)	(0.007)	(0.016)	(0.013)	(0.011)	(0.009)
Constant	0.530***	0.568***	0.777***	0.723***	0.682***	0.665***
	(0.071)	(0.077)	(0.164)	(0.133)	(0.117)	(0.099)
Additional controls	No	Yes	No	Yes	No	Yes
Observations	5,056	4,930	5,221	5,088	10,277	10,018
# clusters	362	352	365	355	365	355
R-squared	0.064	0.075	0.058	0.063	0.058	0.065

Notes: Linear regression with robust standard errors clustered on indvidiual in parentheses. All specifications include word fixed effects. Additional control variables include: Fair wage norm - pre training/free time, session fixed effects, gender, questionnaire measures for envy, competitiveness, guilt, and reciprocity. ***p<0.01, **p<0.05, *p<0.1.

Table 9: Decoding time - heterogenous effects

	Fair wage norm $\leq$ 500 ECU					
Dependent variable:	Trained words		Untrained words		Overall	
Decoding time (min.)	(1)	(2)	(3)	(4)	(5)	(6)
T1 - No Training & Wage Increase	0.009	0.018	0.000	0.014	0.005	0.016
	(0.016)	(0.019)	(0.015)	(0.021)	(0.014)	(0.018)
T2 - Training & No Wage Increase	-0.055***	-0.047***	0.011	0.008	-0.022	-0.019
	(0.015)	(0.016)	(0.016)	(0.017)	(0.014)	(0.015)
T3 - Training & Wage Increase	-0.052***	-0.044***	0.010	0.017	-0.021	-0.013
	(0.014)	(0.015)	(0.015)	(0.017)	(0.014)	(0.015)
Mean decoding time (min.)	-0.007	-0.007	-0.014	-0.012	-0.010	-0.009
1st working phase	(0.008)	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)
Constant	0.422***	0.515***	0.486***	0.662***	0.467***	0.602***
	(0.074)	(0.099)	(0.085)	(0.142)	(0.077)	(0.110)
Additional controls	No	Yes	No	Yes	No	Yes
Observations	2,425	2,373	2,501	2,447	4,926	4,820
# of clusters	172	168	172	168	172	168
R-squared	0.099	0.117	0.051	0.088	0.067	0.095

	Fair wage norm $>$ 500 ECU					
Dependent variable:	Trained words		Untrained words		Overall	
Decoding time (min.)	(1)	(2)	(3)	(4)	(5)	(6)
T1 - No Training & Wage Increase	-0.028	-0.035	-0.022	-0.031	-0.025	-0.033*
	(0.018)	(0.021)	(0.018)	(0.019)	(0.016)	(0.018)
T2 - Training & No Wage Increase	-0.048**	-0.047**	0.009	0.023	-0.019	-0.011
	(0.021)	(0.024)	(0.022)	(0.024)	(0.019)	(0.021)
T3 - Training & Wage Increase	-0.060***	-0.059***	-0.012	-0.005	-0.036**	-0.032**
	(0.017)	(0.019)	(0.015)	(0.015)	(0.014)	(0.015)
Mean decoding time (min.)	-0.028***	-0.023**	-0.073***	-0.048**	-0.052***	-0.036**
1st working phase	(0.008)	(0.011)	(0.024)	(0.024)	(0.015)	(0.015)
Constant	0.660***	0.700***	1.102***	0.866***	0.928***	0.812***
	(0.086)	(0.115)	(0.250)	(0.246)	(0.168)	(0.169)
Additional controls	No	Yes	No	Yes	No	Yes
Observations	2,631	2,557	2,720	2,641	5,351	5,198
# of clusters	190	184	193	187	193	187
R-squared	0.058	0.073	0.084	0.076	0.071	0.071

Notes: Linear regression with robust standard errors clustered on indvidiual in parentheses. All specifications include word fixed effects. Additional control variables include: Fair wage norm - pre training/free time, session fixed effects, gender, questionnaire measures for envy, competitiveness, guilt, and reciprocity. ***p<0.01, **p<0.05, *p<0.1.

Table 10: Time invested - heterogenous effects (alternative specification)

Dependent variable:	Fair wage norm $\leq$ actual wage		Fair wage norm $>$ actual wage	
Time invested (min.)	(1)	(2)	(3)	(4)
T1 - No Training & Wage Increase	0.372	0.295	-0.238	-0.311
	(0.387)	(0.358)	(0.254)	(0.270)
T2 - Training & No Wage Increase	-0.475	-0.495	-0.455	-0.506
	(0.640)	(0.615)	(0.290)	(0.310)
T3 - Training & Wage Increase	0.142	0.061	-0.562*	-0.596*
	(0.406)	(0.332)	(0.314)	(0.335)
Time invested (min.) 1st working phase	0.550**	0.574**	0.940***	0.961***
	(0.262)	(0.220)	(0.094)	(0.093)
Constant	4.041	3.501	0.517	0.292
	(2.542)	(2.333)	(0.958)	(1.419)
Additional controls	No	Yes	No	Yes
Observations	118	117	241	238
R-squared	0.318	0.452	0.497	0.528

Notes: Linear regression with robust standard errors in parentheses.

Subgroup analysis for employees that stated a fair wage norm $\leq$actual wage or $>$ actual wage respectively.

Additional control variables include: Fair wage norm - pre training/free time, session fixed effects,

gender, questionnaire measures for envy, competitiveness, guilt, and reciprocity. ***p<0.01, **p<0.05, *p<0.1.

Table 11: Decoded words - heterogenous effects (alternative specification)

Dependent variable:	Fair wage norm $\leq$ actual wage		Fair wage norm $>$ actual wage	
# Decoded words	(1)	(2)	(3)	(4)
T1 - No Training & Wage Increase	1.596	1.316	1.159	1.672
	(1.540)	(1.546)	(1.009)	(1.227)
T2 - Training & No Wage Increase	-0.227	-2.314	0.591	0.834
	(2.338)	(2.929)	(1.101)	(1.218)
T3 - Training & Wage Increase	3.101*	2.447	0.916	1.038
	(1.579)	(1.630)	(1.082)	(1.195)
# decoded words 1st working phase	0.973***	1.027***	1.147***	1.166***
	(0.119)	(0.121)	(0.043)	(0.053)
Constant	4.946	11.495	0.158	4.296
	(3.111)	(7.303)	(1.195)	(4.402)
Additional controls	No	Yes	No	Yes
Observations	118	115	241	237
R-squared	0.581	0.664	0.680	0.692

Notes: Linear regression with robust standard errors in parentheses.

Subgroup analysis for employees that stated a fair wage norm $\leq$actual wage or $>$ actual wage respectively.

Additional control variables include: Fair wage norm - pre training/free time, session fixed effects,

gender, questionnaire measures for envy, competitiveness, guilt, and reciprocity. ***p<0.01, **p<0.05, *p<0.1.