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Kathrin Manthei, Alwine Mohnen*

The incentive impact of the fixed wage – A real effort experiment**

According to most simple agency models only the performance dependent part of the compensation drives the agent's effort decision. However, we show that this is not necessarily the case for reference dependent and loss averse agents. Based on Pokorny (2008) we firstly analyze the impact of the fixed wage on work performance within a linear incentive contract when agents are loss averse. Secondly, we test the resulting hypotheses in an economic real effort experiment. Varying the fixed wage but keeping the piece rate constant over treatments, we find a non-monotonic slope of effort in the fixed payment with significantly higher effort levels for a very low fixed wage. Very high fixed payments also yield higher subject performance but to a minor and less robust extent.

Die Anreizwirkung von Fixlöhnen – Ein Real Effort Experiment

Ein typisches Ergebnis einfacher Prinzipal-Agent-Modelle ist, dass die Arbeitsanstrengung des Agenten lediglich vom leistungsabhängigen Teil der Vergütung getrieben wird. In dieser Arbeit wird gezeigt, dass dies nicht notwendigerweise gilt, wenn Agenten referenzpunktabhängige Präferenzen und Verlustaversion aufweisen. Zunächst wird basierend auf einem Modell von Pokorny (2008) analysiert, wie der Fixlohn die Arbeitsanstrengung innerhalb eines linearen Anreizvertrages bei Verlustaversion beeinflusst. Darauffolgend werden die resultierenden Hypothesen in einem ökonomischen Experiment mit realen Anstrengungen getestet. Bei variierenden fixen, zugleich aber konstanten Stücklöhnen zeigen die Resultate einen nicht-monotonen Verlauf der Leistungsergebnisse im Fixlohn. Bei sehr niedrigem treten signifikant bessere Leistungsergebnisse auf als bei einem mittleren Niveau. Auch sehr hoher Fixlohn steigert die Performance der Probanden, allerdings nicht so stark und auch weniger robust..

Key words: **real effort experiment, incentives, fixed wage, loss aversion**
(JEL: M12, M21, M52)

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1. Introduction

Most simple principal-agent models predict that stronger incentives ceteris paribus lead to higher performance of the agent. On the other hand, it is noticeable that only a relatively small part of the total compensation is performance dependent in many firms. For example, Murphy (1999), referring to Towers Perrin's *1997 Worldwide Total Remuneration report,* shows that although the composition of executive pay varies considerably between industries, firm sizes, and countries, predominantly the greater fraction of the total compensation is covered by the base salary which constitutes a fixed compensation. This seems to be true especially for CEO payments outside the US. Due to this observation some questions arise: Does the fixed wage play an additional role in incentive schemes apart from attracting employees and ensuring the acceptance of the contract? Is there a linkage between the height of fixed payments and the strength of incentives within an incentive contract?

Economic theory teaches us the relevance of variable, performance-based payments. Particularly according to most simple standard agency models only the variable wage component induces incentives. A higher piece rate is followed by an increase in the effort level whereas the fixed wage only ensures the agent's participation (for seminal papers on the standard approach see, e.g. Holmstrom, 1979; Grossman & Hart, 1983; Hart & Holmstrom, 1987).

The impact of *exclusively* paying a fixed wage on the effort decision has been examined empirically. An important approach of designing an employer-employee relationship in the lab is the gift-exchange game (Fehr, Kirchsteiger, & Riedl, 1993). Typically an employer offers a fixed wage to an employee and asks for a certain effort level in exchange. The desired effort level is not binding but effort exertion is costly for the employee. According to standard game theoretical predictions the employee should exert the lowest effort level possible and therefore the employer should offer the lowest wage possible at the beginning of the game. However, this does not match the results of most of the experimental studies. Generally, higher wages are paid and higher effort levels are exerted than predicted by theory. Furthermore, effort exertion significantly increases with the wage offered. Gaechter and Fehr (2002) give a comprehensive overview on gift-exchange-experiments with abstract (merely monetary) effort choice. These results are generally explained by concepts of social preferences like reciprocity (Rabin, 1993; Dufwenberg & Kirchsteiger, 2000) and inequity aversion or fairness (Akerlof, 1982; Falk & Fischbacher, 2006; Fehr & Schmidt, 1999; Bolton & Ockenfels, 2000). Furthermore, a number of real-effort or field experiment studies have shown that the effects mentioned above are also present in more realistic environments (e.g. Gneezy, 2004; Cohn, Fehr, & Goette, 2008). However, evidence seems to be more ambiguous when it comes to real-effort tasks as e.g. Hennig-Schmidt, Rockenbach and Sadrieh (2008) as well as Greiner, Ockenfels and Werner (2011) do not find higher effort exertion due to a mere wage increase.

The impact of varying piece rates on performance has also been investigated in empirical studies. Some of these studies find a positive relation between incentives and employee performance for simple tasks. This is frequently mentioned in the studies by

Lazear (2000), Paarsch and Shearer (2000), and Shearer (2004) who find an increase in productivity is related to the introduction of piece rates. For a good overview of the empirical evidence see Prendergast (1999). By contrast, other empirical studies do not confirm theoretical results. Gneezy and Rustichini (2000) experimentally examine the effect of differently high piece rates on effort provision for a real effort task and find a non-monotonic relationship. In treatments with monetary incentives higher piece rates did indeed yield higher performance. If monetary incentives were not offered, however, subjects outperformed those receiving a low piece rate. The authors conclude that introducing piece rates does not necessarily lead to an increased work effort. Other research results show that higher incentives in fact lead to lower work effort (e.g. Camerer et al., 1997; Fehr & Goette, 2004; Goette & Huffman, 2003; Pokorny, 2008). The findings in the latter studies can be explained by the workers' reference dependent preferences. Pokorny (2008) for instance uses an experimental design similar to Gneezy and Rustichini (2000) exposing the participants to varying strengths of incentives. The results, however, differ substantially as they show an inverse U-shaped relationship between effort levels and incentive intensity. Pokorny's (2008) explanation is based on the subjects' loss aversion with regard to a reference wage.

Loss aversion and reference dependency go back to Kahneman and Tversky (1979) who investigated decisions under risk while noticing some anomalies which could to be explained by an S-shaped utility function where the inflection point is the reference point from where endowments are evaluated. That is, the individual is risk seeking below but risk averse above the reference point. The key of this approach with regard to wages is the assumption that peoples' utility does not only depend on their absolute income level but also on the relation of their income to a certain reference wage. Employees have a certain income or wage target in mind which they do not want to go below. Therefore, incomes that are lower than the target income are perceived as losses whereas exceeding the target income is perceived as gains. Still, the studies mentioned above do not explicitly manipulate the reference point and hence it is hard to rule out alternative explanations thoroughly. A recent experimental study by Abeler, Falk, Goette and Huffman (2011), however, shows how effort provision can be influenced by reference points. The latter contribution is closely related to our work as the authors applied a similar real effort task and piece rates to examine effort provision and reference dependency. They exogenously manipulate the subjects' reference points under controlled conditions. Subjects can choose how long they want to work and how much they want to earn. The results show a clear effect of the reference point manipulation on the subjects' work intensity such that subjects stop working when the reference wage has been reached.

The objective of this paper is to investigate the role of the fixed payment *within* an incentive contract. According to simple standard theoretical models, the fixed wage does not provide any incentives, which is only related to piece rates. Consequently the effort level is independent of the height of the fixed wage. Considering reference dependent preferences, however, the level of the fixed wage makes a difference as the total amount of the wage is evaluated compared to a reference wage. Higher fixed payments shift the absolute wage closer or even above the reference wage thus affect-

ing the effort decision. For this reason we test whether there is an impact of the fixed payment within an incentive contract on the effort level chosen.

In our approach we first analyze reference dependent preferences and loss aversion concerning linear wage contracts in a very simple framework. In particular we try to shed light on the question how the fixed wage component drives the effort decision if individuals are loss averse. For that purpose we derive theoretical predictions on the effect of varying fixed wages on the effort decision from a model developed in Pokorny (2008). In this simple model the agent is loss averse with regard to a certain reference wage. After the reference level is reached, the marginal return of effort decreases. Hence, compared to the standard case, it is rational that less or no additional effort will be made after reaching the reference wage level. We show that with increasing fixed wages effort provision declines and even piece rate incentives lose power once the fixed wage becomes too high.

Secondly, we test the resulting predictions in a real effort experiment at the Universities of Bonn and Cologne, Germany. The subjects were all paid the same piece rate but the amount of the fixed wage is varied depending on the three treatments: low, intermediate and high. All of them were offered to work on the same calculation task and each participant in the experiment knew ex ante the precise duration of the working time and his wage contract. Note that there are no explicit principals in this experiment who benefit from the agents' effort. We do this to measure the impact of wages in a 'clean' way. Including interaction with principals might produce different motives and hence decisions.

We decided to run a real effort experiment in order to create an environment which is closer to real work conditions. The downside of this approach is that we lose control of the cost of effort which has consequences on the way the data can be interpreted. However, laboratory experiments are almost always very abstract and this is likely to affect the results (Gneezy, 2004, pp. 4-5, 7-8). Since we have real effort costs instead of a monetary cost function in our setting, we believe our results produce better implications for real work environments than in the case of an abstract effort choice. Furthermore, we intended to prevent subjects from concentrating on purely numerical concerns.

Our experimental results indicate that workers indeed care about the fixed payments. Subjects receiving the low fixed wage worked significantly more than those who were paid an intermediate fixed wage. Furthermore subjects being offered the high fixed wage also increased performance compared to those with intermediate fixed wage even if the effect is less pronounced. As our principal-agent model including loss aversion can explain only part of the observed behavioural pattern, we suggest a different kind of explanation for the results which focuses on a kind of social norm representing the appropriateness of the fixed wage payment.

The reminder of this paper is structured as follows. In the next section the details of the experimental set-up are described. In section 3 behavioural predictions are developed. The results are reported in section 4. Section 5 discusses interpretations and explanations of our data and the last section concludes the paper.

2. Design and procedures

We invited 181 undergraduate students from various faculties at the Universities of Bonn and Cologne, Germany to participate in the experiment. Altogether we conducted two sessions in July 2004, one in Bonn and one in Cologne, and introduced three different treatments. Each of the three treatments was run at both Universities to avoid any university-specific subject pool effects. As we used a real effort task in this experiment similar conditions of the environment when solving the task were crucial to achieve unbiased results. This is why both sessions (Bonn and Cologne) were conducted in a large classroom and all three treatments were run in the same room at the same time[1]. Arriving subjects drew a seat number assigning them to a certain marked seat in the room. The rooms were carefully chosen so that we could set up a fixed seating where subjects had large spaces between them. We did this to prevent any kind of communication or collaboration[2]. Hence, none of the participants knew if his neighbor was in the same treatment group or not. They did not even know if there were different treatments or how many of them. After all participants were seated properly, we simultaneously handed out files including instructions, tasks and quizzes as an outside option[3]. Subjects were given some time to read the instructions. Neither the instructions nor the compensation scheme were read out aloud[4]. Subsequently we answered the participants' questions one-to-one quietly. When all questions were answered we asked the participants to turn the pages and the main part of the experiment began. We stressed the duration of 40 minutes and put an alarm clock on the front desk showing the time. Four supervisors were present in the sessions.

The task consisted of solving relatively simple but tedious calculation exercises (see example below). Subjects were requested to add up the digits in a row. After that they had to compare if the sum in the upper row was greater or less than the sum in the lower row. If the value of the upper row was greater, they had to subtract the sum value of the lower row from the upper row. If the value of the upper row was less or equal, than the value of the lower row, they were to add up both values. This result was then to be filled into the cell labeled "Result".

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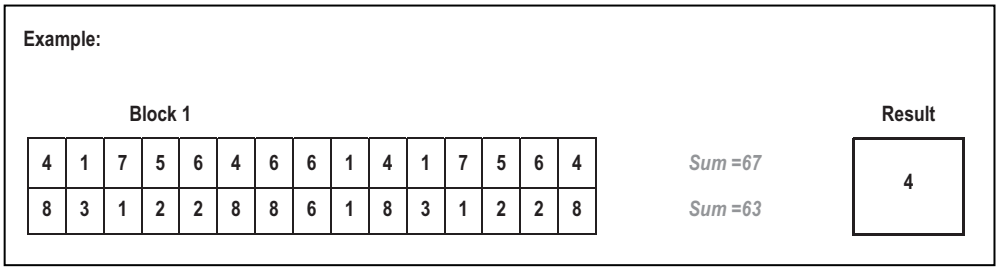
1 E.g. the time of day, temperature, noise, light conditions in the room may have a high influence on the individual performance. These aspects could be held constant that way.

2 There was at least one empty seat left and right between subjects. Furthermore every second row was kept empty completely.

3 For an example of the instructions see appendix.

4 In most experiments instructions are read out aloud in order to create common knowledge and control the subjects' beliefs. Still, in our opinion this procedure could be neglected here as there was no strategic interaction at all between the participants. Thus we preferred to use printed instructions in order to be able to have all subjects of all treatments in one single room.



As described before the focus of our interest was the potential influence of the fixed wage on the subjects' motivation to exert effort within an incentive contract. We wanted to make sure that all participants had the same expectations on how much they could earn from the experiment. Therefore, we had stated explicitly that the average income would be roughly 10 euros when recruiting subjects for the experiment. The compensation scheme in the experiment consisted of a piece rate of 0.15€[5] for each correct calculation and a fixed wage which was varied over the three treatments (see *Table 1*). The height of the fixed wage component was the only feature that differed across treatments.

Table 1: Treatment overview

Treatments		
Low	Intermediate	High
2€ fixed wage	6€ fixed wage	12€ fixed wage

We chose the 2€ fixed wage as a very small fixed wage where it was obvious that reaching the announced average of 10€ would hardly be possible. In the intermediate treatment with 6€ fixed wage subjects could earn around the average of 10€. In the 12€ treatment the announced average wage was in fact already exceeded with no additional effort provision. To ensure that participants did not solve the calculation exercise just to keep busy, they were additionally offered crossword puzzles and similar entertaining quizzes as an outside option. We emphasized in the instructions that subjects would not receive variable wages for solving these quizzes. Participants in all three treatments were granted exactly forty minutes to work on the task. After forty minutes a bell rang and the supervisors collected the exercise sheets. Moreover, questionnaires were handed out to each subject to collect some demographic data. Afterwards participants were informed when and where they were to come to and receive their payment[6].

3. Hypotheses

In the following, we develop hypotheses on the effort decisions that we might observe in the experiment. First, we consult standard agency models.

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5 One Euro was roughly one US Dollar at the time of the experiment.

6 The remuneration was paid privately and in cash about one week after the session had taken place.

Simple standard agency models

Given a linear wage contract, the fixed wage does not provide incentives to work harder. Thus, according to simple principal-agent models the height of the fixed component does not influence the effort decision of the agent because only the variable component is relevant. Hence, there should not be a difference in the effort levels:

$$H1: e_L = e_I = e_H$$

where e denotes the average effort in the respective treatment (index L for low, I for intermediate and H for high wage).

According to this hypothesis *H1* we should not observe any treatment effects at all in the experiment. Alternative hypotheses, however, might suggest monotonic relationships where higher fixed wages lead to either rising or shrinking performance. Increasing effort choices with higher wages are often associated with pro-social behavior towards a counterpart. But this does not seem to be plausible in this case as our subjects make individual effort decisions without any consequences for other persons. Therefore we might as well neglect this notion.

What seems more reasonable is a monotonic and decreasing slope of effort in the fixed wage possibly caused by reference dependent preferences and loss aversion: (1) because they have been shown to affect effort decisions in other studies (see e.g. Abeler's et al. (2011) study in which the reference points have been exogenously manipulated) and (2) because our attempt to recruit subjects by promoting an average pay of 10€ might have influenced their wage expectations[7].

Reference dependency and loss aversion

A key notion of reference dependency and loss aversion in the context of work relationships is the evaluation of wages in relation to a reference point. That is, not only the absolute amount of wage determines the resulting utility but rather the relative amount compared to the reference point. This reference point might for instance be a wage which the agent considers to be appropriate for his work, an expected pay, a rival's or work mate's wage or simply the previous wage. Since wage levels below the reference wage are perceived as losses, marginal returns below are higher than above the reference wage. It follows that compared to standard theory less or no additional effort is rational after reaching the reference point. Consequently, piece rates have a weaker impact on the effort level if the fixed wage is above the reference wage than in case of a fixed level below.

As we focus on the fixed payment, we now interpret a simple model of reference dependency and loss aversion by Pokorny (2008) with respect to the influence of the fixed wage component on the agent's effort decision. Therefore, reference dependency is introduced by a utility function with a kink at the reference point. Note that such a utility function is a very simple way to include loss aversion and reference de-

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7 Here we assume that the reference point is constant over treatments due to the announcement of average wage in the recruiting phase of the experiment. However, in our design we cannot rule out the effect that subjects adjusted their reference wage, once they learned their actual wage scheme and the task at the beginning of the experiment.

pendency. Still the location of the reference point has to be clearly known and precisely determined.

Let us assume a function *U* which is additive separable in utility from wage *v(w)* and the disutility from effort exertion *c(e)*:

$$U(w,e) = v(w) - c(e),$$

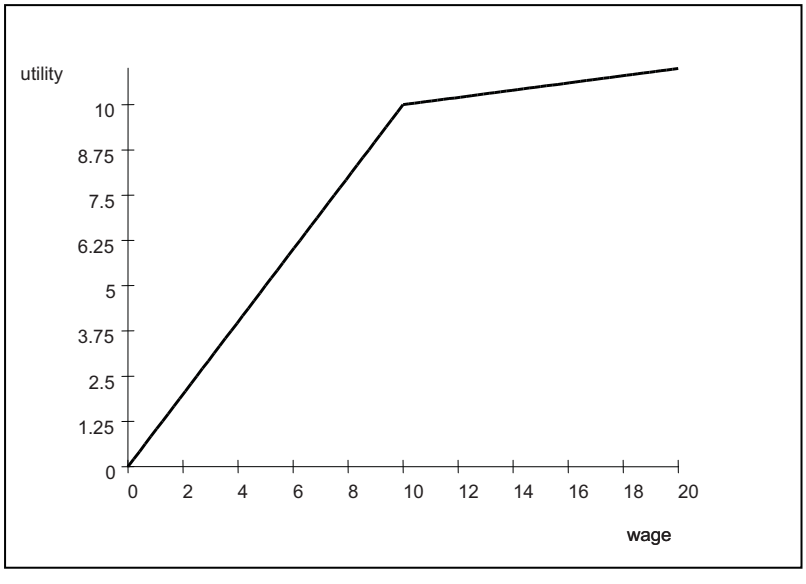
where *w* denotes wage and *e* represents the effort the agent exerts. The agent evaluates her actual wage by comparing it to the reference wage *R*.

$$v(w) = \begin{cases} rw & if\ w < R \\ R + (w - R)s & if\ w \geq R \end{cases} \quad (1)$$

with $0 \leq s < r$. *Figure 1* illustrates the slope of the utility function *v(w)* which is discontinuous at reference value *R*.

Since *s* is smaller than *r,* i.e. the slope above the reference point is lower, marginal returns on effort are smaller above the reference point than below. Assessing the situation from the reference point *R,* the agent is in a loss situation if he stays below; otherwise he is in a win situation.

Figure 1: Utility from wage (plotted for R=10, s=0.1)



As the agent is work-averse, effort exertion *e* is costly with a standard convex cost function *c*(*e*) [8]. Furthermore, let the wage contract *w* be linear in *e* with a fixed wage α and a piece rate β:

[8] The cost function c(e) is assumed to be convex in e with $c'(e) > 0$, $c''(e) > 0$, $c(0) = 0$ and $\lim_{e \to \infty} c'(e) = \infty$.

$$w = \alpha + \beta e .$$

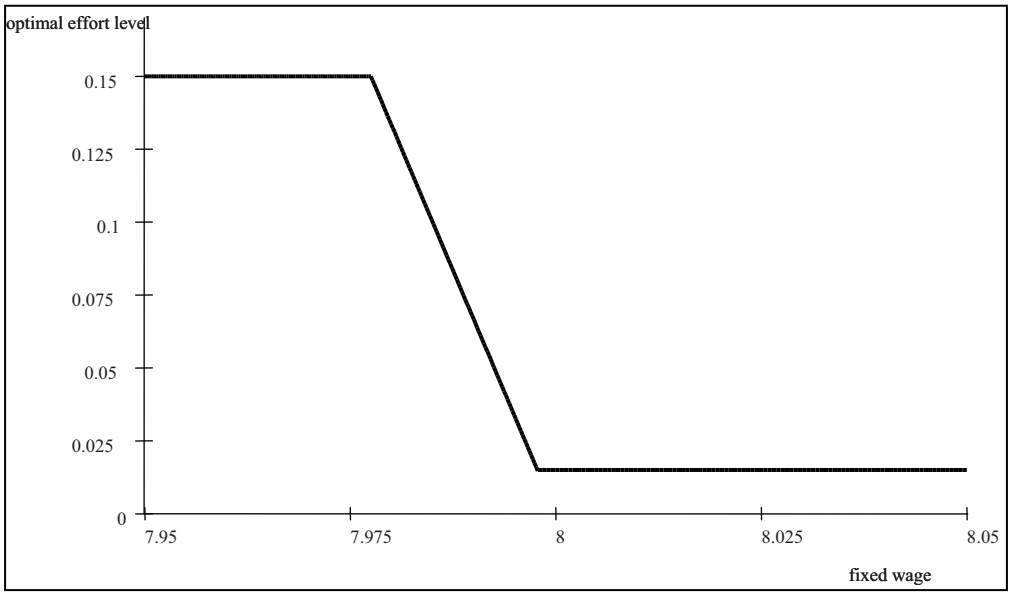
Then a critical effort level $e = e^R$ can be determined which denotes the effort level that yields a wage which is located exactly on the kink. That is, the critical value of *e* is accurately the point where the change from higher marginal returns to lower marginal returns takes place. This is exactly the case if the wage $w = \alpha + \beta e$ equals *R*, so we get:

$$e^R = \frac{R - \alpha}{\beta} .$$

Obviously, e^R decreases in the fixed wage α. If we interpret the model with respect to the fixed wage, we find that the level of effort exerted depends on the location of the reference point and the fixed wage, respectively. If the fixed wage α is sufficiently small, the agent's optimal effort level yields a wage in the left part of the utility function (below *R*). Here the marginal returns for the agent are constantly high, and in turn, the agent will work on a high level.

If the fixed wage is sufficiently high, the optimal effort choice is located to the right of the critical value e^R. As the returns on effort are relatively low compared to the previous situation, the employee chooses a constantly low level of effort.

Figure 2: Change of optimal effort level in the fixed wage (plotted for R=8, s=0.1, c(e)=0.5e², $\beta = 0.15$)



These cases occur if α is sufficiently extreme. In between these areas the optimal effort decision always equals the critical value, thus $e^* = e^R$. Then the optimal effort

level results in a wage which is located exactly on the kink. The change of e^* in the fixed wage α is exemplarily illustrated in *Figure 2.* [9]

Figure 2 illustrates that for extreme values of the fixed wage the agent chooses a constant effort level: for low fixed wages he works on a high level and for a sufficiently high fixed payment on a low level. This result exactly corresponds to the different marginal returns for the agent below and above the reference point. Furthermore, we recognize an area where the optimal effort level chosen by the agent decreases in the fixed wage. In this area the agent always chooses e^R. Intuitively, if the fixed wage within the incentive contract is higher, the reference wage will already be reached for lower effort levels. This makes the agent choose lower effort since he does not want to exceed the reference wage due to the lower marginal returns above it[10].

Regarding loss aversion and reference dependent utility the effect of varying the fixed wage depends on the individual's reference point. As shown in *Figure 2*, reference dependent preferences and loss aversion lead to a weakly decreasing slope of effort in the fixed wage.

$$H2: e_L \geq e_I \geq e_H .$$

If the fixed wage is sufficiently small, we should observe relatively high scores. In all other cases the optimal effort level should be lower. Hence, there might be a decreasing relation between scores and the fixed wage component in our experimental results if in one or two of the higher paid treatments the absolute wage exceeds the reference point but not in the low paid treatment.

4. Results

To approximate the subjects' effort the number of correct answers is our key outcome variable. And hence we analyze the number of correctly solved calculations in the different treatments. Some descriptive results are presented in *Table 2*[11].

Table 2: Descriptive statistics

Fixed wage	Observations	Mean	Median	Standard-deviation	Max	Min
low	59	21.068	21	9.958	47	1
intermediary	64	18.094	17	7.904	47	0
high	58	20.207	20	9.354	42	0

Figure 3 illustrates the median number of correct answers for low wage, intermediary wage and high wage where ninety percent of the scores lie within the interval presented along the vertical lines.

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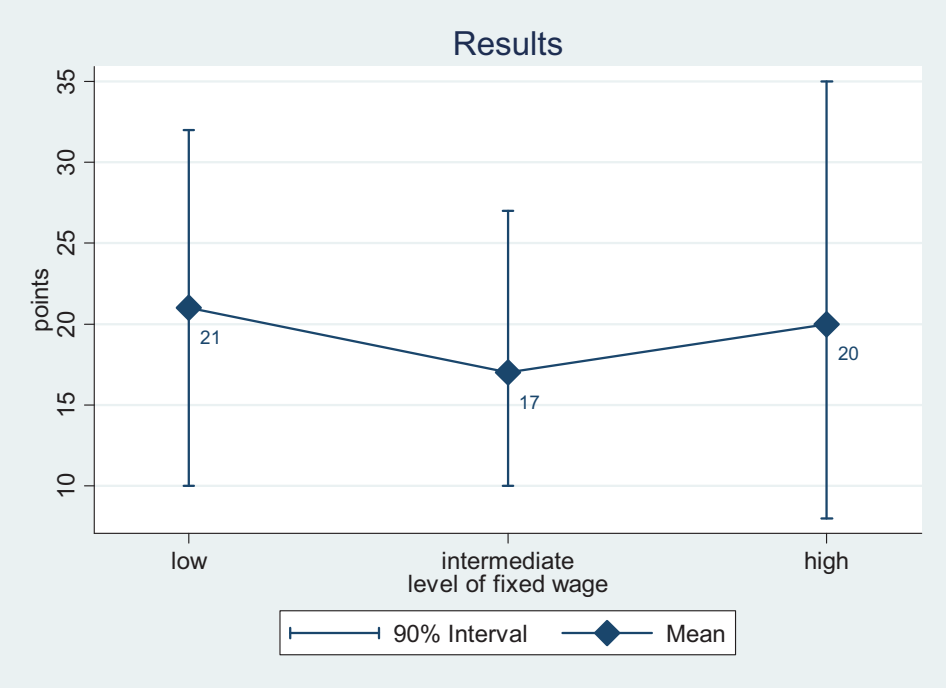
9 The theoretical result which is displayed in *Figure 2* can be found in the appendix.

10 Note, that the agent will always exert positive effort for any positive incentive parameter β.

11 The full distribution of the data is presented in *Figure 5* in the appendix.

Figure 3: Median point scorings over treatments



As shown in *Figure 3* the relation between exerted efforts and fixed wage components is non-monotonic in our data. For a low level of fixed wage the number of correct answers is noticeably higher than for an intermediary level. With a relatively high fixed wage the number of correct answers seems to increase again. As the individual results of the real effort task probably do not only depend on the strength of exerted effort but also on several unobserved factors we use parametric rather than non-parametric methods to analyze our data.

In our opinion it is likely that other individual characteristics like e.g. calculation ability or session specific aspects like room conditions (noise, temperature) might have had an influence on the individual performance which makes the data relatively noisy, especially compared to standard lab experiments with abstract effort choice. However, the allocation of abilities in all three treatments should be normally distributed due to the large treatment sizes. But for session effects we control in the following regression analysis. We include several control variables of which the most important one seems to be the location of the session (University of Bonn or University of Cologne)[12]. This

[12] An important difference between the sessions at the University of Bonn and the University of Cologne is that this experiment was one of the first at the University of Cologne. At the University of Bonn economic experiments were conducted regularly and were well-known among students. Note that since there was only one session at each of the two universities this variable covers the time and the subject pool of the session as well.

is highly important due to the fact that subjects were not assigned randomly to the sessions.

We analyze the results with median regression since there are a considerably large number of outliers in the data[13]. In particular the low and the intermediary wage treatments show important outliers. For instance in the intermediary wage treatment the subject who showed the best performance yielded 47 points whereas the second best participant only achieved a score of 33. Furthermore all treatments show minimum scores of zero or one. As the median regression minimizes the sum of absolute deviations rather than squared deviations, it is less sensitive towards outliers. Hence, we consider the median regression to be a better measure for the central tendency of our data[14].

The results of the regressions are presented in *Table 3*. We include two wage dummies: one for the highly paid group and another for the low paid group. The subjects receiving an intermediary wage serve as a reference group in the regression to which the two other treatments are compared.

Considering *Table 3* coefficients of both wage dummies show a positive sign and are significantly different from zero[15]. Subjects in the low wage treatment achieve 4 correct calculations more than those in the intermediary treatment and this result is significant at 1% for all three models. The effect is weakly significant for a pairwise comparison using the Mann-Whitney-U-Test (p-value=0.09 two-tailed). Moreover, subjects in the high fixed wage treatment yield significantly 3 correct answers more than individuals paid an intermediary fixed wage. This result is similar for models 2 and 3 with a significance level of 10% and 5%, respectively. Still, the latter effect seems to be less robust as it diminishes when using OLS regression or pairwise tests (p-value=0.14, Mann-Whitney-U-Test, two-tailed).[16] Hence, it follows that deviations from the intermediary wage in both directions lead to higher performance even though the impact of the high fixed wage seems to be less pronounced in size and also in robustness.

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13 For the application of median regression, see Greene (2003, p. 448).

14 We also ran an OLS regression on the data which can be found in the appendix in *Table 4*. The results do not differ qualitatively from those reported in *Table 3*, however levels of significance are less pronounced.

15 Performing an F-test on the coefficients of the two treatment variables does not yield significance at any conventional level.

16 Additionally, we ran a pairwise comparison using a one-sided t-test. The difference between the low and the intermediary wage treatments are significant on a 5% level (P<t=0.0340). Comparing the intermediary and the high wage groups the difference is weakly significant (P>t=0.0895).

Table 3: Estimation results median regression

Dependent variable	Number of correct answers		
Explanatory variable	Regression coefficients (t-statistics)		
	Model 1	Model 2	Model 3
Intercept	17***	20***	10.12
	(15.47)	*(4.58)*	*(1.23)*
High fixed wage	3**	3*	3.39**
	(2.19)	*(1.91)*	*(2.31)*
Low fixed wage	4***	5***	4.21***
	(2.95)	*(3.24)*	*(2.83)*
Cologne	7.44e-16	-1.65e-16	-1.21
	(0.00)	*(0.00)*	*(-.99)*
Income1		-4	-.39
		(-0.91)	*(-.09)*
Income2		-3	.21
		(-0.69)	*(.05)*
Income3		-3	.12
		(-0.64)	*(.03)*
Age			.30
			(1.62)
No. of Observations	181	181	181
Pseudo R^2	0.0245	0.0325	0.0435

High fixed wage is a dummy variable with value one if the subject was paid a high fixed wage and zero otherwise. Low fixed wage is a dummy variable with value one if the subject was paid a low fixed wage. Cologne is a session dummy variable with value one if the subject participated in the session at the University of Cologne. Age controls for the age of the individual. The Income variables are dummies for income groups[17].

*** significant at 1% level, ** significant at 5% level, * significant at 10% level

As the results might be driven by the individual income level we asked some questions about the monetary amount the participants had monthly at their disposal. The applied parametric analysis allows us to control for these external factors such as the mentioned income effect. But the results show that income does not have a significant effect on the effort decision.

A second interesting question is whether different levels of the fixed wage component influence the quality of task performance or approach of solving the task. Realizing that a wage is high (or even higher than expected) participants might feel too motivated or even pressurized to work harder and faster. A consequence might be higher error rates. To analyze this factor we examine the number of given answers and the corresponding error rates.

17 There were four different intervals for the subjects' monthly income between the participants could choose from in the questionnaire.

Figure 4: Median error rate over treatments

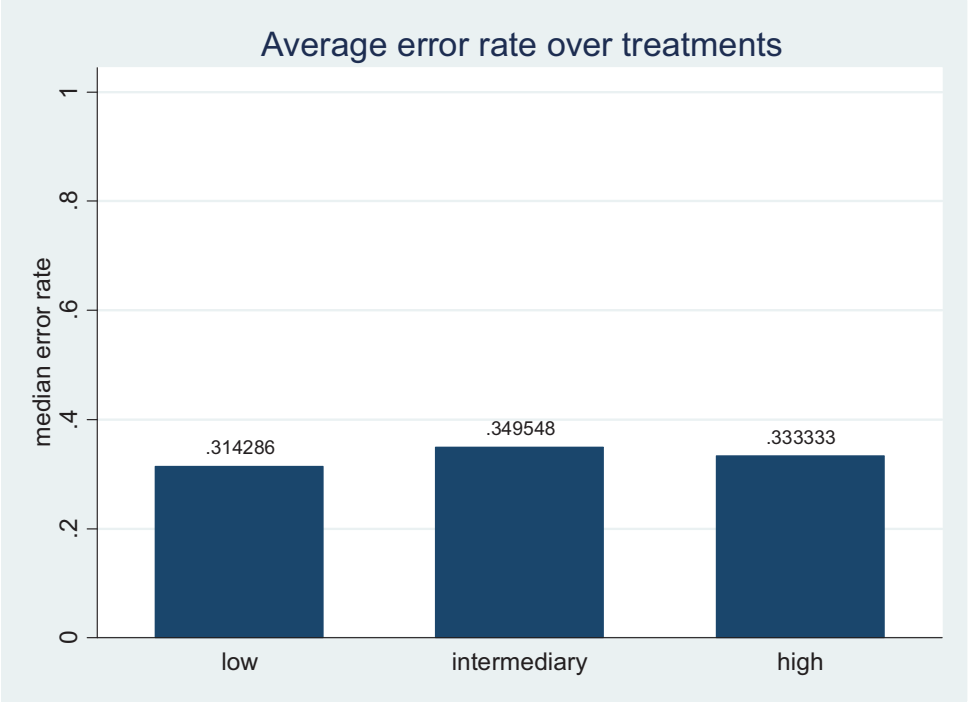

Figure 4 shows an error rate which is quite high and hardly ever changes throughout the treatments. And indeed we do not find significant differences in error rates for the different treatments in models 1 and 2. Thus, we conclude that the better results of the low wage group were not triggered by a superior work quality but simply by higher work quantity.

5. Interpretation

As mentioned above we find (weakly) significant differences between treatments and hence we cannot confirm standard theoretical results (*H1*). The height of the fixed wage in fact does matter with regard to effort levels. However, the mechanism beyond is less clear.

In our H*ypothesis 2* we apply reference dependent preferences and loss aversion predicting a decreasing relationship of scores in the fixed wage. However, this relationship can only be identified between the low fixed wage treatment and the intermediate wage treatment. The theoretical model suggests this to happen when in one of the higher paid treatments the reference wage is reached or exceeded but not so in a less paid treatment. In order to analyze this more deeply we consider the actual amount of money that subjects were paid in total (fixed wage plus piece rate). *Figure 6* in the appendix displays the distribution of these total earnings over the different treatments (averages are presented in *Table 5*). If reference wages played a role and if our subjects indeed took our announcement of an average pay of 10€ as a reference

then those subjects that actually reached earnings of 10€ or more should refrain from exerting more effort. Looking at the intermediate treatment that showed the lowest performance the average payoff was only 8.72€ (and hence smaller than 10€). Accordingly, incentives should still have worked for this group because their payment was still below their reference wage. However, for all of these considerations so far we only took correct answers into account.

Table 5: Earnings

Fixed wage	Actual income in €		Potential Income in €	
	Mean	Median	Mean	Median
low	5.16	5.15	6.86	6.80
intermediary	8.72	8.55	10.22	10.35
high	15.03	15.00	16.52	16.50

We have seen above that around one third of all answers given were not correct. If subjects underestimated or even neglected their number of false answers and linked their effort decision rather to the number of answers given, they potentially expected higher earnings than they actually yielded. Thus we calculated the income potential subjects would have reached if all of their answers were correct (potential income). The distribution of this potential income is displayed in *Figure 7* in the appendix. And in fact most of the participants in the intermediate treatment would have earned around 10€ or more if their answers had been correct. This gives us a hint that subjects might have felt less incentives to solve even more calculations as they thought to have earned around the announced 10€.

However, this can also explain only part of the experimental results since the theory might well predict higher effort choices for lower wages but never a re-increase for even higher wages. Moreover, after a decrease, the effort choices should remain on the same level or diminish even more[18].

The increase in the high fixed wage treatment is somewhat puzzling and it is hard to set up a straightforward interpretation, especially as its robustness is rather limited. Compared to the high fixed wage the piece rate might be perceived as being quite low and in fact the fraction of pay resulting from the latter is minor in this treatment. Subjects may have wondered why the experimenter chose this unequal combination within the compensation scheme. Possibly they used the fixed wage as some kind of anchor trying to figure out what they would be able to earn in total. They might have concluded that a large number of correct answers were anticipated by the experiment-

[18] Another straightforward interpretation is of course the occurrence of an income effect. According to the Slutsky equation a higher fixed payment leads to less effort if leisure is a normal good, which can be assumed here. Still we do not believe in an income effect because the subjects' life income is not likely to be severely influenced by the participation in an experiment. This argument is also supported by the examination of the income variables which are insignificant in any specification of the estimation models. That is, the level of income does not significantly influence the number of correct answers in the experiment.

er such that the fraction of wage brought about by the variable component raises to an extent they consider reasonable[19]. Nevertheless this notion cannot sufficiently explain the full range of results since it would suggest a monotonously increasing relationship.

Another possible and in the light of the extensive literature more evident explanation might be some sort of reciprocal considerations. As our experimental design does not include principals, reciprocity in the common sense is not very plausible. Still there might be some related motive behind the observed behavior which is not directly linked to a counterpart but to the wage received. Some kind of "bad conscience" of exerting low effort when being paid a very generous fixed wage (12€) might have triggered the subjects effort decision. A low effort level could be recognized as inappropriate if a very generous fixed amount is paid in addition to a piece rate. The fixed wage of 12€ is apparently very high especially because we announced only an average of 10€. Hence it might have exceeded the expectations of participants and this might have been perceived as a friendly act by the experimenter. Although there are no obvious advantages of higher scorings for the experimenter, the participants might suffer from a bad conscience if they receive a high fixed wage but do not exert corresponding efforts. As argued in Bewley (1999) a certain amount of money goes along with a certain effort level, i.e. employees have an appropriate effort level in mind fitting to the height of their remuneration.

Still, all approaches mentioned above fall short of providing clarification for the full behavioural pattern. But combining loss aversion and the above mentioned explanation of appropriateness of wage and effort we might find another possible explanation. Bewley (1999) provides evidence that employees do not behave strategically but feel impelled by morale. He stresses the idea that their efforts are mainly driven by the adequacy of their actual wages[20]. As there is no clearly demanded effort level in our experiment, the agent might derive a desired effort level from the height of the fixed wage he is offered. Consequently it seems possible that the appropriateness of the height of the fixed payment and the effort level makes the agent increase performance with rising fixed wages[21]. Then appropriateness of wage and work is a kind of social norm. This means that the employee transfers the fixed wage via the social norm into an appropriate level of effort.

If the employee is loss averse the following interaction is additionally possible: Given a very low wage the social norm of appropriateness would merely require a low effort level. However, the employee suffers from loss aversion if the reference point is

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19 We thank an anonymous referee for the suggestions to discuss this matter.

20 Bewley (1999) conducts interviews with employees, employers, trade unionists and civil servants.

21 As the fixed wage is the unconditional part of the compensation the agent might interpret the level of the fixed wage as a measure of trust towards him. In turn the variable payment could be considered as an instrument of control by the agent. Therefore only the height of the fixed wage should be relevant for the agent's considerations of appropriateness.

not reached. So for very low wages the effort would be relatively high in order to get closer to the desired reference wage. Yet, close to the reference point effort decreases because the marginal returns are lower after exceeding the reference point. Consequently for intermediate fixed wages loss aversion might overpower the norm of appropriateness which leads to lower efforts. In turn for sufficiently high fixed wages the norm of appropriateness may dominate loss aversion and as a consequence the effort choices increase. This might be a possible explanation for our experimental results but we are aware that the relevance of this approach is to be tested in future research.

6. Conclusion

Our experimental results indicate that workers indeed care about the fixed wages. The group with the low fixed payment as well as (to some extent) the group with the high fixed wage worked more than the participants who received an intermediate fixed wage. However, at first sight it is quite surprising that an intermediate fixed wage level leads to less effort than a low or high one.

Our empirical findings cannot be explained by any of the two theories we considered beforehand, namely standard agency models and reference dependent preferences. Although these theories would lead us to predict different relationships between the level of the fixed wage and the chosen effort level, none of them is able to explain the experimental results comprehensively.

The experiment shows that the fixed wage does have a significant influence on the individual's effort decision. Linear incentive schemes seem to be effective if the fixed wage is relatively low or very high. In case of a low fixed payment it appears as if the efforts are potentially driven by reference dependent preferences. If a sufficiently high fixed wage is paid the effort level increases in comparison to an intermediate fixed wage. Possibly a social norm is important in this context demanding a certain level of effort to coincide with a certain fixed wage, where not fulfilling the norm leads to disutility. The combination of two different explanatory approaches seems to be quite arbitrary at first glance. But typically gift exchange experiments with fixed wages provide clean evidence for reciprocity and accordingly appropriateness of wage and effort. Furthermore, the relevance of loss aversion and reference dependent preferences could be shown in previous real effort experiments (e.g. Abeler et al., 2011; Goette & Huffman, 2003). Since the current experiment is a kind of combination of those why should we not observe both motivations together? Certainly an exact test of the validity of this approach is necessary and should be subject to further research.

Finally, the most important conclusion we draw is that the fixed wage is indeed directly relevant for the effort decision, and this is true within an incentive contract. Disentangling and understanding the motives beyond will be key for designing optimal incentives schemes in real work environments.

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Appendix

A1 Theoretical result

Based on the model in Pokorny (2007) we derive the following result:

For given values of α *and* β *the agent's optimal effort level e* is:*

$$e^* = \begin{cases} c'^{-1}(r\beta) & \text{if } \alpha < R - c'^{-1}(r\beta)\beta \\ \dfrac{R-\alpha}{\beta} & \text{if } R - c'^{-1}(s\beta)\beta \geq \alpha \geq R - c'^{-1}(r\beta)\beta \\ c'^{-1}(s\beta) & \text{if } \alpha > R - c'^{-1}(s\beta)\beta \end{cases}$$

Proof:

Due to the strict concavity of the objective function and the assumption on the cost function there must be a unique internal optimum.

Suppose that $e^* < e^R$, then $e^* = c'^{-1}(r\beta)$ must hold. Thus, the agent chooses an effort level to the left of the kink. This happens iff

$$c'^{-1}(r\beta) < \frac{R-\alpha}{\beta} \quad .$$
$$\Leftrightarrow \alpha < R - c'^{-1}(r\beta)\cdot\beta$$

The equation defines a unique cut-off value for α such that $e^* = c'^{-1}(r\beta)$ iff α is smaller than the cut-off value.

For $e^* > e^R$, the optimum is defined by

$$e^* = c'^{-1}(s\beta).$$

Consequently e^* must be located right of e^R which occurs iff

$$\alpha > R - c'^{-1}(s\beta)\cdot\beta .$$

The cut-off value is strictly larger than the cut-off value defined by $e^* = c'^{-1}(r\beta)$ since $s < r$. It follows that in all other cases the agent chooses $e^* = e^R$.

q.e.d.

A2 Experimental results

Figure 5: Full data distribution of by treatments

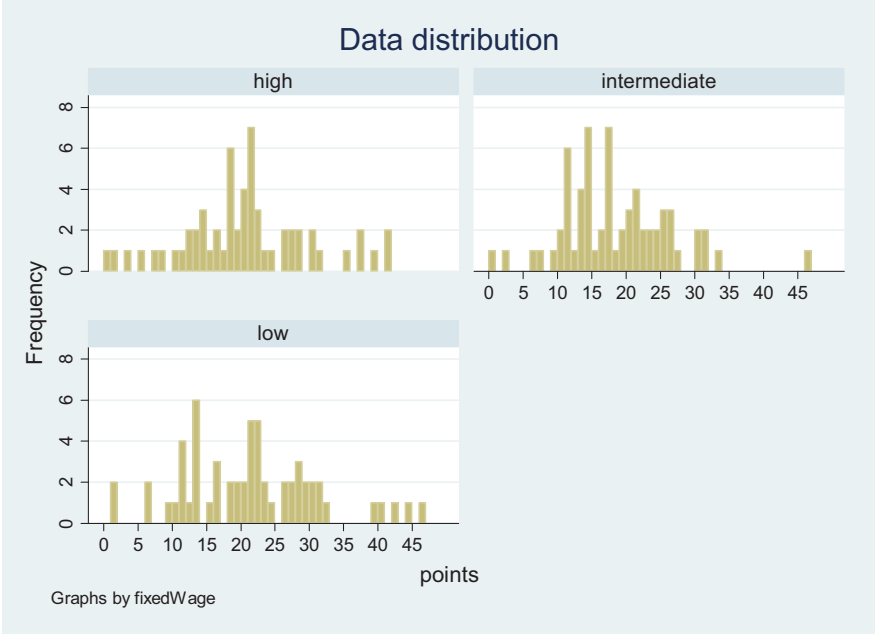


Figure 6: Total income distribution by treatment

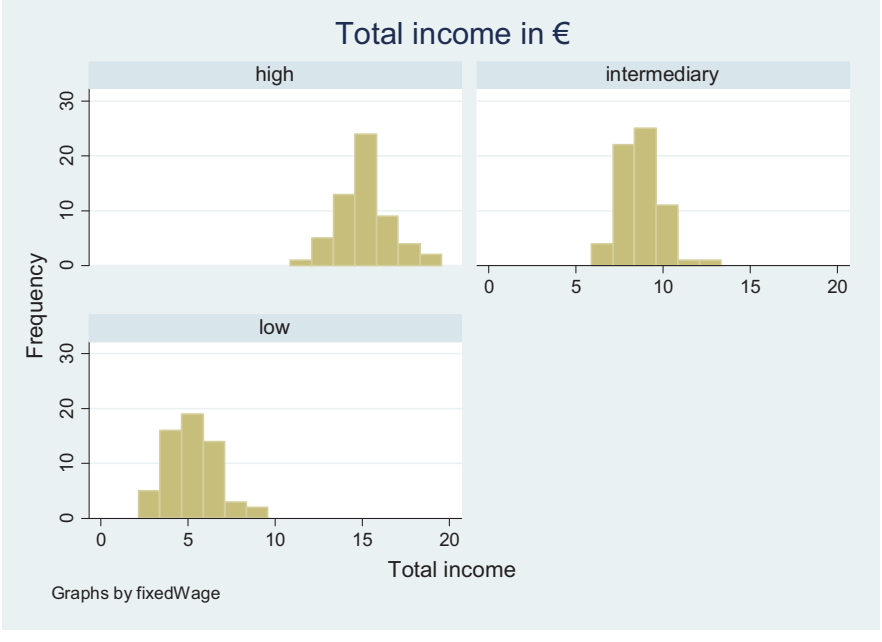
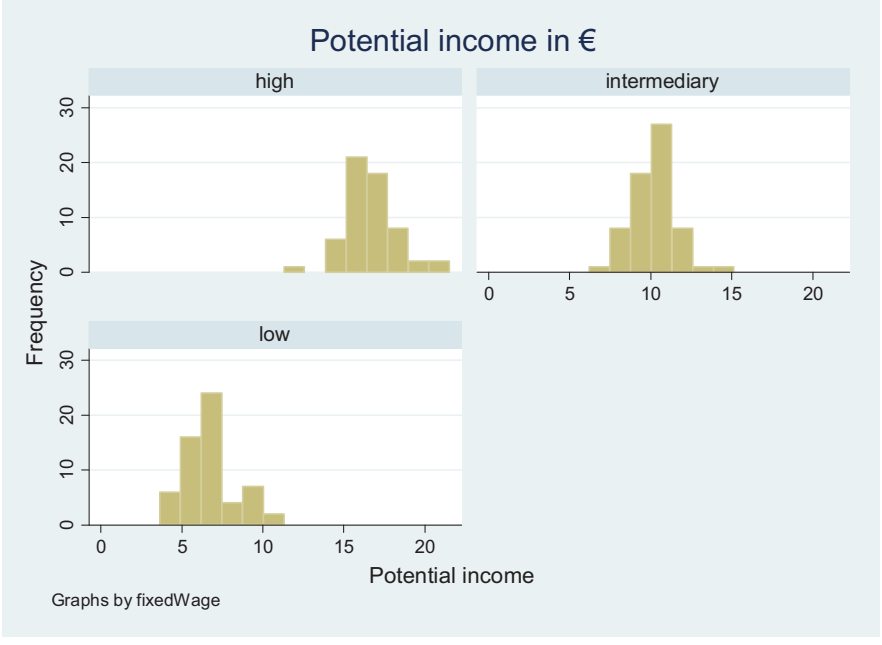


Figure 7: Potential earnings distribution by treatment



A3 OLS Regression

The variables are defined at the bottom of Table 2.

Table 4: Estimation results OLS regression

Dependent variable:	Number of correct answers		
Explanatory variable	Regression coefficients (t-statistics)		
	Model 1	Model 2	Model 3
Intercept	19.30***	23.51***	9.80
	(14.45)	*(4.39)*	*(0.87)*
High fixed wage	2.00	1.86	1.86
	(1.22)	*(1.12)*	*(1.12)*
Low fixed wage	2.88*	2.88*	2.55
	(1.77)	*(1.75)*	*(1.54)*
Cologne	-2.28*	-2.26*	-1.90
	(-1.7)	*(-1.67)*	*(-1.38)*
Income1		-4.69	-1.18
		(-.88)	*(-.17)*
Income2		-3.92	1.99
		(0.73)	*(.29)*
Income3		-3.94	1.44
		(-.70)	*(.21)*
Age			.33
			(1.38)
No. of Observations	181	181	181
Adjusted R^2	0.0187	0.0071	0.0123

A4 Instructions

Your personal ID-CODE ☐

We cordially welcome you to our experiment

Please do not talk to other participants of this experiment from now on! If you have any questions, please ask them after you have read these instructions carefully!

Instructions:

On the sheet you can see a block of figures. Each block consists of two rows. Your task at stage one will be to add up the digits per row. Thus you calculate two sums. (see example row 1: total of 67, row 2: total of 63).

Example:

Block 1																
4	1	7	5	6	4	6	6	1	4	1	7	5	6	4	*Sum =67*	**Result**
8	3	1	2	2	8	8	6	1	8	3	1	2	2	8	*Sum =63*	4

At stage two you should compare if the sum in the upper row is greater or less than the sum in the lower row. If the value of the upper row is greater, then you should subtract the value of the lower row from the upper row. If the value of the upper row is less or equal, than the value of the lower row, you should add both values up. This result should be filled into the column "Result" (In the upper example: 4). Only this final result is relevant for your payment!

Compensation

For your participation you will receive 6€ in any case.

In addition you will receive an incentive of 0.15€ for every correctly calculated final result.

Your process time will be **40 minutes**. You can split up your process time individually for solving the arithmetic problem (see above) or the puzzles attached to this sheet. For solving the riddles you will receive no incentives.

Following the process time of 40 minutes, you will receive a questionnaire. The money will only be paid out if you fill out the questionnaire completely.

The money will be paid out from **22.07. to 05.08.2004 daily between 10 a.m. and 12 p.m.** in room 119b (office: Herbert-Lewin-Str. 2). Please bring along your personal anonymous ID-code. The ID-Code can be found in the right corner of this cover sheet. Additionally, you will find it on a separate slip of paper attached to your cover sheet. Please rip it off and bring it with you when you pick up the money.

If there are any questions now, please raise your hand and wait for an instructor to come to your seat.

Please don't ask questions **aloud**!

Thank you for your participation!