What is a fair wage?

Reference points, Entitlements and Gift Exchange

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Abstract: Society adopts institutions that can change incentives, reference points and entitlements for the economic agents. In this paper we look at two stylized wage setting institutions and their effect on wage offers and effort in the classic gift exchange experiments of Fehr, Kirchsteiger and Riedl (1993). The first one is the exogenously imposed minimum wage institution (first instituted in New Zealand in 1894). The second institution we look is an endogenous wage proposal institution where workers first make wage proposals. We find that the imposition of an exogenous minimum wage floor at the competitive outcome lowers average wage offers. However, workers do not negatively reciprocate and continue to offer high effort. In the second institution workers make non-binding (endogenous) minimum wage proposals. The introduction of endogenous minimum wage proposals marginally increases wage offers while, average effort decreases when wage proposals are not matched. Finally, relative to the baseline, overall efficiency with the non-binding minimum wage decreases, while, efficiency is only slightly higher under endogenous minimum wage proposals. We find that clear evidence that the institutional structure has important implications towards wage offers, effort and efficiency.

JEL Codes: J2, J3.

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1 Introduction[2]

Private contracts are an intimate part of the fabric of exchange and are relied upon for the consummation of various economic transactions. Such contracts emerge endogenously, require little monitoring and (for this reason) are the preferred vehicle for economic transactions. However, when such interactions don't function as perceived then society imposes institutions (through legislation) to supposedly "correct the wrong". Examples of such instances are the renewed financial legislation after the recent crisis, laws that ensure enforcement of contracts, labor market legislation, etc. It is clear that behind the imposition of these institutions is the perception that society can undo the wrong, or at the least mitigate it to some extent.

Freeman (2008), for example, recognizes that wage-setting institutions can affect economic performance in three ways: they "alter incentives" and hence the actions of the participating agents, they "facilitate efficient bargaining," and they "increase information, communication, and trust". However, we know from the experimental literature that the imposition of these institutions can also alter reference points, or entitlements, for the economic agents and alter behavior in subsequent periods (see for example the literature on price and quantity controls[3]).

The imposition of these institutions is, however, not neutral towards the actions of the agents (that form the institution) nor towards the outcomes. One can expect that a change in rules that govern an institution will change the incentives for the market participants and hence their actions. It is in this light the experimental approach is very useful in that one can clearly study how changes in institutional rules alter agent actions. For example, Falk et al. (2006) show that the imposition of a non-binding minimum wage can change reference points

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[3] See for example, Isaac and Plott (1981), Coursey, and Smith (1983), Kujal (1994) among others.

both for workers and firms. They find that the imposition of a non-binding minimum wage changes reservation wages which results in a rise in subjects' reservation wages that persists even after the minimum wage has been removed. This is a clear example of how seemingly neutral events can change reference points and hence outcomes.

The imposition of the minimum wage legislation was motivated by the perception that markets on their own do not provide "fair" compensation towards the lower end of the wage strata. Interestingly, this contrasts with the experimental results of Fehr et al. (1993) where they find support for the fair wage hypothesis (Akerlof, 1982) in a free market setting. They observe reciprocity in employer-employee relationships where fair wage offers are reciprocated with higher effort and vice versa. The interesting question to thus ask is regarding the effect of imposing such legislation on the mutual reciprocity.

In this paper we look at how the imposition of labor market institutions impact wages and worker effort, and subsequently market efficiency. The imposition of an institution (or rules) may create reference points or a sense of entitlement for employers and workers alike. Given this we look at simplified versions of two wage setting institutions. The first one, exogenously imposed, is the minimum wage institution. The minimum wage legislation was first enacted in New Zealand in 1894 and its primary goal was to ensure "fair" compensation to workers[4]. Since then, minimum wage laws have been widely enacted across the world[5]. There is much debate among economists on the benefits and the drawbacks of the introduction of a minimum wage[6]. It is widely accepted that this institution, which is supposed to ensure a reasonable wage to low skill workers, is ultimately motivated by fairness concerns.

[4] Its intention was to guarantee a "minimum standard of living to workers".
[5] Almost all countries in the top ten ranking of the Heritage Foundation 2009 Index of Economic Freedom report have minimum wage laws keeping in mind fairness concerns.
[6] There is evidence that institutions reduce inequality, however, how institutions affect aggregate economic outcomes is not clear (Freeman, 2008).

The second institution we look at is an institution that tries to capture a structure where workers propose a minimum acceptable wage. Under this institution the minimum wage proposal is endogenously determined, however, it is not binding on the employers. Workers make individual wage proposals and then the average of all proposals is presented to the employers as the "wage proposal". This institution reflects a scenario where workers collectively make a one-time wage proposal to the employers. We chose this institution over a wage bargaining institution with repeated offers due to its simplicity and that it reflects an essential feature of wage bargaining institutions where (initial) endogenous wage proposals come from workers. We feel that making wage proposals should give a sense of entitlement (to that wage) to workers.

Exogenously imposed minimum wage or an endogenous minimum wage proposal should have different impact on labor markets. The minimum wage may provide a reference point to employers while the endogenous wage proposal may result in expectations of entitlement to that wage for the workers.

Given this we study the effect of imposing an exogenous, and endogenous, minimum wage institution in a gift exchange environment. We are interested in studying how the imposition of the minimum wage institution impacts private fairness in the Fehr et al. (1993) gift exchange experiment. We first replicate the findings in Fehr et al. and then study the effect of exogenously imposing the minimum wage institution on average wage. We find support for the crowding out of private fairness with average wage offers declining across all periods. Interestingly a higher proportion of the wage offers are made around the minimum wage. The exogenously imposed minimum wage partially crowds out fairness concerns in employer-employee relationship. Interestingly, even though wage offers decline, effort levels do not. Wage-effort reciprocity is thus also crowded out.

In the endogenous wage proposals institutions workers make a non-binding minimum wage proposal. We find that average wage offers increase, however, effort levels decrease. Endogenous wage proposals crowd out worker reciprocity when wage proposals are not met by employers. If proposed wage offers are not met, workers reciprocate negatively decreasing effort levels.

Similar to Falk et al (2006) we also show that institutions can change reference points for workers and the firms. We provide an interesting extension to the standard competitive model in the sense that the standard model generally assumes that only the level of payoffs matters. However, it might be that the gains are indeed evaluated relative to a reference point or worker expectations[7]. Therefore, if people have reference-dependent fairness preferences, policy measures may affect these points relative to which workers evaluate the fairness of their employment situation[8]. The exogenous, as well as the endogenous, introduction of a minimum wage in a competitive market may thus change the reference point according to which employers, or employee, judge an offer as fair or unfair. For the same reason, the introduction of a minimum wage may affect the wages offered by the employers and, ultimately, the employees' decisions about the effort levels.

Literature review:

Some papers have looked at how exogenously, or endogenously, determined wages affect worker performance in the work environment. The closest to ours is (Falk, Fehr and Zehnder, 2006). They study the effect of imposing a non-binding minimum wage on worker preferences and its impact on entitlements. They elicit reservation wages from workers using the strategy method. Any wage offer above (below) the reservation wage is automatically accepted (rejected). They show that the imposition of a non-binding minimum wage affects people´s reservation wage. The temporary introduction of a minimum wage leads to a rise in

[7] As in Falk et al. (2006).
[8] Falk et al (2006) make a similar point with regard to worker entitlements.

subjects' reservation wages which persists even after the minimum wage has been removed. They do not analyze the effect over the effort of the workers but over their reservation wage. Their findings suggest that the cause of the change in the reservation wage is the change in the perception of what is considered to be a fair wage. They argue that public policies can affect behavior not only through changing behavior but by also shaping perceptions of entitlements and thus, reservation values (p 1351). As in their paper we also show that institutional arrangements can also shape wage expectations (entitlements) and hence effort.

Brandts and Charness (2004), study the impact on gift exchange of both, the competitive imbalance (both, an excess of supply (workers) and an excess of demand (employers)). They assert that although there is a lot of evidence about the gift-exchange phenomenon, however, the motivation behind its occurrence is lacking. They introduce a binding minimum wage to obtain an excess supply of workers and find that gift exchange is not altered with different conditions in the competitive imbalance. However, the effort provision declines when a binding minimum wage is introduced. The introduction of a binding minimum wage seems to lower effort provision at all wages and also decreases the probability of a high wage is offer.

Another set of papers has looked at how control (Falk and Kosfeld, 2006) or endogenizing decisions (Charness et al, 2012) can impact worker performance. Falk et al. (2006) look at how exogenously imposed performance targets can be counter-productive and affect employee performance. In their setup an outside imposition of effort level is construed as in indication of distrust and is negatively reciprocated. Charness et al. (2012), meanwhile, study the effect of delegating the wage decision to employees on employee performance. Delegating the wage decision implies that wages are endogenously determined in their structure. They find that delegation significantly increases employee effort with performance

increasing for the same wage levels. Finally, earnings of both employers and employees increase under this setup.

2. Experimental Design

We are interested in studying how the introduction of the minimum wage institution, exogenous and endogenous, alters reference points or entitlements in labor markets. The externally imposed minimum wage provides a reference point for employers while the endogenously chosen wage proposal provides an entitlement wage to workers. Our experimental design consists of three treatments, the Baseline treatment (BASE, henceforth), the Exogenous Minimum Price treatment (EXO, henceforth) and the Endogenous Minimum Price treatment (ENDO, henceforth). The BASE is the free market setting as in Fehr et al (1993). In the second set of experiments we introduce an exogenous non binding minimum wage set at the competitive market wage[9]. A competitive minimum wage is a reasonable place to start as, a priori[10], the imposition of a minimum wage at that level should not affect wage-effort outcomes[11]. We conjecture that the exogenously imposed competitive minimum wage will provide reference points to employers pushing the average wage downwards.

In the third set of experiments we introduce a non-binding endogenous minimum wage proposal from the employees. We feel that making minimum wage proposals gives workers an entitlement to what they consider as a fair wage. In this treatment each employee is asked to make a minimum acceptable wage offer and then the average of all the offers is taken to be the "initial wage proposal". The minimum acceptable wage proposal is non-binding and in theory this should not affect wage offers, or effort levels, from workers. We conjecture that a minimum wage proposal will create entitlements for workers on what they

[9] The minimum wage is introduced at the competitive level.
[10] The experimental evidence on price (wages) and quantity controls suggests to the contrary (Isaac and Plott (1981), Smith and Williams (1981), Coursey and Smith (1984), Kujal (1994), Falk et al (2004)).
[11] We, however, know from earlier experimental literature that this is not the case. Even non-binding price, or quantity, levels impact agent behavior.

perceive as a fair wage and if not reciprocated may induce negative reciprocity with workers responding with lower effort levels. It would be interesting to see whether fairness and reciprocity concerns hold when minimum wage proposals come from the workers and are not exogenously imposed, and how it may alter their perception of what is a fair wage.

Our design follows Fehr et al (1993) and the game has two stages. The first stage is a one-sided oral auction in which employers and workers exchange one unit of labor time. Employers act as bidders: they propose a wage[12] and do not have the opportunity to choose the worker. Meanwhile, employees act as sellers. If the worker accepts the offer, the contract is concluded. If it is not accepted, the employer can change the bid in an additional round with the new one being higher than the previous highest unaccepted bid. The first stage lasts three minutes. If some traders cannot conclude a contract, they earn zero profits in this period.

In the second stage, workers determine the value of the good for the buyers choosing an effort level anonymously (their choice is revealed only to their employer to eliminate group pressure effects) and without any constraint (there are no sanctions associated with the effort chosen). As in Fehr et al (1993) we run four sessions for the BASE and EXO treatment. We ran five sessions in the ENDO treatment in order to have enough data for different levels of minimum wage proposed. Finally, each session has twelve periods.

In all sessions there are more workers than firms (nine workers and six firms or employers)[13]. The excess supply of workers is to give the competitive theory its best shot. Either party does not know the identity of their trading partners. This avoids any reputation effects. Further, no labor market terms are used, employers are called buyers, workers are called sellers, the wage is called a price and the effort level is called the quality level. Each

[12] It has to be multiple of five in order not to put a commission fee. It enables workers to earn a small amount of money at marginal trades.

[13] Unfortunately, two subjects did not show up for the third session of the BASE and, for the fourth session of the EXO treatments. We had eight workers and five firms in these sessions. Further, in the third and fourth sessions of the ENDO treatment there were eight workers and six firms.

participant knew how profits are computed and were given sufficient time to read the instructions carefully and to ask questions.

The experiments lasted for two hours including the instructions[14]. All subjects were (randomly selected) volunteer[15] students recruited by e-mail and participate for the first time in such an experiment (each agent could only participate in one session). Before the beginning of a session, each subject had to draw a card that determined if she will be a seller or a buyer. Workers and employers were in separate rooms. In each room the supervisor transmitted the bids, acceptances and effort messages using Google chat to the experimenter in the other room[16].

Subjects were paid a 3 euro show up fees in addition to the profits they earned during the experiment. Experimental Money (EM) was used for the purpose of the experiment with an exchange rate of 45 units of EM to 1 Euro. All workers are identical and the payoff of a worker *j* is:

$$u_j = p_j - c - m(e_j), \qquad (1)$$

Where, p is the wage, e is the effort level provided by the worker, c = 26 (constant) is the monetary cost of providing one unit of labor time and, $m(e)$ is the monetary effort cost. The payoff of an employer *i* is:

$$\pi_i = (v - p_i)e_i, \qquad (2)$$

Where v = 126 is a valuation given exogenously. The assumption that effort interacts with price in the payoff of the employers had been made to avoid losses and analyze only fairness concerns. The monetary effort cost schedule is given by the following table (it is the same for all workers):

Table I: Monetary Effort Cost Schedule

[14] Appendix A.
[15] ORSEE was used for subject recruiting.
[16] This is very similar to Fehr et al (1993) where wage proposals are made using telephones.

e	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
m(e)	0	1	2	4	6	8	10	12	15	18

Utilities, payoff functions of the firms, cost efforts and the values of all parameters are public information in both treatments.

Note that since the Fair Labor Standards Act was passed in 1938, the minimum wage has been fixed at about 50% of the observed average wage (closer to 55% in the 1950s and 1960s, 40% in the 1990s)[17,18]. In our BASE treatment the observed average wage is equal to 59.95. Following this rule the minimum wage in the EXO should be equal to 29.98. This is very close to our choice of the minimum wage at the competitive level of 30.

Prediction with Money-Maximizing Agents

Money-maximizing agents have no incentives to choose an effort level higher than the minimum one as effort is costly and workers cannot be punished for providing low effort. If firms assume that agents are money-maximizers they do not have incentives to offer wages above the equilibrium wage level. With parameters values of, v = 126 and c = 26 one should expect that wages converge to the competitive equilibrium level of 30. Note that if some workers receive a wage level > 30 then some traders are involuntary rationed.

The Fair Wage-Effort Hypothesis

Hypotheses 1 to 3 are the same as in Fehr et al. (1993).

HYPOTHESIS 1: The effort level is increasing in the wage.

[17] Minimum Wages, Employment, and the Distribution of Income. Charles Brown. Handbook of Labor Economics, Volume 3, edited by O. Ashenfelter and D. Card, Chapter 32. University of Michigan and NBER.
[18] Minimum Wage Laws: Are They Overrated? Charles Brown. Journal of Economic Perspectives- Volume 2, Number 3- Summer 1988-Pages 133-145.

HYPOTHESIS 2: Average wages are considerably higher than the market-clearing wage. If the game is repeated the wages do not converge to the market wage.

HYPOTHESIS 3: The average effort is above the minimum one and if the game is repeated it does not converge to the minimum one.

We add two additional hypotheses resulting from our minimum wage treatments.

HYPOTHESIS 4: If the introduction of a minimum wage provides a reference point to employers it should lower wage offers.

HYPOTHESIS 5: If final accepted wage offer is lower than the initial wage proposal then effort is negatively impacted.

Our first basic analysis of the data is the same as the one in Fehr et al. (1993). The OLS regression to test the First Hypothesis is[19]:

$$e = \alpha + \beta p + \mu, \qquad (3)$$

Hypothesis 1 cannot be rejected if β is significantly greater than zero. In the experiment agents do not know the effort levels chosen by their partners, as a result they cannot adjust their individual notion of fairness to a common market level. To take into account the possibility of agents having different ideas of what is a fair response to a wage offer a dummy variable d_i is introduced for workers and we fit the following regression:

$$e = \sum_i \gamma_i d_i + \beta p + \mu, \qquad (4)$$

Following this we test if all estimated γ_i are equal to the estimated α of the first regression to analyze for the significance of behavioral differences among workers. We also test if effort varies systematically between periods using a period dummy p_t and running the following regression:

[19] All regressions to test the fifth hypotheses are estimated with OLS. We also ran two sided censored Tobit regressions to take into account the ceiling in the possible values the dependent variable can assume. The results do not differ. Tobit regressions are available upon request. We also do a non parametric test to test the equality in populations (Kruskall Wallis equality of population rank test). Our results are robust to these tests.

$$e = \sum_t \theta_t p_t + \beta p + \mu, \qquad (5)$$

Again, we test with linear restrictions if there are significant differences between all estimated θ_t and the original estimated α of the first regression. To test the Second and the Third Hypotheses we look an Average Relative Overpayment (as defined in Fehr et al., 1993):

$$r = (p_0 - c - \tau)/(v - c) \qquad (6)$$

Where, $\tau = 30 - c$ and p_0 is the average wage in the period. If Hypothesis 2 is true, r should be greater than zero and should not converge to zero.

To test the Fourth and Fifth Hypotheses we perform t tests to compare the Average Wage, the Average Effort Level, the Average Relative Overpayment and the Average Efficiency of the two treatments. If Hypotheses 4 and 5 are true, the difference in mean of the Average Wage and the Average Effort Level should be significant.

Finally to test hypothesis 5 we will run the following regression.

$$e_i = \eta + \delta d_i + \theta (a_i - p_i) + v_i \qquad (7)$$

Where, e_i is the effort for agent i, d_i is a dummy which take value 1 (and 0 otherwise) if the individual offer, a_i, is greater than p_i (what agents finally accept). The second term, $(a_i - p_i)$, captures whether the individual offer is above or below the final accepted wage offer. The last term is the cross product between the second and third term in the regression. The idea behind regression (7) is that if agents take their wage proposals as an *implicit entitlement* then any accepted offer under this reference point should impact effort negatively.

Finally (as in Fehr et al.) we analyze efficiency. When two participants conclude a transaction (there is a match between firm i and worker j), the sum of their gains is defined as:

$$G_{ij} = \pi_i + u_j = (v - p_i)e_j + p_i - c - m(e_j). \qquad (8)$$

Standard theory predicts the minimum effort and a wage equal to $\tau + c$, therefore, with the values of the parameters chosen in Fehr et al. (1993) the joint benefits are:

$$G_s = (v - c - \tau)\, e_{min} + \tau = 0.1 * 96 + 4 = 13.6 \qquad (9)$$

Note that G_s is lower than the maximum G_{ij} that can be achieved: i.e. there is a conflict between individual and joint benefits. If fairness considerations exist then this discrepancy may be decreased. We use f_{ij} as a measure of efficiency of a transaction between firm *i* and worker *j*.

$$f_{ij} = G_{ij}/G_s, \qquad (10)$$

Standard theory predicts a f_{ij} = 1 but the highest possible value of f_{ij} is 7.29 when p = 125. Therefore f_{ij} assumes values between 1 and 7.29.

3. Main Results

3.1 Descriptive Statistics.

Henceforth we will refer to prices as wages, sellers as workers, buyers as employers and quality level as effort level. In the BASE and the EXO treatments 275 wages were accepted out of 276 wage offers meanwhile, 359 wages were accepted out of 360 (wage offers) in the ENDO treatment. The lowest observed wage was 25[20] in the BASE, 30 in the EXO and 10[21] in the ENDO experiments. Interestingly, the proportion of wage offers at the competitive level (the non-binding minimum wage) is much higher in the EXO and ENDO than in the BASE experiments. In the EXO and ENDO treatments, 17% and 14% of the offers are observed at the competitive wage of 30, respectively; while only 5% of them are observed in the BASE experiments. Finally, the highest wage is 95 in the BASE and 120 both, in the EXO and ENDO treatments.

[20] This was observed once in the first period of the first session, another in the last period of the second session and another in the tenth period of the third session. Even though these prices give negative benefits to the sellers they accepted them.

[21] This was observed once in the fifth period of the second session. It is worth noting that in the ENDO there were also offers of 15, 20 and 25 that even though those wages give negative benefits for the sellers, they accepted them.

Even though there are more workers than firms, lowest wage offers were sometimes rejected by the workers forcing the employers to increase their wage offer[22]. We also observe that when a firm improves upon a rejected offer the worker chooses a lower conversion rate to punish the firm for her earlier low offer.

The overall average wage offer in all sessions of each treatment was 59.95, 54.37 and 65.84 in the BASE,EXO and ENDO[23] treatments respectively. The average wage offer in the minimum wage treatment (EXO) is significantly lower (*p=0.00002*)[24] than observed in the baseline experiments (BASE). Our results clearly show that the introduction of a minimum wage shifts offers downwards. This result suggests that exogenously imposed institutions that provide reference points can crowd out private fairness. Interestingly, the opposite happens when an endogenous minimum wage is introduced, i.e. the average wage in the ENDO treatment is significantly higher than what is observed in the BASE (*p=0.0004*) experiments. Endogenous wage proposals seem to have a positive effect on the average wage offer.

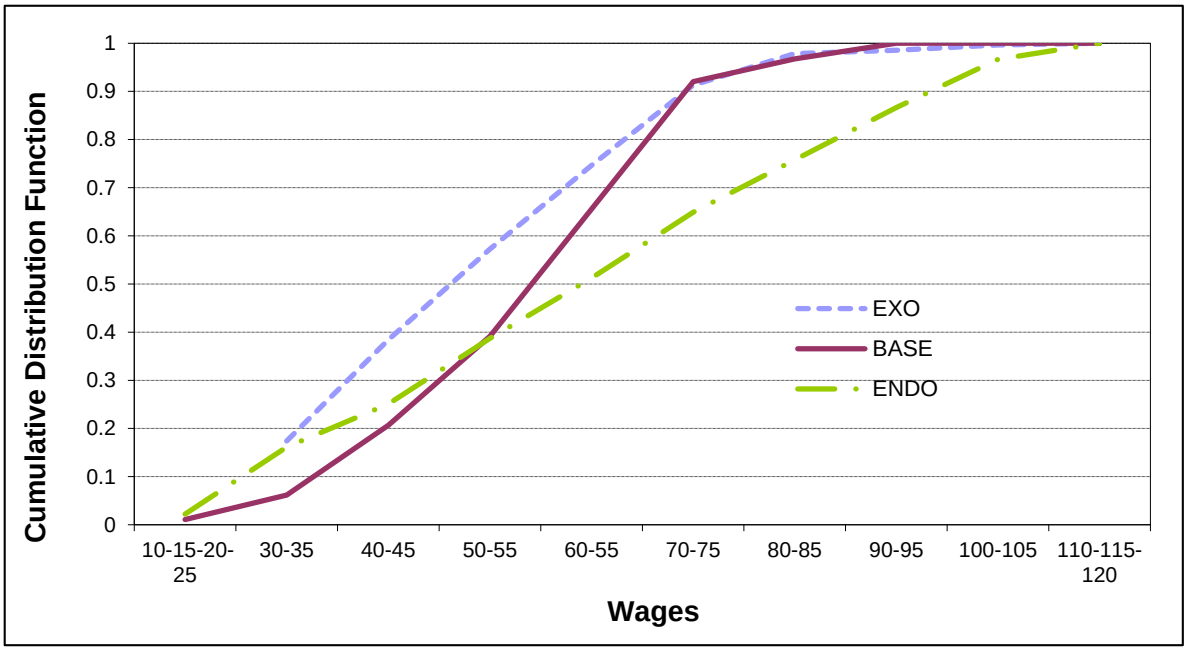
Looking at effort one finds that the average effort chosen by the workers is 0.27, 0.28 and 0.22 in the, BASE, EXO and ENDO experiments, respectively. These levels are almost three times as high as predicted by the money maximizing theory. Further, even though wages are lower in the EXO treatment, the average effort is not significantly affected. The difference in means across the BASE and EXO experiments in the average effort level is not statistically significant (t-test: *p=0.6811*). More surprising are the results in the ENDO treatment where the average wage offer is significantly higher than in BASE and the average effort is significantly lower (t-test: *p=0.0033*). One explanation for this may be that workers may develop a perception of entitlements while making wage proposals. Subsequently, if the wage proposals (or worker expectations) are not matched, workers may respond by lowering

[22] In all treatments, one offer of thirty was not accepted. In those periods where the wage is not accepted this firm does not participate in the market, therefore only five transactions were concluded.
[23] The wage offers we obtain are lower than observed in Fehr et al. who obtain an average wage offer of 72.
[24] It is also confirmed by a Kruskal Wallis test. Results available on request.

effort[25]. Interestingly, we observe that the effort level decreases as the difference between the wage proposal and the wage offer increases (see figure III).

It is interesting that the imposition of an exogenously imposed minimum wage and an endogenous wage proposal has opposing effects. The competitive minimum wage provides a reference point to the employers' that negatively affects wage offers meanwhile, effort levels are maintained. The effect of endogenous wage proposals is negative on worker effort levels, however, average wage increases. As earlier mentioned effort levels may decrease as the workers feel entitled to the wage proposals and upon not getting them negatively reciprocate by lowering effort levels. It is, however, not clear why average wage offers increase under endogenous wage proposals, and don´t go down in response to lower effort levels. It is possible that, as in the EXO treatment, employers try to elicit higher effort through higher wage signals.

Figure I: Cumulative Distribution Function. BASE versus EXO and ENDO



[25] We check for this later on.

Looking at the wage frequency distribution for the three treatments (figure I) we can see that in the EXO treatment, 38.41 % of the final offers are between 30 and 45, 22.84% in the ENDO treatment, while only 19.50% of them are in this interval in the BASE. Both the EXO and ENDO treatment result in leftward shift of the distribution of wage offers. Though, the shift is greater for the exogenously imposed minimum wage institution.

The introduction of an exogenously imposed competitive minimum wage decreases wage offers. It seems that the imposition of the exogenous minimum wage institution alters the reference point of wage offers towards the minimum wage resulting in lower wage offers. As a result, higher effort levels are not reciprocated with higher wages. We observe the opposite in the ENDO treatment, that is, high wage offers are not reciprocated with high effort. These results are interesting, as they point out that higher wages in the BASE treatment with respect to the EXO were not being offered purely due to reciprocity concerns. If reciprocity concerns were important than the imposition of the minimum wage should not have altered wage offers as they should have reciprocated to high effort.

We now look at the observed average and median effort levels of workers for given wage intervals. There is a general increasing trend in both average and median effort with wages in all the treatments (see Figure II). However, the average (and median) effort levels in the endogenous wage treatment are lower than in the BASE and EXO treatments (as mentioned before, the difference in means across the BASE and EXO experiments in the average effort level is not statistically significant (t-test: $p=0.6811$). However, the average effort is significantly lower in the ENDO compared with the BASE (t-test: $p=0.0033$). We summarize our first main result below.

Result 1: *The effort level is increasing in wage for all treatments (BASE, EXO and ENDO). We fail to reject Hypothesis 1.*

Given that the wage effort relation varies across treatments we further analyze the data for possible structural breaks as wages increase. Looking at structural breaks helps entangle differences in wage-effort relation for the high and low wage-effort groups. We do this by pooling the data of the four sessions together for each treatment and then dividing the data in the corresponding wage-effort pairs for wages lower, and higher, than 60. These intervals are chosen as a great proportion of wage offers[26] are between 30 and 90.

Figure II: Average Effort – Wage Relation

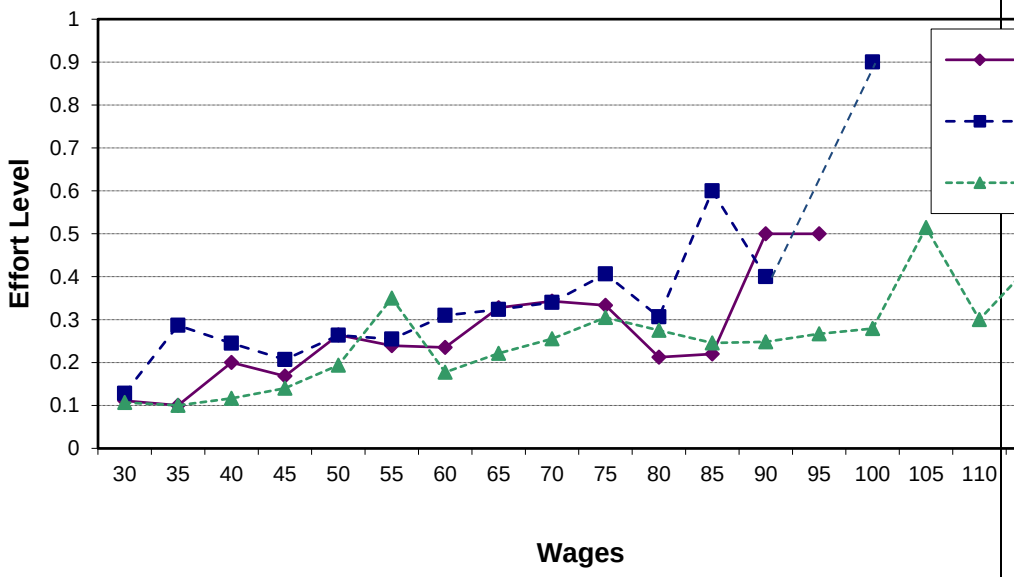


Table II: Results of the regression e = α+βp+μ

	N	α	p(α)	SD(α)	β	p(β)	SD(β)	R^2
BASE Low Wage level	144	0.019	0.756	0.062	0.004	0.002***	0.001	0.067
BASE High Wage level	131	0.190	0.331	0.197	0.002	0.468	0.003	0.004
EXO Low Wage level	188	0.037	0.507	0.056	0.004	0.000***	0.001	0.067
EXO High Wage level	87	0.039	0.836	0.189	0.005	0.033**	0.003	0.052
ENDO Low Wage level	170	0.005	0.922	0.466	0.004	0.000***	0.001	0.077
ENDO High Wage level	189	0.103	0.297	0.098	0.002	0.074	0.001	0.017

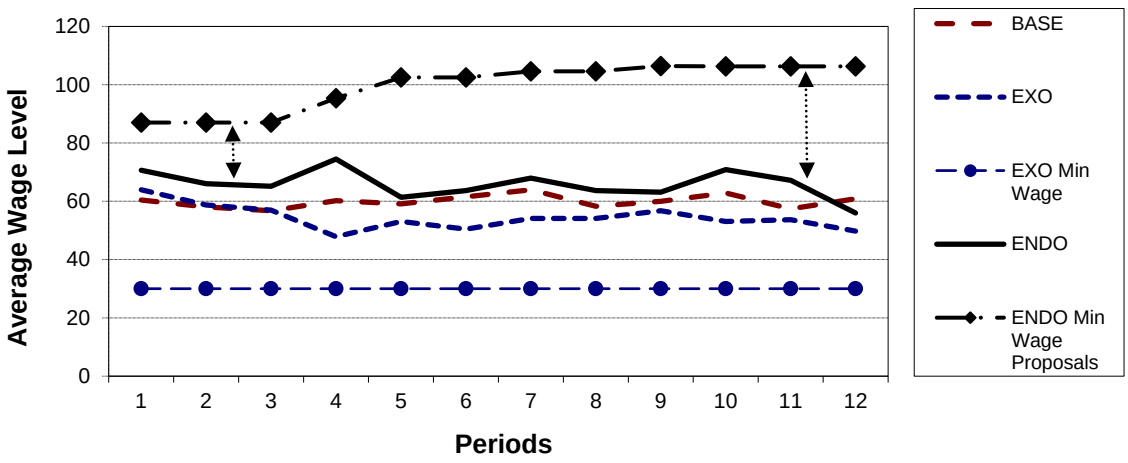
[26] Except for a few outliers at 25 or 100.

One can see in table II that the β-coefficient in the BASE treatment is statistically different from zero only for lower wages but not for higher ones. This is interesting as it tells us that the effort level is responsive to wage increase only at lower levels. The relationship, however, does not hold for higher wage levels. We obtain a similar result in the ENDO treatment where β-coefficient is statistically different from zero only for lowest wages but not for the highest ones. This is, however, not the case in the EXO treatment where the β-coefficient is statistically different from zero for both groups of wages suggesting a positive relation at both low and high wage levels. Our results suggest that reciprocal behavior may not be prevalent across all wage-effort levels. It seems that increase in wages from lower levels are reciprocated, however, wage (effort) increases at higher levels are not equally reciprocated. We observe this behavior in the BASE and the ENDO treatments, and the not in the EXO treatment.

To further understand the wage effort relationship we now analyze the behavior of average effort and average wage across periods in the three treatments. In figure III we can see that wage offers start at similar levels in all the treatments. However, in the EXO treatment they decline till the fourth period and then stabilize again. From the fourth period onwards, the average wage in the EXO treatment is always smaller than in the control although, it is still significantly above the minimum wage. Looking at the wage offers in the EXO treatment one notices that the wage starts declining once one buyer chooses the minimum wage. This then triggers similar offers from other subjects. It seems that most buyers are reluctant to be the first movers but, are eager followers. In the case of the ENDO treatment we observe that there is an increasing gap between the minimum wage proposals and the wage offers. The wage offers decline as the minimum wage proposals increase. The wage proposals have an effect upon wage offers that goes in the opposite direction. In all treatments average wages are significantly above the minimum wage of 30.

Result 2: *Average wages are considerably higher than the market-clearing wage. Furthermore, wages do not converge to the market wage for the duration of the experiment. We fail to reject Hypothesis 2.*

Figure III: Evolution of Average Effort Levels

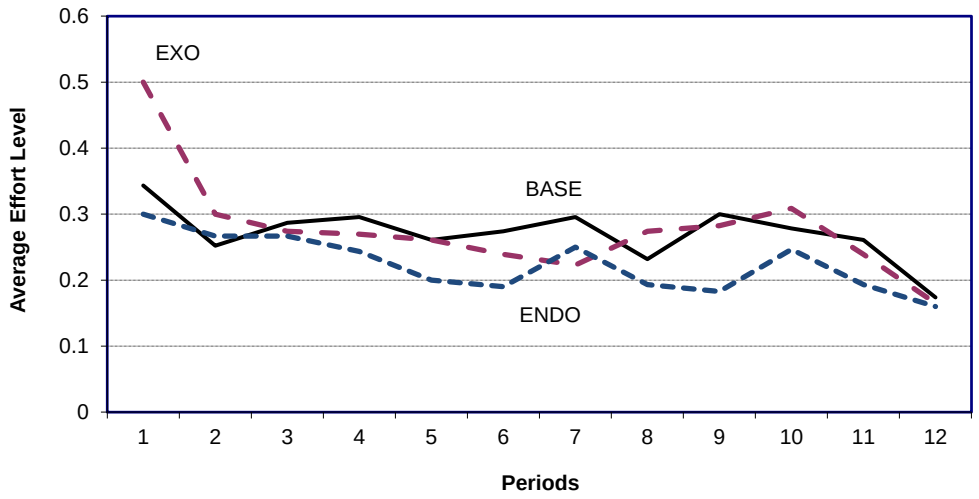


Now, we look at the average effort (Figure IV) chosen over time. While, the behaviour of average effort is similar across all three treatments there is a difference of trends across treatments. Relative to the BASE experiments there is a strong negative trend both in the EXO and ENDO treatment. In figure IV one can clearly see that the average effort is above the minimum level and does not converge to it in the repeated game. We can see that average effort is above 0.1 in all periods.

Pooling data from all sessions in the BASE treatment we find that the evolution of the Average Effort Level presents a (statistically) significant trend at 10% significance level (*p=0.0574*). There is, however, a statistically significant negative trend at 5% (*p=0.008*) in

the EXO treatment. Moreover, the first half of the trend is greater than the overall trend (statistically significant at 10%: *p=0.081*). A similar result is obtained in the ENDO, i.e. there is a statistically significant negative trend (*p=0.0005*) and the first half of the trend is greater than the overall trend (statistically significant at 5%: *p=0.03*). This again confirms that effort levels increase by a greater proportion for lower wage levels.

Figure IV: Evolution of Average Effort Levels



We can thus conclude that even though the minimum wage does not decrease the average effort level for the BASE and EXO treatments. However, the imposition of the minimum wage creates a negative trend in the evolution of the reciprocity of workers. This effect is of a greater magnitude in the short run. Interestingly, the effect is stronger in the ENDO experiments. In addition to a negative trend; a reduction in the average effort level (with respect to BASE) is also observed. These results show that fairness concerns are being crowded out as the experiment progresses in both the EXO and ENDO treatments. Hypothesis 3 is supported for the BASE experiments, but not for the EXO or ENDO treatments. We summarize these results below.

Result 3:*The average effort is above the minimum effort level and does not converge to the minimum effort in the repeated game in the BASE treatment.*

Finally we analyze the Average Relative Overpayment (ARO). Defined as $r = (p_0-c-\tau)/(v-c)$, ARO represents the percentage of surplus employers give to their workers. According to the Money-Maximizing Agents Theory this should be zero as there is an excess supply of workers in the market. Note that if ARO is lower in the minimum wage treatment this signifies crowding out of private fairness. As observed for effort levels, ARO declines across both the BASE and the EXO treatments. It is 0.302 in the BASE and 0.246 in the EXO treatment[27]. The difference of ARO across the two treatments is also statistically significant ($p=0.008$). Comparing across treatments we find that ARO is 0.302 in the BASE experiments while, it is 0.359 in the ENDO experiments. The difference is statistically significant at the 1% confidence level ($p=0.003$)[28]. These results show that under the endogenous wage proposal institution employers, on average, share a higher proportion of the surplus than under the BASE or EXO experiments.

3.2. Regression Analysis

We now explore our results in detail. To investigate whether the effort level is increasing in wage[29] (Hypothesis 1) we run an OLS and a Tobit regression with the effort level (wage) being the dependent (independent) variable. We obtain similar results for both estimations and thus only report the OLS regressions. One can see the results of the first regression in Table III for the BASE, EXO and ENDO treatments.

One can see (Table III) that the β-coefficient in the regression for Hypothesis 1 is positive and significant in all of the regressions[30]. This tells us that the effort level depends

[27] Fehr et al. (1993) obtain an ARO of 0.42.
[28] We shed more light on this later where we look at the evolution of ARO across the experimental periods.
[29] We use the same approach as in Fehr et al. (2006).
[30] Except in the regression for the last period in the BASE and EXO treatments.

positively on wages. These results are along the line of the main result in Fehr et al. (1993). Further note that the introduction of the minimum wage decreases the standard deviation (SD) of wages in almost all the regressions[31]. This is along the line of the results in the empirical literature where they show that the imposition of wage institutions decreases wage dispersion. In our case we observe this as the imposition of the minimum wage institution lowers wage offers from above.

Table III: Results of the regression e = α+βp+μ[32]

	N	α	p(α)	SD(α)	β	p(β)	SD(β)	R^2
	BASE Treatment							
S1-4	275	-0.0040	0.9338	0.0479	0.0046	0.0000***	0.0008	0.1132
SL1-4	23	0.0465	0.6147	0.0910	0.0021	0.1578	0.0014	0.0927
S1	72	0.0403	0.4128	0.0489	0.0025	0.0070***	0.0009	0.0994
S2	72	0.0063	0.9534	0.1082	0.0040	0.0220**	0.0017	0.0727
S3	59	0.0575	0.5891	0.1059	0.0055	0.0020***	0.0017	0.1549
S4	72	0.0313	0.8009	0.1236	0.0039	0.0367**	0.0019	0.0608
	EXO Treatment							
S1-4	275	0.0299	0.4312	0.0379	0.0046	0.0000***	0.0007	0.1464
SL1-4	23	0.1384	0.1028	0.0811	0.0005	0.7235	0.0015	0.0061
S1	72	0.0876	0.2081	0.0689	0.0037	0.0124**	0.0015	0.0861
S2	71	-0.0609	0.3824	0.0693	0.0059	0.0000***	0.0012	0.2509
S3	72	-0.0663	0.4480	0.0868	0.0051	0.0003***	0.0014	0.1684
S4	60	0.0688	0.5074	0.1031	0.0051	0.0047***	0.0017	0.1299
	ENDO Treatment							
S1-5	359	0.0423	0.1435	0.0288	0.0028	0.0000***	0.0004	0.1130
SL1-5	30	-0.0068	0.9089	0.0586	0.0030	0.0036***	0.0009	0.2650
S1	72	0.1358	0.2380	0.1141	0.0017	0.3197	0.0018	0.0141
S2	72	0.0520	0.4247	0.0648	0.0024	0.0074***	0.0009	0.0980
S3	72	-0.0245	0.5338	0.0392	0.0038	0.0000***	0.0006	0.3480
S4	71	-0.0209	0.7470	0.0647	0.0041	0.0000***	0.0009	0.2523
S5	72	0.1142	0.0113	0.0439	0.0011	0.0714*	0.0006	0.0457

As in Fehr et al (1993) we run a regression with a dummy variable for each agent. This is done to take into account the possibility of differences in notions of fairness between agents. In our experiments agents do not have the possibility of knowing the effort level

[31] The SD does not decrease in the regression of the last periods in the BASE and in the first session regressions' of the BASE and the EXO.

[32] S#: Session #; SL1-4: Results of the estimation with the last period data of all sessions; N: Number of observations; p(): p-value of the relevant coefficients; SD(): Standard Deviation of the relevant coefficients; R^2: Adjusted coefficient of determination.

chosen by their partners, as a result none of them can adjust their notion of fairness to a common market level. We find that the intercept is significantly different among agents, meaning that the notion of fairness differs among individuals. This is obtained for all treatments.

Now, it is possible that the effort level of the agents varies systematically across periods. As in Fehr et al (1993) we introduce a period dummy p_t. We confirm the result (Fehr et al.), that the behavior according to the effort level between periods is not significantly different in the BASE. This, however, is not the case in the EXO and ENDO treatments where we find that the effort level systematically varies across periods. This could be due to the fact buyers adjust slowly to the minimum wage announcement. Once the first offer is made at the minimum wage others follow suit. In the ENDO treatment the reason is different, as the wage proposal is updated every few periods agents adjust their effort level given that and the wage offers they receive. It could be due to this that we observe differences in effort levels across periods both in the EXO and in the ENDO treatments.

We now look at the evolution of the Average Relative Overpayment per period (Figure V). Recall that this is the proportion of the surplus given to workers[33]. We find that the Average Relative Overpayment is (statistically) significantly greater than zero in all treatments[34].

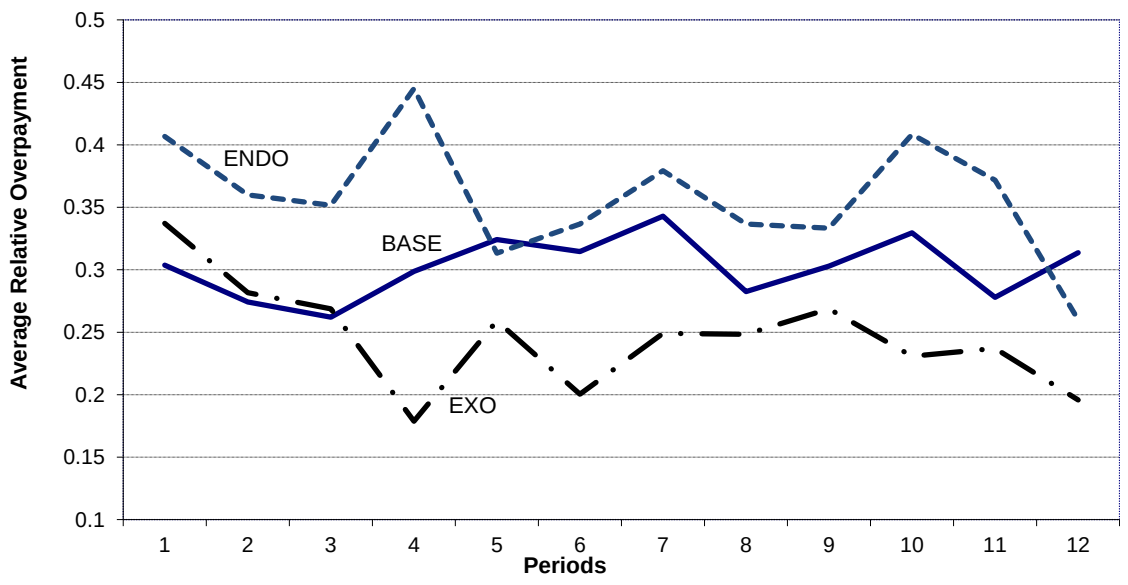
Analyzing all sessions together ARO has no statistically significant negative trend neither in the BASE nor in the ENDO treatments ($p=0.338$ and $p=0.094$ respectively). The opposite happens in the EXO treatment where there is a negative trend and, moreover, it is greater in the first half of the treatment ($p=0.005$). This suggests that employers share a smaller proportion of the surplus with the workers as the experiment progresses when the

[33] The theoretical prediction is that they should get zero.
[34] BASE vs EXO (*p value=0.008*), BASE vs ENDO (*p value=0.008*), EXO vs ENDO (*p value=0.000).*

minimum wage is imposed exogenously. This clearly implies that the minimum wage treatment affects income distribution negatively.

The introduction of the non-binding minimum wage significantly reduces the Average Relative Overpayment. The Average Relative Overpayment is 0.3023 in the BASE and 0.2463 in the EXO experiments and is statistically significant at the 10% level (*p=0.008*). This further lends support to the assertion that the minimum wage institution crowds out private fairness. Even though effort levels do not decline, average relative overpayment is significantly lower in the EXO treatment. On the other hand, the effect is just the opposite with the introduction of the endogenous minimum wage. In the ENDO treatment ARO is greater than in the BASE (ARO in ENDO = 0.3586) and this difference is statistically significant (*p=0.003*).

Figure V: Evolution of the Average Relative Overpayment across periods



Now, we analyze whether the introduction of the non-binding exogenous minimum wage negatively affects wage offers. We do this by looking at the mean difference of wages

between treatments. We find that the introduction of a non binding minimum wage makes firms significantly reduce wage offers *(p=0.00).* As explained before, the opposite happens in the ENDO treatment where agents use the minimum price as a signal to induce firms to offer greater wages which results in a higher average wage offer*(p=0.00*).

Result 4: *The introduction of the non-binding exogenous minimum wage reduces average wage offers in the EXO treatment. Meanwhile, average wage offers are greater in the ENDO treatment. Hypothesis 4 is partially supported by our data.*

Even though average wage offers decline average effort is not significantly affected when we compare the BASE with the EXO treatment. Even though the average wage offer increases in the ENDO treatment with respect to the BASE, average effort is reduced. Our results thus reject Hypothesis 5 that states that effort levels should also decline if average wage declines. The Average Effort Level is 0.27 in the BASE and 0.28 in the EXO experiments. Though this difference is not statistically significant, the increase in average effort as average wage declines suggests workers use higher effort levels as a signaling device to obtain higher wages[35]. Contrarily, in the ENDO it seems that agents respond with smaller effort levels when firms do not offer wages in the line with their wage proposal. It seems that the presence of a non-binding wage proposal institution instills expectations of entitlements among employees. When they are not met, workers respond by lowering effort. This is an example of negative reciprocity in the case when worker expectations are not realized.

Result 5*: Average effort does not decline with the decrease in wages in the EXO treatment. Average effort levels across the BASE and EXO treatments are not significantly different. However, average effort declines in the ENDO treatment. Hypothesis 5 is not supported by our data.*

[35] Some subjects asked us this question during the experiment.

Finally, we run the regression in equation (7) ($e_i = \eta + \delta d_i + \theta(a_i - p_i) + v_i$). This regression also provides one of the more interesting results in our paper. Here we check for the relation between effort levels (e_i) and the difference between the wage proposals (a_i) and the final accepted offer (p_i) in the ENDO treatment. This regression allows us to see whether negative effort is due to the fact workers wage expectations are not fulfilled. Our results are presented in table-IV below. Where both coefficients δ and θ are negative *(-0.05198 and -0.00402)* and significant at 10 and 5%, respectively (*p-value*, *0.0816* and *0.0457*).This result shows that effort is negatively related with wage expectations. Making a wage proposal seems to give workers wage entitlements and when not reciprocated are negatively reciprocated through lower effort levels.

Table IV: ENDO Treatment

Results of the regression $e_i = \eta + \delta d_i + \theta(a_i - p_i) + v_i$

Variable	Coefficient	SD	t statistic	p-value
η	0.354	0.0249	14.205	0.000
δ	-0.0415	0.02653	-1.566	0.1179
θ	-0.0025	0.00033	-7.377	0.0000***

Situations like the one studied above are not rare. Worker involvement in the management process is common. Workers sit in the boardrooms as representatives and make proposals towards firm functioning. Our result is interesting as it points out that in situations where wage proposals are made, the proposer feels entitled to the proposed wage and upon not getting it responds negatively by expending less effort. It is clear that the perception of entitlements in this sense impacts incentives and efficiency of the system.

Finally, we present another interesting result on the effect on efficiency. Stigler (1946) commented that the introduction of minimum wage will result in resource misallocation[36].

[36] Stigler, 1946, The Economics of Minimum Wage Legislation. American Economic Review 36: 358-365.

We find that total efficiency decreases in the EXO treatment where, average efficiency[37] f_{ij} is 3.28, while it is 3.60 in the BASE treatment. The difference between both treatments is statistically significant (*p=0.003*). The reduction in efficiency (as well as the one in the wages offered and the relative overpayment) is another of the negative consequences of the introduction of the exogenous fairness based institution. The opposite happens in the ENDO treatment. Compared with the BASE, average efficiency increases; now it is 3.74, even though, this difference with the BASE is not statistically significant (*p=0.25*). We can conclude that the introduction of the endogenous minimum wage increase the average wage offer and the Relative Overpayment. It also marginally increases efficiency even though the increment is not significant.

4. Conclusion:

Labor markets across the world have different institutional arrangements regarding wage bargaining, working hours, overtime payment etc. that can importantly impact outcomes. One such example is the minimum wage legislation that was first enacted, and later emulated in several developed countries, with a similar argument. Most wage setting institutions are imposed keeping fairness concerns in mind. Meanwhile, other wage setting institutions are set to give the workers some say in the wage setting process.

In this paper we first experimentally study the effect of the minimum wage (exogenously and endogenously determined) in a gift exchange experiment. We first successfully replicate the results of Fehr et al (1993) where private fairness concerns effectively prevent wages from decreasing to the market-clearing level: firms take into account that the effort level of workers depends on wages when they make their wage offers and higher wages are reciprocated with high effort. We then introduce a non-binding

[37] Recall that the standard theory predicts a level of efficiency equal to 1.

minimum wage at the competitive wage. We find that average wage levels are lower than in the control experiments. However, average effort levels do not decline correspondingly. It seems that even though private fairness is crowded out, i.e. lower wage offers are obtained; workers still offer higher effort levels. The distribution of wages offered shifts to the left, with a substantial proportion of the offers (38.41%) near the minimum wage levels.

We find that the minimum wage institution crowds out private fairness resulting in lower wage offers. Further, average relative overpayment and the efficiency gains that fairness creates are also diminished. Finally, it also creates a negative trend in the evolution of effort levels workers reciprocate firms with. It seems that effort is also negatively affected in the long run.

We further run experiments looking at a simplified version of a wage proposal institution where workers make an average wage proposal to the firms. Such an institution reflects the various wage bargaining institutions where both sides of a sector negotiate wage increases or minimum wage levels. We find that this institution has several interesting properties. It seems that allowing the workers to propose a minimum acceptable wage results in certain expectations regarding wage which, when not met, result in lower effort (negative reciprocity). Average wage offers increase in this framework and are above the (free market) control experiments. Surprisingly, the higher wage levels result in negative reciprocity when wage offers do not coincide with average wage proposals. It seems that it is not only the wage level but also the wage expectation that plays a role. In this sense, and in spite of the higher average wage, the endogenous minimum wage crowds out positive reciprocity.

Our experiments show that one can study different institutional arrangements in an experimental setup and study how they impact outcomes. It would be interesting to see how institutional structures alter the well known gift exchange result under different institutional arrangements. We are already working on some of these extensions.

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