

University of Mannheim / Department of Economics

Working Paper Series

***Do Legal Standards Affect Ethical Concerns of
Consumers? An Experiment on Minimum Wages***

David Danz Dirk Engelmann Dorothea Kübler

Working Paper 12-3

February 2012

Do Legal Standards Affect Ethical Concerns of Consumers? An Experiment on Minimum Wages*

David Danz[†] Dirk Engelmann[‡] Dorothea Kübler[§]

February 25, 2012

Abstract

To address the impact of regulation on ethical concerns of consumers, we study the example of minimum wages. In our experimental market, consumers have monopsony power, firms set prices and wages, and workers are passive recipients of a wage payment. We find that the consumers exhibit considerable fairness towards the workers by buying from the firm with the higher price and the higher wage. We also find that consumers have a tendency to split their demand equally between firms, which is a simple strategy to provide both workers with a minimal payoff. Introducing a minimum wage in a mature market raises average wages despite its significant crowding-out effects on consumers' fairness concerns. Abolishing a minimum wage crowds in consumers' fairness concerns, but crowding in is not sufficient to avoid overall negative effects on the workers' wages.

Keywords: Fairness, Crowding Out, Consumer Behavior, Minimum Wage, Experimental Economics

JEL-Classification: C91, J88, K31

*We thank Dana Novotny and Julia Schmid for help with conducting the experiment as well as Maria Bigoni, Jana Friedrichsen, Richard McAdams, Georg Weizsäcker, Axel Werwatz, and participants at the 2005 GEW meeting in Cologne, the LSA Meeting 2007 in Berlin, the Annual Meeting of the Vfs 2008 in Graz, the 23rd Annual Congress of the EEA 2008 in Milan, the Annual Meeting of the Vfs 2011 in Frankfurt am Main and the 52nd Annual Conference of the New Zealand Association of Economists 2011 in Wellington for helpful comments and suggestions. Financial support through SFB 649 ("Economic Risk") is gratefully acknowledged.

[†]Social Science Research Center Berlin (WZB), Reichpietschufer 50, D-10785 Berlin, Germany. E-mail: danz@wzb.eu.

[‡]University of Mannheim, Department of Economics, L7, 3-5. 68131 Mannheim, Germany; Centre for Experimental Economics, University of Copenhagen; CESifo, Munich; Economics Institute of the Academy of Sciences of the Czech Republic. E-mail: dirk.engelmann@uni-mannheim.de.

[§]Social Science Research Center Berlin (WZB), Reichpietschufer 50, D-10785 Berlin, and Department of Economics and Management, Technical University Berlin. E-mail: kuebler@wzb.eu

1 Introduction

In the last decades, firm policy with regard to worker protection, climate change, or related issues of ethical relevance has received a lot of attention from the public. Firms can profit from fair behavior towards their workers or from environment-friendly production technologies if a sufficient number of consumers is willing to pay a higher price for its products than for products of other firms. Acting according to the consumers' views of proper conduct allows a firm to gain a reputation for being ethical. Thus, it is possible that ethical behavior survives in a market environment. However, this depends crucially on the preferences of consumers.

The consumers' willingness to pay for ethical behavior of firms expresses itself not only in choosing to buy from firms that satisfy higher standards at higher prices, but also in agreeing to legal regulations that are likely to result in higher prices. Freeman (1996), for example, reports on an ABC/Washington Post poll from 1989 which posed two questions to the public. First, it asked whether the respondent's salary or the salary of someone in the immediate family would go up if the government increased the federal minimum wage in the US. Responses were as follows: Only in 8% of the cases the chief wage earner's salary would go up, in 12% of the cases the salary of someone else in the family would go up, and in 79% the salary of no-one in the family would go up. The same respondents were then asked whether they would still favor raising the minimum wage if business passed the increased salary costs on to the consumers through higher prices. To this question, 82% answered with yes while only 16% said no. The fact that the vast majority of consumers accepts higher prices because of a raise in the minimum wage is striking as it suggests substantial willingness to pay for fair treatment of third parties. On the other hand, this was a hypothetical question, and it might well be that words are not followed by deeds. We use an experiment with real monetary incentives to study consumers' willingness to pay for fair firm conduct in a controlled environment.

The main issue addressed by our experiment is how regulation interacts with fairness of the consumers in a context where consumers may have to pay higher prices to be fair towards workers. Often governments want to ensure certain standards of behavior by legal regulation, such as a minimum wage. But consumers themselves may be willing to pay higher prices if they know that the firm pays its workers a fair wage. The effects of government intervention on consumer behavior can be ambiguous. Apart from the direct effect of the regulation, e.g. forcing firms to pay a certain minimum wage, indirect effects

can play a role if consumers' preferences are not purely selfish. On the one hand, a minimum wage might undermine the reputation gain of a firm from paying workers a fair wage (above the minimum wage) and as a result lead to lower wages. Also, if consumers are willing to pay for a fair treatment of workers, a minimum wage can crowd out such fair behavior by consumers. On the other hand, a minimum wage might be interpreted by consumers as an indication that market wages are too low. If that is the case and in particular if the minimum wage is low, consumers will pay more attention to wages paid by firms and possibly condition their purchase decision on them.

In the experiment, we use a simple setup to study the relationship between fairness and regulation. Consumers have monopsony power in a duopoly market. Workers have no bargaining power as they have no decision to take. They are employed by a firm and can neither be fired nor quit themselves. Their only source of income is the wage. The consumer is informed about the prices and wages of both firms. He can then decide which firm to buy from, and he can also split his demand between firms. This gives the consumer the power to enforce higher wages by buying from the firm with the higher wage.

Our four treatments serve to investigate the effects of the introduction and abolishment of two different minimum wages. In two treatments, there is no minimum wage initially, but it is introduced after the first half of the experiment. These treatments differ only with regard to the level of the minimum wage. In the other two treatments, there is a minimum wage at the beginning, but it is abolished after the first half of the experiment, again for both minimum wage levels. This allows us to study the effect of a minimum wage at different stages of experience in a market, and the effect of changes in the minimum wage policy for different levels of the minimum wage.

We observe two distinct strategies of fair consumers in all treatments. First, consumers often split purchases equally between firms even when prices differ. Second, they sometimes buy more or even all units at the more expensive firm that also pays a higher wage.

Regarding the policy effects, we find that the introduction of a minimum wage leads to a significant increase in the workers' rents. In contrast, abolishing a minimum wage always affects workers negatively. Furthermore, we find that consumers exhibit a considerable willingness to pay for a better treatment of workers as suggested in the poll quoted by Freeman (1996), but we also find that this is affected in important ways by the minimum wage policy. Consumers adjust their behavior to changes in the minimum wage regime. Importantly, these adjustments are larger than what can be explained by the changes in

prices and wages. In particular, the consumers' willingness to buy from the firm with a higher price and a higher wage less frequently after the introduction of a high minimum wage. Furthermore, the strategy of consumers to split the demand equally between the two firms is chosen more frequently when a minimum wage is abolished and decreases when a high minimum wage is introduced, suggesting crowding out of fairness concerns. Overall, we find that changes in economic policy not only change the set of choices, but also the fairness concerns of consumers, measured as changes in their preferences for specific types of allocations. Thus, regulation can indeed crowd out fairness concerns or change the perception of what constitutes a fair outcome.

Related literature In the light of the experimental literature on fairness, it is not surprising that consumers in our experiment care about the wage of the worker. Experimental evidence has shown repeatedly that many people's choices cannot be reconciled with purely selfish preferences. In the dictator game (e.g. Forsythe, Horowitz, Savin and Sefton 1994, Roth 1995) proposers often allocate positive amounts of money to another player, which is in line with other-regarding preferences.

The game used here is related to the three-person ultimatum game by Güth and van Damme (1998) where the proposer can allocate money to a responder and to a dummy. The responder can accept or reject the proposal and the dummy is passive although his payoff depends on the actions of the other players. Experimental tests of this game show that the responder earns more than the dummy on average, see Güth and van Damme (1998) and Güth, Schmidt and Sutter (2007). This suggests that the responders' willingness to punish proposers for the sake of the dummy player is limited. On the other hand, in a third-party punishment game (Fehr and Fischbacher, 2004), where a third player can punish the dictator in a two-person dictator game after he has made the choice, unequal splits are frequently punished and dictators frequently split the pie equally.¹ In our experiment, since a consumer can choose between two firms he can play them off against each other. In contrast to the three-person ultimatum game and the third-party punishment game, he can punish an unfair firm by switching to the less unfair firm. This makes punishment by the consumer quite effective. Of course, punishment is typically costly because the consumer

¹All these experiments find evidence for indirect reciprocity of participants because they reward or punish friendly or unfriendly acts between two other participants. See also Nowak and Sigmund (1998), Nowak and Sigmund (2005), Seinen and Schram (2006), and Engelmann and Fischbacher (2009) on indirect reciprocity.

might have to pay a higher price at the firm with the higher wage. Furthermore, note that punishing a firm also punishes its worker, which renders it difficult to achieve a fair outcome in the short run.

Our experiment also relates to the literature on crowding out of intrinsic motivation with extrinsic or economic incentives.² Falk and Kosfeld (2006) study the interaction between intrinsic motivation and formal rules. They examine the impact of the principal's choice to restrict the possible choices of the agent on the effort level of the agent. They find that the intention of the principal matters, i.e., the crowding-out effect of restricting the agent's choice set critically depends on the principal actually taking this choice instead of an exogenous change in the choice set. In contrast, the minimum wage in our experiment is introduced or abolished exogenously, i.e., by the experimenter, but we find that it can nevertheless affect behavior adversely.

Little experimental work has been done on minimum wages yet. A notable exception is the study by Falk, Fehr and Zehnder (2006) which focuses on the impact of a minimum wage on the reservation wage of workers and on their fairness perceptions. Brandts and Charness (2004) investigate the effect of a minimum wage in a labor market characterized by gift exchange between workers and employers. In contrast to these two studies, we focus on the consumers' reaction to a minimum wage, not the workers'.

A large portion of the empirical literature on minimum wages investigates the employment effect of raising the minimum wage. This has been rather controversial (Card 1992, Card and Krueger 1994, Dickens, Machin, and Manning 1999). In our experimental design, employment is exogenously fixed to keep the question of what is a fair wage simpler for the consumers. Empirical studies on minimum wages have also observed so-called spillover effects. An increase in the minimum wage has been found to increase wages by more than the required amount (Card and Krueger 1995, Katz and Krueger 1992). In line with this research, we observe in our experimental dataset that consumers and firms are willing to pay more than the minimum wage. In particular, depending on the treatment the average wage is 12%-64% above the minimum wage.³

The rest of the paper is structured as follows. Section 2 describes the design in detail. In Section 3 we present and analyze the results. Section 4 concludes.

²See Frey (1997), Frey and Jegen (2001), Gneezy and Rustichini (2000a) and (2000b). See also Ostrom (2000) for a discussion.

³Note that efficiency-wage reasons cannot play a role in our experiment as the effort of the worker is fixed.

2 Experimental Design

We study a duopoly market with one consumer who can buy up to 10 units of a fictitious homogeneous good. Each unit has a value of 25 points for the consumer. Both firms are run by a manager, and we will refer to them as firms in the following. Each firm employs one worker. The workers are actual participants in the experiment, even though they have no choice to make. The firm can produce up to 10 units of the good. The firm chooses a price (per unit) $p \in [0, 50]$ and a wage w (per unit). If no minimum wage is in place, then $w \in [0, 50]$, otherwise $w \in [\underline{w}, 50]$, where $\underline{w} \in \{3, 6\}$ denotes the minimum wage that is varied across treatments.⁴ The firms cannot price discriminate, i.e., the same price-wage combination holds for all 10 units, and the firms do not have an option to restrict supply except by raising the price to a prohibitively high level. Wages are paid only for units actually sold and there are no other costs. Workers have no costs, no other source of income than the wage, and no outside option. If a consumer buys a unit from a firm that has chosen price p and wage w , the consumer earns $25 - p$ for this unit, the firm makes a profit of $p - w$ and the worker earns w . These earnings are multiplied by the purchased number of units in order to compute total earnings in a period.

The timing of the game is as follows. After the two firms have made their choices, the consumer is informed about both firms' price-wage pairs (p_1, w_1) and (p_2, w_2) . He then decides how many units to buy from each of the two firms. The consumer can buy any combination of integer amounts from the two firms up to a total quantity of 10, and he can also buy no units at all. At the end of each period the participants are informed about all decisions in their group, i.e., about both firms' price-wage combinations and about the decision of the consumer.

The stage game with selfish agents has three subgame-perfect equilibria. In each of these, firms set $w = 0$ if there is no minimum wage and $w = \underline{w}$ if there is a minimum wage. The equilibrium prices are $p = w$, $p = w + 1$ or $p = w + 2$ (with $p_1 = p_2$), and the consumer always buys 10 units from the cheaper firm, as long as $\min(p_1, p_2) < 25$, which always holds on the equilibrium path. Off the equilibrium path, the consumer buys nothing if $\min(p_1, p_2) > 25$ for both firms and an arbitrary quantity if $\min(p_1, p_2) = 25$.) If both firms choose the same price, in equilibrium the consumer can split his demand in an arbitrary

⁴We also conducted a few sessions for $\underline{w} = 1$ and $\underline{w} = 9$, but decided to focus on $\underline{w} = 3$ and $\underline{w} = 6$ in later sessions. With $\underline{w} = 1$, the minimum wage has hardly any effect while it is almost always binding in the case of $\underline{w} = 9$.

way between the two firms. Note that in equilibrium almost the whole surplus goes to the consumer.⁵ In contrast, the payoffs are split equally among all five market participants if both firms choose $p = 20$, $w = 10$ and the consumer buys 5 units from each of the firms. In this case the payoff for all participants is $\pi = 10 \cdot 5 = 50$. Hence the minimum wage of 3 or 6 that we implemented is below the wage that would ensure equal payoffs.

Note that as long as the consumer buys 10 units, the total earnings in the market are constant. How a consumer spreads his purchases across the two firms does not affect the total earnings. This has the appealing property that we can study consumers' concerns for fairness that are not confounded with concerns for efficiency.⁶

Details of the implementation are as follows. We used a fixed-matching protocol where a group of five participants (one consumer and two firm-worker pairs) stayed together during the entire experiment. The main motivation for fixed groups is that we are interested in a situation where consumer behavior can drive firm behavior. Participants kept their role for the whole experiment in order to enhance possible inequalities and fairness concerns. The experiment lasted for 40 periods.

An important aspect of our design is that in spite of the repeated interaction, consumers do not have a strategic incentive to signal that they care about fairness if in fact they do not. There is no reason to pretend to be fair in order to change other subjects' behavior (though consumers may still pretend to be fair to preserve a positive (self-)image). This is in contrast to many other experiments that try to assess the fairness concerns of players such as ultimatum, trust and gift-exchange games. In these games, signaling typically increases the extent of fair behavior in early periods of repeated games, because the presence of a small share of fair players (or the mere possibility that they exist) makes it possible for selfish players to mimic them. In our experiment, since higher wages translate at least to some degree into higher prices, selfish consumers want to signal that they do *not* care about the worker but only about low prices.

⁵As the stage game has three equilibria with $p = w$, $p = w + 1$ or $p = w + 2$, collusive equilibria of the repeated game exist due to the possibility to punish deviations. While our main focus is on wages, we note that we do not find evidence of collusive firm behavior (see Table 1 below). In addition, all equilibria involve wages equal to the minimum wage. If the consumer is selfish, he does not want to pay more for a higher wage and thus a (selfish but collusive) firm has no reason to pay higher wages.

⁶See Kritikos and Bolle (2001), Charness and Rabin (2002), Engelmann and Strobel (2004), and Harrison and Johnson (2006) for evidence that experimental subjects frequently exhibit preferences to maximize the total payoff. These papers show that the interpretation of many experimental results as evidence for fairness concerns is problematic since fairness concerns are frequently confounded with concerns for efficiency.

To study the effects of changes in the minimum wage policy, we conducted two sets of treatments. In the NMF treatments (No Minimum wage First), there was no minimum wage initially, but it was introduced after the first 20 periods. In the MF treatments (Minimum wage First), a minimum wage was in place initially, but it was abolished after 20 periods. At the beginning of the experiment, the participants were informed that there would be a change in the rules after 20 periods without mentioning that this change concerns the minimum wage. They were also informed that the group composition and the role assignment would not be changed. We implemented a market frame. In the instructions (for the full text see the Appendix), participants are called consumers, firms, and workers, and we used the terms “prices” and “wages”. The minimum wage was introduced as follows. In the MF treatments, it was stated that the wage had to equal at least \underline{w} . The minimum wage $\underline{w} \in \{3, 6\}$ was varied between the sessions but kept fixed within a session. After the first 20 periods, participants in the NMF treatments were informed that from the next period on the wage had to be at least \underline{w} , and in the MF treatments it was specified after 20 periods that from the next period on the wage had to be non-negative.

The experiment was conducted in a computer pool at the Technical University Berlin. The experiment was programmed and run using z-Tree (Fischbacher, 2007). We had a total of 640 subjects, 256 of which were in the role of workers who did not take any decisions. Each subject participated only once in one of the 38 sessions, each consisting of two to four groups of five participants. Each group represents one independent observation. Overall, we collected data from 32 groups for each of our treatments NMF3, NMF6, MF3 and MF6.

At the end of a session, earnings in points were converted at a rate of 200 points = 1€ and were paid out in cash. Participants received 5€ in points as an initial endowment. This served to cover possible losses which can occur if firms sell at a price below the wage or consumers buy for a price above their valuation, and to ensure that workers get at least some non-trivial compensation.⁷ The sessions took between 60 and 90 minutes and average earnings were around 14.54€ (including the initial endowment).⁸

⁷Paying the workers a higher initial endowment was not feasible because it would have changed the egalitarian price-wage combination and more importantly would have reduced any fairness motivation to pay them a higher wage. We did observe some participants in the role of a worker who were clearly unhappy with the fact that they had no choice to make and also earned only slightly more than their initial endowment.

⁸If the consumers buy 10 units (all other decisions only determine the distribution of rents among players), the average payoffs are 10 Euro plus 5 Euro initial capital. The slightly lower earnings that we observe result from consumers occasionally buying fewer than 10 units.

3 Results

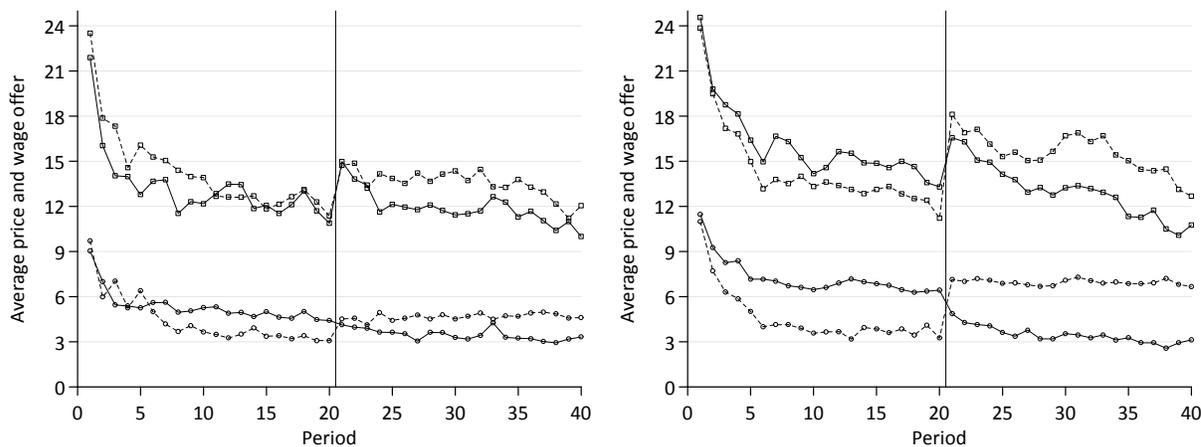
In this section, we first provide an overview of the prices and wages set by firms and the resulting distribution of earnings (Section 3.1). In Section 3.2 we investigate the choices of consumers. How the choices of consumers are affected by the minimum wage policy is addressed in Section 3.3 where we present a model of consumer choice to test for crowding-in and crowding-out effects of minimum wage policies.

3.1 Firm Behavior

3.1.1 Wage and Price Dynamics

We start our analysis by looking at the wage and price offers over time as plotted in Figure 1. The values reported are those set by the firms, not only the wages and prices that were actually paid.⁹

Figure 1: Average price offers (squares) and wage offers (circles) over time in MF (solid) and NMF (dotted) for $\underline{w} = 3$ (left panel) and $\underline{w} = 6$ (right panel).



Interestingly, in all treatments the starting values of the wage and price offers are close

⁹We observe some cases where it appears that a participant in the role of the firm confused wage and price. We infer this from the fact that for one period the participant reversed a price-wage pattern that he had chosen before and afterwards. We generally excluded these observations from the analysis in the paper (2.96% of the data). Including them, however, neither affects any of our results quantitatively nor the significance of any of the treatment effects.

to the fair allocation, independent of the minimum wage levels. In fact, using Fisher-Pitman permutation tests we cannot reject the hypothesis that the average wage offers in the first periods are equal to 10 both on an aggregate level as well as for each treatment separately. The average price offers in the first period are significantly higher than 20 in all treatments but MF3 (23.5 on average). These findings suggest that participants in the role of firms understand the game and are able to determine the fair outcome.

However, during the first periods the wages and prices drop dramatically in all treatments. Indeed, if we focus on the first six periods, all treatments show a significantly negative time trend in the average wage and price offer.¹⁰ In contrast, in periods 7–20 there are almost no significant time trends.¹¹ The observed dynamics in the early periods of all treatments can be interpreted as some firms initially expecting consumers and other firms to be more concerned with fair wages and prices than they actually are. When they discover that the consumer they are paired with mainly cares about prices and that the other firm does not set a high wage (in combination with a high price), they lower their wage and price.

Also, regarding the dynamics after a policy change, the first six periods of the second half show decreasing wages and prices while again wages and prices are much more stable in periods 27–40.¹² As we are interested in medium-run behavior that is fairly stable over time, we exclude the first six periods of each part of the experiment for the analysis in the remainder of the paper.

3.1.2 Wage and Price Levels

In order to analyze the aggregate effect of a minimum wage on the market outcome, Table 1 gives an overview of the average wage offers, the average price offers as well as the average earnings of each market participant for each treatment and part.¹³

¹⁰We run OLS regressions with the average price (wage) offer as the dependent variable, and a separate intercept and time trend per treatment as independent variables (clustered standard errors).

¹¹In periods 7–20 the wages show no significant time trend at all, and the prices show a significant but moderate time trend in NMF3 only.

¹²In periods 27–40, the time trends of the average wage offers are significant in MF6 only, while the trends of the average price offers stay significant in NMF3, NMF6 and MF6. However, the magnitude of these trends is much lower than in the first six periods of each half.

¹³Reported test results are based on OLS regressions per treatment with the average wage offer, price offer, and profits as dependent variables and a dummy for the minimum wage regime as the independent variable. Standard errors are clustered on the group level.

Table 1: Average price offers, wage offers and payoffs.

	w	NMF			MF		
		$t \in \{7, \dots, 20\}$	$t \in \{27, \dots, 40\}$	<i>change</i>	$t \in \{7, \dots, 20\}$	$t \in \{27, \dots, 40\}$	<i>change</i>
\bar{w}	3	3.51	4.72	1.20***	4.92	3.33	-1.59***
	6	3.74	6.92	3.18***	6.69	3.20	-3.50***
π_w	3	30.13	43.10	12.98***	45.36	29.26	-16.10***
	6	30.38	64.51	34.14***	64.13	30.00	-34.13***
\bar{p}	3	12.95	13.32	0.38	12.35	11.47	-0.88
	6	13.07	15.13	2.06**	14.93	12.14	-2.79***
π_c	3	127.10	122.52	-4.58	140.94	148.58	7.64
	6	124.16	107.07	-17.08**	115.56	142.06	26.49***
π_f	3	77.52	70.92	-6.60	58.49	67.17	8.67**
	6	77.90	68.07	-9.83*	66.49	76.25	9.76**

Note: p -values based on clustered standard errors: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

First note that average wages are often far above the wage predicted in equilibrium with selfish players. Without a minimum wage, average wages are always higher than 3 in all treatments, which is significantly different from the predicted wage of 0 (all $p < 0.001$), and average prices are always above 11, which is again significantly higher than the predicted price of at most 2 ($p < 0.001$ for all treatments). For example, in the parts of MF3 and in NMF3 when no minimum wage is in place, the average wage is 3.51 and 3.33, respectively. And even when a minimum wage is in place, average wages and prices are above the predicted level ($p < 0.001$ for all treatments).¹⁴ For example, in the parts of treatments MF3 and NMF3 when a minimum wage is in place, the average wage is 4.92 and 4.72 respectively.

From Table 1 it can also be taken that the average wage offers and hence the workers' earnings significantly increase when a minimum wage is introduced and significantly decrease when a minimum wage is abolished. On the other hand, the price level and the consumers' profits (rows 5-8 in the table) are only affected significantly when the minimum wage is sufficiently high (NMF6 and MF6). In these two treatments, the introduction of a minimum wage increases average price offers and decreases consumer profits while its abolishment decreases average price offers and increases consumer profits. Since the price

¹⁴In absence of a minimum wage, 80.0% of the wage offers are above 0, and 95.7% of the price offers are above 2. In presence of a minimum wage, 37.6% of the wage offers are above the minimum wage in place, and 89.9% of price offers exceed the minimum wage in place by more than 2 units.

offers tend to be more sticky than the wage offers (changes in prices over time are always smaller than respective wage changes), the firms tend to lose from the introduction of a minimum wage (marginally significant in NMF6) while the abolishment of a minimum wage significantly increases firm profits (MF3 and MF6).

Observation 1 *(i) Average wages and prices are higher than the predicted values with selfish players in all treatments. (ii) The introduction of a minimum wage leads to higher wage offers and earnings of the workers, and the abolishment of a minimum wage lowers wage offers and earnings of the workers.*

3.2 Consumer behavior

The analysis in the previous section has demonstrated that wages are often above the level of the subgame-perfect equilibrium with selfish firms and consumers. In this section, we investigate whether the consumers' behavior is affected by the wages and prices set by the firms.

If a consumer is purely self-interested, we expect him to buy 10 units from the cheaper firm in periods where the price offers differ. When price offers do not differ, self-interested consumers should buy 10 units with an arbitrary split between firms.

We observe two clear deviations of the consumers' choices from this prediction. First, consumers do not buy 10 units in total from both firms in 7.5% of the cases even though in only 0.5% of the cases both prices are equal to or above the consumers' valuation of 25. The second notable deviation from the game-theoretic prediction with selfish players is that in 16.3% of the cases the consumers do not buy exclusively from the strictly cheaper firm. In the following, we will explore the driving forces of these choices and investigate how they are affected by policy changes.

3.2.1 Buying less than 10 units

Buying less than 10 units in total may either be motivated by self-interest if consumers try to break collusive behavior of the firms, or by social concerns for the workers when the consumers regard the overall wage level as too low. Although such a boycott is the most powerful tool to change the behavior of the firms, it is costly for the consumers since the loss of buying less than 10 units is much higher than buying from a firm with a relatively

high price.¹⁵

If the willingness to buy less than 10 units is driven by social concerns for the workers, we should observe this behavior more often when wage offers are low. On the other hand, if the consumers buy less than 10 units out of self-interest, we would expect to observe it more often when the lower of both price offers p_l is high. Table 2 reports regressions where we estimated the effect of the wage and price structure in the market on the consumers' propensity to reduce consumption below 10 units.

Table 2: Consumers' propensity to buy less than ten units.

Model:	Probit			
Dependent variable:	$I_{\{q_1+q_2<10\}}$			
	NMF3	NMF6	MF3	MF6
$p_l = \min\{p_1, p_2\}$	0.068*** (0.026)	0.094*** (0.027)	0.065* (0.035)	0.156*** (0.042)
$w_l = \min\{w_1, w_2\}$	-0.036 (0.044)	-0.040 (0.061)	-0.055 (0.047)	0.036 (0.050)
$ p_1 - p_2 $	0.003 (0.013)	-0.005 (0.019)	0.007 (0.013)	0.000 (0.016)
$ w_1 - w_2 $	0.047 (0.036)	-0.038 (0.046)	-0.040 (0.037)	-0.009 (0.032)
$I_{t>20}$	-0.016 (0.133)	-0.413 (0.298)	-0.187 (0.230)	0.123 (0.342)
<i>const</i>	-1.994*** (0.285)	-1.975*** (0.548)	-2.177*** (0.477)	-4.710*** (0.811)
<i>n</i>	875	876	864	863
<i>logℓ</i>	-295.71	-300.47	-134.05	-55.98
χ^2	14.00	20.93	5.75	15.77

Note: Clustered standard errors in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The dummy variable $I_{t>20}$ is 0 for all observations in rounds 1–20 and 1 for all observations in rounds 21–40.

The regressions show that the consumers' propensity to buy less than 10 units is significantly increasing in the lower of both prices in all treatments, except in MF3 with only

¹⁵Nevertheless, we observe that boycotts are sometimes quite extreme. In 19.8% of the cases where the consumers bought less than 10 units in total (and at least one price offer is below 25), they boycott both firms completely and buy nothing.

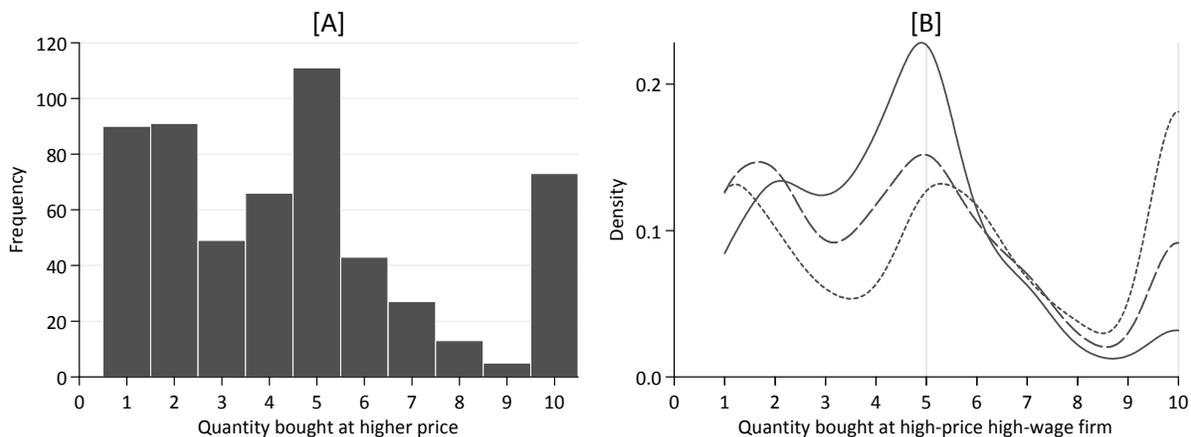
marginal significance. Since wages do not have any significant effect, we conclude:¹⁶

Observation 2 *The consumers' willingness to buy less than 10 units is driven by self-interest only, with higher prices decreasing the likelihood that all 10 units are bought.*

3.2.2 Buying from the more expensive firm

We now turn to cases in which the consumers do not buy all units at the cheaper firm. With reference to the preceding section, we first note that the consumers' propensity to buy from the firm with the strictly higher price is unrelated to the propensity to buy less than 10 units. Both actions together occur in only 1.3% of the cases and they are statistically independent.¹⁷ This is not surprising as buying from the firm with the higher price cannot be driven by self-interest while we find that buying less than 10 units is merely driven by self-interest.

Figure 2: *Panel A:* Histogram of units bought at a strictly higher price. *Panel B:* Kernel density estimates of the number of units bought at the high-price-high-wage firm for high (solid line), intermediate (dashed line) and low wage w_l (dotted line).



¹⁶Including the average wage (price) offers instead of the lowest of both wage (price) offers does not change the corresponding coefficient (nor its significance). Hence, we cannot effectively differentiate between an effect of the average wage (price) offer or the lower of both wage (price) offers.

¹⁷A probit regression of a dummy variable for consumers buying less than 10 units on a dummy variable for consumers buying at the firm with the strictly higher price as the independent variable yields $p = 0.860$ (clustered standard errors).

Figure 2.A shows the histogram of the number of units bought from the strictly more expensive firm. The distribution has three peaks. First, the consumers often buy one or two units at the firm with the strictly higher price, which is close to the self-interested choice of zero. Second, consumers often buy an equal number of units at each firm even though the two prices differ.¹⁸ Third, consumers occasionally buy all units from the firm with the higher price. These observations are unlikely to be due to confusion since in 84.7% of the cases where the consumers bought more units from the firm with the higher price, this firm also offered a higher wage. Interestingly, both strategies (buying five units from each firm and buying 10 units from the more expensive firm) are well separated from each other since there is only little mass on 7, 8, and 9 units.

Our main interest is in the question how wages affect the consumers' purchasing decisions. To get a first impression of this effect, Figure 2.B shows the kernel density estimates for the number of units bought at the firm which has both the higher price and the higher wage (conditional on such a firm existing and at least one unit being bought at this firm) for different levels of the lower of both wage offers $w_l = \min\{w_1, w_2\}$.¹⁹ The graph suggests that moving from high to low w_l , the percentage of cases in which the same number of units is bought from both firms declines from 23.5% (high w_l) to 17.4% (medium w_l) to 13.1% (low w_l). Similarly, the fraction of purchases where all units are bought from the more expensive firm increases from 2.7% (high w_l) to 10.8% (medium w_l) to 21.1% (low w_l).

Splitting purchases equally or buying all units from the more expensive firm might reflect short-term and long-term fairness considerations, respectively. A consumer who wants to split payoffs equally in the current period would buy equal or almost equal shares from both firms, even if prices and wages differ.²⁰ A consumer who wants to induce firms to increase wages could buy all 10 units from the firm with the higher wage and the higher price ("buy-by-wage" strategy). Thus, equal splits of purchases appear to primarily reflect

¹⁸When considering the whole data set (i.e., including observations where prices are equal), buying five units from each firm is the second most frequent choice of consumers (16.0%), which is only chosen less often than buying 10 units from one firm (66.7%).

¹⁹The density estimations use a Gaussian kernel with a bandwidth of 0.58. A low w_l is defined as $w_l \leq 2$, an intermediate w_l as $2 < w_l \leq 5$ and a high w_l level as $w_l > 5$. The categories have been chosen such that the number of observations per category is as similar as possible (175, 167 and 226, respectively).

²⁰The precise split depends on the fairness motives of the consumer. For example, a consumer with maximin preferences would buy more units from the firm with the lower wage, such that the payoffs of both workers are equal. E.g. if $w_1 = 2$ and $w_2 = 3$, buying six units from Firm 1 and four units from Firm 2 would lead to total earnings of 12 for both workers. This satisfies maximin preferences if $p_i - w_i \geq w_i$ for $i = 1, 2$.

static fairness concerns, whereas purchases of all units from the firm with the higher price and the higher wage may reflect long-term concerns for workers or indirect reciprocity.

In order to better understand consumer behavior, we will analyze both strategies of consumers below. We focus on the extreme strategies of buying exactly equal shares from both firms or buying all units from the high-price high-wage firm. These are by far the most prominent strategies among all strategies where the consumer buys at least as many units from the high-price as from the low-price firm (see Figure 2).

Buying the same number of units from both firms The strategy to buy equal amounts at both firms might reflect the consumers' wish to maximize the minimum payoff among market participants. The reason is that a worker is among the least earning market participants in 82.4% of all observations and in case of identical wage offers (51.1% of the observations) attempts to maximize the lowest worker profit would lead a consumer with maximin preferences to buy five units from each firm. If the observed behavior of buying similar numbers of units from both firms is indeed driven by maximin preferences, we would expect consumers who face differing wage offers to buy more from the firm with the lower wage offer. However, since the calculation of the optimal distribution given maximin preferences is not trivial to compute, consumers might use a simple equipartition rule as a heuristic in order to support both workers roughly equally.

Figure 2.A shows that substantial mass of the distribution is located between zero and five units. This could either indicate that consumers have maximin preferences (and the high-price firm pays the higher wage) or that the consumers' willingness to support both workers equally is reduced if the difference between prices or the price level are very high. In order to examine the validity of these potential explanations, Table 3 reports on regressions where we estimate the effects of the price and wage structure on the consumers' propensity to split purchases equally. The estimations reveal that the consumers' propensity to buy equal shares is increasing in the lower of both wage offers w_l (significant in NMF3 and MF6 and marginally significant in NMF6 and MF3). This is consistent with the view that fair consumers choose an equal split to equalize earnings if they find that wages are at a satisfactory level. Furthermore, the absolute price difference (in contrast to the price level) has a negative effect on the consumers' propensity to split units equally (though this is significant only in the MF6 treatment), which corroborates the hypothesis that concerns for equality decrease when equality is relatively more expensive.

Table 3: Consumers' propensity to split units equally among firms.

Model:	OLS			
Dependent variable:	$- q_1 - q_2 $			
Observations:	$p_1 \neq p_2$			
	NMF3	NMF6	MF3	MF6
$p_l = \min\{p_1, p_2\}$	0.075 (0.057)	0.094 (0.058)	0.096 (0.068)	0.071 (0.048)
$w_l = \min\{w_1, w_2\}$	0.333*** (0.096)	0.362* (0.202)	0.253* (0.147)	0.470*** (0.160)
$ p_1 - p_2 $	-0.025 (0.020)	-0.040 (0.029)	-0.038 (0.025)	-0.086*** (0.024)
$ w_1 - w_2 $	0.118* (0.065)	-0.037 (0.073)	-0.041 (0.055)	0.177 (0.113)
$I_{t>20}$	-0.685** (0.298)	-2.415*** (0.762)	1.064** (0.466)	2.491*** (0.663)
<i>const</i>	-9.930*** (0.578)	-9.781*** (0.734)	-10.786*** (0.717)	-12.425*** (0.706)
n	622	615	631	655
R^2	0.112	0.14	0.13	0.18
χ^2	6.10	3.76	2.26	8.81

Note: Clustered standard errors in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The dummy variable $I_{t>20}$ is 0 for all observations in rounds 1–20 and 1 for all observations in rounds 21–40.

As already noted, with maximin preferences the consumers' propensity to buy equal shares should depend on the absolute wage difference. However, the coefficient of $|w_1 - w_2|$ is not significant or only marginally significant in NMF3. Although this finding already casts some doubt on the hypothesis of maximin preferences, we employ a finite mixture model to estimate the proportion of observations that are consistent with each of the strategies considered thus far.²¹ These include the self-interested strategy (buy all units at the lowest price, split units arbitrarily if prices are equal), the maximin strategy (choose q_1 and q_2 such that minimum payoff of all market participants is maximized), the equipartition strategy (buy 5 units at each firm), the buy-by-wage strategy (buy all units at the highest wage, split units arbitrarily if wages are equal) and a randomization strategy (split units arbitrarily).

²¹We excluded the observations where the consumers bought less than 10 units in total since none of the strategies above makes reasonable (and nonambiguous) predictions in these cases.

We include the latter in order to capture observations that are not predicted by any of the other strategies (though these observations might be the result of a weighted application of more than one of the strategies considered here, see Section 3.3). To construct the log likelihood function, we assign a likelihood of 1 if an observed choice meets the prediction of the strategy considered and 0 otherwise. In cases where a strategy makes non-unique predictions, an observation that has been predicted is assigned a likelihood of $1/(\# \text{ predicted values})$. Following this approach we find that 68.8% of the data are explained by self-interested behavior. The estimated weight of the equipartition heuristic amounts to 8.5% while the weight of maximin behavior is the lowest of all with 2.8% only. The buy-by-wage strategy and unexplained choices amount to 5.2% and 14.7%, respectively. While all weights are significantly different from zero, the weight of the equipartition heuristic is significantly larger than the weight of maximin behavior ($p = 0.006$).²²

Observation 3 *The consumers' propensity to buy similar shares from both firms (i) increases in the wage level, (ii) decreases the more the two prices differ, and (iii) can mainly be ascribed to an equipartition heuristic rather than maximin preferences.*

Buying all units from the firm with the higher wage As Figure 2 reveals, a substantial number of consumers buy all units from the firm with the higher wage. One possible explanation is that consumers who care for the workers use this strategy to punish a firm for paying too low wages. If this is the case, we expect the consumers' willingness to buy all units from the high-price high-wage firm to depend negatively on the lower of both wage offers. Furthermore, due to the price sensitivity of fairness concerns, we expect that the consumers' willingness to buy from the more expensive firm is lower the higher the difference in the price offers.

In order to test these hypotheses, Table 4 reports the regression results of the consumers' willingness to buy all units from the high-price high-wage firm on the price and wage structure. The estimations show that this propensity of consumers is indeed decreasing in the lower of both wage offers, though this effect is significant only in MF3 and marginally

²²Restricting the analysis to observations where non-selfish behavior is costly ($p_1 \neq p_2$), we find that the estimated weight of maximin behavior is not different from zero ($p = 0.515$) while the weights of all other strategies remain significantly different from zero. The corresponding weight estimates are 75.5% for self-interested behavior, 2.4% for the equipartition heuristic, 0.3% for maximin behavior, 2.1% for buy-by-wage, and 19.7% for noise. The weight of the equipartition heuristic remains significantly higher than the weight of maximin behavior ($p = 0.0429$).

Table 4: Consumers' propensity to buy all units from the high-price high-wage firm.

Model:	Probit			
Dependent variable:	$I_{\{q_i=q_i+q_j p_i>p_j\wedge w_i>w_j\}}$			
Observations:	$p_i > p_j \wedge w_i > w_j$			
	NMF3	NMF6	MF3	MF6
$p_l = \min\{p_1, p_2\}$	0.039 (0.032)	0.114*** (0.042)	-0.044 (0.087)	0.024 (0.045)
$w_l = \min\{w_1, w_2\}$	-0.001 (0.063)	-0.141* (0.073)	-0.227** (0.115)	-0.022 (0.071)
$ p_1 - p_2 $	-0.002 (0.021)	0.012 (0.053)	-0.572*** (0.137)	0.020 (0.019)
$ w_1 - w_2 $	0.071** (0.036)	-0.022 (0.055)	0.340** (0.146)	-0.024 (0.059)
$I_{t>20}$	-0.017 (0.226)	-0.450 (0.383)	0.840*** (0.253)	0.967** (0.465)
<i>const</i>	-2.081*** (0.330)	-2.457*** (0.397)	-0.977 (0.690)	-2.533*** (0.792)
<i>n</i>	284	271	315	237
<i>logℓ</i>	-76.77	-51.71	-51.10	-48.93
χ^2	49.27	16.59	31.45	11.49

Note: Clustered standard errors in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The dummy variable $I_{t>20}$ is 0 for all observations in rounds 1–20 and 1 for all observations in rounds 21–40.

significant in NMF6. Moreover, the absolute wage difference exerts a significant positive effect on the consumers' willingness to buy all units from the high-price high-wage firm in NMF3 and MF3. Thus, after controlling for prices and the wage at the low-price low-wage firm, consumers are more willing to pay a high price the higher the wage at the high-price high-wage firm. These results are consistent with the hypothesis that buying all units from the high-price high-wage firm is a long-term strategy to encourage firms to pay higher wages. Again, we find evidence of the price sensitivity of fairness concerns. In MF3 the absolute price difference exerts a significant negative effect and in NMF6 the price of the other (low-price low-wage) firm has a significant positive effect.

Observation 4 (i) A significant proportion of consumers are willing to buy all units from the firm with the higher price as long as it offers a higher wage. (ii) Consumers more often

buy all units from the high-price high-wage firm, the lower the wage offer of the low-wage firm and the higher the wage difference between firms.

3.3 Policy changes and consumer behavior

The consumers' sense of fairness is expressed in two different ways, namely an inclination to split purchases equally across firms even if prices differ and an inclination to buy all units from the firm with a higher wage and a higher price. We have observed that the choice of the two strategies depends on prices and wages in the market. We have also observed that policy changes affect wages directly since the minimum wage is often binding.²³ In this section we study whether changes in the consumers' choices can be explained by changes in wages and prices alone or whether the consumers' fairness perceptions are affected by policy changes per se, in particular whether minimum wages crowd out of fairness concerns.

Some first answers to this question can be taken from the raw data and from the regressions reported in Tables 3 and 4. When simply counting the fraction of consumers who buy the same number of units at both firms at least once, the introduction of a minimum wage in the NMF treatments leads to a drop from 23/64 to 19/64. This fraction increases from 13/64 to 19/64 in the MF treatments after the abolishment of the minimum wage.²⁴ Regarding the second strategy, the introduction of a minimum wage in the NMF treatments decreases the fraction of consumers buying at least once all units from the high-price high-wage firm from 18/64 to 7/64. In the MF treatments this fraction increases from 2/64 to 15/64 when the minimum wage is abolished.²⁵

The regressions reported in Tables 3 and 4 include the dummy $I_{t>20}$ to capture changes in behavior after the policy change while controlling for changes in the price and wage structure. Table 3 shows crowding-out and crowding-in effects in that consumers split their purchases less equally after the introduction of a minimum wage in the NMF treatments while they split them more equally after the minimum wage has been abolished in the MF treatments. According to Table 4, the strategy to buy all units from the high-price high-

²³We studied minimum wage levels that are true interventions in the markets. Given all observations in the first half of the NMF treatments, 48% [76%] of the wage offers are below the considered minimum wage levels of $\underline{w} = 3$ [$\underline{w} = 6$].

²⁴As in Table 3 we focus on observations where $p_1 \neq p_2$. Note however, that these changes are not significant: A two-sided Fisher's exact test yields $p = 0.573$ and $p = 0.307$, respectively.

²⁵As in Table 4, we focus on observations where $p_i > p_j$ and $w_i > w_j$. The two-sided Fisher's exact test yields $p = 0.024$ and $p = 0.001$, respectively.

wage firm is crowded in by removing the minimum wage in the MF treatments while there is no significant crowding-out effect in the NMF treatments.

This evidence is suggestive of changes in consumer preferences. However, the regression analysis considers the two fairness strategies of the consumers one at a time and does not allow us to assess their relative importance and whether this is affected by policy choices. In the following, a model that captures both fairness strategies along with their dependence on the price and wage offers is presented. Before we describe the model, we briefly discuss why prominent fairness models are not well suited to capture the fair behavior observed in our experiment.

3.3.1 Existing fairness models

We observe first that inequality aversion models such as Fehr and Schmidt (1999) or Bolton and Ockenfels (2000) are not able to capture the two types of fair behavior we observe. According to both models, subjects do not discriminate among other players who all have a higher or all have a lower payoff than themselves (according to Bolton and Ockenfels, subjects are not even concerned with redistributing from those who have more than themselves to those who have less). Thus, given that in our experiment the consumers almost always earn the highest payoff, they should not care how the remaining surplus is distributed among the firms and workers according to these models. The fair behavior we observe is only reasonable if consumers care about the distribution among the other players. This aspect is better captured by Charness and Rabin (2002) who assign a special weight to the subject with the lowest payoff or by Cox, Friedman, and Sadiraj (2008) who model utility as concave in all subjects' payoffs. However, even these models do not capture the behavior in our experiment as they do not address the tension between short-term and long-term considerations exhibited by the two different fairness strategies that we observe. Essentially, the models are static and do not allow for a trade-off between current-period utility and an attempt to teach firms to be fair in the future.²⁶

Models of reciprocity such as Dufwenberg and Kirchsteiger (2004) or Falk and Fischbacher (2006) cannot account for our results either, as reciprocity would suggest that the low-price firm is rewarded with more purchases, a behavior indistinguishable from self-

²⁶One could also apply the model by Charness and Rabin (2002) to the entire repeated game rather than to the stage game, thereby allowing for intricate strategies of teaching firms to change wages. This would, however, put all the weight on the long-term concern and thus would not capture the trade-off between the two different types of fairness strategies.

ishness. One could expand these models to incorporate indirect reciprocity, which would be consistent with rewarding firms that pay higher wages. However, this would complicate the models and make them intractable as one would need to consider how consumers trade off direct reciprocity (reaction to prices) with indirect reciprocity (reaction to wages). Furthermore, beliefs are crucial in this approach and an extension to indirect reciprocity would require finding answers to questions such as whether the beliefs of the workers (and the second-order beliefs of the consumer and firms regarding the workers' beliefs) matter as well.

3.3.2 A model of consumer choice

Instead of building on any of the established models of fair behavior, we present a stylized model that directly incorporates the two fairness strategies of consumers that we observe, namely an equal split of purchases and buying less at the low-wage low-price firm. This stylized model does not propose a novel theory of social preferences, but is tailored to our game in order to capture how consumers trade off these two motives and self-interest. This allows us to estimate how the weight that the consumers assign to both motives relative to their self-interest changes with the minimum wage policy. Specifically, we assume that subjects maximize the following utility function:

$$u(r_1|p, w) = - \left[r_1 p_1^\beta + (1 - r_1) p_2^\beta \right] + \lambda_h [r_1 w_1^\alpha + (1 - r_1) w_2^\alpha] + \lambda_e [r_1(1 - r_1)]. \quad (1)$$

The first term captures self-interest, where r_1 denotes the proportion of units the consumer buys from firm 1. The parameter β captures the marginal disutility of prices. Hence, for $\beta > 0$ higher prices decrease utility and a purely self-interested consumer ($\lambda_h \rightarrow 0, \lambda_e \rightarrow 0$,) always buys the maximum number of units from the cheapest firm. The second term in (1) captures the preference for high wages if $\alpha > 0$ and $\lambda_h > 0$, where α determines the marginal utility of wages and λ_h determines the importance of the taste for sufficiently high wages compared to the other preference components. For $\lambda_h \rightarrow \infty$ (and λ_e is bounded) the consumer is exclusively interested in buying from the firm with the higher wage. Finally, the third term reflects the consumer's taste for dividing the number of units equally between firms when $\lambda_e > 0$. For $\lambda_e \rightarrow \infty$ (and λ_h is bounded) the consumer is solely interested in buying five units at each firm.

In order to estimate the parameters of the model, we derive the best response of the consumers to a specific price-wage tuple, which is given by

$$r_1^*(p, w) = \min \left\{ \max \left\{ \left(\frac{1}{2} + \frac{(p_2^\beta - p_1^\beta) + \lambda_h(w_1^\alpha - w_2^\alpha)}{2\lambda_e} \right), 0 \right\}, 1 \right\} \quad (2)$$

Since we want to capture policy effects on the consumer's behavior that are beyond pure adjustment effects to different prices and wages, we estimate the fairness parameters λ_h and λ_e for the NMF and MF treatments separately while we include a dummy for the second half of the experiment for both parameters. We minimize the squared difference between the observed fraction of units bought from firm 1 and the predicted fraction (2) with respect to the model parameters. Note that we do not put any restrictions on the parameters in the estimation procedure. For computational reasons, we replace the step link function in (2) by a logit link function.²⁷ For the estimations, we include those observations where the consumers bought less than ten units, but our main results are robust to excluding these observations.²⁸

The descriptive model performs well since the variance left unexplained as a fraction of the total variance amounts to 15.4% only (adjusted $R^2 = 0.845$). Furthermore, given that we did not impose any parameter restrictions, the fact that all estimates are in the expected range is reassuring. In addition, the estimates of α and β corroborate the findings from the preceding sections. Specifically, regarding the marginal utility of wages, the estimation yields $\hat{\alpha} = 0.570$ which is significantly different from both 0 and 1. This suggests that for higher average wage levels, consumers become less sensitive to wage differences and decrease their willingness to buy from the firm with the higher wage in favor of buying similar shares at both firms and of buying for lower prices overall. Furthermore, the estimated parameter determining the curvature of the marginal disutility of prices $\hat{\beta} = 0.896$ is slightly but not significantly smaller than 1, which suggests that the disutility of a marginal price increase is independent of the average price level. Thus, the price level does not affect the fairness considerations of consumers. The fact that $\hat{\beta}$ is significantly larger than 0 shows that fairness of the consumers is price sensitive, that is, if the price difference becomes larger, they buy more from the cheaper firm. The estimation results with respect to the remaining

²⁷Using the normal distribution as an alternative link function yields a worse fit to the data.

²⁸In line with the previous analysis, we exclude the first six periods of each half as well as the periods where the consumers made obvious errors.

parameters are presented in Table 5.

Table 5: Estimation of policy effects on consumers' preferences.

		$t \in \{7, \dots, 20\}$	$t \in \{27, \dots, 40\}$	<i>change</i>
NMF3	λ_h	0.304***	0.458***	0.154
	λ_e	0.147***	0.134***	-0.013
NMF6	λ_h	0.282***	0.000	-0.282**
	λ_e	0.187***	0.117***	-0.070***
MF3	λ_h	0.449***	0.610***	0.162*
	λ_e	0.121***	0.249***	0.127***
MF6	λ_h	0.397**	0.502***	0.105
	λ_e	0.126***	0.255***	0.129***

Note: p -values based on clustered standard errors:

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

We note first that in the estimations based on the whole data set, both dimensions of the consumers' fairness concerns are relevant since the parameter estimates for λ_e and λ_h are significantly different from zero in each part of the experiment with the exception of λ_h after the introduction of a minimum wage $\underline{w} = 6$. Thus for the average consumer both motives matter whether there is a minimum wage in place or not.

Our main interest lies in the effect of changes in the minimum wage regime on the consumers' fairness preferences reported in the last column of Table 5. First, we observe that the introduction of the minimum wage of 6 in NMF6 significantly decreases the weights of both fair strategies, λ_h and λ_e . Second, the abolishment of a minimum wage (both in MF3 and MF6) increases λ_e significantly while λ_h is at best marginally significantly affected, suggesting that consumers become more concerned about splitting their purchases equally.²⁹ Note that these effects are not due to changes in prices and wages, as such changes are controlled for in the estimations.

Of particular interest for the question how regulation affects the fairness concerns of consumers is the comparison of inexperienced consumers (i.e., those who have not yet experienced the other policy regime) between treatments. Comparing the first part of both treatments shows that the presence of a minimum wage reduces the consumers' preference

²⁹Tests within the treatments MF3 and MF6 separately as well as tests aggregated over both treatments yield $p_{(H_0: \Delta \lambda_e = 0)} \leq 0.001$ and $p_{(H_0: \Delta \lambda_h = 0)} \geq 0.089$.

for equipartition (for $\underline{w} = 6$ and on the aggregate³⁰) while it has no significant effect on the consumers' strategy to buy from the high-wage firm.³¹

Finally, crowding-in effects after the abolishment of a minimum wage make the consumers' fairness preferences even more pronounced than when consumers have no experience with a minimum wage. Comparing markets without a minimum wage that have experienced a minimum wage before (MF, periods 27-40) with those markets where participants have no experience and there is no minimum wage (NMF, periods 7-20), we find that both, λ_h and λ_e , are significantly larger in the former.³² Given the previous results of crowding out and crowding in, it is not surprising that after the abolishment of a minimum wage (MF, periods 27-40) both, λ_h and λ_e , are significantly higher than after the introduction of a minimum wage (NMF, periods 27-40).³³ We conclude

Observation 5 (i) *The consumers' tendency to buy equal shares from both firms and to buy only at the high-wage firm can be identified as separate strategies in addition to choices driven by self-interest.* (ii) *The introduction of a minimum wage of 6 decreases both the consumers' preference for high wages and their preference for equal splits of purchases. The abolishment of a minimum wage increases the consumers' willingness to buy equal amounts from both firms.* (iii) *Aggregating over the size of the minimum wage and comparing all four scenarios, the consumers' fairness preferences as exhibited through the choice of these two strategies are strongest after the abolishment of a minimum wage.*

The results of the model estimation and the regression results above are overall consistent with respect to the sign of the changes. Differences between the two approaches in terms of significance levels of the effects of policy changes can be due to the fact that the model incorporates both strategies of fair consumers simultaneously in addition to self-interest, which is not the case for the regressions.

³⁰The corresponding p-values for $\underline{w} = 6$ and on aggregate are $p_{(H_0:\Delta\lambda_e=0)} \leq 0.017$; for $\underline{w} = 3$ the p-value is $p_{(H_0:\Delta\lambda_e=0)} = 0.238$.

³¹Tests for $\underline{w} = 3$, $\underline{w} = 6$, and on aggregate yield $p_{(H_0:\Delta\lambda_h=0)} \geq 0.159$.

³²The corresponding p-values for the data with $\underline{w} = 3$, $\underline{w} = 6$ and on aggregate are $p_{(H_0:\Delta\lambda_h=0)} \leq 0.005$ and $p_{(H_0:\Delta\lambda_e=0)} \leq 0.027$.

³³The corresponding p-values are for $\underline{w} = 3$, $\underline{w} = 6$, and on aggregate are $p_{(H_0:\Delta\lambda_h=0)} \leq 0.005$ and $p_{(H_0:\Delta\lambda_e=0)} \leq 0.027$.

4 Conclusions

Over the last decades, important insights into fairness concerns have been gained from experimental research. Much of this research, however, investigates situations where it is rather obvious what would constitute fair behavior and how fair outcomes can be achieved. Outside the laboratory, it is often complicated to achieve fair outcomes or even to decide what constitutes a fair outcome. We have studied an experimental market where consumers have to take complex decisions to achieve fair outcomes. We have also introduced a policy change in the market in order to investigate how this affects consumer choices and market outcomes.

We have found that although the consumers act self-interestedly in most of the cases, they reveal a substantial willingness to forgo own payoffs in order to support the workers. Specifically, we have identified two strategies of the consumers to implement a fair market outcome. First, the consumers exhibit a preference for an equal split of the purchased quantities even if the prices of the firms differ. Second, if the average wage level is low, the consumers sometimes buy all units from the more expensive firm if it offers a higher wage. Buying a similar number of units can be interpreted as implementing a fair outcome in the short-run if the wage level is high enough. But if wages are too low, fair minded consumers shift purchases to the firm with the higher wage, presumably to encourage higher wages in later rounds. As can be expected from rational consumers, both strategies are chosen less often when they are too costly, i.e., when the difference in prices is too high. We thus observe that although achieving fair outcomes for all participants is far from trivial in our game, a number of participants in the role of consumers make an effort to do so. The behavior of consumers encourages firms to raise wages above the minimum level.

Do legal standards affect ethical concerns of consumers? We observe that introducing a minimum wage has a positive effect on the welfare of workers because the direct effect (i.e., the minimum wage is frequently binding) overcompensates the negative indirect (crowding-out) effect. The abolishment of a minimum wage clearly increases the consumers' willingness to forgo own income in order to support the workers. However, this crowding-in effect is overcompensated by the direct effect of the abolishment of the minimum wage such that workers in sum suffer from the abolishment of a minimum wage. Furthermore, consumers act as if they care less about the equal distribution of purchases if a minimum wage is in place initially. Therefore, both comparing across treatments for the same phase of the experiment and within treatments across time, we find that the presence of a minimum

wage weakens fairness concerns by consumers, but that this effect is dominated by the direct effect of the minimum wage, because it is frequently binding.

Obviously, since our study considers a very specific setting, one needs to be careful when drawing policy conclusions. While we have provided a behavioral existence proof of crowding out through regulation and crowding in through deregulation, a number of abstractions from natural labor markets (such as the restriction to monopsonistic buyers) preclude drawing lessons on the effects of minimum wages on naturally occurring labor markets. Specifically, our result that the direct effect of a binding minimum wages dominates the indirect crowding effect certainly depends on the specific conditions of the market and on the level of the minimum wage. Moreover, we have by design excluded any possible impact of minimum wages on employment levels as well as on the workers' motivation, which would both be important determinants of the overall welfare effects of minimum wages. What our behavioral existence proof implies, however, is that crowding effects should not be ignored when devising new (de-)regulation schemes.

References

- Bolton, G.E. and Ockenfels A. (2000). ERC: A theory of Equity, Reciprocity and Competition. *American Economic Review* 90, 166-193.
- Brandts, J. and Charness, G. (2004). Do Labour Market Conditions Affect Gift Exchange? Some Experimental Evidence. *Economic Journal*, 114, 684–708.
- Card, D. (1992). Do Minimum Wages Reduce Employment? A Case Study of California 1987-89. *Industrial and Labor Relations Review*, 46(1), 38–54.
- Card, D. and Krueger, A. (1994). Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania. *American Economic Review*, 84 (4), 772–793.
- Card, D. and Krueger, A. (1995). Myth and Measurement. The New Economics of the Minimum Wage. Princeton University Press, Princeton, New Jersey.
- Charness, G. and Rabin, M. (2002). Understanding Social Preferences with Simple Tests. *Quarterly Journal of Economics* 117(3), 817–869.
- Cox, J.C.; Friedman, D., and Sadiraj, V. (2008). Revealed Altruism. *Econometrica* 76(1), 31–69.
- Dickens, R., Machin, S., and Manning, A. (1999). The Effects of Minimum Wages on Employment: Theory and Evidence from Britain. *Journal of Labor Economics* 17(1), 1–23.
- Dufwenberg, M. and Kirchsteiger, G. (2004). A Theory of Sequential Reciprocity. *Games and Economic Behavior*, 47(2), 268–298.
- Engelmann, D. and Fischbacher, U. (2009). Indirect Reciprocity and Strategic Reputation Building in an Experimental Helping Game. *Games and Economic Behavior* 67(2), 399–407.
- Engelmann, D. and Strobel, M. (2004). Inequality Aversion, Efficiency, and Maximin Preferences in Simple Distribution Experiments. *American Economic Review*, 94(4), 857–869.

- Falk, A. and Fischbacher, U. (2006). A Theory of Reciprocity. *Games and Economic Behavior* 54, 293–315.
- Falk, A., Fehr, E., and Zehnder, C. (2006). Fairness Perceptions and Reservation Wages - The Behavioral Effects of Minimum Wage Laws. *Quarterly Journal of Economics*, 121 (4), 1347–1381.
- Falk, A. and Kosfeld, M. (2006). The Hidden Costs of Control, *American Economic Review*, 96 (5), 1611–1630.
- Fehr, E., and Fischbacher, U. (2004). Third-Party Punishment and Social Norms. *Evolution and Human Behavior*, 25, 63–87.
- Fehr, E. and Schmidt, K.M. (1999). A theory of Fairness, Competition and Cooperation. *Quarterly Journal of Economics*, 114, 817- 868.
- Forsythe, R., Horowitz, J.L., Savin, N.E., and Sefton, M. (1994). Fairness in Simple Bargaining Experiments. *Games and Economic Behavior*, 6, 347–369.
- Fischbacher, U., 2007. Zurich Toolbox for Ready-made Economic experiments. *Experimental Economics*, 10(2), 171–178.
- Freeman, R.B. (1996). The Wage as a Redistributive Tool. *Economic Journal*, 106, 639–649.
- Frey, B.S. (1997). *Not just for the Money*. Edward Elgar, Cheltenham.
- Frey, B.S. and Jegen, R. (2001). Motivation Crowding Theory. *Journal of Economic Surveys*, 15, 589–611.
- Gneezy, U. and Rustichini, A. (2000a). Pay Enough or Don't Pay at All. *Quarterly Journal of Economics*, 115(2), 791–810.
- Gneezy, U. and Rustichini, A. (2000b). A Fine is a Price. *Journal of Legal Studies*, 29, 1–17.
- Güth, W. and van Damme, E. (1998). Information, Strategic Behavior and Fairness in Ultimatum Bargaining - An Experimental Study. *J. Math. Psychology*, 42, 227–247.

- Güth, W., Schmidt, C., and Sutter, M. (2007). Bargaining Outside the Lab - A Newspaper Experiment of a Three Person-Ultimatum Game. *Economic Journal*, 117, 422–448.
- Harrison, G.W. and Johnson, L.T. (2006). Identifying Altruism in the Laboratory. In: D. Davis (Ed.) *Experiments in Fundraising and Charitable Contributions*. Research in Experimental Economics, Volume 11. JAI Press, Greenwich, Connecticut.
- Katz, L. and Krueger, A. (1992). The Effect of the Minimum Wage on the Fast Food Industry. *Industrial and Labor Relations Review*, 46(1), 6–21.
- Kritikos, A. and Bolle, F. (2001). Distributional Concerns: Equity- or Efficiency-oriented? *Economics Letters*, 73, 333–338.
- Nowak, M.A. and Sigmund, K. (1998). Evolution of Indirect Reciprocity by Image Scoring. *Nature* 393, 573–577.
- Nowak, M.A. and Sigmund, K. (2005). Evolution of Indirect Reciprocity. *Nature* 437, 1291–1298.
- Ostrom, E. (2000). Collective Action and the Evolution of Social Norms. *Journal of Economic Perspectives*, 14(3), 137–158.
- Roth, A.E. (1995). Bargaining Experiments, in J.H. Kagel and A.E. Roth (eds). *The Handbook of Experimental Economics*. Princeton University Press, Princeton.
- Seinen, I. and Schram, A. (2006). Social Status and Group Norms: Indirect Reciprocity in a Helping Experiment. *European Economic Review* 50, 581–602.

Instructions (Treatment MWF), NOT FOR PUBLICATION

Welcome to this experiment! You can earn money in this experiment, and the amount that you will receive at the end depends on the decisions you and the other participants make.

Please read these instructions carefully. If there is anything you do not understand, please indicate this by raising your hand. We will answer your questions individually. The instructions are identical for all participants.

The experiment consists of several periods. At the beginning of the experiment, each participant is randomly assigned a role that remains the same up to the end of the experiment. You know your own role but do not know the roles of other participants. Of course your anonymity will be protected throughout the entire experiment. This means that the other participants will not be told your real identity. The same applies to all participants.

The experiment deals with a situation in which there are firms, employees, and consumers. There are two firms, each of which has been assigned one employee who can manufacture a maximum of ten units of a specific product. How much the employee actually produces depends on how many units the consumer wants to buy from the firm. The firm determines the wage that the employee earns per unit sold. An employee remains assigned to the same firm throughout the entire experiment. Both firms produce the same product, and both offer this product to the same consumer. The consumer can buy a maximum of ten units of the product, and can decide which firm to buy from and how many units to buy from each of them.

At the beginning of the experiment, the five roles—two firms, two employees, and one consumer—will be assigned to the five participants. Throughout the entire experiment, these assigned roles will remain the same. This means that the firms, the employees, and the consumer that you are dealing with will remain the same in all rounds.

The payment each participant receives is measured in points and depends on the participant's role:

- The employee receives the wage paid by the firm. It is a piece rate; that is, the employee receives a fixed amount set by the firm per unit sold. The wage must be at least three points per unit. The employee himself does not take any decisions. If the consumer does not buy anything from the firm, the employee does not receive a wage, and thus receives a payment of zero.
- The firm receives the unit price for the product, multiplied by the number of units bought by the consumer, minus what the firm pays the employee. If the consumer does not buy anything from the firm, the firm does not have to pay the employee, so in total, the firm receives zero.
- The value the consumer places on one unit of the good is 25 points. He can buy a maximum of 10 units, but he can also buy less. This means that he receives 250 points minus the total price if he buys 10 units of the good. If he buys less than 10 units, he receives the number of units multiplied by 25, minus the sum of the prices that he has to pay for them. The consumer can distribute the purchase of units between the two firms as desired, and he is not forced to buy from either of the two firms. If a consumer does not buy anything, he receives no payment in that period.

The procedure of the experiment is as follows:

1. First, each of the two firms chooses the wage for the employee assigned to it and the price at which it wants to sell each unit of the product. The wage per unit must lie between 3 and 50 points, and the price per unit between 0 and 50 points.
2. The consumer learns the price at which each of the firms is offering the good and what piece rate it pays its employee. On this basis, the consumer decides how many units he wants to buy from each firm.
3. The purchases are made.
4. The decisions and payments to all participants are displayed on the computer screen.

This situation will be repeated 20 times. Then, after we have informed you about a change in the rules, another 20 periods will follow. In this second part of the experiment, the roles of all participants will remain the same as in the first, and the group will remain the same as well.

Your final payment will amount to the sum of all payments in all periods. The exchange rate for the points that you can earn throughout the experiment is 200 points = 1 Euro.

At the beginning, you will receive a fixed amount of 5 Euro. Any losses you make will be deducted from this amount.

If there is anything you did not understand, please let us know by raising your hand. We will then answer your questions individually.