FAIRNESS PERCEPTIONS AND RESERVATION WAGES— THE BEHAVIORAL EFFECTS OF MINIMUM WAGE LAWS*

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In a laboratory experiment we show that minimum wages have significant and lasting effects on subjects' reservation wages. The temporary introduction of a minimum wage leads to a rise in subjects' reservation wages which persists even after the minimum wage has been removed. Firms are therefore forced to pay higher wages after the removal of the minimum wage than before its introduction. As a consequence, the employment effects of removing the minimum wage are significantly smaller than are the effects of its introduction. The impact of minimum wages on reservation wages may also explain the anomalously low utilization of subminimum wages if employers are given the opportunity to pay less than a minimum wage previously introduced. It may further explain why employers often increase workers' wages after an increase in the minimum wage by an amount exceeding that necessary for compliance with the higher minimum. At a more general level, our results suggest that economic policy may affect people's behavior by shaping the perception of what is a fair transaction and by creating entitlement effects.

I. Introduction

For decades, economists have been interested in the economic and social consequences of minimum wage laws. Important puzzles remain, however, despite much progress in both labor market theory and empirical analysis. First, several studies report anomalously low utilization of subminimum wages in situations where employers could actually pay workers less than the minimum [Freeman, Wayne, and Ichniowski 1981; Katz and Krueger 1991, 1992; Manning and Dickens 2002]. Katz and Krueger [1992] found, for example, that the introduction of the opportunity to pay subminimum wages to youth had no discernible effect on teenage workers' wages. This underutilization of the

opportunity to pay less than the prevailing minimum occurred, even though the vast majority of firms paid a starting wage below the new hourly minimum immediately before it became effective. Second, there is evidence that minimum wage laws have so-called spillover effects [Card and Krueger 1995; Katz and Krueger 1992; Dolado, Felgueroso, and Jimeno 1997; Teulings 2003; Teulings, van Dieten, and Vogels 1998].[1] For example, Katz and Krueger [1992] and Card and Krueger [1995] show that after an increase in the minimum wage, fast food restaurants increased wages for workers by an amount in excess of that necessary for compliance with the higher minimum wage. Third, the new minimum wage research in the 1990s questioned the conventional wisdom that increases in the legal minimum wage *always* cause a decrease in employment, in particular, if the minimum wage increase is modest [Card 1992; Card and Krueger 1994; Katz and Krueger 1992; Machin and Manning 1994; Dolado et al. 1996]. Although these results remain contested, it is probably fair to say that they represent a considerable challenge to the conventional view of the employment effects of minimum wages (see, e.g., Neumark and Wascher [1992, 2000], Card, Katz, and Krueger [1994], and Card and Krueger [2000]).

Why do profit-maximizing employers not take advantage of the possibility of reducing wages below the legal minimum, and why do they pay more than the required minimum for those workers who earned less than the new minimum wage before it was introduced? We report the results of laboratory experiments that examine possible driving forces behind these phenomena in this paper. We provide, in particular, evidence showing why profit-maximizing employers may find it profitable to pay workers much higher wages after the removal of a legal minimum wage than before its introduction.[2] This result provides a possible explanation for the anomalously low utilization of subminimum wage opportunities because these opportunities were typically introduced after a previous increase in the minimum wage. In addition, our data show why profit-maximizing employers may find it optimal to pay wages above the minimum wage even if they paid wages much lower than the minimum wage before its intro-

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1. A notable exception is the United Kingdom where no spillover effects have been found [Manning and Dickens 2002].
2. Throughout the paper we use the term "employer" or "firm" for subjects who are in the role of an employer in the laboratory experiment. The term "worker" is used for subjects who are in the role of a worker in the experiment.

duction. This result provides an explanation for the second puzzle, i.e., why there are wage spillover effects. Finally, we report evidence suggesting that employers may find it optimal neither to decrease employment after the introduction of a binding minimum wage nor to increase employment after its removal.

We identify the observed pattern of reservation wages as the driving force behind all these phenomena. Workers' fairness concerns shape individual reservation wages in our experiment and give rise to upward sloping labor supply schedules at the firm level. We observe that the minimum wage strongly affects reservation wages, suggesting that it influences what is perceived as a fair wage. After the *introduction* of a minimum wage, workers' reservation wages increase, and a substantial share of the workers even exhibits reservation wages above the legal minimum. Profit-maximizing firms are thus forced to pay wages above the minimum, which explains the spillover effect.[3] After the *removal* of the minimum wage, workers' reservation wages decrease somewhat; however, they still substantially exceed those before the introduction of the minimum wage. It seems that the minimum wage leads to a kind of ratchet effect in workers' perception of what constitutes a fair wage. This means that individual firms face a tighter labor supply schedule after the removal of the minimum wage than before its introduction. Therefore, the payment of substantially higher wages after the removal of the minimum wage than before the introduction is a profit-maximizing strategy. This finding explains why firms may find it unprofitable to utilize subminimum wage opportunities and echoes results reported in Katz and Krueger [1992]. They report that 62 percent of fast food restaurant managers not using the subminimum opportunity for youth believed they could not "attract qualified teenage workers at the subminimum wage" although the vast majority of these restaurants hired workers at less than the new minimum wage prior to its increase.[4]

3. Flinn [2005] shows that minimum wages can also affect workers' reservation wages in search and matching models with wage bargaining. The reason is that the minimum wage changes the asset values of unemployment and employment. However, as firms and workers are exogenously rematched in every period of our experiment, these effects cannot play a role in our setup. Teulings [2005] provides an elegant explanation of spillover effects in an extended competitive model. Teuling's explanation and our explanation in terms of changes in reservation wages are not mutually incompatible.

4. The fact that reservation wages and, hence, actual wages remain high after the removal of the minimum wage may also inform us about the forces behind the adjustment of reservation wages over time. Our result suggests that

The pattern of reservation wages also shapes the employment effect of the minimum wage. Since workers' fairness concerns impose an upward sloping labor supply constraint on individual firms, firms can increase employment if they pay higher wages. Theoretical analyses [Rebitzer and Taylor 1991; Manning 1995, 2003; Burdett and Mortensen 1998; Bhaskar and To 1999] indicate that a minimum wage may actually increase employment under these circumstances. This is, however, not obvious in our context. As the minimum wage not only increases wages but also reservation wages, firms may also reduce employment. We find that the increase in reservation wages is not strong enough such that the introduction of a binding minimum wage has a positive net effect on employment. In addition, the asymmetric response of reservation wages to the introduction and the removal of the minimum wage is associated with asymmetric employment effects: employment decreases less after the removal of the minimum wage than it increased after the introduction of the minimum wage.[5]

To what extent should one expect the behavioral forces identified in the experiment to be present in labor markets outside the laboratory as well? Although it is advisable to be cautious when generalizing findings from one empirical domain to another, we believe that the impact of minimum wages on reservation wages might well be present in labor markets outside the laboratory. First, fairness concerns, which shape reservation wages in our experiment, have been shown to affect laboratory behaviors even at rather high stake levels—up to three months' income [Cameron 1999; Slonim and Roth 1998; Fehr, Fischbacher, and Tougareva 2002]. Thus, the argument that stakes are higher in the "field" than in the laboratory and that the laboratory results can therefore be dismissed as irrelevant, is on weak ground. Second, the argument that we used a rather narrow subject pool—students—in our experiment is also not compelling because evidence

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actual wage payments which were previously experienced may strongly shape reservation wages. This finding may have important consequences for the debate regarding the compatibility of the "wage curve," as documented by Blanchflower and Oswald [1994], and the Phillips curve. In particular, one condition for the compatibility of the wage curve approach with the Phillips curve approach is that past increases in real wages be fully reflected in current increases in reservation wages [Blanchard and Katz 1997, 1999].

5. Similar to our findings Kramarz and Philippon [2001] report for the French labor market between 1990 and 1998 that the effects of labor cost increases and decreases caused by legal changes were not symmetric.

from representative experiments from Germany, the Nether-lands, and Switzerland show that the basic behavioral patterns observed in fairness-related experiments with students also pre-vail in representative samples [Bellemare and Kröger 2004; Fehr et al. 2002; Falk and Zehnder 2006]. Third, evidence from ques-tionnaire studies with firms' human resource managers—some of them even with representative samples of firms—suggests that workers' fairness concerns play a prominent role in firm's wage policies [Bewley 1999; Agell and Bennmarker 2003]. Finally, re-cent papers indicate that laboratory measures of social prefer-ences can be good predictors of behavior in field settings. Karlan [2005] shows that reciprocity (i.e., trustworthiness) in trust games predicts subjects' loan repayments one year after a labo-ratory experiment, and Carpenter and Seki's work [2005] sug-gests that laboratory measures of conditional cooperation forecast productivity in the workplace.

At a more general level, our results indicate that economic policies may not only affect private agents' incentives, but also change their perception of what is fair and create entitlement or status quo effects. In the past, economists have concentrated their efforts on understanding the incentive effects of government policies. However, our results—in combination with other recent evidence [Madrian and Shea 2001; Ariely, Loewenstein, and Prelec 2003] demonstrating that seemingly innocuous situational details can have powerful behavioral effects—suggest that econo-mists may gain substantially by also focusing their research on these other effects of government policies. The work by Ariely, Loewenstein, and Prelec [2003], for example, shows that arbi-trary anchors have strong effects on subjects' reservation prices. If arbitrary anchors are even able to affect reservation values, should we not also expect a government intervention as strong and as salient as an increase in minimum wages to influence reservation wages strongly? Thus, public policies are likely to affect behavior not only through changing incentives but also by shaping perceptions of entitlements and, thus, reservation values.

In the following, we first present our experimental design. Then we show our results in Section III. In Section IV we examine the extent to which the impact of minimum wages is due to the fact that minimum wages are necessarily a kind of wage guide-line; we thus study the impact of *nonbinding* wage guidelines on actual wages and reservation wages in this section. Section V

TABLE I
FIRMS' REVENUE FUNCTION

Employed workers	Total revenue	Marginal revenue
0	0	–
1	390	390
2	740	350
3	1000	260

discusses the applicability of our findings to labor markets outside the laboratory and suggests several further experiments that might provide a deeper understanding of the minimum wage's impact on reservation wages.

II. EXPERIMENTAL DESIGN

In this section we present the experimental design. We first describe the experimental game, followed by a description of the treatments and procedures. Finally, we discuss the behavioral predictions.

II.A. *The Experimental Game*

Workers are randomly matched to firms in each period of the experiment, and can only conclude a contract with the firm with which they are matched. There are six firms and eighteen workers in each experimental session; i.e., each of the six firms is randomly matched with three workers in each period. Firms have identical revenue functions with labor as the only variable input and a decreasing marginal revenue product of labor. To hire workers, firms can submit a unitary wage offer w to the matched workers; i.e., wage discrimination is ruled out. Firms can make wage offers to all matched workers or to fewer workers. Workers do not know how many wage offers the firm makes; each individual worker only knows whether he or she received a wage offer.

A worker can accept or reject w. If the worker rejects w, he or she is unemployed and earns nothing in this period. If a worker accepts the offer, a binding contract is concluded; the worker receives w, and the firms' revenue increases according to the marginal revenue the worker generates. Each firm's revenue function is shown in Table I. Firms' profits are given by total

revenue minus wages. Thus, an individual firm's profit function is as follows:

$$\Pi_{\text{Firm}} = \begin{cases} 0, & \text{if no worker is employed} \\ 390 - w, & \text{if one worker is employed} \\ 740 - 2w, & \text{if two workers are employed} \\ 1000 - 3w, & \text{if three workers are employed.} \end{cases}$$

Workers' payoffs depend on the wage offer and on whether the offer is accepted or rejected. Thus, payoffs for workers are

$$\Pi_{\text{Worker}} = \begin{cases} 0, & \text{if no wage offer is received} \\ 0, & \text{if a wage offer is rejected} \\ w, & \text{if a wage offers is accepted.} \end{cases}$$

Both workers' and firms' payoff functions are common knowledge among the participants. After all decisions in a period are made, payoffs are calculated and displayed on the subjects' computer screens: firms are informed both about their own payoffs and those of the workers with whom they have been matched; workers, too, are informed both about their own payoffs and that of their firm. The next period begins after all subjects have received this payoff information.

Since we were particularly interested in workers' individual reservation wages, we used the strategy method to elicit workers' acceptance decisions. To this end, workers were asked to indicate the lowest wage they would in fact be willing to accept before they knew which wage offer they actually received. If the wage offer actually received was lower than the worker's acceptance threshold, the offer was automatically rejected; otherwise it was accepted. Note that the specification of an acceptance threshold determined a worker's complete strategy, because the worker implicitly stated his accept/reject response to every possible wage offer. Neither the firms nor the other workers were informed about an individual workers' acceptance threshold. A firm was only informed about how many workers accepted its wage offer.

The acceptance threshold represents a worker's reservation wage. This information about reservation wages will prove useful for understanding the firms' behavioral responses to the introduction and the removal of minimum wages. In addition, the information about reservation wages enables us to implement a useful matching procedure. A large body of evidence now indicates that a significant share of experimental subjects exhibit a preference for fairness and reciprocity [Camerer 2003; Fehr and

Gächter 2000]. In addition, the strength of fairness motives differs among those subjects who care for fairness. Therefore, we expected both a significant share of the workers to exhibit positive reservation wages as well as heterogeneity in these reservation wages. This means that—on average—firms face an upward sloping labor supply schedule. Thus, if we play the experiment for a very large number of periods, firms are likely to learn the distribution of reservation wages, enabling them to respond appropriately to this distribution.

However, repeating the same experiments for very many periods has also the drawback that subjects become bored or that their concentration diminishes over time, increasing the randomness of their behavior. Therefore, we only repeated each treatment condition for fifteen periods and increased the probability of a firm receiving a representative draw of matched workers by implementing the following matching protocol. We partitioned workers according to their reservation wage into three groups of equal size in each period such that there was a group with high, a group with intermediate, and a group with low reservation wages. The random matching ensured that each firm faces one worker from each group. We conjectured that, regardless of the behavioral equilibrium (i.e., the stable behavioral pattern) in our setting, this matching protocol would speed up adjustment toward this stable pattern.

II.A. *Treatments and Treatment Orders*

To study the economic effects of a legally binding minimum wage, each session contains two treatments: a treatment without a minimum wage (NO) and one with a minimum wage (MW). Both treatments are played for fifteen periods. The minimum wage is set at a level of 220; i.e., firms cannot offer wages below 220 in the MW treatment. Therefore, the range for permissible wage offers for firms is defined as follows: the constraint $0 \leq w \leq 1000$ prevails in the NO treatment, while wage offers have to obey $220 \leq w \leq 1000$ in the MW treatment. We implemented two treatment sequences to study potential sequence effects. In five sessions, subjects first completed the NO and then the MW treatment. The treatment order was reversed in the other five sessions.

II.B. Subjects, Payments, and Procedures

All subjects were students of the University of Zurich or the Swiss Federal Institute of Technology Zurich (ETH). Each subject participated in only one session. Subjects were randomly subdivided into two groups before the start of the experiment; some were assigned the role of a firm and others the role of workers. The assigned roles remained fixed for the whole session. All interactions were anonymous, i.e., the subjects did not know the personal identities of their trading partners.

To make sure that subjects fully understood the procedures and the payoff consequences of the available actions, each subject had to read a detailed set of instructions before the session started. Participants then had to answer several questions about the feasible actions and the payoff consequences of different actions. We only started a session after all subjects had correctly answered all questions. The exchange rate between experimental currency units ("points") and real money was 150 Points = 1 Swiss Franc (~US $ 0.80).

The computerized experiment was programmed and conducted with the experimental software z-Tree [Fischbacher 1999]. We had 24 subjects (six firms and eighteen workers) in each of the ten sessions, yielding a total of 240 participants in the experiment. A session lasted approximately two hours and subjects earned on average 49 Swiss Francs (CHF 49 ~ US $ 40).

II.C. Behavioral Hypotheses

If we assume common knowledge of rationality and money-maximizing behavior, the predicted results of this experiment are straightforward. Since the outside option is zero, selfish workers accept every wage offer above or equal to zero, which the firms anticipate. Thus, firms offer a wage of one (or zero) to all three workers in a subgame perfect equilibrium of the NO treatment, and the workers accept.[6] Full employment thus results, and firms reap almost all gains from trade. Firms cannot offer wages below 220 in the MW treatment due to the existence of a legal minimum wage, although workers would be willing to accept the same low

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6. Every strategy combination of the following form is a subgame-perfect Nash equilibrium: the firm offers a wage of one to all three workers, at least one worker accepts only positive wage offers, and the other workers accept all non-negative wage offers. Additionally, there is also another subgame-perfect Nash equilibrium, in which every worker accepts all nonnegative wage offers and therefore the firm offers a wage of zero.

wages as in the NO treatment. Since the minimum wage is less than the third worker's marginal product, profit-maximizing firms offer the minimum wage to all three workers. As in the NO treatment, all workers are employed. A further implication of common knowledge of rationality and selfishness is that the treatment order does not affect the predicted behavior in any treatment. We summarize the most important predictions of this approach as the

SELF-INTEREST HYPOTHESIS.

> (a) Wages will be zero or one in the absence of a minimum wage and equal to 220 in the presence of the minimum wage. The treatment order does not affect wages in either treatment.
>
> (b) Reservation wages are zero or one in the absence of a minimum wage and do not exceed 220 in the presence of the minimum wage, irrespective of the treatment order.
>
> (c) Full employment prevails in both treatment conditions.

As mentioned previously, however, there is considerable evidence for the existence of heterogeneous preferences for fairness and reciprocity. These preferences imply that a person is willing to sacrifice material payoff in order to punish either unfair behavior or unfair people, or to move payoffs closer to equality. In our context, for example, a worker could punish a firm for offering a low wage by rejecting the latter's offer. Such rejection behaviors have been frequently observed in the ultimatum bargaining game [Güth, Schmittberger, and Schwarze 1982; Camerer 2003]. The equal split between the proposer and the responder is the salient (fair) reference point in this two-player game, and the responder often rejects low (unfair) bargaining offers, although this means that he earns nothing. To avoid rejections, the proposers typically offer on average between 70 percent and 80 percent of the equal split [Camerer 2003; Fehr and Gächter 2000]. Thus, in our context, if firms anticipate that some workers will reject low offers, they also have an incentive to increase their wages beyond those the self-interest model predicts. Moreover, the existence of heterogeneous fairness preferences, in combination with restricted mobility of workers across firms, also means that firms do not face a flat, but an upward sloping labor supply schedule.[7]

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7. We believe that some restrictions on workers' mobility also prevail in field settings because of the many frictions that are present in real world labor mar-

In the absence of precise knowledge about the distribution of fairness preferences in our subject pool, it is difficult to make precise quantitative predictions. However, one might speculate that—similar to the ultimatum game—firms will distribute the available revenue such that workers earn 70 percent to 80 percent of the equal split. If a firm employs three workers, the available revenue is 1000, and the equal split implies a wage of 250. Thus, if workers receive on average 70 percent to 80 percent of the equal split, the average wage should be between 175 and 200. If this conjecture holds true, the minimum wage will also increase actual wages in the presence of fairness preferences.

For our purposes, it is important whether fairness preferences are based solely on the allocation of final payoffs across firms and workers—as in models of inequity aversion [Fehr and Schmidt 1999; Bolton and Ockenfels 2000]—or whether they are also shaped by beliefs about other players' intentions [Rabin 1993; Dufwenberg and Kirchsteiger 2004; Falk and Fischbacher forthcoming]. The difference between these two approaches can be nicely illustrated in the context of a simplified ultimatum game where the proposer only has two ways of dividing up a bargaining cake of $10 [Falk, Fehr, and Fischbacher 2003]: In the "fair" condition, the proposer can only offer 5:5 (5 for herself and 5 for the responder) or 8:2. In the "unfair" condition the proposer can only offer 8:2 or 10:0. If the responder only cares about the final allocation of payoffs, the rejection rate of the 8:2 offer should be identical across both conditions. However, an offer of 8:2 in the "fair" treatment reveals that the proposer is very unfair because she could have offered 5:5. In contrast, an offer of 8:2 in the "unfair" treatment does not reveal an unfair intention because the only alternative was 10:0. In fact, the rejection rate of the 8:2 offer is 44 percent in the "fair" treatment and only 9 percent in the "unfair" treatment in the Falk et al. [2003] experiments, indicat-

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kets. Mobility costs and search costs in a world of imperfect information may well generate upward sloping labor supply schedules for individual firms. Manning [2003], for example, provides substantial evidence in favor of this view. In addition, a simple thought experiment suggests that the labor supply schedule individual firms face is not completely flat: do we expect all employees to quit if a firm cuts all wages by 1 percent? The likely answer to this question is "no," and therefore, the labor supply schedule is likely to be upward sloping. The real question, therefore, is how strongly individual firms' labor supply schedules are upward sloping. Empirical evidence alone, and not assumption, can answer this question.

ing that the set of feasible alternatives affects the responders' fairness attributions and hence their rejection behavior.

These findings suggest that the minimum wage is also likely to affect the workers' fairness perceptions and, hence, their reservation wages in our experiment. A wage of 220, for example, may be perceived as very fair in the absence of a minimum wage because the firm also could have offered much less, whereas a wage at the legal minimum of 220 may be perceived as rather unfair in the MW treatment because the firm was forced to offer that wage anyway. Evidence in favor of this view comes from Brandts and Charness [2004] who introduced a minimum wage in the context of a labor market with worker moral hazard where workers' fairness concerns drive effort. They show that workers provide less effort for the same wage level in the presence of the minimum wage, lending support to the view that the impact of minimum wages on workers' attributions of fairness intentions to firms partially shapes their effort responses. Workers cannot choose an effort level in our experiment, but they can choose their reservation wages according to their fairness perceptions.

Note, however, that none of the models mentioned above, based on the idea that attributions of fairness intentions shape behavior, predict asymmetrical rejection behavior in response to the introduction and the removal of a minimum wage. According to these models, if the minimum wage is abolished, it will no longer affect workers' attributions of fairness intentions to firms. In view of these considerations we can now formulate the

FAIRNESS HYPOTHESIS.

> (a) Wages will be much higher than zero in the absence of the minimum wage. The introduction of a legal minimum wage further raises actual wages, and the removal of the minimum wage reduces wages. Actual wages before the introduction and after the removal of the minimum wage law are indistinguishable.

> (b) The introduction of a legal minimum wage raises reservation wages, and the removal of the minimum wage decreases reservations wages. Reservation wages before the introduction and after the removal of the minimum wage are indistinguishable.

> (c) Underemployment may occur already in the absence of a minimum wage and minimum wages generate ambigu-

ous employment effects; i.e., employment may increase, decrease, or remain unaffected.

Part (c) of the fairness hypothesis follows from the assumption of heterogeneous fairness preferences. If this assumption holds, individual firms face upward sloping labor supply schedules which may render it optimal to offer wages some workers reject. It is also well-known (see, e.g., Bhaskar and To [1998] or Boal and Ransom [1997]) that increases in the minimum wage may not reduce but increase employment under these circumstances because the hiring of additional workers can only be accomplished in the absence of a minimum wage if all workers' wages increase. Minimum wages may also have this effect in our experimental setting. Depending on the level and the degree of heterogeneity in reservation wages, hiring fewer than three workers may be profit-maximizing. For example, if reservation wages of the three matched workers are (0, 10, and 100), hiring three instead of two workers produces marginal costs of $3 \times 100 - 2 \times 10 = 280$, which exceeds the third worker's marginal revenue, which is only 260. It is therefore optimal for the firm to hire two instead of three workers in this case. The introduction of a minimum of 220 reduces the marginal cost of labor from 280 to 220, which is less than the third worker's marginal revenue. Thus, hiring all three workers may be profitable in the presence of the minimum wage if the legal minimum leaves reservation wages unaffected or does not affect them very strongly.

However, if minimum wages cause a strong enough increase in reservation wages, it is also possible that firms reduce employment. If, for example, the distribution of reservation wages is (30, 80, 130) before the introduction of the minimum wage, the marginal cost of employing the third worker is given by $3 \times 130 - 2 \times 80 = 230$ which is below the third worker's marginal revenue. Therefore, a profit-maximizing firm employs all three workers. If the minimum wage shifts the distribution of reservation wages to (30, 80, 240), the marginal cost of the third worker equals $3 \times 240 - 2 \times 220 = 280$ which exceeds the revenue produced by the third worker. Thus, the minimum wage lowers employment in this case. These examples illustrate that much depends on the concrete distribution of reservation wages and on the quantitative impact of minimum wages on reservation wages. No concrete quantitative employment predictions are possible in the absence of knowledge about these characteristics of the distribution.

III. Results

In this section we present our main results. We concentrate on the economic effects of introducing a minimum wage in subsection III.A. We start by reporting how the minimum wage regime affects wages. These results are subsequently explained in the light of workers' reservation wages. Next we investigate and explain the employment effects of introducing a minimum wage. We analyze the effects of a removal of minimum wages on wages and employment in subsection III.B. Special emphasis is given to potential asymmetries. We explore whether the impact of a minimum wage is affected by the treatment sequence, i.e., whether we consider the introduction sequence or the removal sequence.

III.A. Introducing the Minimum Wage—Effects on Wages, Reservation Wages, and Employment

Our first result concerns the wages paid to workers in the introduction sequence where the minimum wage is initially absent and introduced in the second phase of a session. The main findings can be summarized as follows:

RESULT 1 (wages). In the absence of a minimum wage law, wages are much higher than predicted by the self-interest model; however, the vast majority of wages is below the minimum wage level of 220. Nevertheless, in the presence of a minimum wage law, the majority of wages is not just raised to the level of the minimum wage but above that level.

This result is consistent with part (a) of the fairness hypothesis. Support for Result 1 comes from Figure I and regression (1) of Table II. Figure I shows a histogram of all wages paid to workers, both in the NO and the MW conditions, with wage intervals in steps of 10. As is obvious from this figure, wages in the NO condition (gray bars) are much higher than the self-interest model predicts. On average, firms pay wages of 188, and the standard deviation is 32.1. The lowest wage paid in the NO condition is 25, and more than 94 percent of all wage payments are equal to or above 150.

Figure I also shows that wages increase substantially after the introduction of the minimum wage (black bars). The average wage in the MW condition is 237.7 with a standard deviation of 11.1. The treatment differences in wages are highly significant, as

TABLE II
EFFECTS OF INTRODUCING A MINIMUM WAGE ON WAGES AND EMPLOYMENT

Dependent variable:	(1) wage	(2) employment
Minimum wage dummy	50.11***	.291***
	(7.46)	(.048)
Constant	187.58***	2.10***
	(8.38)	(.078)
Number of observations	2021	900
Prob > F	.003	.0038
R^2	.533	.0357

OLS estimation with robust standard errors clustered on sessions in parentheses. *** indicates significance at the 1-percent level. The minimum wage dummy is 1 if a minimum wage exists and 0 otherwise.

can be inferred from regression (1) of Table II. We regress wages on a minimum wage dummy, which takes the value one if the observation comes from the MW treatment and zero otherwise.[8]
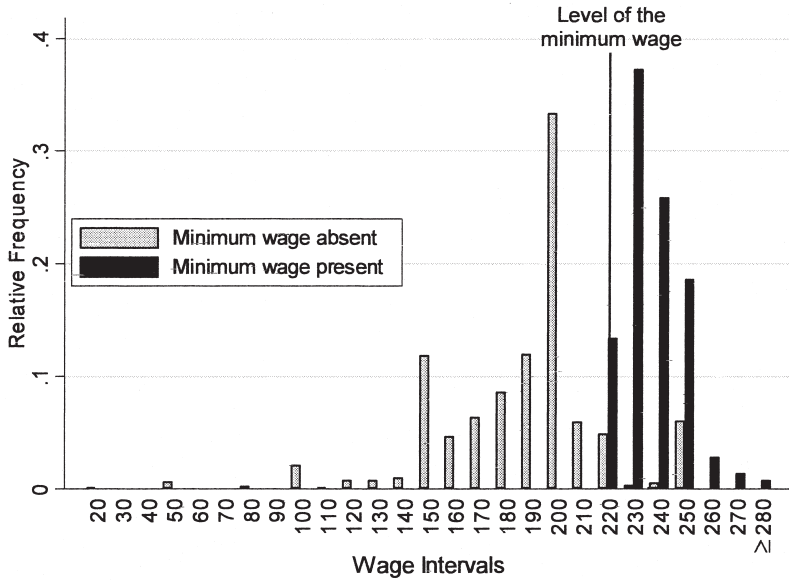

FIGURE I
Distribution of Wages in the Absence and the Presence of a Minimum Wage (Minimum wage is introduced in the second phase of a session.)

The coefficient of the minimum wage dummy is positive and significant at any conventional level. Figure I illustrates a further interesting observation. Note that many wages in the MW condition exceed 220, the level of the minimum wage. Only 7 percent of all wages are exactly at the level of the minimum wage, all other wages are higher than 220. This "spillover" effect of minimum wages is remarkable, since the minimum wage was *binding* in the sense that without the minimum wage, only 8 percent of the wages were above 220. Put differently, while 92 percent of the wages were *below* 220 before the introduction of the minimum wage, firms subject to the minimum wage regime pay wages *above* 220 in 93 percent of the cases.

Result 1 raises two important questions: 1) Why do wages attain their high level in the absence of a minimum wage law? 2) Why do wages exceed the minimum wage in the presence of the law? Part (b) of the fairness hypothesis provides answers to both of these questions. The hypothesis in part (b) predicts that workers' fairness preferences cause reservation wages that are substantially above zero and the introduction of the minimum wage is predicted to cause a further rise in reservation wages. This change in reservation wages may then induce firms to pay wages above the minimum wage. Our next result shows whether we indeed observe these predicted regularities in reservation wages.

RESULT 2 (reservation wages). In the absence of the minimum wage law, individual reservation wages are much higher than the self-interest model predicts, but almost all of them are below the minimum wage level of 220. However, in the presence of the minimum wage law, a large share of the subjects exhibit reservation wages above the minimum wage level.

Support for Result 2 comes from Figure II which shows a histogram of stated reservation wages in the NO condition (gray bars) and the MW condition (black bars). Reservation wage intervals are in steps of 10. Figure II reveals that only about 8 percent of all reservation wages are between 0 and 10 in the NO condition; i.e., only a small minority of workers chooses reservation wages close to the level the self-interest model predicts. In contrast, more

8. Since observations within a session may be dependent, all reported robust standard errors are clustered on sessions. This holds for all regressions in this paper.
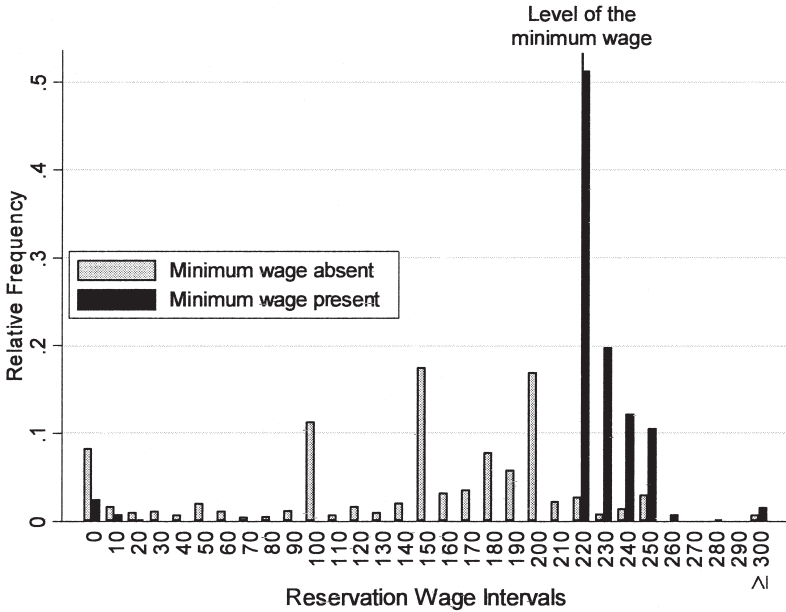
FIGURE II
Distribution of Reservation Wages in the Absence and the Presence of a
Minimum Wage (Minimum wage is introduced in the second
phase of a session.)

than 82 percent of the chosen reservation wages are at least 100, 66 percent are at least 150, and 28 percent are 200 or higher. However, only 9 percent are equal to or higher than the later minimum wage of 220. The resulting mean reservation wage is 145.

The distribution of reservation wages in the NO condition is consistent with the fairness hypothesis. Workers with high acceptance thresholds could earn much more if they were willing to reduce their thresholds. This can be shown empirically by regressing the workers' earnings on their reservation wages. This results in a strongly negative relationship in the NO condition, with a "reservation wage coefficient" of $-.499$ and a t-statistic of -15.6 (OLS regression with robust standard errors, clustering on sessions). Apparently, many workers are willing to accept the costs of rejecting low offers.

Figure II also shows that the introduction of the minimum wage affects reservation wages. While 91 percent of the reserva-

tion wages are below the minimum wage level in the NO condi-
tion, 49 percent of reservation wages exceed the minimum wage
in the MW condition. This result suggests that minimum wages
systematically affect what is considered to be a fair wage. Many
workers seem to perceive a wage of 220, which would have been
considered as fair and quite generous in the NO treatment, as
unfairly low in the MW treatment. As mentioned above, fairness
preferences may make it profitable for the firms to pay relatively
high wages in the NO treatment, while the change in reservation
wages due to the minimum wage law may make the payment of
wages above the minimum wage in the MW treatment profitable.
To check this conjecture, we computed the firms' profit-maximiz-
ing wages across treatments and for each session, given the
workers' observed reservation wage schedule. Remember that
three workers are assigned randomly to each firm at the begin-
ning of a period. After indicating their reservation wages, the
workers are subdivided into three groups: a low (l), a medium (m),
and a high (h) reservation wage group. Subsequently, each firm is
randomly matched with one worker out of each of these three
groups. Assuming that firms know the distribution of reservation
wages, they choose their wage offers in order to maximize the
following expected payoff:[9]

(1) $E[\pi_F(w)] = p_l(w) \cdot 390 + p_m(w) \cdot 350 + p_h(w) \cdot 260$

$$- [p_l(w) + p_m(w) + p_h(w)] \cdot w,$$

where p_i is the probability that a worker in the reservation wage
group $i \in \{l,m,h\}$ accepts the offered wage. Accordingly, the first-
order condition is

(2) $\dfrac{\partial E[\pi_F(w)]}{\partial w} = \dfrac{\partial p_l(w)}{\partial w} \cdot 390 + \dfrac{\partial p_m(w)}{\partial w} \cdot 350 + \dfrac{\partial p_h(w)}{\partial w} \cdot 260$

$$- \left[\dfrac{\partial p_l(w)}{\partial w} + \dfrac{\partial p_m(w)}{\partial w} + \dfrac{\partial p_h(w)}{\partial w}\right] \cdot w$$

$$- [p_l(w) + p_m(w) + p_h(w)] = 0.$$

9. To a first approximation, the proposers in the ultimatum game typically
make offers that maximize their expected monetary earnings. For example, the
modal offer was close to the offer that maximized the proposers' expected earnings
in each of the four countries in which Roth et al. [1991] conducted ultimatum
games. Therefore, we assume that firms in our setting maximize their expected
monetary payoff.

TABLE III
PROFIT-MAXIMIZING WAGES AND ACTUAL WAGES IN THE ABSENCE AND PRESENCE OF
A MINIMUM WAGE

	Minimum wage absent						Minimum wage present					
Session number	S1	S2	S3	S4	S5	S1–5	S1	S2	S3	S4	S5	S1–5
Profit-maximizing wage	177	183	151	189	184	177	233	227	237	238	232	233
Actual wage	165	172	154	189	200	176	234	228	237	238	243	236

The table shows averages for the individual sessions S1, S2, . . . , S5 as well as for all sessions together (S1–5). In these sessions the minimum wage was introduced in the second phase of a session.

The profit-maximizing wage w^* equalizes the marginal revenue of a higher offer with its marginal cost. As in a standard monopsony problem, the marginal cost of a wage increase not only consists of the wage multiplied by the expected change in employment, but also includes the additional wage costs for the expected employment realized at the previous wage level.

Given the actual distribution of reservation wages in the experiment, it is possible to calculate the profit-maximizing wage and employment for each firm in each period.[10] Table III shows the average of the resulting profit-maximizing wage offers together with average wages actually realized for each session in the NO and the MW treatment. This table reveals several interesting findings. First, the profit-maximizing wage across sessions in the NO condition lies between 151 and 189. This explains our finding that wages greatly exceed the low level the self-interest model predicts. Second, on average, firms pay wages that closely approximate profit- maximizing wages. The relative differences between profit-maximizing and actual average wages per session are between 0.29 percent (Session 4) and 8.7 percent (Session 5). This suggests that firms well understood the monopsonistic profit-maximization problem. Third, the correlation between the means of the profit-maximizing and realized wages across sessions is positive and significant (Spearman's rho = .900, p = .0374). This shows that firms not only understood the maximization problem but also responded to the session-specific distribu-

10. We calculate the wage that maximizes expected profits in each period of every session, given the matching procedure described above and assuming that firms have perfect knowledge about the distribution of workers' reservation wages.

tion of reservation wages. This is quite remarkable, given that firms were not informed about the distribution of reservation wages but had to discover it in a trial and error process. Fourth, Table III shows that, as a consequence of the increase in reservation wages in the MW condition, profit-maximizing wages in fact exceed 220. This provides an explanation for the spillover effect reported in Result 1, i.e., the fact that firms pay wages in the MW condition that are not only higher than those in the NO condition, but also in excess of 220. Moreover, the difference between profit-maximizing and actual wages is rather small, as it is in the NO condition, indicating that firms well understood the optimization problem. The relative difference between profit-maximizing and actual wages is in most sessions below 1 percent in the MW treatment.

In Section II we argued that firms may not be willing to employ all three matched workers when reservation wages are heterogeneous. Figure II shows that workers exhibit a considerable degree of heterogeneity with respect to their reservation wages in the NO condition. As firms' wage offers are close to optimal (see Table III), it is therefore likely that employment is lower than predicted by the self-interest model. In principle, the introduction of a minimum wage could therefore lead to an increase in employment, because firms in the MW condition are exogenously forced to pay a minimum wage far above the observed average wage level in the NO condition. However, we also know that minimum wages lead to a considerable increase in reservation wages so that workers reject wage offers under a minimum wage regime that they would have accepted in the absence of a minimum wage law. Depending on the strength of each effect, the minimum wage law can therefore increase or decrease employment. Result 3 summarizes our findings concerning the employment effects of the introduction of a minimum wage:

RESULT 3 (employment). Employment in the absence of the minimum wage is much lower than the self-interest model predicts. The introduction of minimum wages causes a significant increase in employment. However, due to the increase in workers' reservation wages, the employment effect of the minimum wage is smaller than it would have been had workers' reservation wages remained stable.

Support for Result 3 comes from regression (2) in Table II where

we regress firm level employment on a constant and a dummy for minimum wages. Regression (2) shows that employment is clearly below the level predicted by the self-interest hypothesis in the NO condition. Instead of three workers, 2.1 workers are employed on average. In fact, employment per firm does not exceed 2.4 in any single session of the NO treatment. The reason for why firms employ fewer than three workers has to do with the level and the heterogeneity of workers' reservation wages. The reason for the low employment level is not that firms submit too few job offers. In fact, firms submit three job offers in 96.2 percent of the cases. However, 28.9 percent of the offers are turned down on average.

The minimum wage dummy in regression (2) also indicates that the introduction of the minimum wage increases employment per firm by roughly 0.3 workers (14 percent)—from 2.1 workers per firm in the NO treatment to 2.4 workers per firm in the MW treatment. The positive employment effect of minimum wages occurs in each of the five sessions and is likely to be a consequence of firms' optimal wage policy. In a previous version of this paper [Falk, Fehr, and Zehnder 2005] we explicitly compared profit-maximizing employment levels—given the observed distribution of reservation wages—and actual employment levels. In each session profit-maximizing employment and actual employment is higher in the presence of a minimum wage.

III.B. Removing the Minimum Wage—Economic Effects and Asymmetries

Up to this point, we have studied the economic effects of introducing a minimum wage. In the following, we explore the minimum wage effects on wages and employment when the minimum wage is removed rather than introduced. In particular, we will focus on the question whether the economic effects are symmetrical; i.e., whether the treatment order affects the treatment effects. Since the treatments (NO and MW) are exactly the same regardless of the treatment order, one would expect that removing the minimum wage causes the same absolute changes in wages, reservation wages, and employment as the introduction of the minimum wage. In fact, the fairness hypothesis predicts that the effect of the minimum wage on these variables is the same regardless of the treatment order. Results 4, 5, and 6 show, however, that these predictions are not consistent with the data.
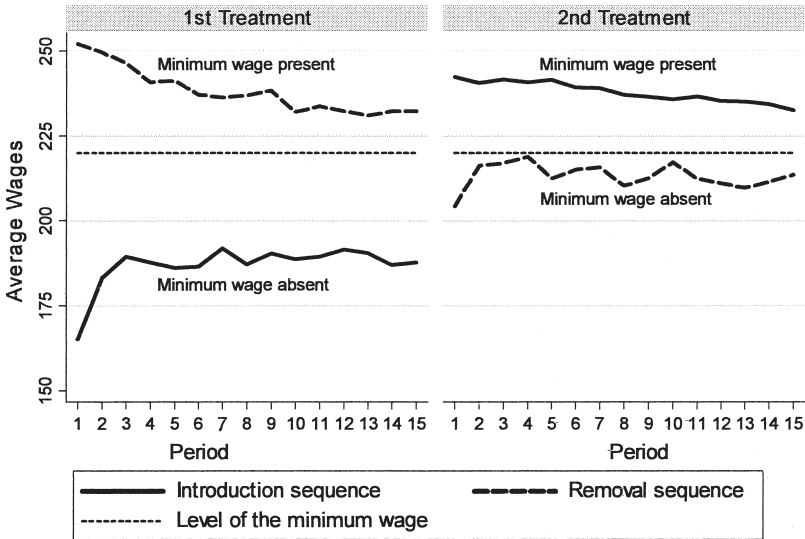
FIGURE III
Average Wages of Employed Workers in Different Treatment Sequences

RESULT 4 (asymmetry in wages). The temporary introduction of
    the minimum wage has permanent effects on actual wages,
    i.e., even after the removal of the minimum wage, actual
    wages remain close to the previous minimum wage level.
    Thus, pre- and post-minimum wage economies exhibit signif-
    icantly different wages, although the two economies are iden-
    tical in all exogenous parameters.

Support for Result 4 comes from Figures III and IV and from
regression (1) in Table IV. Figure III shows employed workers'
average wages over time for both treatments in both sequences.
The solid line shows wages for the introduction sequence; the
dashed line shows wages for the removal sequence. Wages in the
MW treatments of both the removal and introduction sequences
are very similar. In the removal sequence, 11 percent of the paid
wages are exactly at the level of the minimum wage, while 89
percent of the wages are higher. In the introduction sequence, 7
percent of the paid wages are exactly at the level of the minimum
wage, while 93 percent of the wages are higher. This shows that
the spillover effect described in Result 1 appears, regardless of
whether we introduce the minimum wage at the beginning of the

TABLE IV

EFFECTS OF AN INTRODUCTION VERSUS REMOVAL OF A MINIMUM WAGE ON WAGES, RESERVATION WAGES, AND EMPLOYMENT

Dependent variable:	wage (1)	reservation wage (2)	median reservation wage (3)	employment (4)
Minimum wage dummy	50.11***	78.31***	64.01***	.291***
	(7.03)	(3.52)	(4.44)	(.046)
Dummy for removal sequence	25.70***	11.70	26.67**	.167
	(8.85)	(9.57)	(8.84)	(.095)
Minimum wage dummy × dummy for removal sequence	−25.70***	−11.75	−27.47**	−.258***
	(7.53)	(9.83)	(8.89)	(.063)
Constant	187.58***	145.16***	161.69***	2.10***
	(7.91)	(4.71)	(4.04)	(.074)
Number of obs.	4076	5400	300	1800
Prob > F	.0000	.0000	.0000	.0008
R^2	.472	.256	.761	.020

Robust standard errors clustered on sessions are in parentheses. *** indicates significance at the 1 percent level; ** indicates significance at the 5 percent level. Median reservation wages are calculated per period, session, and treatment. In the removal sequence the MW treatment takes place before the NO treatment, in the introduction sequence the MW treatment comes after the NO treatment.
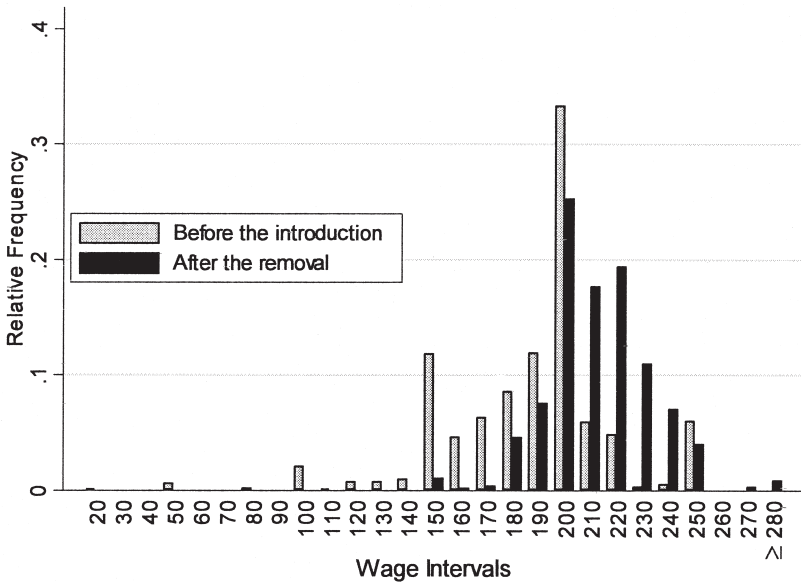
FIGURE IV
Distribution of Wages before the Introduction and after the Removal of the
Minimum Wage

experiment or after subjects experienced an economy without the
minimum wage. In addition, the mean wage is exactly 237.7 in
both sequences. While wages in the MW conditions are identical,
wages in the NO conditions differ substantially. Whereas before
the introduction of the minimum wage the mean wage in the NO
treatment (see subsection III.A) is equal to 188, mean wages
remain at 213 after removal of the minimum wage. Thus, the
previous minimum wage strongly affects wages in the NO condi-
tion of the removal sequence. Further evidence for this result is
found in Figure IV, which displays the distribution of wages in
the NO conditions of both treatment sequences. Our results show
clearly that high wages (above 200) are chosen much more fre-
quently in the NO treatment after the removal of the minimum
wage than before its introduction. The results of regression (1) in
Table IV further support this, showing that the wage difference
between the introduction and the removal sequence is highly
significant. Wages are regressed on a minimum wage dummy, a
dummy for the removal sequence, and the interaction of the two.
The minimum wage dummy takes the value one if the observa-

tion comes from the MW treatment and zero otherwise. Likewise the dummy for the removal sequences takes the value one if the observation comes from the removal sequence and zero otherwise. Finally, the interaction variable "minimum wage dummy $\times$ dummy for the removal sequence" is an interaction term of these two dummy variables. Since we omitted the dummy for the introduction sequence, the constant in this regression measures the average wage in the NO treatment of the introduction sequence. The minimum wage dummy measures the wage increase due to the minimum wage in the introduction sequence. It is positive and significant. The dummy for the removal sequence measures the difference in actual wages in the NO condition across treatment sequences. The coefficient of this dummy indicates that wages in the NO condition are 25.7 units higher after the removal of the minimum wage law than before its introduction. The interaction term measures the difference in the minimum wage effect across sequences. The coefficient of the interaction term is significantly negative, indicating that the impact of the minimum wage on actual wages is smaller in the removal sequence than in the introduction sequence. Thus, the results of the regression indicate that a minimum wage law has lasting effects on actual wages even after the removal of the law.

Why do firms pay higher wages after the removal of the minimum wage than before its introduction? A key factor in answering this question is the impact of minimum wages on reservation wages.

RESULT 5 (asymmetry in reservation wages). Reservation wages are higher after the removal of the minimum wage than before its introduction.

Support for Result 5 comes from Figure V. It shows the distribution of reservation wages in the two NO conditions, i.e., before the introduction (gray bars) and after the removal of the minimum wage (black bars). The figure reveals that the relative frequency of high reservation wages is much higher after the removal of the minimum wage. While only 28 percent of the reservation wages in the NO treatment are 200 or higher in the introduction sequence, this number is 52 percent in the removal sequence. For wages above or equal to 220, the respective numbers are 9 and 23 percent.

Figure V also shows that very low reservation wages are chosen more frequently after the removal of the minimum wage.
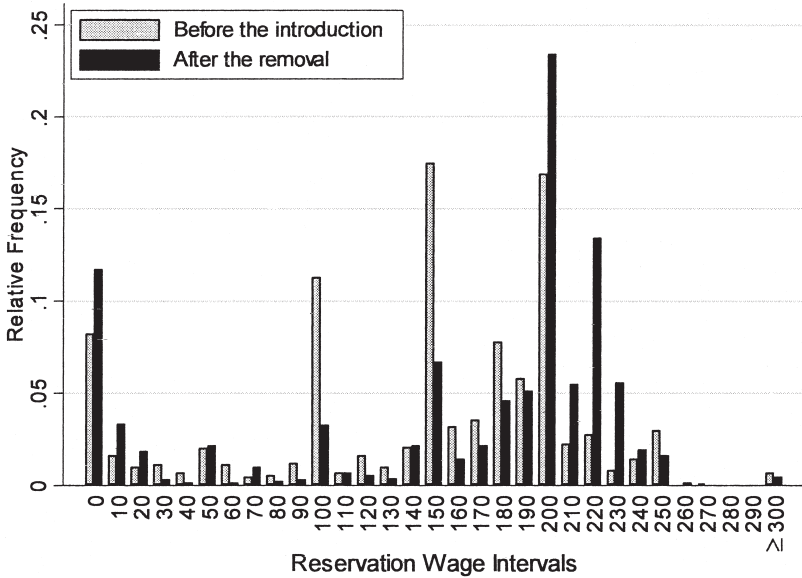
FIGURE V

Distribution of Reservation Wages before the Introduction and after the
Removal of the Minimum Wage

While in the introduction sequence only 10 percent of the stated reservation wages are below 30, this is the case for 17 percent of the reservation wages in the removal sequence. Taken together, these observations lead to the following aggregate picture: the average reservation wage is 145 before the minimum wage is introduced and 157 after its removal. The respective median values are 150 and 200. The big difference between median and average values comes from the shift at the lower end of the reservation wage distribution. While the small increase in very low reservation wages strongly influences the average reservation wage in the removal sequence, this change does not affect the median. However, the probability of being assigned a worker with a very low reservation wage remains rather small for firms; thus, the data on average reservation wages are likely to underestimate the economic impact of the former minimum wage on actual wages in the NO condition of the removal sequence. The change in medians, therefore, better captures the likely economic relevance of the increase in reservation wages for the formation of actual wages; the medians suggest that reservation wages are

strongly influenced by the previous minimum wage law. The results of regression (2) and (3) in Table IV further support the finding that the previous minimum wage law affects reservation wages in the NO condition. In regression (2), reservation wages are regressed on a minimum wage dummy, a dummy for the removal sequence, and the interaction of the two. The same regression model is employed in regression (3) for medians of reservation wages per period, session, and treatment. The constant measures the reservation wage in the NO treatment of the introduction sequence. The dummy for the removal sequence measures the difference between the reservation wages in the NO treatments across sequences. The coefficient of this dummy is positive in both regressions, but only significant in regression (3): median reservation wages are thus significantly higher in the postminimum wage economy than in the preminimum wage economy.

The sum of the dummy for the removal sequence and the interaction term measures the difference in the two MW conditions.[11] In both regressions, the effect is basically zero (11.70 − 11.75 = −0.05, respectively, 26.67 − 27.47 = −0.8) and insignificant (F-Test for the hypothesis that the sum of the dummy for removal sequence and the interaction term equals zero, $p = 0.709$ and $p = 0.713$, respectively), which indicates that the treatment sequence does not affect reservation wages in the MW conditions.

So far, we have shown that the minimum wage continues to affect the distribution of reservation wages after its elimination. However, the question remains open whether this effect should change the wage-setting behavior of profit-maximizing firms. We calculated the profit-maximizing wages given the different distributions of reservation wages before the introduction and after the removal of the minimum wage. Our calculations show that it was indeed optimal for firms to pay different wages in the pre- and the postminimum wage economy. When we aggregate, we get a mean (median) profit-maximizing wage of 184 (200) for all NO sessions of the removal sequence compared with 177 (180) for all NO sessions in the introduction sequence, respectively. The same

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11. Intuitively, this claim holds for the following reason. The MW dummy takes on a value of one in the MW condition of the introduction sequence, while all three dummy variables in the regression take on a value of one in the MW condition of the removal sequence. Thus, the difference between the MW conditions in the two different sequences is represented in the regression by the situation where the dummy for the removal sequence and the interaction term take on a value of one.

calculations for the MW treatments reveal that there are no differences between the two sequences. Mean (median) profit-maximizing wages are 233 (230) for the MW sessions in the introduction sequence and 231 (230) for the MW sessions in the removal sequence. These calculations are in line with the fact that wages in the MW treatments are practically identical, regardless of the sequence of treatments.

Next, we examine whether the asymmetric response of wages and reservation wages also led to an asymmetric response in employment.

RESULT 6 (asymmetry in employment). The introduction of the minimum wage causes significantly larger employment changes than its removal. In particular, the introduction causes a significant increase in employment, whereas the removal leaves employment basically unchanged.

Regression (4) in Table IV shows that the employment effects of the minimum wage differ significantly between the introduction and the removal sequences. The significantly positive coefficient of the minimum wage dummy indicates that employment increases after the introduction of the minimum wage. Recall that the interaction term measures the difference in the effect of minimum wages across sequences. Thus, the negative coefficient of this term indicates that the employment effect of the minimum wage is smaller in the removal sequence than in the introduction sequence. Finally, the regression also shows that there is no significant difference in employment between the NO and the MW treatments in the removal sequence because the sum of the minimum wage dummy and the interaction term are close to zero and insignificant ($0.291 - 0.258 = 0.033$, F-Test for the hypothesis that the sum of the minimum wage dummy and the interaction term equals zero, $p = 0.464$).[12]

IV. SOURCES OF THE MINIMUM WAGE EFFECT

One of our most important findings concerns the impact of the minimum wage on workers' reservation wages. Workers be-

12. The sum of the minimum wage dummy and the interaction term gives us the difference between the NO condition and the MW condition of the removal sequence for the following reason: all three dummy variables in the regression take on a value of one in the MW condition of the removal sequence, while only the dummy for the removal sequence takes on a value of one in the NO condition of this sequence.

haved as if they perceived the same wage to be less fair after the introduction of the minimum wage because they rejected wage offers that they had previously accepted. Therefore, the minimum wage seems to affect workers' views of what constitutes a fair wage. If this conjecture is true, then other interventions that change workers' fairness perceptions may have similar effects. In particular, *nonbinding* wage guidelines may also raise workers' reservation wages if they are set above the wage that previously prevailed. In many economies, employer or employee organizations or government institutions sometimes propose wage guidelines. We conducted further control sessions to examine the conjecture regarding the effects of wage guidelines. Subjects in these sessions first experienced the situation without a wage guideline (and without minimum wages) for fifteen periods, after which we introduced the guideline. The level of the wage guideline was set at 220—the level of the minimum wage in the previous sessions. Like the minimum wage, the guideline was common knowledge among the subjects, and it was made clear that the guideline only constituted a nonbinding rule about the lower bound of firms' wage offers.

We conducted two sessions with wage guidelines. Figure VI shows that the introduction of the wage guideline increased reservation wages considerably. The average reservation wage without the guideline is 115, whereas the mean reservation wage with the guideline is 154. The proportion of observations at 200 and 220 is much higher with the wage guideline. However, we observe almost no reservation wages above 220 in the presence of the wage guideline. Thus, although the guideline raises reservation wages, the increase is smaller than after the introduction of a binding minimum wage because 49 percent of the stated reservation wages were even above 220 in the latter case (see Figure II). The increase in reservation wages is also associated with an increase in actual wages. The average wage in the treatment without the guideline is 175, while average wages are 206 in the guideline treatment—a rise of 31 units. Recall from subsection III.A that the introduction of a minimum wage increased wages by 50 units. Thus, a nonnegligible part of the wage increase legally binding minimum wages cause may be attributed to the guideline effects of minimum wages. The change in employment rounds up the effects of wage guidelines. Average employment per firm is 2.21 without the guideline, whereas average employment increases to 2.47 in the presence of the guideline. Thus, as
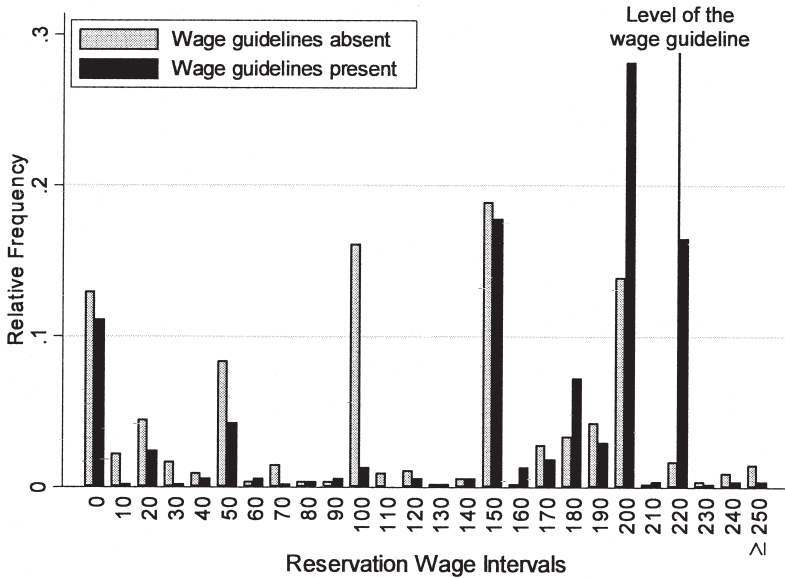
FIGURE VI

Distribution of Reservation Wages in the Absence and Presence of a
Nonbinding Wage Guideline

in the case of a legally binding minimum wage, the wage increase
the guideline causes seems to ease firms' labor supply constraint
and contributes to a higher employment level.

V. Summary and Interpretation

Almost all economic reasoning is based on the assumption
that changes in the incentives people face are the predominant
cause in behavioral changes. Therefore, economic policy analysis
focuses on how policy shapes incentives. However, the results of
this paper suggest that economic policies have deeper effects.
Subjects in our experiments exhibited higher reservation wages
after the introduction of a minimum wage, suggesting that mini-
mum wages affect their fairness perceptions. A wage once con-
sidered fair may no longer be perceived as such after the intro-
duction of a minimum wage. Moreover, we observe that reserva-
tion wages remain higher after the removal of the minimum wage
than before its introduction. One reason for this asymmetry may
be that the minimum wage, or the high wages associated with its

existence, generates feelings of entitlement which persist after the removal of a binding minimum wage. The individual perceives entitlements as rights, associated with a motivational disposition to defend them [Schlicht 1998, p. 24]. Important sources for entitlements are past allocations, which result in a "sense of ownership in the status quo" [Zajac 1995, p. 121]. Applied to our context, we speculate that once workers have been exposed to a minimum wage, they become used to receiving a relatively high wage. This experience may create entitlements, i.e., workers think they have a right to receive high wages and are willing to defend them. As a consequence, they set relatively high reservation wages even after the elimination of the minimum wage.

Although the introduction of a minimum wage also led to a positive employment effect in our experiment, one should not conclude from this that a positive employment effect will also prevail in the real world because the number of firms was fixed in our experiment. If we had allowed for the entry and exit of firms, the employment effects might well have been negative because the minimum wage decreased profits substantially. In addition, if we had permitted endogenous investment choices, the profit-decreasing effect of minimum wages would probably have reduced the capital stock and hence employment. Also, much depends on the concrete quantitative details both in reality as well as in our experiments, such as the slope of the labor supply schedule. However, one robust implication for employment emerges from the positive effect of minimum wages on reservation wages. This effect means that the standard approach—which precludes an impact of minimum wages on the labor supply schedule—may underestimate the negative employment effect of minimum wages under competitive conditions. Likewise, labor market models assuming monopsonistic competition may overestimate the positive employment effect of minimum wages if they neglect that minimum wages tend to shift the labor supply curve.

In order to further assess the applicability of our findings to situations outside the laboratory, it is also important to stress that only vertical fairness concerns could play a role in our experiment because all workers within a firm received the same wage and they did not know the wages other firms paid. Thus, the main fairness issue for an individual subject in the role of a worker was how much he or she earned relative to the marginal or the average product of labor. Fairness comparisons among workers within the same firm may, however, play an even more

important role for the impact of minimum wages on reservation wages in real labor markets. Horizontal fairness concerns may be a powerful force that may explain the anomalously low utilization of subminimum wages because such concerns imply that workers with similar tasks should be paid similar wages regardless of whether the employer could pay a subminimum wage to some of them. This conjecture is worth testing in future experiments by implementing a minimum wage law that covers only part of the workers. Likewise, fairness concerns among workers with different jobs may generate spillover effects because the reservation wage of more highly skilled workers may depend on the actual wages of unskilled workers who earn more after an increase in minimum wages. This conjecture could also be tested by assigning different workers different productivities in the experiment. Finally, it would be interesting to know how nonbinding minimum wages or minimum wage laws that are incompletely enforced affect both reservation wages and actual wages. Our wage guideline treatment was only a first step in this direction and much remains to be done to fully understand the impact of minimum wage laws on reservation wages. At a more general level, we believe that research efforts that examine how economic policies shape the perceived fairness of the interactions between private agents and the perceived entitlements will have a high return and may enable researchers to explain hitherto puzzling phenomena.

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