Labor Unions and Fairness

A New Perspective on the Wage–Setting Process*

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Abstract

We set up a unionized labor market model with unions caring about material welfare and fairness. Utility is derived relative to a material and a fairness reference. We show that not only the trade-off between fairness and consumption matters for the wage-setting process, but also the size of the reference chosen. Both parameters influence the union's objectives and therefore determine the shape of the wage-setting curve on the macro level. In contrast to the existing literature we find that fairness might not only lead to higher aggregate wage pressure and unemployment but the opposite. If the economy is hit by a technology shock we show that again both parameters have a major impact on how the economy adjusts. They determine if adjustment takes place more in terms of wages or in terms of employment. Our model is therefore able to account for different degrees of wage rigidity.

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1 Introduction

Up to now, most models of unionized labor markets are strictly bound to the assumptions of classical homo economicus and neglect issues of fairness totally. On a more general level you could say that "[t]the neoclassical theory of wage determination [...] has nothing to say about fairness." (Rees 1993, p. 243). Regardless of the union utility function, if bargaining takes place or if a monopoly union prevails, if membership is endogenous or preferences heterogenous or if a multiperiod setting is considered, all approaches assume that utility is only to be derived from material gains, mostly employee remuneration or higher employment. This is clearly in line with the pioneering feat of Dunlop (1944) who proceeded from the microeconomic theory of the firm. This starting point got heavily criticized by Ross (1948), who, among other things, considered equity comparisons and fairness to be a major issue in union wage determination.

Indeed, restricting unions or agents in general to care only about material gains is a very narrow conception of utility. For a long time there was unfortunately only anecdotal evidence available (Rees, 1993). However over the last few decades results from experimental economics and psychological evidence show that people strongly care about fairness and that such fairness considerations influence individual behavior in the labor market.

Influenced by insights of other social sciences experimental economics started to question the assumptions of classical homo economicus and over the course of time it worked out a long list of so-called anomalies, which could not be explained within the existing paradigm[1] (Charness, 2004 and Falk and Fischbacher, 2006). Especially in settings with incomplete contracts[2] (Tirole, 1999) the behavior predicted often deviates substantially from the behavior observed (Fehr, Kirchler, Weichbold, & Gächter, 1998). Having workers caring about fairness already found its way into the labor market literature, especially in efficiency wage theory (Akerlof, 1982, Akerlof and Yellen, 1990 and Danthine and Kurmann, 2007) and more recently even in the international trade literature (Egger &

[1]This even lead the Journal of Economic Perspectives to publish an "anomalies column".

[2]The labor contract is highly incomplete(Fehr, Fischbacher, & Gächter, 2002).

Kreickemeier, 2008).

However, fairness did not enter the labor union literature except some works discussing union rivalry (Oswald, 1979 and Gylfason and Lindbeck, 1984)[3]. "Few models of unions [...] consider the role of equity concerns on wage determination. This seems like a particularly egregious omission, however, for even the most casual acquaintance with collective bargaining teaches one that equity comparisons are both rife and important" (Kaufman 2002, p. 147).

Considering the Dunlop-Ross controversy as well as recent evidence we therefore discuss in this paper how fairness could become part of the union's objectives and how it affects the labor market outcome. By trying to make up for the "egregious omission" we contribute, over half a century later, to bridge the gap between Dunlop and Ross.

We demonstrate that the inclusion of fairness considerations into a union's utility function profoundly changes the workings of the wage–setting process and the reaction of the aggregate economy to macroeconomic shocks. We proceed as follows. The next section is focused on how to include fairness into the union's utility function. Section 3 presents the theoretical model. We first analyze how the wage-setting behavior of the union is shaped on the micro level and then discuss the implications for the wage-setting curve for the aggregate economy. In Section 4 it is analyzed how fairness modifies the reaction of the economy if hit by an adverse technology shock. Section 5 concludes.

2 Fairness in the Union Utility Function

It is well known that the predictions of labor union models rest heavily upon the assumed utility function, see, e.g., Pencavel (1991) and Booth (1995). Unfortunately we have little knowledge about trade unions' objectives. Moreover, "[n]owhere in economics have the objectives of an agent been modeled with less attention to foundations than in the study of unions" (Flanagan, 1993 p. 10). The key idea of our paper is to include fairness

[3]There exists some literature which pursued the wage reference perspective, see Pehkonen, 1990 to explain wage rigidity

considerations into the union wage-setting process to bring theory closer to real–world wage setting. [4] "The one factor that seemed to be of overwhelming importance in all these real-world [wage-setting] situations was fairness" (Rees 1993, p. 244). Given all the experimental evidence and the insights from other social sciences, it is time to allow agents (unions) not only to care about material payoffs but about immaterial payoffs, too.

We consider firm–level labor unions and assume that all employed workers are members of the union. Workers who are dismissed or who voluntarily leave the firm also leave the labor union. Each union member in firm i obtains a rent Ω_i (measured in terms of utility) that is generated by this employment relationship. Total utility U_i of the labor union is this rent times the number of workers N_i employed at firm i:

$$U_i = N_i \cdot \Omega_i \tag{1}$$

In traditional union models the rent is equal to the utility differential $u(w_i) - u(\overline{w})$, where w_i denotes the real wage in firm i and $\overline{w}$ some expected alternative income the worker would earn when he or she is not employed at firm i. We integrate fairness considerations into this setup by assuming that workers also obtain a utility gain when they perceive the wage paid to be equitable. "[F]airness always seemed to be judged by making some kind of wage comparison" (Rees, 1993 p. 244).[5] Thus, in line with the efficiency–wage models of Danthine and Kurmann (2007) and Koskela and Schöb (2009) the workers compare their wage with the firm's output per worker Y_i/N_i to assess whether the firm pays a fair wage.[6] More specifically, we define Ω_i as

$$\Omega_i = \Omega_i(w_i, N_i) \equiv \rho \left[\ln w_i - \ln \left(\frac{Y_i}{N_i} \right)^{\upsilon} \right] + (1-\rho) \left[\ln w_i - \ln \overline{w} \right], \tag{2}$$

with $0 \leq \rho \leq 1$ and $0 < \upsilon < 1$. The rent Ω_i therefore is a weighted average of a "fairness (or psychological) rent" (the term in the first bracket) and a "material rent"

[4] We do not take the heterogeneity of agents into account, thus neglecting the question of preference aggregation and principal-agent problems within the union.

[5] See also Ross, (1948 p. 50): "[C]omparisons play a large and often dominant role as a standard of equity in the determination of wages under collective bargaining".

[6] This has been termed the "internal reference" by these authors.

(the term in the second bracket) with ρ and $1-\rho$ being the respective weights of these utility components. Labor is the only variable input of production, hence $Y_i = Y_i(N_i)$. In eq. (2) a logarithmic specification for the utility function has been assumed. Notice that the marginal rate of substitution between material rent and fairness rent depends on the parameter ρ which we call the "fairness parameter".

Considering the extreme case of $\rho = 0$, the fairness component vanishes and what remains is the traditional rent–maximizing labor union (what will be called the standard case later on). In this case, employees only care about their material rent

$$\Omega_i^s = \Omega_i^s(w_i) \equiv \ln w_i - \ln \overline{w}, \tag{3}$$

where the superscript s refers to the standard case. The expected alternative income $\overline{w}$ is the outside option of the worker and serves as kind of an external reference wage. If the earned wage does not exceed this reference, no rent is obtained. Hence, the utility of being a union member in the firm under consideration equals zero. In traditional labor union models it is argued that the external reference is all that should matter for workers.

In the general case with $0 < \rho < 1$ workers additionally care about their wage in comparison to their contribution to the firm's output. With that we are in line with Rees (1993) who considers fairness to be a local phenomenon, meaning that wage comparisons are based on a reference which is close by. To ensure non–negative profits, wages can not be higher than average productivity. Employees know that and act rationally in not setting the fairness reference level too high. This is captured by the exponent $0 < \upsilon < 1$ in the definition of the fairness reference in eq. (2). The fairness reference mirrors the principle of dual entitlement, see Kahneman et al. (1986b). Workers (and firms) behave as if they have an entitlement to the terms of the reference level. If the earned wage is higher than the fairness reference workers derive psychological utility whether or not the wage is low compared to the outside wage.

To see the implications of the labor union's utility function more clearly, the marginal rate of substitution (MRS) between employment and wages is computed:

$$\text{MRS} = \frac{\partial U_i/\partial N_i}{\partial U_i/\partial w_i} = \frac{lnw_i - ln\overline{w} - \rho\left[\upsilon ln\left(Y_i/N_i\right) - ln\overline{w} - \upsilon(1-\varepsilon_{YN})\right]}{N_i/w_i}, \tag{4}$$

where ε_{YN} denotes the elasticity of Y_i with respect to N_i. We assume that the production function is subject to diminishing marginal returns to labor which are important for the workings of the model later on. Because of this assumption, the elasticity of labor productivity with respect to employment, $(\varepsilon_{YN} - 1)$, is negative.

The expression in eq. (4) can be easily compared with the marginal rate of substitution in the standard model by setting the fairness parameter ρ equal to zero. In this case results:

$$\text{MRS}^s = \frac{\partial U_i^s / \partial N_i}{\partial U_i^s / \partial w_i} = \frac{lnw_i - ln\overline{w}}{N_i / w_i} \tag{5}$$

Obviously, the difference in the marginal rate of substitution, and therefore in the slope of the indifference curve, is determined by the marginal utility of employment. In the standard case $\partial U_i^s / \partial N_i$ denotes the rent Ω_i^s which the marginal worker receives. In the general setting it holds that $\partial U_i / \partial N_i = \Omega_i + N_i \partial \Omega_i / \partial N_i$. Notice that the difference in the rents obtained depends on whether the fairness reference is higher, equal or lower than the outside wage, or in more formal terms $\Omega_i \lessgtr \Omega_i^s$ if $\upsilon ln(Y_i/N_i) - ln\overline{w} \gtrless 0$. Because the rent Ω_i is a positive function of the firm's employment level, $\partial U_i / \partial N_i$ denotes not only the rent Ω_i which the marginal worker receives, but additionally the change of the rent for all workers already employed. The latter effect arises because an increase in employment leads to a decline in output per worker, thereby lowering the fairness reference level. This leads to an increased differential to the wage paid, thus increasing fairness utility for all workers taken together by $\upsilon(1 - \varepsilon_{YN})$.

Summing up, the difference in the MRS does not only depend on the different rents of the marginal worker but also on the effect of a change in employment on the rent of all non-marginal workers. For the trade-off between wages and employment we therefore

can distinguish between the following three cases:

$$\begin{aligned}
&\text{MRS} < \text{MRS}^s \quad \text{for} \quad \upsilon ln\left(\frac{Y_i}{N_i}\right) - ln\overline{w} > \upsilon(1-\varepsilon_{YN}) \qquad \text{case 1} \\
&\text{MRS} = \text{MRS}^s \quad \text{for} \quad \upsilon ln\left(\frac{Y_i}{N_i}\right) - ln\overline{w} = \upsilon(1-\varepsilon_{YN}) \qquad \text{case 2} \\
&\text{MRS} > \text{MRS}^s \quad \text{for} \quad \upsilon ln\left(\frac{Y_i}{N_i}\right) - ln\overline{w} < \upsilon(1-\varepsilon_{YN}) \qquad \text{case 3}
\end{aligned} \tag{6}$$

In case 1 $\partial U_i/\partial N_i$ is smaller than in the standard case, which leads the union to be willing to give up more employment for an increase in wages. Thus, the indifference curve runs flatter in $w_i - N_i$ space than in the standard case. This case occurs when the fairness reference is of such a size that the rent of the marginal worker Ω_i plus the change in the fairness utility of all workers already employed is below the standard rent. Cases 2 and 3 can be interpreted analogously. Note that these cases are independent of the fairness weight ρ. What matters is the relative size of the fairness reference.

This discussion shows that the trade-off between wages and employment depends on whether and how social norms are included into the analysis. In line with this notion there already exists some theoretical literature which aims to incorporate the above mentioned insights from experimental economics and psychology.

The first and very innovative work to mention is the one from Danthine and Kurmann (2006, 2007) who set up a fairness based utility function in efficiency wage models. They developed the so called "internal reference perspective", which is used in this paper, too.[7] However, here it gains a different working mode, more in line with the theory. References are crucial to perform judgments of fairness (Kahneman, Knetsch, & Thaler, 1986a). The choice of these reference transactions are subject to framing effects (Tversky and Kahneman, 1986 and Kubon-Gilke, 1990) which makes it rather implausible to determine a reference as weighted average of two references as done by Danthine and Kurmann. In contrast, our approach includes the possibility to derive utility from fairness comparisons as well as consumption possibilities with each having a single reference level.[8] The notion

[7] Koskela and Schöb (2009) develop further the reference perspective in the efficiency wage framework.

[8] Of course, the fairness reference influences wages set and therefore has an effect on consumption.

to incorporate material and fairness utility is already to be found in a paper of Rabin (1993) which is also used as starting point by Danthine and Kurmann (2007). However, the approach of Rabin, as well as the one from Danthine and Kurmann, models fairness and material utility as perfect substitutes (Nelson, 2001) which violates the convincing assumption of diminishing marginal rates of substitution. In our model, the relative value of fairness increases with material welfare.

3 The Model

3.1 A micro level analysis

The goods market is described by the standard monopolistic competition framework. In the economy is a continuum of firms, indexed by $i \in [0, 1]$, each of which has a labor demand function $N_i = N_i(w_i)$ with $\partial N_i / \partial w_i < 0$. Labor unions unilaterally determine wages at the firm level.[9] The maximization of union utility in eq. (1) and eq. (2) subject to the labor demand function leads to:

$$N_i \left[\frac{\partial \Omega_i}{\partial w_i} + \frac{\partial \Omega_i}{\partial N_i} \frac{\partial N_i}{\partial w_i} \right] = -\frac{\partial N_i}{\partial w_i} \Omega_i \tag{7}$$

In the utility maximum the marginal utility of wages (on the left-hand side) equals marginal costs (on the right-hand side). Marginal costs reflect the fact that the dismissed employees loose the rent related to the employment relationship. Marginal utility comprises both a direct and an indirect effect. The direct effect is the increase in the rent Ω_i for all employees because of the increase in the wage rate. The indirect effect emerges because the resulting decrease in employment increases labor productivity and therefore the fairness reference. As a consequence, the fairness rent decreases for all employees. The indirect effect only appears because of the inclusion of fairness considerations into the analysis. This effect lowers marginal utility of wages and *cet. par.* leads to lower wage pressure in comparison to the standard model. However, the rent Ω_i that is lost in case of

[9] We consider a monopoly union model instead of a bargaining model in order to keep the analysis as simple as possible. A Nash bargaining model would lead to the same qualitative results.

dismissal also differs from the traditional model. For example, if the fairness reference is higher than the outside wage, $\Omega_i < \Omega^S$, hence marginal cost is lower than in the standard model. In the end, it depends upon the three cases derived in Section 2 whether the inclusion of fairness considerations lowers or increases wage pressure in comparison to the standard model.

To get more detailed results we parameterize a more specific version of the model. To derive an explicit labor demand function, it is assumed that each firm faces a goods demand function of the form $Y_i = p_i^{-\eta} Y$ with $\eta > 1$, where p_i is the price of the firm's product relative to the aggregate price level. The elasticity of the demand for goods is constant and equals η (in absolute values). The variable Y denotes an index of aggregate output which from the firm's point of view is taken to be exogenous because of the assumed large number of firms. Of course, in the general equilibrium Y is itself an endogenous variable. The production function is $Y_i = AN_i^{\alpha}$ with $0 < \alpha < 1$, where A describes the state of technology. Profit maximization of the firm leads to the following labor demand (LD) function:

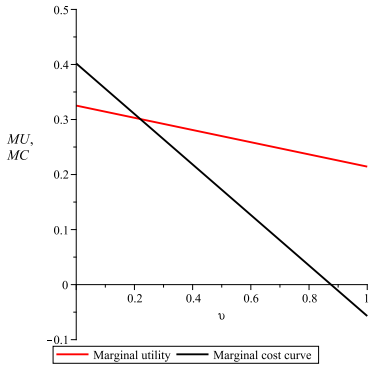
$$N_i = N_i(w_i) = \left[\alpha\kappa\, A^{\kappa}\, Y^{1-\kappa}\, w_i^{-1}\right]^{1/(1-\alpha\kappa)} \tag{8}$$

where $\kappa = (\eta - 1)/\eta$. Taking account of this equation in the first-order condition (7), we are able to analyze the consequences of an increase in the fairness reference which is modeled throughout as an increase in the parameter υ. An increase in the fairness reference at a given wage level has a negative effect on both, marginal utility as well as marginal cost of a wage rise. However, they are affected in a different intensity (see Figure 1).[10] Marginal cost is reduced because of the lower rent Ω_i which the marginal worker looses. Marginal utility decreases because the decrease in employment affects the rent of all inframarginal workers negatively due to the increased fairness reference. Notice

[10]We calibrate the model as follows: $\alpha = 0.7 \quad Y = 2 \quad \eta = 5 \quad A = 3 \quad \overline{w} \approx 1.23$. With that we assure that the threshold value for υ (case 2) equalizes on the micro and macro level (given the value for b in the next section). In addition we set the employment level to 0.67 in the standard case and we are not forced to show only cutouts of the figures. (The analysis holds for all $ln(AN_i{}^{\alpha-1}) > 0$ so sufficiently for all $A > 1$.) The impact of the fairness reference is amplified by ρ. Here we assume $\rho = 0.5$.

that the increase in υ influences only this indirect effect on marginal utility (at a given wage level). It can be shown that the decline in marginal utility due to an increase in υ is less pronounced than the decline in marginal cost.

Figure 1: The fairness reference affects marginal utility and marginal costs



The wage level that has been chosen for Figure 1 is the optimal wage for case 2 which is equal to a traditional, only material rent-maximizing union. As a consequence, at the intersection of both curves the effect of the fairness reference cancels out. To the left, i.e. with a relatively low fairness reference, marginal costs of a wage increase are higher than marginal utility, so the union would react by setting lower wages (case 3). To the right, marginal costs are lower than marginal utility, hence the union would set higher wages (case 1).

Knowing the different effects of an increase in the fairness reference on marginal utility and marginal costs, we have a closer look on the wage-setting behavior. In the optimum wages are set as markup upon the fairness reference and the outside option. From eqs. (7) and (8) it follows that

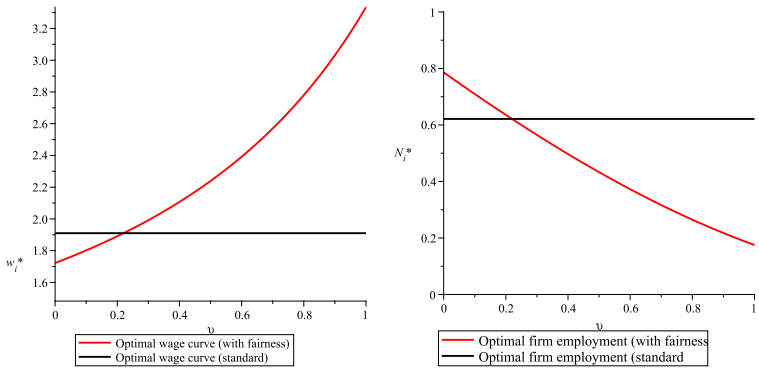
$$lnw_i^* = 1 - \alpha\kappa + ln\overline{w} + \rho\left[-\upsilon(1-\alpha) + \rho\upsilon ln\left(AN_i^{*(\alpha-1)}\right) - ln\overline{w}\right] \tag{9}$$

In the standard case, wages are set as markup on the outside option only:

$$lnw_i{}^{s*} = 1 - \alpha\kappa + ln\overline{w} \tag{10}$$

Because the parameter ρ,υ and α are in between zero and unity, the markup in our model $1-\alpha\kappa-\rho\upsilon(1-\alpha)$ is always smaller than the standard markup, which is due to the change of the rent of all workers already employed (which has a negative effect on the marginal utility of an increase in wages). Having the markup smaller than in the standard case, the question arises whether the optimal wage is higher or lower than in the standard case. This depends on how the fairness reference influences marginal utility and costs. If the influence reduces marginal costs stronger than marginal utility the optimal wage is higher than in the standard case (case 1). Case 3 produces the opposite result and in case 2 both effects cancel out. Given the impact on the optimal wage, the employment level is affected exactly the other way round. This is shown in figure 2:

Figure 2: Optimal wages and firm employment - Case distinctions



(a) Optimal wage (b) Optimal firm employment

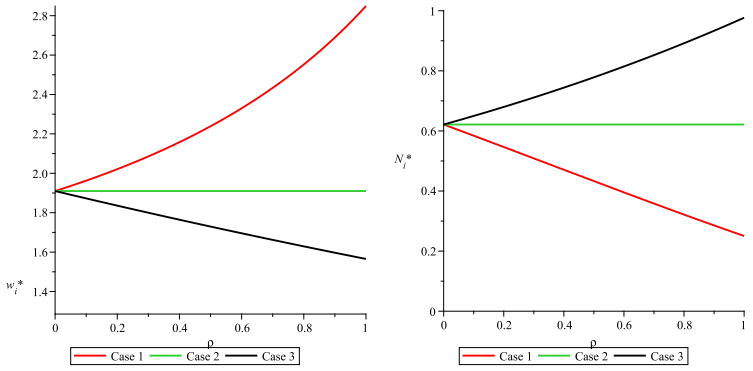
To summarize, it holds that

$$w_i^* > w_i^{s*} \quad \text{and} \quad N_i^* < N_i^{s*} \qquad \text{for case 1}$$
$$w_i^* = w_i^{s*} \quad \text{and} \quad N_i^* = N_i^{s*} \qquad \text{for case 2}$$
$$w_i^* < w_i^{s*} \quad \text{and} \quad N_i^* > N_i^{s*} \qquad \text{for case 3}$$

As a next step we consider a change in the preference for fairness ρ. It turns out that

the fairness parameter ρ amplifies the deviation of wages and employment from those of the standard model. The direction of the change depends on which of the above cases prevails. For example, if we set $\upsilon = 0.5$, case 1 is obtained, in which wage pressure is stronger than in the standard case. If workers' preference for fairness grows, implying that unions care increasingly about fairness utility, the optimal wage set by the union will increase and employment will decrease. However, the effect of the fairness parameter is not one way. For example, with $\upsilon = 0.01$ case 3 prevails. In this case an increase in ρ leads to lower wages and higher employment. The effects of an increase in the preference for fairness in all 3 cases are summarized in figure 3.[11]

Figure 3: The fairness parameter as amplifier



(a) Optimal wages (b) Optimal firm employment

We conclude from the analysis of the wage–setting behavior of a single union that it is not only important *if* and to what extent people care about fairness, but also *how* they care about fairness. The size of the fairness reference υ determines the direction in which employment and wages go when the union's preference for fairness increases. The fairness

[11] Having ρ approaching 1 appears rather implausible since then unions would only care about fairness. However "the worker's attitude toward the rate of pay is more significant, for many purposes, than the real income it provides" (Ross (1948), 1948 p. 51).

parameter works as an amplifier because with rising ρ the difference between marginal utility and marginal cost (at the initial wage level) increases. The fairness parameter and the size of the fairness reference dominate the outcome on the firm level, suggesting to play an important role in determining the aggregate outcome, too.

3.2 A macro level analysis

Along with the continuum of firms, we assume, that workers are homogenous and given by a [0-1] continuum such that $N_i = n$. n is therefore to be interpreted as employment rate. In equilibrium all prices and wages are identical, thus $p_i = 1$ and $w_i = w$. Because of eq. (8) the inverse labor demand function is then given by:

$$w = \kappa\alpha A n^{\alpha-1} \tag{11}$$

In order to derive the wage-setting equation, the outside option must be specified more precisely. With probability n workers get a job elsewhere in the economy and earn w, whereas with probability $1-n$ workers get unemployed and receive unemployment benefits b. Utility related to the outside option then is $\ln \overline{w} = n \ln w + (1-n) \ln b$. Taking account of eq. (9), the following equation for the wage-setting curve (WS) can be derived:

$$lnw = \frac{1-\alpha\kappa}{1-n} + lnb - \frac{\rho}{1-(1-\rho)n}\left[\frac{(1-\alpha)(1-n)\upsilon + (1-\kappa)n}{1-n} - \upsilon ln\left(An^{\alpha-1}\right) + lnb\right] \tag{12}$$

Wages are set as markup on the fairness reference and unemployment benefits. In contrast, in the standard model wages are set as markup on unemployment benefits only:

$$lnw^s = \frac{1-\alpha\kappa}{1-n} + lnb \tag{13}$$

In the following analysis, we assume that $\upsilon ln(An^{(\alpha-1)}) > lnb$. It appears rather implausible that workers choose a fairness reference which is below unemployment benefits. With that we are in line with the common notion that "comparison [is] always made upward rather than downward" (Rees, 1993 p. 244).

In the following we will first have a closer look at the shape of the wage-setting curve that differs from the standard case because of the inclusion of fairness considerations. The

slope of the WS curve is given by:

$$\frac{\partial lnw}{\partial n} = \frac{(1-\alpha\kappa)(1-\rho) - (1-\alpha)\rho\upsilon\frac{1}{n} + (1-\rho)\rho\upsilon ln\left(An^{(\alpha-1)}\right) - (1-\rho)\rho lnb}{\left[(1-(1-\rho)n)\right]^2} \tag{14}$$

Obviously the WS curve is neither strictly monotonously falling nor rising but the slope depends on the level of employment. The sign of the derivative depends on the sign of the numerator. If employment is low, the WS curve has a negative slope because of the diminishing marginal returns to labor. With rising employment the slope becomes less negative, equals zero at some value for n and is positive thereafter. The size of ρ and υ heavily influence the critical point of n at which the slope switches signs. The greater the two parameters, the later the WS curve bends upwards, or to put it the other way round, the longer (and steeper) the WS curve is downward sloping. If only one of the two parameters approaches zero, the downward sloping section of the WS curve gets infinitely small, even for very low values of n. If ρ approaches zero the WS curve then regains the shape of a standard WS curve. To summarize, the size of the fairness reference as well as the fairness weight matter substantially for the slope of the WS curve.[12] It can be shown that the parameters ρ and υ do not affect the sign of the second derivative of the wage-setting equation which is positive. As a consequence, the wage-setting curve is convex.

In the following, we will first analyze how a change in υ affects the shape of the wage-setting curve (at any level of employment). From eq. (12) follows:

$$\frac{\partial lnw}{\partial \upsilon} = \frac{\rho}{1-(1-\rho)n}\left[\alpha - 1 + ln(An^{\alpha-1})\right] \tag{15}$$

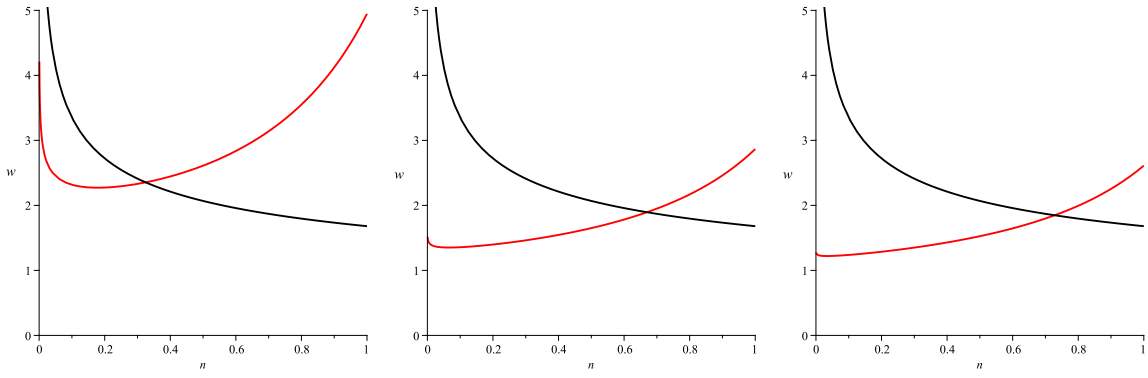
If υ changes, it has an effect on marginal costs as well as on marginal utility of a wage increase. As one can see in the term in brackets, the change in the rent of all workers already employed $(\alpha - 1)$ is set against the change in the size of the fairness reference. At lower levels of employment (left tail) the WS curve shifts upwards and at higher levels of employment (right tail) the WS curve shifts downwards. This is because the fairness reference is a function of average productivity which decreases with employment

[12] Koskela and Schöb, 2009 derive some similar results in an efficiency–wage model.

affecting marginal costs of a wage increase.[13] It can also be shown that at low levels of employment the slope decreases (gets more negative) and at higher levels of employment the slope increases. Consequently both tails are bent upwards simultaneously.

Graphically, equilibrium wages and employment are given by the intersection of the labor demand curve and the wage-setting curve. The variation in υ leads to different aggregate levels of wages and employment in the equilibrium which then reflects the three cases defined in eq. (6). Applying the aggregation conditions to the micro cases, or what amounts to the same thing, comparing optimal wages in the standard case (eq. 13) with optimal wages in the general model (eq. 12), leads to the macro case distinctions (see appendix 6.2[14].

Figure 4: Variation of the fairness reference on the macro level ($\rho = 0.5$)



(a) Case 1 ($\upsilon = 0.9$) (b) Case 2 ($\upsilon \approx 0.22$) (c) Case 3 ($\upsilon = 0.1$)

We observe this behavior in figure 4 that shows that the different cases produced by a variation in the size of the fairness reference υ evoke different equilibrium wages and levels of employment. Note, that figure 4(b) produces the same wage employment combination

[13]We assume $A > 1$ to guarantee that an increase in υ leads to an increase in the fairness reference. Additionally we parameterized $A = 3$ leading to an upward shift of the WS for all levels of employment. Of course this does not change the results.

[14]Now, the cases apply only to the equilibria.

as the standard case. Interestingly, the shape of the WS curve is markedly different from the standard case. This is due to having set $\rho = 0.5$. However, case 2 produces always the same equilibrium outcomes. Again this constitutes only a threshold between case 1 and 3.

If the equilibrium outcomes are compared with the results in the standard model, one obtains an analogy to the micro findings (for a continuous variation of υ see the appendix 6.2):

$$\begin{aligned} w^* > w^{s*} \quad &\text{and} \quad n^* < n^{s*} \qquad \text{for case 1} \\ w^* = w^{s*} \quad &\text{and} \quad n^* = n^{s*} \qquad \text{for case 2} \\ w^* < w^{s*} \quad &\text{and} \quad n^* > n^{s*} \qquad \text{for case 3} \end{aligned}$$

Our results on the firm level suggest that the fairness parameter ρ again acts as an amplifier. However, we first focus on the shift of the WS curve at any level of employment. The shift of the WS curve due to an increase in the fairness weight is:

$$\frac{\partial lnw}{\partial \rho} = -\frac{1-n}{(1-(1-\rho)n)^2}\left[\frac{(1-\alpha)\eta[(1-n)\upsilon+n]+\alpha n}{(1-n)\eta} - \upsilon ln\left(An^{(\alpha-1)}\right) + lnb\right] \quad (16)$$

It is the term in squared brackets which determines the sign. This term changes signs with an increasing employment level. The fairness reference on the left side and the first term on the right side depend on the level of employment. At low levels of employment the sign is positive. The increase in ρ leads to higher wages because of the amplification of the relatively stronger effect on marginal costs than on marginal utility of a wage increase. Due to this effect, the left tail of the WS curve kind of "bends" or shifts upwards. With relatively high employment the sign is negative. The increase in ρ then leads to a relatively stronger negative effect of a wage increase on marginal utility. Lower wages are set, thus this part of the WS curve shifts downwards. As a consequence, the increase in ρ leads a clockwise rotation of the wage-setting curve.

Note, that the term in squared brackets is equal to the one from eq. (12). Considering

the equilibrium outcomes as default the sign switches according to the case distinctions.

$$\frac{\partial lnw}{\partial \rho} > 0 \quad \text{in} \quad \text{case 1}$$
$$\frac{\partial lnw}{\partial \rho} = 0 \quad \text{in} \quad \text{case 2}$$
$$\frac{\partial lnw}{\partial \rho} < 0 \quad \text{in} \quad \text{case 3}$$

In case 1 an increase in ρ leads to an upward shift of the WS curve in the equilibrium. The upward shifting part intersects with labor demand leading to higher wages. In case 2 the intersection of the WS curve and labor demand is not affected because it constitutes the pivotal point of the rotation. In case 3 the downward shifting part of the WS curve intersects with labor demand leading to lower wages set.

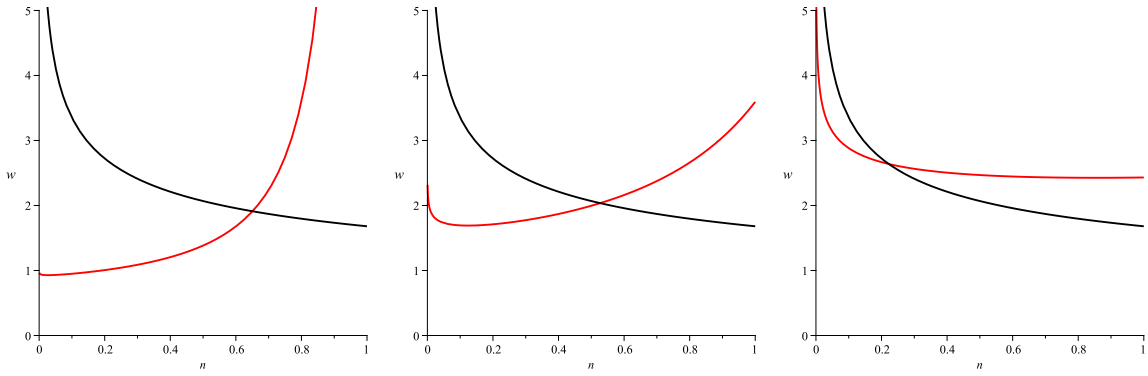
To summarize, the level of the fairness reference determines the cases and therefore the threshold value of n where the sign switches. The higher υ the longer[15] counts case 1 leading to an intersection of the WS curve with labor demand at a higher wage level and lower employment. In case 3 the right tail is bent down already at lower employment levels thus leading to an intersection with labor demand at lower wages and higher employment. Now, having the union putting gradually more and more weight on the fairness reference leads to an amplification of these developments as we can see in figures 5 and 6.

In case 1 (figure 13) the left tail is faster upward shifting than the right one is downward shifting. This leads to increasing wages and lowers employment. In case 3 (figure 14) the right tail is faster downward shifting than the left one is upward shifting. This leads to an increase in employment and a decrease in wages.

In both cases, if the union does not care much about fairness, the WS curve runs very much like in the standard case. Wage pressure increases with employment due to the increasing outside option. However, the higher ρ the more important is the fairness reference. It is a function of the average productivity which decreases with employment because of the diminishing marginal returns to labor. Now, in case 1 the fairness reference decreases substantially (because of a high value of υ) leading even to a totally downward

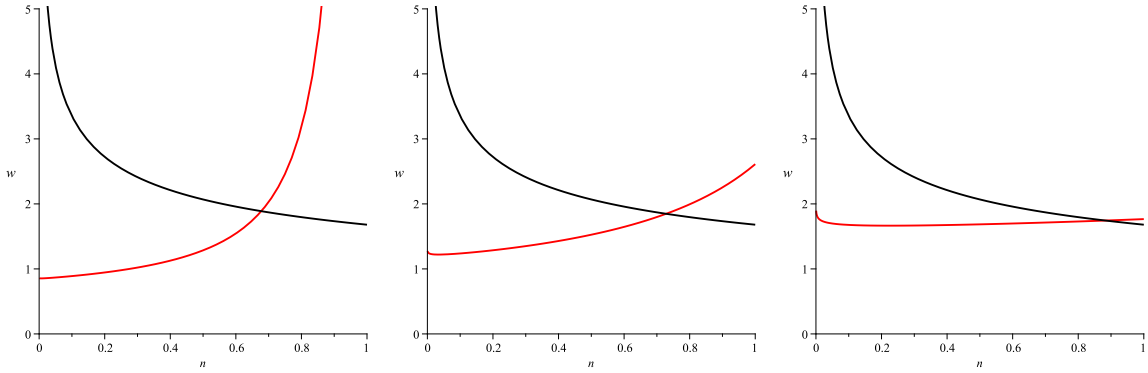
[15]Think of moving along the horizontal axis increasing n.

Figure 5: Variation of the fairness parameter in case 1 ($\upsilon = 0.5$)



(a) $\rho = 0.1$ (b) $\rho = 0.5$ (c) $\rho = 0.9$

Figure 6: Variation of the fairness parameter in case 3 ($\upsilon = 0.1$)



(a) $\rho = 0.1$ (b) $\rho = 0.5$ (c) $\rho = 0.9$

sloping WS curve as in figure 5(c). However, in case 3 the decrease in average productivity does not push through on the fairness reference because of the small value of υ. We thus have a almost horizontally, only slowly upward sloping WS curve. Having equal weight on both references leads both to affect the course of the WS curve as you can clearly see

in figures 5(b) and 6(b).

As on the micro level, increasing the fairness parameter leads to an amplification of the differential in wages and employment made up by the fairness reference level. Thus the amplifier mode of the fairness parameter prevails on the aggregate level (see appendix 6.2 for a continuous analysis).

The fairness reference as well as the fairness parameter have a major impact on aggregate outcome. Thus the mechanisms derived push through aggregation. The size of the fairness reference determines the different cases which decide in which direction equilibrium wages and employment are to move when the fairness weight increases. Again, ρ measuring the weight which unions put on fairness takes the working mode of an amplifier. The higher the fairness parameter, the more sensitive the WS curve reacts to changes in the size of the reference. In turn it shows, that it is not only about if but how fairness is included into union's preferences.

4 Macroeconomic implications of technology shocks

Given the different possible shapes of the wage-setting curve it is interesting to see how the general equilibrium is affected by macroeconomic shocks. In this version of the paper we will consider an adverse technology shock that reduces A. As a consequence, labor demand is shifted downwards, since

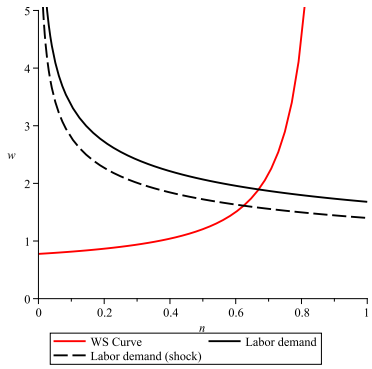
$$\left.\frac{\partial lnw}{\partial A}\right|_n = \frac{1}{A} > 0 \tag{17}$$

Contrary to the standard case, in our model, the technology parameter is part of the fairness reference thus the WS curve is affected by changes in A as well:

$$\left.\frac{\partial lnw}{\partial A}\right|_n = \frac{\rho \upsilon \frac{1}{A}}{1-(1-\rho)n} > 0 \tag{18}$$

A technology shock does not only shift labor demand, but also the WS curve downwards. However, as is evident from the derivative, it matters heavily how much the union cares about fairness and of which size the fairness reference is (size of ρ and υ).

Figure 7: Technology shock



(a) standard case

$$\lim_{\rho \to 0} \frac{\rho \upsilon}{1-(1-\rho)n} = 0 \tag{19}$$

$$\lim_{\upsilon \to 0} \frac{\rho \upsilon}{1-(1-\rho)n} = 0 \tag{20}$$

$$\lim_{\rho \to 1} \frac{\rho \upsilon}{1-(1-\rho)n} = \upsilon \tag{21}$$

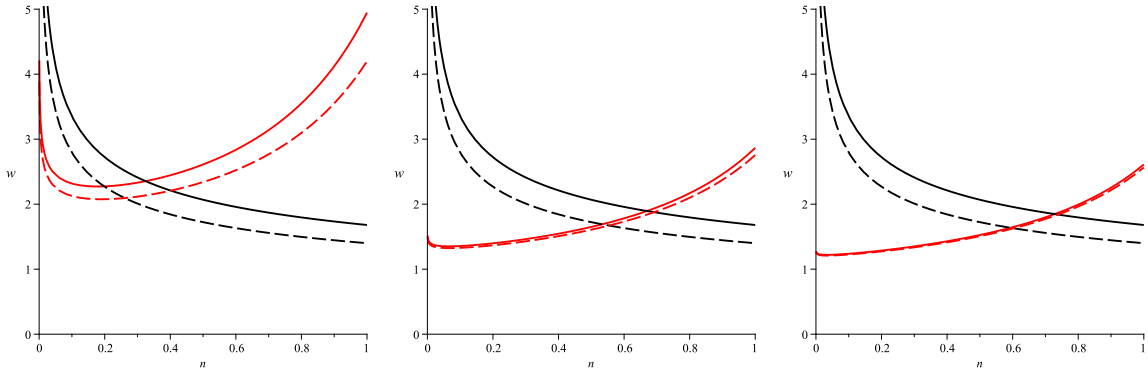
If the fairness parameter approaches zero, the WS curve merely does not shift at all (see eq. 19 and behaves as in the standard case (see figure 7). The shock leads to a significant decrease in employment and wages. Of course, this meets our expectations. A union with a low preference for fairness is not to distinguish from a conventional rent maximizing union.[16] In case 3 the relative size of the fairness reference is small thus changes in A do not affect the WS curve very much as given in eq. 20. However, the higher the fairness reference (case 1) the WS curve shifts the more the union cares about fairness (see eq. 21). Having the fairness parameter approaching 1 the WS curve shifts exactly to the extent of labor demand times υ[17]. The WS curve shifts always to a smaller extend downwards than

[16]Irrespectively of the fairness reference' size.

[17]In this case wages are constant and all adjustment takes place in terms of employment. This is equal to Danthine and Kurmann

labor demand. Now, performing an adverse technology shock by setting $\triangle A = -0.5$, (see figure 8) the derived behavior results.

Figure 8: Technology shock for different sizes of the fairness reference ($\rho = 0.5$)



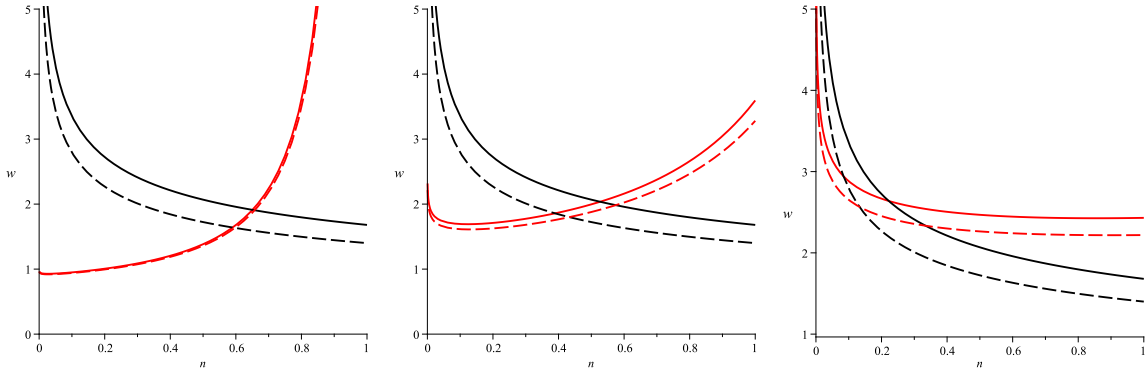
(a) Case 1 ($\upsilon = 0.9$) (b) Case 2 ($\upsilon \approx 0.22$) (c) Case 3 ($\upsilon = 0.1$)

In all cases the reaction of the economy is similar but differs markedly from the standard case. It is now, that the reaction takes place more in terms of employment than in terms of wages. Irrespectively of the effect the inclusion of fairness has on the aggregate levels of employment and wages, the reaction on shocks is surprisingly similar. In case 1 wages are more sticky because of the shift of the WS curve and in case 3 it is due to the slope of the WS curve. Case 2 is a mixture of both. Important to note is that real wages are more rigid in any case.

In addition the fairness parameter plays an important role affecting the position, slope as well as the shifting behavior of the WS curve, see figures 9 and 10.

We know from eq. (12) that wages are set as markup on the weighted references. Now, if the fairness reference decreases because of the technology shock wages decrease accordingly, at all levels of employment. Consequently, the higher the fairness parameter in case 1 the more shifts the WS curve downwards. However, the different levels of ρ

Figure 9: Technology shock for different fairness parameter in case 1 ($\upsilon = 0.5$)

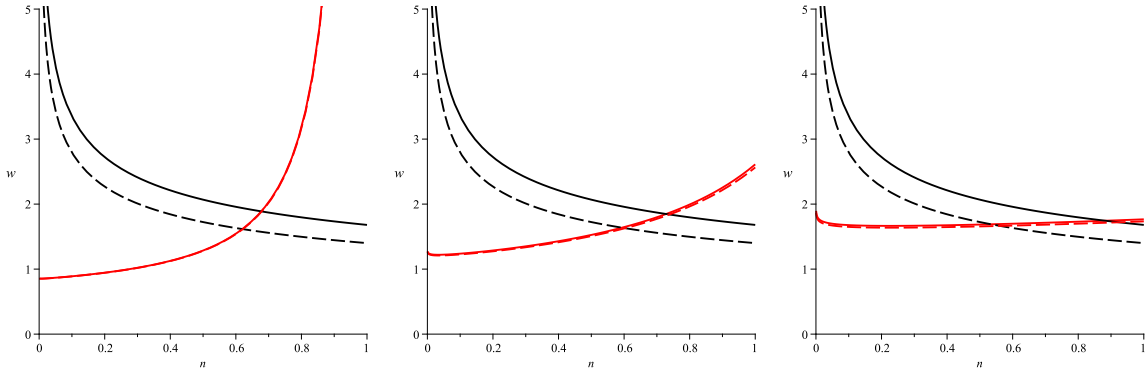


(a) $\rho = 0.1$ (b) $\rho = 0.5$ (c) $\rho = 0.9$

have, as discussed in the last section, a major impact on the shape of the WS curve. Therefore, as you can see in figure 9, the technology shock evokes different reactions on the equilibrium. The higher the preference for fairness, the more slopes the WS curve downwards and is shifted by the technology shock, the more the accommodation takes place in terms of employment. This case is comparably to the results of Danthine and Kurmann, (2007): fairness leads to real wage rigidity. The intuition is as follows. A is part of the fairness reference. In case 1 a technology shock leads to a sudden decrease of the size of the fairness reference. With increasing fairness parameter the WS curve becomes downward sloping and is shifted downwards by the shock. Thus at all levels of employment lower wages are set after the shock. However labor demand is lowered by the shock, too. This increases average productivity and therefore the fairness reference which attenuates the decrease in wages. In the extreme, both movements equal out (see eq. 21. Consequently the reaction in wages decreases with the fairness parameter, and reaction in employment increases.

In contrast to this working mode in case 3 wage rigidity increases with the fairness

Figure 10: Technology shock for different fairness parameter in case 3 ($\upsilon = 0.1$)



(a) $\rho = 0.1$ (b) $\rho = 0.5$ (c) $\rho = 0.9$

parameter, because it produces a flatter WS curve, see figure 10. The WS curve merely does not shift because the technology shock does not push through on the size of the fairness reference, however it is almost flat if there is high weight on fairness because then the outside option can not provide wage pressure with increasing employment (see section 3.2). Now, labor demand practically shifts along the flat WS curve leading to increasing changes in employment and decreasing changes in wages.

All in all, real wage rigidity increases with the fairness parameter as you can see in table 1.[18] However, it matters which fairness reference is chosen. Once the shock is absorbed by a shifting WS curve (case 1) and once by a movement along a flat WS curve (case 3).

To conclude, with the inclusion of fairness considerations, we therefore do have increasing rigidity in wages but comply to the empirically observed fact that WS curves seem to be upward sloping. If you consider figure 9(b), for example, the results are simi-

[18]By choosing a nominal frame in the union's utility function this model is also able to account for nominal wage rigidity.

Table 1: Relative change of employment due to technology shock

Standard case		0.46
Case distinctions	Case 1 ($\upsilon = 0.9$)	1.77
	Case 2 ($\upsilon \approx 0.22$)	1.47
	Case 3 ($\upsilon = 0.1$)	1.45
Case 1 ($\upsilon = 0.5$)	$\rho = 0.1$	0.57
	$\rho = 0.5$	1.53
	$\rho = 0.9$	14.73
Case 3 ($\upsilon = 0.1$)	$\rho = 0.1$	0.57
	$\rho = 0.5$	1.45
	$\rho = 0.9$	7.92

lar. The WS curve is mainly upward sloping, obeying the empirical regularity, however, there is far less movement in wages and much more movement in employment compared to the standard case (see table 1). It is the same to case 3 in figure 10. Finally, including fairness instills wage rigidity. Irrespectively of the equivocal effect it has on the level of employment and wages, the adjustment of the economy when hit by a shock is definite. Moreover we are able to show that fairness makes wages more rigid without having the WS curve violating empirical observed regularities (see Koskela and Schöb, 2009).

5 Conclusions

In this paper we show that fairness considerations produce a different wage-setting behavior in unionized labor markets than derived in conventional models. On the micro level it

is crucial how fairness affects marginal utility and marginal costs of an increase in wages. It has a reducing effect on both quantities, however what matters is the force of one effect relative to the other. If marginal costs are affected more strongly, higher wages are set and lower firm employment results (case 1). If marginal utility is affected more strongly, the opposite happens, lower wages are set and higher firm employment results (case 3). The force of these effects is determined by the relative size of the fairness reference. Given a change in the fairness parameter, it depends on the cases (the size of the reference) if the wage-setting behavior of the union leads to increasing (case 1) or decreasing (case 3) employment. The fairness parameter thus takes the working mode of an amplifier.

The different cases derived on the micro level also have a major impact on the wage–setting behavior on the macro level. If marginal utility is affected more strongly the WS curve runs flatter (case 3). Lower wages and higher employment result compared to the standard case. If marginal costs of an increase in wages are affected more strongly, produced by an increasing υ, both tails of the WS curve bend upwards. The WS curve then has a downward sloping section as well as an upward sloping section, thus is given by a u-form (case 1). In this case higher wages are set and aggregate unemployment is higher. The different shapes of the WS curve are again amplified by an increasing fairness weight. In the first case the WS curve kind of rotates in the $w - n$ space, with a lengthening downward sloping section. This is due to the fact that employment enters negatively into the fairness reference because it decreases average productivity. Here wages increase as well as unemployment. In the third case the WS curve becomes flatter with an increasing fairness weight. Lower wages and lower unemployment result. Again, the fairness parameter works as an amplifier of the respectively prevailing case. This stands clearly out to the yet existing literature. In addition it is possible to have a union which cares much about fairness but the WS curve is nevertheless upward sloping in the $w - n$ space obeying empirically observed regularities.

Given the different possible shapes of the WS curve we can show that the economy reacts in a distinct way to an adverse technology shock. In any case, the economy reacts with an decrease in wages and employment. However it depends on the size of the fairness

reference and the fairness parameter how much of the adjustment is done in wages and how much is done in employment. Comparably to the efficiency wage model of Danthine and Kurmann (2007) we can show that increasing the fairness parameter leads to wage rigidity. However, this heavily depends on the size of the reference. Moreover, we show that for some combinations of ρ and υ the WS curve remains upward sloping, thus complying empirical insights, and still generates wage rigidity (Koskela and Schöb, 2009). Typically enough fairness may lead to differing aggregate levels of wages and employment but the reaction to shocks is distinct.

To summarize, it does not only matter if workers care about fairness, but how they do. The size of the fairness reference chosen and its determining influence on the effect the fairness parameter produces is crucial and matters for the wage-setting behavior of unions as well as for the economy as a whole and its reaction on shocks.

6 Appendix

6.1 Appendix to section 3.1

The optimal employment decision of the firm and the optimal wage set by the union are given by the tangential point of the union's indifference curve and the firm's labor demand curve. Figure 11 denotes the standard case.

Changing the size of the fairness reference υ is affecting the union's indifference curve. Figure 12 shows how the firm wage employment equilibrium is determined by a shifting respectively "rolling" indifference curve. Increasing the fairness reference therefore leads to higher wages and lower employment[19]. In figure 12(c) wages are lower compared to a standard rent maximizing union, in figure 12(b) they are equal and in figure 12(a) they are higher. This makes up the cases distinctions and is the working mechanism behind figure 2.

Changing the fairness parameter ρ again affects the union's indifference curve. How-

[19]This result is comparable to a union putting continuously less weight on employment.

Figure 11: Optimal wage and employment in the standard model

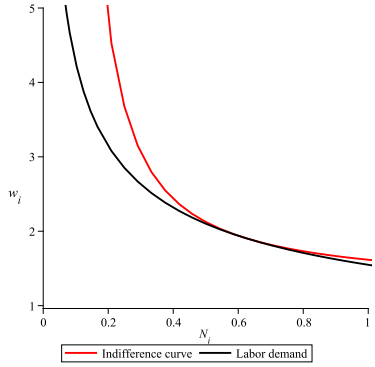
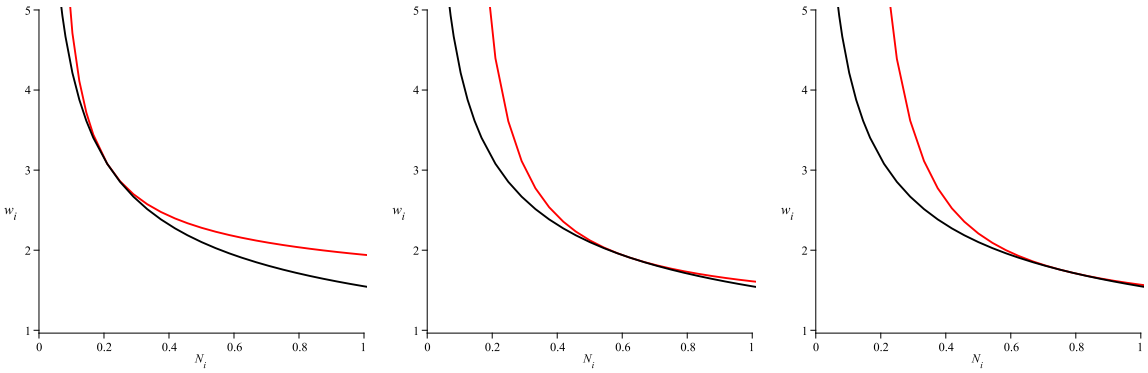


Figure 12: Variation of the fairness reference in the general model

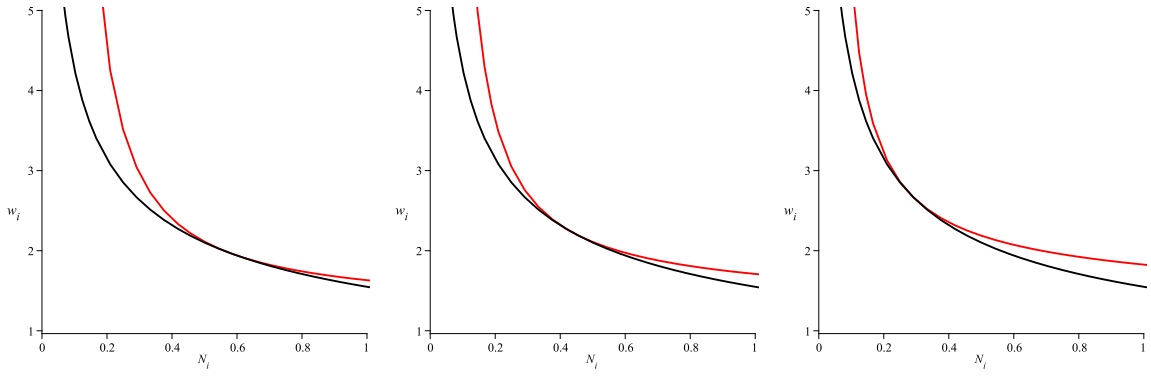


(a) Case 1 ($\upsilon = 0.9$) (b) Case 2 ($\upsilon = 0.22$) (c) Case 3 ($\upsilon = 0.01$)

ever, now it depends on the case in which direction the indifference curve "rolls". In case 1 it "rolls" to the left along firm labor demand leading to an increase in wages and a decrease in employment. See figure 13.

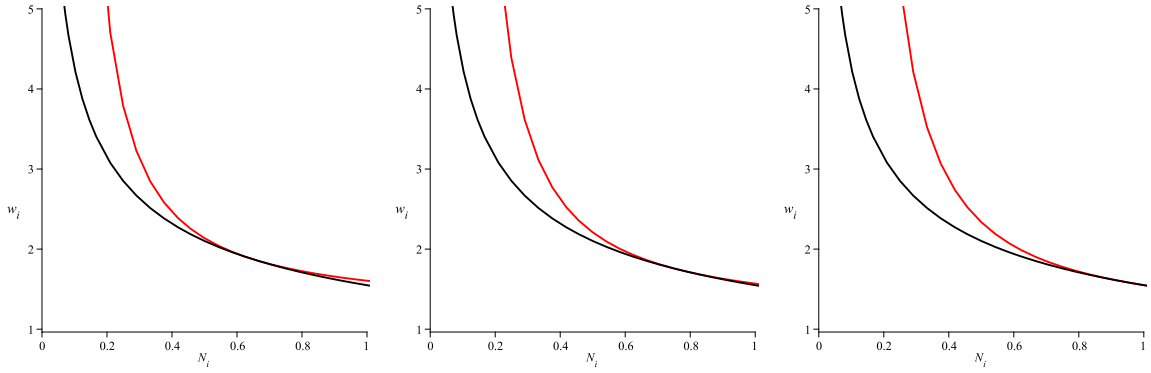
In case 3 the indifference curve again "rolls" along firm labor demand, however in the opposite direction. See figure 14.

Figure 13: Variation of the fairness parameter in case 1 ($\upsilon = 0.5$)



(a) $\rho = 0.1$ (b) $\rho = 0.5$ (c) $\rho = 0.9$

Figure 14: Variation of the fairness parameter in case 3 ($\upsilon = 0.01$)



(a) $\rho = 0.1$ (b) $\rho = 0.5$ (c) $\rho = 0.9$

In case 2 the indifference curve is not affected. This mechanism is the amplifier function what is comprised in figure 3.

6.2 Appendix to section 3.2

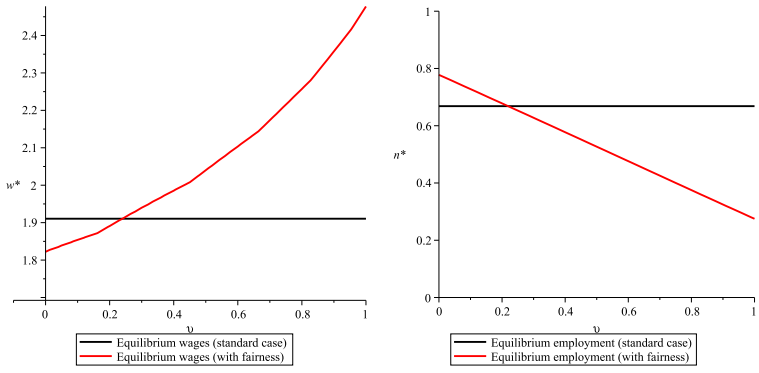
Asymptotic behavior: In case 1 and with ρ approaching one, the WS curve is above labor demand if n approaches one and vice versa if n approaches zero. Because of convexity and the asymptotic behavior of the wage-setting curve, we can rule out multiple equilibria.

Macro case distinctions:

$$\begin{aligned} \upsilon ln\left(An^{*(\alpha-1)}\right) &> \frac{(1-\alpha)(1-n^*)\upsilon+(1-\kappa)n^*}{1-n^*} + lnb \quad \text{case 1} \\ \upsilon ln\left(An^{*(\alpha-1)}\right) &= \frac{(1-\alpha)(1-n^*)\upsilon+(1-\kappa)n^*}{1-n^*} + lnb \quad \text{case 2} \\ \upsilon ln\left(An^{*(\alpha-1)}\right) &< \frac{(1-\alpha)(1-n^*)\upsilon+(1-\kappa)n^*}{1-n^*} + lnb \quad \text{case 3} \end{aligned} \tag{22}$$

The consequences of a continuous increase in υ and with that in the size of the fairness reference on equilibrium real wages and employment are summarized in figure 15 that resembles figure 1 for the analysis on the firm level.

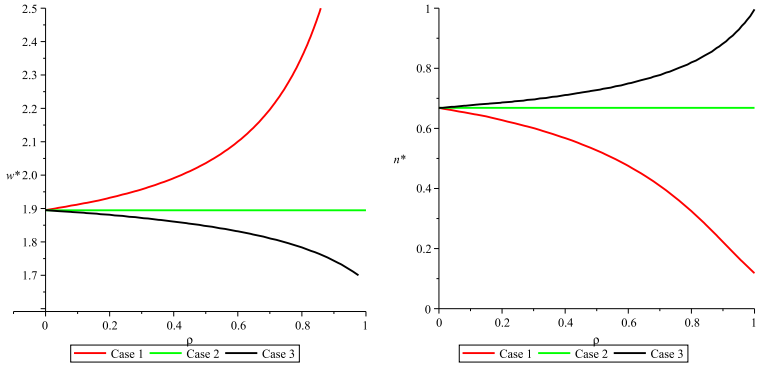
Figure 15: Equilibrium wages and employment - Case distinctions



(a) Equilibrium wage (b) Equilibrium employment

The developments of equilibrium wages and employment triggered by continuously increasing fairness are summarized in figure 16. Obviously ρ works on the aggregate level as amplifier, too.

Figure 16: The fairness parameter as amplifier on the aggregate level



(a) Equilibrium wages (b) Equilibrium employment

References

Akerlof, G. A. (1982). Labor contracts as partial gift exchange. *The Quarterly Journal of Economics*, *97*, 543-69.

Akerlof, G. A., & Yellen, J. L. (1990). The fair wage-effort hypothesis and unemployment. *The Quarterly Journal of Economics*, *105*, 205-83.

Booth, A. L. (1995). *The economics of the trade union.* New York: Cambridge University Press.

Charness, G. (2004). Attribution and reciprocity in an experimental labor market. *Journal of Labor Economics*, *22*, 665-88.

Danthine, J.-P., & Kurmann, A. (2006). Efficiency wages revisited: The internal reference perspective. *Economics Letters*, *90*, 278-84.

Danthine, J.-P., & Kurmann, A. (2007). The macroeconomic consequences of reciprocity in labor relations. *Scandinavian Journal of Economics*, *109*(4), 857-81.

Dunlop, J. (1944). *Wage determination under trade unions.* New York: Macmillan.

Egger, H., & Kreickemeier, U. (2008). *Fairness, trade and inequality* (Working Paper No. 2344). CESifo.

Falk, A., & Fischbacher, U. (2006). A theory of reciprocity. *Games and Economic Behavior*, *54*, 293-315.

Fehr, E., Fischbacher, U., & Gächter, S. (2002). Strong reciprocity, human cooperation, and the enforcement of social norms. *Human Nature*, *13*, 1-25.

Fehr, E., Kirchler, E., Weichbold, A., & Gächter, S. (1998). When social norms overpower competition: Gift exchange in experimental labor marktes. *Journal of Labor Economics*, *16*, 324-51.

Flanagan, R. J. (1993). Can political models predict union behavior? In R. J. Flanagan, K. O. Moene, & M. Wallerstein (Eds.), *Trade union behavior, pay-bargaining, and economic performance.* Oxford University Press.

Gylfason, T., & Lindbeck, A. (1984). Union rivalry and wages: An oligopolistic approach. *Economica*, *51*(202), 129-39.

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1986a). Fairness and the assumptions of economics. *The Journal of Business*, *59*(4), 285-300.

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1986b). Fairness as a constraint on profit seeking - entitlements in the market. *The American Economic Review*, *76*(4), 728-41.

Kaufman, B. E. (2002). Models of union wage determination: What have we learned since dunlop and ross? *Industrial Relations*, *41*(1), 110-158.

Koskela, E., & Schöb, R. (2009). A note on internal and external reference in efficiency wage models. *Journal of Economics*, *96*, 79-86.

Kubon-Gilke, G. (1990). *Motivation und beschäftigung: Eine sozialpsychologische beurteilung der effizienzlohntheorien und ihrer kritik*. Frankfurt am Main: Campus Verlag.

Nelson, W. R. J. (2001). Incorporating fairness into game theory and economics: Comment. *The American Economic Review*, *91*(4), 1180-83.

Oswald, A. J. (1979). Wage determination in an economy with many trade unions. *Oxford Economic Papers*, *31*, 369-85.

Pehkonen, J. (1990). Trade union objectives and the cyclical variability of wages and employment. *Scandinavian Journal of Economics*, *92*(4), 573-586.

Pencavel, J. H. (1991). *Labor markets under trade unionism*. Oxford: Blackwell.

Rabin, M. (1993). Incorporating fairness into game theory and economics. *The American Economic Review*, *83*(5), 1281-1302.

Rees, A. (1993). The role of fairness in wage determination. *Journal of Labor Economics*, *11*(1), 243-252.

Ross, A. (1948). *Trade union wage policy*. Berkeley: University of California Press.

Tirole, J. (1999). Incomplete contracts: Where do we stand? *Econometrica*, *67*, 741-81.

Tversky, A., & Kahneman, D. (1986). Rational choice and the framing of decisions. *The Journal of Business*, *59*(4), 5251-78.