Institute for Strategy and Business Economics
University of Zurich

Working Paper Series
ISSN 1660-1157

Working Paper No. 134

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May 2012

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First version: 30 May 2010
Final version: 21 May 2012

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Abstract

This paper provides non-experimental field evidence on positive and negative worker reciprocity. We analyze the performance reactions of professional workers to fair and unfair wage allocations in their natural environment. The objects of interest are professional soccer players in the German Bundesliga. This environment enables us to circumvent the main problems of observational studies on reciprocity because there is substantial transparency in individual player values and performance. Our main finding is that workers exhibit both positive and negative reciprocity toward employers who deviate from a player's perception of a fair market wage. This perception of a fair wage follows from a Mincer-type wage equation that incorporates a worker's past performance. The different results between changing and non-changing players are in line with theories of fairness perception but cannot be explained by private information from the employers or the personal career concerns of the players. Altogether, our findings provide strong evidence for the external validity of previous laboratory results on gift exchange in the labor market.

JEL-Classification: D84, J30

Keywords: Reciprocity, Fairness, Gift Exchange, Job Changes

1. Introduction

Consider the following scenario. Tom just finished his B.A. in Management and applies for a job in the retailing industry. From a business magazine, he knows the average salary of new job entrants in this industry. After a series of job interviews, Tom receives only one job offer, which offers a salary that is considerably lower than the average salary level. Because he does not want to be unemployed, Tom accepts the offer and begins working in the industry. Now imagine a situation in which the same average wage level for new entrants applies but in which Tom's wage offer substantially exceeds the average salary. Again, he accepts the offer and starts working in the industry. Will it matter for Tom's subsequent working performance which of the two scenarios actually occurs? And to what extent will his behavior reflect fairness considerations? This paper aims to answer these questions and reports evidence from a non-experimental field study that explores whether paying above-market wages induces workers to improve their performance. In addition, we test whether paying below-market wages induces workers to reduce their performance.

The literature on gift exchange in the labor market (Akerlof, 1982; Akerlof and Yellen, 1988, 1990) assumes that Tom uses the average salaries of similar others (i.e., newcomers to the industry) to form his reference wage, against which he compares his actual salary. If Tom perceives himself to be underpaid, he will reduce his performance, and if he perceives himself to be overpaid, he will increase his performance. Overall, this literature proposes that workers and employers engage in reciprocal gift giving, where the size of the gift from the worker is his performance in excess of the minimum work standard while the size of the gift from the firm is represented by wages in excess of what the worker could earn at another firm. This gift-exchange view of labor relations is supported by findings from numerous laboratory experiments (Pereira et al. 2006; see Fehr and Gächter, 1998, 2000 for overviews).

The inclination of individuals to reward those who have been kind to them and to punish others who have been unkind to them has been labeled positive and negative reciprocity, respectively (see the discussion in Rabin, 1993). Studies in support of positive and negative reciprocity among individuals are now so numerous that several formal theories of reciprocal behavior have been developed (Cox et al. 2009; Dufwenberg and Kirchsteiger, 2003; Falk and Fischbacher, 2006).

However, the observation that these theories are mainly built on laboratory evidence has recently become a concern for several researchers (e.g., Levitt and List, 2007), and the extent to which this evidence translates into the field remains the subject of ongoing discussion. Whereas several field experiments on worker reciprocity have now been performed (Bellemare and Shearer, 2009; Cohn et al., 2009; Gneezy and List, 2006; Hennig-Schmidt et al., 2010; Kube et al., forthcoming a), their findings are less clear, and the effects detected are usually smaller than those detected in laboratory studies. This conflict between laboratory and field studies is sometimes considered evidence that laboratory findings do not translate into the field (Levitt and List, 2007).

It may be too soon to draw such conclusions, as the number of existing field studies remains limited. This lack of studies is particularly severe in the area of observational field studies on worker reciprocity. These studies have encountered considerable problems, such as a lack of good proxies for worker effort, a mix of incentives for workers, productivity differences among workers, and the influence of workers' strategic considerations when choosing effort levels (Falk and Heckman, 2009). Moreover, alternative wages for employees are often not observable for researchers (Bellemare and Shearer, 2009). While these problems are specific to observational studies, experimental and observational field studies share a common shortcoming: studies that jointly analyze positive *and* negative reciprocity are scarce,[1] which makes it difficult to compare previous reciprocity findings across different studies.

In this paper, we aim to close this gap in the literature and present observational field evidence on both positive and negative worker reciprocity. We aim to circumvent the aforementioned measurement problems by using seasonal data from professional soccer players in their natural environment (the German Bundesliga) over a five-year period. The choice of this industry has considerable advantages for the purpose of our study. First, for each worker, objective performance values and employer information can be obtained for every year under study (Kahn, 2000). In particular, we use an expert evaluation of player performance to reveal productivity differences across players within the same tactical position. This effort proxy is much more reliable than those used in previous field studies (e.g., Lee and Rupp, 2007). Information on the team that a player stayed with during a particular season allows us to address concerns about personal reputation as a motivational factor in player performance.

Second, although player salaries are not publicly available, there is considerable transparency in the player market (Torgler et al., 2008) because the highly renowned German *Kicker Sportmagazin* provides market value estimates for the players in the German Bundesliga. Previous studies have most frequently used these wage data, because the data's reliability has been judged to be high (Franck and Nüesch, 2011; 2012; Frick, 2007; Haas et al., 2004; Kern and Süssmuth, 2005; Torgler and Schmidt, 2007). These data allow us to compare a player's actual wage with his fair market wage. Such entitlements have previously been documented to trigger fairness perceptions (see Fehr et al. 2009 and the references therein). Third, professional sports players do not face a complex mix of incentives. Performance has to be provided on the field and is constantly observed by managers and

[1] The field experiment by Kube et al. (forthcoming a) forms the notable exception.

fans.[2]

In line with the gift-exchange view, we use the average wage of similar others to form a player's reference wage. In a first step, we obtain this reference wage as the prediction from a Mincer-type wage equation that includes a player's observable characteristics (e.g., age, experience, tenure) and his performance in the previous season. In a second step, the player is assumed to form the fairness evaluation of his current wage by comparing it to the reference wage and, subsequently, to choose his performance level.

Our empirical results support earlier experimental findings in the field in that we find a small but statistically significant effect for wages that deviate from market levels: depending on whether wages are lowered or increased relative to the reference wage, output elasticities amount to -0.25 and 0.10, respectively. Whereas performance reductions in response to underpayment are in line with negative reciprocity, they are never optimal for purely self-interested players (because future wages are increasing in performance). In contrast, performance increases in response to overpayment may well reflect the career concerns of personally self-interested players. To test whether the positive effect should instead be attributed to fairness concerns, we compare performance responses across changing and non-changing workers. Whereas both groups face comparable career incentives, findings by Gneezy and List (2006) reveal that positive reciprocity decreases with the duration of an ongoing working relationship. We thus predict that positive reciprocity is higher for players who have recently changed to a new team than for players who have remained with their former team. Our empirical results support this prediction.

The remainder of this study is organized as follows. The next section derives our testable hypotheses. Section 3 discusses our data and presents our estimation approach to

[2] We want to emphasize that during our sample period there were no obvious cases of player transfers in the German Bundesliga in which players were primarily bought to increase merchandising sales. Therefore, we view on-field performance to be the most important performance aspect for teams in our sample.

analyze fairness considerations and worker performance. Section 4 presents the empirical results, and section 5 concludes.

2. Testable Hypotheses

The gift-exchange view of labor relations (Akerlof, 1982; Akerlof and Yellen, 1988; 1990) represents a well-established alternative to the standard competitive model (Kirchler et al., 1996). This view is based on the notion that workers have a clear reference point for what constitutes a fair wage. Theories developed in social psychology and sociology propose that whenever an employer deviates from paying the reference wage, workers will respond by adjusting their effort level. Equity theory (Adams, 1963), for example, assumes that "a wage decrease which creates underpayment reduces effort, while a wage increase that generates overpayment increases effort" (Kirchler et al., 1996; 317). In economics, this idea has become known as the fair wage-effort hypothesis (Akerlof and Yellen, 1988; 1990). Many laboratory experiments document the predicted behavioral pattern, which has primarily been linked with work morale's reaction to fair or unfair wage payments (see the references in Kube et al., forthcoming a).

Whether a certain wage reflects under- or overpayment depends on what constitutes the reference wage. The literature currently contains a range of views of reference wage formation. Kahneman et al. (1986), for example, acknowledge that the reference wage "may also reflect the history of relations between a firm and a particular individual: different rules apply to a current employee and tenant and to their potential replacements" (S297). This finding has led researchers to suggest market wages as reference wages for newcomers but *status quo* wages as reference wages for employed workers. Support for this suggestion is found in the non-cyclical [cyclical] patterns in incumbents' [newcomers'] wages (Cohn et. al, 2009).

However, in light of the high transparency in the sports industry, this approach to the reference wage does not appear to be particularly appropriate: incumbent players change teams frequently before the end of their contract term or resign a longer (and better paid) contract with their current employer. Many of these changes are accompanied by substantial media coverage of the alleged wage and transfer payments. To this end, incumbent workers are likely able to infer their reference wage from the wages of other players who share similar characteristics. This reference wage has previously been used by Summers (1988) in his relative wage-based efficiency wage theory and by Akerlof (1982) in his work on labor contracts as a partial gift exchange.

Support for this idea also comes from the fair wage-effort hypothesis by Akerlof and Yellen (1988, 1990). These authors assume that the reference wage is given by a weighted average of market wages and co-worker salaries. However, recent experimental evidence on horizontal wage inequality and team production does not show that “wage inequality has a significant impact on either [team production] participation or effort choices” (Bartling and von Siemens, 2011;1). Therefore, we do not consider intra-team wage inequality to be an influence on a worker’s reference wage. Instead, we assume that a player’s reference wage is given by the average market wages earned by other players (even those who work for other employers) with similar observable characteristics. However, to the extent that co-workers share similar characteristics, their wages are also incorporated into the formation of reference wages. In contrast to Kahneman et al. (1986), this approach results in a unified concept of reference-wage formation for both newcomers and incumbents: in both cases, workers can use the average wage earned by similar others to judge the fairness of their current salaries.

On the basis of this process of reference-wage formation and the gift-exchange view of labor relations, we specify the following hypothesis:

Hypothesis 1: *Wage deviations from a player's reference wage lead to changes in the player's performance.*

To make our analysis directly comparable to previous studies, we split Hypothesis 1 into the following two directional hypotheses.

Hypothesis 1a: *Under positive reciprocity, overpayment ("fair wages") results in increased worker performance.*

Hypothesis 1b: *Under negative reciprocity, underpayment ("unfair wages") results in reduced worker performance.*

Some researchers have argued that there is a tendency in individuals to react more strongly to unfair behavior than to reward the same degree of fair behavior (Kirchler et al., 1996; Baumeister et al., 2001; Cohn et al, 2009). Because this argument has been empirically supported in a number of studies (Al-Ubaydli and Lee, 2009; Charness, 2004; Kube et al., forthcoming a; Offerman, 2002), we also propose a hypothesis about the relative strength of positive and negative reciprocity.

Hypothesis 2: *Unfair wage allocations lead to larger (in absolute terms) performance changes than fair wage allocations.*

3. Data and Empirical Analysis

3.1 The Institutional Design of the German Bundesliga

The German Bundesliga enjoys the highest weekly attendance of all European soccer leagues, and has the second highest profitability and revenues among European soccer leagues. For instance, in the 2007/08 season, the league generated revenues of 1.44 billion Euro, resulting in profits of 136 million Euro (Deloitte, 2009).

The 1. Bundesliga consists of 18 teams that compete with each other to win the German championship, to qualify for international competitions, and to avoid relegation to the lower division (the three worst-performing teams are relegated to the 2. Bundesliga). Throughout the course of a season, each team plays each other team twice, once at the team's home field and once at the competitor's home field. Most of the matches are played on Saturdays and Sundays, starting at 3:30 pm (Saturday) or 5:30 pm (Sunday). Moreover, a team that plays at home on a particular weekend will usually have to play at a competitor's home field on the subsequent weekend. Thus, at the end of the season, each team will have played 34 matches, 17 of them being home matches.

3.2 Sample Description

Our data contain information on 487 professional soccer players for the 2001/02–2005/06 period. We are thus able to study player behavior over 5 consecutive seasons. For each player, we have precise information on his playing position, season performance, minutes spent on the field, and team affiliation. This information was obtained from Opta Sports, a professional company that specializes in the collection and provision of sports data[3].

Opta Sports evaluates player performance using the so-called Opta Index. This index has been in use by the company over the last 14 years and is highly respected by team officials. The index reflects a weighted average of a very large number (>100) of individual performance values, such as goals, passes, tackles, shots on target, player sanctions, dribbles and runs, and clearances. These values are collected with the help of voice-recognition software that enables real-time catchment. In addition, performance measurement is position specific (e.g., goals conceded, catches made and balls dropped refer to goalkeepers only),

[3] Opta Sports is the official data provider for the English Premier League and provides many teams in the 1. Bundesliga with in-depth data coverage of their players' performance values. However, their data are not publicly available, and the company charges a fee for the provision of player performance values. Unfortunately, financial constraints prevented us from obtaining a more comprehensive dataset from Opta Sports.

generating an unusually detailed measure of each player's performance. An important feature of the Opta Index is its position-related weighting of specific performance values; for instance, goal scoring is inherently required from strikers but represents an outstanding performance for defenders. In summary, the Opta Index makes player performance comparable across players within the same tactical position and should thus be considered an objective, independent expert evaluation of individual player performance.

In addition to performance-related information, we collected information on players' age, experience (measured in previous 1. Bundesliga matches), and tenure with the current team from the print version of *Kicker Sportmagazin* and its website. This magazine is by far the most traditional, most prestigious soccer magazine in Germany. It is published twice weekly and has been published in its current format since 1968. Between seasons, *Kicker Sportmagazin* publishes a special issue, which contains detailed information on teams' most recent player transfers. For each player, we rely on these special issues to infer the abovementioned characteristics, as well as height, weight, and nationality.

Whereas performance and worker characteristics can thus be very accurately measured in connection with German soccer, we have to rely on salary proxies for our analysis, as players' salaries are not officially published by the Bundesliga. These proxies are taken from *Kicker Sportmagazin* in the form of market value estimates. To construct these estimates, a specific set of *Kicker* journalists follows each team in the German Bundesliga. Torgler et al. (2008) state that team-journalist relationships remain almost identical over several years, which makes the data "likely to be consistent since it has been collected in a consistent and systematic manner" (p. 16). Overall, the adoption of market values from *Kicker Sportsmagazin* as proxies for player salaries has become a well-established procedure in the literature.

Table 1 displays summary statistics for all observations in our sample. Market wages appear to be realistic and range from 100,000 to 11 million Euro.

-Insert Table 1 about here –

Although it is difficult to interpret the absolute number of 750 as a representation of player performance, it is important to note that performance varies considerably across players, with eight players even exhibiting negative values on the Opta Index. A negative value may result from, for instance, own goals or a very bad performance over a relatively short time horizon. As Table 1 reveals, we chose to include only players who appeared on the field for at least 90 minutes in a given season. This duration was chosen because it corresponds to the length of one full match. This procedure ensures that our results are not influenced by substitution players, who appear rather irregularly on the playing field and may thus have special working motivations. On average, a player in our sample plays almost 18 complete matches (17.6 = 1580/90), with some players playing every match within a season (34 = 3060/90). Player age ranges from 17 to 39 years, with an average of approximately 27 years. Finally, players have on average played 96 matches in the 1. Bundesliga before the beginning of a season.

Before turning to our modeling approach for fairness considerations and worker performance, and because the composition of the league changes between seasons, we provide an overview of all teams that played in the German 1. Bundesliga in our sample period in Table 2. For each team, this table displays the seasons in which the team appears in our sample. As Table 2 reveals, the overall number of teams involved in our estimations is 24, with some teams, such as Bayern Munich, Schalke or Stuttgart, appearing in all seasons, and other teams appearing inconsistently, such as St. Pauli or Frankfurt, which appear in only one and two seasons, respectively.

-- Insert Table 2 about here --

3.3 Modeling Fairness Considerations and Worker Performance

The exact measurement of performance values notwithstanding, sports players have considerable discretion about their performance level, as effort is not directly observable, and contracts are necessarily incomplete. In this regard, the relationship between a sports player and his team closely resembles most employer-employee relationships in other industries.

To determine the reference wage for a player, we specify a Mincer-type (excluding schooling) wage equation (Mincer, 1974). In particular, we predict a player's fair market value from his age and experience. To control for employer-specific human capital, we also account for a player's tenure with his current team.

In addition to these standard explanatory variables, evidence from multiple experimental studies suggests the inclusion of a player's previous performance as well; Charness et al. (2004) found previous performance to influence wage offers by employers in repeated gift-exchange games. Moreover, "most workers in fact feel that fairness requires a relation between remuneration and performance" (Akerlof and Yellen, 1988; 48). Therefore, we specify the wage equation as

$$w_{ijtp} = \beta_0 + \beta_1 performance_{i,t-1} + \beta_2 minutes_{i,t-1} + \beta_3 age_{it} + \beta_4 age_{it}^2 + \beta_5 exper_{i,t-1} + \beta_6 exper_{i,t-1}^2 + \beta_7 tenure_{it} + \beta_8 tenure_{it}^2 + \alpha_i + \gamma_t + \theta_j + \pi_p + \epsilon_{ijtp} \quad (1)$$

where w_{ijtp} denotes player *i*'s wage in season *t* when playing for team *j* in position *p*. We model a player's wage in season *t* as a function of his performance in the previous season ($performance_{i,t-1}$), the number of minutes that he played in the previous season ($minutes_{i,t-1}$), nonlinear functions of his age in season *t* (age_{it}, age_{it}^2), his Bundesliga experience at the end of season *t-1* ($exper_{i,t-1}, exper_{i,t-1}^2$), and the number of years that he has been with his current team ($tenure_{it}, tenure_{it}^2$). Player ($\alpha_i$), time ($\gamma_t$) team ($\theta_j$), and position ($\pi_p$) fixed effects are included to reflect differing degrees of unobservable heterogeneity. Player fixed effects, for example, adjust for unobservable productivity components between players. Team effects, in turn, are included to capture wage level differences across teams, and seasonal dummies reflect different profitability conditions of the *league as a whole*. For example, during our sample period, the Bundesliga suffered from lower TV revenues as a result of the bankruptcy of media entrepreneur Leo Kirch. Consequently, teams faced substantial deductions in TV revenues, which most likely had an effect on player salaries.

By using the fitted values from equation (1), we are effectively modeling the average wage payment for a player with the same individual characteristics as player *i* in season *t* (age, tenure, and employer) and the same performance as player *i* in season *t-1*. This model gives us an estimate of player *i*'s reference wage at the beginning of season *t*. We denote this reference wage by *r*.

As we now demonstrate, this estimate enables us to model worker performance as a function of the utility that he derives from the wage payment. Specifically, we assume that the utility that the player gets from wage *w* depends on his reference wage *r* as follows:

$$u(w,r) = \alpha\, v(w) + (1-\alpha)\{Fair(r) + \lambda * Unfair(r)\} \quad (2)$$

where $\alpha \in [0,1], v(w)$ is the consumption utility component and $\{Fair(r) + \lambda * Unfair(r)\}$ denotes the fairness utility component (which depends on the reference wage). During the estimations, we assume $v(w) = log(w)$ such that player utility is concave in wages. Using the estimate for the reference wage, we construct *Fair(r)* and *Unfair(r)* from the difference in the utility of the current wage and the utility of the reference wage. If this difference is positive (such that the player received more utility from the current wage than what he would have received from the reference wage), the variable *Fair(r)* takes on this difference. If, in contrast, this difference is negative, the variable *Unfair(r)* takes the absolute value of this difference. Note also that we set the value of the *Fair(r)* [*Unfair(r)*] variable to be zero whenever *Unfair(r)* [*Fair(r)*] takes on a positive value. Therefore, we are modeling the fairness utility component as a piecewise linear function, where λ in equation (2) measures the extent to which individuals react more strongly to unfair wage allocations than to fair wage allocations.

In a second stage, we model worker performance as a function of a player's current wage and fairness perceptions (where we drop the dependence of *Fair* and *Unfair* on *r* for reasons of readability.):

$$\log(performance_{ijtp}) = \beta_0 + \beta_1 \log(w_{ijtp}) + \beta_2 Fair_{ijtp} + \beta_3 Unfair_{ijtp} + \alpha_i + \gamma_t + \theta_j + \pi_p + \epsilon_{ijtp} \quad (3)$$

In equation (3), we include a full set of player (α_i), seasonal (γ_t), team (θ_j), and position (π_p) fixed effects. Seasonal, position and team fixed effects are important because they reflect outside conditions for a player (within the season and position). As shown by Falk et al. (2003, 2008), the available outside options for a proposer in an ultimatum bargaining situation determine the responder's received intention behind a certain action. These intentions are an important influence on fairness perceptions of specific allocations. Therefore, we would not expect players to punish unexpectedly low wages paid by a team that is not profitable or in a situation in which general wages are particularly low. We estimate equation (3) by ordinary least squares (OLS) and adjust standard errors for clustering on the player level. Note that we expect $\beta_3 < 0$, and $\lambda = \frac{\beta_3}{\beta_2} < -1$.

Figure 1 summarizes the assumed timeline underlying our analysis.

-Insert Figure 1 about here -

Concluding this section, we want to emphasize that the log-log specification of equation (3) reflects nicely on the reasoning of the fair wage-effort hypothesis “that effort is proportional to the wage for workers paid less than the subjectively determined fair wage” (Akerlof and Yellen, 1988; 48). This feature is readily integrated into our approach because the logarithmic utility function implies that fairness is measured as the logarithmic “return” from the current salary relative to the reference wage. Thus, our approach makes fair and unfair wage allocations comparable across their underlying distributions.

4. Results

In this section, we first present the estimation results from our wage equation. Next, we document descriptive evidence that worker performance differs between over- and underpaid workers. To determine the extent to which this difference is driven by positive reciprocity, negative reciprocity, or a combination of both, we subsequently present results from a linear regression approach. Finally, we aim to shed light on the motivational concerns of workers that underlie these results.

4.1 Predicting Fair Wages

Table 3 displays the estimation results of a linear regression model for a player's next-season wage on his performance in the previous season and on his individual characteristics. All coefficients in Table 3 reveal the expected signs. In line with our reasoning from the theoretical section, we find the previous season's performance to improve this season's wage level for a player. Similarly, greater experience leads to higher wages, in terms of both absolute number of match appearances and playing minutes in this season. Interestingly, professional soccer players also reveal the well-known nonlinear relation between age, experience and wages, as reflected in the obtained concavity. Analyzing these concave relationships in greater detail, we find player values to be maximized, *ceteris paribus,* around the age of 22 years and after 219 matches in the German Bundesliga. Comparing these values to the summary statistics in Table 1, we see that these values lie in the observed range for players in our sample. Whereas the point estimates on firm-specific human capital also reveal a concave relationship, these coefficients are not statistically significant.

-- Insert Table 3 about here --

4.2 Subsequent Player Performance

Building on the average market wage to serve as a reference wage for fairness considerations, we are able to derive for every player in each season, whether he was in a “fair” state, where his wage exceeded his reference wage, or whether he was in an “unfair” state. A simple descriptive analysis reveals the performance levels of the workers to differ substantially across both states. Whereas the average subsequent performance value of players who earn at least their reference wage equals 812.28, the average performance of players who are in an unfair state equals 707.21. This difference is highly statistically significant (a *Wilcoxon-Mann-Whitney* test[4] yields z = 7.40, p-value < 0.001). This result is in line with Hypothesis 1, which states that wage deviations from the reference wage lead to performance changes. Although this result is already interesting in itself, the adoption of a linear regression model is needed to determine whether this finding should be attributed to better performance from overpaid workers (Hypothesis 1a), worse performance from underpaid workers (Hypothesis 1b), or a combination of the two.

-- Insert Table 4 about here –

Column 1 in Table 4 shows the estimation results for equation (3)[5]. The associated performance sensitivities to the over- and underpayment amount are 0.100 and -0.249, respectively. In addition, we document a statistically significant *negative* influence from higher absolute wages on worker performance. Although we were surprised by this coefficient, this finding could result from the downward stickiness of player wages. If wages are slightly increasing with age, but performance is decreasing with age, downward sticky wages may lead to the observed effect.[6] In columns 2 and 3, our model is subsequently extended to control for team and player position effects, respectively.

We find workers' responses to fair and unfair wage allocations to be extremely robust to the inclusion of team and position fixed effects: independent of these additional controls, the performance sensitivity to overpayment remains at approximately 0.08 whereas the absolute sensitivity to underpayment remains at approximately 0.26. The relative size of positive to

[4] This test is also known as *Wilcoxon rank-sum* or *Mann-Whitney U* test.
[5] The difference in the number of observations from Tables 3 and 4 is caused by 34 observations, for which predicted wages were negative (partly due to very low performance values).
[6] We are grateful to an anonymous referee for this insight.

negative sensitivities is -3.15, which suggests workers' disposition to punish underpayment to be stronger than the disposition to reward overpayment. A formal test, however, fails to reject the null that the ratio of positive to negative reciprocal behavior (*lambda*) is significantly different from -1. Therefore, we find only illustrative evidence for Hypothesis 2. Nevertheless, in line with Hypotheses 1a and 1b, we find both positive and negative deviations from the reference wage to influence worker performance.

4.*3 Motivational Concerns for Reciprocity*

Are the documented findings in Table 4 attributable to worker reciprocity? Or do these findings mirror personal self-interest in receiving future gifts from employers? For underpaid workers, the answer to the influential role of reciprocity is affirmative. The reader will recall from Table 3 that seasonal performance is positively associated with subsequent wage expectations. This association implies that workers' reaction of reducing their performance in response to unfair payments is not in their best self-interest. *Homo oeconomicus* would therefore never engage in such kind of behavior. However, this finding is in line with our theoretical predictions for *homo reciprocans*.

To determine whether positive reciprocity is the mechanism underlying performance increases for fairly treated workers, we separate players who changed teams between season *t-1* and season *t* from those players who remained with their team. Whereas these two groups of players face comparable career incentives (or other aspects of personal self-interest), previous findings by Gneezy and List (2006) reveal that positive reciprocity decreases with the duration of an ongoing working relationship. In line with these findings, we predict that positive reciprocity is higher for players who have moved to a new team (i.e., who are at the beginning of a new working relationship) than for players who have already been with their team for some time.

-- Insert Table 5 about here –

Table 5 presents separate estimation results for changing and non-changing players. The results show the previous pattern of positive and negative performance effects from wage differentials for non-changing workers. In line with our expectation, changing players are much more motivated to repay gifts (high wages) from their new employers; in comparison to non-changing players, changing workers' performance sensitivity to overpayment is approximately 44 times greater. Table 5 also shows that changing players do not punish "unfair" wages. This observation is in line with the gift-exchange view. Recall that the size of the gift from the employer is equal to the wages in excess of what a player could earn with another team. If a player is moving to a team that pays him less than his reference wage, then all other wage offers must have been below the wage offer that he eventually accepted (we consider the importance of non-monetary utility in the decision making of changing players below); despite its low level, the current wage actually represents a gift from the new employer. In consequence, the player has no reason to punish the new team for being "unfair".

We would also like to note that Table 5 supports our previous interpretation that downward wage stickiness drives the negative coefficient on *log(wage)*. Here, we observe that the negative effect is nonexistent for those players who change teams; in these situations, a new contract will be much more flexible in the downward direction than a prolongation of an existing contract for non-changers.

The detected difference raises the question of whether the distribution of unfair and fair wage deviations, wages, and performance levels differs between the two groups. We address this concern in Table 6 and provide *Wilcoxon-Mann-Whitney* tests for key worker characteristics for changing and non-changing players.

-- Insert Table 6 about here –

Table 6 does not reveal any meaningful statistical differences for the explanatory variables from our performance or wage equation, i.e., for wage, *Fair, Unfair,* age, playing minutes, and performance levels, the groups of non-changing and changing workers are comparable. Therefore, our finding cannot be attributed to differences across members the two groups.

However, a potential concern about our descriptive analysis is that we do not incorporate non-monetary utility sources for players in Table 6.[7] Specifically, rational players should change teams whenever doing so increases their expected career earnings. Therefore, players might be willing to trade immediate short-term wages with non-monetary aspects, such as expected playing time with the new team, the opportunity to become a team leader, or to play in international competitions, all of which could ultimately increase the player's wages at some later point. If this is the case, we will have another, non-fairness-related explanation for why changing players do not punish low wages.

Although we are unable to measure precisely a player's playing time expectations (which might partly relate to unobservable contractual arrangements) and opportunity to become a team leader, we are able to objectively measure each team's participation in international, European competitions. Therefore, we chose to integrate only this non-monetary aspect in the descriptive analysis. Specifically, we collected information on all Champions

[7] We are grateful to an anonymous referee for bringing this point to our attention.

League (CL) and European League (EL) participants from the German Bundesliga for the 2001/02–2005/06 period and created a dummy variable, *international competition*$_{jt}$, which takes the value 1 if team *j* played in the CL or EL in season *t* and takes the value 0 otherwise. We then calculated for each player *i* the difference in *international competition*$_{jt}$ between his team *j* in season *t-1* and his team *j'* in season *t* (for non-changing players *j* equals *j'*). Note that this difference variable, denoted by *d(international competition*$_{ijt}$*)*, can take three values:

1) *d(international competition*$_{ijt}$*)= -1:* player *i*'s current team does not play in an international competition but his previous team did.
2) *d(international competition*$_{ijt}$*)= 1:* player *i*'s current team does play in an international competition but his previous team did not play in an international competition in season t-1.
3) *d(international competition*$_{ijt}$*)= 0:* no difference in the international competition status between player *i*'s team in season *t* and his previous team in season t-1.

If players are willing to forego higher wages for the previously unavailable opportunity to play in an international competition, we predict that (a) on average, *d(international competition*$_{ijt}$*)* is higher among the group of changers than among the group of non-changers, and (b) changing players are more likely to be in the unfair state when the value of the difference variable is greater. Therefore, in our model, *unfair*$_{ijt}$ and *d(international competition*$_{ijt}$*)* are positively correlated. However, none of these predictions is supported by the data: in contrast to (a), we observe that the value on *d(international competition*$_{ijt}$*)* is in fact lower among changing players (-0.028) than among non-changing players (0.073). Although this difference is statistically significant at the 5% level (*Wilcoxon-Mann-Whitney* test: z=2.05), this effect does not suggest that players change teams often for the opportunity to play in international competitions (relative to their experience with their previous employer in the last season). Analyzing the correlation between *unfair* and *d(international competition)* for changing players, we observe a value of -0.0668, which is not statistically significant at any conventional level. Although this evidence is not conclusive, we do not believe that the difference in the performance for changing and non-changing players mainly reflects the willingness of changing players to trade off short-term wages against non-monetary utility components that might improve the player's career opportunities in the long run.

In consequence, the detected performance differences between changing and non-changing workers rule out another easy alternative explanation for our results, namely, that the detected behavior stems from omitted variable bias. A critical reader might argue that the documented pattern is most easily explained by omitted variables in our wage prediction because players perform better when their wage is higher than the amount predicted from equation (1) but perform worse when their wage is lower than predicted. However, omitted variable bias cannot explain the asymmetry in behavior from changing workers—why should they not perform worse when their wage is lower than predicted but much better when their wage is higher than predicted? However, from the perspective of fairness perception, this asymmetry is easily explained.

Nevertheless, we decided to address the omitted variable bias problem from yet another perspective in the next subsection.

4.4 Robustness Checks

The above results reveal that players' performance response to fair and unfair wage allocations follow a clear pattern that is perfectly in line with the gift-exchange view and previous laboratory evidence. We now show that our findings are robust to the inclusion of a player's current wage in the wage equation (section 4.4.1), or performance expectations, and injury proxies (section 4.4.2).

4.4.1 Using Current Wages to Predict the Reference Wage

Including a player's current wage as an additional explanatory variable in equation (1) may be based on two theoretical grounds. First, the reader should recall from section 2 that a worker's current wage is traditionally considered the relevant reference wage for fairness evaluations of incumbent workers. Although we emphasized the importance of market values in the highly transparent soccer industry, fairness perceptions may still be conditioned on current wage levels. Including current wages in equation (1) thus provides a more general approach with respect to formation of the reference wage. Second, the incorporation of a player's current wage level reduces any persistent omitted variable bias in our wage equation. That is, if there are any long-term factors missing from equation (1) that determine the player's value for a team, the inclusion of the current wage should help to mitigate this problem.

-- Insert Table 7 about here –

Table 7 displays estimation results for our performance equation when a player's current wage is included to form his fair wage perception. The results show a qualitatively identical pattern for players' response to fair and unfair wage levels and support our previous conclusions.[8]

4.4.2 Using Performance Expectations to Predict the Reference Wage[9]

At the time of contract negotiations, players have certain expectations about their future performance. As these expectations are missing from our wage regression (1), some readers might be concerned that our previous findings merely reflect alternating player performances

[8] We also found it encouraging that this finding is robust to whether we use a fixed-effects linear regression model or an Arellano-Bond dynamic panel data model for the wage prediction. The results for the Arellano-Bond approach are available from the authors upon request.

[9] We are grateful to an anonymous referee for bringing this point to our attention.

in the presence of roughly constant player wages. Specifically, consider a player who was injured for the majority of season *t-1* but recovered before the beginning of season t. This player should be expected to perform better in season t than in season t-1, suggesting that our previous model underestimates his true reference wage for season t (because of his low values for playing minutes and performance). If, at the same time, his true wage did not change significantly, he would be likely to end up in a *fair* state. In combination with improved performance after his recovery, this lack of a change might give rise to the previously detected pattern.

Unfortunately, we were unable to incorporate a player's exact injury status in our wage regression because this information is not publicly available for our sample period. Therefore, we must construct a proxy variable. We start by calculating for each player the ratio of his playing time in season *t-1* to his playing time in season *t-2*. The idea is that if a player had been severely injured in season *t-1*, then his playing time in this season should have been considerably lower than his playing time in season *t-2*. We then create a dummy variable, *injury,* which takes the value 1 if a player's playing time ratio is among the lowest decile of all players in our sample. Note that if this variable correctly picks up on a player's intermediate injury status in season t-1, we expect that this variable will have a positive effect on a player's reference wage, as his expected performance in season t is likely to be underestimated from his performance in season t-1 (when he was injured).

In addition to this injury status variable, we also adjust our wage regression model (1) by including a player's performance expectation *based on observables*. To this end, we first run a linear regression model of a player's performance in season *t* on his playing minutes in season *t-1,* his age in season *t*, his experience at the end of season *t-1,* and his tenure with the team in season *t*. For age, experience, and tenure, we also incorporate squared terms in the regression to capture nonlinearities between performance and these regressors. Therefore, the fitted values of this regression capture the expected performance of a player given his observable characteristics at the end of season *t-1* (such as his experience and previous playing time) and deterministic information in season *t* (such as his age or tenure).

The associated estimates for the wage equation (given in Table A.1 in the Appendix) show a positive yet nonsignificant effect of the performance expectation variable. In line with our expectations, the injury status variable positively affects a player's expected wage. The estimated coefficient is very large (385,226.10) and statistically significant at the 5% level. We note that most of the other variables maintain their statistical significance, even in the presence of the performance expectation term.

-- Insert Table 8 about here –

Table 8 displays the estimation results for our performance equation when we control for injury status and performance expectations based on observables. Except for the statistical nonsignificance of *fair* in Model 1, the results show a qualitatively identical pattern in players' responses to fair and unfair wage levels and corroborate our previous findings.

Concluding our section on the empirical results, we document a positive correlation between fair wages and team success. Whereas the average subsequent team ranking for players with an unfair wage allocation is 9.84, it is substantially better, amounting to 7.18, for teams with fairly paid players (*Wilcoxon-Mann-Whitney* test: z=-7.90; p<0.01). These results are particularly interesting, as they suggest the theoretically predicted positive relationship between fair treatments of workers and firm success.

5. Discussion and Conclusion

This paper provides field-data evidence that positive and negative wage deviations from market-level entitlements influence worker performance. Like earlier experimental studies on gift exchange in the field, our non-experimental analysis only reveals a small effect of raising wages above the market level on performance. In response to a 1% wage increase (relative to the reference wage), seasonal performance improves by approximately 0.10%. This observation is in line with the previously detected range of 0.07 to 0.38 in the literature (Kube et al. forthcoming b). In contrast to many previous studies, however, we find this effect to be statistically significant. Likewise, lowering wages below a worker's reference wage results in small but statistically significant deteriorations in work performance. When employers lower wages below the reference wage by 1%, performance deteriorates by 0.25%. Whereas our point estimates from various specifications consistently support the notion that "hurting hurts more than helping helps" (Offerman, 2002), we cannot reject the null hypothesis that the effects are of equal absolute size. A likely explanation for this finding is that reputational concerns among professional soccer players are offsetting the negative effect from underpayment. Support for this interpretation comes from Al-Ubaydli et al. (2009), who found that positive reciprocity is stronger than negative reciprocity in markets in which reputational concerns play a role.

In a subsequent analysis, we are able to relate these findings to fairness concerns of workers rather than to personal self-interest. For workers who move to a new employer, a 1% wage increase above the market level results in a 3.0% performance improvement. Whereas these workers' reputational concerns are comparable to those of non-moving workers, this finding supports the previously detected decrease in worker reciprocity over the course of a working relationship (Gneezy and List, 2006).

This paper makes several contributions to the existing literature on worker reciprocity. First, to the best of our knowledge, our study is the first non-experimental field study on positive *and* negative worker reciprocity. Observational studies in this area are scarce. Mas (2006) studies the performance response of policemen to arbitration results and shows wage expectations to serve as a reference point for worker behavior. However, in contrast to our study, he cannot observe reciprocal behavior, as wages are set by an independent third party. Krueger and Mas (2004) find the number of defective tires to increase significantly following labor strikes. Lee and Rupp (2007) study in-time flights (a proxy for pilot effort) as a behavioral response of pilots to wage cuts but find only limited evidence that wage cuts lead to reduced pilot effort. A unifying feature of these studies (and most lab and field experiments) is that they focus on either positive or negative worker reciprocity. Our analysis differs from this approach and complements previous findings by studying both behavioral patterns on the same data.

Second, we derive a player's fair wage perception from a Mincer-type wage equation that also includes the player's previous seasonal performance value. This perception serves as the reference wage against which fair and unfair payments are compared. This approach reflects Akerlof and Yellen's observation that "most workers in fact feel that fairness requires a relation between remuneration and performance" (Akerlof and Yellen, 1988; 48). Indeed, the same observation has been made for subjects' behavior in the laboratory (Charness et al., 2004). Our procedure thus differs from field experiments, which frequently offer a certain payment during the recruitment process, which may subsequently be altered to induce reciprocal behavior. A problem with this later approach stems from the observation by Cohn et al. (2009) that worker reciprocity is affected by the perceived fairness of the wage offer in the first place; unfortunately, the origin of this fairness perception is often unclear.

Third, our field environment differs from most studies because it involves multi-period interaction between workers and employers, which is why workers have the self-interest to perform well and establish a good reputation. The observation that workers exhibit reciprocal behavior in such a setting thus extends previous evidence, which is frequently based on one-shot games to explicitly rule out reputation concerns of workers.

Finally, our analysis contributes to the literature because it uses a very large number of observations from 487 workers. Our data thus substantially exceed the typical number of observations in field experiments.

Our findings have important managerial implications for wage setting, as they suggest that market transparency influences fairness perceptions. As stated by Cohn et al. (2009), "…little is known about how workers' perceived fairness of their wage depends on the wages to their co-workers" (p.14). The findings from our study suggest that workers incorporate available information from the market (comprising co-workers and non-co-workers) to form wage entitlements. Recent empirical evidence supports this argument.

In a laboratory real-effort experiment, Greiner et al. (2010) had subjects work in two stages. In the first stage of the experiment, all subjects received identical wages. In the second stage, wage differentials were introduced that were either known to the workers (transparent condition) or not (control condition). The authors were interested in learning whether transparency influenced effort choice in both fixed and piece-rate wage schemes. They found transparency to increase performance for high wages and to decrease performance for low wages. Although the direction of the difference between the wage groups was similar between fixed and piece-rate wage schemes, the difference was only statistically significant for the latter group. Though very illustrative, their evidence is based on only 129 subjects, which is a considerably smaller number of workers compared with our sample.

Combining our findings with those by Greiner et al. (2010) enables us to understand anecdotal evidence on wage increases for top managers following legal publication requirements for companies. Although such requirements were originally created with the intention to limit bonuses and salaries, they have also created improved transparency in wage differentials and thus influenced the fairness perceptions of top managers. As “underpaid” managers believed themselves to be subject to unfair treatment, their salaries had to increase to impede negative performance effects. The “fair” response of more able top managers was then to increase their own salaries even further.

It is difficult to find plausible alternative interpretations of our findings. However, as pointed out to us by an anonymous referee, one alternative interpretation could be that our findings reflect inequality aversion (Bolton and Ockenfels, 2000; Fehr and Schmidt, 1999) by workers and/or preferences for process fairness (Bolton et al., 2005; Trautmann, 2009; Krawczyk, 2011) instead of worker reciprocity. Although we cannot fully exclude the possibility that these mechanisms partly influence our findings, we believe that the gift-exchange view provides the behaviorally more plausible explanation for our findings.

Models of inequity aversion (Bolton and Ockenfels, 2000; Fehr and Schmidt, 1999) propose that some individuals dislike unequal payoffs. Although subjects can easily determine the degree of inequality in most experimental settings, the required calculations easily become computationally overwhelming for players in our setting. There are two reasons for this complexity. First, at the time of contract negotiations, the size of the “pie” is unknown to workers and team owners. Determining inequality among players thus requires each player to form probabilistic beliefs about all potentially resulting pie sizes. Second, while this procedure is already computationally involved, its complexity becomes overwhelming in the presence of team production processes. Beliefs regarding the potential pie sizes require each player to form beliefs about the performance levels of every single co-worker (all of whom contribute to the joint production process). In contrast, the gift-exchange view only requires that players observe other players’ wages and that they calculate the average wage among similar other players.

Our choice of reference wage reduces the explanatory power of models on procedural fairness (Trautmann, 2009; Krawczyk, 2011) for our findings. These models use the differences in (average) expected values across players as a measure for procedural fairness. However, as we construct a player's reference wage from the average wages of similar others there is no room for procedural unfairness among similar co-workers. Consequently, procedural fairness plays only a minor role in our setting. Concerning the interaction between players and team owners, the computational complexity for players to form the expected payoff of the team owner is again very complex, making the gift-exchange view the more intuitive explanation.

Another explanation for our findings could be that market wages may not serve as the reference wage for fairness considerations but as a "neutral" income target for workers. Previous studies by Camerer et al. (1997) and Farber (2005, 2008), for instance, have shown that New York City Taxi drivers' labor supply is influenced by daily income targets. However, these studies show that drivers spend long hours on days with low wages and that they stop working early on days with high wages. In other words, these studies would make the prediction that players *increase* performance in response to wages below their income target. Our empirical findings clearly reject this view.

Finally, an alternative approach might be to explain our findings by disappointment aversion of individuals (Bell, 1985). For disappointment averse players, payments above and below market wage would result in elation and disappointment, respectively. Because affective states have been documented to determine work performance, happy workers would perform better than disappointed workers. However, this theory cannot explain why changing and non-changing workers react differently to wage differentials from the market level.

Our results also raise new exciting questions for future research. If reciprocity can also be encountered in team production technologies, we must know more about the underlying mechanisms. For instance, how does the negative reciprocity of a worker who feels unfairly treated affect the performance of co-workers in the presence of piece-rate contracts? In addition, future studies must address the influence of fairness considerations on work performance over time. If, in our data, newly arriving workers do not respond to low wages but established workers do, more work is needed on the transition timing and associated fairness perceptions that lead formerly new-arrivals to finally start punishing low wages.

ACKNOWLEDGEMENTS

We are grateful to Zdenko Ninkovic at Opta Sports for the provision of information on the Opta Index and player's playing time and to two anonymous referees for their insightful comments and suggestions. We also thank Björn Bartling, Donja Darai, Armin Falk, Ed Lazear, Stephan Nüesch, and participants at the International Meeting in Experimental and Behavioral Economics (IMEBE) 2011, Colloquium in Personnel Economics 2011, WK ORG 2011, Economics and Psychology of Football 2010, and the Conference on European Sports Economics 2010 for helpful comments and suggestions.

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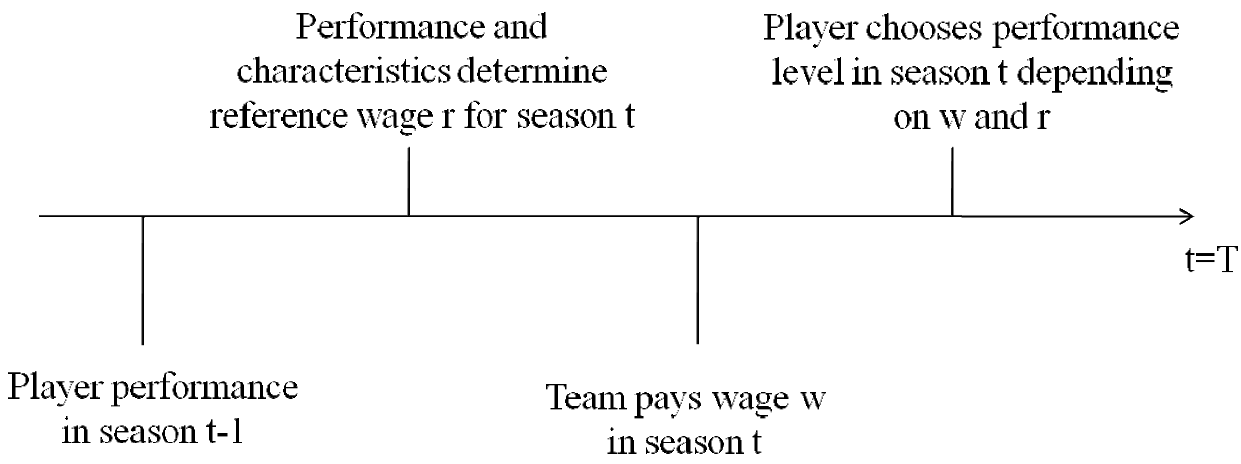
FIGURES

Figure 1: Timeline of the Analysis



TABLES

Table 1: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max	# Obs.
Log (Wage)	14.33	0.71	11.51	16.21	1,009
Wage (in Mio Euro)	2.13	1.60	0.10	11	1,009
Performance	750.39	231.70	-247	1,847	1,009
Time on Pitch	1,597.63	874.37	90	3,060	1,009
Age	27.28	3.94	17	39	1,009
Experience	95.74	81.78	2	471	1,009

Note: Displayed are summary statistics for professional soccer players in the German Bundesliga in the period 2001/02 – 2005/06. The players included appeared at least 90 minutes (equivalent of one complete match) in a season on the playing field.

Table 2: Teams in the German Bundesliga (2001/02 – 2005/06)

Team	2001-02	2002-03	2003-04	2004-05	2005-06
Bayern Munich	X	X	X	X	X
Leverkusen	X	X	X	X	X
Hertha BSC Berlin	X	X	X	X	X
Dortmund	X	X	X	X	X
Kaiserslautern	X	X	X	X	X
Wolfsburg	X	X	X	X	X
Hamburg	X	X	X	X	X
Duisburg					X
1860 Munich	X	X	X		
Schalke	X	X	X	X	X
Stuttgart	X	X	X	X	X
Freiburg	X		X	X	
Bremen	X	X	X	X	X
Rostock	X	X	X	X	
Frankfurt			X		X
Nuremberg	X	X		X	X
Bochum		X	X	X	
Mönchengladbach	X	X	X	X	X
Bielefeld		X		X	X
Cologne	X		X		X
Cottbus	X	X			
St. Pauli	X				
Hannover		X	X	X	X
Mainz				X	X

Table 3: Estimation Results for the Wage Equation

Variable	Coefficient		Std. Error
Performance	1,072.37	***	(220.05)
Playing Time	445.14	***	(70.88)
Age	678,421.40	**	(270,986.10)
Age^2	-15,628.57	***	(5,954.92)
Experience	16,940.47	**	(6,928.95)
$Experience^2$	-38.65	***	(13.41)
Team Tenure	17,837.71		(46,137.98)
$Team\ Tenure^2$	-485.61		(4,505.67)
Player Fixed Effects		Yes	
Season Fixed Effects		Yes	
New Team Fixed Effects		Yes	
Position Fixed Effects		Yes	
R^2 (within)		0.41	
N		1,009	

Note: Displayed are the OLS estimation results for the estimation equation $w_{ijtp} = \beta_0 + \beta_1 performance_{i,t-1} + \beta_2 minutes_{i,t-1} + \beta_3 age_{it} + \beta_4 age_{it}^2 + \beta_5 exper_{i,t-1} + \beta_6 exper_{i,t-1}^2 + \beta_7 tenure_{it} + \beta_8 tenure_{it}^2 + \alpha_i + \gamma_t + \theta_j + \pi_p + \epsilon_{ijtp}$, where w_{ijtp} denotes player i's wage in season t, $performance_{i,t-1}$ denotes seasonal performance in season $t-1$, and $minutes_{t-1}$ denotes player i's total minutes on the playing field in season $t-1$. The included observations are all players in the sample that appeared at least 90 minutes on the playing field for a given season. Heteroskedasticity-robust standard errors are given in parantheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Table 4: Estimation Results on Player Performance (All Players)

	Model 1			Model 2			Model 3		
Variable	**Coefficient**		**Std. Error**	**Coefficient**		**Std. Error**	**Coefficient**		**Std. Error**
Log(Wage)	-0.168	***	(0.054)	-0.172	***	(0.047)	-0.172	***	(0.048)
Fair	0.100	**	(0.045)	0.082	**	(0.042)	0.083	**	(0.041)
Unfair	-0.249	***	(0.085)	-0.261	***	(0.081)	-0.259	***	(0.083)
Player Fixed Effects	Yes			Yes			Yes		
Season Fixed Effects	Yes			Yes			Yes		
New Team Fixed Effects	No			Yes			Yes		
Position Fixed Effects	No			No			Yes		
Lambda	-2.49			-3.18			-3.12		
R^2	0.04			0.21			0.21		
N	975			975			975		

Note: Displayed are the OLS estimation results for the estimation equation $\log(\text{performance}_{ijtp}) = \beta_0 + \beta_1 \log(\text{wage}_{ijtp}) + \beta_2 \text{Fair}_{ijtp} + \beta_3 \text{Unfair}_{ijtp} + \alpha_i + \gamma_t + \theta_j + \pi_p + \varepsilon_{ijtp}$, where $\log(performance_{ijtp})$ denotes player *i*'s log performance in season *t*, $\log(w_{ijtp})$ denotes his logarithmic wage in season *t* , and *Fair* and *Unfair* denotes player *i*'s extent of over- or underpayment, respectively. Heteroskedasticity-robust standard errors that have been adjusted for clustering on the player level are given in parantheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively. In line with our theoretical propositions, the documented statistical significance on *Fair* and *Unfair* is based on one-sided tests (in none of the models, however, does the level of statistical significance change when two-sided tests are applied)

Table 5: Estimation Results on Player Performance (Changing vs. Non-Changing Players)

Variable	Non-Changing Players: Coefficient	Coefficient	Changing Players: Coefficient	Coefficient
logwage	-0.121**	-0.120**	0.068	0.470
	(0.054)	(0.055)	(0.369)	(0.553)
Fair	0.067*	0.069*	3.035***	3.553***
	(0.048)	(0.048)	(0.937)	(1.091)
Unfair	-0.254***	-0.252***	0.383	0.645
	(0.096)	(0.098)	(0.412)	(0.707)
Player Fixed Effects	Yes	Yes	Yes	Yes
Season Fixed Effects	Yes	Yes	Yes	Yes
Position Fixed Effects	No	Yes	No	Yes
Lambda	-3.79	-3.65	0.13	0.18
N	846	846	129	129
R2	0.05	0.06	0.69	0.74

Note: Displayed are the OLS estimation results for the estimation equation

$$\log(performance_{ijtp}) = \beta_0 + \beta_1 \log(w_{ijtp}) + \beta_2 Fair_{ijtp} + \beta_3 Unfair_{ijtp} + \alpha_i + \gamma_t + \theta_j + \pi_p + \epsilon_{ijtp}$$

, where $\log(performance_{ijtp})$ denotes player *i*'s log performance in season *t*, $\log(w_{ijtp})$ denotes his logarithmic wage in season *t* , and *Fair* and *Unfair* denotes player *i*'s extent of over- or underpayment, respectively. Heteroskedasticity-robust standard errors that have been adjusted for clustering on the player level are given in parantheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively. In line with Table 4, the documented statistical significance on *Fair* and *Unfair* is based on one-sided tests.

Table 6: A Comparison of Player Characteristics across Changing-and Non-Changing Players

	Non-Changing Players:		**Changing Players:**		
Variable	Mean	Std. Dev.	Mean	Std. Dev.	z-Statistic
Log (Wage)	14.35	0.70	14.34	0.68	0.43
Fair	0.22	0.44	0.15	0.30	1.46
Unfair	0.33	0.41	0.33	0.38	-0.67
Performance	752.51	226.54	732.74	251.70	0.47
Time on Pitch	1593.39	868.36	1538.60	849.76	0.69
Age	27.09	3.78	26.57	3.27	1.47
Experience	92.76	76.77	90.05	61.51	-0.78
	N = 846		N = 129		

Note: Displayed are test-statistics for *Wilcoxon-Mann-Whitney* tests between changing and non-changing players. ***, **.,* denote statistical significance at the 1%, 5%, and 10% level, respectively.

Table 7: Robustness Check 1: Estimation Results on Player Performance (All Players)

	Model 1			Model 2			Model 3		
Variable	**Coefficient**		**Std. Error**	**Coefficient**		**Std. Error**	**Coefficient**		**Std. Error**
Log(Wage)	-0.205	***	(0.064)	-0.204	***	(0.053)	-0.199	***	(0.053)
Fair	0.180	***	(0.043)	0.158	***	(0.034)	0.159	***	(0.037)
Unfair	-0.300	***	(0.092)	-0.320	***	(0.084)	-0.314	***	(0.085)
Player Fixed Effects	Yes			Yes			Yes		
Season Fixed Effects	Yes			Yes			Yes		
New Team Fixed Effects	No			Yes			Yes		
Position Fixed Effects	No			No			Yes		
Lambda	-1.67			-2.03			-1.97		
R^2	0.06			0.21			0.21		
N	909			909			909		

Note: Displayed are the OLS estimation results for the estimation equation $\log(performance_{ijtp}) = \beta_0 + \beta_1 \log(wage_{ijtp}) + \beta_2 Fair_{ijtp} + \beta_3 Unfair_{ijtp} + \alpha_i + \gamma_t + \theta_j + \pi_p + \varepsilon_{ijtp}$, where $\log(performance_{ijtp})$ denotes player *i*'s log performance in season *t*, $\log(w_{ijtp})$ denotes his logarithmic wage in season *t* , and *Fair* and *Unfair* denotes player *i*'s extent of over- or underpayment, respectively. For the fair wage prediction, we included a player's current wage in addition to the explanatory variables in equation (1). Heteroskedasticity-robust standard errors that have been adjusted for clustering on the player level are given in parantheses. ***, **,* denote statistical significance at the 1%, 5%, and 10% level, respectively. In line with our theoretical propositions, the documented statistical significance on *Fair* and *Unfair* is based on one-sided tests (in none of the models, however, does the level of statistical significance change when two-sided tests are applied).

Table 8: Robustness Check 2: Estimation Results on Player Performance (All Players)

	Model 1			Model 2			Model 3		
Variable	**Coefficient**		**Std. Error**	**Coefficient**		**Std. Error**	**Coefficient**		**Std. Error**
Log(Wage)	-0.160	***	(0.057)	-0.174	***	(0.055)	-0.174	***	(0.055)
Fair	0.064		(0.053)	0.074	**	(0.033)	0.074	**	(0.033)
Unfair	-0.255	***	(0.097)	-0.281	***	(0.096)	-0.280	***	(0.098)
Player Fixed Effects	Yes			Yes			Yes		
Season Fixed Effects	Yes			Yes			Yes		
New Team Fixed Effects	No			Yes			Yes		
Position Fixed Effects	No			No			Yes		
Lambda	-3.98			-3.80			-3.78		
R^2	0.04			0.21			0.21		
N	982			982			982		

Note: Displayed are the OLS estimation results for the estimation equation log(performance$_{ijtp}$) = $\beta_0 + \beta_1$ log(wage$_{ijtp}$) + β_2 Fair$_{ijtp}$ + β_3 Unfair$_{ijtp}$ + $\alpha_i + \gamma_t + \theta_j + \pi_p + \varepsilon_{ijtp}$,, where $\log(performance_{ijtp})$denotes player *i*'s log performance in season *t*, log(w_{ijtp}) denotes his logarithmic wage in season *t* , and *Fair* and *Unfair* denotes player *i*'s extent of over- or underpayment, respectively. For the fair wage prediction, we included a player's injury status in season *t-1* and performance expectations for season *t* in addition to the explanatory variables in equation (1). Heteroskedasticity-robust standard errors that have been adjusted for clustering on the player level are given in parantheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively. In line with our theoretical propositions, the documented statistical significance on *Fair* and *Unfair* is based on one-sided tests (in none of the models, however, does the level of statistical significance change when two-sided tests are applied.

APPENDIX:

Table A.1: Estimation Results for the Extended Wage Equation

Variable	Coefficient		Std. Error
Performance	1,141.97	***	(226.49)
Playing Time	608.29	***	(119.33)
Age	279,285.70		(436,847.90)
Age^2	-8,077.12		(8,801.92)
Experience	17,522.79	***	(6,779.32)
$Experience^2$	-37.79	***	(12.81)
Team Tenure	10,722.54	***	(48,016.67)
$Team\ Tenure^2$	1,299.00		(5,005.74)
Performance Expect.	2,806.73		(2,509.66)
Injury Status	385,226.10	**	(166,078.00)
Player Fixed Effects	Yes		
Season Fixed Effects	Yes		
New Team Fixed Effects	Yes		
Position Fixed Effects	Yes		
R^2 (within)	0.42		
N	1,009		

Note: Displayed are the OLS estimation results for the estimation equation $w_{ijtp} = \beta_0 + \beta_1 performance_{i,t-1} + \beta_2 minutes_{i,t-1} + \beta_3 age_{it} + \beta_4 age_{it}^2 + \beta_5 exper_{i,t-1} + \beta_6 exper_{i,t-1}^2 + \beta_7 tenure_{it} + \beta_8 tenure_{it}^2 + \alpha_i + \gamma_t + \theta_j + \pi_p + \epsilon_{ijtp}$, where w_{ijtp} denotes player i's wage in season t, $performance_{i,t-1}$ denotes seasonal performance in season $t-1$, and $minutes_{t-1}$ denotes player i's total minutes on the playing field in season $t-1$. The included observations are all players in the sample that appeared at least 90 minutes on the playing field for a given season. Heteroskedasticity-robust standard errors are given in parantheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively.