CONTRACTS AS RENT-SEEKING DEVICES: EVIDENCE FROM GERMAN SOCCER

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Recent theoretical research has identified many ways how contracts can be used as rent-seeking devices vis-à-vis third parties, but there is no empirical evidence on this issue so far. To test some basic qualitative properties of this literature, we develop a theoretical and empirical framework in the context of European professional soccer where (incumbent) teams and players sign binding contracts which, however, are frequently renegotiated when other teams (entrants) want to hire the player. Because they weaken entrants in renegotiations, long-term contracts are useful rent-seeking devices for the contracting parties. However, they reduce the likelihood of (mutually beneficial) transfers, which generates a trade-off in the spirit of Aghion and Bolton (1987). Using a data set from the German "Bundesliga," our model predictions are broadly confirmed. (JEL L14, J63, L40, L83)

I. INTRODUCTION

Recent theoretical research has identified a variety of ways how contracts can be used as rent-seeking devices vis-à-vis third parties. Examples include breach penalties, exclusivity clauses, retroactive rebates or, in the context of labor markets, long-term contracts, and noncompete clauses. As a result of such rent-seeking incentives, various forms of inefficiencies may arise, for example, with respect to entry decisions (Aghion and Bolton 1987; Chung 1992),

investment incentives (Feess and Muehlheusser 2003; Segal and Whinston 2000; Spier and Whinston 1995), or the allocation of workers (Posner, Triantis, and Triantis 2004). While these mechanisms are reasonably well understood from a theoretical perspective, there is a lack of empirical research. In this paper, we aim at empirically testing some of the crucial qualitative properties of strategic contracting models. In doing so, we develop a theoretical and empirical framework in the context of European professional soccer. We argue that the issue of strategic contracting arises naturally in this industry and that teams and players have a joint incentive to use *long-term contracts as rent-seeking devices*.

In European professional soccer, the contracts between teams and players are in principle binding throughout the agreed duration, but they are frequently renegotiated before they expire when other teams want to hire the player. This triggers a (re)negotiation process between the player, the current team (incumbent), and the new team (entrant) in which they bargain over whether

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ABBREVIATIONS

DM: German Marks
EC: European Commission
GLM: Generalized Linear Model
PML: Pseudo-Maximum Likelihood

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or not to transfer the player to the new team.[1] According to long-standing regulations in European professional sports, holding a valid contract with the player gives the incumbent team the right to veto the transfer, which allows to extract a payment from the new team (the *transfer fee*) for letting the player go. By contrast, after an important regime change induced by the so-called *Bosman judgment* in 1995, after a player's contract has expired, he is free to move to any other team without requiring his old team's consent.[2] As this weakens the incumbent team's bargaining position, the *joint* renegotiation payoff of the initial contracting parties (player and incumbent team) is higher when the player's contract has not yet expired.[3] Moreover, this joint renegotiation payoff may be increasing in the remaining duration of the player's contract, as the incumbent team can threaten to "lock up" the player for a longer period of time.

Under the rent-seeking motivation alone, the contracting parties would prefer their contract to last as long as possible. In reality, however, there are countervailing effects, and we focus on the detrimental effect of long-term contracts on the likelihood of transfers: By diminishing future teams' stake in eventual renegotiations, long-term contracts reduce their incentive to actually trigger renegotiations even in cases where transfers are mutually beneficial. In deciding on the contract duration, the incumbent team and the player will hence compare the benefit from a higher joint renegotiation payoff in case of a transfer to the forfeited gains due to a lower transfer probability. In our data, we indeed find that the transfer probability strongly depends on whether a player's contract is still valid or has already expired.

In our model, a potential new team first needs to decide on acquiring information about the player's true value for it, and then about whether or not to trigger a renegotiation process in order to realize a transfer.[4] Acquiring such information, however, will only be worthwhile for the new team when its expected renegotiation payoff in case of a transfer is sufficiently large, which in turn depends on the remaining duration of the player's contract with the incumbent team. We consider the simplest feasible framework where, at the time of a potential transfer, the player's contract is either expired or lasts for one more period. Our model first predicts that in case of a transfer, the joint renegotiation payoff of the incumbent team and the player is higher for nonexpired contracts. This establishes the role of contract durations as rent-seeking devices. Second, a player's probability of being transferred is higher for expired contracts which leads to the tradeoff just described. This is in the spirit of Aghion and Bolton (1987) where trade with the entrant is deterred more often when the fee for breach of contract is high.

In the empirical analysis, we use data from Germany's top professional soccer league (the "Bundesliga"), and we have information on 422 contracts, as well as player- and team-specific information such as age, performance, position, experience, or final league position and budgets, respectively. The empirical results strongly support our theoretical predictions: while the joint renegotiation payoff of the player and the incumbent team is far larger when a player's contract has not yet expired, the probability for a transfer to occur is significantly lower. Moreover, but less crucial for our main research question, we find that, *given* that a contract has not yet expired, the remaining contract duration has no significant impact on the transfer probability. For the joint renegotiation surplus, however, our results are less clear-cut, and we do find some evidence that the contracting parties benefit from a longer remaining contract duration. In any case, our findings suggest that long-term contracts are indeed useful rent-seeking devices.

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1. In contrast to US sports, it is very common for European soccer players to play for several teams throughout their career. Moreover, in roughly 75% of all transfers in our data set, the respective player's contract with his old team had not yet expired.

2. See Court of Justice of the European Communities, Case C-415/93. The data used in the empirical part are all taken from this period.

3. For the German Bundesliga, for example, there is plenty of anecdotal evidence suggesting that in the course of contract negotiations, both teams and players have very well in mind the possibility of a future transfer of the player, including the anticipated payoff consequences in the resulting renegotiation process. For example, according to Meinolf Sprink, an executive at Bayer 04 Leverkusen, " … the motive of influencing (later) transfer fees is always present." Furthermore, Claus Horstmann, former CEO of 1. FC Köln (Cologne) says that "we use long-term contracts to protect our investments." Source: Spiegel online, August 6, 2010, http://www.spiegel.de/sport/fussball/0,1518,710282,00.html

4. We follow the literature on incomplete contracts by assuming ex post efficiency of the renegotiation process, *given that* it occurs (see, e.g., Hart and Moore 1990, Segal and Whinston 2000, Spier and Whinston 1995). That is, after the entrant has invested in information collection, a transfer will occur if and only if the player is more valuable in the new team, independent of the remaining duration of the player's contract with the incumbent team.

A. Relation to the Literature

The role of contracts as rent-seeking devices has been stressed in the economic literature since Diamond and Maskin (1979) who analyzed a search model where parties contract with each other but continue to search for better matches. They show that there is an incentive to stipulate high damages in the initial contract as this will increase the payoff in the new partnership. As they note (see p. 294), "the rationale for these contracts is solely to 'milk' future partners for damage payments."

Aghion and Bolton (1987) emphasize the close relationship between breach penalties, contract durations and an entrant's "waiting" costs, as the penalty determines the effective duration of a contract. They show how excessive breach penalties tend to deter efficient market entry.[5] However, as pointed out by Spier and Whinston (1995), these inefficient entry decisions are driven by the absence of renegotiation, and they show that ex post efficiency can be restored once renegotiation is possible. Similarly, Posner, Triantis, and Triantis (2004) analyze the role of noncompete clauses in labor contracts. Again, the inefficiencies generated by such contract clauses depend on whether or not renegotiation is permitted.[6]

Our framework is in-between the two polar cases of excluding renegotiation altogether and having a renegotiation process in which any allocative inefficiency is eliminated, respectively: we do allow for renegotiation, and transfers are also efficient when they occur. However, the likelihood of renegotiation is endogenous and depends on the terms of the contract. Another difference to Spier and Whinston (1995) is that they consider renegotiation between the initial contracting parties only, while also the entrant participates in the renegotiation process in our framework.

Another inefficiency identified in the literature refers to relation-specific investment incentives as considered in Spier and Whinston (1995), who show that inefficiencies of strategic contracting may arise even when ex post efficiency is ensured by renegotiations because the contract terms lead to inefficient levels of relation-specific investment. Segal and Whinston (2000) analyze how the efficiency properties of exclusive dealing clauses depend on the type of investments. Also focusing on investment incentives, Feess and Muehlheusser (2003) compare the impact of different legal regimes in European professional soccer on teams' incentives to invest in the training of young players. While long-term contracts are also jointly beneficial for the contracting parties in renegotiations, allocative inefficiencies are not taken into account.

In our paper, we focus on a reduction of transfer probabilities as the disadvantage of long-term contracts, countervailing the benefit from rent-seeking. Alternatively, one could consider a potentially detrimental effect in the form of lower effort incentives ("shirking") after a long-term contract is secured.[7] This issue has sparked a large amount of empirical research in the context of sports, but the evidence is mixed, and the results are very sensitive to the empirical frameworks used, see, e.g., Marburger (2003), Berri and Krautmann (2006), Krautmann and Donley (2009), Krautmann (1990).

Last, but not least, while our paper focuses on the rent-seeking effect of long-term contracts and transfer fees, Terviö (2006) emphasizes the positive role of transfer fees on the allocation of players among teams. He assumes that player talent is initially uncertain, but will be revealed in a first period, and that better players have a higher marginal productivity in strong teams. Transfer fees alleviate the efficient allocation of players as they enable small teams to pay talent in the first period, which will then be transferred to top teams if and only if capabilities turn out to be high. From a theoretical point of view, we see our paper as complementary as both aspects are likely to play an important role in reality: Transfer fees facilitate the efficient allocation of players across teams due to the mechanisms analyzed by Terviö (2006), but they may also prevent efficient transfers due to rent-seeking motives.

The remainder of the paper is organized as follows: Section II introduces a simple theoretical framework for analyzing the issue of strategic contracting in the context of sports. The main model predictions are then empirically tested in

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5. In a similar vein, Chung (1992) shows that contracting parties have an incentive to choose socially excessive damage clauses which also lead to ex post inefficiencies.

6. A related issue is the controversy whether parties to a contract are able to commit not to renegotiate, see, e.g., Hart and Moore (1999), Maskin and Tirole (1999). Carbonell-Nicolau and Comin (2009) design and implement an empirical test which, using data from the Spanish soccer league, leads them to reject the commitment hypothesis.

7. Another issue in this context concerns the role of long-term contracts as a *pre-contractual* incentive device. Here, a long-term contract serves as a reward for good performance and therefore tends to have a positive effect on effort incentives, see, e.g., Stiroh (2007).

Section III. Section IV discusses our findings and concludes.

II.   THEORY

A. The Model

We consider a variant of the canonical buyer-seller framework with the possibility of future entry as considered in the literature on strategic contracting discussed in the introduction. We adopt it to our context of European professional sports as follows:

At date $t = 0$, a player bargains with team i (the *incumbent*) over a contract stipulating a wage W per period and a contract duration. To make our points, it suffices to consider only two possible contract durations, a *short-term contract* which lasts for one period (until date $t = 1$), and a *long-term contract* which lasts for two periods (until date $t = 2$). The player's career horizon is assumed to also last until $t = 2$, such that it is fully covered by a long-term contract. After the initial contract is signed at date $t = 0$, the player starts playing in team i, where his productivity is $Y > 0$ per period throughout his career.[8]

At date $t = 1$, a new team e (the *entrant*) may be interested in hiring the player. The player's productivity in team e per period, Y_e, is a random variable with two realizations, $Y_e = Y + \gamma$ where $\gamma > 0$ or $Y_e = Y_L < Y$, both of which are equally likely. Thus, it depends on the realization of Y_e whether or not the player is more productive in team e, and a transfer is only mutually beneficial for $Y_e = Y + \gamma$.

To find out the true value of the player's productivity, team e must make a costly investment. For instance, it may need to collect information about the player himself or it must figure out how well he fits in its tactical system. The investment cost z is team e's private information, and from the viewpoint of team i and the player at the contracting stage, it is hence a random variable. For simplicity, we assume that z can take on only two values, $z \in \{\underline{z}, \overline{z}\}$, where $\Pr(z = \underline{z}) = \alpha \in (0, 1)$ and $\Pr(z = \overline{z}) = 1 - \alpha$. As in Aghion and Bolton (1987), assuming private information with respect to a cost parameter of the entrant is a convenient way of modeling the basic idea that

rent-seeking motives might prevent entry even in cases where it might be mutually beneficial to all parties.[9] After the investment decision is made, team e decides whether or not to enter negotiations with team i and the player.[10]

We follow the literature on incomplete contracts by assuming that the eventual process of renegotiation occurs under complete information, i.e., that the realization of Y_e becomes common knowledge after it has been revealed to team e. Also in line with the literature, we assume throughout that at each stage, multi-party decisions are taken cooperatively by all parties involved *at that stage*.[11] This implies that single-party investment decisions are individually optimal. Therefore, the choice of contract at date 0 maximizes the expected joint surplus of the player and team i, while at date 1, team e will invest whenever the cost (z) is lower than its own expected renegotiation payoff. Finally, when it turns out that the player's productivity is higher in team e (i.e., for $Y_e = Y + \gamma$), he will be transferred regardless of his contractual status with team i. For $y_e = Y_L < Y$, the player keeps playing for team i until his career ends at date $t = 2$. Figure 1 summarizes the sequence of events and the respective parties involved. The analysis proceeds backward.

B. Renegotiation

Assume that team e has invested and has learned that $Y_e = Y + \gamma$. Then, the player will be transferred at date 1, and for the remaining time until the player's career ends at date 2, the division of the total renegotiation surplus $Y + \gamma$ depends on the player's contractual status: For nonexpired contracts, the incumbent team has a veto right, which allows it to extract a transfer fee from the new team. By contrast, after the contract has expired, the player is free to move to the new team without requiring his old team's consent.

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8. As is standard in the literature on the economics of professional sports, this productivity is meant to capture the marginal revenue that can be attributed to a player such as, for example, increases in TV money, merchandizing sales or premia from international competitions.

9. All that is needed for our results is that, at the date of contracting, the contracting parties are facing some uncertainty concerning future entrants' willingness to hire the player.

10. We assume that Y_L is sufficiently small such that team e does neither negotiate when $Y_e = Y_L$ is realized nor without having invested in information acquisition. A similar assumption is made in Aghion and Tirole (1997) in the context of taking uninformed investment decisions with respect to projects of unknown profitability.

11. As for our context, see, e.g., Aghion and Bolton (1987), Spier and Whinston (1995), and Segal and Whinston (2000). Moreover, also in the broader context of incomplete contracting models, canonical frameworks such as Grossman and Hart (1986) and Hart and Moore (1990) exhibit this feature.

FIGURE 1
Sequence of Events
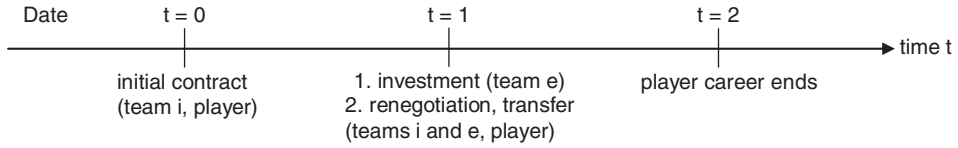
For the surplus division in the resulting bargaining game, we use the nucleolus solution as pioneered by Schmeidler (1969), and in particular the approach by Leng and Parlar (2010) which provides a closed-form solution for the resulting payoffs for the three-player case.[12]

Out of all feasible coalitions and payoff divisions, the nucleolus is the one that minimizes the difference between the value of the coalition and the share of the player with the lowest payoff (the "excess" or the "unhappiness of the most unhappy player").[13] It will become clear that all we need for our results is that team e's share of the surplus is higher for expired contracts compared to nonexpired ones.[14]

Recall that the player's contract ends at date $t = 1$ under a short-term and at date $t = 2$ under a long-term contract. Denoting by $R \in \{0, 1\}$ the *remaining* duration of the player's contract at the renegotiation date 1, and by V_q the payoff which coalition $q \in \{p, i, e, ie, pi, pe, pie\}$ can realize on its own, we have

$$V_p = RW, V_e = 0, V_i = V_{ie} = R(Y - W), V_{pi} = Y,$$

$$V_{pe} = RW + (1 - R)(Y + \gamma), \quad V_{pie} = Y + \gamma.$$

For example, the player alone can generate a payoff equal to his wage in team i for the

remaining duration of his contract with team i ($V_p = RW$), while for the same time period, team i alone would receive the value of the player's service net of the wage payment ($V_i = R(Y - W)$). Due to team i's veto power in case of a nonexpired contract, the coalition of the player and team e can achieve a payoff only for the time period $(1 - R)$, where the player's contract with team i has already expired.[15] The different time periods relevant for the renegotiation process are illustrated in Figure 2.

The parties' renegotiation payoffs $\Pi_j(R)$ for $j = i, e, p$ are given by the resulting nucleolus values which are derived in the Appendix.[16] Moreover, we denote by $\Pi_{ip}(R) := \Pi_p(R) + \Pi_i(R)$ the *joint* renegotiation payoff of player and team i, where $\Pi_{ip}(R) = Y + \gamma - \Pi_e(R)$. This leads to the following result:

RESULT 1. *Using the nucleolus solution to determine the division of surplus at the renegotiation stage at date* $t = 1$,

(i) the renegotiation payoff of team e is strictly higher when the player's contract has expired, that is,

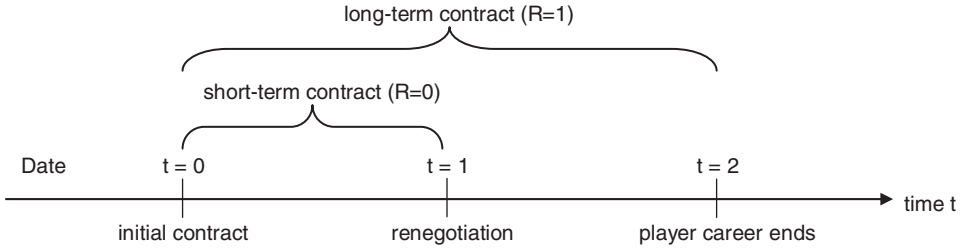(1) $\quad \Pi_e(0) = (1/2)\gamma > (1/3)\gamma = \Pi_e(1)$

(ii) the joint renegotiation payoff of the player and team i is strictly lower when the player's contract has expired, that is,

(2) $\quad \Pi_{ip}(0) = Y + (1/2)\gamma < Y + (2/3)\gamma = \Pi_{ip}(1)$

12. We are grateful to an anonymous referee for bringing this paper to our attention.

13. The Shapley value as the most popular cooperative bargaining concept for more than two players is not suitable here as it is not necessarily in the core. The reason is that it assigns a positive payoff to incumbent teams even after a player's contract has expired. This is at odds with the institutional framework of our context, according to which incumbent teams lose their veto power after contract expiration. Hence, when a player's contract has expired, the incumbent team is not needed since the player and his new team alone can realize the same surplus as the grand coalition. In fact, in our data set the transfer fee is zero for all transfers for which the respective player's contract had expired.

14. See, e.g., Segal and Whinston (2000), Burguet, Caminal, and Matutes (2002), Feess and Muehlheusser (2003), and Terviö (2006) for alternative specifications of the renegotiation game.

15. One might argue that players can reduce the incumbent team's veto power simply by threatening not to perform well on the pitch. However, even if this effect mattered in our context, all we need is the realistic assumption that holding a nonexpired contract with a player gives a team some bargaining power in the course of renegotiation.

16. Of course, $\Pi_j(\cdot)$ depends on all model parameters, but as to not convolute the notation, we will throughout use as function arguments only those variables which are of particular interest at the respective stage of the model.

Remaining Contract Duration at Renegotiation Stage

Intuitively, as for part (i) when the player's contract with team i is still valid ($R = 1$), all three parties are needed to realize the additional surplus γ, which is then shared equally, so that team e reaps $(1/3)\gamma$. In contrast, for $R = 0$ team i has no more veto power, so that only team e and the player are needed to realize γ, which leads to $(1/2)\gamma$ for team e. It follows that team e is better off under a short-term contract ($R = 0$).

As the joint renegotiation payoff of the player and team i is just the difference between the overall surplus $Y + \gamma$ and team e's payoff, part (ii) of the result follows immediately. Hence, the contracting parties benefit from nonexpired contracts that allow them to extract a larger share of the total renegotiation surplus. This gives rise to the *rent-seeking motive* which is at the core of this paper. Note that in our model specification, $\Pi_e(R)$ – and hence also $\Pi_{ip}(R)$ – is independent of the player's initial wage W in team i, so that the choice of W is a purely distributive matter, and therefore not used as a rent-seeking device.

C. Investment and Transfer Probability

Recall that renegotiation takes place only if $Y_e = Y + \gamma$ is realized, and that this occurs with probability $(1/2)$. Thus, team e's expected renegotiation payoff at the stage of the investment decision is $(1/2)\Pi_e(R)$, and it will invest if this exceeds the cost of investment, $z \in \{\underline{z}, \overline{z}\}$. In what follows, we confine attention to the case of interest where the investment decision depends on the remaining duration of the player's contract, which is ensured by the following assumption:

ASSUMPTION 1. $\underline{z} < (1/2)\,\Pi_e(1) < \overline{z} < (1/2)\,\Pi_e(0)$.

Hence, under a long-term contract ($R = 1$), team e will only invest for $z = \underline{z}$, while under a short-term contract ($R = 0$), it will invest for both realizations of z. From the viewpoint of the contracting parties (player and team i) who do not observe z, the probability for team e to invest is hence simply equal to 1 under a short-term contract and equal to $\alpha < 1$ under a long-term contract. Denoting by $p(R)$ the probability that the player is transferred, and taking into account that this happens only when team e invests and the high value $Y_e = Y + \gamma$ is realized, we straightforwardly get the following result:

RESULT 2. *The probability that the player is transferred is higher for short-term contracts, i.e.,* $p(0) = (1/2) > (\alpha/2) = p(1)$.

D. Initial Contract

It remains to close the model by determining the optimal contract type for the contracting parties at date $t = 0$, taking into account the possibility of renegotiation and transfer at date $t = 1$, where the remaining contract duration will then be $R = 0$ ($R = 1$) under a short (long)-term contract. Their objective can therefore be expressed in terms of choosing the value of R which maximizes their expected joint payoff:

$$(3) \qquad \max_{R \in \{0,1\}} E\,[J\,(R)] := Y + p\,(R) \cdot \Pi_{ip}\,(R)$$

$$+ (1 - p\,(R)) \cdot Y.$$

Independently of the underlying contract, the player plays with productivity Y for team i until date 1. The transfer occurs with probability $p(R)$ in which case the contracting parties get their joint renegotiation payoff $\Pi_{ip}(R)$. Recall from Results 1 and 2 that $\Pi_{ip}(1) > \Pi_{ip}(0)$, but $p(1) < p(0)$, so that a long-term contract leads to a higher joint renegotiation payoff *if* a transfer takes place, but decreases the probability of a transfer in the first place. When no transfer

occurs, the player continues to play for team i for the final period of his career with productivity Y. This leads to the following result (the proof is in the Appendix):

RESULT 3. *There exists a critical threshold $\overline{\alpha} := (3/4)$ such that a long-term contract is strictly optimal for $\alpha > \overline{\alpha}$, and a short-term contract is strictly optimal for $\alpha < \overline{\alpha}$.*

Intuitively, a higher value of α makes a long-term contract more profitable for the contracting parties, as the expected cost in the form of a lower transfer probability when $z = \overline{z}$ is realized (resulting in no investment by team e) becomes smaller.

III. EMPIRICAL ANALYSIS

In the following, we aim at testing our two predictions from the theory part: the impact of the remaining duration of a player's contract on the likelihood of a transfer and on the resulting joint renegotiation payoff of the player and the old team in case of a transfer (rent-seeking motive).

A. Data

We have compiled a data set which covers four consecutive seasons from 1996/1997 to 1999/2000 of the "Bundesliga," Germany's major professional soccer league.[17] Using the leading German soccer magazine "Kicker," apart from a number of player- and team-specific variables, we have collected detailed information on durations of contracts signed between players and teams, player remuneration, and transfer fees paid by the player's new team to his old team in case of a transfer. In total, we have information on 421 contracts out of which 293 are *first* contracts (that is, the first contract signed by the respective player during the observation period) and 128 *second* contracts. Out of these 128 second contracts 66 are renewals, where the player

signs another contract with his current team, and 62 are transfers. In our analysis, we focus on these second contracts. In particular, we use the data on transfers to test our theoretical predictions regarding the likelihood of a transfer and the outcome of the resulting renegotiation process. By definition of second contracts, these observations include the necessary information from the players' first contracts such as the remaining contract duration at the time of a transfer. In addition, the information about the wage in the first contract and the performance prior to signing a second contract yields important information on the players' quality.

Table 1 presents the descriptive statistics for the variables used throughout. The first row shows that for both transfers and renewals, the yearly wages in the second contracts are on average higher than those in the first contracts. Moreover, players who were transferred or whose contracts were renewed earned above-average wages already in their respective first contract. For example, for transferred players, the mean wage in their previous (first) contract is 1.12 million DM compared to a mean wage of only 0.84 million in the full sample of first contracts.[18]

For the players who were transferred from one team to another during the observation period, the average transfer fee paid by the player's new team to his old one was 2.66 million DM. For about 27% of these cases, the transfer fee was zero, because the respective player's contract with his old team had expired, and the player was free to leave. In line with our theoretical analysis, as a measure for the *joint* renegotiation payoff of the player and his old team in case of a transfer, we use the sum of the transfer fee which the old team receives and the total value of the player's contract in this new team, where the latter is defined as the annual wage times the duration of his contract with the new team.

Finally, Table 1 also shows the descriptive statistics of all other control variables used in the empirical analysis: player-specific variables such as age, tenure with the current team, his wage in the first contract, the number of league games, the number of international games, and an indicator for above average performance in the season prior to the transfer, where the latter variables serve as proxies for player ability. In addition, we include team-specific variables such

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17. This 4-year horizon of our sample is due to two regime changes with respect to the transfer rules in European professional sports: The first regime change is the Bosman judgment explained above (effective since season 1996/1997), according to which teams lose any veto power once a player's contract has expired. The second regime change resulted from a decision of the European Commission (effective since season 2000/2001) which makes it easier for players to resign from their current contracts, thereby reducing teams' veto power also when a player's contract is still valid. Our modeling of the renegotiation process in the theoretical framework is therefore consistent with the legal regime in place during the seasons 1996/1997–1999/2000.

18. All monetary variables are measured in the German pre-Euro currency "Deutsche Mark" (DM), where $1\,\mathrm{DM} \approx 0.5\,\mathrm{EUR} \approx 0.65\,\mathrm{US\$}$.

TABLE 1
Descriptive Statistics

Variable	First Contract[a] Mean (SD)	Second Contract[a]	
		Transfer Mean (SD)	Renewal Mean (SD)
Annual wage[b]	0.84 (0.75)	1.63 (1.31)	1.67 (1.33)
Annual wage previous contract		1.12 (0.94)	1.19 (1.12)
Transfer fee		2.66 (3.52)	
Total joint renegotiation payoff[c]		7.33 (7.48)	
Contract duration	3.20 (0.95)	2.97 (0.97)	3.21 (1.21)
Remaining contract duration		1.53 (1.25)	1.44 (1.15)
Number of league games	77.36 (91.76)	132.03 (99.97)	153.97 (112.87)
Number of international games	7.67 (15.23)	18.61 (27.48)	22.29 (29.11)
Above average performance in previous season		0.62	0.48
Age	26.71 (3.81)	28.21 (3.23)	29.39 (3.44)
Tenure in current team (years)	2.93 (3.91)	0	4.30 (5.10)
Yearly budget current team	37.91 (10.59)	43.05[d] (15.77)	45.00 (13.55)
Final league position in previous season		9.48 (5.05)	7.55 (4.85)
Number of observations	293	62	66

[a]These figures refer to the first season of the contract.
[b]All monetary variables are measured in million German Marks (DM), where $1\,\text{DM} \approx 0.5\,\text{EUR} \approx 0.65\,\text{US\$}$.
[c]Total joint renegotiation payoff is defined as (Annual wage × Contract duration) + Transfer fee.
[d]In case of a transfer, the player's current team is the one to which he is transferred.

as the annual budgets[19] and a team's final league position at the end of the season.[20]

Overall, there is no difference in these variables for players with transfers and players with renewals.

Further information on the distribution for contract durations associated with transfers is provided in Table 2. The first contract had expired in about 25% of all cases where a second contract had been signed. In over 80%, the remaining duration was 2 years or less. About 73% of all second contracts signed after a transfer lasted for 3 years or less.

B. Econometric Results

The econometric analysis focuses on our two main model predictions (Results 1 and 2) concerning the impact of the remaining contract duration (R):

HYPOTHESIS 1: *A player' transfer probability is higher when his contract has expired.*

19. Yearly budgets also seem to capture well any variation in the available total (nominal) funds to be spent by teams on their rosters across seasons (e.g., due to inflation or higher league income from selling TV rights which is then distributed among teams); in all regressions, including season dummies in addition to team budgets has no effect on the estimation results.
20. There are 18 teams competing in the Bundesliga, and rank one is the best.

TABLE 2
Distribution of Contract Durations in Case of a Transfer

|	Years							
	0	1	2	3	4	5	6	Average
Duration second contract		3	17	25	13	4	0	2.97
Remaining duration first contract	17	12	21	8	3	1	0	1.53

HYPOTHESIS 2: *When a player is transferred to a new team, the joint renegotiation payoff of the player and his old team is higher when their contract has not yet expired.*

The first prediction is addressed by using a Probit model, for the second, we use OLS (with and without selectivity correction) as well as a generalized linear model (GLM). Before turning to the econometric analysis, we present some descriptive evidence for the two hypotheses.

Descriptive Evidence. Figure 3 shows the relationship between the remaining contract duration R and our two main outcome variables. In order to compute these results, all remaining durations weakly above 3 have been consolidated as there are only few observations with values larger than 3 (see Table 2), so that $R \in \{0, 1, 2, 3\}$.

FIGURE 3

Impact of R on Transfer Probability and Joint Renegotiation Payoff
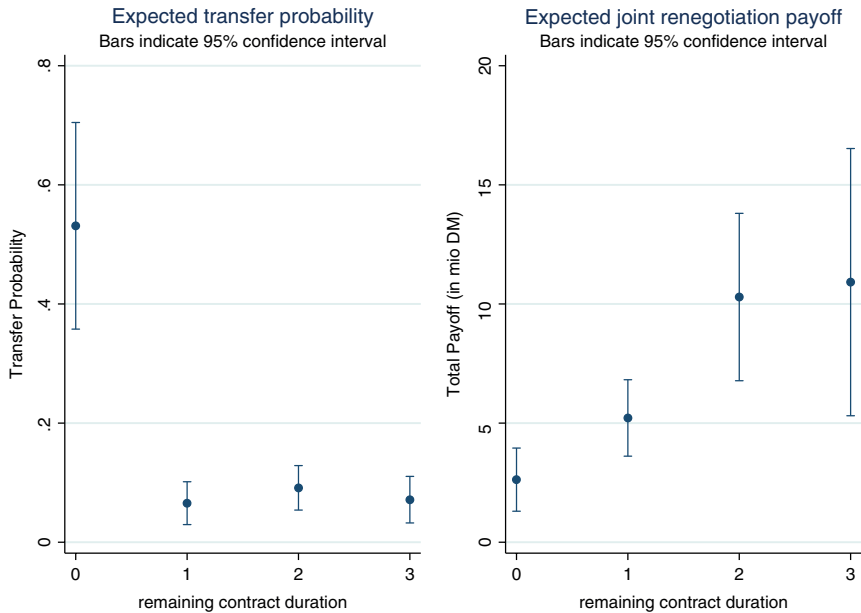
The left panel shows that the probability of a transfer increases sharply from roughly 10% to over 50% when the remaining duration decreases from one to zero. For nonexpired contracts ($R > 0$), the differences in the transfer probabilities appear to be small.

The right panel displays the expected joint renegotiation payoff of the contracting parties (i.e., transfer fee plus the player's total earnings under his new contract), which is minimum for $R = 0$, and then increasing in R (note that the confidence intervals are large due to the relatively low number of 62 transfer observations). In summary, Figure 3 is supportive of both hypotheses, which we now investigate in more detail using regression models.

Transfer Probabilities. To assess the impact of the contractual status on the transfer probability (Hypothesis 1), we estimate a binary probit model, where a player has only two options at the end of each season: either to move to another team or to stay with his current team. In this simple model, when $R = 0$, staying with the current team implies that the player has renewed his contract. Thus, there is no distinction between no changes in a player's contractual status and renewals; all that matters is whether a player

is transferred or not (we will get back to this below).

The effect of the categorical variable $R \in \{0, 1, 2, 3\}$ is captured by three dummy variables with $R = 1$ as the base category. As additional control variables we use two age dummies (< 25 and > 30), the current wage, a dummy indicating above average performance in the past season, a dummy for more than 10 international games, the tenure with the current team, the team's budget, and the final league position.[21]

Table 3 reports the average marginal effects which are obtained by taking the mean of all individual marginal effects in the sample. Inference is based on standard errors obtained using the delta method. While expired contracts ($R = 0$) are significant, remaining contract durations of two and three years are not. The estimated marginal effect indicates an increase in the transfer probability by 45 percentage points when the contract expires. In line with the descriptive evidence presented in Figure 3, this shows that contract expiration is a crucial determinant for transfers.

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21. The number of league games was never significant in any specification and is therefore omitted in all estimations.

TABLE 3
Average Marginal Effects on Transfer
Probability (Probit)

	Transfer Probability
$R = 0$	0.455 (4.99)
$R = 2$	0.015 (0.55)
$R = 3$	−0.016 (0.58)
# International games > 10	0.039 (1.43)
Annual wage in first contract	0.016 (1.32)
Age < 25	−0.047 (1.91)
Age > 30	−0.078 (3.53)
Above average performance previous season	0.083 (3.47)
Tenure in current team	−0.001 (0.39)
Yearly budget current team	−0.001 (1.04)
Final league position of current team in previous season	0.004 (1.35)
Log likelihood	−162.76
Observations	613

Note: Absolute *t*-statistics in parentheses.

Note that for the trade-off between the higher joint renegotiation payoff in case of a transfer and the resulting lower transfer probability underlying our theory, it does not matter whether the transfer probability is continuously decreasing in the remaining contract duration or only higher for expired contracts. Moreover, our simple framework does not allow to capture this distinction since, at the date of the transfer decision, contracts either cover the player's whole remaining career horizon or are expired. This issue will therefore be discussed in more detail in Section IV.

Apart from the remaining contract duration, the transfer probability is also driven by above average performance which increases the probability of a transfer by 8 percentage points. Moreover, both young players and old players have lower transfer probabilities.

In the specification reported in Table 3, renewals are ignored in the sense that they are treated as ongoing contracts with the first club. This may potentially bias the estimated probit coefficients and marginal effects. In order to analyze this possibility we also estimated a multinomial probit which explicitly accounts for transfers and renewals being different actions. The results, reported in Appendix C, indicate that accounting for renewals has no influence on the results regarding transfer probabilities reported in Table 3.

Joint Renegotiation Payoff. Turning to Hypothesis 2, recall our theoretical prediction

that long-term contracts are useful rent-seeking devices, as they increase the initial contracting parties' joint payoff in renegotiations with the new team (Result 1). Therefore, the dependent variable of interest in all regressions reported in Table 4 below is the joint renegotiation payoff for the player and his old team (i.e., the transfer fee plus the total wage value of the player's contract with his new team) when a transfer occurs.

There are several ways to specify the regression model. Given a set of explanatory variables **x**, we must specify the functional relationship between the dependent variable *y* and **x**. As the dependent variable has a very skewed distribution it is well known that OLS may be problematic. This is confirmed by a RESET test which strongly rejects this specification. The traditional approach to deal with skewed dependent variables is to take the log of *y*, $\ln(y)$. The OLS regression of $\ln(y)$ on **x** is not rejected by the RESET test. This is the first model we consider, and the results are reported in column 1 of Table 4.

Furthermore, because transferred players differ from other players, estimating using the subsample of transferred players may cause selection bias. In order to address this issue, in column 2 of Table 4 we report the results of a classic Heckman selection model, where the control term for possible selectivity is based on the binary probit model discussed under "Transfer Probabilities" in Section III.B. Comparing the results in columns 1 and 2 indicates that there is no evidence for selection bias as the *t*-statistic of the correction term λ is almost zero (assuming that the statistical assumptions underlying the Heckman model are satisfied). Furthermore, note that the point estimates for the OLS and the selection model are almost identical. For these reasons, we will not pursue the selection model any further.

Even though the log-linear model displayed in column 1 is not rejected by the RESET test, it needs to be treated with caution. Santos Silva and Tenreyro (2006) have shown that OLS of the log-linear model is consistent only under strong assumptions. Assume that the true model can be written as $y = \exp(\mathbf{x}\beta)v$, where *v* is an error term with $E[v|\mathbf{x}] = 1$. The log-linear model is $\ln(y) = \mathbf{x}\beta + \ln(v)$. Due to Jensen's inequality, $E[\ln(v)|\mathbf{x}] \neq 0$. This will affect the estimate of the intercept. More importantly, Santos Silva and Tenreyro (2006) show that if *v* is heteroskedastic, then $E[\ln(v)|\mathbf{x}]$ will be a function of **x**. This in turn leads to inconsistent estimates of β in the log-linear model. For this reason, Santos Silva

TABLE 4
Joint Renegotiation Payoff of Player and Old Team in Case of Transfer

	OLS[a]	Selection Model[a]	GLM[b]
$R = 0$	−0.821 (3.36)	−0.699 (1.17)	−0.517 (1.78)
$R = 2$	0.176 (0.71)	0.189 (0.81)	0.216 (0.90)
$R = 3$	0.358 (1.33)	0.347 (1.38)	0.561 (1.91)
# International games> 10	0.267 (1.37)	0.287 (1.42)	0.317 (1.67)
Previous annual wage	0.150 (1.46)	0.152 (1.42)	0.163 (3.59)
Age < 25	−0.249 (0.95)	−0.286 (0.85)	−0.394 (1.98)
Age > 30	−0.384 (1.53)	−0.434 (1.33)	−0.461 (2.25)
Above average performance previous season	0.414 (2.38)	0.459 (1.75)	0.461 (3.07)
Yearly budget new team	0.022 (3.82)	0.022 (4.10)	0.021 (4.37)
λ[c]		0.098 (0.22)	
Constant	0.239 (0.78)	0.046 (0.05)	0.267 (.87)
Observations	62	62	62
R^2	.68	.68	.67[d]
H_0	*p* value	*p* value	*p* value
$\beta_{R=0} = \beta_{R=2}$	.00	.10	.00
$\beta_{R=0} = \beta_{R=3}$	.00	.11	.00
$\beta_{R=2} = \beta_{R=3}$	.46	.53	.08

Note: *t*-statistics based on robust standard errors in parentheses.
[a]Dependent variable: ln(joint renegotiation payoff).
[b]Dependent variable: joint renegotiation payoff.
[c]$\lambda = \phi\left(\mathbf{x}\hat{\gamma}\right)/\Phi\left(\mathbf{x}\hat{\gamma}\right)$, where $\mathbf{x}\hat{\gamma}$ is the estimated linear index of the probit model and ϕ and Φ are the standard normal density and distribution function, respectively.
[d]R^2 is computed as the square of the correlation coefficient between ln(y) and $\widehat{\ln(y)}$, where $\widehat{\ln(y)}$ is the prediction based on the GLM.

and Tenreyro (2006) suggest to directly estimate the GLM $y = \exp(\mathbf{x}\beta)v$ by Maximum Likelihood. This so-called Pseudo-ML (PML) estimator is consistent if the mean function $E[y|\mathbf{x}] = \exp(\mathbf{x}\beta)$ is correctly specified, even when the remainder of the distribution of y is misspecified (see Gourieroux, Monfort, and Trognon 1984). This feature is important because the GLM estimator with log link is numerically equal to the well-known Poisson ML estimator for count data. Given the described feature of PML, however, the data do not have to follow a Poisson distribution and y does not even have to be an integer for the estimator based on the Poisson likelihood function to be consistent.[22] The GLM results are reported in column 3 of Table 4, and they are similar to those obtained from the OLS model in column 1.[23] In the GLM the quality indicators *previous annual wage* and *more than 10 international games* become significant, as do the two

age dummies. One possible explanation for this change is heteroskedasticity with respect to these variables.[24]

As for the impact of the remaining contract duration R, the three respective dummies $R = 0, 2, 3$ measure the effect relative to $R = 1$. Moreover, some additional tests are required which are provided at the bottom of Table 4. In the OLS specification (column 1), only the dummy for $R = 0$ is significant, and the tests at the bottom of the Table show that both the difference between $R = 0$ and $R = 2$, and between $R = 0$ and $R = 3$ are significant, while the difference between $R = 2$ and $R = 3$ is not. Thus, similar to our empirical analysis of transfer probabilities, this model indicates that the effect of the

22. For more details, see Santos Silva and Tenreyro (2006).

23. The R^2 are also almost identical. Note that these R^2 measure the fit of the log dependent variable. It is also possible to compute a R^2 for the fit of the untransformed dependent variable by computing the square of the correlation coefficient of y and $\hat{y}$. For the log-linear model, it is sufficient to use $\hat{y} = \exp\left(\mathbf{x}\hat{\beta}\right)$ even though this is only correct up to a proportional

factor, see Wooldridge (2009, 213). The corresponding R^2 are .61 for the OLS model and 0.65 for the GLM, respectively. Hence, the GLM fits the untransformed total payoff slightly better.

24. Informally, this is confirmed by comparing the variances of the total payoff differentiated by the dummy for more than 10 international games and by being below or above the median of the previous wage. The variance is twice as large for international players and for players with high previous wages. Even more pronounced is the increase in the variance of the total payoff with increasing R. For $R = 0$ and $R = 1$ the variance is roughly 8, for $R = 2$ it is 66, and for $R = 3$ it is 100.

remaining contract duration on the joint renegotiation payoff is mainly driven by out-of-contract players.

In the GLM specification with log link (column 3), however, the dummies for both $R = 0$ and $R = 3$ are significantly different from the base level $R = 1$. Furthermore, the tests reported at the bottom of the table indicate that $R = 2$ and $R = 3$ are statistically different from $R = 0$, and that $R = 2$ is different from $R = 3$. All in all, these finding suggest that, while contract expiration ($R = 0$) is still a major determinant of the joint renegotiation payoff, the latter is also affected by the actual remaining contract duration in case of nonexpired contracts ($R > 0$). Figure 4 illustrates the estimated effect of R on the log of the joint renegotiation payoff for the OLS and GLM models. In both cases, there is an increase in the joint renegotiation payoff with increasing R, but given the small sample size, not all differences are significant. Whether the joint renegotiation payoff increases in R even for nonexpired contracts or only compared to expired ones is an interesting issue which we will discuss in more detail in Section IV below.

Our measure of the joint renegotiation payoff might under-estimate the actual payoff when transferred players receive signing bonuses from their new teams. Anecdotal evidence suggests that signing bonuses are in fact sometimes paid for top players with expired contracts. When these payments are sufficiently large, then the estimated payoff difference between expired and nonexpired contracts might vanish. Presumably, when a player's contract has expired, the new team will pay part of the saved transfer fee to the player in the form of a signing bonus. Unfortunately, signing bonuses in European soccer are notoriously hard to observe and our data set contains no respective information. Therefore, we have performed a sensitivity analysis where we add a fraction of the average transfer fee in our sample to a player's salary in case he is transferred and his contract has expired. It turns out that the results remain robust even when adding as much as 50% of the average transfer fee (which includes the large amounts paid for transfers with long remaining contract durations). Therefore, we conclude that our results concerning the impact of the remaining duration of a player's contract on joint renegotiation payoff of the contracting parties are not driven by unobserved signing bonuses.

IV. DISCUSSION

We have developed a framework in the context of European soccer in order to test some of the central hypotheses concerning the strategic use of contract terms as rent-seeking devices, which have been derived in the previous theoretical literature. We view our results as first empirical evidence in this respect.

Our framework emphasizes the role of long-term contracts as rent-seeking devices from which the contracting parties can benefit in case of a transfer. We show that their joint renegotiation payoff is considerably higher for nonexpired compared to expired contracts, and we provide evidence that this payoff is also higher for nonexpired contracts with a longer remaining duration. In our view, the positive relationship between remaining contract duration and renegotiation surplus would be hard to explain by relying on factors other than bargaining power. Of course, one might argue that better players get longer contracts, so that they have *ceteris paribus* also longer remaining contracts when the probability for a transfer is equally distributed over time. However, recall that we find that long-term contracts remain beneficial to the contracting parties even when controlling for player ability or taking into account that transferred players might statistically differ from nontransferred ones.[25]

Obviously, the rent-seeking motive alone would create an incentive to sign contracts of unlimited duration. In reality, this incentive is countervailed by a number of factors such as liquidity constraints or legal restrictions.[26] In our paper, and in line with the relevant literature on strategic contracting discussed above, we focus on the adverse effect of long-term contracts on

25. Long-term contracts could also be used as commitment devices for investments in (general) human capital of players. While such investments are crucial for transforming young talents into professionals, this motive seems of minor importance in the present study, as all players under consideration are already full-fledged professionals. Moreover, to maintain incentives to invest in junior athletes, long-term contracts might be useful precisely because of the mechanism considered in our paper: they reduce the likelihood of transfers of junior players, and if this nevertheless happens, the team that has invested receives a compensation in the form of a transfer fee. See Segal and Whinston (2000) for a related argument in the context of exclusivity provisions.

26. For example, according to a rule enacted in 2002 (i.e., after the end our observation period) by the governing body in soccer, FIFA, the duration maximum for contracts signed between players and teams is 5 years. Another relevant

FIGURE 4

Estimated Effect of R on ln(Joint Renegotiation Payoff)

Estimated coefficients for R=0; R=2; R=3

90% Confidence Intervals
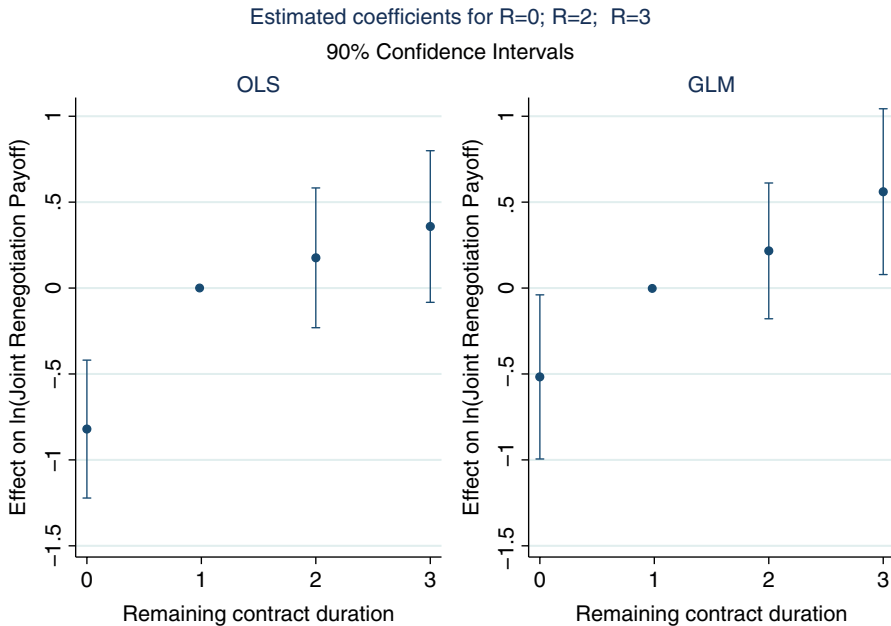
the likelihood of transfers.[27] Again, our empirical analysis strongly corroborates the view that the remaining contract duration is an empirically important factor, and it also reveals that the effect is driven by out-of-contract players.

In our model, we have conveniently assumed that long-term contracts last until the end of the player's career horizon, so that there are no different remaining durations of nonexpired contracts. We did so not only for analytical tractability, but also because the question whether the impact of a player's contractual status on the entrant's (and hence also on the contracting parties) renegotiation payoff is exclusively driven by

expired contracts or also affected by the remaining duration of (nonexpired) contracts is a subtle one. The reason is that cooperative bargaining theory suggests that even the theoretical answer to this question depends rather delicately on the exact model structure applied.

For example, when considering a larger career horizon for the player (denoted by k), then under the nucleolus concept as considered in our paper, it can easily be shown that the entrant's payoff decreases in the remaining contract duration R if the player's career horizon k is low compared to R. By contrast, if k is sufficiently large, then all that matters is whether the contract is expired or not.[28] Recalling that for the rent-seeking motive, it is sufficient that the entrant's payoff is highest when the player's contract has expired, it is clear that these subtle case distinctions, which occur even within the *same* cooperative bargaining concept, are not at the heart of our paper.[29]

In our model, we stipulate a causal link from the remaining contract duration to the transfer

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factor in this context might be risk-sharing considerations, and the effect on the optimal contract duration would be ambiguous, depending on the degrees of risk-aversion of teams and players. For instance, if players are more risk-averse then clubs are, then a longer contract duration serves as an insurance device for potential injuries, and longer contracts increase the joint utility of the two parties due to improved risk-sharing.

27. In our approach, the joint surplus ex ante depends only on the probability of a transfer, and on the resulting renegotiation payoff in case of a transfer. When in addition considering other relevant factors such as risk-sharing, then the contract duration would also directly affect the joint surplus of the contracting parties even when no transfer occurs.

28. Details are available from the authors upon request.

29. Under the Shapley value, it can be shown that the entrant's payoff decreases in R, but recall that the Shapley value is not necessarily in the core and hence not a convincing concept in our context.

TABLE 5
Average Contract Durations Before and After
Bosman Judgment

Season	94/95	95/96	96/97	97/98	98/99	99/00
Average Duration	2.917	2.831	3.224	3.295	3.278	3.266

probability, driven by the new team's share in renegotiations. One might challenge this interpretation by suggesting that transfer probabilities are in fact independent of the terms of a player's contract, and that the negative relationship is driven by sorting of players into different contracts.[30] Note first that this alternative theory would be difficult to reconcile with our empirical finding that it matters strongly whether or not a player's contract has expired, thereby giving rise to a discontinuous jump of the respective outcome variable when the remaining duration becomes zero. Even more importantly, unlike such an explanation, our framework is also consistent with observed changes in average contract durations occurring in response to an institutional change (the Bosman judgment of 1995), which has occurred just before our observation period starts. Before the Bosman judgment, incumbent teams retained some veto power even after a player's contract had expired, thereby receiving a (smaller) transfer fee also in this case. In line with our model, the incentive to sign longer contracts under the pre-Bosman regime is smaller, because of the less pronounced difference between nonexpired and expired contracts in terms of the incumbent team's veto power. Therefore, our model would predict a stronger incentive to sign longer contracts as a result of the Bosman judgment. Table A1 shows the average contract durations in the two seasons before the judgment (1994/1995 and 1995/1996) and the four seasons afterwards. Consistent with our theoretical prediction, there has indeed been an upward jump of the average duration by approximately half a year in the aftermath of the judgment.

The literature on strategic contracting discussed in the Introduction exhibits a further common feature, namely that not only outsiders, but also some of the contracting parties themselves may be harmed in the course of using contracts as rent-seeking devices, and must hence be compensated ex ante in exchange for agreeing to such a contract.[31]

In our context, this issue arises naturally as in renegotiations, players tend to be better off when their contract is expired, while the reverse is true for incumbent teams who are better off when the remaining contract duration is large.[32] This suggests that when a long-term contract is jointly optimal, a player would have to be compensated ex ante for agreeing to such a contract in the form of a higher wage. In contrast, when a short-term contract is optimal, then the incumbent team would demand compensation from the player, leading to a lower wage. In either case, this argument would predict a positive correlation between wages and contract durations. Our data allow to tentatively investigate this issue and, controlling for ability, we find that on average, one more year of contract duration increases a player's annual wage by 24%. However, because of potential endogeneity issues with respect to the contract duration and the lack of appropriate instruments, this result has to be treated with caution, and a more detailed analysis is warranted in further research.

While fully consistent with our theory based on strategic contracting and rent seeking, we believe that any empirically observed positive correlation between wages and contract durations would be hard to reconcile with alternative explanations: For example, under the realistic assumption that players *ceteris paribus* prefer higher wages and longer contracts, these two variables should be substitutes rather than complements, leading to a *negative* correlation. In particular, consider the case where risk-aversion of players (leading to a strong preference of long-term over

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30. Note that such a theory would also need to explain why players with high transfer probabilities systematically sign short-term contracts. This would be puzzling since our empirical analysis clearly shows that contracting parties benefit from long-term contracts when a transfer occurs, which suggests that players with high transfer probabilities should have higher incentives for signing longer contracts, resulting in a *positive* relationship between contract durations and transfer probabilities.

31. In the literature, the issue of ex ante compensation is typically not explicitly analyzed when the focus is on investment incentives which are not affected by the ex ante division of surplus, see, e.g., Hart and Moore (1988), Spier and Whinston (1995). The same is true for other contexts such as asset ownership where incomplete contracting frameworks are used, see, e.g., Hart and Moore (1990), Roider (2004).

32. In our model, the incumbent team is always better off under a long-term contract which is not yet expired at the date of renegotiation. For the player, a sufficient condition being better off in renegotiations under a short-term (and hence expired) contract is that his wage (W) is not larger than his total value for team i (Y), see Result 1 and the Appendix.

short-term contracts) is a major force in determining contract durations. In this case, players should be willing to sacrifice part of their wage in return for a longer contract. Again, this would suggest that the two variables are negatively correlated.

Let us now get back to our results from a broader perspective. Because the driving forces in our framework are not only relevant for contracting in the sports sector, our results might also be of interest for other contexts where long-term contracts are used. For instance, there is a recent debate in the European Commission (EC) about how to deal with long-term contracts in the electricity sector.[33] On the one hand, the EC emphasizes that long-term contracts might be helpful in promoting investment incentives as firms are facing uncertainty, e.g., concerning future legislation with respect to interstate grids. Moreover, with respect to the final allocation, it acknowledges that long-term contracts are not necessarily fully predetermining as there is the possibility of "secondary trade" (see p. 183), i.e., entry by another firm (as a result of renegotiation with the incumbent firm) which tends to improve efficiency. However, on the other hand it also emphasizes that long-term contracts " … raise search cost (transaction costs) for any player interested.... This raises barriers to entry.... Hence, both the Court and the Commission has concluded that long-term contracts should, with certain exceptions, be disqualified … " (see p. 183). Obviously, this latter argument is analogous to the one made and empirically confirmed in our context.

APPENDIX A: PROOF OF RESULT 1

To derive the surplus division under the nucleolus concept, we adopt Theorem 2 in Leng and Parlar (2010, 671) which provides a closed form solution for the (normalized) three-player case when the core is nonempty as in our context. For this purpose, we first normalize the payoffs so that all "coalitions" consisting of one party only are zero. Starting from the original values for the different coalitions

$$V_p = RW, \quad V_e = 0, \quad V_i = V_{ie} = R(Y - W), \quad V_{pi} = Y,$$

$$V_{pe} = RW + (1 - R)(Y + \gamma), \quad V_{pie} = Y + \gamma,$$

the normalized values are

$$\widetilde{V}_p = 0, \quad \widetilde{V}_e = 0, \quad \widetilde{V}_i = \widetilde{V}_{ie} = 0, \quad \widetilde{V}_{pi} = (1 - R)Y,$$

$$\widetilde{V}_{pe} = (1 - R)(Y + \gamma), \quad \widetilde{V}_{pie} = (1 - R)Y + \gamma.$$

33. See European Commission, "DG Competition Report on Energy Sector Inquiry," January 10, 2007, http://ec.europa.eu/comm/competition/sectors/energy/inquiry/full_report_part2.pdf

It can easily be checked that, for expired contracts ($R = 0$), we are in case 3 of Theorem 2 in Leng and Parlar (2010),[34] while we are in case 1 for nonexpired ones ($R = 1$).

For the case $R = 0$, the normalized nucleolus payoffs are

$$\widetilde{V}_p^0 = (1/2)\left(\widetilde{V}_{pe}^0 + \widetilde{V}_{pi}^0\right) = (1/2)((Y + \gamma) + Y) = Y + (1/2)\gamma$$

$$\widetilde{V}_e^0 = (1/2)\left(\widetilde{V}_{pie}^0 - \widetilde{V}_{pi}^0\right) = (1/2)((Y + \gamma) - Y) = (1/2)\gamma$$

$$\widetilde{V}_i^0 = (1/2)\left(\widetilde{V}_{pie}^0 - \widetilde{V}_{pe}^0\right) = 0.$$

Adding the values we subtracted for the normalization and taking into account that we consider expired contracts ($R = 0$) leads to renegotiation payoffs

$$\Pi_p(0) = \widetilde{V}_p^0 + RW = Y + (1/2)\gamma$$

$$\Pi_e(0) = \widetilde{V}_e^0 = (1/2)\gamma$$

$$\Pi_i(0) = \widetilde{V}_i^0 + R(Y - W) = 0.$$

For the case $R = 1$, the normalized nucleolus payoffs are

$$\widetilde{V}_p^1 = \widetilde{V}_i^1 = \widetilde{V}_e^1 = (1/3)\widetilde{V}_{pie}^1 = (1/3)\gamma.$$

Adding the values we subtracted in the course of the normalization leads to the following renegotiation payoffs

$$\Pi_p(1) = \widetilde{V}_p^1 + RW = (1/3)\gamma + W$$

$$\Pi_e(1) = \widetilde{V}_e^1 = (1/3)\gamma$$

$$\Pi_i(1) = \widetilde{V}_i^1 + R(Y - W) = (1/3)\gamma + (Y - W).$$

Hence, for team e we get $\Pi_e(1) = (1/3)\gamma$ and $\Pi_e(0) = (1/2)\gamma$ as stated in Result 1. As for the joint payoff of the player and team i, adding up their payoffs gives $\Pi_{ip}(0) = Y + (1/2)\gamma$ and $\Pi_{ip}(1) = Y + (2/3)\gamma$ as stated in Result 1.

APPENDIX B: PROOF OF RESULT 3

Substituting from Results 1 and 2, we have

$$E[J(0)] = 2Y + (1/4)\gamma \quad \text{and} \quad E[J(1)] = 2Y + (\alpha/3)\gamma.$$

Defining $\Delta := E[J(1)] - E[J(0)]$ as the expected joint surplus difference between a long- and a short-term contract, it follows that $\Delta = (1/12)\gamma(-3 + 4\alpha)$ which is strictly positive for $\alpha > (3/4)$ (in which case the expected joint surplus is higher under a long-term contract) and strictly negative for $\alpha < (3/4)$ (in which case the expected joint surplus is higher under a short-term contract).

34. In our context, the cases 3 and 4 of Theorem 2 in Leng and Parlar (2010) turn out to be equivalent.

TABLE A1
Average Marginal Effects of Probit Estimations

	Binary Probit		Multinomial Probit	
	Transfer	**Transfer[a]**	**Transfer[a]**	**Renewal[a]**
$R = 0$	0.455 (4.99)	—	—	—
$R = 2$	0.015 (.55)	0.019 (0.70)	0.018 (0.67)	−0.044 (1.48)
$R = 3$	−0.016 (.58)	−0.010 (0.37)	−0.010 (0.37)	−0.049 (1.57)
# International games > 10	0.039 (1.43)	0.051 (2.03)	0.052 (2.06)	0.043 (1.58)
Annual wage in first contract	0.016 (1.32)	0.011 (0.88)	0.011 (0.85)	0.022 (1.68)
Age < 25	−0.047 (1.91)	−0.045 (1.93)	−0.044 (1.83)	−0.036 (1.23)
Age > 30	−0.078 (3.53)	−0.059 (2.71)	−0.058 (2.63)	0.019 (.65)
Above average performance previous season	0.083 (3.47)	0.080 (3.38)	0.081 (3.40)	−0.005 (.21)
Tenure in current team	−0.001 (.39)	−0.001 (0.29)	−0.001 (0.28)	0.007 (2.41)
Yearly budget current team	−0.001 (1.04)	−0.002 (1.57)	−0.002 (1.62)	−0.003 (2.48)
Final league position of current team in previous season	0.004 (1.35)	0.003 (1.15)	0.003 (1.16)	−0.006 (2.05)
Log Likelihood	−162.76	−140.77	−291.43	
Observations	613	581	581	

Note: Absolute *t*-statistics in parentheses.
[a]Only subsample with $R > 0$.

APPENDIX C: TRANSFER AND RENEWAL PROBABILITIES

Besides transferring to another team, another option to change the contractual status is a renewal of the contract with the incumbent team. In order to take this possibility into account, we estimate a multinomial probit model with three outcomes: at the end of each season, a player either (i) is transferred, (ii) renews his contract, or (iii) does not change his contractual status. Including the dummy for expired contracts ($R = 0$) into such a model would cause an identification problem as, for the third option, this dummy is always zero by definition. When a player's contract has expired, he can only continue his career when either being transferred or signing a new contract with his current team, i.e., the option of not changing the contract is not available. For this reason, we estimate the multinomial probit only for the subsample with $R > 0$, and the marginal effects for the two choices *transfer* and *renewal* (no contract change is the reference category) are displayed in columns 3 and 4 of Table A1. In order to compare these results with the binary model, we also report estimates of the binary model for the subsample with $R > 0$ in column 2. Also for comparison reasons, column 1 repeats the results reported in Table 3. Comparing columns 1 and 2 reveals no major differences in the relevant point estimates of the marginal effects.

The results for the transfer probability based on the multinomial model in column 3 are also almost identical to those of the binary model reported in column 2. This indicates that, in order to identify the impact of the remaining contract duration on the transfer probability, it is not necessary to distinguish between renewals and no change in contractual status. Therefore, we conclude that it is sufficient for our purposes to restrict attention to the binary probit model.

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