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Abstract

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 are, however, 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 also lead to allocative distortions in the form of deterring efficient transfers. Since incumbent teams tend to benefit more from long-term contracts in renegotiations than players do, these must be compensated ex ante by higher wages when agreeing to a long-term contract. Using data from the German "Bundesliga", our model predictions are broadly confirmed.

Keywords: Strategic contracting, rent-seeking, empirical contract theory, long-term contracts, breach of contract,

JEL classification: L14, J63, L40, L83

1 Introduction

Motivation 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 non-compete 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 (Spier and Whinston, 1995; Segal and Whinston, 2000; Feess and Muehlheusser, 2003), or the allocation of workers (Posner, Triantis, and Triantis, 2004).

As detailed below, the frameworks considered in this literature differ along a variety of important dimensions, but they all share two common properties. First, while potentially detrimental from a social point of view, the rent-seeking devices are *jointly beneficial* for the contracting parties. Second, not only outsiders, but also some of the contracting parties themselves may be harmed in the course of the contractual relationship and must hence be compensated when signing the contract. For example, when a buyer is likely to breach in the future, she might accept a stiff penalty clause only when being compensated ex ante by paying a low price.[1] To the best of our knowledge, all research in this area is purely theoretical, and there is no empirical evidence so far.

Framework In this paper, we test some of the main qualitative properties of strategic contracting models. In doing so, we develop a theoretical and empirical contracting framework in the context of European professional soccer. As the incentive structure exhibits all the general properties described above, our analysis points to *long-term contracts* as useful rent-seeking devices.

In European professional soccer, the contracts between teams and players are in principle binding throughout the agreed duration. However, they are frequently renegotiated *before* they expire when other teams want to hire the player.[2] In the course of such

[1] The issue of ex ante compensation is usually not explicitly analyzed in the literature 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).

[2] In contrast to US sports, it is common for European soccer players to play for several teams throughout their careers. Thereby, transfers between teams often take place while a player's contract with his

a renegotiation process between the player, the current team (incumbent) and the new team (entrant), the threat points are determined by the remaining duration of the player's contract with the incumbent team. In particular, according to long-standing regulations in this sector, holding a valid contract with the player gives the incumbent team the right to veto the transfer, which allows it to extract a payment from the new team (the *transfer fee*) for letting the player go. This transfer fee will 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. As a result, when a transfer is agreed upon, the longer the player's remaining contract duration, the lower the entrant's renegotiation payoff, and the higher thus the *joint* renegotiation payoff of the contracting parties (i.e. player and incumbent team). The player alone, however, might be worse off in renegotiations under a long-term contract which calls for compensation ex ante in the form of a higher wage in the incumbent team.[3]

Specifically, we develop a model where a player and the incumbent team bargain over the duration of their contract and the player's wage. After the contract is signed, a new team may want to hire the player. This team first decides on acquiring information about the player's value, and it then triggers a renegotiation process with the contracting parties whenever the player is more valuable in the new team. Hence, given that renegotiation occurs, the contract terms affect the distribution of surplus only, but not the transfer decision itself which is always ex post efficient.[4]

The social cost of long-term contracts is an inefficiently low frequency of renegotiations, because the new team reaps only part of the renegotiation surplus, while fully covering the (privately known) cost of information acquisition. As a result, the new team's investment incentive is the lower, the lower its renegotiation payoff. This latter

current team is still valid. In our data, this is the case in roughly 75% of all transfers.

[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 resulting payoff consequences. For example, according to Meinolf Sprink, executive at Bayer 04 Leverkusen, "...the motive of shaping (later) transfer fees is always present". Furthermore, Claus Horstmann, CEO of 1. FC Köln (Cologne) says that "we use long-term contracts to protect our investments...". Source: Spiegel online, August 6, 2010, "Gib mir fünf!" (Give me five!), http://www.spiegel.de/sport/fussball/0,1518,710282,00.html

[4]This is a standard feature of incomplete contracting models with renegotiation, see e.g. Hart and Moore (1990), Spier and Whinston (1995), or Segal and Whinston (2000).

payoff is decreasing in the remaining duration of the player's contract with the incumbent team, so that longer contracts reduce the frequency of renegotiation. Consequently, in deciding on the contract duration, the contracting parties are facing the following trade-off: the longer the duration of the contract, the higher their joint renegotiation payoff when a transfer occurs, but the lower the likelihood of a transfer as the renegotiation stage is reached less often.

Results The following predictions emerge from our theoretical framework: *First*, as just pointed out, a player's transfer probability is decreasing in the remaining duration of his current contract which reduces allocative efficiency. *Second*, transfer fees (i.e. the renegotiation payoff of incumbent teams) are increasing in the remaining duration of the player's contract and decreasing in the player's wage in the incumbent team. Both results are intuitive and are driven by the impact of the initial contract terms on the veto power of the incumbent team.[5] *Third*, a player's wage in his new team (i.e. his renegotiation payoff) is increasing in his wage in the incumbent team, but can be either increasing or decreasing in the remaining duration of his initial contract. The first property is again intuitive, and the second result is due to the fact that a player benefits from a long remaining contract duration when his wage in the incumbent team is sufficiently high. *Fourth*, regardless of the effect on the player alone, the joint renegotiation payoff of the incumbent team and the player (i.e. transfer fee plus wage in the new team), is increasing in the remaining duration of the player's initial contract. This confirms the role of contract durations as rent-seeking devices. *Fifth*, when a player is ex post harmed by long-term contracts or benefits less in the renegotiation process than the incumbent team, he is *compensated* ex ante by the incumbent team by receiving a higher wage.

To test our results, we use data from Germany's top professional soccer league ("Bundesliga"). We have information on 422 contracts including duration and (base) wages, as well as player- and team-specific information such as performance, position, experience, or final league position and budgets, respectively. To test the impact of the remaining contract durations on transfer probabilities, we estimate a multinomial logit model where, at the end of each season, players may either change teams, re-new their contracts with

[5] Note that allocative distortions only arise when renegotiation does not occur (resulting in no transfer) although the player would be more valuable in the new team. Because the renegotiation process itself is efficient, a transfer is never agreed upon when the player is more valuable in the incumbent team.

their current teams or simply continue an ongoing contractual relationships. We find that on average, a longer remaining contract duration significantly reduces the probability of being transferred. This clearly supports the view of contract duration affecting player mobility.

Our predictions about renegotiation payoffs are also broadly supported by the data: First, one additional year of remaining contract duration increases the average transfer fee substantially. Second, a player's wage in his new team is increasing in the wage in his previous team. Third, in line with the ambiguity derived in the theoretical framework, we do not find a significant impact of the remaining duration of the player's previous contract. Fourth, one more year of remaining contract duration increases the joint renegotiation payoff of a player and his old team by more than 50 percent, suggesting that long-term contracts are indeed useful rent-seeking devices. Finally, we find that incumbent teams benefit more from long-term contracts than players do. According to our theory, this calls for player compensation in form of a higher wage in the incumbent team. In fact, controlling for ability, one more year of contract duration on average increases a player's annual wage by 24 percent.

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, "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.[6] 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 non-compete clauses in labor contracts. Again, the inefficiencies generated by such contract clauses depend on whether or not renegotiation

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

is permitted.[7]

Our framework is in-between the two polar cases of excluding renegotiation altogether and having a renegotiation process 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.

The remainder of the paper is organized as follows: Section 2 introduces a simple theoretical framework for analyzing the issue of strategic contracting in our sports context. Section 3 describes the data used for the empirical analysis in Section 4, in which the model predictions are empirically tested. Section 5 discusses our findings and concludes.

2 The model

In the following, we consider a simple buyer-seller framework with the possibility of future entry as considered in the literature on strategic contracting discussed above, and adopt it to our context of European professional sports as follows:

At date -3, a player bargains with team i (the *incumbent*) over a contract stipulating

[7] 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 (2005) design and implement an empirical test which, using data from the Spanish soccer league, leads them to reject the commitment hypothesis.

a duration T and a wage W per unit of time.[8] The player's career horizon is normalized to last from date 0 until date 1, and his productivity in team i is $Y > 0$ per unit of time.[9]

At date -2, after the contract has been signed but before the player starts playing for team i at date 0, a new team e (the *entrant*) may be interested in hiring him. The player's productivity in team e is $Y + \gamma$ per unit of time where γ is a random variable distributed on $[-\infty, \infty]$ with density $f(\gamma)$. However, to find out the true value of γ, team e must make an investment decision $I \in \{0, 1\}$. For instance, it may need to collect information about the player himself, it must figure out how well he fits in its tactical system, or it must decide about alternative candidates. 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 distributed on $[0, \infty]$ with density $h(z)$. 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 lead to unwarranted and inefficient entry deterrence.[10]

At date -1, after the investment decision is made, team e decides whether or not to enter negotiations with the contracting parties. We assume that the expected value of γ is negative which ensures that team e will never want to negotiate without having chosen to invest in information acquisition.[11] As our focus is on inefficiencies created through strategic contracting even when renegotiations are ex post efficient, we furthermore assume that γ becomes common knowledge in the renegotiation process.

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*, while (single-party)

[8] As will become clear below, because of a one-to-one relationship between contract duration and the resulting payment (transfer fee) to the incumbent team in case a transfer occurs before the contract expires, there is in principle no need to additionally stipulate a breach penalty in the contract. In reality, such breach penalties are sometimes observed and can be interpreted as upper bound on team i's bargaining power.

[9] As is standard in the literature, 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.

[10] 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.

[11] 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.

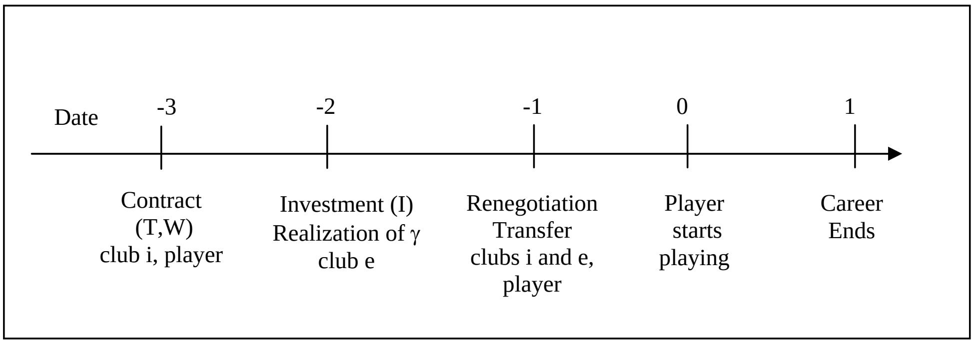

Figure 1: Sequence of Events

investment decisions are individually optimal:[12] That is, the contract signed at date -3 maximizes the expected *joint surplus* of the player and team i, while at date -2, team e will invest whenever the cost (z) is lower than its *own* expected renegotiation payoff. Finally at date -1, given that team e has invested and triggered the renegotiation process, the player is transferred whenever it is efficient to do so (i.e. when $\gamma \geq 0$), regardless of his contractual situation. The sequence of events is summarized in Figure 1.

Because of our assumption that γ is learned before date 0, the player might be traded directly at date 0 without having played for team i at all. We make this assumption for analytical simplicity, and because it is in line with the set-ups considered in the literature on strategic contracting where trade occurs only after the arrival of new potential trading partners. In reality, players will typically start playing in their incumbent teams before being transferred to another team. All of our results can also be derived in a continuous framework where productivity shocks can occur at any time so that the player plays for both teams.

2.1 Benchmark

As for the efficient investment decision, a transfer takes place if and only if team e invests and learns that $\gamma \geq 0$. Therefore, expected social welfare $SW(I)$ is given by

[12]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, canonicals frameworks such as Grossman and Hart (1986) and Hart and Moore (1990) exhibit this feature.

$$SW(I) = \begin{cases} Y & \text{if } I = 0 \\ Y + \int_0^\infty \gamma f(\gamma)\, d\gamma - z & \text{if } I = 1 \end{cases} . \tag{1}$$

Without investment, the player will play for team i with productivity Y throughout his whole career. With investment, a transfer takes place when $\gamma \geq 0$, so that his productivity is Y for all $\gamma \leq 0$ and $Y + \gamma$ otherwise. This leads to a threshold $\widetilde{z}^f := \int_0^\infty \gamma f(\gamma)\, d\gamma$, such that it is efficient for team e to invest for all $z \leq \widetilde{z}^f$.

2.2 Date -1: Renegotiation

Assume that team e has invested z and has learned that $\gamma \geq 0$. Then, a change of teams takes place, and the division of the renegotiation surplus γ per unit of time depends on each party's veto power. Consistent with the legal environment in European professional soccer since 1995, team i can credibly threaten to veto the transfer as long as the player has a valid contract, but it has no more veto power after the contract has expired.[13] Hence, this contrasts with a *reserve clause* as known in US sports, and longterm contracts are in fact binding.[14]

To capture this crucial aspect, we use the Shapley value concept to determine the surplus division at each point in time. When the player's contract is still valid (from date 0 until date T), all three parties are involved. By contrast, for the remaining period $(1 - T)$ where the contract has expired, team i fully loses its veto power, and the bargaining effectively occurs between the player and team e only. An important aspect we need to take into account is that in this case, it would be quite unrealistic to assume that the player's threat point is zero. Instead, we assume that he can always obtain a "threat point" payoff equal to his base productivity Y. For example, this property would naturally emerge under the assumption that, after contract expiration, there is competitive bidding for the player's services by several other teams (including team i),

[13] This legal regime was implemented by the so-called "Bosman judgment" of the European Court of Justice in 1995, 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.

[14] One might argue that players can reduce the incumbent team's veto power simply by threatening not to perform well on the pitch. However, all we need is the realistic assumption that holding a valid contract with a player increases a team's veto power in the renegotiation process.

and where the player's productivity in each of these teams is equal to Y.[15]

Denoting by $\pi_j^c(\gamma, W) \geq 0$ the renegotiation payoff of party $j = i, e, p$ per unit of time depending on whether the player has a valid contract with team i or not, $c = V, N$, we get the following result (see Appendix A for details):

Lemma 1 *Using the Shapley value concept, the renegotiation payoffs per unit of time are as follows:*

(i) For the period $[0, T]$ *where the player's contract is still valid:*

$$\pi_i^V = Y - W + \frac{1}{3}\gamma, \quad \pi_p^V = W + \frac{1}{3}\gamma, \quad \text{and} \quad \pi_e^V = \frac{1}{3}\gamma.$$

(ii) For the period $[T, 1]$ *where the player's contract has expired:*

$$\pi_i^N = 0, \quad \pi_p^N = Y + \frac{1}{2}\gamma, \quad \text{and} \quad \pi_e^N = \frac{1}{2}\gamma.$$

Clearly, $\pi_i^V > \pi_i^N = 0$ as team i benefits from its veto power as long as the contract is still valid. Since team i becomes irrelevant after the contract has expired, team e and the player each reap half of the renegotiation surplus.[16] Note, however, that the player may nevertheless benefit from a valid contract when his wage in team i is sufficiently high as $\pi_p^N > \pi_p^V$ if and only if $W < Y + \frac{1}{6}\gamma$.[17]

Total renegotiation payoffs over time are given by simply adding up over the periods with and without valid contract:

$$\Pi_j(\gamma, T, W) = T \cdot \pi_j^V(\gamma, W) + (1 - T) \cdot \pi_j^N(\gamma, W) \;\; \forall j = i, e, p. \tag{2}$$

Result 1 *Total renegotiation payoffs have the following properties:*

[15] The alternative assumption that such alternative employment opportunities do not exist, leading to a threat point payoff of zero for the player, would clearly be unrealistic in the present context.

[16] These features emerge naturally also for alternative specifications of the renegotiation process; see e.g. Segal and Whinston (2000), Burguet, Caminal, and Matutes (2002), Feess and Muehlheusser (2003) and Terviö (2006).

[17] This feature of the Shapley value is quite intuitive in our context. For instance, assume that $Y = 80$ and $\gamma = 100$ so that the player gets $80 + \frac{1}{2} \cdot 100 = 130$ per unit of time for period $(1 - T)$ where his contract has expired. Hence, whenever $W > 130$, he will clearly get more than 130 in renegotiations as long as his contract is valid; otherwise he would prefer to veto the transfer. Clearly, for smaller values of W, the opposite might hold so that the player benefits from being out of contract.

(i) with respect to the player's wage in team i (W), it is (weakly) decreasing for team i, neutral for team e, and (weakly) increasing for the player. The joint renegotiation payoff of the player and team i is independent of W.

(ii) with respect to the remaining contract duration (T), it is increasing for team i, decreasing for team e, and ambiguous for the player. The joint of renegotiation payoff of the player and team i is increasing in T.

All properties follow directly from Lemma 1. The player's wage in team i increases his payoff when staying with team i, and this also increases his payoff when a change of team occurs. The opposite holds for team i. As these two effects offset each other, W is neutral for their joint renegotiation payoff and thus also for team e. Hence, W is a purely distributive matter and hence not influenced by rent-seeking considerations.

The crucial point in *part (ii)* is that, even in cases where the player's payoff alone is decreasing in T, the *joint* payoff of the player and team i is always increasing in T. This follows immediately from the fact that team e's payoff is decreasing in T.[18]

Of course, in our context the renegotiation payoffs of team i and the player can be naturally interpreted as the transfer fee and the player's annual wage in team e, respectively.[19]

2.3 Date -2: Investment

Given the outcome of the renegotiation process, team e will invest whenever its expected renegotiation payoff net of investment costs z is non-negative. It follows that there exists a threshold $\widetilde{z}(T) := \int_0^\infty \Pi_e(\gamma, T) f(\gamma)\, d\gamma$ such that the investment occurs for all $z \leq \widetilde{z}(T)$. Moreover, team e's investment incentives are *decreasing* in T as

$$\widetilde{z}'(T) = \int_0^\infty \frac{\partial \Pi_e(\gamma, T)}{\partial T} f(\gamma)\, d\gamma < 0. \tag{3}$$

Finally, since $\Pi_e(\gamma, T) < \gamma$ for all $\gamma \geq 0$, it follows that $\widetilde{z}(T) < \widetilde{z}^f$ for all $T \geq 0$. As a result, compared to the efficiency benchmark, there is under-investment even for $T = 0$, because team e bears the full cost of the investment (z), but gets only part of the social

[18] To see this, simply note that $\Pi_p(\cdot) + \Pi_i(\cdot) \equiv Y + \gamma - \Pi_e(\cdot)$, and $\frac{\partial \Pi_e}{\partial T} < 0 \;\; \forall T, \gamma$.

[19] Since the player's career horizon is normalized to one, his total renegotiation payoff equals his "average" renegotiation payoff per unit of time.

gain in case of a transfer ($\Pi_e < \gamma$). And as $\widetilde{z}'(T) < 0$, the under-investment problem is aggravated by longer contract durations.

¿From the viewpoint of the contracting parties who do not observe z, the probability of a transfer is then given by $\Pr\left(z \leq \widetilde{z}(T)\right) \cdot \Pr\left(\gamma \geq 0\right)$ which is, again due to $\widetilde{z}'(T) < 0$, also strictly decreasing in T. We summarize as follows:

Result 2 *The probability that the player will be transferred is decreasing in the remaining duration of his contract.*

2.4 Date -3: Contracting

The duration of the contract agreed upon by the player and team i maximizes their expected joint payoff:

$$J(T) = Y + \Pr\left(z \leq \widetilde{z}\,(T)\right)\left[\int_0^\infty \left(\gamma - \Pi_e(\gamma, T)\right) f\left(\gamma\right) d\gamma\right]. \tag{4}$$

The player and team i get at least Y with certainty. When a transfer takes place (i.e. when team e invests and $\gamma > 0$), then *in addition* they get the total renegotiation surplus γ minus team e's share of it. Recall that team e's (renegotiation) payoff is independent of W, so W does also not enter $J(T)$.

If interior, the optimal contract duration T^* trades off at the margin the expected costs from increasing the contract duration because of a lower transfer probability versus the expected gain from rent-seeking in case a transfer occurs. Note again that the contract duration can be interpreted as a breach penalty in the framework of Aghion and Bolton (1987) as it influences the contracting parties' decisions and payoffs in a similar way: the higher the breach penalty (or the longer the contract duration), the lower is the entrant's profit when entry occurs (rent-seeking), but the probability of entry is inefficiently low.

In our model, we focus on the rent-seeking motive when determining the contract duration. In reality, however, there are also other factors influencing the contract duration with differing impacts across players and teams. For example, short term contracts may be superior when the incumbent team is planning to hire a new coach who prefers a different tactical system. Moreover, contract durations may also be driven by risk preferences, by private information of players about their expected future productivity or by changes in the legal environment.[20] For similar reasons, contracts may be extended or renewed before expiry and before another team attempts to hire the player.

Summing up, there are many reasons why the optimal contract duration varies across player-team pairs, and we will hence observe different durations for reasons beyond the rent-seeking motive. We do not want to model these different motives explicitly, but it is interesting to see how changes in the contract duration affect the player's wage W in team i. We assume that W is determined such that the total expected joint surplus under the optimal contract, $J(T^*)$, is shared equally between the contracting parties.[21] Relegating the formal analysis to Appendix B, we get the following result:

Result 3 *When an increase in the contract duration decreases the expected renegotiation payoff for the player or increases it by less than for team i, the player gets compensated by a higher wage W.*

The intuition for the result is straightforward, but it has consequences for the empirical part. Assuming that the division of the player's and team i's *expected* joint surplus in the whole game is driven by their relative bargaining positions at the contracting stage, it is clear that the party who benefits more from a longer contract duration in the renegotiation process must compensate the other party ex ante. In Appendix B, we show that the outcome depends on the interplay of three effects, and that it is in principle possible that the player must compensate the incumbent team. However, the reverse case where the player is compensated seems much more intuitive and is also supported by the empirical analysis below: Recall that in renegotiation, team i clearly benefits from a longer (remaining) contract duration, while the effect on the player is ambiguous. Therefore, for compensation of team i to occur, the effect on the player's renegotiation payoff would have to be strongly positive, which is neither intuitive nor supported by our empirical analysis.

[20] For example, Feess, Frick, and Muehlheusser (2004) find a strong increase of average contract durations after the Bosman judgement.

[21] Our argument does not depend on the 50:50 split, but holds whenever the wage is determined by the relative bargaining power of the player and team i at the contracting stage.

3 Data

Our data set covers four consecutive seasons of the German top professional soccer league ("Bundesliga") from 1996/97 to 1999/2000.[22] Using the leading German soccer magazine "Kicker", we have compiled data with detailed information on contract durations, player remuneration and transfer fees. In total, we have complete information on 293 players who signed at least one contract in the observation period. Out of these players, 128 signed a *second contract* during the observation period; with 66 renewals and 62 transfers.[23] For those 62 players who changed teams during the observation period, we have all the necessary information about the previous (i.e. first) and the new (i.e. second) contract. Hence, these observations will be used for analyzing the renegotiation game. The information about the previous contracts of these players will prove useful in dealing with selection issues. Throughout, we will refer to the wage and the remaining duration of the first contract as the remaining contract duration and as the previous wage. By contrast, the duration and the wage in the second contract are referred to as the new duration and as the new wage.

Table 1 provides the descriptive statistics for the 293 first contracts and the 128 second contracts (66 renewals and 62 transfers to new teams). Note first that, compared to the annual wage under the first contract, a new contract is on average associated with an increase of about 100%. This holds both for transfers and for renewals with almost identical variance. Also, the contract duration of the previous contract is almost the same for players renewing their contract and for players changing teams.

Second, players with second contracts already had higher wages in the first contract

[22] This four-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 resulted from the so-called Bosman judgement explained above (effective since season 1996/97), 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 1996/97-1999/2000.

[23] Based on our sample of first contracts, we do observe all second contracts signed in the observation period. Because new contracts (renewals, in particular) signed by less prominent players are not always publicly reported, our sample captures the large majority, but probably not all first contracts signed during the observation period.

Variable	1. Contract Mean	Std. Dev.	2. Contract Team change Mean	Std. Dev.	Renewal Mean	Std. Dev.
yearly wage (in million)	0. 84	0. 75	1.63	1.31	1.66	1.32
transfer fee (in million)	-		2.66	3.52	-	
joint = wage + transfer fee (in million)	-		4.21	4.63	-	
contract duration (in years)	3.10	0.94	2.94	0.96	3.09	1.19
wage previous contract (in million)	-		1.12	0.94	1.18	1.12
duration previous contract (in years)	-		3.14	1.13	3.05	1.07
remaining duration previous contract (in years)	-		1.49	1.22	1.38	1.13
zero remaining contract duration	-		0.27		0.22	
league games	77.4	91.8	132.0	100.0	152.6	112.6
international games	7.7	15.2	18.6	27.5	22.1	28.9
budget (in million)	37.9	10.5	43.1	15.8	44.8	13.6
performed above average last season			0.50		0.42	
final league position last season (1-18)			9.48	5.05	7.55	4.81
Number of observations	293		62		66	

All monetary variables are measured in German Marks (DM), where 1 DM ≈ 0.5 Euro ≈ 0.65 US $.
There are 10 cases with missing observations for the transfer fee, and hence also for the joint surplus.

Table 1: Descriptive Statistics

which suggests that better players have a higher probability of changing their contract. This view is reinforced by the fact that the average number of international games is also considerably higher for players signing a second contract.[24] The conjecture that high-ability players are more likely to sign new contracts will be supported by the results of the multinomial choice model presented below.

Table 1 also provides descriptive statistics of further control variables used in the empirical analysis. In addition to the number of international games already mentioned, also the number of league games can be seen as an indicator of experience and quality. Player performance in the previous season is measured by a dummy variable indicating whether a player performed better than the average player on his position. Relating the performance to the average performance of all players on the same position is useful as the performance index varies considerably among different positions. The performance measure is based on a composite index considering both position-specific factors such as the number of assists per match for a striker, and team specific factors such as the result

[24]International games are those played between national teams, including e.g. the qualifiers for the FIFA world cup and, if qualified, the games at the FIFA world cup itself. Since only the best players are selected for the national team, the number of international games serves as a good quality indicator.

of a match. We also use information on the yearly budgets and the final league position of teams to account for team heterogeneity.[25]

4 Results

4.1 Transfer probability

For all of our hypotheses on wages and transfer fees, we need to take into account that players who are transferred may systematically differ from those who are not. At the end of each season, a player either *(i)* changes teams, *(ii)* re-signs with his current team, or *(iii)* does not change his contractual status.[26] We model this decision as a multinomial logit model with three outcomes. Overall, there are 694 player-year observations for the estimation of the multinomial logit model which refer to 293 different players. As control variables for both the decision to change the team and for the characteristics of the new contract, we use the variables shown in table 1 above. These control variables include team characteristics such as the yearly budget and final league position in the previous season, and player characteristics such as position and the number of league and number of international games. Based on these estimates, we compute selection correction terms which are included correspondingly in the outcome equations for wages and transfer fees. This extension of the standard selection model has first been proposed by Lee (1983), and was further developed by Dubin and McFadden (1984) and Dahl (2002). Bourguignon, Fournier, and Gurgand (2007) carry out a Monte Carlo analysis of these estimators and some extensions of them. Based on their findings for small samples, we use a generalization of the Dubin and McFadden estimator. More details are provided in Appendix C.

In the empirical analysis, we need to deviate from the chronological order of the theory part. In the model, we had to work backwards, and therefore started by analyzing the renegotiation game which led first to our results on transfer fees and on wages in the new team. In the empirical part, however, we need to take care of a potential selection bias

[25]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 absolutely no effect on the estimation results.

[26]None of the players in our data set has terminated his career during the observation period.

	Team change
remaining duration at end of season	-0.029***
	(0.010)
performed above average last season	0.100***
	(0.032)
final league position last season	0.006***
	(0.002)

****** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.
Only significant marginal effects are shown.*

Table 2: Transfer probability, marginal effects

when analyzing transfer fees and new wages after a change of teams. Hence, we start with the multinomial logit model which yields first the results on the transfer probability. The respective result from the theory part can be expressed as follows:

Hypothesis 1 *A player's transfer probability is decreasing in the remaining duration of his contract.*

Table 2 presents the estimated marginal effects of the variables that have significant coefficients in the multinomial logit estimation, evaluated at the mean of all explanatory variables.[27] These marginal effects measure the expected change in the transfer probability when the corresponding variable increases. The probability that a player is transferred decreases by approximately 3 percentage-points for another year of remaining contract duration. As the overall transfer probability is only 9 percent (62 transfers in 694 player-years), an additional remaining year of contract duration reduces the transfer probability by about one third. Furthermore, the transfer probability is significantly higher for players who performed above average confirming the basic intuition that new teams are more willing to initiate a renegotiation process for high potential players. Finally, players are less likely to transfer when their team performed well during the last season (i.e. had a lower rank position).

[27]We restrict attention to transfer probabilities as this is our variable of interest. The full multinomial logit estimation results are presented in Table 7 in Appendix C. We also computed the average marginal effects over all players. The results are very similar to those in Table 2.

4.2 Transfer fees

We now turn to the empirical analysis of the renegotiation payoffs. Starting with transfer fees, the renegotiation payoff of team i, our theory leads to the following Hypothesis:

Hypothesis 2 *Transfer fees are (i) increasing in the remaining duration of a player's previous contract, and (ii) decreasing in the player's wage in his previous team.*

Transfer fees are zero for expired contracts as the initial team no longer plays an active role in the renegotiation process. Hence, the relationship between remaining contract duration and transfer fee is deterministic in these cases. We therefore restrict the analysis to the 36 cases with positive remaining contract durations.

The dependent variable is the log of the transfer fee, and as control variables we now use only the number of league games and international games, and the budget of the new team. The exclusion restrictions for the selection model are imposed by not including tenure in the old team, above average performance in the past season, and final league position in the past season in the transfer fee regression. For example, a player's tenure in the old team rather seems to affect the likelihood of a transfer (see Table 7) than the transfer fee paid by the new team. While not a formal test, the fact that these variables are not significant when included in the transfer fee equation suggests that these exclusion restrictions are valid.

Both regressions show a positive significant impact of the remaining contract duration. Given that two of the selection terms are significant, the OLS estimates may be biased. In the selection model, the estimated coefficient for remaining contract duration is approximately 0.8. Hence, an additional year of remaining contract duration roughly doubles the transfer fee.[28] This confirms part (i) of Hypothesis 2.

The wage in the previous contract has no significant impact on transfer fees which, at first glance, contradicts part (ii) of Hypothesis 2. However, despite of using a number of control variables (league games and international games, and position-specific performance measures) as proxies for player quality, still part of the measured impact of the wage in the previous contract seems due to a quality effect. But then, the non-significance may be attributed to the following countervailing effects: On the one hand, a higher pre-

[28]The exact computation for the percentage increase is given by $100 \cdot (\exp(\beta) - 1))$ which equals 1.2 in our case.

	(1)	(2)
	Selection Model	***OLS***
remaining duration previous contract	0.783***	0.460***
	(0.163)	(0.122)
wage previous contract (ln)	-0.0158	0.154
	(0.183)	(0.183)
league games	-0.00281	-0.000516
	(0.00258)	(0.00152)
international games	0.0502***	0.0572***
	(0.0148)	(0.0157)
international games squared	-0.000589***	-0.000591***
	(0.000188)	(0.000192)
budget	0.0170**	0.0186**
	(0.00614)	(0.00698)
$\lambda(\Gamma_1)$	-0.579**	
	(0.220)	
$\lambda(\Gamma_2)$	-5.529**	
	(2.232)	
$\lambda(\Gamma_3)$	-3.634	
	(3.906)	
Constant	9.396**	10.35***
	(4.541)	(2.454)
Observations	36	36
R-squared	0.751	0.638

Dependent variable: ln(fee)
**** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.*
Column (1) displays the estimates of the selection multinomial logit.
Column (2) displays the OLS estimates based on all contracts signed after the first contract.
Only observations with strictly positive remaining contract duration are used because a zero remaining duration perfectly predicts a zero transfer fee.

Table 3: Transfer fees

vious wage weakens the bargaining position of incumbent teams, thereby reducing the transfer fee as suggested by our theory. But on the other hand, players with higher previous wages are of higher quality which ceteris paribus increases transfer fees. Our subsequent results will allow to approximately quantify the (by and large equal) sizes of both effects, which is consistent with the small and non-significant net effect measured here.

4.3 Wages

For the empirical analysis of the new wage, recall that it is driven by the terms of *two* different contracts: First, as suggested in Result 1 above, the remaining duration and the wage of the player's previous contract affect the new wage via the renegotiation process. Second, the duration of the new contract will also have an impact on the annual wage: When deciding upon the terms of the new contract, the two contracting parties (now the player and team e instead of team i) have a rent-seeking motive vis a vis future entrants similar to the one analyzed for the first contract.[29] And as the new team tends to benefit more from a longer contract in renegotiations, it is to be expected that the annual wage in the new team is increasing in the duration of this very contract (compensation). To keep things simple, we did not explicitly model this additional contracting stage in the theoretical part, but in reality, players sign a series of contracts during their career. Hence, we must account for the fact that the rent-seeking motive also influences the duration of the second contracts we observe, and thereby also the annual wage. We address these issues in two steps, starting with the impact of the previous contract terms on the player's new wage, while the impact of the duration of the new contract on the players' annual wage in the new team is discussed in subsection 4.5 below.

Recall from Result 1 that a higher previous wage should increase a player's new wage, whereas the impact of the remaining duration in the previous contract is ambiguous. We thus test the following Hypothesis:

Hypothesis 3 *A player's annual wage in his new team is increasing in his annual wage in his previous team.*

[29] Thereby, the contracting parties are facing the same trade-off between transfer probability and joint renegotiation payoff as in the first contract.

	(1)	(2)	(3)	(4)
	Selection Model	***Selection Model***	***OLS***	***OLS***
remaining duration previous contract	0.0348	0.0188	0.0734	0.0504
	(0.105)	(0.140)	(0.0578)	(0.0876)
wage previous contract (ln)	0.413***	0.458***	0.392***	0.471***
	(0.0966)	(0.114)	(0.0913)	(0.113)
contract duration	0.245***	0.177	0.215***	0.137
	(0.0916)	(0.130)	(0.0795)	(0.116)
league games	0.00157*	0.00190	0.00117	0.000692
	(0.00085)	(0.00145)	(0.00071)	(0.00103)
international games	0.00667	0.00676	0.00517	0.00828
	(0.00797)	(0.00913)	(0.00729)	(0.00877)
international games squared	-3.44e-05	-4.57e-05	-2.34e-05	-6.04e-05
	(8.51e-05)	(9.47e-05)	(8.22e-05)	(9.45e-05)
budget	0.017***	0.0124**	0.017***	0.013***
	(0.00413)	(0.00470)	(0.00412)	(0.00469)
$\lambda(\Gamma_1)$	-0.200	-0.253		
	(0.138)	(0.157)		
$\lambda(\Gamma_2)$	-0.307	-1.254		
	(1.237)	(1.553)		
$\lambda(\Gamma_3)$	-2.313	-4.468*		
	(1.610)	(2.348)		
Constant	5.024**	2.841	6.987***	6.425***
	(1.983)	(2.464)	(1.220)	(1.479)
Observations	62	45	62	45
R-squared	0.654	0.616	0.634	0.574

Dependent variable: ln(wage)
**** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.*
Columns (1) and (2) display the estimates of the selection model. Column (1) is based on all observations, column (2) is based on observations with strictly positive remaining contract duration only. The estimation results of the selection multinomial logit are presented in the appendix. Columns (3) and (4) are OLS estimates based on the same data selection rule as in columns (1) and (2).

Table 4: New wages

The results in Table 4 confirm Hypothesis 3. On average, a player's previous wage has a significant and positive impact on the wage in his new club. This is true for all specifications. Again, the available quality variables do not allow to fully control for players' ability, so that the estimated impact of the previous wage tends to also include a quality component, the value of which will be approximated using Table 5 below.

Interestingly, the remaining duration of the old contract has no significant impact on the wage in the new contract. This result, which holds regardless of whether we exclude players with expired contracts or not, is in line with our prediction of countervailing effects. Specifically, new teams need to pay large transfer fees when the remaining contract duration is high, but they are not willing to pay large transfer fees and high wages at the same time. On the other hand, players may benefit from valid contracts in case of transfers when their wage in the incumbent team is sufficiently high (see Part (ii) of Result 1).

4.4 Joint renegotiation payoff

While the effect of the remaining duration of a player's old contract on his wage in the new wage is theoretically ambiguous and empirically insignificant, our model leads to a clear prediction for the *joint* renegotiation payoff of incumbent teams and players, suggesting that long-term contracts are useful rent-seeking devices:

Hypothesis 4 *The joint renegotiation payoff of the incumbent team and the player (transfer fee plus wage in the new team) is increasing in the remaining duration of the player's previous contract.*

Again, we report results for the selection model and for OLS, using the same sample definitions as in the analysis of wages.[30]

In columns (1) and (3), we use all transfers, i.e. also those following expired contracts for which the joint renegotiation payoff is just the wage since transfer fees are zero. In columns (2) and (4), we restrict the sample to those cases where the remaining contract duration was positive. Because some of the selection correction terms are significant, we focus on the selection model. We find that the effect of the remaining contract duration is significantly positive and almost identical for the samples with and without expired

[30]Sample sizes are different because there are several missing observations for transfer fees.

	(1)	(2)	(3)	(4)
	Selection Model	***Selection Model***	***OLS***	***OLS***
remaining duration previous contract	0.454***	0.471***	0.423***	0.212
	(0.128)	(0.162)	(0.0781)	(0.129)
wage previous contract (ln)	0.256**	0.164	0.237*	0.230
	(0.123)	(0.136)	(0.123)	(0.142)
contract duration	0.234**	0.0519	0.194*	0.156
	(0.114)	(0.158)	(0.108)	(0.175)
league games	0.00102	-0.000956	0.000745	2.24e-05
	(0.00106)	(0.00205)	(0.000907)	(0.00123)
international games	0.0299***	0.0367***	0.0327***	0.0443***
	(0.0106)	(0.0108)	(0.0110)	(0.0115)
international games squared	-0.00028**	-0.0004***	-0.00032**	-0.0005***
	(0.000131)	(0.000139)	(0.000140)	(0.000141)
budget	0.0204***	0.0169***	0.0218***	0.0178***
	(0.00475)	(0.00450)	(0.00512)	(0.00515)
$\lambda(\Gamma_1)$	-0.522***	-0.479***		
	(0.166)	(0.161)		
$\lambda(\Gamma_2)$	-1.614	-4.119**		
	(1.552)	(1.657)		
$\lambda(\Gamma_3)$	-4.854**	-4.534		
	(1.894)	(2.861)		
Constant	5.220**	7.111**	9.011***	9.947***
	(2.429)	(3.319)	(1.630)	(1.813)
Observations	52	36	52	36
R-squared	0.825	0.800	0.780	0.705

Dependent variable: ln(joint)
**** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.*
Columns (1) and (2) display the estimates of the selection model. Column (1) is based on all observations, column (2) is based on observations with strictly positive remaining contract duration only. The estimation results of the selection multinomial logit are presented in the appendix. Columns (3) and (4) are OLS estimates based on the same data selection rule as in columns (1) and (2).

Table 5: Joint renegotiation payoff (transfer fee plus new wage)

contracts. On average, one more year of remaining contract duration increases the joint renegotiation payoff of the contracting parties by more than 50 per cent.

In our model, the wage in the old club is a purely redistributive device, and hence has no impact on the joint renegotiation payoff of the contracting parties. In the first column of Table 5, the estimated value of 0.256 for the previous wage can therefore serve as a rough approximation for the size of the inherent quality component. As already discussed in sections 4.2 and 4.3, this interpretation can also be used to "adjust" the estimates for this variable in the transfer fee and wage regressions: In Table 4, subtracting 0.256 from the respective estimated coefficients for the previous wage (≈ 0.4) would lead to a net effect (due to the player's improved bargaining power) of approximately 0.15. In turn, a (negative) effect of the same size would also be present in the transfer fee regression (Table 3). In combination with the approximated quality effect, this may help to explain why we did not find a (significantly) negative effect of the previous wage in the transfer fee regression.

4.5 Compensation

As for the issue of compensation, recall from the theoretical part (Result 3) that, when teams benefit more from long-term contracts in renegotiations than players do, players will be compensated ex ante through higher wages. Indeed, we have found that teams strongly benefit from long-term contracts by receiving higher transfer fees, while there is no significant impact on wages. Based on our compensation argument, this leads to the following hypothesis:

Hypothesis 5 *A player's wage in his new contract is increasing in the contract duration.*

Table 4 shows that the contract duration has a significantly positive effect on the wage when using all second contracts (columns 1 and 3). When using the subsample with strictly positive remaining contract durations only (columns 2 and 4), the effects go in the right direction, but are insignificant which may be due to the smaller sample size. For testing Hypothesis 4, there is no need to exclude players with expired previous contracts, because the impact of the new contract durations on the new wages should be independent of the terms of the previous contracts. Hence, we can rely on the subsample using all second contracts.

An important issue is the potential endogeneity of the contract duration. At the end of the theory section, we pointed out that the contract duration is influenced by factors that are unobservable in our data, such as the relative degree of risk aversion between players and teams or the informational environment. Therefore, the contract duration may be endogenous. In order to control for endogeneity, we also estimated the wage regression by 2SLS, using age and age squared as instruments for contract duration.[31] These instruments appear plausible for the following reasons: First, contract duration is clearly a function of age, with older players getting shorter contracts. Second, conditional on experience, it is unlikely that age is correlated with the error term in the wage equation. By the same reasoning, age may credibly be excluded from the wage equation. The validity of these instruments cannot be rejected by the Sargan overidentification test. Using the Hausman test for endogeneity, we cannot reject the hypothesis of exogeneity of contract duration in the wage equation. These results suggest that the estimated effect of contract duration on wages in Table 4 is unbiased.

5 Discussion

We have developed a framework in the context of European soccer to test some of the central hypotheses on the issue of strategic contracting. Using a data set from the German "Bundesliga", we show that contract durations are useful rent-seeking devices vis a vis non-contracting parties. All in all, the empirical analysis broadly supports our model predictions according to which the terms of a contract have both, allocative (likelihood of transfers) and distributional (transfer fees, wages) effects. We view this as first empirical evidence for similar predictions derived in the more general buyer-seller frameworks in previous research on strategic contracting.

Our empirical results clearly support the view that long-term contracts are used as rent-seeking devices, and our theoretical framework is just rich enough to illustrate the basic trade-off between higher payoffs in case of a transfer and lower transfer probability. Still, a fair question in assessing our contribution is if the empirical results could equally well be explained by different theories. In the following, we discuss several alternatives, and argue why we do believe that our theory based on strategic contracting fits best with

[31] The results of the 2SLS estimation are available on request.

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

Table 6: Average contract durations before and after Bosman judgement

the empirical findings.

Negative correlation between (remaining) contract durations and transfer probabilities In our model, this negative correlation is interpreted in a causal sense, i.e., that longer contracts lead to lower transfer probabilities. A natural alternative explanation could be a matching model with learning where, because of the learning process still being in its infancy, incentives for early termination may be low. Such a model would also predict a negative relationship between contract durations and transfer probabilities.

To see why our strategic contracting approach seems superior in explaining the observed empirical regularities, we need to go one step beyond the institutional framework of our empirical analysis. Before the regime initiated by the Bosman judgement (which, recall, demarcates the starting point of our observation period), old teams retained some veto power even after a player's contract had expired, thereby receiving a (smaller) transfer 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 valid and expired contracts in terms of the old team's veto power. Therefore, our model predicts an increase in contract durations as a result of the Bosman judgement. Table 6 shows the average contract durations in the two seasons before the judgement (1994/95 and 1995/96) and the four seasons afterwards. Consistent with our theoretical prediction, there has indeed been a jump of the average duration by approximately half a year in the aftermath of the judgement.[32] By contrast, a theory based on the quality of matches would be difficult to reconcile with the systematic increase in contract durations after the (unanticipated) regime change.

Another alternative explanation could reverse causality by arguing that transfer probabilities are in fact independent of the terms of a player's contract, and that the negative

[32]Feess, Gerfin, and Muehlheusser (2010) exploit the natural experiment induced by the judgement to disentangle selection and incentives effects in explaining the relationship between performance and contract duration.

relationship is driven by sorting of players into different contracts. Such a theory would then need to explain why players with low transfer probabilities systematically sign longer contracts. However, the data 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. Furthermore, such a theory could again not explain that contract durations have increased after the regime change.[33]

Positive correlation between wages and contract durations In our theory based on rent-seeking, the observed complementarity between wages and contract durations arises because in renegotiations, teams benefit more from long-term contracts than players do, so that the latter have to be compensated for such contracts in the form of higher wages.

Alternatively, it could also be argued that both higher wages and longer durations are needed to attract high-quality players. In this respect, consider first the case where the duration of a contract is not an issue such that bargaining occurs with respect to wages only, which are then increasing in player quality. However, when bargaining also occurs with respect to the duration of the contract, then, keeping player quality fixed, a team can now attract a high-quality player by offering either a high wage or a long-term contract, suggesting that wages and durations are substitutes rather than complements.

For a similar reason, risk-aversion of players (leading to a strong preference of long-term over short-term contracts) is also hard to reconcile with the observed empirical relationship: If player risk-aversion were the primary force underlying the bargaining process between teams and players (rather than the rent-seeking motive), then players should be willing to sacrifice part of their wage in return for a longer contract; again, this

[33] As a further explanation, 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 are useful precisely because of being rent-seeking devices: 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.

would suggest that the two variables are substitutes rather than complements.

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.[34] 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 pre-determining 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.

[34]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

Appendix

A Derivation of Lemma 1

A.1 Valid contract

Using the Shapley value, the renegotiation payoffs per unit of time as stated in Lemma 1 are computed as follows:[35]

Permutation		Marginal Contribution	
	team i	team e	Player
i, e, p	$Y - W$	0	$W + \gamma$
i, p, e	$Y - W$	γ	W
e, i, p	$Y - W$	0	$W + \gamma$
e, p, i	$Y - W + \gamma$	0	W
p, e, i	$Y - W + \gamma$	0	W
p, i, e	$Y - W$	γ	W
Σ Payoffs	$6Y + 2\gamma - 6W$	2γ	$6W + 2\gamma$
Shapley Value ($= \frac{1}{6}\Sigma$)	$Y - W + \frac{1}{3}\gamma$	$\frac{1}{3}\gamma$	$W + \frac{1}{3}\gamma$

Note that as long as the contract is valid, team i has full veto power over the player and can unilaterally force exertion of the contract.

A.2 Contract expired

Repeating the same exercise for the case where the player's contract is expired, and under the assumption that the player can alone obtain a payoff equal to his base productivity Y, the Shapley value leads to payoffs per unit of time as follows (and as stated in Lemma 1):

[35]The Shapley value is the standard cooperative bargaining concept for $N > 2$ players, see e.g. Mas-Colell, Whinston, and Green (1995, p. 680ff).

Permutation		Marginal Contribution	
	team i	team e	Player
i, e, p	0	0	$Y + \gamma$
i, p, e	0	γ	Y
e, i, p	0	0	$Y + \gamma$
e, p, i	0	0	$Y + \gamma$
p, e, i	0	γ	Y
p, i, e	0	γ	Y
Σ Payoffs	0	3γ	$6Y + 3\gamma$
Shapley Value ($= \frac{1}{6}\Sigma$)	0	$\frac{1}{2}\gamma$	$Y + \frac{1}{2}\gamma$

B Derivation of Result 3

In a first step, recall that the player earns wage W in team i only when the transfer does *not* occur, which happens with probability

$$\begin{aligned} g(T) &:= 1 - \Pr\left(z \leq \widetilde{z}(T)\right) + \Pr\left(z \leq \widetilde{z}\,(T)\right) \cdot \Pr\left(\gamma \leq 0\right) \\ &= 1 - H(\widetilde{z}\,(T))(1 - F(0)) > 0, \end{aligned}$$

where $g'(T) = -h(\cdot)\widetilde{z}'\,(T)\,(1 - F(0)) > 0$.

It follows that for any T, W^* is then implicitly given as follows:

$$g(T)W^* + H(\widetilde{z}\,(T))\left[\int_0^\infty \Pi_p(\gamma, T, W) f\,(\gamma)\,d\gamma\right] \equiv \frac{1}{2}J(T), \tag{5}$$

where the first and second term on the LHS reflect the player's expected wage in team i and e, respectively. Moreover, since $\Pi_i(\cdot) + \Pi_p(\cdot) \equiv Y + \gamma - \Pi_e(\cdot)$, the RHS of Eqn. (5) can be re-written as

$$\frac{1}{2}Y + \frac{1}{2}H(\widetilde{z}\,(T))\left[\int_0^\infty \Pi_i(\gamma, T, W) + \Pi_p(\gamma, T, W) f\,(\gamma)\,d\gamma\right] \tag{6}$$

Combining Eqn. (5) and (6) then yields

$$g(T)W^* - \frac{1}{2}Y - \frac{1}{2}H(\widetilde{z}\,(T))\left[\int_0^\infty \Pi_i(\gamma, T, W) - \Pi_p(\gamma, T, W) f\,(\gamma)\,d\gamma\right] \equiv 0 \tag{7}$$

To determine the derivative $\frac{dW^*}{dT}$, define the LHS of Eqn. (7) as $X(W^*, T)$ so that, by the implicit function theorem, $\frac{dW^*}{dT} = \frac{\frac{\partial X}{\partial T}}{-\frac{\partial X}{\partial W^*}}$.

More specifically, using the results for the renegotiation payoffs from Lemma 1, we get

$$
\begin{aligned}
\Pi_i(\gamma, T, W) &= T \cdot (Y - W + \frac{1}{3}\gamma) + (1 - T) \cdot 0 \\
\Pi_p(\gamma, T, W) &= T \cdot (W + \frac{1}{3}\gamma) + (1 - T) \cdot \frac{1}{2}(Y + \gamma)
\end{aligned}
$$

and it will be useful to define the following differences:

$$
\begin{aligned}
\Delta &:= \Pi_i(\cdot) - \Pi_p(\cdot) = T \cdot (Y - 2W) - \frac{1}{2} \cdot (1 - T)(Y + \gamma) <> 0 \\
\Delta_W &:= \left[\frac{\partial}{\partial W}\Pi_i(\cdot) - \frac{\partial}{\partial W}\Pi_p(\cdot)\right] = 0 \\
\Delta_T &:= \left[\frac{\partial}{\partial T}\Pi_i(\cdot) - \frac{\partial}{\partial T}\Pi_p(\cdot)\right] = Y - 2W + \frac{1}{2}(Y + \gamma) <> 0
\end{aligned}
$$

Making use of these differences and going back to Eqn. (7), we get

$$
-\frac{\partial X}{\partial W^*} = -g(T) + \frac{1}{2}H(\tilde{z}(T)) \left[\int_0^\infty \Delta_W f(\gamma)\, d\gamma\right] = -g(T) < 0, \tag{8}
$$

since $\Delta_W = 0$. Moreover,

$$
\frac{\partial X}{\partial T} = g'(T) - \frac{1}{2}\left[H(\tilde{z}(T)) \int_0^\infty \Delta_T f(\gamma)\, d\gamma + H'(\cdot)\tilde{z}'(T) \int_0^\infty \Delta f(\gamma)\, d\gamma\right] <> 0 \tag{9}
$$

Clearly, for $\frac{dW^*}{dT} > 0$ to hold, we need $\frac{\partial X}{\partial T} < 0$. Thereby, the first term in Eqn. (9) is positive, while the sign of the bracket term is ambiguous and depends on the signs of Δ_T and Δ (which are both ambiguous as well) and the properties of the distribution $H(\cdot)$.

Intuitively, whether or not the player is compensated by team i as T increases depends on the interplay of the following three effects: First, the impact on the transfer probability $1 - g(T)$, which is decreasing in T. Second, the difference of the absolute renegotiation payoffs (Δ) for a given T. Clearly, Δ becomes negative for low values of T as $\Pi_i(T = 0) = 0$. On the other hand, as T increases, $\Delta > 0$ is also possible. Third, the *rate* at which the difference of the total renegotiation payoffs changes as T increases (Δ_T), where we know from Result 1 that the total renegotiation payoff for team i increases in T, while the effect is ambiguous for the player.

Result 3 then simply says that if the net effect leads to $\frac{\partial X}{\partial T} < 0$, then it is the case that team i benefits more than the player from an increase in the contract duration. Since the total joint surplus is to be shared equally, this calls for player compensation in the form of a higher wage.

C Selection model with multiple outcomes

C.1 Model specification

The selection model with three outcomes $j = 1, 2, 3$ can be written as follows

$$y_j^* = z\gamma_j + \eta_j \tag{10}$$

$$y = 1 \text{ if } y_1^* > \max_{j \neq 1}(y_j^*) \tag{11}$$

$$w_1 = x\beta_1 + u_1 \text{ if } y = 1 \tag{12}$$

Let us denote the option team change with $j = 1$, hence the wage equation refers to the wage in case of a team change. As is well known OLS of the second part will be biased if u_1 and the η_j are correlated. The first part is a latent variable model which is used to derive the probabilities of each option. The probability of a team change is given by

$$P(y = 1) = P[y_1^* > \max_{j \neq 1}(y_j^*)]$$

Assuming an extreme value distribution for η_j yields the well-known logit probabilities, e.g. for the first option as (assuming that option 3 is the reference option)

$$P(y = 1) = \frac{\exp(z\gamma_1)}{1 + \sum_{i=1,2} \exp(z\gamma_i)}$$

Estimates of γ can be used to generate control functions that take account of the potential correlation between u and η. Denote these control functions as $\Gamma_j = f(\widehat{p}_1, \widehat{p}_2, \widehat{p}_3)$, where $\widehat{p}_i$ are the estimated choice probabilities, and write the second stage as

$$w_1 = x\beta_1 + \lambda\Gamma_j + \varepsilon_1,$$

where ε_1 is mean-independent of x. The different methods discussed in Bourguignon, Fournier, and Gurgand (2007) differ in the construction of the control functions Γ.The method we use following the suggestion in Bourguignon, Fournier, and Gurgand (2007) in case of small samples defines the control functions as

$$\Gamma_3 = \ln(\widehat{p}_3)$$

$$\Gamma_i = \widehat{p}_i \ln(\widehat{p}_i)/(1 - \widehat{p}_i), i = 1, 2$$

where we assume that choice number 3 is the reference category. The estimated coefficients $\widehat{\lambda}$ correspond to $\sigma_u \rho_{iu}$, where σ is the standard deviation of u_1 and ρ_{iu} is the correlation coefficient between u_1 and $\eta_i, i = 1, 2, 3$.

C.2 Multinomial logit estimation results

	(1)	(2)
	Change team	Renew contract
remaining duration at end of season	-0.498***	-0.605***
	(0.161)	(0.163)
wage previous contract	0.358	0.338
	(0.260)	(0.257)
league games	0.00125	0.000611
	(0.00165)	(0.00149)
international games	-0.00893	0.0176
	(0.0155)	(0.0148)
international games squared	0.000112	-8.47e-05
	(0.000173)	(0.000163)
tenure in current team	-0.0646	0.0751**
	(0.0504)	(0.0354)
performed above average last season	1.240***	0.377
	(0.325)	(0.317)
budget old team	-0.0130	-0.0280*
	(0.0159)	(0.0155)
final league position old team last season	0.0849**	-0.0309
	(0.0335)	(0.0317)
Constant	-6.900**	-5.161
	(3.253)	(3.209)
Observations	694	694

*** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.*
"No change"of contract status serves as reference category. Note that there are 694 observations because, starting with the 415 first contracts in the data, we take into account all subsequent outcomes (transfer / renewal / no change) for each subsequent year until contract expiration.

Table 7: Multinomial logit of contract status at end of season

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