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Legal Restrictions on Buyout Fees: Theory and Evidence From German Soccer

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Abstract

We perform a theoretical and empirical analysis of the impact of transfer fee regulations on professional soccer in Europe. Based on a model on the interaction of moral hazard and heterogeneity, we show (i) how the regulations effect contract durations and wages, (ii) that contracting parties have an incentive to agree upon inefficiently long contracts, (iii) how these incentives vary with the legal system, and (iv) how the relationship between contract duration and performance also depends on the legal system. With one exception, all theoretical results are empirically confirmed using a comprehensive data set from the top German Soccer League ("Bundesliga").

Key words: regulation of labor markets, long-term contracts, sports economics, breach of contract, empirical contract theory.

1 Introduction

Motivation In recent years, there has been an ongoing controversy in the economic and legal profession whether the freedom of contract should be restricted when two parties want to agree on binding long-term agreements. Examples include exclusive dealing clauses, long-term (labor) contracts precluding unilateral termination, and excessively high damage clauses for breach of contract.

Following the general lines of the early Chicago School, Stigler (1975, Ch. 7) argued that restricting the set of feasible contracts can never increase social welfare, because parties will not sign inferior contracts. However, modern contract theory has identified a variety of reasons why binding long-term agreements may be privately optimal but socially unwarranted. One argument is that the contracting parties may deliberately accept inefficiencies as to reduce the payoff of third parties. In these cases, the inefficiencies may be mitigated by appropriate restrictions on the freedom of contract (see the literature discussion below).

Although the theoretical literature provides many interesting insights, there is a lack of empirical evidence. This is owing to the fact that an empirical analysis requires the following conditions to be simultaneously fulfilled, which is rarely the case: i) the terms of the contracts must be observable or at least reconstructible, ii) there has been a change in the legal regime which generates some variation of the relevant contract terms, and iii) the sample must be representative and sufficiently large to allow for the results to be generalized.

In the present paper, we perform a theoretical and empirical analysis of the impact of transfer fee regulations for professional soccer players in Europe. This is an appropriate field of application since the legal regimes governing the transfers of players in Europe have been changed dramatically in recent years, and because we were able to collect contract and performance data for 1308 player years in the German Bundesliga from time periods where different legal regimes were in force.

Our paper aims at contributing to three lines of research. With respect to sports economics, we are (to the best of our knowledge) the first to apply a coherent modeling approach to analyze the impact of changes in the legal environment in European soccer and to use a rich data set to test the predictions empirically. As for contract theory, we consider as interesting the theoretical analysis and empirical confirmation of the interplay between heterogeneity and moral hazard. Finally, our analysis sheds light on the impact of legal restrictions on economic variables such as the contract length, salaries, transfer fees actually paid and performance.

Legal situation Before turning to a description of our analysis, we need to provide some brief background knowledge on transfer fee regulations in European soccer. Up to 1995, the most important regulation was that a club could demand a transfer fee which was administered by the national soccer associations even if a player's contract had already expired. These fees were supposed to stabilize the league's competitive balance, and were therefore increasing in the strength of the new club and decreasing in the strength of the old club.[1] We label this regime the "pre-Bosman regime" P. Under regime P, clubs and players were not able to agree credibly upon a contract where a player could leave for free when the contract had expired.

In the famous "Bosman Case" in December 1995, the European Court of Justice ruled that this transfer system was not in accordance with article 39 of the Treaty of Rome, because it was judged to hamper the mobility of professionals.[2] Since then, clubs are no longer entitled to receive transfer fees for out-of-contract players. The verdict did not restrict the transfer fees for players with valid contracts.[3] We will refer to this situation as to the "Bosman regime" B.

Recently, even regime B was challenged by EU Competition Commissioner Mario Monti by pointing to ordinary labor market relationships where firms and employees are

[1] It is somewhat unclear whether this aim has ever been achieved, see e.g. the survey article by Szymanski (2003) who also discusses the literature on the impact of the comparable "reserve clause"-system used in US sports.

[2] See Court of Justice of the European Communities, Case C-415/93.

[3] Another aspect of the judgement was concerned with the admissible number of foreign players in a team, which is not at issue here.

usually not allowed to agree upon any contract length and any transfer fee they want to. In general, "unreasonably" high buy-out-fees are usually declared void in court. According to a compromise between the Commission and the governing bodies of European Soccer, FIFA and UEFA reached in March 2001, a player can leave his current club without the club's approval when paying a fee for breach of contract and, depending on his age, a fee for compensation of educational expenses. This is in sharp contrast to regimes P and B, where the old club could always impede the transfer if it did not want to accept the transfer fee offered by another club as long as the players contract had not yet expired.

Summing up, by appropriately varying the contract length, any transfer fee the player and his club want to agree upon can be implemented under regime B ("freedom of contract"). To the contrary, regime M imposes an *upper* bound on the implementable transfer fee which is equal to the sum of the fee for breach of contract and the compensation payment for the education of the player. In a similar vein, regime P imposes a *lower* bound on the implementable transfer fee, which is equal to what the old club is entitled to after the player's contract has expired.

Framework and main results To compare the three regimes, we develop a model where a club and a player sign a contract containing a wage and a contract length. We assume that the player's average productivity is the higher, i) the higher his potential and ii) the shorter his (remaining) contract length. While the first assumption is straightforward, as for the second one, note that less than 10% of the average player's annual salary is performance related (see Ziebs (2002, pp. 156-167)) and therefore, this is the simplest way of expressing that a player has lower effort incentives when he has a long-term contract anyway.[4] For our purpose, all that matters is that to a large extent, wages are not tied too closely to actual performance and that this reduces effort incentives. Since

[4] Note that players can be observed on the pitch week by week which suggests that some performance measures such as goals scored would be readily available. However, one possible explanation why wages do not depend too strongly on verifiable measures could be given by using a multi-tasking argument à la Holmström and Milgrom (1991) and Baker (1992): Since soccer is a team sport and each player has multiple tasks to fulfill, incentive pay which conditions on verifiable tasks like scoring goals may well lead a player to neglect other tasks like defending, which are equally important but much more difficult to verify.

there is a (stochastic) relationship between the unobservable effort decision of a player and his observed actual performance, a player's actual performance tends to fall short of this potential maximum performance. Under slight abuse of terminology, we will refer to this as a *moral hazard problem* which clearly tends to become the more severe, the longer a player's contract lasts.

After having signed his contract, the player plays for his initial club unless an exogenous shock leads to higher productivity in another club. For instance, this other club may have hired a coach who prefers a tactical system in which the player fits extraordinary well. All we need is that there is a positive probability that a change of clubs is efficient within the total career horizon, which is clearly the case in reality. Since the potential of players is known in our model, the renegotiation process between the clubs and the player is efficient and results in a transfer whenever the productivity shock occurs. It follows that the contract length and the regime affect the division of surplus, but they will not directly influence the allocation of players. Note that legally administered or contractually fixed transfer fees are *veto sums* the initial club is entitled to, and thus establish upper bounds on the transfer fees *actually paid*. In the renegotiation stage, we assume (and confirm empirically) that the initial club benefits from a high veto sum and a high contract length, whereas the renegotiation payoffs of the player and the new club are both weakly decreasing in these arguments.

Our main results, however, refer to the impact of transfer fee regulations on the initial contract. We show that clubs and players indeed have an incentive to accept inefficiencies caused by long-term labor contracts to reduce the payoff of third parties. These incentives strongly depend on the different legal restrictions of transfer fees. In particular, when signing the initial contract, the player and the club face the following trade-off: on the one hand, a shorter contract reduces the moral hazard problem, thereby leading to a higher performance. But on the other hand, shorter contracts increase the new club's renegotiation payoff, which ceteris paribus reduces the expected *joint* payoff of the player and his initial club. In the initial contract, the club and the player are trying to balance these countervailing effects at the margin. The crucial point is that the distribution of renegotiation payoffs does not only depend on the (remaining) contract length, but also on the transfer system. This feature drives our results, and leads to a higher contract length under regime B compared to regimes P and M. Furthermore, we show that the impact of the contract length on the initial wage and the transfer fee actually paid is maximum under regime B.

Our last and presumably most interesting finding from the point of view of empirical contract theory refers to the relation between the contract length and the actual performance. Again, we have two countervailing effects: on the one hand, the longer the contract, the lower the performance (moral hazard effect). But on the other hand, we show that the equilibrium contract length is increasing in a player's potential (selection effect). Comparing the three systems, we find that the relationship between performance and contract length should be minimum under system B since there, the moral hazard effect is most pronounced compared to the selection effect.

For the empirical analysis, we have compiled a comprehensive data set from the German Bundesliga covering 1308 player years. The data contains all available information on contract lengths, salaries, transfer fees and performance measures from 1994 to 2001. As the Monti system has been put into force only very recently, the data allows for a comparison between systems P and B only. All our theoretical results are empirically confirmed, one exception being the impact of a player's remaining contract length on his salary in the *new* club after a transfer which, according to our model, should be most pronounced under system B. However, we provide a plausible explanation based on unobservable sign-up fees which tend to generate systematic countervailing effects.

Relation to the literature As indicated above, our paper is related to three lines of research. With respect to the literature on sports economics, the impact of the Bosman judgement has been analyzed by Simmons (1997) and Antonioni and Cubbin (2000) who also argue that the average contract length should increase after the judgement. That more flexible labor markets lead to a higher contract length is also empirically shown by Kahn (1993) for Major League Baseball in the US. Szymanski (1999) argues that players benefit from the judgement, but takes the initial contract as being given.

To the best of our knowledge, all preceding empirical analyses on transfer fees including Speight and Thomas (1997), and Carmichael, Forrest, and Simmons (1999) (for the English Premier League), and Frick and Lehmann (2001) (for the German Bundesliga) do neither have data on the contract length nor performance measures. Therefore, all these papers were restricted to analyzing the impact of players' characteristics such as their position, age and experience on the transfer fees paid.

Our theoretical model partly builds on Feess and Muehlheusser (2003a) and Feess and Muehlheusser (2003b) who also compare the different regimes using a contract theoretic approach. In the second paper, the moral hazard issue is analyzed in more detail as a player's effort choice also affects his expected benefit from a transfer. Moreover, in both papers, the renegotiation process is modeled explicitly, and one main focus is on the comparison of the incentives to invest in the education of young talents under the different legal regimes. In this paper, we have to neglect such investment issues because the relevant data is unavailable.

To the best of our knowledge, our paper is the first one which analyzes the legal regimes both theoretically *and* empirically. Thereby, a novel feature is that it explicitly deals with the interplay of countervailing effects due to heterogeneity and moral hazard. It is well-known among empirical contract theorists that the failure of adequately dealing with this issue may lead to severely biased empirical results (see e.g. Abbring, Chiappori, Heckman, and Pinquet (2003) and the survey by Chiappori and Salanie (2003)). Consequently, several papers are dealing with the issue of separating these effects to yield unbiased results (see e.g. Lazear (2000), Ackerberg and Botticini (2002) and Banerjee, Gertler, and Ghatak (2002)). While our data does not allow for a full separation of these effects, our empirical analysis nevertheless verifies that the relative importance of these effects under the different legal regimes behaves as predicted by the model.

Our paper is also related to the literature about restrictions on the freedom of contract. Diamond and Maskin (1979) analyze situations where two parties to a contract have a joint incentive to use the contract as a commitment device to reduce the expected payoff of future trading partners. Aghion and Bolton (1987) show that a buyer and a seller may stipulate a damage clause to prevent efficient trade with an outside party for some states of the world. Whereas their result holds only if renegotiation is excluded, Spier and Whinston (1995) extend the model to renegotiation and relation-specific investments, and they show that the result can qualitatively be preserved in such a framework. In all these situations, an appropriate restriction on the set of feasible contracts would be socially desirable. On the other hand, Segal and Whinston (2000) stress the potential beneficial effect of exclusive dealing clauses on investment incentives. We are not aware of any empirical results on these issues. As explained above, the different transfer regimes which we analyze also entail restrictions on the freedom of contract. Although we do not perform a welfare comparison of these three regimes, our analyses shows both theoretically and empirically how important economic variables such as the contract terms or performance are affected by these restrictions.

We proceed as follows: After developing our theory in section 2, we present the data and our empirical findings in section 3. Section 4 critically discusses our assumptions and suggests some lines for further research.

2 Theory

2.1 The model

We consider a model where at date -1, a player and his initial club ("club i") bargain over a contract containing a contract length T and a wage W per unit of time. At date 0, the player starts playing in the league, and his career horizon is normalized to 1. We suppose that the player's performance e per unit of time in club i depends both on his potential e_0 and his contract length T, and we make the following assumption:

Assumption 1 *The player's performance per unit of time in club i is the higher, the higher his potential e_0 and the lower the length of the initial contract T, i.e. $e = e(e_0, T)$ satisfying $\frac{\partial}{\partial e_0}e(\cdot) > 0$, $\frac{\partial}{\partial T}e(\cdot) < 0$ and $\frac{\partial^2}{\partial T^2}e(\cdot) < 0$.*

That e increases in the player's potential is straightforward, and the moral hazard problem behind the negative relationship between e and T has been explained in the introduction (see, however, our remarks at the end of subsection 2.1). For simplicity, we will continue with the explicit functional specification $e(e_0, T) = e_0 - \frac{1}{2}T^2$, where $e_0 > \frac{1}{2}$. Thus, the player's *actual* performance e is lower than his potential e_0 for all $T > 0$.[5] Finally, we assume that the monetary surplus generated by the player is simply equal to e, so that the terms "productivity" and "performance" are used synonymously throughout.

With probability $g \in (0,1)$, a shock occurs at some certain date $t \in (0,1)$ leading to a performance $e^{\max} = \gamma e_0$ where $\gamma > 1$ per unit of time in another club, called the "new club" (club n). Thus, whenever the shock occurs, the player is more productive in club n, independent of the terms of the initial contract. We assume common knowledge of $e(\cdot)$ and $e^{\max}$ at date -1, the only uncertainty being whether or not the shock occurs.

Since there is no asymmetric information in the model, we make the standard assumption that negotiations are efficient such that they maximize the joint surplus of the parties involved in the negotiations. This implies that i) at date -1, the initial contract will maximize the joint surplus of the player and club i, and ii) in the renegotiation process at date t, the player joins club n at date t regardless of the terms of the initial contract, and regardless of the transfer system. The player then plays for club n with productivity $e^{\max}$ per unit of time until the end of his career at date 1. When the shock does not occur, we simply assume that the player keeps playing for club i with productivity $e(T)$ until his career ends. The sequence of events is summarized in Figure 1:

[5] Note carefully that the assumption refers to the *partial* derivative, i.e. for a given potential e_0; we will show below in subsection 2.4 that, in equilibrium, high potential players will sign longer contracts so that the oberserved relationship between contract length and absolute performance may well be positive.

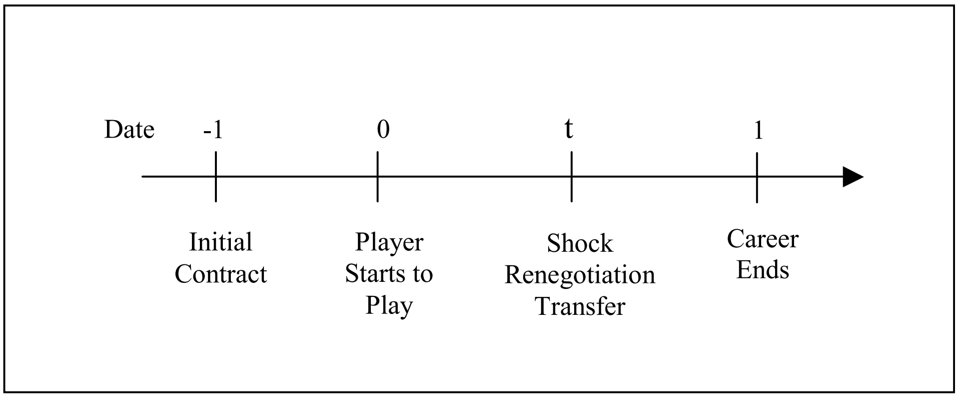

Figure 1: Sequence of Events

To avoid confusion, there is one point concerning Assumption 1 which we would like to discuss right away (and not only in the discussion in section 4). Our model will be driven by the trade-off between the advantage of long contracts through higher payoffs in the renegotiation game at date t and the disadvantage of long contracts captured by the moral hazard problem $\frac{\partial}{\partial T}e(\cdot) < 0$. The economic logic behind the moral hazard problem is that a player knows that he will be paid in the future as long he has a valid contract, even if he performs poorly. Hence, the moral hazard problem at each point in time depends on the *remaining* contract length, and not on T itself. Accounting for this would require a continuous model where e varies over time. And in our model where the productivity shock leading to a change of clubs can only occur once at a certain date t, it would then be optimal for club i and the player to agree upon an infinite number of short-term contracts up to $t - \varepsilon$ (where $\varepsilon \to 0$), and to a long-term contract covering the whole remaining time horizon at $t - \varepsilon$. To avoid these unrealistic features, it would then be necessary to assume that the shock can occur at any point in time during the player's career. In fact, we considered a model where e is decreasing in the *remaining* contract length, and where $g = g(s) > 0$ $\forall s \in (0, 1)$. This continuous setting has two advantages - it is more realistic and it is more convenient when turning from theory to the empirical part. However, since the analysis then becomes extremely tedious without changing any of our results, we finally decided to use this simpler discrete version. The reason why all results remain unchanged is that the only aspect that matters is that the *average* performance decreases in the original contract length, and this is true in both variants.

2.2 Renegotiation at Date t

Before we solve the model backwards starting with the renegotiation stage at date t, we must first describe the three regimes more formally.

Definition 1 *A transfer system $r^l = (r^{lV}, r^{lN})$, $l = P, B, M$ is characterized by two legally administered transfer fees (veto sums) per unit of time which club i must accept if the player wants to join club n at date t under contract situation $c \in \{V, N\}$.*

The upper index V indicates that the player still has a valid contract, whereas N means that the contract has expired. These fees are *veto sums* for the initial club, and thus constitute *upper* bounds for the transfer fees actually paid. To distinguish between the administered fees and the transfer fees actually paid, we refer to the first ones as veto sums. Expressing all magnitudes per unit of time is helpful to separate the impact of the transfer fee system from the impact of the remaining contract length. Note that $r^{BN} = r^{MN} = 0$, since there are no veto sums (and hence no transfer fees actually paid) for expired contracts after the Bosman judgement. Furthermore, $r^{PV} = r^{BV} = \infty$, since there is no fee under systems P and B which the initial club *must* accept if the player has a valid contract. Finally, $0 < r^{PN}, r^{MV} < \infty$, since club i can not prevent the transfer upon receiving some finite amount when the player's contract has expired under regime P, and when the player has a valid contract under regime M. We summarize the legal situation in the following table:

	Valid contract (V)	No contract (N)
Pre-Bosman (P)	$r^{PV} = \infty$	$0 < r^{PN} < \infty$
Bosman (B)	$r^{BV} = \infty$	$r^{BN} = 0$
Monti (M)	$0 < r^{MV} < \infty$	$r^{MN} = 0$

Table 1: Veto sums for club i

Note that $r^{lV} - r^{lN} > 0 \ \forall l = P, B, M$ and that this difference is maximum under regime B.

To determine the renegotiation payoff, assume that the player has signed a contract with club i stipulating some contract length T, and that he wants to join club n at date t. Define $\alpha_j(e_0, r^{lc})$ as party j's renegotiation payoff per unit of time as a function of e_0 where $l = P, B, M$ captures the transfer fee system, $c = V, N$ the contractual situation, and where the index $j = i, p, n$ stands for club i, the player and club n, respectively.

Instead of modeling this three-party renegotiation process explicitly, we take a reduced-form approach and introduce the following assumptions on the renegotiation payoffs per unit of time:

Assumption 2 *For all $r^c \in [0, \infty]$, renegotiation payoffs per unit of time have the following properties:*
i) $\frac{\partial \alpha_i(e_0, r^c)}{\partial r^c} \geq 0$, $\frac{\partial \alpha_p(e_0, r^c)}{\partial r^c} \leq 0$, *and* $\frac{\partial \alpha_n(e_0, r^c)}{\partial r^c} \leq 0$.
ii) $\frac{\partial \alpha_n(e_0, r^c)}{\partial e_0} > 0$ *and* $\frac{\partial^2 \alpha_n(e_0, r^c)}{\partial e_0 \partial r^c} \leq 0 \ \forall \ e_0 > \frac{1}{2}$.

Part i) of Assumption 2 expresses that club i's renegotiation payoff per unit of time (i.e. the actual transfer fee per unit of time) is weakly increasing in its veto sum r^c, whereas the player's payoff (i.e. his new wage) and club n's payoff (i.e. the remaining surplus) are weakly decreasing in r^c. The assumption can be justified for two reasons: first, it is quite natural that club i benefits from more veto power. Second, we have shown elsewhere that these properties can be endogenously derived from a bargaining game in which the player negotiates simultaneously with both clubs in Nash-bargaining fashion.[6]

Note that we assume the partial derivatives with respect to r^c to be only weak, since in reality it does not seem to make any difference for the threat points in the renegotiations

[6]See Feess and Muehlheusser (2003b), where we build on an idea initially developed by Burguet, Caminal, and Matutes (2002). Note that applying the Shapley value which is a frequently used concept for cooperative games with more than two players is tedious here. The reason is that we would have to specify the payoffs not only when club i either has full veto power (when $r = \infty$) or no veto power at all ($r = 0$), but also for all $r \in (0, \infty)$. In fact, to the best of our knowledge, the Shapley value has been used in contract theoretic models only when, using our terminology, either $r = 0$ or $r = \infty$ were considered. Examples include Segal and Whinston (2000) who use a slightly more general concept when analyzing exclusive dealing clauses or Hart and Moore (1990) for the case of asset ownership.

whether the veto sum for a mediocre player is 200 or 300 million Euro.

Part ii) of the assumption expresses that club n benefits from an increase in e_0 which determines the size of the renegotiation surplus, but this increase becomes smaller when the veto sum of club i, r^c, rises (i.e. when the transfer system becomes stricter). To see that this also seems natural, note that a sufficient condition for this assumption to hold is that club n gets a fixed percentage of the renegotiation surplus for a *given* r^c whereas this percentage is decreasing in r^c due to part i) of the assumption. For example, suppose club n gets $\frac{1}{4}$ of the surplus for $r = r^V$ and $\frac{1}{2}$ for $r = r^N < r^V$. When the renegotiation surplus increases from 100 to 200, say, his payoff increases by 25 (from 25 to 50) if $r = r^V$ and by 50 (from 50 to 100) if $r = r^N < r^V$.

Finally, each regime $l = P, B, M$ is completely specified by two numbers r^{lV} and r^{lN}. Thus, when no confusion is possible, instead of writing $\alpha_j(e_0, r^{lc})$ we save on notation and from now on simply write $\alpha_j^{lc}(e_0)$. Recalling that all $\alpha_j^{lc}(e_0)$ are expressed per unit of time, the overall payoffs from renegotiation are obtained by summing over time. In doing so, we can restrict attention to $T \in [t, 1]$, since it does not make any difference whether the contract length is $T = t$ or some $T < t$. In both cases, the player is out-of-contract when the shock occurs, so that only r^{lN} would matter for the renegotiation game. The idea behind the renegotiation process is again illustrated in figure 2:

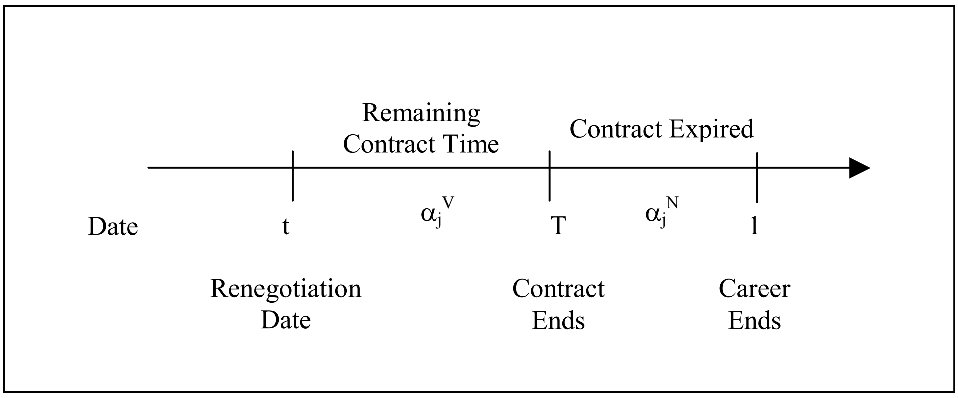

Figure 2: Illustration of the Renegotiation Process

Moreover, for our empirical purposes it will be useful to express total renegotiation payoffs not as a function of the contract length T but, equivalently, as a function of the remaining contract length $R := T - t$. Denoting by $\pi_j(e_0, R, r^l)$ party j's total renegotiation payoff as a function of the player's potential e_0, the player's remaining contract length R and the veto sums under system l, we get:

$$\pi_i(e_0, R, r^l) = R \cdot \alpha_i^{lV}(e_0) + (1 - R - t) \cdot \alpha_i^{lN}(e_0) \tag{1}$$

$$\pi_p(e_0, R, r^l) = R \cdot \alpha_p^{lV}(e_0) + (1 - R - t) \cdot \alpha_p^{lN}(e_0) \tag{2}$$

$$\pi_n(e_0, R, r^l) = R \cdot \alpha_n^{lV}(e_0) + (1 - R - t) \cdot \alpha_n^{lN}(e_0). \tag{3}$$

In each line, the first term gives the payoff for the period for which the player has a valid contract, while the second term is the payoff for the period for which the contract has expired. Thus, $\pi_i(\cdot)$ is the total transfer fee actually paid, $\pi_p(\cdot)$ is the total wage of the player in club n, and $\pi_n(\cdot)$ is club n's share of the total surplus $(1-t)\gamma e_0$ to be shared in the renegotiation process. This leads to the following results:

Proposition 1 *i) Under each regime, the total renegotiation payoff is increasing in R for club i and decreasing for the player and club n, i.e. $\frac{d}{dR}\pi_i(\cdot) > 0$, $\frac{d}{dR}\pi_p(\cdot) < 0$, and $\frac{d}{dR}\pi_n(\cdot) < 0$, $\forall l = P, B, M$.*
ii) Under regime P, club i (weakly) benefits from an increase in r^{PN} while the player and club n are (weakly) worse off, i.e. $\frac{d\pi_i(e_0,R,r^{PN})}{dr^{PN}} \geq 0$, $\frac{d\pi_p(e_0,R,r^{PN})}{dr^{PN}} \leq 0$, $\frac{d\pi_n(e_0,R,r^{PN})}{dr^{PN}} \leq 0$.
iii) Under regime M, club i (weakly) benefits from an increase in r^{MV} while the player and club n are (weakly) worse off, i.e. $\frac{d\pi_i(e_0,R,r^{MV})}{dr^{MV}} \geq 0$, $\frac{d\pi_p(e_0,R,r^{MV})}{dr^{MV}} \leq 0$, $\frac{d\pi_n(e_0,R,r^{MV})}{dr^{MV}} \leq 0$.
iv) The marginal effect of an increase in R is largest under regime B, i.e. $\left|\frac{d}{dR}\pi_j(\cdot, r^B)\right| > \left|\frac{d}{dR}\pi_j(\cdot, r^P)\right|, \left|\frac{d}{dR}\pi_j(\cdot, r^M)\right| \ \forall j = p, i, n$.

Proof. Follows immediately from Assumption 2 and Table 1. ■

The proposition is just a simple transformation of Assumption 2 and the entries in Table 1; but it is very useful for our purposes of testing the proposition in the empirical part of the paper. The reason for part i) is that due to $r^{lV} - r^{lN} > 0 \ \forall l$, club i gets the higher payoff for a longer period of time, while the reverse is true for the player and for club n. Parts ii) and iii) follow directly from Assumption 2 part i). Finally, as for part iv), the impact of the contract length is highest under regime B, because the difference of veto sums is highest, too.

For our empirical purposes, let us emphasize another aspect of Proposition 1: Although our statements refer to a player's *total* wage π_p in club n, they also hold for $\frac{\pi_p}{1-t}$, i.e. for a player's average wage in the new club *per unit of time* as $(1-t)$ is a constant. In the empirical tests, we will use the annual wage of a player in the new club.

2.3 The Initial Contract

We can now turn to the analysis of the initial contract. Under each regime l, this contract will maximize the expected joint surplus of the player and club i given by

$$JS(e_0, T, r^l) = te(e_0, T) + g\left[(T-t)\left(e^{\max} - \alpha_n^{lV}(e_0)\right) + (1-T)\left(e^{\max} - \alpha_n^{lN}(e_0)\right)\right] \\ + (1-g)(1-t)\, e(e_0, T). \tag{4}$$

Regardless of the shock, club i and the player get the surplus $e(\cdot)$ up to date t. If the shock occurs (which happens with probability g), they get the new total surplus $e^{\max}$ minus club n's renegotiation payoff. This payoff is $\alpha_n^{lV}(e_0)$ for period $(T-t)$ for which the player's contract is still valid, and $\alpha_n^{lN}(e_0)$ for period $(1-T)$ when the contract has expired. With probability $(1-g)$, there is no shock, and club i and the player share surplus $(1-t)e(\cdot)$. Substituting $e(\cdot) = e_0 - \frac{1}{2}T^2$, and rearranging yields

$$JS(e_0, T, r^l) = (1 - g(1-t))\left(e_0 - \frac{1}{2}T^2\right) \\ + g\left[(T-t)\left(e^{\max} - \alpha_n^{lV}(e_0)\right) + (1-T)\left(e^{\max} - \alpha_n^{lN}(e_0)\right)\right]. \tag{5}$$

The optimal contract length under regime l is denoted T^l and solves $\arg\max_T JS(e_0, T, r^l)$. Since $\frac{d^2}{dT^2} JS(\cdot) = -(1 - g(1-t)) < 0$, the problem is strictly concave in T, so that T^l satisfies the first order condition and is thus given by:

$$T^l = \frac{g\left[\alpha_n^{lN}(e_0) - \alpha_n^{lV}(e_0)\right]}{(1 - g(1-t))}. \tag{6}$$

This leads to

Proposition 2 *i) The optimal contract length is highest under regime B, i.e.* $T^B > T^P, T^M$.
ii) Under each regime, the higher a player's potential e_0*, the higher the length of the initial contract, i.e.* $\frac{dT^l}{de_0} > 0 \; \forall l = P, B, M$.

Proof. See Appendix A. ■

The intuition for part (i) can be seen from Eqn. (6): When deciding on the optimal contract length, club i and the player trade-off two inefficiencies: the longer the contract, the lower the player's performance as $\frac{d}{dT}e(\cdot) < 0$. But the shorter the contract, the higher is club n's renegotiation payoff. The first effect is independent of the transfer system, whereas the second effect depends on the *difference* between club n's payoff per unit of time with and without a valid contract. The higher this difference, the higher club i's and the player's incentive to increase T. And this difference is maximum under system B, because $r^{BV} = \infty$ and $r^{BN} = 0$ (see Table 1 above). Ordering T^P and T^M is not possible without specifying respective values of r^{PN} and r^{MN} as $r^{PV} > r^{MV}$, but also $r^{PN} > r^{MN}$ so that the difference is indeterminate. Note that, without any negative effect associated with long term contracts (modeled here as a moral hazard problem via Assumption 1), we would get a corner solution $T^l \equiv 1 \forall l$ as there would only remain the incentive to reduce the renegotiation payoff of club n.[7] Part (ii) follows from assuming that the impact of T on club n's renegotiation payoff increases in e_0 since the amount to be divided is $e^{\max} = \gamma e_0$. While it can easily be shown that T^l is also increasing in g, so that players with a higher shock probability would also sign a longer contract, we focus here on the impact of a player's potential e_0 to explain why we observe different contract lengths in reality.[8]

It remains to determine how the surplus is split between club i and the player via the wage W. As for this, we simply assume that the player gets some share β of the surplus,

[7] To see this, simply set $e(\cdot) = e_0$. Then $JS(\cdot)$ in Eqn. (5) is strictly increasing in T.
[8] See also the discussion in section 4.

where $0 < \beta < 1$. β may vary from player to player, depending for instance on the initial competition of clubs for players, on the position or on the relative bargaining skills of the parties. All we need is that β is neither zero nor one, and this seems to be quite plausible.

Denote by $\Pi_p(e_0, T^l, r^l)$ the player's overall payoff when the jointly optimal contract length T^l is chosen, i.e.

$$\Pi_p(e_0, T^l, r^l) = (1 - g(1-t)) \cdot W + g \cdot [(T^l - t) \cdot \alpha_p^{lV} + (1 - T^l) \cdot \alpha_p^{lN}]. \tag{7}$$

Whenever the player is playing for club i (which happens with probability one until date t and with probability $(1-g)$ for period $(1-t)$), he gets wage W per unit of time. If the shock occurs, he gets renegotiation payoff $\pi_p(e_0, T^l, r^l) = (T^l - t) \cdot \alpha_p^{lV}(e_0) + (1 - T^l) \cdot \alpha_p^{lN}(e_0)$. Since the player gets a fraction β of the joint surplus, we have $\Pi_p(e_0, T^l, r^l) = \beta \cdot JS(e_0, T^l, r^l)$, and the initial wage $W^l = W(e_0, T^l, r^l)$ per unit of time is thus implicitly given by

$$(1 - g(1-t))W^l + g \cdot [(T^l - t)\alpha_p^{lV}(e_0) + (1 - T^l)\alpha_p^{lN}(e_0)] = \beta \cdot JS(e_0, T^l, r^l). \tag{8}$$

This leads to

Proposition 3 *i) Under each regime, a higher optimal contract length leads to a higher initial wage, i.e.* $\frac{d}{dT}W^l(\cdot)\big|_{T=T^l} > 0 \; \forall l = P, B, M$.
ii) At the margin, this effect is largest under regime B*, i.e.* $\frac{d}{dT}W^B(\cdot)\big|_{T=T^B} > \frac{d}{dT}W^P(\cdot)\big|_{T=T^P}$ *,* $\frac{d}{dT}W^M(\cdot)\big|_{T=T^M}$.

Proof. See Appendix B. ■

As for part i), recall from Proposition 2 part ii) that the privately optimal contract length increases in e_0. And for any $\hat{e}_0 > e_0$ (which implies $T^l(\hat{e}_0) > T^l(e_0)$ for the optimal contract length $T(\cdot)$) we must have $JS(\hat{e}_0, T^l(\hat{e}_0)) > JS(e_0, T^l(e_0))$ since the player and club i could otherwise simply choose the same contract length for $\hat{e}_0$ as for e_0 which would still lead to $JS(\hat{e}_0, T^l(e_0)) > JS(e_0, T^l(e_0))$. And since the player's wage is increasing in JS, part i) follows. For an intuition of part ii), recall that the negative impact of T on club n's renegotiation payoff is highest under system B, so that the impact of T on JS (and hence on W) must be highest, too.[9]

2.4 Comparison of actual player performance

In this subsection, we investigate the impact of the legal systems on the relationship between the equilibrium contract length T^l and the actual performance e. As for this, denote for all $l = P, B, M$ by $e^l = e(e_0, T^l)$ the actual performance of a player with potential e_0 when the optimal contract length T^l is chosen.

To determine the sign of $\frac{de^l}{dT^l}$, we have to take into account the following countervailing effects: On the one hand do we know from part ii) of Proposition 2 that players with higher potential sign longer initial contracts. Since high potential players perform better than low potentials if the contract length is identical, this suggests a *positive* relationship between e^l and T^l. We call this the "selection effect". But on the other hand, it is clear from Assumption 1 that the moral hazard problem ceteris paribus increases with the contract length, and this suggests a *negative* relationship between e^l and T^l. As mentioned in the Introduction, this interplay between moral hazard and heterogeneity is a well-known problem in empirical contract theory, and it implies - in our model - that the sign of the overall effect can be either positive or negative.[10] However, we get a precise prediction concerning the *relative importance* of these two effects under the different regimes:

Proposition 4 *For the relationship between the actual performance e^l and the equilibrium contract length T^l under the different regimes, we have $\frac{de^B}{dT^B} < \frac{de^P}{dT^P}, \frac{de^M}{dT^M}$.*

Proof. See Appendix C. ■

[9] Note, however, that Proposition 3 holds only if the *optimal* contract length T^l is chosen. For any other contract length, the moral hazard effect could outweigh the renegotiation effect, thereby reducing JS and thus W for any β given.

[10] Note that we cannot exclude $\frac{de^l}{dT^l} < 0$ by arguing that it can never be optimal for club i and the player to sign a contract such that the selection effect is dominated. If the impact on club n's renegotiation payoff is strong enough, this can be consistent with joint surplus maximization.

Intuitively, the reason for $\frac{de^B}{dT^B} < \frac{de^P}{dT^P}$ is as follows: Recall from Proposition 2 part i) that the incentive to increase the initial contract length is highest under regime B. Thus, the corresponding level of e_0 for each T is lower than under regime P. In other words, since a long contract is chosen even for mediocre players, the moral hazard effect is relatively more important under system B compared to system P. An analogous argument holds for the result $\frac{de^B}{dT^B} < \frac{de^M}{dT^M}$. As in Proposition 2 part i), the comparison between regimes P and M is ambiguous and depends on the difference between the renegotiation payoffs when the player's contract is valid or expired and thus on the sign of $(r^{PN} - r^{PV}) - (r^{MN} - r^{MV})$. Summing up, we find that the legal restrictions expressed in the systems P, B and M not only influence the terms of the contract and the payoffs, but also the relationship between the equilibrium contract length and the performance.

3 Empirical Analysis

3.1 Description of the Data

In this section we aim at providing empirical support for the predictions of our model. Since system M has been enacted just recently, we have to restrict attention to systems B and P. Our data cover six consecutive seasons in the German top professional soccer league ("Bundesliga") of which the first two (1994/95 and 1995/96) have been played under system P and the remaining four (1996/97-1999/2000) under system B. Using the two leading German soccer magazines "Kicker" and "Sport-Bild", we have compiled a data set with detailed information on player performance, contract duration, annual remuneration and transfer fees paid. Player performance per season is measured by a composite index, called "kick index", that takes into consideration both position-specific factors such as the number of assists per match for a striker, and team specific factors as the result of a match.[11]

Our data set includes information on 1308 different contracts. In 695 cases, these

[11] More information about the composition of this performance index is provided in Appendix D.

contracts were signed following a transfer, while in the remaining 613 cases, players re-signed with their current club. Altogether, we know the annual salaries agreed upon in 937 cases, and the duration of the contract in 975 cases. When a player has been transferred from another club, we have information about the remaining contract length at the time of the transfer in this *old* club for 239 cases. Moreover, we have the actual transfer fees for 684 cases (in 142 of them, the transfer fee was zero). Overall, our sample includes 53% of all transfers in which a non-zero transfer fee was paid during the time period under consideration. These are all cases where the transfer fee has been reported in the media, and we see no reason for a sample selection bias. Nevertheless, we will account for this possibility by also using a Heckman Two Step Procedure in the empirical analysis.

Finally, since the composite index is only calculated for "regular" players who appeared in a match for at least 30 out of the 90 minutes a soccer match lasts, we have information on performance for 1318 player years. Table 2 gives more information on the dependent variables and shows how many cases refer to the Pre-Bosman- and the Bosman-period, respectively. As will become clear below, our estimations will involve the simultaneous use of these variables. This tends to reduce the available number of observations as we do not have *all* relevant information for all cases. For example, we have information on the contract length *and* the salary for 604 cases, and on the contract length *and* the performance in 739 cases.

insert table 2 here

During the time period of our sample, the soccer industry in Europe has seen a huge increase in TV revenues (during the 6-year period under consideration the increase was 100%), a fact which we have to take into account. In our estimations, we will therefore not use the nominal values of the variables which are measured in monetary units (i.e. transfer fees and wages), but instead use the standardized values $\ln(\frac{\text{transfer fee}}{\text{average transfer fee}})$ and $\ln(\frac{\text{annual salary}}{\text{average annual salary}})$.[12]

[12] Kernel density estimates for these standardized variables and for player performance as well as the distribution of contract durations are provided in Appendix E.

As control variables we use measures that have been identified in a number of studies as (potential) determinants of player salaries and transfer fees in European soccer (see the literature review in the Introduction). As can be seen in table 3, these variables include both individual characteristics of the players like age and nationality and team characteristics such as the average number of tickets sold per game.

insert table 3 here

3.2 Testing the Theoretical Predictions

3.2.1 Testing Proposition 1

Proposition 1 is concerned with the impact of the remaining contract length in a player's *old* club at the time of the transfer on the renegotiation payoffs under the different regimes. Since there is no real-world data for system M yet, part (iii) of Proposition 1 cannot (yet) be tested. Moreover, we do not have player specific data for the administered transfer fee r^{PN}, i.e. about club i's veto sum if a contract has expired under the Pre-Bosman system. This also renders the test of part ii) impossible, which leaves us with testing the remaining parts of the Proposition:

Hypothesis 1 *a) Under regimes P and B, a higher remaining length of the player's old contract increases the transfer fee paid by the new club and decreases the player's annual salary in the new club.*
b) At the margin, these effects are stronger under regime B than under regime P.

Naturally, the hypothesis concerns only situations in which a transfer has been carried out which leaves us with a sample size of $N = 239$. We estimate an OLS model with heteroskedasticity consistent t-values (see White (1980)) because the LM-Test suggests that unobserved player characteristics do not affect our results. In fact, there are only seven players in our sample who have been transferred more than once. The estimation results concerning the transfer fees are reported in table 4 (column (1)).

insert table 4 here

The table shows that our theoretical results concerning the impact of the remaining contract length on the transfer fees actually paid are empirically confirmed. One more remaining year of contract in the old club increases the transfer fee by 3.2%, and this effect is significant at the 1%-level. Moreover, we also find that this effect has become stronger under the Bosman regime B, i.e. we get another increase by 0.9% and thus 28% more compared to regime P. Also, our control variables confirm the findings by, among others, Carmichael, Forrest, and Simmons (1999) and Frick and Lehmann (2001), for instance, that age and career games played have a statistically significant and non-linear impact on the transfer fees.

As already mentioned, our data set contains only about half of all transfers carried out during the time period under consideration, a fact which could at least theoretically bias our sample. For this reason we have also tested a Heckman Two-Step model by estimating the probability of a transfer first, and then the transfer fee given that a transfer has taken place. As instrumental variable we use the player's tenure in his old club as this presumably influences the likelihood of a transfer, but not the transfer fee itself. The results of this estimation are reported in column (2) of table 4 and are virtually identical to the OLS estimates which suggests that there is no sample bias.

The respective results for annual wages are shown in table 5:

insert table 5 here

First, recall that part (i) of Proposition 1 is expressed with respect to the player's *total* wage π_p, whereas part (i) of Hypothesis 1 refers to the *annual* wage (which can be interpreted as the wage per unit of time, i.e. as $\frac{\pi_p}{1-t}$ in the theoretical model). As explained in subsection 2.2, this is clearly the adequate measure for testing the Proposition. The estimation confirms our theoretical result that a higher remaining contract length has a negative effect on the player's annual wage in his new club: one more remaining year of contract reduces his annual wage by 2%. Again, this effect is highly significant. Finally, a Heckman Two-Step estimation yields basically identical results.

However, it cannot be empirically confirmed that the impact on wages is higher under system B. By contrast, we find at a low significance level that the negative impact of the remaining contract length on the wage in the new club has become weaker under regime B. In our view, this might be attributed to hidden sign-up fees which clubs pay "under the table" to players whose contracts with their old clubs have expired. There is abound anecdotal evidence that this practice has become quite common only in the aftermath of the Bosman judgement. Of course, these payments should be interpreted as part of a player's salary. Unfortunately, they are notoriously hard to observe and consequently, we have no information in which cases such fees have been paid in our sample.[13] If such fees are paid in addition to the regular wage to out-of-contract players, and if this phenomenon is more pronounced under regime B, then our regression under-estimates the benefit from being out-of-contract under system B, and thus also the wage reduction from having a positive remaining contract length.

3.2.2 Testing Proposition 2

Whereas Proposition 1 referred to the renegotiation game, Proposition 2 analyzes the impact of the transfer fee system and a player's potential e_0 on the contract length. Since we have no empirical proxy for e_0 (our index measures only the *actual* performance e), we have to restrict our attention to part (i) of Proposition 2:

Hypothesis 2 *The average contract length is higher under system B than under system P, i.e. $T^B > T^P$.*

When testing the hypothesis, the LM-test statistic suggests that an OLS estimation is inferior to a Random Effects-model. The results of the RE-estimation are reported in table 6:

insert table 6 here

The average contract length has indeed been increasing from 2.43 years to 2.91 years after the Bosman ruling, and controlling for a number of different dimensions of a player's

[13] One example is the transfer of German "prodigal" Sebastain Deisler from Hertha BSC Berlin to Bayern Munich in 2002. The fact that Munich had paid a sign-up fee of 10 Mio. € became publicly known only after an obvious leakage in the administration of one of the clubs. This resulted in a copy of the cheque being printed on the title page of Germany's largest tabloid "Bild".

performance, we find that this is statistically significant at a high level. This lends broad support to our hypothesis that this difference has to be attributed mainly to the changes in the underlying incentive structure. Furthermore, most of the statistical controls have the expected sign and are statistically different from zero. For example, older players sign shorter contracts while more "established" players (those with a high number of career games and those who have played for their respective national team) get longer contracts.[14]

3.2.3 Testing Proposition 3

Let us first recall that, in Proposition 1, we were interested in the impact of a player's remaining contract length in his *old* club on the *new* contract terms (i.e. the transfer fee and the wage paid by the new club). In other words, we considered the impact of the old contract on the renegotiation game for a new contract. Now, we are testing the impact of the contract length in a club on the wage *in this club* itself. Since it is precisely the anticipated gain in the renegotiation game that sets incentives for long-term contracts, Proposition 1 was the basis for Proposition 3. Of course, the adequate measure for testing the Hypothesis is again not the total wage but the annual wage (see the remarks after Proposition 1).[15] We test the following hypothesis:

Hypothesis 3 *a) Under both systems P and B, the annual wage in the current club is increasing in the contract length in the current club.*
b) This effect is larger under system B.

The fact that we are now concerned with the impact of the contract length on the wage in the current club implies that, compared to the test of Proposition 1, the sample size increases from $N = 239$ to $N = 604$. This is due to the fact that we can now also use those cases in which a player and his club renewed their contract without a transfer

[14] Similar findings have been reported by Kahn (1993) using data from US Major League Baseball.
[15] In our theoretical model, this makes no difference as the expected time the player plays for club i is independent of the contract length.

taking place (of course, this new contract will typically stipulate a different length and/or wage than the previous one). This also increases the degree of unobserved heterogeneity, because we now have up to four different contracts per individual player. Therefore, in addition to the OLS model used for testing Hypothesis 1, we also estimate a Random Effects model, the results of both being shown in table 7:

insert table 7 here

Our RE estimates strongly confirms the hypothesis: When the contract length increases by one year, the annual wage goes up by 0.7%. This effect is significant at the 1%-level. Moreover, the interaction term (Contract Duration times Bosman Dummy) is positive and significant, implying an additional increase of about 0.5% per year under regime B. In turn, this implies an increase by more than 50% compared to regime P. Again, the signs of the standard control variables are as expected, and as predicted in previous studies (see e.g. Lucifora and Simmons (2003)): For example, the number of career games has a positive but decreasing influence on wages, and being selected for the national team also increases a player's income.

3.2.4 Testing Proposition 4

We now move to testing the relationship between the contract duration and the actual performance. Let us first mention that, conversely to Proposition 4, Hypothesis 4 is stated with respect to the *remaining* contract length instead of the *absolute* (initial) contract length. As explained at the end of subsection 2.1, this difference comes from the fact that in our model, we have expressed the moral hazard problem with respect to the absolute contract length for simplicity. For empirical purposes, however, it seems adequate to choose the remaining contract length instead. As explained above, the underlying economic logic is the same since in both cases, the *average* performance is decreasing in the contract length.

As pointed out in section 2.4, this relationship between the remaining contract length and performance is indeterminate from a theoretical point of view: on the one hand do players with a higher potential sign longer contracts, while on the other hand, a longer remaining contract length leads to lower performance incentives ("moral hazard effect"), thereby driving the overall result ambiguous.

However, our theory unambiguously predicts how the net impact of the two effects changes as one moves from regime P to regime B: While the moral hazard problem is basically the same under both regimes, the incentive for the initial club i and the player to sign a long-term contract is higher under system B, which reinforces the impact of the moral hazard problem in equilibrium. We thus test the following hypothesis:

Hypothesis 4 *A larger remaining contract length has a stronger negative impact on observed performance under system P than under system B.*

To identify the determinants of a player's performance, we again estimate a RE-model, because we have up to six observations per player. The estimation results are shown in table 8:

insert table 8 here

The table shows that the hypothesis is supported by the data: First, a remaining contract length of one more year increases average performance by 2.15 index points, thereby suggesting that the selection effect dominates in our sample. Second and more importantly, this effect becomes weaker under the Bosman regime (-1.21 index points). We take this result as supportive of the basic idea of our model that the legal change affects the trade-off between the selection- and the moral hazard-effect, thereby not only leading to a different equilibrium contract length, but also to a different relationship between contract length and performance.

4 Discussion

We have developed a model for analyzing the impact of the three different transfer systems in European soccer. Our main theoretical and empirical results can be summarized as follows: (i) under all regimes, the initial club benefits at the renegotiation stage from high veto sums and from long contracts. (ii) since the impact of the contract length on the renegotiation payoffs is maximum under the Bosman regime B, the contract length is highest under this regime, too. (iii) when a player signs a longer contract, then he is compensated for his lower renegotiation payoff by receiving a higher initial wage per unit of time. This effect is again maximum under regime B. (iv) finally, the relationship between the contract length and the observed performance can theoretically be either positive (when the selection effect dominates) or negative (when the moral hazard effect dominates), but in any case, it is higher under regime P than under system B.

Although all but one of our theoretical propositions are confirmed empirically at a highly significant level, one may nevertheless challenge some of our underlying assumptions. First, recall that an interior solution for the contract length arises due to the trade-off between the new club's renegotiation payoff (which decreases in T, respectively R) and the moral hazard problem (which increases in T, respectively R). Thereby, we assume that the moral hazard problem is independent of the transfer fee system, whereas the renegotiation impact of the contract length depends on the system. Alternatively, one might assume that the moral hazard problem also depends on the transfer fee system, for instance because a player's incentive may be higher if he expects a high payoff in renegotiations.[16] However, we believe it to be reasonable that at least part of the problem arises simply due to the fact that the player is "insured" by the long-term contract.

Furthermore, different contract durations within one regime (B, say) in our model arise due to different potentials (e_0). Let us emphasize that we are far from denying that there are many other aspects influencing the optimal contract length: risk preferences may be different,[17] the shock probability g may vary from player to player, and in a dynamic model where the shock can arise at any point of time, the probability densities may differ across players. Moreover, the moral hazard exposure may also vary across players which could be captured in our model by assuming that $e_k = e_0 - b_k T^2$, thereby expressing the player-specific moral hazard exposure via b_k. However, it is well known in

[16] This is exactly the assumption underlying the results in Feess and Muehlheusser (2003b).

[17] Note, however, that introducing risk-aversion would not change our results qualitatively. Under the realistic assumption that players are more risk averse than clubs, this would simply give another argument in favor of signing long term contracts.

empirical sports economics that high-potential players sign longer contracts (see i.e. Kahn (1993)). In addition, explaining different contract durations via differences in e_0 leads to interesting insights on the impact of transfer regimes which are perfectly compatible with our empirical findings. Finally, with respect to the issue of identification, our result that the relationship between the remaining contract length and observed performance should be more pronounced under regime P seems rather specific and can hardly be explained with other approaches. We therefore tend to take the empirical confirmation of this result as being supportive of our theory.

Although the impact of legal restrictions on contract terms has so far hardly been tested empirically so that our approach seems to be important, there exists a clear drawback of our analysis: the theoretical literature aims at analyzing potential restrictions on the freedom of contract from a normative perspective, and this is clearly missing in our paper - we have no propositions like "system B is socially superior to system P". From a theoretical point of view, our model allows for such a prediction: since actual performance is decreasing in the contract length, and since the contract length is maximum under regime B, the quality of the league should be lower after the Bosman judgement as the moral hazard problem becomes more severe. However, we have not tested such a hypothesis because we believe that our performance measure only allows for *relative*, but not for absolute performance comparisons - it seems to us that the grades assigned to players in the soccer magazines do not relate to the absolute quality of the league. In other words, it is not possible that both, the defender and the striker loose the same tackle at the same time. Furthermore, social welfare also depends on competitive balance and on the incentives to invest in the training of young talents, which both are aspects that are not incorporated in our theoretical model.

Although these issues are clearly important and deserve further research, we are also interested in extending our framework in the following two directions: First, the fact that only about 10 percent of a player's salary is related to performance indicates that setting incentives is not costless. And since the moral hazard problem is most severe under regime B due to higher contract durations, our model would also predict that the performance-related payments should be higher after the Bosman judgement, too. Second, Proposition 4 sheds light on the interplay between the selection effect and the moral hazard-effect, but it does not allow to fully separate these two effects. This requires to gather more detailed data at the individual player level, and we are currently working on such a project. Preliminary results show that, controlling for age, position and other factors, the ratio between actual performance and maximum performance is indeed decreasing in the remaining contract length, thereby supporting the moral hazard assumption underlying our theory.

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A Proof of Proposition 2

Part i) Define $h_l(e_0) := \alpha_n^{lN}(e_0) - \alpha_n^{lV}(e_0)$. From Assumption 2 part i), since $r^{lV} - r^{LN}$ is maximum under regime B ($r^{BV} = \infty$ and $r^{BN} = 0$), it follows that $h_B(e_0) > h_P(e_0), h_M(e_0)$.

Part ii) We have $\frac{dT^l}{de_o} = \frac{g}{1-g(1-t)} h_l'(e_0)$ and it follows from Assumption 2 part ii) that $h_l'(e_0) > 0$ since $r^{lV} > r^{LN}$ for all $l = P, B, M$.

B Proof of Proposition 3

Part i) From Eqn. (8), and from $e^{\max} - \alpha_n^{lc}(e_0) = \alpha_i^{lc}(e_0) + \alpha_p^{lc}(e_0)$ for $l = P, B, M$ and $c = V, N$, it follows that W^l is implicitly given by the following equation:

$$
\begin{aligned}
&(1 - g(1-t)) \cdot W^l + g \cdot [(T^l - t)\alpha_p^{lV}(e_0) + (1 - T^l)\alpha_p^{lN}(e_0)] \\
&= \beta \cdot \left[(1 - g\,(1-t)) \left(e_0 - \frac{b}{2}T^2 \right) + g \left[(T-t) \left(\alpha_i^{lV}(e_0) + \alpha_p^{lV}(e_0) \right) + (1-T) \left(\alpha_i^{lN}(e_0) + \alpha_p^{lN}(e_0) \right) \right] \right]
\end{aligned}
$$

which is equivalent to

$$
\begin{aligned}
&0 = (1 - g(1-t)) \cdot (W^l - \beta(e_0 - \frac{b}{2}T^2) \\
&\quad - g \left[(T-t) \left(\beta(\alpha_i^{lV}(e_0) + \alpha_p^{lV}(e_0)) - \alpha_p^{lV}(e_0) \right) + (1-T) \left(\beta \left(\alpha_i^{lN}(e_0) + \alpha_p^{lN}(e_0) \right) - \alpha_p^{lN}(e_0) \right) \right]
\end{aligned}
$$

Applying the implicit function theorem, we get

$$
\frac{dW^l}{dT} = -\frac{(1 - g(1-t)) \cdot \beta b T - g \cdot \left[\beta(\alpha_n^{lN}(e_0) - \alpha_n^{lV}(e_0)) + \alpha_p^{lN}(e_0) - \alpha_p^{lV}(e_0) \right]}{(1 - g(1-t))}
$$

Evaluating this derivative at the optimal contract length, $T^l = \frac{g\left[\alpha_n^{lN}(e_0)-\alpha_n^{lV}(e_0)\right]}{(1-g(1-t))}$ (see Eqn (6)), this simplifies to

$$\left.\frac{dW^l}{dT}\right|_{T=T^l} = \frac{g\left[\alpha_p^{lN}(e_0)-\alpha_p^{lV}(e_0)\right]}{(1-g(1-t))} > 0 \ \forall l = P, B, M \tag{9}$$

Part ii) It follows directly from observing in Eqn. (9) that $\frac{dW^l}{dT^l}$ is the larger, the larger $\left(\alpha_p^{lN}(e_0)-\alpha_p^{lV}(e_0)\right)$. From Assumption 2 part i), this term is maximum under regime B, since $r^{BN}=0$ and $r^{BV}=\infty$.

C Proof of Proposition 4

Recall from Eqn. (6) that the optimal contract length under regime l is given by

$$T^l(e_0) = \frac{g\left[\alpha_n^{lN}(e_0)-\alpha_n^{lV}(e_0)\right]}{(1-g\,(1-t))} \tag{10}$$

Now define $h_l(e_0) := \alpha_n^{lN}(e_0)-\alpha_n^{lV}(e_0)$. Note that Assumption 2 part ii) together with the entries in table 1 implies that the following relation holds:

$$\alpha_n'^{MN}(e_0) = \alpha_n'^{BN}(e_0) > \alpha_n'^{PN}(e_0), \alpha_n'^{MV}(e_0) > \alpha_n'^{BV}(e_0) = \alpha_n'^{PV}(e_0). \tag{11}$$

This in turn implies that $h_l(\cdot)$ is strictly increasing in e_0 for all $l = P, B, M$ since $h_l'(\cdot) = \alpha_n''^{lN}(e_0) - \alpha_n''^{lV}(e_0) > 0$ for all l. Let us assume for simplicity that $h_l(\cdot)$ is also continuous and differentiable such that the inverse function $h_l^{-1}(\cdot)$ is well-defined. We can now re-write Eqn. (10) in terms of $h_l(\cdot)$ and solve for e_0 to yield $e_0 = h_l^{-1}(\frac{1-g(1-t)}{g}T^l)$ so that the function

$$E_0(T) \equiv h_l^{-1}(\frac{1-g\,(1-t)}{g}T) \tag{12}$$

gives that level of potential which corresponds to (equilibrium) contract length T. In the next step, denote e^l as the actual performance of the player when (equilibrium) contract length T is chosen, i.e. $e^l = e(E_0(T), T)$. Using Eqn. (12) allows us to establish the relationship between T and the actual performance e^l:

$$e^l(T) = h_l^{-1}(\frac{1-g\,(1-t)}{g}T) - \frac{1}{2}(T)^2$$

such that $\frac{d}{dT}e^l = h_l^{-1\prime}(\cdot)(\frac{1-g(1-t)}{g}) - T$ where $h_l^{-1\prime}(\cdot) > 0$ for all $l = P, B, M$. For the comparison of the different regimes, we can again use Assumption 2 part ii) to establish that $h'_B(e_0) > h'_P(e_0), h'_M(e_0)$. Using the Eqn. (11), we have

$$\begin{aligned} h'_B(e_0) > h'_P(e_0) &\Leftrightarrow \\ \alpha_n^{\prime BN}(e_0) - \alpha_n^{\prime BV}(e_0) > \alpha_n^{\prime PN}(e_0) - \alpha_n^{\prime PV}(e_0) &\Leftrightarrow \\ \alpha_n^{\prime BN}(e_0) - \alpha_n^{\prime PV}(e_0) > \alpha_n^{\prime PN}(e_0) - \alpha_n^{\prime PV}(e_0) &\Leftrightarrow \\ \alpha_n^{\prime BN}(e_0) > \alpha_n^{\prime PN}(e_0) & \end{aligned}$$

which is true since $r^{BN} = 0 < r^{PN}$. Analogously, for the comparison of $h'_B(e_0)$ and $h'_M(e_0)$ we have

$$\begin{aligned} h'_B(e_0) > h'_M(e_0) &\Leftrightarrow \\ \alpha_n^{\prime BN}(e_0) - \alpha_n^{\prime BV}(e_0) > \alpha_n^{\prime MN}(e_0) - \alpha_n^{\prime MV}(e_0) &\Leftrightarrow \\ \alpha_n^{\prime BN}(e_0) - \alpha_n^{\prime BV}(e_0) > \alpha_n^{\prime BN}(e_0) - \alpha_n^{\prime MV}(e_0) &\Leftrightarrow \\ \alpha_n^{\prime BV}(e_0) < \alpha_n^{\prime MV}(e_0) & \end{aligned}$$

which also holds since $r^{BV} = \infty > r^{MV}$. Since the ranking for the derivatives of the inverse functions $h_l^{-1\prime}(\cdot) = \frac{1}{h'_l(\cdot)}$ is then just reversed, the statement in the proposition follows.

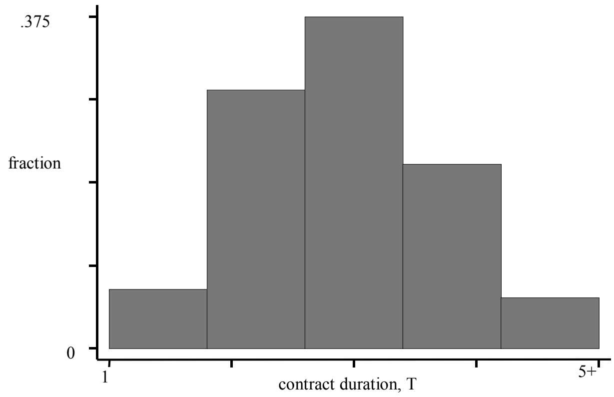
D Composition of the Performance Index

Performance Independent of Player Position	Number of Points	Performance Dependent on Player Position	Number of Points
		Goalkeeper	
Team Win	5	Goal Against Team	-20
Team Loss	-5	No Goal Allowed	10
Goal Scored	20	Ordinary Save	10
Goal Scored for Opponent	-10	Difficult Save	20
Penalty Kick Successful	10	*Defender*	
Penalty Kick Missed	-10	Tackle Won	5
Goal Assist	15	Tackle Lost	-5
Responsible for Goal Against Team	-20	Long Pass	1
Responsible for Penalty Kick	-10	Shot on Goal Prepared	2
Goal Missed	-5	No Goal Allowed	10
Shot on Goal (-16m)	4	1-2 Goals Against	-5
Shot on Goal (16m+)	1	3-4 Goals Against	-10
Yellow Card	-3	5-6 Goals Against	-20
Yellow/Red Card	-15	7+ Goals Against	-30
Red Card	-20	*Midfielder*	
		Tackle Won	3
		Tackle Lost	-2
		Long Pass	1
		Shot on Goal Prepared	5
		Forward	
		Tackle Won	1
		Shot on Goal Prepared	2

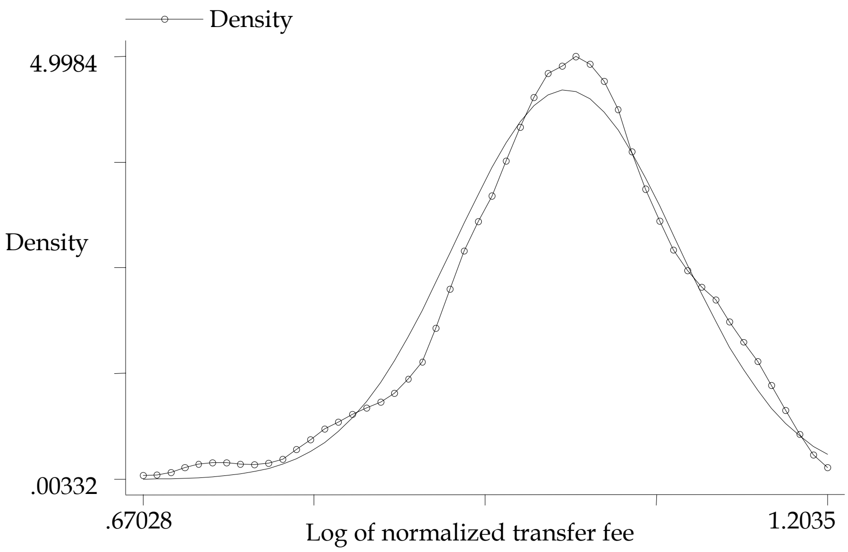
Source: Ziebs (2002, p. 100)

E Illustration of Sample Properties

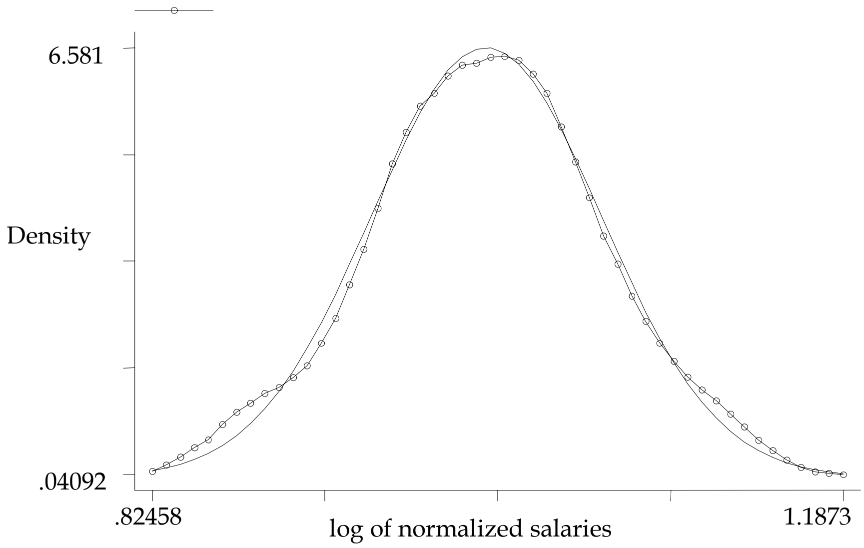
Distribution of Contract Duration



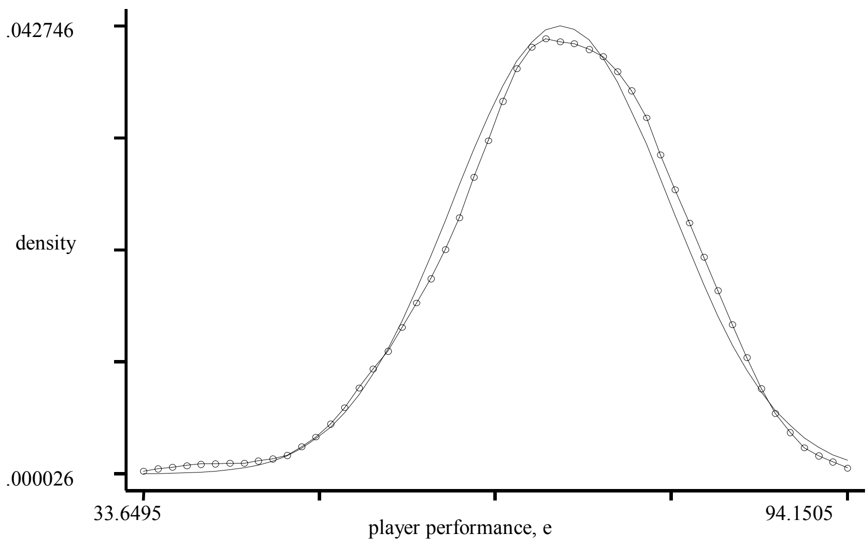
Kernel Density Estimates



a) Transfer Fees



b) Salaries



c) Player Performance

Table 2: Descriptive Statistics for Dependent Variables (1 DM ≈ 0.5 €)

Variable	Mean	Std Dev	Min	Max	N of Cases		
					Total	P	B
Player Performance (composite kick-index)	69.6	9.3	35.6	92.2	1318	450	868
Contract Duration (in years)	2.83	1.0	1	7	975	224	751
Annual Salary (in DM)	1,050320	1,015379	80000	6,500000	937	111	826
Actually Paid Transfer Fee (in DM)	1,354000	2,372435	0	17,000000	684	187	497

Table 3: Independent Variables

Variable	Mean	Std Dev
Post-Bosman Era#	0.68	0.46
Season Dummies For Each Season#		
Player Characteristics		
Remaining Contract Years	2.53	1.07
Age	26.0	4.2
Number of Career Games Played	72.5	93.0
Appearance in National Team#	0.33	0.47
Semi-Professional#	0.11	0.31
Home-Grown Talent#	0.23	0.42
Nationality Dummies#		
German	0.70	0.46
Western Europe	0.10	0.30
Eastern Europe (reference category)	0.12	0.33
Other Countries	0.08	0.27
Position Dummies#		
Goalkeeper (reference category)	0.10	0.30
Defender	0.27	0.44
Midfielder	0.41	0.49
Forward	0.22	0.41
Team Change Between Seasons#	0.29	0.45
Team Characteristics		
Team Qualified for European Cup#	0.36	0.48
Average Number of Tickets Sold	27337	12527
Stadium Capacity Utilization (in %)	0.66	0.21
Final League Position	9.65	5.17

Dummy variable (0=no; 1=yes)

N=1,308 (cases for which we have information on either the annual salary, the length of the contract or on both variables).

Table 4: Influence of Remaining Contract Length and Transfer Fee System on Transfer Fees

The following regressions test the empirical validity of Proposition 1. The dependent variable is log standardized transfer fee. The estimation technique in (1) is OLS with robust standard errors (White (1980)) and the Heckman Two-Step Procedure in (2) where the instrument used is "tenure in the current club".

	(1)	(2)
Remaining Contract Years	0.0355***	0.0354***
	(4.32)	(4.82)
Remaining Contract Years*Bosman Dummy	0.0154**	0.0154**
	(2.49)	(2.53)
Contract Duration in New Club	-0.0019+	-0.0018+
	(-0.32)	(-0.36)
Age	0.0280**	0.0279**
	(2.10)	(2.06)
Age Squared‡	-0.0463*	-0.0461*
	(-1.84)	(-1.74)
Number of Career Games Played‡	0.0436***	0.0430***
	(3.70)	(3.40)
Number of Career Games Played Squared‡‡	-0.0011***	-0.0011***
	(-3.05)	(-2.93)
Semi-Professional#	-0.0424+	-0.0421*
	(-1.51)	(-1.93)
Member of National Team#	0.0176**	0.0178**
	(2.07)	(2.06)
Citizenship East European Country#	reference category	reference category
Citizenship Germany#	-0.0149+	-0.0153+
	(-1.14)	(-1.27)
Citizenship West European Country#	0.0192+	0.0192+
	(1.47)	(1.61)
Citizenship Other Country#	0.0347***	0.0347***
	(2.65)	(2.82)
Goalkeeper#	reference category	reference category
Defender#	0.0022+	0.0031+
	(0.16)	(0.20)
Midfielder#	0.0081+	0.0091+
	(0.62)	(0.61)
Forward#	0.0285**	0.0294*
	(2.16)	(1.90)
Team Qualified for European Cup#	0.0420***	0.0418***
	(5.47)	(5.44)
Mills Lambda	-	0.0037+
		(0.20)
Constant	0.4490**	0.4459**
	(2.53)	(2.58)
Number of Observations	239	604
Censored Observations	-	365
Uncensored Observation	-	239
F-Value	20.6	-
R^2*100	60.8	-
LM-Test	0.4+	-
Wald Chi Squared	-	370.7***

‡ Coefficient multiplied by 100 for presentational purposes
‡‡ Coefficient multiplied by 1,000 for presentational purposes
# Dummy variable
+ Not significant
* Significant at the 10% level
** Significant at the 5% level
*** Significant at the 1% level

Table 5: Influence of Remaining Contract Length and Transfer Fee System on Annual Wage in the New Club

The following regressions test the empirical validity of Proposition 1. The dependent variable is log standardized annual wage in the new club. The estimation technique in (1) is OLS with robust standard errors (White (1980)) and the Heckman Two-Step Procedure in (2) where the instrument used is "tenure in the current club".

	(1)	(2)
Remaining Contract Years	-0.0195***	-0.0190***
	(-4.81)	(-4.40)
Remaining Contract Years*Bosman Dummy	0.0037+	0.0034+
	(1.05)	(0.98)
Contract Duration in New Club	0.0042+	0.0040+
	(1.25)	(1.39)
Transfer Fee Paid	0.5331***	0.5338***
	(12.30)	(14.62)
Age	0.0040+	0.0043+
	(0.50)	(0.56)
Age Squared‡	-0.0059+	-0.0066+
	(-0.38)	(-0.44)
Number of Career Games Played‡	0.0179**	0.0200***
	(2.39)	(2.75)
Number of Career Games Played Squared‡‡	-0.0003+	-0.0003+
	(-1.47)	(-1.47)
Member of National Team#	0.0133**	0.0125***
	(2.55)	(2.56)
Semi-Professional#	0.0004+	-0.0008+
	(0.02)	(-0.06)
Citizenship East European Country#	reference category	reference category
Citizenship Germany#	0.0067+	0.0080+
	(0.92)	(1.18)
Citizenship Western European Country#	0.0110*	0.0111+
	(1.70)	(1.63)
Citizenship Other Country#	-0.0016+	-0.0016+
	(-0.18)	(-0.23)
Goalkeeper#	reference category	reference category
Defender#	0.0186**	0.0147*
	(2.00)	(1.65)
Midfielder#	0.0258***	0.0217***
	(2.84)	(2.58)
Forward#	0.0199**	0.0156*
	(2.16)	(1.77)
Team Qualified for European Cup#	0.0112**	0.0121***
	(2.44)	(2.64)
Constant	0.3842***	0.3971***
	(3.46)	(4.03)
Number of Observations	239	604
Censored Observations	-	365
Uncensored Observations	-	239
F-Value	27.9	-
R^2*100	72.6	-
LM-Test	0.03+	-
Wald Chi Squared	-	638.8***

‡ Coefficient multiplied by 100 for presentational purposes
‡‡ Coefficient multiplied by 1,000 for presentational purposes
# Dummy variable
+ Not significant
* Significant at the 10% level
** Significant at the 5% level
*** Significant at the 1% level

Table 6: Influence of Transfer Fee System on Contract Length

The following regression tests the empirical validity of proposition 2. The dependent variable is the length of the individual contract. The estimation technique is a Random Effects Model.

	(1)
Bosman Dummy	0.5345***
	(7.82)
Age	0.0657+
	(0.86)
Age Squared	-0.0030**
	(-2.17)
Number of Career Games Played	0.0024**
	(2.38)
Number of Career Games Played Squared‡	-0.0060***
	(-2.36)
Member of National Team#	0.3178***
	(4.10)
Home Grown Talent	-0.3887***
	(-3.12)
Citizenship East European Country#	reference category
Citizenship Germany#	-0.0165+
	(-0.16)
Citizenship West European Country#	0.0093+
	(0.08)
Citizenship Other Country	-0.0207+
	(-0.16)
Goalkeeper#	reference category
Defender#	-0.3284***
	(-2.76)
Midfielder#	-0.1633+
	(-1.42)
Forward#	-0.2233*
	(-1.79)
Team Qualified for European Cup#	0.2253**
	(3.37)
Log of Average Number of Tickets Sold	0.2708***
	(3.95)
Stadium Capacity Utilization	-0.3301**
	(-1.99)
Constant	0.2675+
	(0.21)
Number of Observations	975
Number of Players	676
Observations per Player	1-4
R^2*100	19.4
Wald Chi Squared	217.4***
LM-Test	14.5***
Hausman-Test	36.2***

‡ Coefficient multiplied by 1,000 for presentational purposes
# Dummy variable
+ Not significant
* Significant at the 10% level
** Significant at the 5% level
*** Significant at the 1% level

Since some individual characteristics of the players, such as nationality and position, are usually time-invariant, they can not be included in a fixed effects estimation. Therefore, we report the results of a random effects GLS regression instead. The most important coefficient in the present context (the Bosman-Dummy) remains unchanged in a fixed effects approach.

Table 7: Influence of Contract Length and Transfer Fee System on the Annual Wage

The following regressions test the empirical validity of proposition 3. The dependent variable is the log Standardized Annual Wage in the current club. The estimation technique used is OLS with robust standard errors (White (1980)) in (1) and a Random Effects Model in (2).

	(1)	(2)
Contract Duration	0.0077**	0.0050**
	(2.43)	(2.01)
Contract Duration * Bosman Dummy	0.0044*	0.0059***
	(1.88)	(3.61)
Age	0.0256***	0.0268***
	(4.62)	(4.82)
Age Squared‡	-0.0425***	-0.0445***
	(-4.03)	(-4.14)
Number of Career Games Played‡	0.0366***	0.0363***
	(6.13)	(6.01)
Number of Career Games Played	-0.0007***	-0.0007***
Squared‡‡	(-4.36)	(-3.74)
Member of National Team#	0.0289***	0.0227***
	(6.56)	(4.89)
Semi-Professional#	-0.0279**	-0.0202**
	(-2.42)	(-2.04)
Citizenship East European Country#	reference	reference
	category	category
Citizenship Germany#	-0.0030+	-0.0098+
	(-0.50)	(-1.51)
Citizenship West European Country#	0.0166**	0.0161**
	(2.45)	(2.21)
Citizenship Other Countries#	0.0175**	0.0178**
	(2.17)	(2.29)
Goalkeeper#	reference	reference
	category	category
Defender#	0.0080+	0.0108+
	(1.22)	(1.40)
Midfielder#	0.0178***	0.0201***
	(2.89)	(2.77)
Forward#	0.0223***	0.0246***
	(3.35)	(3.16)
Team Qualified for European Cup#	0.0163***	0.0134***
	(4.07)	(3.76)
Stadium Capacity Utilization	0.0363***	0.0378***
	(3.66)	(3.98)
Constant	0.5137***	0.5017***
	(7.17)	(7.00)
Number of Observations	604	604
Number of Players	-	477
Observations per Player	-	1-4
F-Value	38.6	-
R^2*100	51.0	50.4
Wald Chi Squared	-	568.9***
LM-Test	-	38.2***
Hausman-Test	-	68.6***

‡ Coefficient multiplied by 100 for presentational purposes
‡‡ Coefficient multiplied by 1,000 for presentational purposes
# Dummy variable
+ Not significant
* Significant at the 10% level
** Significant at the 5% level
*** Significant at the 1% level

Since some individual characteristics of the players, such as nationality and position, are usually time-invariant, they can not be included in a fixed effects estimation. Therefore, we report the results of a random effects GLS regression instead.

Table 8: Influence of Remaining Contract Length and Transfer Fee System on the Player Performance

The following regressions test the empirical validity of proposition 4. The dependent variable is the performance measure "kick-index". The estimation technique used is a Random Effects Model.

	(1)
Remaining Contract Years	2.1516***
	(3.65)
Remaining Contract Years * Bosman Dummy	-1.2089*
	(-1.84)
Age	0.3880+
	(0.34)
Age Squared	-0.0047+
	(-0.22)
Number of Career Games Played	0.0048+
	(0.43)
Number of Career Games Played Squared‡	-0.0088+
	(-0.30)
Member of National Team#	3.4903***
	(4.56)
Citizenship East European Country#	reference category
Citizenship Germany#	2.8316**
	(2.40)
Citizenship West European Country#	3.3295**
	(2.49)
Citizenship Other Countries#	2.6908*
	(1.79)
Goalkeeper#	reference category
Defender#	-6.0702***
	(-4.34)
Midfielder#	-5.8396***
	(-4.26)
Forward#	-7.9655***
	(-5.41)
Team Change Between Seasons	-3.6428***
	(-5.10)
Stadium Capacity Utilization	3.0558*
	(1.70)
Final League Position	-0.5020***
	(-7.10)
Season 1999/00#	reference category
Season 1998/99#	-0.2027+
	(-0.26)
Season 1997/98#	-0.4716+
	(-0.55)
Season 1996/97#	-1.4426+
	(-1.54)
Season 1995/96#	-3.6861**
	(-2.07)
Season 1994/95#	-3.5289*
	(-1.83)
Constant	65.9348***
	(4.39)
Number of Observations	741
Number of Players	392
Observations per Player	1-6
R^2*100	29.7
Wald Chi Squared	237.6***
LM-Test	9.7***
Hausman-Text	85.4***

‡ Coefficient multiplied by 1,000 for presentational purposes
# Dummy variable
+ Not significant

* Significant at the 10% level
** Significant at the 5% level
*** Significant at the 1% level

Since the grading of players has changed over the period under investigation, we include year dummies in our estimate. Moreover, since some individual characteristics of the players, such as nationality and position, are usually time-invariant, they can not be included in a fixed effects estimation. Therefore, we report the results of a random effects GLS regression instead.