NBER WORKING PAPER SERIES

TESTING OUT CONTRACTUAL INCOMPLETENESS: EVIDENCE FROM SOCCER

Oriol Carbonell-Nicolau
Diego Comin

Working Paper 11110
http://www.nber.org/papers/w11110

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
February 2005

Testing out Contractual Incompleteness: Evidence from Soccer
Oriol Carbonell-Nicolau and Diego Comin
NBER Working Paper No. 11110
February 2005
JEL No. L10, L20, L60, K0

ABSTRACT

The theory of incomplete contracting is rival to that of complete contracting as a frame of reference to understand contractual relationships. Both approaches rest upon diametrically opposed postulates and lead to very different policy conclusions. From a theoretical viewpoint, scrutiny of the postulates has revealed that both frameworks are reasonable.

This paper designs and implements an empirical test to discern whether contracts are complete or incomplete. We analyze a problem where the parties' inability to commit not to renegotiate inefficiencies is sufficient for contractual incompleteness. We study optimal contracts with and without commitment and derive an exclusion restriction that is useful to identify the relevant commitment scenario. The empirical analysis takes advantage of a data set from Spanish soccer player contracts. Our test rejects the commitment hypothesis, which entails the acceptance of the existence of contractual incompleteness in the data. We argue that our conclusions should hold a fortiori in many other economic environments.

Oriol Carbonell-Nicolau
Rutgers University
carbonell@econ.rutgers.edu

Diego Comin
Department of Economics
New York University
269 Mercer Street, 725
New York, NY 10003
and NBER
diego.comin@nyu.edu

TESTING OUT CONTRACTUAL INCOMPLETENESS: EVIDENCE FROM SOCCER*

Oriol Carbonell-Nicolau† Diego Comin‡

January 2005

Abstract

The theory of incomplete contracting is rival to that of complete contracting as a frame of reference to understand contractual relationships. Both approaches rest upon diametrically opposed postulates and lead to very different policy conclusions. From a theoretical viewpoint, scrutiny of the postulates has revealed that both frameworks are reasonable.

This paper designs and implements an empirical test to discern whether contracts are complete or incomplete. We analyze a problem where the parties' inability to commit not to renegotiate inefficiencies is sufficient for contractual incompleteness. We study optimal contracts with and without commitment and derive an exclusion restriction that is useful to identify the relevant commitment scenario. The

*We thank Alberto Bisin, Chris Flinn, John Ham, Oliver Hart, Alessandro Lizzeri, Torsten Persson, Giorgio Topa, and seminar participants at Universitat Pompeu Fabra, Harvard University, New York University, SUNY at Buffalo, New York Fed, and IIES for helpful comments; Leticia Morales Ripalda for excellent assistance; and Carlos del Campo, Oriol Domènech, Juan Antonio Jiménez, Manuel Esteban, Pedro Martín, José María Pajares, *AS*, *El País*, and *Marca* for data provision. Comin thanks the "Galácticos" for inspiration. All errors are our own. Financial assistance from the Research Council at Rutgers University and the C.V. Starr Center for Applied Economics at New York University is gratefully acknowledged.

†Rutgers University; carbonell@econ.rutgers.edu

‡New York University, NBER, and New York Fed; diego.comin@nyu.edu

empirical analysis takes advantage of a data set from Spanish soccer player contracts. Our test rejects the commitment hypothesis, which entails the acceptance of the existence of contractual incompleteness in the data. We argue that our conclusions should hold *a fortiori* in many other economic environments.

Keywords: incomplete contract, optimal contract, commitment, renegotiation.

JEL classification: L14.

1 Motivation

The theory of incomplete contracting is rival to that of complete contracting as a frame of reference to understand contractual relationships. On the one hand, complete contracts specify all the actions to be taken contingent on all observable information. On the other hand, incomplete contracts may omit relevant clauses when these are contingent on information which is non-verifiable by third parties, even if this information is observable by the contracting parties.

There is much at stake in the debate about which approach is more appropriate. Theories built around the idea that contracts are incomplete have shed new light on a wide variety of economic phenomena. Such theories include the limits of the firm (Grossman and Hart [1986], Hart and Moore [1990]), the foundations of debt contracts (Aghion and Bolton [1992], Hart and Moore [1998]), the design of bankruptcy procedures (Aghion et al. [1992]), the allocation of voting rights in corporations (Grossman and Hart [1988] and Harris and Raviv [1989]), the limits of the services provided by the government (Hart et al. [1998], Acemoglu et al. [2003]), the genesis of democracy (Fleck and Hanssen [2002]), the extension of the franchise (Acemoglu and Robinson [2000]), and the genesis of feudal contracts (Comin and Beunza [2001]).

In this paper, we intend to discern which of the two contracting paradigms is more appropriate. Approaching the question directly is very complex because it requires knowing all the clauses in the contract, the information sets of the contracting parties (as well as those of third parties), the actual behavior of the parties along the equilibrium path, and the actions they would have taken out of the equilibrium path. As in many other empirical problems, the researcher never has all this information. To identify the relevant contracting environment, we propose a strategy that is indirect.

Amongst the existing contributions to the foundations of incomplete contracts, the approach of Segal [1995, 1999] and Hart and Moore [1998, 1999] is prominent. This approach relies heavily on the assumption that parties to a contract are unable to commit not to renegotiate their contract. At the core of the Segal-Hart-Moore argument is the fact that lack of commitment may place severe limitations on the set of implementable outcomes, thereby leading to the signing of contracts which are not "sufficiently" contingent on variables that are relevant.[1]

Our environment, which differs from that of Segal-Hart-Moore in many respects, is one in which the contracting parties' inability to commit not to renegotiate their contracts ex-post restricts the set of implementable outcomes and provides—as in the aforementioned authors' contributions—a rationale for contractual incompleteness. This implies that we can establish the incompleteness of contracts by ascertaining the parties' lack of commitment not to renegotiate.

Contract theorists are divided about the issue of commitment. The question is why parties do not find ways to prevent ex-post beneficial but exante detrimental renegotiation. For insightful discussions, see Tirole [1999], Maskin and Tirole [1999], and Hart and Moore [1999]. Reasonable arguments can be made in favor and against the commitment hypothesis. As Hart and Moore [1999, p. 132] put it,

> "the degree of commitment [not to renegotiate] is something about which reasonable people can disagree."[2]

Once the theoretical approach has reached a dead end, any attempt to determine the ability of parties to commit not to renegotiate must resort to empirical observation. This is what we try to do in this paper by focusing on one specific transaction—namely, the transfer of a soccer player from club A to club B.

[1] It should be noted that other explanations of incomplete contracts exist that are based on bounded rationality—and not on the commitment assumption. See Anderlini and Felli [1994], Battigalli and Maggi [2002], and references therein.

[2] The commitment issue also resides at the center of many other economic problems, such as time inconsistency (Kydland and Prescott [1977], Barro and Gordon [1983]), or entry deterrence (Dixit [1979]).

Unfortunately, testing for commitment directly requires the same large amount of information as testing for contractual incompleteness. Nevertheless, moving one step backwards and analyzing the optimal contract between the player and club A with and without commitment allows us to derive an exclusion restriction that we can bring to the data to identify the contracting environment.

In a world where parties can commit, the player and A can design a contract that allows them to achieve two goals: maximize extraction of the entrant's rent and divide the surplus extracted to optimize risk-sharing. This implies that the player and A can credibly commit not to transfer the player to B unless B pays the sum that maximizes their expected joint surplus. In Section 2, we show that if there is commitment and the player and A sign *any* optimal contract, this sum is **only** a function of club A's valuation of the player and the parties' beliefs about club B's valuation of the player.

When parties lack this ability to commit, however, the optimal contract does not in general separate the problems of rent extraction and surplus division. We provide one possible explanation for this assertion, but we, on no way, claim it to be the only rationale for the non-separability of rent extraction and surplus division.

In our context, the player is risk-averse. One goal of the optimal contract is to insure the player against the risk of a failed transaction. However, when bargaining with club B, the player does not internalize the loss incurred by club A when a transaction fails. If the player is fully insured, he will tend to behave too aggressively at the renegotiation stage. To avoid this, the optimal contract trades off insuring the player with aligning the parties' incentives at the renegotiation stage. This trade-off arises only when parties cannot commit not to renegotiate and implies that variables related to the division of surplus may affect the rent extracted from club B when the player is transferred.

More specifically, we show that, under no commitment, it is no longer the case that the value of the player for club A and the distribution of B's valuations of the player are sufficient statistics for the total financial outlay incurred by club B to hire the player. In particular, the compensation that the player must pay A to unilaterally break the relationship—known as the transfer fee—may affect the total payment made by B above and beyond the clubs' valuations of the player.

The critical observation for our exclusion restriction follows: under commitment, the transfer price is only a function of club A's valuation of the player and the parties' beliefs about the club B's valuation. Under no commitment, however, the transfer fee may have predictive power over the transfer price even after controlling for the clubs' valuations of the player.[3] Furthermore, since the optimal contract under no commitment is incomplete, the excess sensitivity of the transfer payments to the transfer fee would imply that the contracts signed by clubs and soccer players are incomplete.

To implement this test, we construct a data set containing information about all the transfers of soccer players in the Spanish league ("La Liga") during the three seasons between 1998 and 2001. This data set contains demographic information for each player, as well as two measures of the players' value constructed by two specialized magazines and information about salaries received by players from the buying clubs and compensations to the selling clubs.

Our point estimate of the elasticity of the total compensation received by club A and the player in a transaction with respect to the transfer fee is approximately 0.5. This result, however, could be due to the mismeasurement of the value of the player if this is correlated with the transfer fee. To explore this possibility, we use the model developed in Section 2 to study the determinants of the transfer fee. This allows us to obtain three instruments for the transfer fee for each player: the probability of transferring a player by position, by club, and the average transfer fee for the club excluding the player. We then show that the excess sensitivity of the total transfer price to the transfer fee persists after instrumenting for the transfer fee. Using an overidentifying restriction test, we also show that the instruments used are valid (i.e. both relevant and exogenous). Based on these results, we conclude that parties cannot commit not to renegotiate and therefore that soccer contracts are incomplete.

To the best of our knowledge, this is the first paper that tests for the existence of commitment and contractual incompleteness. We know of three related strands of the literature.

The first subset of papers try to test some implications of the property-rights approach of Grossman and Hart [1986] and Hart [1995]—an application of the theory of incomplete contracts. Baker and Hubbard [2003] find that ownership patterns in trucking reflect the importance of both incomplete contracts (Grossman and Hart [1986]) and job design and measurement is-

[3] The mere presence of a transfer fee does not imply that parties are unable to commit because some clauses of the optimal complete contract can be written as a transfer fee.

sues (Holmstrom and Milgrom [1994]). Acemoglu et al. [2004] show that the relationship between a downstream (producer) industry and an upstream (supplier) industry is more likely to be vertically integrated when the producing industry is more technology intensive and the supplying industry is less technology intensive.

Rather than testing the implications of the theory of incomplete contracts, our approach is more primitive in that it focuses on a postulate—the no commitment hypothesis—which constitutes a source (rather than an implication) of contractual incompleteness.

Another subset of papers studies the importance of reputation on contractual choices and on outcomes. Crocker and Reynolds [1993] study the choice of procurement contracts for airplane engines in the US military. They find that higher values of some measures of reputation and complexity lead to the drafting of a more incomplete contract. McMillan and Woodruff [1999] use several measures of trusts to show that inter-firm trade credit is more likely when the delivering firm trusts its client. Finally, Banerjee and Duflo [2000] test the importance of several measures of reputation (like the age of the firm or whether the client-firm relationship is repeated) on the contract chosen by a software developing firm and its client and on the ex-post cost overruns and their distribution. Their results seem to indicate that reputation allows firms to move from fixed-cost contracts to time and material contracts and to reduce the share of the overrun paid.

These three papers are very interesting but the fact that reputation and repetition matter for the choice of a contract is not very informative about the extent to which they suffice to solve the commitment problem. Two scenarios are possible. The first is one where reputation and folk-theorem type of considerations are so important that agents behave as if their relationship were governed by a comprehensive contract. The second is one where contractual incompleteness is generalized and agents value the consolidation of a trustable relationship enormously. We hope to overcome this identification problem by a more direct approach to testing for commitment and contractual incompleteness.

Finally, our test for contractual incompleteness is similar in spirit to those conducted elsewhere to test the completeness of financial markets (Cochrane [1991], Mace [1991] and Townsend [1994]).

The paper contains three additional sections. Section 2 lays out the model and the concepts and notation used in the rest of the paper. Section 3 contains the theoretical results needed to design our test. Section 4 implements the test. Section 5 concludes by arguing that, because actions taken by players and clubs become widely observable to the general public and reputational considerations play an important role in the world of soccer, the contractual incompleteness observed in soccer contracts is likely to hold *a fortiori* in many other economic environments.

2 Modeling soccer contracts

We envisage a two-period model. At date 0, a club, A, and a player sign a contract. At date 1, after the contract is in place, the player and A interact with a potential recruiter, B, also referred to as the outsider.

An ex-post unverifiable ***state of nature*** described by a vector $v = (v_A, v_B) \in V = V_A \times V_B$ is realized at the beginning of date 1. Here, v_i represents i's valuation of the player, V_A and V_B are finite subsets of $[0, \overline{v}_A]$ and $[\underline{v}_B, \overline{v}_B]$, respectively, and $0 < \overline{v}_A < \underline{v}_B < \overline{v}_B < +\infty$. These inequalities imply that it is common knowledge that B's valuation of the player exceeds that of A, so that allocative efficiency requires that the player be matched with B.[4] It is assumed that v_A and v_B are independent random variables, and that each v_i occurs with probability $\alpha_i(v_i)$.[5] Without loss of generality, we may assume that $\alpha_B(\underline{v}_B) > 0$.

We make the following assumptions on the distribution of information at the beginning of date 1, after the realization of the state of nature. First, A's valuation of the player is commonly observed by all agents. Second, B's valuation is B's private information.

The first assumption reflects the idea that the player's performance on A becomes observable by other employers; in the terminology of Milgrom and Oster [1987], the player is "visible."[6]

At the end of date 1, an outcome is realized. An ***outcome*** is an allocation of the player to a club along with a number of monetary transfers. We

[4] Assuming possible but uncertain gains from trade with the outsider would require a notion of efficiency along the lines of Holmstrom and Myerson's "durability" (Holmstrom and Myerson [1983]) and would complicate matters significantly. We see no reason why the assumption of uncertain gains from trade would undermine the results of the paper.

[5] Independence can be dispensed with.

[6] While most workers' abilities can be concealed by an employer from potential employers, some particular types, such as movie actors, artists, and professional sports players, are closer to the "visible" characterization.

may designate an outcome by a vector $y = \Big((d_i)_{i\in\{A,B\}}, (x_i)_{i\in\{P,A,B\}}\Big)$, where $d_i = 1$ if club i signs the player, $d_i = 0$ otherwise, and $x_i \in \mathbf{R}$ represents the monetary transfer received by agent i. An outcome is feasible if its corresponding distribution of transfers, $(x_i)_{i\in\{P,A,B\}}$, has $x_P + x_A + x_B = 0$. The set of all feasible outcomes is denoted Y.

An outcome $y = \Big((d_i)_{i\in\{A,B\}}, (x_i)_{i\in\{P,A,B\}}\Big)$ realized in state $v = (v_A, v_B)$ gives a utility of

$$u_i(y, v) = d_i v_i + x_i \text{ to agent } i \in \{A, B\}$$

and a utility of

$$u_P(y, v) = u(x_P) \text{ to the player;}$$

here, u is continuous, strictly increasing, and concave.

The present setting ignores two issues. First, it does not take into account that the player could care not only about money but also about the identity of the club he ends up playing on. In this case, the player could have private information about his preferences over clubs. This would introduce an informational asymmetry between club A and the player which does not appear in our model. Second, our setting ignores that the player has control over his performance and can therefore influence the clubs' valuations, thereby improving his bargaining power not only prior to the signing of the contract but also in any ex-post renegotiation of it. We conjecture that extending our model to incorporate these considerations would not alter the essence of our results. We have chosen to use a simpler enviroment to ease exposition.

2.1 Feasible contracts

A ***contract*** signed by the player and A at date 0 is defined as a map from the set of states V to the set of outcomes Y.

The feasibility of a contract depends on whether the parties are able to commit not to renegotiate contractual inefficiencies, according to a well-defined notion of inefficiency (to be introduced shortly). In the next subsections, a precise definition of contract feasibility, with and without commitment, is furnished.

A contract is feasible if it can be implemented through a mechanism. To make this terminology precise, some preliminaries are needed.

A ***mechanism*** is defined as a tuple

$$g = \Big(S_P, S_A, S_B, \rho\Big),$$

where $\Big\{S_P, S_A, S_B\Big\}$ is a collection of strategy sets and $\rho : S \to Y$, where $S = S_P \times S_A \times S_B$. A mechanism induces a Bayesian game to be played by the player, A, and B, at the beginning of date 1, after the realization of the state. The nature of this game is determined by the parties' ability to commit not to renegotiate. We consider the two cases—where there is and where there is not commitment—in turn.

2.1.1 Commitment

Under commitment, every agent i must simultaneously choose an action from S_i. The map ρ turns the agents' choices into a feasible outcome. The parties are *committed* to abide the outcome dictated by ρ. This outcome *cannot* be renegotiated even if it is inefficient in the allocative sense (i.e., if it assigns the player to A). Since the state of nature is payoff-relevant and all agents receive (at least partial) information about its realization, the agents' strategies in this game may be contingent on this information. The player and A, who observe v_A, may therefore choose actions contingent on v_A, while B, who observes both v_A and v_B, may choose actions that depend on (v_A, v_B). The player and A's beliefs about v_B are derived consistently from the prior distribution of the state. Given the assumed independence between v_A and v_B, these beliefs do not vary with v_A even though v_A is observable. They may thus be described by the probability measure α_B over V_B. A strategy profile $s = s(\cdot)$ (specifying, for each player, an action from his action space given the player's information about the state of nature) gives player i an expected payoff of

$$\sum_{v \in V} u_i\Big(\rho(s(v)), v\Big)\alpha(v),$$

where α denotes the joint distribution of (v_A, v_B). The game associated to the mechanism g is denoted as $\Gamma(g)$.

We say that a contract f is ***feasible with commitment*** if a mechanism $g = \Big(S_P, S_A, S_B, \rho\Big)$ may be obtained such that some equilibrium s of the game $\Gamma(g)$ induces the outcome dictated by contract f in every state of the world and, at this outcome, each agent obtains at least an expected payoff of 0. These conditions are formally expressed as follows.

- $f(v) = \rho(s(v))$ for every $v \in V$.
- $u_B\Big(\rho(s(v)), v\Big) \geq 0$ for every $v \in V$.
- $\sum_{v \in V} u_i\Big(\rho(s(v)), v\Big)\alpha(v) \geq 0$ for every $i \in \{P, A\}$.

If these conditions are fulfilled, we say that g implements f.

2.1.2 No commitment

The notion of feasibility with no commitment is a bit more complicated. With no commitment, inefficient outcomes are not final, but rather renegotiated away. Given that we are assuming that it is common knowledge that B's valuation exceeds that of A, here an ***inefficient*** outcome is one that does not allocate the player to club B.

Beyond the specifics of the renegotiation process, introduced in Subsection 3.1.2, the possibility of renegotiation introduces two new considerations.

First, if contract design affects renegotiation, a contract is implemented not only by the choice of a mechanism, but also by the specification of a set of contractible variables that may affect the equilibrium play at the renegotiation stage.[7]

Second, the player and A might acquire information other than that transmitted by their own signals while under the influence of a contract. Of course, the distribution of information that prevails when a mechanism concludes (and before the renegotiation stage is initiated) may affect the equilibrium renegotiated outcome.

To provide a notion of contract feasibility with no commitment that accommodates these two points, some preliminaries are needed.

Given a mechanism $g = \Big(S_P, S_A, S_B, \rho\Big)$, a set of contractible variables $\mathcal{F}$ that affect the renegotiation process, and a collection

$$\left\{ g_{\mathcal{F},y} = \Big(S_P(\mathcal{F}, y), S_A(\mathcal{F}, y), S_B(\mathcal{F}, y), \rho_{\mathcal{F},y}\Big) \right\}_{(\mathcal{F},y)}$$

of renegotiation mechanisms, referred to as a ***renegotiation process***, consider the following extensive game $\Gamma(g, \mathcal{F})$. First, the state of nature v is chosen according to the joint distribution α. Club B observes nature's choice,

[7] This idea was formalized by Aghion et al. [1994].

while the player and A observe A's valuation only. Then each agent i chooses an action s_i from S_i. The agents' choices are simultaneous and determine the outcome $\rho(s)$, where $s = (s_i)_{i\in\{P,A,B\}}$. The outcome $\rho(s)$ is followed by renegotiation.[8] In the renegotiation, each agent i chooses an action a_i from $S_i(\mathcal{F}, \rho(s))$. The action profile $a = (a_i)_{i\in\{P,A,B\}}$ induces the renegotiated outcome $\rho_{\mathcal{F},\rho(s)}(a)$. Here a ***strategy*** for player i is a function $\tilde{s}_i$ that specifies an action contingent on the player's information and on i's past moves. More precisely, for $i \in \{P, A\}$, $\tilde{s}_i(v_A)$ represents the action from S_i i would choose in the first stage—the implementation stage—were i to observe v_A, while $\tilde{s}_i(v_A, s_i, y)$ designates the action from $S_i(\mathcal{F}, y)$ chosen by the type v_A of i in the game's second stage—the renegotiation stage—following her own past choice $s_i \in S_i$ and the observation of outcome y. For B, $\tilde{s}_B(v)$ and $\tilde{s}_B(v, s_B, y)$ are defined similarly.

A ***system of beliefs*** in $\Gamma(g, \mathcal{F})$ is a collection $\mu = \Big\{(\mu_{(v_A,s_P,y)}, \mu_{(v_A,s_A,y)})\Big\}$, where $\mu_{(v_A,s_P,y)}$ and $\mu_{(v_A,s_A,y)}$ are probability measures over V_B, $(v_A, s_i, y) \in V_A \times S_i \times Y$ for each $i \in \{P, A\}$, and $\mu_{(v_A,s_i,y)}$ describes i's beliefs about B's valuation after the observation of nature's choice of A's valuation v_A, i's action s_i at the stage of contract implementation, and the result y dictated by the contract.[9]

Let $\tilde{s}$ be a strategy profile. The expected utility that player $i \in \{P, A\}$ would derive from $\tilde{s}$ in the first stage of the game were she to observe the signal v_A is

$$\tilde{u}_i(\tilde{s}|v_A) = \sum_{v_B\in V_B} u_i\left(\rho_{\mathcal{F},\rho(\tilde{s}(v))}\left(\tilde{s}\Big(v, \tilde{s}(v), \rho(\tilde{s}(v))\Big)\right), v\right)\alpha_B(v_B).$$

The analogous expected utility for B is

$$\tilde{u}_B(\tilde{s}|v) = u_B\left(\rho_{\mathcal{F},\rho(\tilde{s}(v))}\left(\tilde{s}\Big(v, \tilde{s}(v), \rho(\tilde{s}(v))\Big)\right), v\right).$$

[8] For notational convenience, we say that any outcome is followed by renegotiation, yet the renegotiation process is assumed to be irrelevant if $\rho(s)$ is not inefficient.

[9] Observe that we are modelling the game in such a way that agents do not observe the other players' (past and current) moves. Only private signals, own moves, and the outcomes dictated by the contract are observed by each individual. The adoption of this assumption is not consequential. It merely responds to the necessity of being explicit as to the information available to each player at each information set in the formal specification of the game. Assuming that other players' (past and current) moves are observed would not alter the essence of our results.

The expected utility that player $i \in \{P, A\}$ would derive from $\tilde{s}$ in the second stage after choosing the action s_i in the first stage, were she to observe the signal v_A and the result y, and if her beliefs regarding B's valuation were described by $\mu_{(v_A,s_i,y)}$ is

$$\tilde{u}_i\left(\tilde{s}\middle|v_A, s_i, y, \mu_{(v_A,s_i,y)}\right) = \sum_{v_B \in V_B} u_i\left(\rho_{\mathcal{F},y}\left(\tilde{s}\left(v, (s_i, \tilde{s}_{-i}(v)), y\right)\right), v\right)\mu_{(v_A,s_i,y)}(v_B).$$

The analogous expected utility for B is

$$\tilde{u}_B(\tilde{s}|v, s_B, y) = u_B\left(\rho_{\mathcal{F},y}\left(\tilde{s}\left(v, (s_B, \tilde{s}_{-B}(v)), y\right)\right), v\right).$$

Note that this expression differs from the one above in that club B has no uncertainty about the state of the world.

A profile of strategies and system of beliefs $(\tilde{s}, \mu)$ is an ***equilibrium*** in $\Gamma(g, \mathcal{F})$ if (i) the agents' strategies are optimal both at the implementation and renegotiation stages given their information, their beliefs, and the strategies of the other players, and (ii) beliefs are consistent with Bayes' rule. Formally, these conditions are expressed as follows.

- $\tilde{u}_i(\tilde{s}|v_A) \geq \tilde{u}_i(\hat{s}_i, \tilde{s}_{-i}|v_A)$ for each $\hat{s}_i$, every v_A, and all $i \in \{P, A\}$.
- $\tilde{u}_B(\tilde{s}|v) \geq \tilde{u}_B(\hat{s}_B, \tilde{s}_{-B}|v)$ for each $\hat{s}_B$ and every v.
- $\tilde{u}_i\left(\tilde{s}\middle|v_A, s_i, y, \mu_{(v_A,s_i,y)}\right) \geq \tilde{u}_i\left(\hat{s}_i, \tilde{s}_{-i}\middle|v_A, s_i, y, \mu_{(v_A,s_i,y)}\right)$ for each $\hat{s}_i$, every (v_A, s_i, y), and all $i \in \{P, A\}$.
- $\tilde{u}_B\left(\tilde{s}\middle|v, s_B, y\right) \geq \tilde{u}_B\left(\hat{s}_B, \tilde{s}_{-B}\middle|v, s_B, y\right)$ for each $\hat{s}_B$ and every (v, s_B, y).
- The system of beliefs μ is derived from strategy profile $\tilde{s}$ through Bayes' rule whenever possible.

A contract f is ***feasible with no commitment***, for a given renegotiation process $\left\{g_{\mathcal{F},y} = \left(\left(S_i(\mathcal{F}, y)\right), \rho_{\mathcal{F},y}\right)\right\}_{(\mathcal{F},y)}$, if a mechanism $g = \left((S_i), \rho\right)$ and a set of contractible variables $\mathcal{F}$ may be obtained such that, for some equilibrium $(\tilde{s}, \mu)$ in the game $\Gamma(g, \mathcal{F})$, the outcome of the renegotiation process associated with this equilibrium in every state of nature is the outcome dictated by the contract and yields at least an expected payoff of 0 to each agent. Letting

$$y_v = \rho_{\mathcal{F},\rho(\tilde{s}(v))}\left(\tilde{s}\Big(v, \tilde{s}(v), \rho(\tilde{s}(v))\Big)\right),$$

these conditions are formally expressed as follows.

- $f(v) = y_v$ for every $v \in V$.
- $u_B(y_v, v) \geq 0$ for every $v \in V$.
- $\sum_{v \in V} u_i(y_v, v)\alpha(v) \geq 0$ for every $i \in \{P, A\}$.

If these conditions are fulfilled, we say that f is implementable by g and $\mathcal{F}$ without commitment.

2.2 Optimal contracts

Whether there is or there is not commitment, we postulate that the parties sign optimal contracts. A contract f is ***optimal with commitment*** (respectively, ***optimal with no commitment***) if it is feasible with commitment (respectively, with no commitment) and no other contract $\tilde{f}$ is feasible with commitment (respectively, with no commitment), and, at the same time, improves the date-0 expected payoff of at least one of the parties and does not worsen the date-0 expected payoff of either party, that is,

$$\sum_{v \in V} u_i(\tilde{f}(v), v)\alpha(v) \geq \sum_{v \in V} u_i(f(v), v)\alpha(v) \text{ for each } i \in \{P, A\}, \tag{1}$$

with strict inequality for some $i \in \{P, A\}$.

2.3 Incomplete contracts

While there is no well-accepted definition of contractual incompleteness, the common perception is that a contract is incomplete if it is not as "fully" contingent on the state of nature as the parties to the contract would like it to be. This idea is rather vague, and hence may accommodate different formalizations.

Following Tirole [1999], we view an incomplete contract as a contract that is *restricted*. Implementation theory, along with the commitment assumption, provides, through a number of incentive constraints, a well-defined description of the set of feasible outcomes. It is with respect to this set that an incomplete contract is constrained. That is, the parties to an incomplete contract cannot achieve a "best" outcome, relative to what is achievable under the standard approach to contract theory. While in other papers incomplete contracting relates to a focus on a subset of feasible outcomes through the imposition of *ad hoc* restrictions on the set of allowable contracts, we follow Segal [1995, 1999] and Hart and Moore [1988, 1999] and provide a model in which these constraints are derived endogenously from the no commitment assumption.

The formal definition of contractual incompleteness adopted here is stated as follows. A contract f that is feasible with no commitment is ***incomplete*** if the player and A would like to be able to commit not to renegotiate, for then they could sign a feasible (with commitment) contract $\tilde{f}$ which would improve (relative to f) the date-0 expected payoffs of the parties, that is, (1) would hold with strict inequality for some i.

Observe that, in general, an incomplete contract is not flexible enough to make outcomes contingent on the state of nature in an optimal fashion. Also, this notion of incompleteness implies that an incomplete contract is one where parties would like (but are not able) to enforce relevant clauses contingent on information that is observable but not verifiable. We shall see that in our setting the player and A would like to enforce a clause whereby they experience large punishments in case the renegotiation stage is reached.

3 Theoretical results

Our test of the commitment hypothesis is based on an exclusion restriction derived in Subsection 3.1. Subsection 3.2 establishes a connection between lack of commitment and contractual incompleteness. In light of our theoretical results, refutation of the commitment hypothesis entails the acceptance of the existence of contractual incompleteness in the data.

3.1 Determinants of the outsider's financial outlay from signing the player

In this section, we derive two results. First, we characterize the determinants of B's financial outlay from signing the player after the signing of *any* optimal contract and under the commitment assumption (Subsection 3.1.1). Second, we assume lack of commitment and some renegotiation process and characterize, in the context of an example, the determinants of B's financial outlay from signing the player after the signing of some optimal contract (Subsection 3.1.2).

3.1.1 Commitment

In this section, we postulate that the parties are able to commit themselves to refrain from renegotiating their contract if, at some point, it is to their mutual advantage to do so. In principle, there are ways in which parties who are determined to prevent renegotiation might succeed in doing so. This issue is discussed extensively in Maskin and Tirole [1999], Tirole [1999], and Hart and Moore [1999].

We show that, under commitment, the player and A can design a contract that allows them to achieve two goals: maximize extraction of the entrant's rent and divide the surplus extracted to optimize risk-sharing. The separation of the rent extraction and insurance problems implies that *all* the contracts that are optimal with commitment share a common characteristic that plays a central role in the identification of the relevant commitment environment. We start by illustrating this property in the context of a specific contract that is optimal under commitment and then show the result in the general case.

The following description of a contract is informal; its formal analogue, in terms of the notation introduced in Section 2, is omitted to ease exposition.

Consider a contract f^* that specifies a transfer fee F that A is entitled to receive from the player if another club signs the player without A's approval. At date 1, the player may unilaterally negotiate with B and sign for B after paying A the transfer fee. Alternatively, the player may form a coalition with A to bargain a potential transaction with B. In the latter case, A and the player make a joint proposal to B. This proposal is chosen according to the following agreement. Club A and the player announce their private information—i.e., the observed realization of A's valuation. If both agents announce $\hat{v}_A$, B must pay, in order to sign the player, a certain amount $B(\hat{v}_A)$. If B accepts, the amount w is for the player, while $B(\hat{v}_A) - w$ accrues to A. If B declines, the player may not sign for B unless he pays A the fee F. If the player stays on A, he is paid the wage w. Finally, if the agents' announcements do not coincide, f^* dictates that the player must remain on A and receive wage w.

Our first result states that, if the parties are able to commit themselves not to renegotiate their contract, a choice for F, w, and each $B(\hat{v}_A)$ exists such that f^* is optimal. The proof is relegated to the Appendix.

PROPOSITION 1. *Under commitment, F, w, and each $B(\hat{v}_A)$ may be chosen in a way that f^* is optimal.*

At the optimal contract, commitment induces B to take A and the player's joint proposal seriously because otherwise the contract bans any transaction below the transfer fee. On the other hand, a carefully designed system of punishments, along with commitment, induces the player and A to announce v_A truthfully. Each $B(v_A)$ may therefore be chosen to maximize extraction of B's rent, and the surplus extracted may be divided between the parties to optimize risk-sharing.

Contract f^* is versatile enough to permit a separate treatment of rent extraction and surplus division. Under commitment, a contract may be designed that performs well on both fronts. In particular, B's total financial disbursement from hiring the player under the precepts of f^* maximizes the expected rent extracted from B by the player and A and is given by

$$B(v_A) \in \arg\max_{T \in \mathbf{R}} v_A \sum_{v_B < T} \alpha_B(v_B) + T \sum_{v_B \geq T} \alpha_B(v_B),$$

where v_A represents the realization of A's valuation of the player. This observation has implications on the determinants of club B's financial outlay from signing the player: when the parties can commit not to renegotiate contract f^*, the value of the player for A, v_A, and the conditional distribution of the value of the player for B are sufficient statistics for the total disbursement incurred by B when there is a transaction. In other words, after conditioning on v_A and the conditional distribution of v_B, no other variable should have predictive power on B's total cost of hiring the player.

It turns out that this property is not specific of contract f^*. Indeed, it is shared by *any* optimal contract the player A may sign under commitment.

This is stated formally in the following proposition, the proof of which is provided in the Appendix.

PROPOSITION 2. *Suppose that there is commitment. Then, for any optimal contract, if the player signs for* B *in state* $(v_A, v_B) \in V$*,* B*'s total financial outlay solves*

$$\max_{T \in \mathbf{R}} v_A \sum_{\tilde{v}_B < T} \alpha_B(\tilde{v}_B) + T \sum_{\tilde{v}_B \geq T} \alpha_B(\tilde{v}_B).$$

This result is one of the two basic pillars for the identification restriction that allows us to test the commitment hypothesis and, ultimately, whether or not contracts are incomplete. The second main theoretical result is derived in the next section.

3.1.2 No commitment

In this section, we study optimal contracts with no commitment. Here, we do not attempt to be general. Rather, our aim is to illustrate that, under lack of commitment and certain renegotiation processes, the determinants of B's total financial expenses from signing the player may differ from those of the previous section.

The analysis of the present section differs from that of the previous one in that now agents rely on renegotiation whenever the signed contract results in an inefficient outcome, and, as is standard, this outcome serves as the default outcome (i.e., the "threat" point) should renegotiation break down.

Since we want to emphasize a particular connection between contract design and renegotiation, we allow the parties to contract on an upper bound (a non-negative real) on any monetary transfer A may receive if the player changes club. This upper bound is referred to as ***transfer fee***. It is effective for the duration of any subsequent renegotiation process involving the player, A, and B. Other aspects of this process, such as the distribution of bargaining power, the order of moves, the number of moves, and the parties' ability to impose certain default outcomes are beyond the control of the contracting parties.[10] Thus, we focus on the case in which $\mathcal{F}$ consists only of one variable, the said transfer fee.

[10] Unlike Aghion, Dewatripont, and Rey [1994], we do not assume that the parties can impose trade as a default option, for here trade involves a third party who does not sign the initial contract.

The renegotiation process. We restrict attention to the following simple renegotiation process. Suppose that a contract results in the implementation of outcome y in state v, and let F be the transfer fee inherited from this contract. The renegotiation process that follows can be divided into two sub-processes. In the first sub-process, the player and B bargain over the total sum B would expend were the player to change club. We assume that in this negotiation the player has all the bargaining power and makes a take-it-or-leave-it offer to B. Here an offer consists of a quantity x that represents B's total financial outlay from hiring the player. Club B may accept or decline. A rejection closes renegotiation and forces the prevalence of the default outcome y. The second sub-process starts if B accepts the player's proposal. In this sub-process, the player and A bargain over the division of B's disbursement x. Either party may force this renegotiation sub-process to result in disagreement. In this case, the default outcome prevails. If, on the other hand, an agreement is reached, the sub-process outputs a payment $z_i(x, F, v_A, y, \beta) \in \mathbf{R}$ received by agent i, where $i \in \{P, A\}$ and $z_P(x, F, v_A, y, \beta) + z_A(x, F, v_A, y, \beta) = x$, and a transaction occurs under the distribution of payments

$$\left(z_P\left(x, F, v_A, y, \beta\right), z_A\left(x, F, v_A, y, \beta\right), x\right).$$

Each z_i may depend on the expense negotiated with B, x, the transfer fee, F, A's valuation of the player, v_A, the default outcome, y, some measure β of the player's bargaining power, and perhaps other variables, such as the distribution of v_B (omitted in the above formulation to ease notation).[11] Observe that we do not model the second stage of the renegotiation process explicitly. Rather, we postulate that the negotiation between the player and A results in a division of the surplus that depends on the variables listed above. Moreover, we shall later impose one condition on each z_i. While we do not rationalize z_P and z_A, along with the condition these objects shall be assumed to satisfy, by the equilibrium play of some game form, it is possible to derive them endogenously.

[11] Observe that, since the player and A have incomplete information about B's valuation, the renegotiation process may yield an inefficient outcome. This may be remedied by modelling the bargaining between the agents as a three-player infinite-horizon extensive game with incomplete information. We conjecture that our results continue to hold if our simple negotiation is replaced by some such extensive game.

The following example illustrates that the transfer fee may play an important role in determining the total expense incurred by B even after conditioning on v_A and the distribution of v_B. We also use the example to discuss the determinants of the optimal transfer fee. This discussion will be relevant for the instrumentation of the transfer fee in the empirical section.

EXAMPLE 1. Suppose that the player's utility function is

$$u(x) = \begin{cases} x^{\vartheta} & \text{if } x \geq 0, \\ -\infty & \text{if } x < 0, \end{cases}$$

where $\vartheta \in (0,1)$. Let $V_A = \{a\}$ and $V_B = \{b, c, d\}$, where $0 < a < b < c < d$. Suppose that, in the negotiation between A and the player, A obtains a share $\beta \in (0,1)$ of the transfer fee agreed upon at date 0.

If the renegotiation stage is reached, the player decides on the amount he demands from B. At this stage, the default outcome (which specifies an allocation of the player to some club and a distribution of transfers) and the transfer fee are already determined.

Given the assumed renegotiation process, B always accepts demands lower than or equal to b. Club B accepts demands in the interval $(b, c]$ when B's valuation of the player is greater than or equal to c. This occurs with probability $p_2 = \alpha_B(c) + \alpha_B(d)$. Demands in the interval $(c, d]$ are accepted by B only when B's valuation of the player is d. This happens with probability $p_3 = \alpha_B(d)$.

Given B's strategy, the player only considers three possible demands: b, c, and d. All other demands are strictly dominated. Demands higher than d are never accepted by B. Any demand in the set $(0, b) \cup (b, c) \cup (c, d)$ are dominated by an element of $\{b, c, d\}$. This means that for every element $\tilde{x}$ of $(0, b) \cup (b, c) \cup (c, d)$ there exists x in $\{b, c, d\}$ such that the probability that B accepts $\tilde{x}$ is not higher than the probability that he accepts x and $x > \tilde{x}$. Therefore, by demanding $\tilde{x}$ the player would leave money on the table.

Given club B's strategy, the player's utility function, the assumed renegotiation process, a transfer fee F, and a default outcome whose distribution of payments assigns x_P to the player, the player's expected utilities associated to each demand are as follows:

$$\begin{array}{ll} u\Big(b - \beta F\Big) & \text{if the player demands } b, \\ p_2 u\Big(c - \beta F\Big) + (1 - p_2) u(x_P) & \text{if the player demands } c, \\ p_3 u\Big(d - \beta F\Big) + (1 - p_3) u(x_P) & \text{if the player demands } d. \end{array}$$

The player's optimal demands are as follows:

$$\begin{array}{ll} b & \text{if } x_P < y_1, \\ c & \text{if } y_1 \le x_P \le y_2, \\ d & \text{if } x_P > y_2, \end{array}$$

where

$$y_1(F) = \frac{u\Big(b - \beta F\Big) - p_2 u\Big(c - \beta F\Big)}{1 - p_2}$$

and

$$y_2(F) = \frac{p_2 u\Big(c - \beta F\Big) - p_3 u\Big(d - \beta F\Big)}{p_2 - p_3}.$$

Observe that the cut-offs $y_1(F)$ and $y_2(F)$ decrease with F. The transfer fee affects the player's incentives in the renegotiation stage because, for a given demand, it reduces the player's payoff in the event of a transaction. In other words, it reduces the player's loss if B rejects the player's demand. This smaller loss induces the player to demand more aggressively.

In what follows we make the following parametric assumption:

$$p_2 c + (1 - p_2) a > \max\Big\{b, p_3 d + (1 - p_3) a\Big\}.$$

This assumption implies that the demand that maximizes the expected rents for the player-A coalition is c.

In general, the optimal contract maximizes the sum of expected utilities for the player and A subject to the player's incentive and participation constraints. It is illustrative to temporarily assume that neither of these constraints is binding at the optimum. In this instance, the optimal contract solves the following problem.

$$\max_{F, x_P} p_2\Big(\Big(c - \beta F\Big)^{\vartheta} + \beta F\Big) + (1 - p_2)\Big(x_P^{\vartheta} + v_A - x_P\Big).$$

If (F^*, x_P^*) solves this problem,

$$c - \beta F^* = x_P^* = \vartheta^{1/(1-\vartheta)}.$$

Observe that this solution completely insures the player, whose payoff is independent of B's response to the player's demand. Note also that the fact that the incentive compatibility constraint is not binding means that A can induce the player to ask for the expected-rent-maximizing demand (i.e., c). In this case, there is no trade-off between surplus division and rent extraction.

Let us now assume that the player's incentive compatibility constraint is binding, i.e., that

$$x_P^* = \vartheta^{1/(1-\vartheta)} > \frac{p_2\Big(\vartheta^{1/(1-\vartheta)}\Big)^{\vartheta} - p_3\Big(d - c + \vartheta^{1/(1-\vartheta)}\Big)^{\vartheta}}{p_2 - p_3} = y_2(F^*).$$

In this case, the player and A have two options.[12] They can perfectly insure the player by setting his payment in the event of no transaction equal to x_P^* and then let the player choose d. This option gives the following sum of expected payoffs for the player and A.

$$p_3\Big(\vartheta^{\vartheta/(1-\vartheta)} + d - \vartheta^{1/(1-\vartheta)}\Big) + (1 - p_3)\Big(\vartheta^{\vartheta/(1-\vartheta)} + v^A - \vartheta^{1/(1-\vartheta)}\Big).$$

Alternatively, A can set x_P so that the player demands c from B at the expense of forcing him to bear some risk. Under this alternative, the aggregate expected payoff to the player and A is

$$\max_F p_2\Big((c - \beta F)^{\vartheta} + \beta F\Big) + (1 - p_2)\Bigg(\Bigg(\frac{p_2(c - \beta F)^{\vartheta} - p_3(d - \beta F)}{p_2 - p_3}\Bigg)^{\vartheta} + v_A - \frac{p_2(c - \beta F)^{\vartheta} - p_3(d - \beta F)}{p_2 - p_3}\Bigg)$$

(here $c - \beta F$ and $\frac{p_2(c-\beta F)^{\vartheta} - p_3(d-\beta F)}{p_2 - p_3}$ are positive; otherwise, the definition of u entails that the sum of expected payoffs is $-\infty$, in which case this alternative is dominated by the previous one). The first-order condition associated with the optimal transfer fee in this second case is as follows:

$$p_2 \overbrace{\beta\Big(-\vartheta(c - \beta F)^{\vartheta-1} + 1\Big)}^{\text{Marginal value of } F \text{ in the unconstrained problem}} + (1 - p_2)\overbrace{\Big(\vartheta\Big(y_2(F)\Big)^{\vartheta-1} - 1\Big)}^{\text{Marginal value of } x_P} \times \overbrace{\frac{\partial y_2(F)}{\partial F}}^{\text{Marginal effect of } F \text{ on cut-off}} = 0$$

$$\times \overbrace{\frac{\partial y_2(F)}{\partial F}}^{\text{Marginal effect of } F \text{ on cut-off}} = 0 \tag{2}$$

[12] Inducing the player to choose b is dominated by the second option because we are assuming that b maximizes the expected rent extracted from B.

This first-order condition recognizes that, when the player's incentive constraint is binding, the transfer fee affects the player's demand to B in addition to determining A's payoff after a transaction. The optimal transfer fee is determined by reaching a compromise between these two margins.

If the player's incentive constraint is binding (i.e., $x_P^* > y_2(F^*)$), the marginal value of the player's payoff when there is no transaction (x_P) is positive. We have already seen that y_2 decreases with F (i.e., $\partial y_2/\partial F < 0$). These two observations imply that the second term in (2) is negative and therefore that the first term must be positive. This means that the optimal transfer fee of the constrained problem is smaller than that of the unconstrained problem (F^*).

Intuitively, at the renegotiation stage, the player does not internalize A's loss when B rejects the player's demand. As a result, the player tends to be too aggressive. Club A must offer the player a risky contract to induce him to demand c. Such a contract reduces the player's payoff when there is no transaction and increases his payoff when he changes club. This differential in the player's utility when he is transferred makes him more cautious at the renegotiation stage.

In general, whether it is optimal to insure the player and let him demand d at the renegotiation stage or to make him bear risk so that he demands c depends on the player's relative risk aversion $(1-\vartheta)$ and on how binding the incentive constraint is. This, in turn, depends, among other things, on the player's risk aversion. For low values of ϑ, x_P^* is small (and $y_2(F^*)$ is large), and therefore the incentive constraint may be non-binding or binding by a small margin. For high values of ϑ, x_P^* is large (and $y_2(F^*)$ is small), and therefore the incentive constraint is likely to be binding by a large margin. Thus, in general, the value of the player for A and the distribution of the value of the player for B are no longer sufficient statistics of B's total financial outlay from signing the player when the parties cannot commit not to renegotiate. With commitment, B's total expense from signing the player was, as demonstrated by Proposition 2, *independent* of the player's degree of risk aversion. This example illustrates that, by contrast, lack of commitment may lead to a situation in which the player's degree of risk aversion has an effect on B's total expense from signing the player. This is the most important lesson from this example.

This observation leaves open the possibility that other variables correlated with the player's risk aversion have an econometric impact on B's total expense in a transaction if risk aversion is not properly controlled for. One such variable may be the transfer fee. To see this more clearly, we make the following sensible conjecture. When the incentive constraint is binding by a small margin, the optimal contract induces the player to demand c at the renegotiation stage. When the incentive constraint is binding by a large margin, the optimal contract provides complete insurance for the player and the player demands d. We have already seen that for low values of ϑ (i.e., when risk aversion is high), x_P^* is small (and $y_2(F^*)$ is large), and therefore the incentive constraint is binding by a small margin. For high values of ϑ, x_P^* is large (and $y_2(F^*)$ is small), and therefore the incentive constraint is likely to be binding by a large margin.

Consider two players whose corresponding v_A and distribution of v_B are identical. Suppose the two players differ in their degree of risk aversion $(1-\vartheta)$. Suppose that the incentive constraint is binding for both players, but that the constraint is binding by a small margin for the more risk averse player, while it is binding by a large margin for the less risk averse player. The optimal contract implies that the transfer fee for the less risk averse player is higher and that this player demands d from club B at the renegotiation stage because it is too costly to induce him to demand c. The more risk averse player, instead, faces a less stringent incentive constraint corresponding to a lower transfer fee. As a result, if the more risk averse player is transferred to B, B's total financial outlay will be c.

It is clear that, in this example, A's valuation of the player and the distribution of B's valuation of the player are not sufficient statistics for B's total payment. In particular, the transfer fee may have predictive power on B's total cost of hiring a player above and beyond v_A and the distribution of v_B.[13] Note that this prediction is in sharp contrast with what happens under commitment, where, as stated in Proposition 2, v_A and the distribution of v_B are sufficient statistics for B's total financial outlay in a transfer. This difference constitutes the exclusion restriction that we test to identify whether parties can commit not to renegotiate contracts. In the next subsection, we show that this same test can also identify whether soccer contracts are incomplete.

[13] In other contexts, there may be other reasons for the non-separability of rent extraction and surplus division when parties cannot commit. For example, the transfer fee may serve as a commitment device to deter coalitions between the player and club B at the renegotiation stage. As we hope it is clear, our goal here is just to illustrate that there are reasons for this non-separability rather than making an extensive list or claiming that the specific mechanism modeled here is the empirically relevant.

Before concluding the analysis of this example, we want to draw the reader's attention to two comparative statics exercises. First, the partial effect of the transfer fee on B's total outlay in the event of a transaction may be positive. This has been illustrated above. Second, this example points to a link between the transfer fee and the probability of transferring a player. This will be useful in the empirical section when we instrument the transfer fee in our regressions.

Consider the optimal transfer fee for two different players who are identical apart from the fact that one faces a distribution of v_B, G, and the other faces a distribution $\bar{G}$ that first-order stochastically dominates the former. From the first-order condition (2), we can see how a higher probability of a transaction under $\bar{G}$ makes the division of surplus in the event of a transaction more important. As a result, the transfer fee under $\bar{G}$ will be closer to the one that achieves the optimal division of surplus in the unconstrained problem (F^*), and therefore higher than that corresponding to G.[14] In sum, by this argument, we expect to observe a positive relationship between transfer fees and the probability of transferring a player.

3.2 Lack of commitment and contractual incompleteness

Since we are ultimately interested in the implications of our test for the existence of incomplete contracts, we need to provide a link between commitment and contractual incompleteness. For our purposes, Proposition 3 below will suffice. This result is obtained under three assumptions.[15] Its proof appears

[14] This mechanism constitutes just one possible theory of the transfer fee. In other renegotiation settings, a high transfer fee can mitigate the lack of commitment and increase the rent extracted by A and the player from B. However, a high transfer fee may also have a negative effect on the expected value of the player-A coalition. For example, since the player's capital gain in the event of transaction may be diminishing in the transfer fee, the marginal product of the player's effort to become a better player may be reduced, and this may deteriorate the player's value for the current team. The optimal transfer fee determined by A and the player at the initial contracting stage will trade off these two forces. Whatever the cost of a higher transfer fee is, since the transfer fee increases the total compensation to the contracting parties when the player is transferred to B, a higher probability of transferring the player increases the importance of this effect and thus the marginal value of the transfer fee.

[15] All assumptions except A.2 are satisfied by Example 1. The condition in A.2 fails to hold in Example 1 because V_A is assumed to be a singleton. This discrepancy between A.2

in the Appendix.

A.1. For every $v_A \in V_A$,

$$\max_{x \in \mathbf{R}} x \sum_{v_B \geq x} \alpha_B(v_B) + v_A \sum_{v_B < x} \alpha_B(v_B) > \underline{v}_B.$$

A.2. If $v_A^* = \max \Big\{ \tilde{v}_A \in V_A : \alpha_A(\tilde{v}_A) > 0 \Big\}$ and $\underline{v}_A = \min \Big\{ \tilde{v}_A \in V_A : \alpha_A(\tilde{v}_A) > 0 \Big\}$, then

$$\begin{aligned} &\min \arg\max_{x \in \mathbf{R}} x \sum_{v_B \geq x} \alpha_B(v_B) + v_A^* \sum_{v_B < x} \alpha_B(v_B) \\ &\qquad > \max \arg\max_{x \in \mathbf{R}} x \sum_{v_B \geq x} \alpha_B(v_B) + \underline{v}_A \sum_{v_B < x} \alpha_B(v_B). \end{aligned}$$

A.3. Let $v_A^* = \max \Big\{ v_A \in V_A : \alpha_A(v_A) > 0 \Big\}$. For each $y \in Y$ and every $x \geq \min \arg\max_{\tilde{x} \in \mathbf{R}} \tilde{x} \sum_{v_B \geq \tilde{x}} \alpha_B(v_B) + v_A^* \sum_{v_B < \tilde{x}} \alpha_B(v_B)$,

$$\begin{aligned} &x - z_A\Big(x, F, v_A^*, y, \beta\Big) \\ &\qquad > \sum_{v_A \in V_A} \left(\max_{\tilde{x} \in \mathbf{R}} \tilde{x} \sum_{v_B \geq \tilde{x}} \alpha_B(v_B) + v_A \sum_{v_B < \tilde{x}} \alpha_B(v_B) \right) \alpha_A(v_A). \end{aligned}$$

Assumptions A.1 and A.2 rule out pathological distributions of v_B. These assumptions would be automatically satisfied, for example, if the distribution of v_B were sufficiently close to a continuous distribution. The last assumption, A.3, says that the player has a sufficiently high bargaining power in the negotiation with A, after B's acceptance of the player's offer.

PROPOSITION 3. *Suppose that there is no commitment. Assume* A.1*,* A.2*, and* A.3*. Let the player be risk-averse. Then every optimal contract is incomplete.*

---

and Example 1 could be resolved if V_A were assumed to contain more than one element. Moreover, one can show that, at the expense of making exposition more cumbersome, A.2 can be modified to encompass Example 1.

This result says that lack of commitment constrains the set of implementable outcomes relative to what is achievable with commitment. In our setting, the contracting parties would like to be able to enforce a clause whereby they experience large punishments in case the renegotiation stage is reached.

Given lack of commitment and the assumed renegotiation process, risk aversion is necessary to generate a trade-off between rent extraction and surplus division. If the player were risk-neutral, the interests of the player and A as to the necessity of designing the contract in a way that maximizes rent extraction would be aligned. In this case, optimal revenue extraction could be achieved with and without commitment.[16]

4 Empirical analysis

In the previous section we have shown that, if agents can commit not to renegotiate, the optimal contract is complete. In addition, when the player changes club, the total expense incurred by B is fully determined by A's valuation of the player and the beliefs the player and A have about B's valuation of the player. We have also shown that, if agents cannot commit not to renegotiate, any optimal contract A and the player may draw up is incomplete. Moreover, the transfer fee agreed upon by the player and A may have predictive power over B's total financial outlay from signing the player after conditioning for v_A and the distribution of v_B.

These results provide us with an exclusion restriction that is useful to test both the parties' ability to commit not to renegotiate and the completeness of contracts. Specifically, if there is commitment, we should observe that, after controlling for the value of the player for the current team and that

[16] In passing, it is worth linking Proposition 3 with the immediately related branch of the literature on the foundations of incomplete contracting. Segal [1999] and Hart and Moore [1999] have provided a theory of incomplete contracting in which renegotiation constrains the set of implementable outcomes and produces sub-optimal allocations. Their setting features complete information. Maskin and Tirole [1999] and Maskin [2002] have demonstrated that if parties are risk-averse and choice rules assign lotteries over outcomes (rather than being deterministic) optimal contracts are immune to lack of commitment in contractual environments with no third parties and (ex-post) complete information. In our model, lack of commitment, along with incomplete information, risk-aversion, and the presence of third parties leads to the implementation of sub-optimal allocations. We see no reason why the use of lotteries should undermine the validity of Proposition 3.

for the future team, no other variable should have any predictive power on B's disbursement. If, on the other hand, there is no commitment, other variables, like the transfer fee, may have predictive power after controlling for the player's quality. Therefore, an observed excess sensitivity of the transfer fee to the outsider's expense would be evidence in favor of the no commitment hypothesis and, by virtue of Proposition 3, of the presence of contractual incompleteness in the data.

Before implementing the test, it is worthwhile noting that the excess sensitivity of the transfer fee to the outsider's payments is sufficient, but not necessary, for lack of commitment. In this sense, our empirical strategy only allows us to identify the incompleteness of contracts but not their completeness.

4.1 Data

Our data set contains player-level data from the Spanish first division soccer league ("La Liga") for the 1999-2000, 2000-2001, and 2001-2002 seasons. Broadly speaking, there are four types of variables. First, we have a set of demographic variables: age, position in the field, and tenure in the team. Second, we have data on the contracts for all the players that played in "La Liga" during the 2000-2001 season and for those players that were transferred to and/or from a "La Liga" club during the three seasons covered by this study. Specifically, we know their wages (net of taxes) from their current employer (for the players not transferred) or from their new employers (for those who were transferred), their transfer fees, and their contract duration (i.e., the duration of the relationship as originally specified in their contract). Third, the data set also contains transfer prices for those players who changed club while having a valid contract. Finally, the last set of variables contains measures of the players' quality and performance. We used the variables computed by two specialized magazines: *AS* and *Marca*.

AS weights several objective measures of a player's performance, like number of games played, number of games won and tied, goals scored, a measure of how important is a goal for the game's result, number of assists, number of important mistakes, etc. *Marca* uses the price paid to buy a player to make an initial assessment of this player's value for the club that has hired him and then they upgrade the player's value according to some objective measure of the player's performance.

These two approaches to the measurement of the players' quality are conceptually very different. The *AS* valuation of a player's performance is completely independent of the player's current value. *Marca*, instead, compares a player's performance with his current value to determine the appropriate increment in value. Both strategies seem reasonable to us. On the other hand, the weights given to the different objective measures of performance are not the same. This disparity is surely beneficial to our analysis because by combining the two measures we should be able to capture different aspects of the player's value for his club.

4.2 Descriptive statistics

During the 2000-2001 season, out of the 550 players that played in the Spanish championship ("La Liga"), 10 percent were goalkeepers, 33 percent defenders, 37 percent midfielders, and 20 percent strikers. As reported in Table 1A, the age of the players ranged from 18 to 38 and average and median age was about 26 years. About 30 percent of the players were new to their teams. Out of these, approximately two out of three came from a different club and a third had been promoted from an affiliated minor league team. Therefore, the turnover rate in the 2000-2001 season was about 20 percent and the average tenure in the team was about 2.1 years.[17] The average and median contract expired in 2003, with a standard deviation on the expiration date of 1.6 years.

The average wage, net of taxes, for the 2000-2001 season was about 200 million pesetas (i.e., about a million dollars at the time), with a standard deviation of 132 million pesetas and a range from 27.5 to 1100. The median wage was 175 million pesetas. Overall, the distribution of wages is approximately log-normal.

Over 95 percent of the players had a positive transfer fee in the 2000-2001 season. Transfer fees range from 0 to 50000 million pesetas. The average transfer fee was 4082 million pesetas (over 20 million dollars), with a standard deviation of about 5000 million pesetas and a median transfer fee of 2000 million pesetas.

Next, we turn to the transfer prices and their connection to the transfer fees. The average transfer price is about 45 percent the average transfer fee. Out of the 135 players who were hired by Spanish clubs during the 1999-2000, 2000-2001, and 2001-2002 seasons and whose contract specified a positive

[17] Conditional on having stayed one year on the team, the average tenure was 2.9.

transfer fee, 90 percent were hired at a transfer price less than or equal to the transfer fee. This is not surprising. Why would a club pay more than the player's transfer fee? There are only two reasons. When club B executes the option of hiring a young player by paying club A the player's transfer fee, B must pay club A an additional compensation for having trained the player. This can explain ten of the seventeen cases where the price-fee ratio is larger than one. The other seven are probably due to misreporting of either the transfer fee or the price.

Finally, the price paid by a buying club to a selling club is only part of the total cost the buying club must incur when hiring a player, for the buying club offers a new contract to the player. In what follows, we define the total compensation paid by a buying club as the sum of the price paid to the old club for the player's transfer plus the total net wage the player is going to receive under the new deal. In our sample of transfers, the total compensation ranges from 145 to 16000 million with an average of 1788 million pesetas, a median of 1150, and a 25-75 percentile of 625-2400 million.

Next, we study the performance and quality measures constructed by *AS* and *Marca*. Our data set contains the values of these measures at the end of the 1998-1999, 1999-2000, 2000-2001, and 2001-2002 seasons. In the 2001-2002 season, *Marca* changed the procedure to compute the players' valuation and hence these numbers are not comparable to the previous seasons' valuations.[18] The decline over time in the average *AS* valuation of the players is probably due to attrition (i.e., only the good players stay in the sample, while the new players' quality is heterogenous).[19] Nonetheless, we observe an increase in the average *Marca* value from the 1998-1999 to the 1999-2000 seasons and a subsequent stabilization of the measure. This increase in *Marca*'s valuations is consistent with the increase in the business value of soccer over the period covered by this paper.

As one would expect, the *AS* performance measure is highly correlated to the value measure from *Marca*. The correlation coefficients range from 50 to 91 percent and are always statistically significant at the 1 percent level. The highest correlation corresponds to the 2001-2002 season, precisely when *Marca* shifted from a value to a pure performance measure.

In Table 1B, we focus on the 2000-2001 season and explore the role of

[18]The new approach followed by *Marca* is closer to *AS*'s because it is also a measure of performance rather than a measure of value.

[19]It could also be due to the migration of the best players to other European leagues, but this has not been the case.

several performance and demographic variables in the construction of the *Marca* player valuation measure. In the first column we can observe that those players who had a good season according to *AS* had also higher *Marca* values at the end of the season. Specifically, the elasticity of *Marca*'s valuation with respect to *AS*'s performance measure is 39 percent. In line with conventional wisdom, strikers are more valuable for *Marca* than players in other field positions. *Marca*'s valuation does not seem to be affected by age. However, the tenure in the team has a positive effect on *Marca*'s valuation. In columns 3 and 4, we include *AS* measures of the players' performance in previous seasons as regressors to identify whether this effect is due to the presence of team specific skills or to selection. The inclusion of these measures of past performance reduces the size of the effect of tenure in the team and makes it insignificant. Thus, we conclude that the effect of tenure in the *Marca* valuation may just reflect selection bias.

In the second column we include team dummies to inspect *Marca*'s philosophy of applying different yardsticks to evaluate the performance of players on different teams. A given objective performance is associated with a highest value if the player plays on Real Madrid or Barcelona (the two most important teams in terms of supporters, historical achievements, and number of supporters in "La Liga"), but teams like Valencia, Deportivo, Celta, and Mallorca also have a premium according to *Marca*. This is quite reasonable provided that these teams ended up in the top six positions at the end of the season and therefore participated in the prestigious European competitions.[20]

In our test for the existence of commitment we will condition on the player's value at his current club. It is therefore important to have an accurate measure of the player's quality. Before presenting formal evidence that supports this premise, it is worth noting that *Marca*'s valuations, for example, are compared to the assessments of the players' value at the end of every season as estimated by the players' agents. Further, *Marca*'s experts have mentioned to us that the agents use *Marca*'s measure for their private business.

One way of assessing the accuracy of *Marca* and *AS* measures is by correlating them with the market's valuation of the players' performance. Later, in Table 3, we will see that our proxies are important to understand transfer

[20] There are two European competitions: the Champions League and the (less important) Uefa Cup. Interestingly, the coefficient of the fixed effect is larger for the teams that participated in the Champions League in the 2001-2002 season.

payments by the buying clubs. In columns 5 and 6 of Table 1B, we study the correlation between the *Marca* valuation and the *AS* performance measure at the end of the 1999-2000 season with the wage rate received by players during the 2000-2001 season. We find that the elasticity of the wage rate with respect to *Marca*'s valuation is 37 percent (27 once we include team dummies) and is very significantly different from zero. Interestingly, the different measures of player's quality and the demographic variables account for 52 percent of the variation in wages. It is important to keep in mind that, in many cases, the contracts that specify the players' compensation in the 2000-2001 season were determined prior to the 1999-2000 season and that, in any case, we don't want to infer any causal relationship from these correlations.

Another way to evaluate the quality of our performance measures is by comparing the *AS* measure with the actual performance at the team level. We define the *AS* performance of a team as the sum of the *AS* performance of the players in the team. Table 2 shows the performance of teams (measured using this transformation of the *AS* performance measure) and the team classification in "La Liga" at the end of the 2000-2001 season.[21] The correlation between the two is 91 percent.

4.3 Testing out contractual incompleteness

The key to identifying the relevant contractual setting is to determine the predictive power of a player's transfer fee on a club's total disbursement from signing a player after controlling for the value of the player for the current team and the new team. However, our measures of the players' values could fail to capture some component of the players' qualities. For our test to be valid, it is crucial that the transfer fee be orthogonal to the unmeasured components of the players' values.

Table 3 reports the regressions that test the role of the transfer fee on the total compensation. In the first column, we just regress the log of total compensation on the quality measures constructed by *AS* and *Marca* at the end of the season and prior to the summer, which is when transfers takes place. As one would expect, players with higher scores in *AS* and *Marca* are more expensive.

Column 2 introduces the log of the player's transfer fee for the old team

[21] More precisely, this exercise was conducted three matches before the season was over.

as a regressor. The estimates indicate that, *ceteris paribus*, a higher transfer fee increases the total payments incurred by the buying club to hire the player. Specifically, the elasticity of the total compensation with respect to the transfer fee is 43 percent and highly significant.

At this stage, however, we must interpret this coefficient with caution. Before concluding that the transfer fee has predictive power over and above the player's valuations, we have to address two potential sources of bias. First, the quality measures provided by *AS* and *Marca* may be imperfect and the transfer fee may be correlated with some unmeasured component of the player's quality. In this case, even under commitment, we should expect the transfer fee to have a positive effect on the total compensation. Second, under commitment and according to Proposition 2, it is the value of the player for the current team and the distribution of beliefs about the player's value for the future team what constitutes a sufficient statistic for the total compensation. If the transfer fee were correlated with the value of the player for the new team after controlling for his current team's valuation, the estimated elasticity of the total compensation with respect to the transfer fee would be biased.

Note, however, that there is no other relevant source of bias in our estimates because, under the null that parties can commit not to renegotiate, no other variable apart from the values of the player for his current and future clubs should affect the buying club's total payment. In this sense, this test is immune to the standard committed variable bias.

We address the potential biases from the mismeasurement of v_A and the distribution of v_B in two ways. First, in regressions not reported here, we find that, in our sample of transferred players, the transfer fee does not have any predictive power on the value of the player for the new team after controlling for the current measures of his quality. Second, to discredit the effect of mismeasurement on the significance of the transfer fee, we instrument for the transfer fee in regression 2. To this end, we need variables that are correlated with the player's transfer fee but uncorrelated with the error term. To find such variables, we need a theory about the determinants of the transfer fee.

In the previous section, we have observed that the transfer fee affects both the division of the surplus in the event of a transaction and the player's incentives when making a proposal to B at the renegotiation stage. The player does not internalize A's loss in the event of no transaction and, as a result, tends to be too aggressive when he makes a demand to B. To mitigate this distortion, the optimal transfer fee tends to be smaller than the fee that achieves an optimal division of surplus. This makes it more attractive for the player to be transferred to club B and induces him to behave more conservatively at the renegotiation stage. This trade-off between surplus division and rent extraction is affected by the probability distribution of v_B, which, *ceteris paribus*, affects the probability of observing a transaction. In particular, an exogenous increase in the probability of a transaction renders the problem of surplus division more relevant and leads to an increase in the optimal transfer fee.

This insight allows us to construct two variables that we use to instrument for a player's transfer fee. These are the frequency of a transfer for the players in the same position and team during the 2000-2001 season.[22] From the previous argument, these variables will be positively correlated with the player's transfer fee. Further, we believe that the probability of transferring a player by position or team is uncorrelated with the error term. The argument has two parts. First, note that the probability of transferring a player is probably unrelated to his value since both good and bad players are transferred. This suspicion is corroborated by the estimation (not reported here) of binary choice models where we have observed that the player's value as measured by *AS* and *Marca* has no significant effect on the (binary) variable that reflects whether the player has been transferred.[23] Second, since the probability of a transfer by position or team seems to be unrelated to our measures of the players' value, it seems very likely that they will also be uncorrelated to the mistakes made by *Marca* and *AS* when measuring the value. For this reason, we believe that the average transfer rates by position and team are valid instruments for the player's transfer fee.

A third instrument for the transfer fee of a player that we consider is the average transfer fee in his club once he is excluded. This variable is a priori correlated with the player's transfer fee because different clubs follow different personnel policies that have a common effect on their players' transfer fees. For example, some clubs decide to sign very long-lasting contracts while others do not mind having a high turnover. Some clubs tend to sign their players with contracts with very high transfer fees to dissuade other clubs

[22]The fraction of players transferred for each of the positions where 17 percent for goal-keepers, 14.6 percent for defenders, 17.5 percent for midfielders, and 18.5 percent for strikers. For the teams, the fraction of players transferred during the 2000-2001 season ranged from 0 for Real Madrid to 27 percent for Mallorca and 28 percent for Alavés.

[23]This is true also when the left-hand-side variable is the probability of transfer by position or by team rather than a binary variable.

to attempt to hire them because this may distract the players and affect their performance. Finally, clubs differ in their governance structures and this affects the incentives of the managers and the contracts they offer the players at the contracting stage. All of these elements should have an effect on the transfer fee, and none of them seems to have a first-order impact on a player's valuation.

In addition, the average transfer fee for a team should be uncorrelated with the error term if *AS* and *Marca*'s assessments of the players' qualities do not feature systematic mistakes within teams that are correlated with the average transfer fee for the team. Given the accuracy of our quality measures at the team level—illustrated, for example, by the high correlation (91 percent) between a team's *AS* score and the actual performance in the league—we think that it is reasonable to believe that the error term and this instrument are uncorrelated.

Interestingly, since we have more instruments than instrumented variables, we can examine the validity of our instruments more formally with an overidentifying restrictions test.[24] Of course, since we cannot test identifying restrictions exactly, passing the overidentifying restriction test is a necessary but not sufficient condition for the instruments' validity. However, we have only one endogenous variable and more than one instrument, and our instruments are strongly significant in the first-stage regression. Thus, we would expect our test to have some power.[25]

Columns 3 to 9 report the results of the instrumented regressions using the seven possible combinations of instruments. For each regression, Panel A reports the two-stage least squares estimate of the elasticity of the total compensation with respect to the transfer fee after controlling for the player's quality measures. Panel B reports the first stage regression of the transfer fee on the instruments. Finally, Panel C reports the p-value of the J statistic that tests the null that the error term is uncorrelated with the instruments.

In columns 3 to 5 we use the three instruments separately to instrument

[24] One interpretation of this test is that it allows us to see whether the effect of the instruments on the total payments by the buying club operate exclusively through the instrumented variable (i.e., the transfer fee) or through some other relevant variable that has been omitted in the regression.

[25] Note that a rejection of the hypothesis that the instruments are exogenous might, in principle, lead to a rejection of the null that there is commitment if the effect of the instruments on the total compensation operates through some variable other than unmeasured quality. This hypothesis, however, is impossible to test.

for the player's transfer fee. In the first stage regression we find that, as one would expect, higher *Marca* valuations and *AS* performance measures are associated with higher transfer fees, though the latter is not always significant. More relevant for our purposes is the fact that the three instruments have a positive and significant effect on the transfer fee, as our theory of the optimal transfer would predict.[26]

In the second-stage regressions reported in Panel A, we observe that the instrumented transfer fee has a large and significant positive effect on the total payments by the buying club.

At this stage the only concern one may have is whether the instruments are truly valid. To check this, we combine them in columns 6 to 9. First, we assess the strength of the instrumental variables. In column 6 we instrument the player's transfer fee with the average transfer fee for the team and with the frequency of transfers for the team. In this case, the instruments are jointly relevant. Specifically, the F-statistic that tests the null that the instruments have no effect on the transfer fee is 19, substantially higher than the rule of thumb threshold of 10. However, the frequency of transfer by position is not marginally significant at the conventional levels (p-value $= 0.09$). This may invalidate the overidentifying restriction test.

In column 7, we instrument with the average transfer by team and with the frequency of transfer by team. In this case, the instruments are clearly relevant since the F-statistic is 23 and both instruments are marginally significant in the first-stage regression. By combining the frequencies of transfer by position and by team to instrument for the transfer fee we may run into a weak instruments bias as indicated by the F-statistic in column 8, clearly below the threshold of 10. In this case, both instruments are marginally significant in the first-stage regression. Finally, in column 9, we combine the three variables to instrument for the player's transfer fee. Again, we find that the instruments are very relevant in predicting the transfer fee above and beyond the player's quality, with an F-statistic of almost 17. Further, all the instruments are marginally significant.

In the second-stage regressions reported in Panel A, we always find that the *Marca* and *AS* quality measures have a positive effect on the total payments of the buying club, although the effect of the former is not always statistically significant. More interestingly, we also find that the instrumented

[26]For the frequency of transfer by position, the effect on the transfer fee reported in column 4 has a p-value of 5.8 percent.

transfer fee has always a strong positive effect on the total compensation to the player and A. This effect is statistically significant. More specifically, the point estimate of the elasticity of the total payments with respect to the instrumented transfer fee ranges from 48 to 62 percent.

To conclude our check of the validity of the instruments, we have to test whether our instruments are exogenous. This can be done by taking advantage of the overidentification of the system. Mechanically, the overidentifying restriction test amounts to checking whether the instruments have any predictive power on the error term above and beyond the quality controls.[27] Panel C of Table 3 reports the p-value for the test of the null that the instruments have no predictive power on the error term above and beyond the quality controls. There we can see that our instruments pass this test. The p-values of the statistics range from 19 to 29 percent, higher than conventional significance levels. This gives us some reassurance on the exogeneity and validity of our instruments.

Hence, we can conclude that the transfer fee has an independent and positive effect on the total compensation above and beyond the player's valuations. In light of Propositions 2 and 5 and Example 1, this implies that parties cannot commit not to renegotiate their initial contracts. Further, since the optimal contract under lack of commitment is incomplete, it also implies that soccer player contracts are incomplete.

5 Concluding remarks

This paper has designed and implemented a test to determine whether contracts are incomplete. To this end, we have studied the contractual relationship between a risk-averse player and a club who sign a contract that involves a third party—a potential recruiter of the player—who is missing at the contracting stage. In this environment, we have shown that the parties' lack of commitment not to renegotiate contractual inefficiencies restricts the set of implementable outcomes—relative to what is achievable under commitment—and leads to the signing of a contract which is incomplete in that the parties would like to be able to enforce clauses that are contingent on observable (but unverifiable) information.

The test is based on the observation that, under commitment, parties can extract rents from the recruiter in an optimal fashion, and, at the same time,

[27] See for example Stock and Watson [2003].

divide the surplus extracted to fine-tune risk-sharing. We have shown that this has the following implication for the determinants of the outsider's total financial outlay from signing the player: whenever a transaction takes place, the old team's valuation of the player and the parties' beliefs about the new team's valuation of the player are sufficient statistics for the outsider's total disbursement. In contrast, when parties lack the ability to commit not to renegotiate contracts, the separation of surplus division and rent extraction is not possible, and variables that affect the division of surplus, such as the transfer fee, may have forecasting power on the outsider's total expenses after controlling for the clubs' valuations of the player.

The test has been implemented using a data set on Spanish soccer player contracts constructed with the help of professionals from the two leading soccer magazines in Spain. We have shown that the player valuations are not sufficient statistics for the total payments of the buying club. In particular, the transfer fee specified ex-ante in the initial contract has a large positive effect on the total cost of hiring a player for the buying club. This finding provides evidence in favor of the no commitment hypothesis and, since an optimal contract under no commitment is incomplete, points to the presence of contractual incompleteness in the data.

The immediate question that comes to mind is whether our result is likely to hold in other environments. We believe that, indeed, this result should hold *a fortiori* in many other economic environments. As we have seen, soccer players tend to have a much higher turnover rate than most workers. As a result, players are transferred repeatedly through the 10-15 years that spans the professional career of a player. Clubs last much longer than that. Further, anything that surrounds soccer is highly visible for the millions of fans who passionately support a team. Hence, any deviation by a player is going to be detected by the team's supporters, who retaliate in various ways at a very large cost for the deviators.[28] The same arguments apply, *a fortiori*, to the deviations incurred by clubs, given their longer life span. The degree of repetition, observability, and punishment make soccer an environment where we should a priori expect folk theorems an reputational considerations to apply. Yet, even in this "ideal" scenario, we have found evidence in favor of lack of commitment and contractual incompleteness.

[28] Examples of this are almost countless. Two very clear cases are those of Figo and Mendieta.

Appendix

A Proofs

LEMMA 1. *Suppose that f is feasible with commitment. Then, for every $v_A \in V_A$, there exists $T(v_A) \in \mathbf{R}$ such that, if $v_B > T(v_A)$, the player signs for B under $f(v_A, v_B)$ and the monetary transfers received by the player and A add up to $T(v_A)$, and, if $v_B < T(v_A)$, there is no transaction with B under $f(v_A, v_B)$.*

Proof. Suppose that f is feasible with commitment. Then, a mechanism $g = \Big((S_i), \rho\Big)$ may be obtained such that, for some equilibrium s of $\Gamma(g)$,

$$u_B\Big(\rho(s(v)), v\Big) \geq 0 \text{ for every } v \in V \tag{3}$$

and $f(v) = \rho(s(v))$ for every $v \in V$. Therefore,

$$\begin{aligned} u_B\Big(f(v_A, v_B), (v_A, v_B)\Big) &\geq u_B\Big(f(v_A, \tilde{v}_B), (v_A, v_B)\Big) \\ &\text{for each } \tilde{v}_B \in V_B \text{ and every } (v_A, v_B) \in V. \end{aligned} \tag{4}$$

Fix v_A, v_B, and $\tilde{v}_B$ such that $f(v_A, v_B)$ and $f(v_A, \tilde{v}_B)$ allocate the player to B with monetary transfers (x_P, x_A, x_B) and $(\tilde{x}_P, \tilde{x}_A, \tilde{x}_B)$, respectively. The equations

$$\begin{aligned} u_B\Big(f(v_A, v_B), (v_A, v_B)\Big) &\geq u_B\Big(f(v_A, \tilde{v}_B), (v_A, v_B)\Big), \\ u_B\Big(f(v_A, \tilde{v}_B), (v_A, \tilde{v}_B)\Big) &\geq u_B\Big(f(v_A, v_B), (v_A, \tilde{v}_B)\Big), \end{aligned}$$

which follow from (4), imply $x_P + x_A = \tilde{x}_P + \tilde{x}_A$.

Therefore, for each v_A, we may define $T(v_A)$ as the sum of the monetary transfers received by the player and A under any outcome $f(v_A, v_B)$ that allocates the player to B. For every such outcome, we have

$$u_B\Big(f(v_A, v_B), (v_A, v_B)\Big) = v_B - T(v_A).$$

But since B can guarantee himself a payoff of 0 (see (3)), the desired result follows. ‖

Proof of Proposition 1. For every $v_A \in V_A$, choose

$$B(v_A) \in \arg\max_{T \in \mathbf{R}} v_A \sum_{v_B < T} \alpha_B(v_B) + T \sum_{v_B \geq T} \alpha_B(v_B).$$

Let f^* be defined as follows. In state $(v_A, v_B) \in V$, the player stays on A if $v_B < B(v_A)$ and signs for B otherwise. The distribution of transfers implemented by f^* is $(w, -w, 0)$, for some $w \in \mathbf{R}$, if the player stays on A and $(w, B(v_A) - w, -B(v_A))$ otherwise. It is easily seen that if $u(w) \geq 0$ and F is sufficiently high then the renegotiation mechanism described in Subsection 3.1.2 (which may be reformulated according to our formal definition) implements f^* and f^* maximizes the sum of the parties' date-0 expected payoffs. $\|$

Proof of Proposition 2. Suppose that there is commitment. Suppose that A and the player sign an optimal contract f. Define $x_P(y)$ as the monetary transfer received by the player under outcome $y \in Y$. Using Lemma 1, we may write

$$\begin{aligned}
&\sum_{v \in V} u_A(f(v), v)\alpha(v) \\
&\quad \leq \sum_{\substack{(v_A, v_B) \in V \\ : v_B \geq T(v_A)}} \Big(T(v_A) - x_P(f(v_A, v_B))\Big)\alpha(v_A, v_B) \\
&\qquad\qquad + \sum_{\substack{(v_A, v_B) \in V \\ : v_B < T(v_A)}} \Big(v_A - x_P(f(v_A, v_B))\Big)\alpha(v_A, v_B) \\
&\quad \leq \sum_{v_A \in V_A} \Bigg\{ v_A \sum_{v_B < T(v_A)} \alpha_B(v_B) \\
&\qquad\qquad + T(v_A) \sum_{v_B \geq T(v_A)} \alpha_B(v_B) \Bigg\} \alpha_A(v_A) - \sum_{v \in V} x_P(f(v))\alpha(v) \\
&\quad \leq \sum_{v_A \in V_A} \Bigg\{ \max_{T \in \mathbf{R}} v_A \sum_{v_B < T} \alpha_B(v_B) \\
&\qquad\qquad + T \sum_{v_B \geq T} \alpha_B(v_B) \Bigg\} \alpha_A(v_A) - \sum_{v \in V} x_P(f(v))\alpha(v).
\end{aligned}$$

Since there exists a contract f° that is feasible with commitment and satisfies

$$x_P(f^\circ(v)) = x_P(f(v)) \text{ for every } v \in V$$

and

$$\sum_{v\in V} u_A(f^\circ(v), v)\alpha(v) = \sum_{v_A \in V_A} \left\{ \max_{T\in\mathbf{R}} v_A \sum_{v_B<T} \alpha_B(v_B) + T\sum_{v_B\geq T} \alpha_B(v_B)\right\} \alpha_A(v_A) - \sum_{v\in V} x_P(f^\circ(v))\alpha(v),$$

the desired conclusion follows. ‖

LEMMA 2. *Let the renegotiation game described in Section 3.1.2 be formally defined as a renegotiation process* $\left\{ g_{F,y} = \left(\left(S_i(F,y)\right), \rho_{F,y}\right)\right\}_{(F,y)}$. *Let* f *be feasible with no commitment, and fix a mechanism* $g = \left((S_i), \rho\right)$ *that implements* f *and an equilibrium* $(\tilde{s}, \mu)$ *of a corresponding game* $\Gamma(g, F)$. *For* $v \in V$, *set*

$$y_v = \rho_{F,\rho(\tilde{s}(v))}\left(\tilde{s}\left(v, \tilde{s}(v), \rho(\tilde{s}(v))\right)\right).$$

Suppose that $y_{(v_A,v_B)}$ *and* $y_{(v_A,\tilde{v}_B)}$ *allocate the player to* B *with corresponding distributions of payments* (x_i) *and* $(\tilde{x}_i)$, *respectively. Then* $x_P + x_A = \tilde{x}_P + \tilde{x}_A$.

Proof. Because $(\tilde{s}, \mu)$ is an equilibrium of $\Gamma(g, F)$,

$$\tilde{u}_B(\tilde{s}|v) \geq \tilde{u}_B(\hat{s}_B, \tilde{s}_{-B}|v) \text{ for each } \hat{s}_B \text{ and every } v.$$

Therefore,

$$u_B\left(y_{(v_A,v_B)}, (v_A, v_B)\right) \geq u_B\left(y_{(v_A,\tilde{v}_B)}, (v_A, v_B)\right),$$
$$u_B\left(y_{(v_A,\tilde{v}_B)}, (v_A, \tilde{v}_B)\right) \geq u_B\left(y_{(v_A,v_B)}, (v_A, \tilde{v}_B)\right),$$

which can be rewritten as

$$v_B + x_B \geq v_B + \tilde{x}_B,$$
$$\tilde{v}_B + \tilde{x}_B \geq \tilde{v}_B + x_B.$$

This implies $x_B = \tilde{x}_B$, whence $x_P + x_A = \tilde{x}_P + \tilde{x}_A$, as desired. $\|$

Proof of Proposition 3. Suppose that there is no commitment. Assume A.1, A.2, and A.3. Let the player be risk-averse. Let f be an optimal contract. Fix a mechanism $g = \Big((S_i), \rho\Big)$ that implements f and an equilibrium $(\tilde{s}, \mu)$ of a corresponding game $\Gamma(g, F)$. For $v \in V$, set

$$y_v = \rho_{F,\rho(\tilde{s}(v))}\Big(\tilde{s}\Big(v, \tilde{s}(v), \rho(\tilde{s}(v))\Big)\Big).$$

For $i \in \{P, A, B\}$, define $x_i(y)$ as the monetary transfer received by agent i under outcome y.

Consider a contract f^* defined by

$$f^*(v_A, v_B) = \begin{cases} \Big(d_B = 1, x - x_P, x_P, -x\Big) \\ \quad \text{if } v_B \geq x \text{ for some } x \in \arg\max_{\tilde{x} \in \mathbf{R}} \tilde{x} \\ \qquad \times \sum_{\tilde{v}_B \geq \tilde{x}} \alpha_B(\tilde{v}_B) + v_A \sum_{\tilde{v}_B < \tilde{x}} \alpha_B(\tilde{v}_B), \\ \Big(d_A = 1, x_P, -x_P, 0\Big) \\ \quad \text{otherwise,} \end{cases}$$

where

$$u(x_P) = \sum_{v \in V} u_P\Big(f(v), v\Big)\alpha(v) = \sum_{v \in V} u\Big(x_P(y_v)\Big)\alpha(v). \tag{5}$$

It is easily seen that f^* is feasible with commitment. In view of (5), therefore, it suffices to show that

$$\sum_{v \in V} u_A\Big(f^*(v), v\Big)\alpha(v) > \sum_{v \in V} u_A\Big(f(v), v\Big)\alpha(v). \tag{6}$$

Lemma 2 implies that, for every $v_A \in V_A$, we may define $T(v_A)$ as the sum of the monetary payments received by the player and A under any outcome $f(v_A, v_B)$ that allocates the player to B. Thus, for any such outcome, we have

$$u_B\Big(f(v_A, v_B), (v_A, v_B)\Big) = v_B - T(v_A).$$

But since B can guarantee himself a payoff of 0, then, for every $v_A \in V_A$, the player signs for B under $f(v_A, v_B)$ if $v_B > T(v_A)$ and there is no transaction with B under $f(v_A, v_B)$ if $v_B < T(v_A)$. It can be shown that because f is optimal $f(v_A, v_B)$ allocates the player to B whenever $v_B = T(v_A)$.[29] We now consider two cases.

First, suppose that $x_P(y_v) \neq x_P(y_{\tilde{v}})$ for some pair $v, \tilde{v} \in V$ with $\alpha(v), \alpha(\tilde{v}) > 0$. Because the player is risk-averse and (5) holds true, x_P must satisfy

$$x_P < \sum_{v \in V} x_P(y_v)\alpha(v).$$

This, along with the observations in the previous paragraph, implies

$$\begin{aligned}
&\sum_{v \in V} u_A\Big(f^*(v), v\Big)\alpha(v) \\
&\quad = \sum_{v_A \in V_A} \left(\max_{x \in \mathbf{R}} x \sum_{v_B \geq x} \alpha_B(v_B) + v_A \sum_{v_B < x} \alpha_B(v_B) \right) \alpha_A(v_A) - x_P \\
&\quad > \sum_{v_A \in V_A} \left(T(v_A) \sum_{v_B \geq T(v_A)} \alpha_B(v_B) + v_A \sum_{v_B < T(v_A)} \alpha_B(v_B) \right) \alpha_A(v_A) - \sum_{v \in V} x_P(y_v)\alpha(v) \\
&\quad = \sum_{v \in V} u_A\Big(f(v), v\Big)\alpha(v),
\end{aligned}$$

which establishes (6).

We now turn to the case where

$$x_P(y_v) = x_P(y_{\tilde{v}}) = \overline{x}_P \text{ for every } v, \tilde{v} \in V \text{ with } \alpha(v), \alpha(\tilde{v}) > 0. \tag{7}$$

We shall show that, in this instance,

$$x_P \leq \sum_{v \in V} x_P(y_v)\alpha(v) \tag{8}$$

and

$$\begin{aligned}
\max\nolimits_{x \in \mathbf{R}} x \textstyle\sum_{v_B \geq x} \alpha_B(v_B) + v_A \sum_{v_B < x} \alpha_B(v_B) &> T(v_A) \\
\times \textstyle\sum_{v_B \geq T(v_A)} \alpha_B(v_B) + v_A \sum_{v_B < T(v_A)} \alpha_B(v_B)& \\
\text{for some } v_A \in V_A \text{ with } \alpha_A(v_A) > 0.&
\end{aligned} \tag{9}$$

Inequality (8) is shown to hold by noticing that (5) gives $x_P = x_P(y_v)$ for every $v \in V$.

[29] Otherwise, another feasible contract $\tilde{f}$ could be obtained which would be exactly as f except that $\tilde{f}(v_A, v_B)$ would allocate the player to B whenever $v_B = T(v_A)$. This contract would improve the date-0 expected payoff of either the player or A without hurting the date-0 expected payoff of any of these two parties.

To show the second part, we suppose that

$$\max_{x\in\mathbf{R}} x\sum_{v_B\geq x}\alpha_B(v_B)+v_A\sum_{v_B<x}\alpha_B(v_B) = T(v_A)\sum_{v_B\geq T(v_A)}\alpha_B(v_B)+v_A\sum_{v_B<T(v_A)}\alpha_B(v_B)$$

for every $v_A \in V_A$ with $\alpha_A(v_A) > 0$ and we obtain a contradiction. Observe that this assumption entails

$$T(v_A) \in \arg\max_{x\in\mathbf{R}} x\sum_{v_B\geq x}\alpha_B(v_B) + v_A\sum_{v_B<x}\alpha_B(v_B) \text{ for every } v_A \in V_A. \quad (10)$$

Let

$$v_A^* = \max\Big\{v_A \in V_A : \alpha_A(v_A) > 0\Big\}.$$

A.1 implies $T(v_A^*) > \underline{v}_B$. Moreover, $\alpha_B(\underline{v}_B) > 0$ by assumption. It follows that there exists $v_B^* \in V_B$ with $v_B^* < T(v_A^*)$ and $\alpha_B(v_B^*) > 0$ such that $\rho\Big(\tilde{s}(v^*)\Big)$ allocates the player to A, where $v^* = (v_A^*, v_B^*)$ (otherwise, some type of B would be losing money). But then renegotiation is reached in state v^*. In this state, the player's demand at the renegotiation stage is some

$$x_{v^*} \in \arg\max_{x\in\mathbf{R}} u\bigg(x - z_A\Big(x, F, v_A^*, \rho(\tilde{s}(v^*)), \beta\Big)\bigg)\sum_{v_B\geq x}\mu_{(v_A^*,\tilde{s}_P(v_A^*),\rho(\tilde{s}(v^*)))}(v_B)$$
$$+u(\overline{x}_P)\sum_{v_B<x}\mu_{(v_A^*,\tilde{s}_P(v_A^*),\rho(\tilde{s}(v^*)))}(v_B).$$

We must have $x_{v^*} \geq T(v_A^*)$, for otherwise those types of B with valuations above $T(v_A^*)$ would find it profitable to mimic the strategy of type v_B^*, force renegotiation, and accept to pay x_{v^*} rather than $T(v_A^*)$. But then there must exist some $v^\circ = (v_A^*, v_B^\circ) \in V$ with $v_B^\circ \geq T(v_A^*)$ and $\alpha_B(v_B^\circ) > 0$ such that $\rho\Big(\tilde{s}(v^\circ)\Big)$ allocates the player to A, for otherwise x_{v^*} could not be a maximizer of the above program.

By the definition of $T(v_A^*)$ and the inequality $v_B^\circ \geq T(v_A^*)$, the player's demand at the renegotiation stage in state v° must be $T(v_A^*)$.

On the other hand, observe that

$$\overline{x}_P \leq \sum_{v_A\in V_A}\bigg(\max_{x\in\mathbf{R}} x\sum_{v_B\geq x}\alpha_B(v_B) + v_A\sum_{v_B<x}\alpha_B(v_B)\bigg)\alpha_A(v_A) < T(v_A^*). \quad (11)$$

Indeed, Proposition 2 entails that the second term of this equation is the maximum ex-ante expected revenue extracted from B under any contract that is feasible with commitment, and therefore it is also the maximum ex-ante expected revenue extracted from B under any contract that is feasible with no commitment. The first part of equation (11) holds because A must obtain at least an ex-ante expected payoff of 0 under f. The second part of (11) follows from (10), the definition of v_A^*, and A.2.

Because A.3 implies

$$T(v_A^*) - z_A\Big(T(v_A^*), F, v_A^*, \rho(\tilde{s}(v^\circ)), \beta\Big) > \overline{x}_P$$

and we have $x_P(y_{v^*}) = \overline{x}_P$, $\alpha(v^*), \alpha(v^\circ) > 0$, and

$$x_P(y_{v^\circ}) = T(v_A^*) - z_A\Big(T(v_A^*), F, v_A^*, \rho(\tilde{s}(v^\circ)), \beta\Big),$$

the assumption in (7) is contradicted.

We conclude that, under the assumption in (7), (8) and (9) must hold true. It follows that we may write

$$\begin{aligned}
&\sum_{v\in V} u_A\Big(f^*(v), v\Big)\alpha(v) \\
&\quad = \sum_{v_A\in V_A}\left(\max_{x\in\mathbf{R}} x\sum_{v_B\geq x}\alpha_B(v_B) + v_A\sum_{v_B<x}\alpha_B(v_B)\right)\alpha_A(v_A) - x_P \\
&\quad > \sum_{v_A\in V_A}\left(T(v_A)\sum_{v_B\geq T(v_A)}\alpha_B(v_B) + v_A\sum_{v_B<T(v_A)}\alpha_B(v_B)\right)\alpha_A(v_A) - \sum_{v\in V} x_P(y_v)\alpha(v) \\
&\quad = \sum_{v\in V} u_A\Big(f(v), v\Big)\alpha(v),
\end{aligned}$$

which establishes (6), as desired. $\|$

References

[1] Acemoglu, D., Robinson, J., 2000. "Why Did the West Extend the Franchise? Democracy, Inequality, and Growth in Historical Perspective," *Quarterly Journal of Economics*, 115, 1167-1199.

[2] Acemoglu, D., Kremer, M., Mian, A., 2003. "Incentives in Markets, Firms, and Governments," NBER Working Paper No. 9802.

[3] Acemoglu, D., Aghion, P., Griffith, R., Zilibotti, F., 2004. "Vertical Integration and Technology: Theory and Evidence," mimeo.

[4] Aghion, P., Bolton, P., 1992. "An "Incomplete Contracts" Approach to Financial Contracting," *Review of Economic Studies*, 59, 473-94.

[5] Aghion, P., Hart, O., Moore, J., 1992. "The Economics of Bankruptcy Reform," *Journal of Law, Economics, & Organization*, 8, 523-546.

[6] Aghion, P., Dewatripont, M., Rey, P., 1994. "Renegotiation Design with Unverifiable Information," *Econometrica*, 62, 257-282.

[7] Anderlini, L., Felli, L., 1994. "Incomplete Written Contracts: Undescribable States of Nature," *Quarterly Journal of Economics*, 109, 1085-1124.

[8] Baker, G., Hubbard, T., 2003. "Contractibility and Asset Ownership: On-Board Computers and Governance in US Trucking," *Quarterly Journal of Economics*, forthcoming.

[9] Banerjee, A. V., Duflo, E., 2000. "Reputation Effects and the Limits of Contracting: a Study of the Indian Software Industry," *Quarterly Journal of Economics*, 115, 989-1017.

[10] Battigalli, P., Maggi, G., 2002. "Rigidity, Discretion and the Costs of Writing Contracts," *American Economic Review*, 92, 798-817.

[11] Barro, R., Gordon, D., 1983. "A Positive Theory of Monetary Policy in a Natural Rate Model," *Journal of Political Economy*, 91, 589-610.

[12] Cochrane, J., 1991. "A Simple Test of Consumption Insurance," *Journal of Political Economy*, 99, 957-976.

[13] Comin, D., Beunza, D., 2001. "Power in the Manor," mimeo.

[14] Crocker, K. J., Reynolds, K. J., 1993. "The Efficiency of Incomplete Contracts: An Empirical Analysis of Air Force Engine Procurement," *Rand Journal of Economics*, 24, 126-146.

[15] Dixit, A., 1979. "A Model of Duopoly Suggesting a Theory of Entry Barriers," *Bell Journal of Economics*, 10, 20-32.

[16] Fleck, R., Hanssen, A., 2002. "The Origins of Democracy: A Model with Application to Ancient Greece," mimeo.

[17] Grossman, S., Hart, O., 1986. "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration," *Journal of Political Economy*, 94, 691-719.

[18] Grossman, S., Hart, O., 1988. "One Share-One Vote and the Market for Corporate Control," *Journal of Financial Economics*, 20, 175-202.

[19] Harris, M., Raviv, A., 1988. "Corporate Governance: Voting Rights and Majority Rules," *Journal of Financial Economics*, 20, 203-235.

[20] Hart, O., 1995. *Firms, Contracts, and Financial Structure.* Clarendon Lectures in Economics. Oxford and New York: Oxford University Press, Clarendon Press.

[21] Hart, O., Moore, J., 1988. "Incomplete Contracts and Renegotiation," *Econometrica*, 56, 755-785.

[22] Hart, O., Moore, J., 1990. "Property Rights and the Nature of the Firm," *Journal of Political Economy*, 98, 1119-1158.

[23] Hart, O, Moore, J., 1998."Default and Renegotiation: A Dynamic Model of Debt," *Quarterly Journal of Economics*, 113, 1-41

[24] Hart, O., Shleifer, A., Vishny, R., 1998. "The Proper Scope of Government: Theory and an Application to Prisons," *Quarterly Journal of Economics*, 112, 1127-1161.

[25] Hart, O., Moore, J., 1999. "Foundations of Incomplete Contracts," *Review of Economic Studies*, 66, 115-138.

[26] Holmstrom, B., Myerson, R. B., 1983. "Efficient and Durable Decision Rules with Incomplete Information," *Econometrica*, 51, 1799-1819.

[27] Holmstrom, B., Milgrom, P., 1994. "The Firm as an Incentive System," *American Economic Review*, 84, 972-991.

[28] Kydland, F., Prescott., E., 1977. "Rules Rather than Discretion: The Time Inconsistency of Optimal Plans," *Journal of Political Economy*, 85, 473-492.

[29] Mace, B., 1991. "Consumption Volatility: Borrowing Constraints or Full Insurance," *Journal of Political Economy*, 99, 928-956.

[30] Maskin, E., Tirole, J., 1999. "Unforeseen Contingencies and Incomplete Contracts," *Review of Economic Studies*, 66, 83-114.

[31] Maskin, E., 2002. "On Indescribable Contingencies and Incomplete Contracts," *European Economic Review*, 46, 725-733.

[32] McMillan, J., Woodruff, C., 1999. "Interfirm Relationships and Informal Credit in Vietnam," *Quarterly Journal of Economics*, 114, 1285-1320.

[33] Milgrom, P., Oster, S., 1987. "Job Discrimination, Market Forces, and the Invisibility Hypothesis," *Quarterly Journal of Economics*, 102, 453-476.

[34] Segal, I., 1995. "Essays on Commitment, Renegotiation, and Incompleteness of Contracts," Ph.D. Thesis, Harvard University.

[35] Segal, I., 1999. " Complexity and Renegotiation: A Foundation for Incomplete Contracts," *Review of Economic Studies*, 66, 57-82.

[36] Stock, J., Watson, M., 2003. *Introduction to Econometrics*, Addison Wesley, New York.

[37] Tirole, J., 1999. "Incomplete Contracts: Where Do We Stand?," *Econometrica*, 67, 741-781.

[38] Townsend, R., 1994. "Risk and Insurance in Village India," *Econometrica*, 62, 539-591.

Table 1A Descriptive Statistics

	Goal Keeper	Defender	Midfielder	Striker	N
Positions	55	180	203	112	550

	Mean	St.devt.	Median	Min	Max	N
Age	26.37	3.73	26	18	39	494

	Mean	St.devt.	25%	50%	75%	Min	Max	N
Tranf.Fee	4082	5086	1000	2000	5000	0	50000	430
Transf. Price	822	1146	200	400	1000	10	10000	253
Total Comp.	1788	1928	625	1150	2400	145	16000	189

	Mean	St.devt.	25%	50%	75%	Min	Max	N
Wage	200	132.53	125	175	250	27.5	1100	435

Marca	Mean	St.devt.	Median	Min	Max	N
1999	582	689	400	50	4000	225
2000	952	932	650	50	7500	321
2001	907	1308	575	90	13450	517
2002	42.06	28.1	41	-1	114	335

AS	Mean	St.devt.	Median	Min	Max	N
1999	164	102	174	1	492	262
2000	153.67	86	157	1	387	323
2001	134	88	128	1	399	485
2002	155.7	941.2	156	3	396	337

Descriptive statistics for players in "La Liga" for the 2000-2001 season. Wages and Marca valuations up to 2001 are measured in million pesetas. Marca valuations for 2002 are measured in Marca points. AS valuations are measured in AS points. Valuations for year X are measured at the beginning of the summer transfer period for the season X-X+1.

Table 1B- Relation between Valuation and Performance Measures

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent var. is the log of Marca in 2001				Dependent var. is log net wage	
Performance						
log(AS 2001)	0.39	0.32	0.31	0.32		
	(0.3)	(0.03)	(0.04)	(0.05)		
log(AS 2000)			0.31	0.32	0.01	0.05
			(0.56)	(0.07)	(0.03)	(0.03)
log(AS 1999)				0.16		
				(0.04)		
Valuation						
log(Marca 2000)					0.37	0.27
					(0.03)	(0.04)
Position						
Goal Keeper	-0.32	-0.33	-0.33	-0.33	-0.34	-0.38
	(0.15)	(0.11)	(0.16)	(0.2)	(0.1)	(0.06)
Defender	-0.39	-0.46	-0.44	-0.5	-0.27	-0.3
	(0.1)	(0.08)	(0.11)	(0.12)	(0.07)	(0.06)
Midfielder	-0.25	-0.1	-0.26	-0.29	-0.1	-0.12
	(0.1)	(0.23)	(0.11)	(0.12)	(0.06)	(0.06)
Demographics						
log(Age)	-0.28	-0.1	-0.56	-0.69	0.28	0.47
	(0.28)	(0.23)	(0.3)	(0.35)	(0.18)	(0.17)
log(Tenure in Team)	0.11	0.1	0.08	0.03	0.05	0.08
	(0.05)	(0.05)	(0.06)	(0.6)	(0.03)	(0.03)
Ad. R2	0.32	0.6	0.39	0.46	0.52	0.62
N	302	302	251	188	228	228
Team Dummies	No	Yes	No	No	No	Yes

t-stats in parenthesis. The valuations computed by the Marca magazine and wages are measured in million of pesetas. The performace measures computed by AS (AS) are expressed in AS points. Goal Keeper, Defender and Midfielder correspond to position dummies.

Table 2: Rankings by Team in League and in AS, 2000-2001 season

Team	Ranking League	Ranking AS	Total Points AS
Real Madrid	1	1	3949
Deportivo	2	2	3784
Valencia	3	4	3616
Mallorca	4	5	3469
Barcelona	5	3	3682
Celta	6	8	3310
Villareal	7	7	3350
Malaga	8	6	3392
Alaves	9	9	3309
Espanyol	10	10	3255
Athletic	11	13	3110
Las Palmas	12	19	2936
Zaragoza	13	11	3216
Rayo	14	12	3167
Real Sociedad	15	20	2808
Valladolid	16	14	3061
Oviedo	17	15	3038
Osasuna	18	17	2941
Racing	19	18	2936
Numancia	20	16	2979

The Rankings are computed 3 matches before the end of the 2000-2001 season
Ranking League is given by the classification in the League. Ranking AS is
the ranking according to the total points assigned by AS to the team

Table 3-Testing for Contractual Incompleteness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A	Dependent variable is the log of the total payments by buying club when a player is transferred								
	OLS		Two-Stage Least Squares						
log(Marca)	0.28	0.13	0.09	0.1	-0.02	0.08	0.1	0.11	0.09
	(0.07)	(0.05)	(0.07)	(0.08)	(0.12)	(0.06)	(0.06)	(0.07)	(0.06)
log(AS)	0.42	0.42	0.42	0.39	0.34	0.41	0.425	0.39	0.42
	(0.08)	(0.05)	(0.07)	(0.07)	(0.08)	(0.06)	(0.07)	(0.07)	(0.06)
log(Transfer Fee)		0.46	0.55	0.71	1.37	0.6	0.48	0.62	0.53
		(0.07)	(0.16)	(0.18)	(0.45)	(0.15)	(0.14)	(0.13)	(0.13)
Ad. R2	0.42	0.68	0.56	0.49	0.46	0.58	0.56	0.51	0.58
Panel B			First Stage for the log of the transfer fee						
log(Marca)			0.15	0.2	0.19	0.14	0.12	0.17	0.11
			(0.07)	(0.07)	(0.07)	(0.07)	(0.06)	(0.07)	(0.06)
log(AS)			0.15	0.04	0.07	0.14	0.17	0.05	0.15
			(0.07)	(0.08)	(0.08)	(0.07)	(0.07)	(0.08)	(0.07)
log(avg. team transfer fee)			0.48			0.46	0.54		0.52
			(0.09)			(0.09)	(0.09)		(0.09)
Prob. Of transfer in position				11		8.8		12.44	9.35
				(5.7)		(5.16)		(5.62)	(4.9)
Prob of transfer in team					1.56		2.08	1.73	7.12
					(0.74)		(0.71)	(0.73)	(0.7)
Ad. R2			0.32	0.13	0.14	0.33	0.37	0.17	0.39
F			34.56	3.68	4.5	19.15	23.1	4.8	16.88
N	107	91	90	96	96	90	90	96	90
Panel C			Overidentifying restriction test						
p-value of Chi-squared	-	-	-	-	-	0.185	0.29	0.25	0.195

Standard errors in parenthesis. Marca and AS are the measures of the player's value and performance at his current team as measured by the specialized magazines Marca and AS. The average transfer fee in the team variable excludes the player.