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Testing the Commitment Hypothesis in Contractual Settings: Evidence from Soccer

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Oriol Carbonell-Nicolau and Diego Comin

Abstract

This paper designs and implements an empirical test to discern whether the parties to a contract are able to commit not to renegotiate their agreement. 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 on Spanish soccer player contracts. Our test rejects the commitment hypothesis. We argue that our conclusions should hold *a fortiori* in many other economic environments.

KEYWORDS: optimal contract, commitment, renegotiation, incomplete contract

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1 Motivation

The inability of the parties to a contract to commit (ex-ante) not to renegotiate their agreement is key to understanding a wide variety of institutions and economic phenomena.¹ Yet, contract theorists are divided about the issue of commitment. The question is why parties do not find ways to avoid engaging in contract renegotiations that are desirable at a later stage but whose prospect reduces welfare at an initial stage (i.e. that is ex-post beneficial but ex-ante detrimental).² 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.”³

Once the theoretical approach has reached a dead end, any attempt to determine the ability of the parties to a contract to commit not to renegotiate their contract must resort to empirical observation. Yet, 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, and the actions they would have taken out in response to other actions not taken by other parties (i.e. outside the equilibrium path). As in many other empirical problems, the researcher never has all this information.

In this paper we present and implement a new empirical strategy to explore the issue of commitment. For concreteness, we focus on one specific transaction: the transfer of a soccer player from club *A* to club *B*. We analyze the optimal contract between the player and club *A* with and without commitment. This allows us to derive a prediction that can be brought to the data to identify the contracting environment (i.e. an exclusion restriction).

¹The topics studied in the literature 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 [1988]), the limits of the services provided by the government (Hart et al. [1998], Acemoglu et al. [2008]), the genesis of democracy (Fleck and Hanssen [2006]), the extension of the franchise (Acemoglu and Robinson [2000]), and the genesis of feudal contracts (Comin and Beunza [2001]).

²For insightful discussions, see Tirole [1999], Maskin and Tirole [1999], and Hart and Moore [1999].

³The commitment issue also resides at the center of many other economic problems, such as time inconsistency (Kydland and Prescott [1977], Barro and Gordon [1983]) and entry deterrence (Dixit [1979]).

In a world with commitment, the player and *A* can design a contract that achieves two goals: (1) maximize the total amount paid by club *B* when transferring the player from *A* to *B* and (2) divide this payment between the player and club *A* in a way that optimizes 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, although we do not claim it to be the only rationale for the said non-separability.

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 the parties cannot commit not to renegotiate their contract 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* when hiring 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, *B*'s total disbursement from hiring the player is only a function of *A*'s valuation of the player and the parties' beliefs about *B*'s valuation of the player. Under no commitment, however, the transfer fee may have predictive power over *B*'s total payment even after controlling for the clubs' valuations of the player. Hence, the excess sensitivity of *B*'s total payment to the transfer fee would imply lack of commitment.⁴

⁴In Section 3, we argue that the presence of a transfer fee is in principle consistent with commitment (or the lack of it). In this regard, our test is not redundant.

Real-world Spanish soccer contracts posit a transfer fee, or buy-out price, at which a player can unilaterally walk away from the contract before its expiration date. By contrast, other European contracts do not generally exhibit a transfer fee. These differences are explained by a peculiarity of Spanish regulation of labor contracts involving professional sports players: the *prohibition* of explicit restraint of a player’s freedom to extinguish a labor contract and initiate a relationship with a new employer, and the *requirement* that any enforceable agreement governing the consequences of breach of contract by a player specify at most a finite amount (the transfer fee) that grants the player’s ability to switch employers.⁵

Our test exploits this feature of Spanish soccer contracts. We construct a data set containing information about all the transfers of soccer players in the Spanish league (“La Liga”) during the three seasons within the period 1998-2001. 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 transfer fees, salaries received by the transferred 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 value were 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 B ’s total outlay from hiring the player 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 the parties cannot commit not to renegotiate their contract.

To the best of our knowledge, this is the first paper that tests for the existence of commitment. 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 [2004] find that ownership patterns in trucking reflect the importance of both incomplete

⁵Real Decreto 1006/1985, Article 16.1.

contracts (Grossman and Hart [1986]) and job design and measurement issues (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 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.

Finally, our test of the commitment hypothesis is similar in spirit to exercises 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 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 (1) actions taken by soccer players and clubs become widely observable to the general public and

(2) reputational considerations play an important role in the world of soccer, the lack of commitment 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 $[0, \bar{v}_A]$ and $[\underline{v}_B, \bar{v}_B]$, respectively, and $0 < \bar{v}_A < \underline{v}_B < \bar{v}_B < +\infty$. 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 .⁶ It is assumed that v_A and v_B are independent random variables, and that each v_i occurs with probability $\alpha_i(v_i)$.⁷ 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.⁸ Second, B 's valuation is private information of B . 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."⁹

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 may designate an outcome by a vector $y = ((d_i)_{i \in \{A, B\}}, (x_i)_{i \in \{P, A, B\}})$, 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 .

⁶Assuming possible but uncertain gains from trade with the outsider would require a notion of efficiency along the lines of Holmstrom and Myerson's [1983] "durability" and would complicate matters significantly. We see no reason why the assumption of uncertain gains from trade would undermine the results of the paper.

⁷Independence can be dispensed with.

⁸Thus, v_A is observable but not verifiable.

⁹While 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.

An outcome $y = ((d_i)_{i \in \{A,B\}}, (x_i)_{i \in \{P,A,B\}})$ realized in state $v = (v_A, v_B)$ gives a utility of $u_i(y, v) = d_i v_i + x_i$ to agent $i \in \{A, B\}$ and a utility of $u_P(y, v) = u(x_P)$ to the player; here, u is continuous, strictly increasing, and strictly concave.¹⁰

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 feasible outcomes Y . Whether there is or there is no commitment, we postulate that the parties sign optimal contracts. A contract f is **optimal** if there is no other contract \tilde{f} that 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; formally, there is not alternative contract \tilde{f} such that

$$\sum_{v \in V} \alpha(v) u_i(\tilde{f}(v), v) \geq \sum_{v \in V} \alpha(v) u_i(f(v), v), \quad i = P, A, \quad (1)$$

with strict inequality for some $i = P, A$, where $\alpha = \alpha_A \times \alpha_B$.

A contract is feasible if it can be implemented through a mechanism. A **mechanism** is defined as a tuple $g = (S_P, S_A, S_B, \rho)$, where $\{S_P, S_A, S_B\}$ is a collection of strategy sets and $\rho : S \rightarrow Y$, 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 structure 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.

Given that B does not sign the contract at date 0, it is natural to assume that B can choose not to sign the player at date 1. To formalize this idea, we assume that S_B contains an element, denoted as \emptyset , for which $\rho(s_A, \emptyset, s_P)$ is an outcome $((d_i)_{i \in \{A,B\}}, (x_i)_{i \in \{P,A,B\}})$ such that $d_B = 0$ and $x_B = 0$, for all s_A and s_P .

¹⁰The 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 environment to ease exposition.

2.1 Implementable contracts

Under commitment, every agent i must choose an action from S_i , and the agents' choices are simultaneous. 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 may be contingent on their 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 $i = P, A$ an expected payoff of

$$\sum_{v \in V} \alpha(v) u_i(\rho(s(v)), v).^{11}$$

The game associated to the mechanism g is denoted as $\Gamma(g)$.

We say that a contract f is **implementable (with commitment)** if a mechanism $g = (S, \rho)$ 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: $f(v) = \rho(s(v))$ for every $v \in V$. In this case, we say that g implements f .¹²

Under lack of 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 assumed renegotiation process, introduced in Subsection 3.2, the possibility of renegotiation introduces two new consid-

¹¹For example, if for every action profile s the outcome $\rho(s)$ prescribes the allocation of the player to A , along with transfers (x_P, x_A, x_B) , then the (ex-ante) expected payoff to the player is $\sum_{v \in V} \alpha(v) u_P(\rho(s(v)), v) = u(x_P)$, and the expected payoff corresponding to club A is $\sum_{v \in V} \alpha(v) u_A(\rho(s(v)), v) = x_A + \sum_{v_A \in V_A} \alpha_A(v_A) v_A$, where $\sum_{v_A \in V_A} \alpha_A(v_A) v_A$ stands for the expected value of v_A .

¹²Observe that the fact that \emptyset is a member of S_B implicitly defines a default option (with zero associated payoff) for B . We could impose participation constraints for the player and A without altering our results.

erations. 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.¹³ Second, the player and A might acquire information other than that transmitted by their own signals while under the influence of a contract. Evidently, the distribution of information that prevails when a mechanism concludes (and before the renegotiation stage is initiated) may affect the equilibrium renegotiated outcome.

Our analysis of the no commitment case (Section 3.2) is not meant to be general, and the reader can follow the theoretical analysis without resort to the underlying formal definition of implementation with no commitment, which is relegated to Section 6.1.

3 Theoretical analysis

This section contains two subsections. In Subsection 3.1, by studying the determinants of B 's financial outlay from signing the player, we identify a property any optimal contract should exhibit under the commitment assumption. In Subsection 3.2, we show that this property need not be satisfied by an optimal contract when there is no commitment. This allows us to derive an exclusion restriction that is useful to test the commitment hypothesis.

3.1 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: (1) maximize extraction of the outsider's rent and (2) divide the surplus extracted to optimize risk-sharing. The separation of rent extraction and insurance 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

¹³This idea was introduced by Aghion et al. [1994].

that is optimal under commitment and then state the result for 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^* described as follows.¹⁴ At date 1, the player may unilaterally negotiate with B and sign for B after paying A a certain amount F . 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 a quantity, to be interpreted as 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 .

If the parties are able to commit not to renegotiate their contract, one may choose F , w , and $B(\hat{v}_A)$ in such a way that f^* is optimal. The proof of the following statement is relegated to Section 6.2.

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 F . 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

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

¹⁴By a slight abuse of terminology, our description of f^* is really a description of the associated mechanism that implements f^* .

where v_A represents the realization of A 's valuation of the player.¹⁵ This observation has implications for 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 and A may sign under commitment. This is stated formally in the following proposition, the proof of which is relegated to Section 6.2.

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

$$\max_{T \in \mathbf{R}} v_A \sum_{\tilde{v}_B < T} \alpha_B(\tilde{v}_B) + T \sum_{\tilde{v}_B \geq T} \alpha_B(\tilde{v}_B). \quad (2)$$

Real-world Spanish soccer contracts posit a transfer fee, or buy-out price, at which a player can unilaterally walk away from the contract before its expiration date. By contrast, other European contracts do not generally exhibit a transfer fee. These differences are explained by a peculiarity of Spanish regulation of labor contracts involving professional sports players: the *prohibition* of explicit restraint of a player's freedom to extinguish a labor contract and initiate a relationship with a new employer, and the *requirement* that any enforceable agreement governing the consequences of breach of contract by a player specify at most a finite amount (the transfer fee) that grants the player's ability to switch employers.¹⁶

Observe that the amount F specified by contract f^* may be interpreted as the said transfer fee. A finite F renders f^* enforceable under Article 16.1 of Spain's Real Decreto 1006/1985. In principle, one could envisage a contingent transfer fee. We ignore whether Spanish regulation allows for such contingent clauses, yet this is irrelevant for our test. One could read the map $B(\cdot)$ as an implicit contingent transfer fee, although specifying it in

¹⁵Observe that $\sum_{v_B < T} \alpha_B(v_B)$ is the probability that B rejects the player and A 's joint offer T (in which case the coalition's payoff is v_A), and $\sum_{v_B \geq T} \alpha_B(v_B)$ is the complement probability.

¹⁶Real Decreto 1006/1985, Article 16.1.

a contract would require a description of the mechanism underlying f^* , for the mere definition of the map $B(\cdot)$ would make the agreement dependent on unverifiable information.

Our data set on Spanish soccer contracts exhibits noncontingent transfer fees. This means that parties generally choose to comply with Spanish law by fixing a noncontingent transfer fee. Obviously, this does not undermine their ability to sign a contract like f^* or, more generally, a contract involving several clauses in addition to the buy-out clause. Our information about Spanish soccer contracts reduces to a few variables such as wages, transfer fees, and contract duration (see Section 4.1 for details), and is therefore *limited*. Any additional information needed to determine the parties' ability to commit not to renegotiate by direct scrutiny of contracts is missing from our data set.¹⁷ In this regard, casual inspection of the raw data and its descriptive statistics may lead to misleading interpretations of the observed variables. Our empirical test provides a more systematic approach to test the commitment hypothesis.¹⁸

Finally, it is worth pointing out that our description of f^* is a mere illustration of an optimal contract in our setting. There are a plethora of alternative optimal contracts. Advocates of the commitment assumption would argue that club A and the player should sign some optimal contract that is implementable with commitment. Any such contract must yield an outcome satisfying (2).

3.2 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

¹⁷Even if one had access to formal written contracts (on record at Spain's INEM (Instituto Nacional de Empleo)) one could not rule out tacit agreements. There are many reasons why Spanish first-division soccer clubs and professional soccer players would want to settle certain transactions secretly.

¹⁸One could argue that it is well-known that players (and other employees) hold out routinely as they seek to renegotiate the terms of their contract, and that formal empirical tests do not seem to be required. Despite this sort of argument, the debate about whether theoretical models should maintain the assumption that parties are able to commit not to renegotiate contractual inefficiencies persists. The question is whether what could be interpreted as 'holding out routinely' is essentially part of the design of the contract, i.e., is implicitly governed by the implemented mechanism and depends on default outcomes (threat points) that parties can commit not to renegotiate. Casual inspection of behavior within contractual relationships is unlikely to provide a convincing answer.

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. We assume that the renegotiation process is affected by a transfer fee A is entitled to receive from the player if another club signs the player without A 's approval. 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.^{19,20}

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. We assume that, in the negotiation between A and the player, A obtains a share $\beta \in (0, 1)$ of the transfer fee specified at date 0.^{21,22}

The following example illustrates that the transfer fee may play an im-

¹⁹Unlike Aghion et al. [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.

²⁰Thus, we focus on the case in which \mathcal{F} (defined in Section 6.1) consists of one variable, the said transfer fee.

²¹This outcome may be rationalized as equilibrium play of a bargaining game of alternating offers (played by A and the player) in which the transfer fee constitutes an upper bound on any monetary transfer A may receive if the player changes club.

²²Observe 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 modeling 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.

portant 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.

Suppose that the player's utility function is $u(x) = x^\vartheta$, where $\vartheta \in (0, 1)$. Let $V_A = \{a\}$ and $V_B = \{b, c, d\}$, where $0 < a < b < c < d$, and suppose that α_B has support V_B .

We interpret the choice of $\emptyset \in S_B$ by B as an action that precludes the agents' interaction under the influence of the mechanism chosen by the player and A at date 0. It can be shown that in equilibrium, all types of B choose \emptyset from S_B , regardless of the mechanism chosen by the player and A . Thus, we can simply assume that the player and A 's relevant posterior beliefs about v_B coincide with α_B .

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

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 $(0, b) \cup (b, c) \cup (c, d)$ is dominated by an element of $\{b, c, d\}$. This means that, for every element z of $(0, b) \cup (b, c) \cup (c, d)$, there exists x in $\{b, c, d\}$ such that the probability that B accepts z is not higher than the probability that he accepts x , and $x > z$. Therefore, by demanding z , the player would leave money on the table.

The player's expected utilities associated to each demand are as follows:

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

where x_P stands for the payment received by the player under the default outcome (the threat point of the renegotiation). Hence, the player's optimal demands are as follows:

$$\begin{array}{ll} b & \text{if } x_P < x_1(F) = \frac{u(b - \beta F) - p_c u(c - \beta F)}{1 - p_c}, \\ c & \text{if } x_1(F) \leq x_P \leq x_2(F) = \frac{p_c u(c - \beta F) - p_d u(d - \beta F)}{p_c - p_d}, \\ d & \text{if } x_P > x_2(F). \end{array}$$

Observe that the cutoffs x_1 and x_2 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, thereby inducing the player to demand more aggressively.

For convenience, the following parametric assumption shall be maintained throughout the sequel:

$$p_c c + (1 - p_c)a > \max \{b, p_d d + (1 - p_d)a\}.$$

This assumption implies that the demand that maximizes (expected) rent extraction from B is c .

The optimal contract maximizes the sum of expected payoffs to the player and A , subject to the player's incentive constraint. It is illustrative to start assuming that the constraint is not binding at the optimum. In this instance, the optimal contract solves the following problem:

$$\max_{(F, x_P)} p_c \left((c - \beta F)^\vartheta + \beta F \right) + (1 - p_c) (x_P^\vartheta + v_A - x_P).$$

A solution (F^*, x_P^*) satisfies

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

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 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 constraint is binding, i.e.,

$$x_P^* = \vartheta^{1/(1-\vartheta)} > \frac{p_c (\vartheta^{1/(1-\vartheta)})^\vartheta - p_d (d - c + \vartheta^{1/(1-\vartheta)})^\vartheta}{p_c - p_d} = x_2(F^*).$$

In this case, the player and A have two options. They can design the contract in such a way that the player is perfectly insured. In this case, the player's default payment (i.e., the payment in the event of no transaction) equals x_P^* , and the player chooses d . This option gives the following sum of expected payoffs to the player and A :

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

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

$$\begin{aligned} & \max_F p_c \left((c - \beta F)^\vartheta + \beta F \right) \\ & + (1 - p_c) \left(\left(\frac{p_c(c - \beta F)^\vartheta - p_d(d - \beta F)}{p_c - p_d} \right)^\vartheta + v_A - \frac{p_c(c - \beta F)^\vartheta - p_d(d - \beta F)}{p_c - p_d} \right). \end{aligned}$$

The first-order condition associated with the optimal transfer fee in this second case is as follows:

$$\begin{aligned} & \overbrace{p_c \left(\beta \left(-\vartheta (c - \beta F)^{\vartheta-1} + 1 \right) \right)}^{\text{Marginal value of } F \text{ in the unconstrained problem}} + \overbrace{(1 - p_c) \left(\vartheta (x_2(F))^{\vartheta-1} - 1 \right)}^{\text{Marginal value of } x_P} \\ & \times \overbrace{\frac{\partial x_2(F)}{\partial F}}^{\text{Marginal effect of } F \text{ on cutoff}} = 0 \end{aligned} \quad (3)$$

This first-order condition shows 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 as a compromise between these two margins.

If the player's incentive constraint is binding (i.e., $x_P^* > x_2(F^*)$), 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 . These two observations imply that the second term in (3) 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, the player's relative risk aversion ($1 - \vartheta$) and the magnitude of $x_P^* - x_2(F^*)$ determine whether or not it is optimal to make the player bear risk, thereby inducing him to demand c . In turn, the difference $x_P^* - x_2(F^*)$ depends, among other things, on the player's risk aversion. For low values of ϑ , x_P^* is small (and $x_2(F^*)$ is large), and therefore the incentive constraint is either non-binding or binding by a small margin. For high values of ϑ , x_P^* is large (and $x_2(F^*)$ is small), and therefore the incentive constraint is likely to be binding by a large margin.

Thus, in general, it is no longer true that v_A and α_B are sufficient statistics for B 's total financial outlay from signing the player. Under 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. Therefore, conceivably, some variable correlated with the player's risk aversion could have an econometric impact on B 's total disbursement, if risk aversion is not properly controlled for. One such variable may be the transfer fee.

To see this, suppose that when the incentive constraint is binding by a small margin, the optimal contract induces the player to demand c . 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 $x_2(F^*)$ is large), and therefore the incentive constraint is binding by a small margin. For high values of ϑ , x_P^* is large (and $x_2(F^*)$ is small), and therefore the incentive constraint is likely to be binding by a large margin. Now, consider two players whose corresponding v_A and α_B are identical. Suppose the two players differ in their degree of risk aversion. 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 B signs the more risk averse player, B 's total financial outlay is 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 .²³ Note that this prediction is in sharp contrast with what happens

²³In other contexts, there may be other reasons for the non-separability of rent extraction and surplus division when the 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. Our goal here was just to illustrate that there are reasons for the existence of a trade-off between rent extraction and insurance that cannot be captured under the commitment assumption.

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. This difference constitutes the basis for our test of the commitment hypothesis.

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 to 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 , α_B , and the other faces a distribution $\tilde{\alpha}_B$ that first-order stochastically dominates the former. From the first-order condition (3), we can see how a higher probability of a transaction under $\tilde{\alpha}_B$ makes the division of surplus in the event of a transaction more important. As a result, the transfer fee under $\tilde{\alpha}_B$ 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 α_B . In sum, by this argument, we expect to observe a positive relationship between transfer fees and the probability that B signs the player.²⁴

One final remark is in order. It can be shown that, in our setting, lack of commitment constrains the set of implementable outcomes relative to what is achievable with commitment. This is true for a wide range of renegotiation processes.²⁵

²⁴This mechanism constitutes just one possible theory of the transfer fee. In other renegotiation settings, a high transfer fee may 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 coalition $\{A, P\}$. 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 may trade off these two forces. Whatever the cost of a higher transfer fee is, since this fee increases the total compensation to the contracting parties when B signs the player, a higher probability of transferring the player increases the importance of this effect and thus the marginal value of the transfer fee.

²⁵The details are available upon request. Given lack of commitment, 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. In passing, it is worth linking this observation with the immediately related branch of the literature

4 Empirical analysis

In the previous section we have shown that, if the player and club A can commit not to renegotiate their contract, the total expense incurred by B when the player changes club 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, under lack of commitment, 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 the parties' ability to commit not to renegotiate. Specifically, if there is commitment, we should observe that, after controlling for the value of the player for the current team and that 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 outsider's total expense to the transfer fee would be evidence in favor of the no commitment hypothesis.

Before implementing the test, it is worthwhile noting that the excess sensitivity of the outsider's total payment to the transfer fee is sufficient, but not necessary, for lack of commitment. In this sense, our empirical strategy allows us to identify lack of commitment but not its presence.

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

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 this statement.

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 the wages (net of taxes) received 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.²⁶ The average and median

²⁶Conditional on having stayed one year on the team, the average tenure was 2.9.

Table 1A Descriptive Statistics

	Goal Keeper	Defender	Midfielder	Striker	N			
Positions	55	180	203	112	550			
	Mean	St.dev.	Median	Min	Max	N		
Age	26.37	3.73	26	18	39	494		
	Mean	St.dev.	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.dev.	25%	50%	75%	Min	Max	N
Wage	200	132.53	125	175	250	27.5	1100	435
	Mean	St.dev.	Median	Min	Max	N		
Marca								
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		
	Mean	St.dev.	Median	Min	Max	N		
AS								
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.

contract expired in 2003, with a standard deviation from 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.²⁷ 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 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, club *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' valu-

²⁷The 50000 million transfer fee was part of the agreement between Valencia and Vicente Rodríguez of Levante (who signed with Valencia in 2000).

ations.²⁸ 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).²⁹ 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 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 a full set of team-specific constants 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

²⁸The new approach followed by *Marca* is closer to *As*'s because it is also a measure of performance rather than a measure of value.

²⁹It could also be due to the migration of the best players to other European leagues, but this has not been the case.

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 (0.3)	0.32 (0.03)	0.31 (0.04)	0.32 (0.05)		
log(AS 2000)			0.31 (0.56)	0.32 (0.07)	0.01 (0.03)	0.05 (0.03)
log(AS 1999)				0.16 (0.04)		
Valuation						
log(Marca 2000)					0.37 (0.03)	0.27 (0.04)
Position						
Goal Keeper	-0.32 (0.15)	-0.33 (0.11)	-0.33 (0.16)	-0.33 (0.2)	-0.34 (0.1)	-0.38 (0.06)
Defender	-0.39 (0.1)	-0.46 (0.08)	-0.44 (0.11)	-0.5 (0.12)	-0.27 (0.07)	-0.3 (0.06)
Midfielder	-0.25 (0.1)	-0.1 (0.23)	-0.26 (0.11)	-0.29 (0.12)	-0.1 (0.06)	-0.12 (0.06)
Demographics						
log(Age)	-0.28 (0.28)	-0.1 (0.23)	-0.56 (0.3)	-0.69 (0.35)	0.28 (0.18)	0.47 (0.17)
log(Tenure in Team)	0.11 (0.05)	0.1 (0.05)	0.08 (0.06)	0.03 (0.6)	0.05 (0.03)	0.08 (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 millions of pesetas. The performance measures computed by AS (AS) are expressed in AS points. Goal Keeper, Defender and Midfielder correspond to position dummies.

prestigious European competitions.³⁰

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 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 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.³¹ The correlation between the two is 91 percent.

4.3 Testing the commitment hypothesis

The key to identifying the relevant commitment 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

³⁰There 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.

³¹More precisely, this exercise was conducted three matches before the season was over.

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

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 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 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 omitted variable bias.

We address potential biases from 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

Table 3 - Testing the Commitment Hypothesis

	(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 (0.07)	0.13 (0.05)	0.09 (0.07)	0.1 (0.08)	-0.02 (0.12)	0.08 (0.06)	0.1 (0.06)	0.11 (0.07)	0.09 (0.06)
log(AS)	0.42 (0.08)	0.42 (0.05)	0.42 (0.07)	0.39 (0.07)	0.34 (0.08)	0.41 (0.06)	0.425 (0.07)	0.39 (0.07)	0.42 (0.06)
log(Transfer Fee)		0.46 (0.07)	0.55 (0.16)	0.71 (0.18)	1.37 (0.45)	0.6 (0.15)	0.48 (0.14)	0.62 (0.13)	0.53 (0.13)
Adj. 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 (0.07)	0.2 (0.07)	0.19 (0.07)	0.14 (0.07)	0.12 (0.06)	0.17 (0.07)	0.11 (0.06)
log(AS)			0.15 (0.07)	0.04 (0.08)	0.07 (0.08)	0.14 (0.07)	0.17 (0.07)	0.05 (0.08)	0.15 (0.07)
log(avg. team transfer fee)			0.48 (0.09)			0.46 (0.09)	0.54 (0.09)		0.52 (0.09)
Prob. of transfer in position				11 (5.7)		8.8 (5.16)		12.44 (5.62)	9.35 (4.9)
Prob. of transfer in team					1.56 (0.74)		2.08 (0.71)	1.73 (0.73)	7.12 (0.7)
Adj. 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

the transfer fee. Here good instruments are 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 Section 3, 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 proposal to B . To mitigate this distortion, the optimal transfer fee tends to be smaller than the fee that achieves an optimal division of the surplus. This makes it more attractive for the player to transfer 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 and use them to instrument for a player's transfer fee. These are (1) the frequency of a transfer for the players in the same position and (2) the frequency of a transfer for the players in the same team. Both variables refer to the 2000-2001 season.³² By the previous argument, these variables will be positively correlated with the player's transfer fee.

We believe that the probability of transferring a player by position or team is a good instrument for the transfer fee because these variables are 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.³³ 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

³²The 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.

³³This is true also when the left-hand-side variable is the probability of transfer by position or by team rather than a binary variable.

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 the player's 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 force contracts with very high transfer fees to dissuade other clubs to attempt to hire their players because this may distract them and affect their performance. Finally, clubs differ in their governance structures,³⁴ 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, since the valuation criteria are common to all players, these elements should not 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 suffer from systematic mistakes within teams that are correlated with the average transfer fee for the team. Given the ex-post 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 the said 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.³⁵ 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.³⁶

³⁴Some are private corporations while others do not have owners.

³⁵One 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.

³⁶Note 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.

Columns 3 to 9 of Table 3 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 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.³⁷

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 made by the buying club.³⁸

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

³⁷For the frequency of transfer by position, the effect on the transfer fee reported in column 4 has a p -value of 5.8 percent.

³⁸Note an additional reason to believe that the significance of the transfer fee is not driven by the omission of v_B : The effect of the transfer fee remains unaffected after instrumenting by characteristics of A (average transfer and probability of a transfer) and the player's position (i.e., probability of a transfer by position). These variables are most likely uncorrelated with v_B .

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 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.³⁹ 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. The reported estimates indicate 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 Proposition 2 and the Example in section 3.2, this implies that the parties cannot commit not to renegotiate their initial contract.

5 Concluding remarks

This paper has designed and implemented a test of the commitment hypothesis in soccer contracts. 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.

³⁹See, for example, Stock and Watson [2003].

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, 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 the parties lack the ability to commit not to renegotiate their contract, 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.

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 contractual settings. 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 detected by the team's supporters, who retaliate in various ways at a very large cost for the deviators.⁴⁰ 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 and reputational considerations to apply. Yet, even in this "ideal" scenario, we have found evidence in favor of lack of commitment.

⁴⁰Examples of this are almost countless. Two very clear cases are those of Figo and Mendieta.

6 Appendix

6.1 Implementable contracts with no commitment

Given a state of nature $v \in V$, an outcome $y \in Y$, a point F from a given set of contractible parameters \mathcal{F} that may affect the renegotiation process, and the player and A 's posterior beliefs $\mathcal{B} = (\mathcal{B}_A, \mathcal{B}_P)$ about B 's valuation, let $h_{(v,y,F,\mathcal{B})}$ be a point in Y . Here, each \mathcal{B}_i ($i = A, P$) is a probability measure over V_B . Suppose that $h_{(v,y,F,\mathcal{B})}$ represents the outcome resulting from renegotiation, given (v, y, F, \mathcal{B}) .

Fix a mechanism $g = (S, \rho)$ and a renegotiation function h , and consider the following Bayesian game $\Gamma(g, h)$. First, the state of nature v is chosen according to the joint distribution α . Club B observes nature's choice, 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.⁴¹ The outcome resulting from renegotiation in state v is $h_{(v,\rho(s),F,\mathcal{B})}$ if \mathcal{B} is the belief system that prevails after the implementation of g . Obviously, $h_{(v,\rho(s),F,\mathcal{B})}$ assigns mass one to the point $\rho(s)$ if this outcome is not inefficient.

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), together with parameter $F \in \mathcal{F}$ and belief system $\mathcal{B} = (\mathcal{B}_A, \mathcal{B}_P)$, gives player i an expected payoff of

$$\sum_{v \in V} \alpha(v) u_i (h_{(v,\rho(s(v)),F,\mathcal{B})}, v).$$

We say that a contract f is **implementable with no commitment** if one can find a mechanism $g = (S, \rho)$, $F \in \mathcal{F}$, and a belief system \mathcal{B} such that (1) some equilibrium s of the game $\Gamma(g, h)$ induces the outcome dictated by contract f in every state of the world (i.e., $f(v) = h_{(v,\rho(s(v)),F,\mathcal{B})}$ for every $v \in V$) and (2) \mathcal{B} is derived from s through Bayes' rule whenever possible. In this case, we say that g implements f .

6.2 Proofs

Lemma 1. *Suppose that f is implementable with commitment. Then, for every $v_A \in V_A$, there exists $T(v_A) \in \mathbf{R}$ such that the following holds: If*

⁴¹For 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.

$v_B > T(v_A)$, B signs the player under $f(v_A, v_B)$, and the monetary transfers received by the player and A add up to $T(v_A)$. If $v_B < T(v_A)$, there is no transaction with B under $f(v_A, v_B)$.

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

$$u_B(\rho(s(v)), v) \geq 0, \quad \text{all } v \in V, \quad (4)$$

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

$$u_B(f(v), v) \geq u_B(f(v_A, \tilde{v}_B), v), \quad \text{all } v_B \in V_B, v = (v_A, v_B) \in V. \quad (5)$$

Fix $v = (v_A, v_B)$ and \tilde{v}_B such that $f(v)$ 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

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

which follow from (5), 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

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

But since B can guarantee himself a payoff of 0 (see (4)), the desired result follows. \parallel

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 changes team 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 F is sufficiently high then (1) the mechanism described in Subsection 3.2 implements f^* and (2) f^* maximizes the sum of the parties' date-0 expected payoffs. \parallel

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

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

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

$$x_P(f^\circ(v)) = x_P(f(v)), \quad \text{all } v \in V,$$

and

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

the desired conclusion follows. ||

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