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Intellectual Property Contracts: Theory and Evidence from Screenplay Sales

by

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ABSTRACT

This paper presents a model of intellectual property contracts. We explain why many intellectual property contracts are contingent on eventual production or success, even without moral hazard on the part of risk-averse sellers. The explanation is based on differences of opinion between buyers and sellers, and reputation building through multiple transactions. Our model predicts that more reputable sellers will be offered a very different mix of cash and contingency payments than inexperienced sellers. We also discuss the probability of sales as a function of seller and product characteristics. The theoretical model is tested on a data base of screenplay contracts.

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1. Introduction

Every new product or service starts with an idea. This idea, in the form of a patent, architect's design, a sketch of a new product or a screenplay, is sold to a commercial entity that produces the product and brings it to market. We refer to the idea for a new product, in whatever form, as intellectual property (IP). Examples, in addition to those just mentioned, abound. A small biotech company may sell a compound to a pharma giant who can develop it into a useful drug. A new design may be sold to a company who may or may not be able to turn it into a useful product. Research papers are submitted to journals for evaluation and possible publication. In the movie industry, deals of the type we have in mind are most common, for example writers sell screenplays or novels to movie studios.

One of the most puzzling empirical regularities in many IP contracts is that oftenproperties are sold on a contingency basis, i.e., part of the seller's compensation depends on the eventual production or success of the property. This is puzzling because these sales rarely involve moral hazard on the part of the seller (once a patent or a screenplay is sold, no more work is required on the part of the seller), and, most often the seller (an individual or a small family owned business) should be much more risk averse than the buyer (typically a large corporation). The natural equilibrium contract in such cases should be an all cash contract, and yet it is not – in addition to the casual evidence we provide, 62% of the contracts in our screenplay datasetare contingent upon production.[1] Our study seeks to explain this puzzle and provide a general frameworkfor analysis of IP and other contracts.

Although the seller of the intellectual propertymay receive an immediate payment, in most cases,an important implication of the sale is the effect on the seller's reputation, which may determine her entire future income. For example, a successful design by an architect may lead to more commissions and higher profits, and successful writers may receive large advances in the future. Consequently, we view reputation formation as a key ingredient in understanding IP contracts.

There are several other important characteristics of IP on which we focus. First, since the property is not a standardized productand each sale is unique,[2] seller and buyer may have very different subjective probability assessments as to the seller's ability to create a valuable property. Second, the buyer may be able to generate information about the value of the property after purchasing it but before investing in the production of the final product.The analysis here is different than much of the other work on contract design, because of the lack of moral hazard issues.[3]

There are some recent papers that consider the impact of different assessments and beliefs on pay and capital structure decisions, and some of the ideas are similar, but there are important differences. In

[1] Screenplays may be extensively changed prior to or during production. However, the contractual set-up is such that once a screenplay is sold, the writer has no more rights to the property and generally changes are made by other people (the professional term is screen doctors.)

[2] Even designs for consumer products are unique IP. A design for a new car is different than any other design even if the finished product is mass produced.

[3] In this regard, our model differs from much of the career reputation literature (e.g. Jensen and Murphy (1990), Gibbons and Murphy (1992)) where the purpose of the contract is to induce optimal effort. Thus, for example, in such models, stronger incentives are required towards the end of someone's career, since a given level of performance sensitivity will have much less of an impact when the remaining career is short. Our model is more in line with ability revelation models (on these distinctions see for example, Greenwald (1986), Gibbons and Katz (1992), Topel and Ward (1992), Von Wachter and Bender (2006) or Waldman (1984)) but again, with no effort component and with uncertainty on both sides.

particular, moral hazard plays a key rolein these papers but not in ours,andreputation effects are important in our work but not in these studies(see Adrian and Westerfield (2009) and Landier and Thesmar (2009)).

Much of the literature on IP is concerned with legal aspects of contracting or protection of IP rights (see for example, Varian (2000, 2005) or Schankerman and Scotchmer (2001)). One of the reasons that IP contracts have not attracted much academic attention is the lack of adequate data. There are very few details on contracts for architectural designs or books(see Chevalier and Mayzlin (2006)) or in fact on most other contracts. There has been work on patents and bio-technology contracts (see for example Lerner (1995)and Lerner and Merges(1998)).[4]Movie industry contracts have also not been generally available (Chisholm(1997) discusses a small sample of star contracts). We use a unique data set on screenplay sales which provides us with contract information amenable to analysis. In addition, we have information about the resulting film projects.

Our theoretical model suggests that inexperienced producers of IP should be offered a very different set of contracts than more experienced producers, and that the nature of the property offered for sale should affect the contractual features. Naturally, less well-known sellers receive lower total compensation, but it is the different structure of the contract that may be surprising. For example, the contracts of inexperienced sellers with different reputations are likely to differ in terms of contingency payments rather than cash payments (more reputable sellers will have higher contingency payments). Just the opposite is likely to be the case for more established sellers. That is, established sellers with better reputations will enjoy greater cash payments than established sellers with lesser reputations. Most other papers derive different contractual features in response to incentive requirements. Our model suggests that there may be other drivers behind the various types of contracts that we observe. We test our model on the contractual features of screenplay sales, and the results are consistent with the theory.

The remainder of the paper is organized as follows. Section 2 describes the model; we present our comparative statics results in section 3 and our empirical tests in section 4. Section5concludes. Appendices A – E present technical results, variable definitions and additional institutional background.

2. Model

The model incorporates many of the features discussed earlier, in a simple, discrete framework. All notation is explained as we go and summarized in appendix A as well.

Consider a seller (*S*, she) of a piece of intellectual property and a producer (*P*, he) who uses the property to produce a final product.[5]*P* is risk-neutral, and both players live a finite number of periods, denoted by *T*, and discount future payoffs using a discount factor $\beta \in (0,1)$. *S* is risk averse in a special

[4] Venture capital (VC) contracts, for which there are good data, are similar to IP contracts in that entrepreneurs pitch ideas to venture capitalists. There is, however, an important difference from the case of IP. If the venture capitalist "buys" the idea (i.e., funds the resulting entity that brings the idea to market), the entrepreneur usually continues to provide services to the resulting entity. Consequently, there is a moral hazard issue that results in contracts that are complicated functions of the sequence of outcomes realized by the firm. As mentioned previously, suppliers of IP generally do not continue to be involved in producing the final product once their property has been sold. Consequently, many features of VC contracts, such as heavy dependence on final outcomes and exit provisions, are rarely observed in IP contracts (for empirical analyses, see for example Kaplan and Stromberg (2003), Lerner and Merges (1998), or Bengtsson and Ravid (2010); for theory, see Harris and Raviv (1989, 1995), or Ravid and Spiegel (1997)).

[5] Having many identical producers would not change results as long as (i) producers do not disagree with each other regarding the initial reputation of the seller, (ii) the seller can negotiate with at most one producer for each property, and (iii) in each period, producers who do not negotiate with the seller in that period, can infer any information generated by the producer with whom the seller does negotiate in that period (later we argue that this is the case in our empirical setting).

sense described below. Each period, *S* generates a piece of intellectual property that can be either "good" or "bad," but importantly, quality is not perfectly observable by either player. *S* can be either competent or incompetent. Competence does not change over time, however, the two players may have different probabilities that *S* is competent at any given period. We denote by q_t^i player *i*'s ($i \in \{P,S\}$) probability that *S* is competent as of the beginning of period *t*. We refer to q_t^P as *S*'s *reputation* at the beginning of period *t*. We assume that, initially, *S* believes she is competent with higher probability than does *P*, i.e., $q_1^S > q_1^P$.[6] Since we will assume that both players are Bayesian and have the same information, it follows that $q_t^S \geq q_t^P$, for all *t*.[7] In general, we denote by $\Pr_i(E)$ the probability that player $i \in \{P,S\}$ assigns to the event *E*.

A competent *S* generates a good property each period with probability $s > 0$, while an incompetent *S*cannot generate a good property (probability 0).[8] If *P* develops the seller's property into an output,[9] we say that *P* "produces" the property. It costs the producer *e* to produce any property, good or bad. A good property, if produced, yields revenue *v*. We assume $v > e$. Both *v* and *e* are exogenous parameters. A bad property, if produced, yields zero revenue.

If *P* purchases a property, he may then perform an initial evaluation to ascertain whether the property is good or bad. This evaluation is assumed to be free, and it results in a noisy signal $\tilde{R} \in \{g,b\}$ of the property's quality such that

$$\Pr\left(\tilde{R} = g \middle| \text{good property}\right) = \Pr\left(\tilde{R} = b \middle| \text{bad property}\right) = r \in \left(\frac{1}{2}, 1\right).$$

Thus, a good signal ($\tilde{R} = g$) is more likely than a bad signal ($\tilde{R} = b$) if the property is good, i.e., $r > 1/2$, and conversely, a bad signal is more likely if the property is bad. One can think in this context of r as the probability of receiving the "correct" signal, so *r* measures the quality of *P*'s signal. The assumption that the accuracy of the signal is the same for both good and bad properties simplifies the exposition but doesn't affect the results.

The object of our analysis is to characterize the contracts between seller and buyer that will arise in the environment just described. In this context, a contract specifies an upfront cash payment, denoted *c*, and subsequent payments that are contingent on the outcome of the production (if any), denoted k_v if the production succeeds (and revenue is *v*) and k_0 if the production fails (and revenue is 0). Note that a contract that offers a contingent amount that is paid if and only if the property is produced, but does not depend on revenue, is a special case in which $k_v = k_0$.This is the case in our screenplay data.

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[6]There is a large literature on over-confidence and excessive optimism that justifies this characterization (see for example, Hong and Kubik (2003), Malmendier and Tate (2005, 2008) or Graham et al. (2010)).

[7] We will also assume presently that, if *S* is competent, this is revealed if a property is successfully produced. In that event the two probabilities will both be one for all subsequent periods. Otherwise *S*'s probability that she is competent will continue to exceed *P*'s. The difference may change over time however.

[8] The assumption that an incompetent seller cannot produce a good property implies that once a seller produces a successful property, he is identified as a competent seller with certainty. All our results will go through if the probability that an incompetent seller produces a "good" property is positive as long as the probability that a competent player produces a "good" property is higher. The current assumption simplifies the analysis, allowing us to focus on the important features of the reputation building process.

[9] To distinguish the intellectual property input from the final product, we refer to the former as a "property" and the latter as an "output."

In general, one can imagine that any of the payments, c, k_v, and k_0 could be negative. That is, *S* may be willing to pay *P* to acquire the property (in order to generate the signal of its quality) or to produce an acquired property (again to generate information about the property and hence about the seller's competence). In many markets, including the market for screenplays we use to test some implications of the model, there are minimum cash payments dictated by a union, and contingency payments are constrained to be non-negative. Consequently, in much of the analysis we assume that $c \geq c_0 > 0$ and $K \equiv (k_v, k_0) \geq 0$.[10]

In order to model risk aversion in a simple fashion, we also assume that *S*"discounts" contingency payments relative to non-contingent payments. In particular, we assume that each $1 contingency payment is worth only $\$\alpha$ to *S*, where $\alpha < 1$. This assumption leads to "bang-bang" contracts that involve choosing either the largest feasible contingency payment if q^S is sufficiently large relative to q^P or the smallest such payment otherwise. With explicit risk aversion, solutions would generally be "interior," but their behavior in response to changes in the exogenous parameters would be similar.

In addition to the assumptions made so far, we also assume that the buyer has all the bargaining power. This may seem somewhat too simplistic, but we also assume that, as the seller's reputation improves, her disagreement outcome improves(that is, one must pay her more to satisfy her participation constraint). This set-up is analytically similar to assuming that the two players split the rents in some fixed proportion, while greatly simplifying the calculations.

To summarize the model, we provide the timeline for each period:

1. *S* makes a pitch to *P*.
2. *P* and *S* negotiate a contract, (c, K).
3. If the property is sold,*P* pays *c* to *S* and
   a. *P* receives the signal $\tilde{R} \in \{g, b\}$;
   b. *P* decides whether to produce the property;
   c. If *P* produces the property, the revenue (*v* or 0) is realized and publicly observed;*P* pays k_v or k_0 to *S*;
   d. Both players update their probabilities that *S* is competent.
4. If the property is not sold, neither player updates his/her probability that *S* is competent.

2.1. The producer's production decision

We solve the problem backwards. First, we analyze *P*'s decision whether to produce a property that he has purchased. Since any upfront cash payment *c* is sunk at this point, given contingency

[10] If we drop the constraints that the cash payment must exceed a minimum amount and the contingency payments must be non-negative, two outcomes that are ruled out by these constraints may become feasible, depending on parameter values. The first is that the seller is willing to pay the buyer to obtain the preliminary signal, even if there is no chance the buyer will actually produce the property. The second is that the seller is willing to pay the buyer to produce a property to generate the additional information provided by the success or failure of the project, even if the preliminary signal is bad. The first case can be ruled out with some relatively innocuous assumptions regarding the seller's outside opportunity. The model can easily accommodate negative payments at some cost in terms of the number of feasible cases. Results, however, would not be very different from those obtained below.

payments *K*, a signal realization *R* and *P*'s current probability q^P that *S* is competent, *P*'s expected payoff if he produces the property is given by

$$G\left(R,q^P\right)v-e-\left(G\left(R,q^P\right)k_v+\left(1-G\left(R,q^P\right)\right)k_0\right), \tag{1}$$

where $G\left(R,q\right)=\Pr\left(\text{property is good}\,\middle|\,R,q\right)$. Using Bayes' Rule, we have

$$G\left(R,q\right)=\frac{r_R qs}{r_R qs+\left(1-r_R\right)\left(1-qs\right)}, \tag{2}$$

where $r_g=r$ and $r_b=\left(1-r\right)$.

P will produce apurchased property, given signal *R*, if and only ifhis expected payoff in (1) is non-negative. To simplify the problem, we assume that the parameters are such that the property's expected payoff given a good signal is positive, at least if*P* believes *S* is competent for sure ($q^P=1$) and that the property's expected payoff given a bad signal is negative, even if *P* believes *S* is competent for sure ($q^P=1$). Formally, we assume

$$G\left(g,1\right)v-e>0>G\left(b,1\right)v-e. \tag{3}$$

This allows us to prove the following, simple lemma.

Lemma 1.*P* will not produce a property whose signal is bad under any feasible contract.

Proof. Since *G* is increasing in its second argument, condition (3) implies that $G\left(b,q\right)v-e<0$ for all *q*. Consequently, our assumption that contingency payments must be non-negative implies that *P*'s expected profit as given in (1)is negative if $R=b$.■

Given Lemma 1 and expression(1), the necessary and sufficient condition for *P* to produce a property he has purchased is that $R=g$ and

$$G\left(g,q^P\right)v-e\geq G\left(g,q^P\right)k_v+\left(1-G\left(g,q^P\right)\right)k_0. \tag{4}$$

We now characterize the probability of production as perceived by each player. At the beginning of any period, before the signal *R* is observed but after the property is sold (if it is sold), player *i*'s probability that the property is produced depends on the contract (specifically, the contingency payments) and player *i*'s beliefs about *S*'s competence. Let $Q=\left(q^P,q^S\right)$ denote the current *state of beliefs* about *S*'s competence, and let

$$\pi^i\left(Q,K\right)=\Pr_i\left(\text{current property is produced}\,\middle|\,Q,K\right),\ i\in\left\{P,S\right\}$$

denote player *i*'s probability that the current property will be produced, given *Q* and the contingency payments*K*. As noted above, if (4) fails, the property will not be produced. If (4) holds, the property will be produced if and only if $R=g$. Therefore, before the signal is observed, player *i*'s probability of productionis given by,

$$\pi^i\left(Q,K\right)=\begin{cases}0,\ \text{if } G\left(g,q^P\right)v-e<G\left(g,q^P\right)k_v+\left(1-G\left(g,q^P\right)\right)k_0,\\ \gamma\left(q^i\right),\ \text{if } G\left(g,q^P\right)v-e\geq G\left(g,q^P\right)k_v+\left(1-G\left(g,q^P\right)\right)k_0,\end{cases} \tag{5}$$

where $\gamma(q)$ is the probability that *P* receives a good signal, given that *S* is competent with probability *q*, i.e.,

$$\gamma(q) = \Pr(R = g|q) = rqs + (1-r)(1-qs)\ . \tag{6}$$

Note that, since $r > 1/2$, γ is an increasing function of *q*. Recall that the probability that the seller is competent from the point of view of the producer, q^P, is smaller than from the point of view of the seller, q^S. Consequently,from *P*'s point of view, the probability of a good signal and hence the probability that the property will be produced (which depends on receiving a good signal), is smaller than from *S*'s point of view.

2.2. Evolution of beliefs about S's competence

In this section we calculate how beliefs of the two parties evolve as information arrives. As mentioned above, we assume that, if the property is produced, the revenue generated is public information. This describes well the screenwriting market used in our empirical tests as well as many other markets. In our model, revenuesshow whether the property is good or bad (remember, good properties yield $v > 0$ for sure, while bad properties yield 0 for sure).[11]Realized revenue also provides information about the seller's competence; in other words, if a production yields *v*, both players will be certain that*S* is competent (only a competent *S* can produce a good property). On the other hand, if the production yields 0, revealing that the property is bad, the players cannot be sure whether *S* is incompetent (in which case her property is bad for sure), or she is competent but "unlucky," an event with probability $1-s$.

We also assume that whether a property that is sold is actually produced is publicly observable. Again, this is common in IP markets. In our model, the signal can be inferred from whether or not the property is produced, since it is produced if and only if the signal is good.

We can now prove the following property of the players' beliefs regarding *S*'s competence.

Lemma 2. A good signal increases both players' probability assessments that *S* is competent, relative to its current value, whereas a bad signal decreases both players' probability assessments that *S* is competent. Finding out for sure that the property is bad (which happens when revenue is zero) decreases both players' probabilities that *S* is competent even more than does a bad signal.

Formally, if we define $F(R,q^i) \equiv \Pr_i(S \text{ is competent}|R,Q)$ and $z(q^i) = \Pr_i(S \text{ is competent}|\text{revenue} = 0,Q)$, then

$$1 \geq F(g,q) \geq q \geq F(b,q) \geq z(q) \tag{7}$$

with equalities if and only if $q = 1$. In particular, the above statements apply to *S*'s reputation (recall, *S*'s reputation is defined to be *P*'s probability that *S* is competent).

Proof. Using Bayes' Rule,

$$z(q^i) = \frac{\Pr(\text{revenue} = 0|S \text{ is competent})q^i}{\Pr(\text{revenue} = 0|S \text{ is competent})q^i + 1(1-q^i)} = \frac{(1-s)q^i}{1-q^i s}\ . \tag{8}$$

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[11] That is, revenue is a sufficient statistic for the pair (revenue, signal) for updating beliefs about competence. Consequently, if revenue is observed, the signal is irrelevant for one's posterior about *S*'s competence.

For player $i \in \{P, S\}$,

$$F\left(R, q^i\right) = \frac{\Pr\left(R \middle| S \text{ is competent}\right) q^i}{\Pr_i\left(R \middle| Q\right)}.$$

But

$$\Pr\left(R \middle| S \text{ is competent}\right) = r_R s + \left(1 - r_R\right)\left(1 - s\right).$$

Therefore,

$$F\left(R, q^i\right) = \frac{\left[r_R s + \left(1 - r_R\right)\left(1 - s\right)\right] q^i}{\Pr_i\left(R \middle| Q\right)} = \begin{cases} \dfrac{\left[rs + \left(1 - r\right)\left(1 - s\right)\right] q^i}{\gamma\left(q^i\right)}, \text{ if } R = g, \\ \dfrac{\left[\left(1 - r\right)s + r\left(1 - s\right)\right] q^i}{1 - \gamma\left(q^i\right)}, \text{ if } R = b. \end{cases} \tag{9}$$

It is easy to verify that (7) holds using the formulas in (8) and (9).■

The properties of beliefs described in Lemma 2 are intuitive: good signals raise the likelihood that the seller is competent, while bad signals lower it; failure of the produced property is worse news than a bad signal, a property we think is realistic. The formal characterization of the evolution of beliefs is an important stepping stone for characterizing the equilibrium contracts but is not essential for understanding the results. Consequently, the formal derivation is presented in appendix A.

2.3. Equilibrium contracts

As mentioned above, we assume that the producer collects all the rents from production, but an increase in the seller's reputation increasesthe value of her next best opportunity. In other words, after a successful production, a producer will have to pay more to satisfy the seller's participation constraint in the future. A possible interpretation of the increased opportunity cost is that the seller can sell the property in another market or obtain some other employment related to her work on the property in question.We refer to the seller's outside opportunity as the "secondary market," while the IP market modeled above is referred to as the "primary market."[12]We also assume for simplicity that no information about the seller's competence in the primary marketis generated by her activity in the secondary market.

Given the assumption that the opportunity cost only changes as a result of events in the primary (IP) market, then, if, in the current period, there is no contract acceptable to both *S* and *P*, no contract will be acceptable to both in any future period, since neither player's beliefs about *S*'s competence will change in the interim. We summarize this implication in the following lemma.

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[12]One interpretation of the seller's alternative is that she can sell the same property to someone else. For example, screenplays not sold to movie producers may be sold to television networks. In this latter case, sellers with better reputations *as screenwriters* can expect to receive higher compensation from TV networks. Alternatively, the seller's outside opportunity may be a salaried position in a secondary market in which her productivity is related to her ability to create intellectual properties. For screenwriters, this might correspond to writing scripts for a TV series. The institutional reality is consistent with our assumptions. While writers with a good reputation in the screenplay market can snag good long term deals (pacts, in professional terminology), a writer can work for long periods on a hit TV series without having much impact on his or her reputation. As Michael Schneider notes in Variety ("Back on Track," 7/19-25/10), "What's hard [for reputation and money] is if you are, say, the third guy on Fringe [a hit TV show]." Similarly, if an academic research paper is published in a major journal or presented in a major meeting (the primary market), there will be many discerning readers and "reviewers." On the other hand, if it is presented only in poorly attended meetings or published in a low impact journal, there may be no competent evaluations.

Lemma 3. If it is optimal for *S*to participate in the secondary market in any given period, it is optimal to continue to do so until the last period, i.e., *S*'s optimal strategy is to switch to her outside opportunity for the current and all remaining periods.

If we denote by $w(q)$ *S*'s per-period payoff in the current and all future periods from participating in the secondary market if her current reputation is q, the present value of *S*'s outside option at period *t*, given that her reputation at that period is *q*, is given by

$$u_t(q) = w(q)A(\beta, T-t+1), \tag{10}$$

where $A(\beta,n) = \left[\dfrac{1-\beta^n}{1-\beta}\right]$ is the annuity factor for an annuity that begins immediately (an annuity due), and lasts *n* periods, including the current period, discounted at rate $\dfrac{1}{\beta}-1$.

We make the following, additional assumptions about *S*'s outside option:

Assumption. $w' \geq 0$ with strict inequality for some values of q^P, *w* is weakly convex, and $w(0) \geq c_0$.

The first property just reflects the assumption, discussed above, that the seller's compensation in the secondary market is increasing in her reputation in the primary market. Convexity of *w* is used in analyzing the comparative statics of the equilibrium outcomes. The assumption that $w(0) \geq c_0$ implies that $w(q) \geq c_0$ for all *q*, since *w* is increasing. This allows us to ignore some uninteresting cases.

We now calculate the present value to *S* of accepting a contract (c,K). Let $U_t(Q)$ denote the present value, at the beginning of period *t*, of *S*'s current and future income, given *Q*(reputation)*assuming equilibrium contracts*. Then the valueto *S* of a given contract (c,K), which may or may not be an equilibrium contract, given *Q*, is:

$$\hat{U}_t(Q,c,K) \equiv c + \pi^S(Q,K)\alpha\left[G(g,q^S)k_v + \left(1-G(g,q^S)\right)k_0\right] + \beta E^S\left[U_{t+1}(\tilde{Q}')\middle| Q,K\right], \tag{11}$$

where E^i is the expectation using *i*'s beliefs, and $\tilde{Q}'$ is the random variable whose realization is next period's state of beliefsand whose distribution is calculated in appendix A.

Next let $\hat{V}(Q,c,K)$ denote *P*'s expected payoff for a contract (c,K) in any period in which the state of beliefs is *Q*. We assume that the producer cares only about his payoff for the current property. That is, *P*has no interest in learning about the seller.[13] *P*'s expected payoff for the contract is the probability that the property is produced, $\pi^P(Q,K)$, times his expected profit (net of the expected contingency payment), given that the property is produced, minus the cash payment, *c*. Formally,

$$\hat{V}(Q,c,K) = -c + \pi^P(Q,K)\left[G(g,q^P)(v-k_v) - \left(1-G(g,q^P)\right)k_0 - e\right]. \tag{12}$$

Since a necessary condition for the property to be produced is that the signal is good, in equation(12) ,*P*'sexpected revenue, *given that the property is produced*, is the probability that the property is good,

[13]If there are many producers but, as we assume here, all information is common knowledge, the free-rider problem may result in the private value of information about a seller being negligible.

given that the signal is good and P's belief q^P that S is competent, i.e., $G\left(g,q^P\right)$, times the revenue if the property is good, v.

Note from equation (12), that when $\pi^P\left(Q,K\right)=0$, $\hat{V}\left(Q,c,K\right)=-c$, i.e., if the property will not be produced for sure, P's payoff is simply the negative of the cash payment to S. Since we require this cash payment to be positive, any property bought by P under a feasible contract for which the property will surely not be produced yields P a negative payoff. We assume, however, that P's payoff in any period in which he does not buy the property is zero. This yields the following lemma.

Lemma 4. No property will ever be bought by P under a contract in which the property will certainly not be produced.[14]

In what follows, therefore, we focus on contracts that satisfy condition (4), i.e., the condition that it is profitable to produce properties that receive a good signal.

We define an equilibrium sequence of contractsas a sequence of contracts $\left\{c_t\left(Q\right),K_t\left(Q\right)\right\},t\in\left\{1,\ldots,T\right\}$ such that, for each $t\in\left\{1,\ldots,T\right\}$, $\left(c_t\left(Q\right),K_t\left(Q\right)\right)$ solves

$$\max_{c\geq c_0,K\geq 0}\hat{V}\left(Q,c,K\right), \tag{13}$$

subject to(4),

$$\hat{U}_t\left(Q,c,K\right)\geq u_t\left(q^P\right), \tag{14}$$

and

$$U_t\left(Q\right)=\hat{U}_t\left(Q,c_t\left(Q\right),K_t\left(Q\right)\right). \tag{15}$$

We refer to the above problem as *the equilibrium problem*.

The objective function in the equilibrium problem, (13), is simply P's expected payoff inperiod t for the contract $\left(c,K\right)$, given the state of beliefs, Q. This reflects our assumption that P extracts all the surplus from any transaction with the seller. Condition (14) is the seller's participation constraint, given her current reputation. Equation (15), together with equation (11), defines the sequence $\left\{U_t\left(Q\right)\middle|t\in\left\{1,\ldots,T\right\}\right\}$ recursively, given $U_{T+1}\left(Q\right)\equiv 0$.

Let $V_t\left(Q\right)$ denote the value of the solution to the equilibrium problem when the state of beliefs is given by Q. As mentioned above, if the property is not sold, we assume P's payoff is zero in that period. Thus, the property is sold in period $t$when beliefs are given by Qif and only if $V_t\left(Q\right)\geq 0$.

We can characterize the solution of the equilibrium problem fully as follows. Denote $E^S\left[U_{t+1}\left(\tilde{Q}'\right)\middle|Q,K\right]$ for K which satisfies(4) by $\bar{U}_t\left(Q\right)$.Note that $\bar{U}_t\left(Q\right)$ is independent of K, since, if the property is produced if and only if $R=g$, the evolution of beliefs depends only on the signal and revenue (if the signal is good), as can be seen fromTable A. Also, define

$$\delta_t\left(Q\right)=u_t\left(q^P\right)-\beta\bar{U}_t\left(Q\right). \tag{16}$$

[14] If the cash payment were not constrained to be positive, P might be able to extract a payment from S in return for generating the signal, and a property could be sold under such a contract.

The quantity $\delta_t(Q)$ is the smallest *current* payoff in period *t* that the IP contract must provide the seller for her to participate, taking account of the value to her of the secondary market, $u_t(q^P)$, and any future reputational benefits $\beta\bar{U}_t(Q)$. Using this notation and substituting for $\gamma(q)G(g,q)$ using (2) and (6), we restate the equilibrium problem as

$$\max_{c\geq c_0, K\geq 0} -c-\left[rq^P sk_v+(1-r)(1-q^P s)k_0\right]+\gamma(q^P)\left[G(g,q^P)v-e\right], \tag{17}$$

subject to (4) and

$$c+\alpha\left[rq^S sk_v+(1-r)(1-q^S s)k_0\right]\geq \delta_t(Q). \tag{18}$$

This version makes it clear that the expected cost to *P* of a payment k_v to *S* that is contingent on a successful production is $rq^P sk_v$, while the benefit to *S* of such a payment is $\alpha rq^S sk_v$. Thus, if

$$\alpha q^S \geq q^P, \tag{19}$$

this contingency payment is more valuable to *S* than to *P*. It follows that it should be set as large as possible subject to the constraint (4)that *P* will produce the property if he receives the good signal *g* and subject to *S*'s participation constraint, (18). If the reverse inequality holds, then this contingency payment should be zero.The same analysis applies to the payment contingent on an unsuccessful production, k_0, but the relevant condition for a positive value of this payment is

$$\alpha(1-q^S s)\geq 1-q^P s. \tag{20}$$

It is easy to check that our assumption that *S* is more optimistic than *P*, $q^S \geq q^P$, implies that condition (20) cannot hold. That is, *S*'s relative optimism implies that any "bets" between her and *P* should involve *S* betting on *success*, not failure. Consequently, for any equilibrium contract, the contingency payment for an unsuccessful production will be zero.[15] Henceforth, we denote k_v by *k* and drop k_0 from the model.

The full solution of the equilibrium problem is derivedformally in appendix B and summarized in Table B(also in appendix B) following the derivation.

3. Comparative Statics Results

In this section, we trace the effects of varying the exogenous parameters, such as the seller's reputation, her opportunity cost, and the minimum cash payment on the likelihood of a sale and the contract provisions. In section 4, we test many of theseimplicationsusing our screenplay data.

As suggested by our analysis of the equilibrium problem above, a critical element in many of the propositions is the relative magnitudes of αq^S and q^P which measure the difference between the beliefs of the seller ("discounted" for risk aversion) and those of the buyer. As the expectations of the buyer and seller converge over time, αq^S tends to become smaller than q^P, since $\alpha<1$. Thus, we expect condition

[15]Payments contingent only on production are equivalent to equal positive payments contingent on success and failure. In the screenwriter contracts for the period covered in our empirical tests, the only contingency payments are those contingent on production, despite repeated requests from the screenwriters to include revenue contingencies. In recent years, revenue contingencies have become more frequent, but, given our data, in deriving predictions for our empirical tests, we constrain the two contingency payments to be the same.

(19)to be true for less experienced sellers with little or no track record, but not for more experienced sellers. As we will see, the propositions below use this property to paint very different worlds for experienced and inexperienced sellers.[16] For ease of exposition, if condition (19) holds (fails), we will say that the seller is *effectively* more (less) optimistic than the buyer. Note that for the seller to be effectively more optimistic than the buyer, she must either be much more optimistic (q^S much greater than q^P) or more optimistic and not too risk averse (α close to one).

Since *S*'s participation constraint, (18), is not binding in all cases (namely, when $\delta_t(Q) < c_0$), it is difficult to characterize $\bar{U}_t(Q)$ and, hence, $\delta_t(Q)$ in general. The participation constraint is binding in the last period, however, since $\bar{U}_T(Q) \equiv 0$,so $\delta_T(Q) = w(q^P) \geq c_0$. Consequently, in the second-to-last period, $\bar{U}_{T-1}(Q) = E^S\left(w\left(\tilde{q}^{P\prime}\right)\middle|Q\right)$, where $\tilde{q}^{P\prime}$ is next period's value of q^P. Therefore, two periods provide a very good sense of how the contracts evolve over time, and in order to obtain comparative statics results, we proceed with a two-period model, i.e., $T = 2$. Most of the mathematical analysis, including proofs of all propositions in this section, is relegated to appendix C.

Our first result analyzes the impact of changing the minimum cash payment on the likelihood of a sale and on the equilibrium contract.[17]

Proposition 1. An increase in the minimum cash payment

- May make a sale less but not more likely;
- Will either increase the cash payment and reduce the contingency payment (unless it is already zero) or have no effect on either.

Discussion. The proposition is intuitive – any constraint on the contractual form will decrease the probability of a deal. The second part says that as the buyer is forced to increase the cash portion of the contract, he will compensate by decreasing the contingency payment, if possible.This proposition, while straightforward, suggests that any minimum payments, such as the guild-mandated prices in the case of screenplays, hurt the sellers of intellectual property since they may lower the probability of sale. This proposition has important policy implications – we show here that in an equilibrium framework, minimum payments will decrease the welfare of the seller.It is, however, difficult to test this result empirically, since we do not have data on properties that were offered for sale but were not purchased.

Proposition 2. As the profitability of a successful production, v, goes up, the probability of a sale goes up, but there is no effect on either payment.

Discussion. The first part of the proposition is straightforward – as a prospective project becomes more attractive, there is a better chance that the property that leads to that project will be sold. The second part is less intuitive. In our model, a seller's compensation is determined by the value of her secondary market alternative, the seller's and buyer's beliefs about the seller's competence, and the values of various parameters related to the probability that the property is of high quality. The value of

[16] We prove each proposition for the terminal period and for a non-terminal period. In most cases, the properties are similar, leading us to believe that our propositions can be generalized to *T* periods.

[17] We use the phrase "a sale is less likely" (respectively, "a sale is more likely") to mean that a change in the given parameter or variable results in a smaller (larger) set of values of the other parameters and variables for which a sale will occur.

the seller's secondary market alternative, in turn, depends only on the seller's reputation. None of these quantities is affected by how successful a successful production is.[18]

Proposition 3. For either date, more reputable sellers (those with higher q^P) will have different contracts than less reputable ones. In particular, if the seller is effectively <u>more</u> optimistic than the buyer, then the contingency component will be larger for more reputable sellers. If the seller and buyer agree on the probability of competence (or, more generally, if the seller is effectively less optimistic than the buyer), then the cash component will be larger for more reputable sellers. Moreover, if a seller's reputation increases from one period to the next, her cash payment also increases.

Discussion. This is the first proposition where the inequality discussed at the beginning of this section (condition (19)) matters. As mentioned there, we expect condition (19)to be true for less experienced sellers with little or no track record, but not for more experienced sellers. Proposition 3 therefore suggests that, if a sale does take place, cash payments will likely increase with reputation for sellers at later stages of their careers. On the other hand, for inexperienced sellers, even if reputation increases, only contingency payments go up. Intuitively, since the buyer is less convinced than the seller that the seller is competent, it is efficient to offer the larger compensation necessary to induce a sale by a more reputable seller by increasing the contingency payment that will be paid only if the property is produced (i.e., the signal is good). This is the first and perhaps most important result that suggests a sharp difference between contracts offered to beginners and contracts offered to well-known sellers. The proposition also predicts that sellers whose reputations improve over time will enjoy larger cash payments, however, testing this prediction is difficult, because we have few observations of repeat sales by the same seller.Consequently, the implication we take to the data is the connection between cash contracts or a larger proportion of cash payments for experienced writers with a track record.

Proposition 4.As the seller's opportunity cost increases, a sale becomes less likely. If the seller is effectively more optimistic than the buyer, then increases in the opportunity cost lead to an increase in the contingency payment; otherwise cash payments will go up.[19]

Discussion. Here too we can see a stark difference between inexperienced and experienced sellers. For the former, who are likely to be much more optimistic than the buyer, the best they can expect when their opportunity cost goes up is higher contingency payments, whereas the experienced sellers, whose "effective" optimism is less likely to exceed that of the buyer, are more likely to enjoy larger cash payments.

Proposition 5. An increase in r (the quality of the signal), keeping reputation and project quality equal,makes a sale more likely, and also affects the cash and contingency payments. In particular, either payment, if it changes, will decrease.

Discussion. The intuition for the first part is clear. To understand the effect on the payments, it is important to recognize that an increase in signal quality increases the probability that the contingency payment will actually be paid. This probability is the probability of a good signal, given that the property is good, times the unconditional probability that the property is good. An increase in signal quality increases the former but does not affect the latter. Therefore, when the contingency payment is positive, if the signal quality increases, the producer can reduce the amount of the contingency payment while still ensuring the seller's participation, since the seller believes it is more likely that she will actually receive

[18] This result does depend on our assumption that the seller benefits from improved reputation only through its impact on her secondary market value. If the players were to split the rents in fixed proportion, for example, payments would be affected by an increase in v.

[19] For period 1, this result requires that the increment in the wage function not be too steep or convex in q. See the proof for a sufficient condition on the wage increment.

the contingency payment. Moreover, an increase in $r$in the first period also decreases the amount of current compensation required to ensure the seller's participation. This is because the increase in r increases the seller's expected future payments from continuing in the primary market. Thus the buyer can reduce the cash payment when it is not at the minimum while still ensuring the seller's participation.

Proposition 6. An increase in s (the effectiveness of a competent seller) increases the probability of a sale. If the seller is effectively more optimistic than the buyer, an increase in s will generally decrease the contingency payment, whereas if the seller is effectively less optimistic, the cash payment will decrease instead.

Discussion. The first part is straightforward: as properties become better on average, a sale becomes more likely. The key to understanding the second part is in recognizing that an increase in the competent seller's ability raises the probability (for both parties) that the property will be produced and the contingency payment will be paid. In the last period, this enables the buyer to reduce the contingency payment when the seller is *effectively* more optimistic than the buyer while keeping its expected value to the seller constant,thus not violating the seller's participation constraint. In the first period, there is a second effect of the increase in s, namely the amount of current compensation required to prevent the seller from switching to the secondary market decreases. This is because the increase in s increases the seller's expected future payments from continuing in the primary market. Thus, not only can the buyer reduce the contingency payment when the seller is effectively more optimistic, but he can also reduce the cash payment.In the opposite case in which the buyer is effectively more optimistic, the buyer will take advantage of these effects by reducing the cash payment instead.

Our model does not imply a specific correlation between contingent contracts and the probability of production. However, it can generate scenarios (sufficient conditions) under which such correlation exists. Since we would like to take this idea to the data, we can state the following:

Proposition 7. If either the probability of generating a good property (s) or the quality of the signal (r) or seller optimism (q^S) are sufficiently low, then properties sold under contingent contracts are less likely to be produced than properties sold under all cash contracts.

3.1. A summary of the results

The propositions above characterize intellectual property contracts. We can explain the presence of contingent contracts in the absence of moral hazard as an equilibrium outcome when there are disagreements about the probability of success, and as such, we would expect to see such contracts mainly offered to untried sellers. This is in contrast with reputation based moral hazard models which predict greater incentives at later stages of one's career. In our setup, once a seller has a track record, and beliefs of buyers and sellers are more similar, then risk aversion indeed kicks in and cash contracts are more likely.

We provide other important implications. We show that, somewhat counter-intuitively,improvements in the quality of the property, quality of the screening or the outcome will lead to better sales, but not necessarily to higher payments. This highlights the different nature of contingency payments in this framework. Economists are used to viewing contingency payments as providing incentives for more effort. However, here contingent contracts are merely intended to allow for a transaction in an environment with asymmetric beliefs and reputation building. Thus, as the probability of success exogenously increases, for the same seller, contingent payments decrease, since they are more likely to be paid.

These insights should be generally applicable to many types of transactions and in particular for intellectual property sales. Below we will see whether the main implications of the theory are consistent with the properties of contracts observed for screenplay sales.

4. Empirical Implications and Testing

Before turning to a description of the data, we must modify our general propositions of the previous section to account for the fact that, in the screenplay market, contracts rarely exhibit any significant dependence on the degree of success of any eventual film produced from the screenplay. Instead, contingent payments, when present, generally depend only on whether the screenplay is produced. Fortunately, incorporating this fact as a constraint in our model involves few modifications to our predictions.[20] These are as follows:

- The statement, “the seller is *effectively* more optimistic than the buyer” must now be interpreted formally as $\alpha\gamma\left(q^S\right) \geq \gamma\left(q^P\right)$ instead of condition (19). Similarly the statement “the seller is *effectively* less optimistic than the buyer” must be interpreted as the reverse inequality.
- Proposition 5: To conclude that the contingency payment decreases with an increase in the quality of the signal, we must make the additional assumption that the seller is sufficiently optimistic. Formally, this assumption is $q^S s > 0.5$.

Below are specific properties that we test on our screenplay data set.

1. *Reputation and contractual form*

Proposition 3 suggests that increases in sellers’ reputations may have two effects on the contract – first, directly, cash payments will increase. Second, indirectly, as reputation increases and the divergence in views between sellers and buyers is likely to decline, cash contracts may become the norm. Thus we expect a negative correlation between proxies for reputation and the probability of contingency contracts.

2. *Changes in opportunity costs*

From proposition 4, we expect increases in the opportunity cost of sellers to affect experienced and inexperienced writers differentially. Whereas experienced writers will receive more cash payments, inexperienced writers will receive more contingency payments. Thus our proxies for opportunity costs, interacted with experience or tested separately for experienced and inexperienced writers, should result in different effects on contracts. Unfortunately, none of our tests yielded significant results. This is likely due to the poor quality of our proxies for opportunity costs. Consequently, these results are not reported.

3. The probability of production

As noted, proposition 7 is only a statement of sufficient conditions. However, we can see whether there is a difference in the probability of production between cash and contingent contracts.

4.1. Data and background

Our data consists of 1269contracts for screenplay salesthat occurred between 1997 and 2003. Our main source of information is the 2003 *Spec Screenplay Sales Directory*, compiled by Hollywoodlitsales.com and used also in Goetzmann et al. (2012).The information provided on each sale usually includes: title, pitch, i.e. a paragraph or two that can be delivered in writing or orally by a writer or an agent (presumably, the pitch is provided by the agents of the buyer or seller), genre, agent,

[20] As mentioned previously, the restriction to production-contingent contracts can be seen as allowing outcome-contingent payments with the added constraint that all such payments be equal. The main effect is to change the criterion for the contingency payment to be more valuable to the seller than to the buyer from $\alpha q^S \geq q^P$ (condition (19)) to $\alpha\gamma\left(q^S\right) \geq \gamma\left(q^P\right)$. Since the function γ is increasing with respect to *q* and most of the parameters, the comparative statics are largely unaffected.

producer, date-of-sale, and buyer. Sometimes additional information is provided. This additional information (definite or tentative) may identify parties who are interested in the project.[21]

We have a purchase price for 777 scripts (61.31% of the total sample). The price may be precise (which we have for 224 scripts, 28.79% of scripts with available price, 17.65% of the total sample). In other cases, *Spec Screenplay Sales Directory* may record an approximate price (554 scripts),such as, mid-600's, or low 400's. In the latter case, we transform the price range into an estimate (for instance, low five figures is transformed into $25,000; high six figures is transformed into $750,000).[22]Prices are adjusted for inflation. [23]

Our main focus is on the type of contract offered. The first type is a fixed payment, non-contingent contract. There are 298 such screenplays in our sample (38%). Alternatively, the screenwriter may be offered a contingent contract (*Contingent*) – 479 of the scripts in our sample fit this description. (Note that there are 10 scripts for which we know the type of contract but not the price.) In a contingent contract the screenwriter receives an initial payment upon contract signing and an additional amount if the script is produced. As noted, in our model a seller may receive a different amount if the production "succeeds" or "fails". The typical screenwriter's contract, however, offers contingent compensation upon production, independent of the revenues of the resulting movie.[24] The average compensation in non-contingent contracts is (in thousands) $1,279. In contingent contracts, the average initial payment is much lower, $454; total compensation if the script is finally produced, including the initial payment, is $1112.

Selling a screenplay can be a lengthy and arduous process (see appendix D). To a large extent, decisions at every stage are based upon the pitch. The pitch must explain the potential appeal of the story, without the details of the actual script. The common belief in Hollywood is that a "high concept" script, one with a simple pitch, is more valuable, and easier to sell to readers and producers.[25]Our data set includes the screenplay "pitch" or "logline." Goetzmann et al. (2012) supports the idea that "softer" pitches are harder to sell and we will use some of the variables in that paper as control variables in our work.

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[21]Here are some examples of the additional information provided. The following comment was added to the description of the screenplay entitled "Kungfu Theater": "DreamWorks purchased project from Mandalay which bought it in September 2000 for six figures." An example of information about the screenwriter's path to developing the screenplay is found in the comments on "Lightning" by Marc Platt: "The writer based screenplay on 1997 novel, 'A Gracious Plenty' which he optioned out of his own pocket. Writer is also a producer." The information may be tentative, e.g., regarding the script "Last Ride," it was noted that, "Ron Howard might direct." In other cases, the information is more definite, e.g., in the notes for the screenplay entitled "Mickey" we find that "Harry Connick Jr. is in talks to star; Hugh Wilson will direct."

[22] There is one exception to this rule. Two movies have (non-contingent) prices listed as "eight figures." Since the highest exact price that we have is $11 million, and we have seen references to record script prices for various studios as being at most in the low seven figures, we have estimated these two prices to be $10 million. Other than these three, the next highest prices in the database are $5 million or "mid-seven figures," of which there are 15.

[23] Before doing the analyses, all prices are adjusted to 2003 dollars using the annual average Consumer Price Index factors from the Bureau of Labor Statistics, available at http://www.bls.gov.

[24] Recently, some screenwriters started receiving (small) payments contingent upon the success of the movie, but the agreement that led to these deals was later than the last sale in our data base.

[25] Cf. Orr, Bonnie, "High Concept," Screentalk.biz, http://www.screentalk.biz/art043.htm. See also: Lerch, Jennifer (1999, 500 Ways to Beat the Hollywood Script Reader: Writing the Screenplay the Reader Will Recommend, Fireside Press; Downs, William Missouri and Robin U. Russin (2003), Screenplay: Writing the Picture, Silman-James Press; "Movie Maker" #54 Vol.11,2004, "Marketing Your Screenplay" Jerrol LeBaron, p.68

Out of 1,269 scripts, the Directory lists the logline (pitch) for 1,218 scripts (95.98%). The average logline description contains 25.92 words and pitches vary from 2 to 96 words). In creating the control variables for the screenplay characteristics we use similar definitions as Goetzmann et al. (2012).

The simplest measure used for the complexity of the script is the number of words in the logline (*LogWords*).Since the number of words is only a rough approximation, and different types of descriptions require more or fewer words for the same level of complexity, we also use a coarser measure.S*oftWords* is an index variable, which equals 0 if the logline contains up to 20 words; 1 if it contains between 21 and 30 words; 2 if it contains between 31 and 40 words; and 3 if it contains more than 40 words.[26] The logline may be just descriptive or may contain references to existing movies. Eighty-five scripts (6.98% of the scripts for which we have the storyline) mention at least one movie in the story line (29 mention two movies). *SoftLogMovies* equals 1 if the logline refers to any other movie and zero otherwise. We assume that an analogy or reference to other movies makes the logline more transparent. Additional information is provided for 573 scripts (45.15% of the sample). As discussed earlier, this information may make the script easier to interpret. (*InfoDummy*) is equal to 1 if additional information is provided and zero otherwise.

In our model, reputation and experience are important for determining the type of contracts that writers are awarded. To measure screenwriter experience we search the Internet Movie Database (IMDb) for the number of scripts previously sold by the screenwriter and produced. If we find no entries, we also search our own database to see if this writer had previously sold any screenplays. The average number of previously produced scripts is 2.0236 per screenwriter. The writers of 730 scripts (57.52% of the sample) have not sold any previous work. We thus create a few reputation buckets.*ReputationMovies* takes the value 0 if the screenwriter has never had any screenplay produced (as per IMDb) or sold (in our database); 1 if the screenwriter has had between 1 and 3 scripts produced (which is the case for 348 scripts, 27.42% of the sample); 2 if between 4 and 10 scripts have been produced (142 scripts, 11.18% of the sample); and 3 if the screenwriter has previously had more than 10 scripts produced (49 scripts, 3.86% of the sample). We also measure the numbers of Oscars and other awards which the writer had won or been nominated for.[27] Since only 3 writers in our sample had won Oscars prior to selling their screenplays we do not use award winner, but define a variable*AnyNom* (*AnyAward*) that takes the value 1 if the screenwriter had been previously nominated for (had won) an award in any of the major festivals tracked by imdb.com: Oscars, Golden Globes, British Academy Awards, Emmy Awards, European Film Awards, and awards from the festivals of Cannes, Sundance, Toronto and Berlin. For 71 scripts, the screenwriter had been nominated in a major festival; in 32 cases, the screenwriter had previously won an award in a major festival; in 27 cases, s/he had been nominated for an Oscar; and for 10 scripts, the screenwriter had previously won an Oscar. As another measure of success,we also construct a variable using the average domestic gross of past films by the writer,*screenwriter competency*. This is of course rough but in a profit oriented industry may be used as a guideline.

Finally, an unknown screenwriter may use a manager to compensate for his lack of experience. A dummy variable, Manager captures this variable and gets a value of 1 if the screenwriter employs a manager, 0 otherwise.

It is difficult to measure opportunity costs in general, but we use the following rough proxy. If a screenwriter has sold a screenplay in a certain year, we check IMDb to see whether the writer also wrote for television that year. If the screenwriter is also listed as a writer of one or more television episodes in the same year, we code a dummy variable, *Opportunity Cost* = 1, and 0 otherwise. If there are two writers for a screenplay sold, we track the writers, and use dummies: *Writer 1 Opportunity Cost*, and *Writer 2*

[26] See Goetzmann et al. (2012) for a discussion of these proxies and the significance of soft information in screenplay sales.

[27] For the importance of awards see Ravid (1999).

Opportunity Cost. In our data, 43 writers had participated in one television episode as writers, while 5 have participated in 2 television shows. We also track the ages of the writers, *WriterAge*. The youngest writer in the sample is Jessica Kaplan who sold her script in 1995 when she was 16 and a high school student.

The Internet Movie Database (IMDb) reports all films produced or that are in production. Our screenplays have led to production of 350 filmsas of early 2010. The largest number of films was produced early on, with a trickle going forward after 2006 or 2007.

A list of the list of variables used appears just before the data tables.

4.2. Results

4.2.1. Contract type, screenwriter reputation, and information

Data Table 1displays the descriptive statistics for all the relevant variables. Panel B in Data Table 1suggests that experience and pastsuccess determine the compensation (as any model would suggest) but these characteristics are also important in determining the type of contract a screenwriter receives as we proposed in our empirical implications section.For example, screenwriters who have sold more than 10 scripts (*ReputationMovies* =3) obtain average payments that are five times as large as those who had previously sold less than 3 scripts(*ReputationMovies* =1). On the other hand, if it is a writer's first movie, he or she receives significantly less money. More importantly for our analysis, writers who have written more successful screenplays (*ReputationMovies* = 3) are much less likely to receive a contingent contract; the probability of receiving a contingent contract for screenwriters with "*ReputationMovies*"=3 is about 0.38 while for those with "*ReputationMovies*"=1 it is about 0.61. Nomination of any kind increases the writer's compensation significantly, as does winning Oscars. More importantly for our model, recognition also results in less contingent compensation. For example, being nominated for an Oscar reduces the probability of getting a contingent contract from 0.62 to 0.46. These facts support our empirical implications.We also note that as experience increases, a larger percentage of cash contracts lead to actual production. This seems to agree with proposition 7, since experienced sellers are likely to be more optimistic than inexperienced sellers.

The next panel includes screenplay-specific variables. The results suggest that shorter ("high concept" in Hollywood lingo) loglines (*SoftWords* = 0) are associated with higher payments, and a lower probability of a contingent contract.Short pitches (*Softwords*=0) result in a contingent contract in 60% of the cases, whereas the longest pitches *(Softwords* = 3) result in a contingent contract in 71% of the cases (see Goetzmann et al. (2012) for an extensive discussion of this issue). Similarly, screenplays that provide additional information (*InfoDummy*= 1) are rewarded for it, and a "transparent script," which is a composite of the two measures, is worth more than a "non-transparent" one.

Data Table 2 provides basic descriptive summaries of our constructed variables (mean, standard deviation, etc.) as discussed earlier.In the next sub-section, we test some of the propositions.

4.2.2. Tests of some of the propositions

Data Table 3 speaks to the contract design question and presents a series of probit regressions(Model 1 – Model 4) estimating the likelihood of receiving a contingent contract. We find that writers are less likely to receive a contingent contract if they have sold more screenplays (*ReputationMovies* is higher).

We can also calculate the predicted probabilities of receiving a contingent contract at various levels of the reputation variable, holding allother variables in the model at their mean levels. A marginal analysis (not included in the paper) shows that the predicted probability of receiving a contingent contract is 0.39 for writers with the highest reputation, those who have sold more than 10 scripts (*ReputationMovies*=3), vs. 0.64 for the writers with lowest reputation, those who have not had any scripts sold previously (*ReputationMovies*=0), holding all other variables at their means. When we use *NumberMovies* as a reputation variable instead of *ReputationMovies*, we also find a significant negative coefficient. If writers are nominated for awards in any major festival (*AnyNom*), it also reduces the likelihood of receiving contingent contracts, but this coefficient is not significant. We tried various combinations of awards – winning Oscars, nominations for Oscars, etc., and, while they are all negative, none of them is significant. It may be that the small number of Oscar winners and nominated writers makes statistical inferences difficult. A variable that measures the average gross of the screenwriter's movies, presumably past success, is not significant, unless it is run without other experience variables. Since much goes into the success of a movie, and gross is not the same as rate of return, this may not be a good proxy (see Ravid (1999)).

Data Table 4 considers the cash ratio, i.e., the ratio of cash paid upfront over the total amount paid, nowrestricting the analysis to transactions involving contingent contracts.We find that the cash ratio is higher for more reputable writers. The coefficients are positive and significant for most of the reputation variables and negative and significant for the first-movie variable (not shown in the table), supporting our previous analysis.

We now turn to the level of complexity (fuzziness) in the pitch, represented either by *SoftWords*or *LogWords* or other combinations. We find that fuzzier screenplays are more likely to receive a contingent contract. Data Table 3 (Models 3 and 4) shows that the coefficient of *SoftWords* is positive and significant. A marginal analysis (not shown) shows that the predicted probability of receiving a contingent contract is 0.60 for scripts that contain less than 20 words (*SoftWords*=0), and this probability increases steadily to 0.72 for scripts that contain more than 40 words (*SoftWords* =3), holding all other variables at their means. If we use *HighWords*, its coefficient is 0.29 and significant (Model 2).Goetzmann et al. (2012) show also that "softer" screenplays tend to command lower prices.

Thrillers and comedies seem to be less likely to result in contingent contracts (Models 3 and 4 in Data Table 3). Desai and Basuroy (2005) note that the most "popular" genres include comedies. It is likely that scripts in some of the more popular genres are perceived to have a higher likelihood of success and hence a lower likelihood of receiving a contingent contract.[28]

The finding that reputation matters is similar to Banerjee and Duflo (2000) or Kaplan and Stromberg (2003).There is an interesting contrast between this result and the findings of Chisholm (1997). Chisholm discusses the probability that actors receive a share contract (as opposed to fixed compensation). She finds that more experienced actors are, if anything, more likely to receive share contracts. Chisholm's findings support the Gibbons and Murphy (1992) and Holmström and Milgrom (1992)'s interpretation of the life cycle of contracts. Experienced actors may need more incentives since their reputation will not be tarnished by one less successful movie, or they may be closer to retirement. However, the contracts Chisholm (1997) investigates are intended to address moral hazard issues as well as risk sharing. In our case, there is no moral hazard, and thus the contract design, which must consider the differential beliefs of buyers and sellers instead, is radically different. Similar to Banerjee and Duflo (2000), we do not seem to find much evidence for risk sharing.[29]

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[28] We repeated all specifications (not reported), with the addition of a *Largestudio* or *Top6* dummy variable. In all cases this variable was positive, but not statistically significant. These results are consistent with large studios using a larger proportion of contingent contracts.

[29] Blumenthal (1988) in a similar framework, analyzes contracts between exhibitors and distributors. Different behavior is predicted and observed in the case of "blind" bidding for films vs. bidding for films that are previewed.

Data Table 5 runs a probit regression of production on various variables, including the type of contract – contingent or non-contingent. There is potential endogeneity, however, between the probability of production and the type of contract.In order to address this issue, we treat *Cont*. as a binary endogenous variable and follow the analysis below. Let y_1 depend on y_2 which is a binary endogenous regressor. We can now introduce an unobserved latent variable, y_2^* which determines whether $y_2 = 1 \; or \; 0$.

$$y_{1i} = \beta_1 y_{2i} + x'_{1i}\beta_2 + u_i ,$$

$$y^*_{2i} = x'_{1i}\pi_{1j} + x'_{2i}\pi_{2j} + v_i \text{ and}$$

$$y_{2i} = \begin{cases} 1 \; if \;\; y^*_{2i} > 0 \\ 0 \; otherwise \end{cases}$$

The regression errors u_i are assumed to be uncorrelated with x_{1i} but correlated with y_{2i}. The instruments x_2 need to be correlated with y_2. The errors (u_i, v_i) are assumed to be correlated bivariate normal with $Var(u_i) = \sigma^2$, $Var(v_i) = 1$ and $Cov(u_i, v_i) = \rho\sigma^2$. .The log likelihood ratio test clearly rejects the null hypothesis, and it appears that Cont. is an endogenous regressor. We now use the “treatreg” command in Stata. Data Table 5 presents the two stages of the instrumental variables analysis. Focusing on the top panel, which presents the “second stage”,we see that the scenario depicted in proposition 7 is supported; indeed, contingent contracts are less likely to be produced. The other significant variables are reputation variables; as one can expect, writers with better reputation are more likely to have their work produced; the coefficient of *AnyNom*is positive and significant.

In summary, the screenplays data seems to support the theoretical analysis. In particular, the empirical findings support our first and possibly most important implication from proposition 3 that, as reputation increases, contingent contracts become less likely.

5. Conclusions

This paper is first and foremost a model of contracts in an environment without moral hazardwhere the seller is risk averse and the buyer is risk neutral. We can expect such contracts to involve mostly cash payments, yet, surprisingly, we very often find contingent contracts in real life environments. We show that reputation and divergence in beliefs can result in contingencies even in such situations, which are common in the sale of intellectual property, where a risk-averse seller with no post-contract obligations contracts with a risk neutral buyer.

Our model determineswhen sales may take place. We also show that the type of contracts offered to inexperienced sellers will be very different from contracts offered to experienced sellers, and in fact, inexperienced sellers are most likely to end up with contingent contracts. The model also suggests that there should be a correlation between the properties of the asset and the type of contracts offered. Finally we are able to suggest which types of properties are most likely to be produced.

We test some of the implications of the model on a large sample of screenplay sales and find that our main predictions are supported.

We believe our framework can be useful for other industries and contracts, such as patents, books,and designs as well as outside the realm of IP.

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Variable Definitions and Data Tables

Script Complexity Variables

- *LogWords* counts the number of words in the script logline.
- *SoftWords* equals 0 if the script logline contains up to 20 words; 1 if it contains between 21 and 30 words; 2 if it contains between 31 and 40 words; and 3 if it contains more than 40 words.
- *HighWords* equals 1 if the script logline contains more than 40 words (*SoftWords* = 3) and 0 otherwise..
- *InfoDummy* equals 1 if additional information about the script is available.
- *TransparentScript* is a script complexity index that equals 1 when the logline contains up to 20 words (i.e. *SoftWords* equals 0), and additional information about the script is available (i.e. *InfoDummy* equals 1).
- *SoftGenres* equals 1 if the qualified number of genres is greater than 1, and 0 otherwise.
- *SoftLogmovies* equals 1 if the script's logline refers to any other movie, and 0 otherwise.
- *SoftIndex* = *SoftWords* + *SoftGenres* + (1-*InfoDummy*) + (1-*SoftLogMovies*) with a value betwen 0 and 6.

Soft information data are from the *Spec Screenplay Sales Directory*.

Reputation and Experience Variables

- *NumberMovies* is the number of scripts previously sold by the script's screenwriter.
- *ReputationMovies* takes the value 0 if the screenwriter has not previously sold any script; 1 if the screenwriter has previously sold between 1 and 3 scripts; 2 if the screenwriter has previously sold between 4 and 10 scripts; and 3 if the screenwriter has previously sold more than 10 scripts.
- *First Movie* takes the value 1 if the screenwriter has not previously sold any script, and 0 otherwise.
- *Nom Oscar (AwardOscar)* takes the value 1 if the screenwriter has been previously nominated for (won) an Oscar.
- *AnyNom (AnyAward)* takes the value 1 if the screenwriter has been previously nominated for an award in one of the following festivals and competitions: Oscars, Golden Globes, British Academy Awards, Emmy Award, European Film Award, Cannes, Sundance, Toronto, Berlin.
- *Screenwriters' competency* is the average domestic gross of the screenwriter's past movies
- *Opportunity cost* measures whether the writer wrote for a TV series the year he sold the screenplay.

Reputation variables data are from IMDb.

Compensation – Contractual Variables

- *Price* reflects the payment made to the screenwriter when he sells the script. In non-contingent contracts, the screenwriter compensation is fixed (i.e. the screenwriter compensation does not depend on whether the movie is produced or not). In contingent contracts, Price reflects the screenwriter compensation when the movie is not produced. All prices are adjusted from the purchase date to 2003 dollars using the Consumer Price Index.
- *Cont* is a dummy variable that equals 0 if the screenwriter's compensation is fixed; that is, the screenwriter receives a certain salary regardless of whether the movie is produced or not. The variable equals 1 when the contract is contingent and compensation is structured in two steps: the screenwriter receives a certain amount for selling the script; and additional payment if the movie is actually made.
- *Produced* is a dummy variable that takes the value 1 if the script has been produced or is in production, and 0 otherwise.

		N	Price			Cont.	Produced	cash p	cont p
			Mean	SD	Median				
Panel A: Contract Summary Statistics									
Scripts with Compensation Information		777	770	2789	424	0.62	0.22		
Scripts with Contingent Contracts		479	454	434	293	1	0.19		
Scripts with Non-Contingent Contracts		298	1279	4428	575	0	0.23		
Panel B: Script Writer Reputation									
ReputationMovies =	0	460	479	464	302	0.628	0.248	0.266	0.228
	1	219	757	1227	510	0.609	0.609	0.29	0.285
	2	77	1654	5948	565	0.667	0.667	0.42	0.294
	3	21	4057	11389	1100	0.381	0.381	0.87	0.125
FirstMovie =	0	460	479	464	302	0.608	0.34		
	1	317	1194	4299	535	0.628	0.248		
NomOscar =	0	764	697	2105	412	0.623	0.283		
	1	13	5090	14167	877	0.462	0.481		
AwardOscar =	0	774	762	2788	423	0.623	0.285		
	1	3	2735	2620	2420	0	0.6		
AnyNom =	0	742	618	868	405	0.624	0.275		
	1	35	4014	12239	605	0.543	0.533		
AnyAward =	0	768	766	2800	420	0.621	0.282		
	1	9	1185	1631	585	0.556	0.539		
Panel C: Signal Variables									
SoftWords =	0	296	1054	4354	535	0.605	0.202		
	1	214	645	885	468	0.605	0.246		
	2	139	500	579	288	0.638	0.223		
	3	102	627	1350	285	0.716	0.255		
InfoDummy =	0	508	634	874	468	0.632	0.206		
	1	269	1028	4580	339	0.599	0.243		
TransparentScript =	0	651	626	894	363	0.627	0.224		
	1	100	1763	7385	520	0.618	0.229		

Data Table 1: Summary statistics for screenplay price

The **Price**column gives the means,standard deviations, and medians of the **Price** variable as classified by the variables and values in the first two columns.The **Cont.** and **Produced** columns give the means of those variables, similarly classified. Compensation variables include the price (in thousands of 2003 dollars) paid to the screenwriter (**Price**); which is either the price paid in non-contingent contracts or the initial price paid in contingent contracts; **Cont** is a dummy variable that takes the value 1 when the screenwriter is offered a contingent contract (i.e. a contract in which compensation depends on whether the movie is ultimately produced or not).**Produced** is 1 if the screenplay was produced or is in production and 0 otherwise.**cash p** is the percentage of cash contracts produced and **contp** is the percentage of contingent contracts produced. We include several screenwriter reputation variables. **ReputationMovies** takes the value 0 if the screenwriter has not previously sold any script; 1 if the screenwriter has previously sold between 1 and 3 scripts; 2 if the screenwriter has previously sold between 4 and 10 scripts; and 3 if the screenwriter has previously sold more than 10 scripts. **FirstMovie** takes the value one if the screenwriter has not previously sold any script, and zero otherwise. **NomOscar** (**AwardOscar**) takes the value 1 if the screenwriter has previously been nominated for (won) an Oscar. **AnyNom** (**AnyAward**) takes the value 1 if the screenwriter has previously been nominated (won) for an award in the following festivals: Oscars, Golden Globes, British Academy Awards, Emmy Award, European Film Award, Cannes, Sundance, Toronto, Berlin... **SoftWords** equals 0 if the script logline contains up to 20 words; 1 if it contains between 21 and 30 words; 2 if it contains between 31 and 40 words; and 3 if it contains more than 40 words. **InfoDummy** equals 1 if additional information about the script is available. We create a script complexity index, **TransparentScript**, that equals 1 when the log line contains up to 20 words (i.e. **SoftWords** equals 0), and additional information about the script is available (i.e. InfoDummy equals 1).

Variable	N	Mean	SD	Min	Max
Signal variables					
LogWords	1217	25.92	13.66	2	96
InfoDummy	1268	0.45	0.50	0	1
SoftLogMovies	1217	0.07	0.25	0	1
SoftWords	1217	1.03	1.06	0	3
Screenwriter Reputation					
NumberMovies	1268	2.03	5.56	0	82
ReputationMovies	1268	0.61	0.83	0	3
Firstmovie	1268	0.57	0.50	0	1
NomOscar	1268	0.02	0.14	0	1
AwardOscar	1268	0.01	0.10	0	1
Anynom	1268	0.05	0.21	0	1
Anyaward	1268	0.02	0.14	0	1
WriterAvgRev	225	4.67e+07	6.05e+07	3902	5.81e+08
Screenwriter Opportunity Cost					
Writer 1 Opportunity Cost	1264	0.08	0.32	0	3
Screenplay genres					
Action	1268	0.15	0.36	0	1
Comedy	1268	0.45	0.50	0	1
Drama	1268	0.20	0.40	0	1
Romance	1268	0.14	0.35	0	1
Thriller	1268	0.18	0.38	0	1
Contract variables					
Price ('000)	777	770.54	2789.43	26	53500
Contingent (dummy)	787	0.62	0.49	0	1
Control variables					
Writer Age	343	38.46	13.65	16	94
Manager	1268	0.14	0.34	0	1
Largebuyer	1268	.56	.50	0	1
Top6	1268	.38	.49	0	1

Data Table 2: Descriptive statistics for the variables

LogWords counts the number of words in the script logline. **SoftWords** equals 0 if the script logline contains less than 20 words; 1 if the script logline contains between 21 and 30 words; 2 if the script logline contains between 31 and 40 words; and 3 if the script logline contains more than 40 words. **SoftLogmovies** equals 1 if the scripts logline refers to any other movie, and 0 otherwise. **InfoDummy** equals 1 if additional information about the script is available.**TransparentScript**equals 1 when the log line contains up to 20 words (i.e. **SoftWords** equals 0), and additional information about the script is available (i.e. **InfoDummy** equals 1). **SoftGenre** equals 1 if the qualified number of genres is greater than 2, and 0 otherwise.**NumberMovies** measures the number of scripts previously sold by the script's screenwriter and is a key proxy for screenwriter reputation. The genre variables are dummy variables. **FirstMovie** takes the value 1 if the screenwriter has not previously sold any script; 0 if the screenwriter has previously sold at least one script. **ReputationMovies**takes the value 0 if the screenwriter has not previously sold any script; 1 if the screenwriter has previously sold between 1 and 3 scripts; 2 if the screenwriter has previously sold between 4 and 10 scripts; and 3 if the screenwriter has previously sold more than 10 scripts. **NomOscar** (**AwardOscar**) takes the value 1 if the screenwriter has previously been nominated for (won) an Oscar. **AnyNom** (**AnyAward**) takes the value 1 if the screenwriter has previously been nominated (won) for an award in the following festivals: Oscars, Golden Globes, British Academy Awards, Emmy Award, European Film Award, Cannes, Sundance, Toronto, Berlin.**WriterAvgRev** is the average revenues of all movies that were made out of the screenwriters scripts in the past.

Writer 1 Opportunity Cost is the dummy variable that takes the value of 1 if in the year that the writer sold the script to the studio, he or she also had participated as a writer in a television episode.

The genre variables are dummy variables. **Action** (**Comedy**, **Drama**, **Romance**, **Thriller**) takes the value 1 if the script is classified in the "Action" (Comedy, Drama, Romance, Thriller) category by Spec Screenplay Directory, and 0 otherwise. Note that more than one of these genre variables may have the value 1.

Cont, is a dummy variable that equals 0 if the screenwriter's compensation is fixed; that is, the screenwriter receives a certain salary regardless of whether the movie is produced or not. The variable equals 1 when compensation is structured in two steps: the screenwriter receives a certain amount for selling the script; and additional payment if the movie is actually made. **Price** is the price paid to the screenwriter.

WriterAge is the age of the screenwriter..**Manager** takes the value of 1 if the screenwriter has a manager, and 0 otherwise.**Large Buyer is a dummy variable which takes the value of 1 if the buyer is one of the largest studios and** top6 is dummy variable if the buyer is one of the six largest studios.

	Model 1	Model 2	Model 3	Model 4
	Coefficient (S.E)	**Coefficient (S.E)**	**Coefficient (S.E)**	**Coefficient (S.E)**
Screenwriter Reputation				
ReputationMovies				
1	-0.05 (0.14)	-0.050 (0.10)	-0.07 (0.11)	-0.07 (.11)
2	0.10 (0.16)	0.08 (0.16)	0.05 (0.17)	0.04 (.17)
3	-0.63** (0.28)	-0.62** (0.31)	-0.58 (0.37)	-0.60* (.37)
AnyNom		-0.22 (0.22)	-0.26 (0.21)	-0.26 (.22)
Screenwriter Competency			4.9e-10 (4.2e-09)	7.4e-10 (2.3e-09)
Signal Variable				
TransparentScript		0.03 (0.14)	0.31* (0.18)	0.31* (0.19)
SoftGenres			-0.09 (0.14)	-0.09 (0.13)
HighWords		0.29** (0.14)		
SoftWords			0.12*** (0.05)	0.12*** (0.05)
InfoDummy			-0.21* (0.12)	-0.24* (0.13)
Screenplay generes				
Action			0.14 (0.16)	0.15 (0.16)
Comedy			-0.24* (0.14)	-0.24* (0.14)
Drama			-0.08 (0.17)	-0.08 (0.17)
Romance			0.28 (0.18)	0.28 (0.18)
Thriller			-0.36** (0.16)	-0.36** (0.16)
Control Variable				
Top6				0.08 (0.09)
ManagerDummy				0.15 (0.15)
Constant	0.33*** (0.06)	0.31*** (0.06)	0.43*** (.13)	0.39*** (0.15)
Number of obs	787	759	756	756
Wald chi2(15)	5.75	10.03	25.95	27.61
Prob> chi2	0.12	0.12	0.026	0.035
Pseudo R2	0.006	0.01	0.027	0.029

*** p-value<.01; ** p-value <.05; * p-value <.10

Data Table 3: Probit regression for contingent vs. non-contingent contract

The dependent variable is *Cont.*

Cont is a dummy variable that equals 0 if the screenwriter's compensation is fixed; that is, the screenwriter receives a certain salary regardless of whether the movie is produced or not. The variable equals 1 when compensation is structured in two steps: the screenwriter receives a certain amount for selling the script; and additional payment if the movie is actually made.

ReputationMoviestakes the value 0 if the screenwriter has not previously sold any script; 1 if the screenwriter has previously sold between 1 and 3 scripts; 2 if the screenwriter has previously sold between 4 and 10 scripts; and 3 if the screenwriter has previously sold more than 10 scripts.**AnyNom** (**AnyAward**) takes the value 1 if the screenwriter has previously been nominated (won) for an award in the following festivals: Oscars, Golden Globes, British Academy Awards, Emmy Award, European Film Award, Cannes, Sundance, Toronto, Berlin.**ScreenwriterCompetency** is the average domestic revenues of all movies that were made out of the screenwriter's scripts in the past.

TransparentScript, that equals 1 when the log line contains up to 20 words (i.e. SoftWords equals 0), and additional information about the script is available (i.e. InfoDummy equals 1**).SoftGenres** equals 1 if the qualified number of genres is greater than 1, and 0 otherwise.**HighWords** equals 1 if the script logline contains more than 40 words (*SoftWords* = 3) and 0 otherwise. **SoftWords** equals 0 if the script logline contains less than 20 words; 1 if the script logline contains between 21 and 30 words; 2 if the script logline contains between 31 and 40 words; and 3 if the script logline contains more than 40 words.

The genre variables are dummy variables. **Action** (**Comedy**, **Drama**, **Romance**, **Thriller**) takes the value 1 if the script is classified in the "Action" (Comedy, Drama, Romance, Thriller) category by Spec Screenplay Directory, and 0 otherwise. Note that more than one of these genre variables may have the value 1.

Top6 is a dummy variable for the buyer of the screenplay being one of the six largest studios.**ManagerDummy** takes the value of 1 if the screenwriter has a manager, and 0 otherwise.

Compensation, soft information and type of contract data are from the Spec Screenplay Sales Directory. Reputation variables and information regarding whether the movies has been produced is from IMDB.

	Model 1	Model 2	Model 3	Model 4
	Coefficient (S.E)	**Coefficient**	**Coefficient (S.E)**	**Coefficient (S.E)**
Screenwriter Reputation				
ReputationMovies	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)
AnyNom	0.01 (0.04)	0.03 (0.04)	0.02 (0.04)	0.02 (0.04)
Signal Variable				
TransparentScript			0.03** (.01)	0.06** (.03)
SoftGenres				
HighWords			-0.06** (0.02)	-0.06*** (0.02)
SoftWords		-0.02*** (0.01)		
InfoDummy		-.01 (0.02)	-0.04** (0.02)	-.04* (0.02)
Screenplay generes				
Action			0.01 (0.02)	0.01 (0.02)
Comedy			0.02 (0.02)	0.02 (0.02)
Drama			-0.01 (0.02)	-0.01 (0.02)
Romance			-0.004 (.02)	-0.00 (0.02)
Thriller			-0.004 (.02)	0.01 (0.02)
Control Variable				
LargeBuyer				0.037** (0.02)
ManagerDummy				0.01 (0.02)
Constant	0.468*** (0.01)	0.51*** (0.01)	0.47*** (.02)	0.45*** (0.02)
Number of obs	459	459	459	459
F-value	6.54	10.50	3.14	3.11
Prob > F	0.00	0.00	0.00	0.00
R-sq	0.028	0.089	0.065	0.077

*** p-value<.01; ** p-value <.05; * p-value <.10

Data Table 4: Cash ratio regression

The dependent variable is the ratio of the cash payment to the total payment for contingent contracts.

NumberMovies measures the number of scripts previously sold by the script's screenwriter and is a key proxy for screenwriter reputation. The genre variables are dummy variables. **ReputationMovies**takes the value 0 if the screenwriter has not previously sold any script; 1 if the screenwriter has previously sold between 1 and 3 scripts; 2 if the screenwriter has previously sold between 4 and 10 scripts; and 3 if the screenwriter has previously sold more than 10 scripts. **AnyNom** (**AnyAward**) takes the value 1 if the screenwriter has previously been nominated (won) for an award in the following festivals: Oscars, Golden Globes, British Academy Awards, Emmy Award, European Film Award, Cannes, Sundance, Toronto, Berlin.

TransparentScript, that equals 1 when the log line contains up to 20 words (i.e. SoftWords equals 0), and additional information about the script is available (i.e. InfoDummy equals 1**).SoftGenres** equals 1 if the qualified number of genres is greater than 1, and 0 otherwise.**HighWords** equals 1 if the script logline contains more than 40 words (*SoftWords* = 3) and 0 otherwise. **SoftWords** equals 0 if the script logline contains less than 20 words; 1 if the script logline contains between 21 and 30 words; 2 if the script logline contains between 31 and 40 words; and 3 if the script logline contains more than 40 words.

The genre variables are dummy variables. **Action** (**Comedy**, **Drama**, **Romance**, **Thriller**) takes the value 1 if the script is classified in the "Action" (Comedy, Drama, Romance, Thriller) category by Spec Screenplay Directory, and 0 otherwise. Note that more than one of these genre variables may have the value 1.

ManagerDummy takes the value of 1 if the screenwriter has a manager, and 0 otherwise.

Compensation, soft information and type of contract data are from the Spec Screenplay Sales Directory. Reputation variables and information regarding whether the movies has been produced is from IMDB.

Dependent variable=Produced	Coefficient (S.E)
Cont.	-0.81*** (0.10)
AnyNom	0.26*** (0.09)
AnyAward	-0.20 (0.16)
Action	-0.02 (0.05)
Comedy	-0.04 (0.04)
Drama	0.08 (0.05)
Romance	0.04 (0.05)
Thriller	-0.08 (0.05)
Large Buyer	-0.01 (0.03)
Constant	0.79*** (0.08)
Dependent variable=Cont.	
SoftWords	0.05 (0.04)
InfoDummy	-0.18* (0.10)
TransparentScript	0.14 (0.14)
ReputationMovies	-.09** (0.04)
ManagerDummy	-0.01 (0.11)
Constant	0.33*** (0.07)
Number of obs	759
Wald Chi-sq	99.67
Prob. > Chi-sq	0.00
LogLikelihood	-438.89
LR Test of independence of equation: $\rho = 0$	
Chi-Square (1)	11.11
Prob > Chi-Square (1)	0.0009

*** p-value<.01; ** p-value <.05; * p-value <.10

Data Table 5: Probit Regression for Films Produced

Cont is a dummy variable that equals 0 if the screenwriter's compensation is fixed; that is, the screenwriter receives a certain salary regardless of whether the movie is produced or not. The variable equals 1 when compensation is structured in two steps: the screenwriter receives a certain amount for selling the script; and additional payment if the movie is actually made.

ReputationMoviestakes the value 0 if the screenwriter has not previously sold any script; 1 if the screenwriter has previously sold between 1 and 3 scripts; 2 if the screenwriter has previously sold between 4 and 10 scripts; and 3 if the screenwriter has previously sold more than 10 scripts.**AnyNom** (**AnyAward**) takes the value 1 if the screenwriter has previously been nominated (won) for an award in the following festivals: Oscars, Golden Globes, British Academy Awards, Emmy Award, European Film Award, Cannes, Sundance, Toronto, Berlin. **TransparentScript**, that equals 1 when the log line contains up to 20 words (i.e. SoftWords equals 0), and additional information about the script is available (i.e. InfoDummy equals 1**).SoftGenres** equals 1 if the qualified number of genres is greater than 1, and 0 otherwise.**HighWords** equals 1 if the script logline contains more than 40 words (*SoftWords* = 3) and 0 otherwise. **SoftWords** equals 0 if the script logline contains less than 20 words; 1 if the script logline contains between 21 and 30 words; 2 if the script logline contains between 31 and 40 words; and 3 if the script logline contains more than 40 words.**SoftLogmovies** equals 1 if the script's logline refers to any other movie, and 0 otherwise.

Action (**Comedy**, **Drama**, **Romance**, **Thriller**) takes the value 1 if the script is classified in the "Action" (Comedy, Drama, Romance, Thriller) category by Spec Screenplay Directory, and 0 otherwise. Note that more than one of these genre variables may have the value 1.

Top6 is a dummy variable for the buyer of the screenplay being one of the six largest studios. **ManagerDummy** takes the value of 1 if the screenwriter has a manager, and 0 otherwise.

Appendix A: Notation and Characterization of Beliefs

Notation

P is the buyer (producer).

S is the seller. *S* can be either competent or incompetent and can produce intellectual property that is either "good" or "bad."

q_t^i is player *i*'s probability that *S* is competent as of the beginning of period *t*. We refer to q_t^P as *S*'s *reputation* at the beginning of period *t*.

$\Pr_i(E)$ is the probability that player $i \in \{P,S\}$ assigns to the event *E*.

s is the probability that a competent seller generates a good property in any period.

e is the cost of production of the final good (not including any payments to *S*).

v is the revenue from the final product. We assume $v > e$.

c is an upfront cash payment to *S*.

k denotes a payment to *S* contingent on production.It is k_v if the production succeeds (and revenue is *v*) and k_0 if the production fails (and revenue is 0).

$K = (k_0, k_v)$.

R is the signal a producer receives after the purchase and before potential production.

r is the probability that *P*'s signal is "correct."

α is the "risk aversion" parameter – each \$1 contingency payment is worth only $\$\alpha$ to *S*, where $\alpha < 1$.

$G(R,q)$ is the probability that *S*'s property is good, given *P*'s signal *R* and the probability *q* that *S* is competent.

$\gamma(q^i) = \Pr_i(R = g | Q)$ is *i*'s probability that the *P*'s signal is good, given the state of beliefs *Q*.

β is *S*'s discount factor.

$Q = (q^P, q^S)$ is the current state of beliefs about *S*'s competence. q^P is *S*'s reputation.

p_i is player *i*'s distribution of next period's state of beliefs, given this period's state of beliefs, *Q*.

$\pi^i(Q,k) = \Pr_i(\text{current property is produced} | Q,k),\ i \in \{P,S\}$.

$U_t(Q)$ is the expected present value of *S*'s current and future income, as of the beginning of period *t*, given the state of beliefs at date *t* is *Q*, assuming equilibrium contracts.

$w(q^P)$is *S*'s per-period payoff in the current and all future periods from participating in the secondary market if her current reputation is q,

$u_t(q^P)$ is the present value, at the beginning of period *t*, of *S*'s outside option, given her reputation at date *t* is q^P. $u_t(q) = w(q)A(\beta, T-t+1)$,

$F(R,q)$ is next period's probability that *S* is competent, given *P*'s signal, *R*, and this period's belief that *S* is competent, *q*.

$z(q^i) = \Pr_i(S \text{ is competent} | \text{revenue} = 0, Q)$,

$\hat{V}(Q,c,K)$ denotes *P*'s expected payoff for a contract (c,K) in any period in which the state of beliefs is *Q*.

$\delta_t(Q)$ is the smallest *current* payoff in period *t* that the IP contract must provide the seller for her to participate, taking account of the value to her of the secondary market, $u_t(q^P)$ and any future reputational benefits $\beta \bar{U}_t(Q)$.

Characterization of Beliefs

Let $\tilde{Q}'$ denote the random variable whose realization is next period's state of beliefs. The distribution of $\tilde{Q}'$, given Q and only whether or not the property is sold and, if so, the contract (i.e., *not* conditional on revenue or the signal), is then given by $\tilde{Q}' = Q$ with probability one if the contract is not sold, and otherwise, the distribution depends on whether (4)is satisfied and whose probabilities are used. If (4) is not satisfied, the property is not produced for sure. Later, we will argue that no property will ever be sold under a contract for which the property is not produced for sure. Therefore, we do not develop the distribution for $\tilde{Q}'$ in that case.

If (4) is satisfied, the property is produced if and only if the signal is *g*. In this case, if the property is produced and is good, the positive revenue reveals that the property is good and, therefore, that *S* is competent. If the property is produced and is bad, zero revenue reveals that the property is bad and, hence player *i* believes *S* is competent with probability $z\left(q^i\right)$, where *z* is given by equation (8). If the property is not produced, the signal must have been bad and, therefore, player *i* believes *S* is competent with probability $F\left(b,q^i\right)$. We can summarize player *i*'s distribution of $\tilde{Q}'$, given *Q* and that the property is sold, denoted $p_i\left(\tilde{Q}'|Q\right)$, in the following table.

$\tilde{Q}'$	$p_i\left(\tilde{Q}'\|Q\right)$
$(1,1)$	$\gamma\left(q^i\right)G\left(g,q^i\right) = rq^i s$
$\left(z\left(q^P\right), z\left(q^S\right)\right)$	$\gamma\left(q^i\right)\left[1-G\left(g,q^i\right)\right] = (1-r)\left(1-q^i s\right)$
$\left(F\left(b,q^P\right), F\left(b,q^S\right)\right)$	$1-\gamma\left(q^i\right)$

Table A

This table gives player *i*'s beliefs, p_i, about next period's state of beliefs, $\tilde{Q}'$, given this period's state of beliefs, *Q* and the fact that the property was sold.

Appendix B: Solution of the Equilibrium Problem

Assumethe equilibrium problem is feasible, i.e., $G\left(g,q^P\right)v-e\geq 0$. If

$$\delta_t\left(Q\right)<c_0\,, \tag{21}$$

the solution is $c_t\left(Q\right)=c_0$, $k_t\left(Q\right)=0$, and $V_t\left(Q\right)=-c_0+\gamma\left(q^P\right)\left[G\left(g,q^P\right)v-e\right]$. If (21) is not satisfied and (19) is satisfied, the solution is $c_t\left(Q\right)=c_0$,

$$k_t\left(Q\right)=\frac{\delta_t\left(Q\right)-c_0}{\alpha rsq^S}\text{, and} \tag{22}$$

$$V_t\left(Q\right)=\gamma\left(q^P\right)\left[G\left(g,q^P\right)v-e\right]-\left[\frac{q^P}{\alpha q^S}\delta_t\left(Q\right)+\left(1-\frac{q^P}{\alpha q^S}\right)c_0\right]. \tag{23}$$

Finally, if both (19) and (21) are not satisfied, the solution is $c_t\left(Q\right)=\delta_t\left(Q\right)\geq c_0$, $k_t\left(Q\right)=0$, and $V_t\left(Q\right)=-\delta_t\left(Q\right)+\gamma\left(q^P\right)\left[G\left(g,q^P\right)v-e\right]$. The property will be sold if and only if

$$\gamma\left(q^P\right)\left(G\left(g,q^P\right)v-e\right)-c_0\geq \max\left\{\delta_t\left(Q\right)-c_0,0\right\}\min\left\{\frac{q^P}{\alpha q^S},1\right\}. \tag{24}$$

Note, a necessary condition for (24) is that $G\left(g,q^P\right)v-e\geq 0$.

Proof. Since both $\gamma\left(q^P\right)$ and $\gamma\left(q^S\right)$ are independent of *k*, the equilibrium problem is a simple linear program. If the problem is feasible, and (21) is satisfied, then the constraint (18) is satisfied for any $c\geq c_0$ and $k\geq 0$, so the solution is clearly as claimed in the lemma for this case.[1]

Suppose the problem is feasible, and (21) is not satisfied. If (19) is satisfied, the slope of constraint (18) is steeper than *P*'s iso-profit lines. Consequently, the solution is to choose $c_t\left(Q\right)=c_0$ and $k_t\left(Q\right)$ such that (18)is binding. This results in $k_t\left(Q\right)$ given by (22) and $V_t\left(Q\right)$ given by (23). If (19) is not satisfied, the slope of constraint (18) is flatter than *P*'s iso-profit lines. Consequently, the solution is to choose $c_t\left(Q\right)=\delta_t\left(Q\right)$, $k_t\left(Q\right)=0$, and $V_t\left(Q\right)$ as claimed in the lemma for this case.

It is easy to check that, in each case, $V_t\left(Q\right)\geq 0$ if and only if (24) is satisfied.■

[1] In this case, *S*'s participation constraint is not binding.

$\gamma\left(q^P\right)\left(G\left(g,q^P\right)v-e\right)-c_0$	$\delta_t\left(Q\right)$	αq^S	**Outcome**
$\geq \max\left\{\delta_t\left(Q\right)-c_0,0\right\}\min\left\{\frac{q^P}{\alpha q^S},1\right\}$	$\geq c_0$	$\geq q^P$	$c_t\left(Q\right)=c_0$ $k_t\left(Q\right)=\frac{\delta_t\left(Q\right)-c_0}{\alpha rsq^S}$ $V_t\left(Q\right)=\gamma\left(q^P\right)\left[G\left(g,q^P\right)v-e\right] -\left[\frac{q^P}{\alpha q^S}\delta_t\left(Q\right)+\left(1-\frac{q^P}{\alpha q^S}\right)c_0\right]$
		$< q^P$	$c_t\left(Q\right)=\delta_t\left(Q\right)$ $k_t\left(Q\right)=0$ $V_t\left(Q\right)=\gamma\left(q^P\right)\left[G\left(g,q^P\right)v-e\right]-\delta_t\left(Q\right)$
	$< c_0$	NA	$c_t\left(Q\right)=c_0$ $k_t\left(Q\right)=0$ $V_t\left(Q\right)=\gamma\left(q^P\right)\left[G\left(g,q^P\right)v-e\right]-c_0$
$< \max\left\{\delta_t\left(Q\right)-c_0,0\right\}\min\left\{\frac{q^P}{\alpha q^S},1\right\}$	NA	NA	No sale

Table B

This table shows the equilibrium outcomes of a meeting between the seller and the producer at date *t*, for various contingencies.

Appendix C: Proofs of Propositions 1-7

As mentioned in the text, $\bar{U}_2(Q) \equiv 0$, and $\delta_2(Q) = w(q^P) \ge c_0$. For period 1,

$$\delta_1(Q) = (1+\beta)w(q^P) - \beta\bar{U}_1(Q) = w(q^P) + \beta\left[w(q^P) - E^S\left(w\left(\tilde{q}^{P\prime}\right)|Q\right)\right]. \qquad (25)$$

Note that, since w is increasing and convex and S is more optimistic than P, $w(q^P) \le E^S\left(w\left(\tilde{q}^{P\prime}\right)|Q\right)$. It follows from (25) that $\delta_1(Q) \le \delta_2(Q) = w(q^P)$ with strict inequality whenever $q^P < q^S$. Using the distribution of $\tilde{Q}'$ calculated in Table A (in appendix A), we have

$$\bar{U}_1(Q) = \left[rq^S sw(1) + (1-r)(1-q^S s)w\left(z(q^P)\right) + \left(1-\gamma(q^S)\right)w\left(F(b,q^P)\right)\right]. \qquad (26)$$

Before we proceed, we state a technical lemma useful for our comparative statics results:

Lemma 5. $\dfrac{\partial}{\partial q^P}\delta_1(Q) \ge w'(q^P) \ge 0$,

$$\frac{\partial}{\partial r}\delta_1(Q) = -\left[q^S s\left(w(1) - w\left(F(b,q^P)\right)\right) + (1-q^S s)\left(w\left(F(b,q^P)\right) - w\left(z(q^P)\right)\right)\right] \le 0 \text{, and}$$

$$\frac{\partial}{\partial s}\delta_1(Q) = -q^S\left[r\left(w(1) - w\left(F(b,q^P)\right)\right) + (1-r)\left(w\left(F(b,q^P)\right) - w\left(z(q^P)\right)\right)\right] \le 0.$$

Proof. For the first result, from(25), it suffices to show that $\dfrac{\partial}{\partial q^P}E^S\left(w\left(\tilde{q}^{P\prime}\right)|Q\right) \le w'(q^P)$. Now

$$\frac{\partial}{\partial q^P}E^S\left(w\left(\tilde{q}^{P\prime}\right)|Q\right) = w'\left(z(q^P)\right)(1-r)(1-q^S s)z'(q^P) + w'\left(F(b,q^P)\right)\left(1-\gamma(q^S)\right)\frac{\partial F(b,q^P)}{\partial q^P}.$$

It is easy to check that, since $q^P \le 1$, $z'(q^P) \le \dfrac{1}{1-q^P s}$ and $\dfrac{\partial F(b,q^P)}{\partial q^P} \le \dfrac{r}{1-\gamma(q^P)}$. Also, since $q^P \ge F(b,q^P) \ge z(q^P)$, and w is convex, $w'(q^P) \ge w'\left(F(b,q^P)\right) \ge w'\left(z(q^P)\right)$. Therefore

$$\begin{aligned}\frac{\partial}{\partial q^P}E^S\left(w\left(\tilde{q}^{P\prime}\right)|Q\right) &\le w'(q^P)\left[\frac{(1-r)(1-q^S s)}{1-q^P s} + \frac{r\left(1-\gamma(q^S)\right)}{1-\gamma(q^P)}\right] \\ &\le w'(q^P)(1-r+r), \text{ since } q^P \le q^S, \\ &= w'(q^P).\end{aligned}$$

This completes the proof of the first statement.

For the second statement,

$$\frac{\partial}{\partial r}\delta_1(Q) = -\beta\frac{\partial}{\partial r}E^S\left(w\left(\tilde{q}^{P\prime}\right)|Q\right)$$
$$= -\beta\left[q^S s w(1) - \left(1-q^S s\right)w\left(z\left(q^P\right)\right) - \left(q^S s - \left(1-q^S s\right)\right)w\left(F\left(b,q^P\right)\right)\right]$$
$$= -\beta\left[q^S s\left(w(1) - w\left(F\left(b,q^P\right)\right)\right) + \left(1-q^S s\right)\left(w\left(F\left(b,q^P\right)\right) - w\left(z\left(q^P\right)\right)\right)\right].$$

The inequality follows from the fact that $1 \geq F\left(b,q^P\right) \geq z\left(q^P\right)$ and *w* is increasing.

For the third statement,

$$\frac{\partial}{\partial s}\delta_1(Q) = -\beta\frac{\partial}{\partial s}E^S\left(w\left(\tilde{q}^{P\prime}\right)|Q\right)$$
$$= -\beta\left[rq^S w(1) - (1-r)q^S w\left(z\left(q^P\right)\right) - \left(rq^S - (1-r)q^S\right)w\left(F\left(b,q^P\right)\right)\right]$$
$$= -\beta\left[rq^S\left(w(1) - w\left(F\left(b,q^P\right)\right)\right) + (1-r)q^S\left(w\left(F\left(b,q^P\right)\right) - w\left(z\left(q^P\right)\right)\right)\right].$$

Again, the inequality follows from the fact that $1 \geq F\left(b,q^P\right) \geq z\left(q^P\right)$ and *w* is increasing.■

Proposition 1. An increase in the minimum cash payment

- May make a sale less but not more likely;
- Will either increase the cash payment and reduce the contingency payment (unless it is already zero) or have no effect on either.

Proof. As is clear from Table B, an increase in c_0 reduces $V_t(Q)$ if $\delta_t(Q) < c_0$ or $\alpha q^S \geq q^P$ or if $\delta_t(Q) \geq c_0$ and $\alpha q^S < q^P$, but the increase in c_0 reverses the $\delta_t(Q) \geq c_0$ inequality. Otherwise, an increase in c_0 has no effect on $V_t(Q)$. When a sale occurs, if $\alpha q^S \geq q^P$, an increase in c_0 increases the cash payment and reduces the contingency payment. If $\alpha q^S < q^P$, an increase in c_0 has no effect on either payment.■

Proposition 2. As the profitability of a successful production, v, goes up, the probability of a sale goes up, but there is no effect on either payment.

Proof. It is obvious from Table B, that an increase in revenue from a successful production, *v*, or a decrease in production costs, *e*, makes a sale more likely but has no effect on either payment.■

Proposition 3. For either date, more reputable sellers (those with higher q^P) will have different contracts than less reputable ones. In particular, if the seller is effectively <u>more</u> optimistic than the buyer, then the contingency component will be larger for more reputable sellers. If the seller and buyer agree on the probability of competence (or, more generally, if the seller is effectively less optimistic than the buyer), then the cash component will be larger for more reputable sellers. Moreover, if a seller's reputation increases from one period to the next, her cash payment also increases.

Proof. First consider date 2. Assuming the property is sold, for q^P such that $\alpha q^S \geq q^P$, an increase in q^P increases the contingency payment (since $\delta_2(Q) = w\left(q^P\right) \geq c_0$) but has no effect on the cash payment, while the opposite is true if $\alpha q^S < q^P$. This latter condition is of course true if seller and buyer have the same probability of competence ($q^P = q^S$).

Now consider date 1. Since $\delta_1(Q)$ is increasing in q^P (Lemma 5), if $\delta_1(Q) \geq c_0$, the results are the same as for date 2. If $\delta_1(Q) < c_0$, a change in q^P has no effect on either payment, unless it reverses the inequality between $\delta_1(Q)$ and c_0. In that case, again the results are the same as for date 2.

Finally, consider the comparison between c_1 and c_2. If *P* buys the property at date 2 and $q_2^P \geq q_1^P$, then $q_2^P = q_2^S = 1$, so $\alpha q^S < q^P$, and $c_2(Q_2) = w(1)$ (see Table B). On the other hand, $c_1(Q_1)$ is either c_0 or $\delta_1(Q_1)$ (Table B). But $w(1) > c_0$ (from our assumptions on *w*), and $\delta_1(Q_1) \leq w(q_1^P) \leq w(1)$, with strict inequality if $q_1^P < 1$ (see the discussion following equation(25)).■

Proposition 4. As the seller's opportunity cost increases, a sale becomes less likely. If the seller is effectively more optimistic than the buyer, then increases in the opportunity cost lead to an increase in the contingency payment; otherwise cash payments will go up.

Proof. First consider period 2. Suppose *S*'s secondary-market wage function, *w*, increases for all q^P. This reduces V_2, as can be seen from Table B (recall $\delta_2(Q) = w(q^P) \geq c_0$), making a sale less likely. When a sale occurs, if $\alpha q^S \geq q^P$, an increase in *w* increases the contingency payment but has no effect on the cash payment. If $\alpha q^S < q^P$, anincrease in *w* increases the cash payment but has no effect on the contingency payment.

Now consider period 1. Suppose *S*'s secondary-market wage function increases from $w(q)$ to $w(q) + d(q)$, where $d(q) > 0$ for all *q*. If this increase results in an increase in $\delta_1(Q)$ for all *Q*, then the result for period 2 goes through. The change in $\delta_1(Q)$ due to the increase in *S*'s secondary-market wage is given by

$$d(q^P) - \beta\left[E^S\left(d\left(\tilde{q}^{P\prime}\right)|Q\right) - d(q^P)\right].$$

Clearly, this expression is positive if *d* is not "too" steep or convex. A sufficient condition is that $\beta d(1) \leq (1+\beta)\min_{q\in[0,1]} d(q)$.■

Proposition 5. An increase in *r* (the quality of the signal), keeping reputation and project quality equal, makes a sale more likely, and also affects the cash and contingency payments. In particular, either payment, if it changes, will decrease.

Proof. Using $q^S \geq q^P$, $r \in (0.5,1)$, $e < v$, and $q^P s < 1$ it is straightforward to check that $\gamma(q^P)\left[G(g, q^P)v - e\right]$ is increasing in *r*, and $\dfrac{q^P}{\alpha q^S}$ is independent of *r*. Since $\delta_t(Q)$ is (weakly) decreasing in *r* for both *t* (see Lemma 5), it follows that V_t is increasing in *r* for both *t*. Thus, an increase in signal quality makes a sale at either date more likely.

For date 2, it is clear from Table B that an increase in signal quality has no effect on the cash payment. If $\alpha q^S \geq q^P$, an increase in *r* decreases the contingency payment (recall δ_2 is independent of *r*). If $\alpha q^S < q^P$, an increase in *r* has no effect on either payment.

For date 1, it is clear from Table B that an increase in signal quality reduces the cash payment when the cash payment equals $\delta_1(Q)$ (i.e., when $\alpha q^S < q^P$ and $\delta_1(Q) > c_0$) and otherwise has no effect on the cash payment. When a sale occurs for $\alpha q^S \geq q^P$ and $\delta_1(Q) > c_0$, an increase in signal quality decreases the contingency payment. In all other cases, a change in signal quality has no effect on the contingency payment.■

Proposition 6. An increase in *s* (the effectiveness of a competent seller) increases the probability of a sale. If the seller is effectively more optimistic than the buyer, an increase in *s* will generally decrease the contingency payment, whereas if the seller is effectively less optimistic, the cash payment will decrease instead.

Proof. The effect of a change in *s* is very similar to that of a change in *r*. Again, it is straightforward to check that $\gamma(q^P)\left[G(g,q^P)v-e\right]$ is increasing in *s*, and $\frac{q^P}{\alpha q^S}$ is independent of *s*. Since $\delta_t(Q)$ is (weakly) decreasing in *s* for both *t* (see Lemma 5), it follows that V_t is increasing in *s* for both *t*. Thus, an increase in the ability of a competent seller makes a sale at either date more likely.

If $\alpha q^S \geq q^P$, an increase in *s* has no effect on the cash payment but reduces the contingency payment. If $\alpha q^S < q^P$,an increase in *s* has no effect on the contingency payment or the cash payment at date 2.

For date 1, it is clear from Table B that a change in *s* reduces the cash payment when the cash payment equals $\delta_1(Q)$ ($\alpha q^S < q^P$ and $\delta_1(Q) > c_0$) and otherwise has no effect on the cash payment. When a sale occurs for $\alpha q^S \geq q^P$ and $\delta_1(Q) \geq c_0$, an increase in *s* decreases the contingency payment. If $\alpha q^S < q^P$ a change in *s* has no effect on *k*. Finally, an increase in *s* may reverse the inequality $\delta_1(Q) \geq c_0$. In that case, either the contingency payment remains at zero or it falls to zero.■

Proposition 7. If either the probability of generating a good property (*s*) or the quality of the signal (*r*) or seller optimism (q^S) are sufficiently low, then properties sold under contingent contracts are less likely to be produced than properties sold under all cash contracts.

Proof: First, recall that the <u>true </u>probability of production for a property sold by a seller is $\gamma(q) = \Pr(R = g|q) = rqs + (1-r)(1-qs)$, where *q* is the seller's true competence probability. To say anything about the empirical production probability, we need to take a stand on the true competence probability.

Consider two sellers who have sold properties, seller "C" (for "contingent") under a contract with $k_t(Q) > 0$ and seller "N" (for "non-contingent") under a contract with $k_t(Q) = 0$. The reason why seller C has a contingent contract and seller N does not is that $\alpha q^S > q^P$ and $\delta_t(Q) > c_0$ for seller C, but one or both of these inequalities is reversed for seller N.

Lower *s* increases $\delta_t(Q)$ (Lemma 5) butreduces $\gamma(q)$. Consequently, sufficiently small *s* can account for the difference in contracts. Lower *r* also increases $\delta_t(Q)$ (Lemma 5) butreduces $\gamma(q)$ if $qs > 0.5$. Consequently, sufficiently small *r* together with $qs > 0.5$ can also account for the difference in contracts. Finally, lower q^S reduces $\gamma(q)$, if $q = q^S$, so that could also account for the difference.■

Appendix D: Selling a Screenplay – The Institutional Background

One can register a screenplay with the Writers Guild of America (WGA); however, a writer will need an agent in order to submit a screenplay to a studio or production company. Getting an agent may not be trivial: quite a few agencies do not accept unsolicited manuscripts,[2] and represent only people who are referred by people they know. The agent may submit a screenplay to be evaluated by a production company. Most major studios have several layers of screening before a script ends up in the hands of someone who can make a purchase decision. WGA sets minimum prices for screenplays, which in early 2004 (somewhat later than the last sale in our dataset) were around $50,000 for a low budget movie and up to $90,000 for a high budget film. However, a purchase (which is when the screenplay appears in our data), even at a very high price, is no guarantee of production. It may still take a while for anything to happen. First, screenplays are "developed," that is, changed, re-written and adapted to both the creative and pragmatic (budget) requirements of the purchasing entity.[3]In our model this corresponds to the "signal" received. Then, even if everybody is happy with the final write-up, there may not be a studio that is willing to finance and distribute the film.[4]

[2] See WGA.org.

[3] A playwright contractually controls a play written for the theater. No one is allowed to change her lines. In the movie business this is very different. Don Jacoby, who received 1.5 million dollars for a script he sold, told Variety in November 1998, "Not eight words from the original script were in the movie."

[4] The film industry boasts a large number of people who make a very nice living writing screenplays, but rarely if ever having anything actually produced.