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# Intellectual Property Contracts: Theory and Evidence from Screenplay Sales

### *Preliminary*

***by***

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***ABSTRACT***

Many Intellectual Property (IP) contracts are contingent on eventual production or success, in spite of the lack of moral hazard and in the possible presence of risk aversion on the part of the seller. This presents a puzzle. We propose a solution based on two key features of the market for IP, namely repeated interaction between buyers and sellers and uncertainty about the seller's ability to produce valuable properties. Since information about the seller's ability accrues over time, differences of opinion between buyer and seller about ability may persist and each sale contributes not only immediate income but affects the reputation of the seller. Using a model based on these features, we find that more reputable sellers should be offered a very different mix of cash and contingency payments than inexperienced sellers. We also relate the type of contract offered to the opportunity cost of the seller and discuss the probability of a sale taking place as a function of seller and product characteristics. The theoretical model is applied to a data base of screenplay sales, and we find that our theory can explain the diversity of contractual features observed in the data.

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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: a company may sell sequel rights to another company, or a writer may sell his life story or a book to a movie studio.

One of the most puzzling empirical regularities in many IP contracts is that often, properties 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 a screenplay dataset we use to provide some empirical evidence are contingent upon production[1]. Our study seeks to explain this puzzle and provide a general framework for analysis of IP and other contracts.

Although the seller of the intellectual property (IP) may 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 product and 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]

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[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, 2007 or Waldman, 1984) but again, with no effort component and with uncertainty on both sides.

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 the type of uncertainty is different, moral hazard plays a key role and reputation effects distinguish our work from 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, 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, i.e., 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 our model; we present our comparative statics results in section 3 and our empirical tests in section 4. Section 5 concludes. 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,

[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 (see for example Kaplan and Stromberg, 2003, or Lerner and Merges or Bengtsson and Ravid, 2010, or for theory 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).

denoted by *T*, and discount future payoffs using a discount factor $\beta \in (0,1)$. *S* is risk averse in a special 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. We restrict our attention to contracts that potentially offer the seller 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 differences may change over time however.

[8] 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. Our assumption that an incompetent seller's property is certainly bad just simplifies the formulas.

[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.

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[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. Results for the intermediate case in which the property is produced if and only if the preliminary signal is good (this is the only possible case when the payments are constrained as indicated) are not very different from those obtained below.

## 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, then, given contingency 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 a purchased property, given signal *R*, if and only if his expected payoff in (1) is non-negative.[11] 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

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

[11] We are implicitly assuming that *P* cannot commit to producing the property with any given probability (including one), regardless of the realization of his signal. If this were possible, an alternative type of contract, in addition to the type we consider, would be feasible, namely one that specifies a cash payment and a probability of production that is independent of the signal. For this second type of contract, the contingency payments would not matter, since they would not affect whether the property is produced (the expected contingency payment could be incorporated in the cash payment).

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 production is given by,

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

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 $r > 1/2$, $\gamma$ 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, revenues show whether the property is good or bad (remember, good properties yield $v > 0$ for sure, while bad properties yield 0 for sure).[12] 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

[12] 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.

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

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,

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

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

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

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 increases the 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."[13] We also assume for simplicity that no information about the seller's competence in the primary market is generated by her activity in the secondary market.

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[13] 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

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.

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

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 value to *S* of a given contract $(c,K)$, which may or may not be an equilibrium contract, given *Q*, is:

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

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 beliefs and 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.

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.

That is, $P$ has no interest in learning about the seller.[14] $P$'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,

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

Since a necessary condition for the property to be produced is that the signal is good, in equation (12), $P$'s expected revenue, *given that the property is produced*, is the probability that the property is good, given that the signal is good and $P$'s belief $q^P$ that $S$ is competent, i.e., $G(g,q^P)$, times the revenue if the property is good, $v$.

Note from equation (12), that when $\pi^P(Q,K)=0$, $\hat{V}(Q,c,K)=-c$, 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.[15]

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 contracts as a sequence of contracts $\{c_t(Q),K_t(Q)\}, t\in\{1,\ldots,T\}$ such that, for each $t\in\{1,\ldots,T\}$, $(c_t(Q),K_t(Q))$ solves

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

subject to (4),

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

and

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

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

The objective function in the equilibrium problem, (13), is simply $P$'s expected payoff in period $t$ for the contract $(c,K)$, 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 $\{U_t(Q) | t\in\{1,\ldots,T\}\}$ recursively, given $U_{T+1}(Q)\equiv 0$.

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[14] 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.

[15] 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.

Let $V_t(Q)$ 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 *Q* if and only if $V_t(Q) \geq 0$.

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 $\bar{U}_t(Q)$. Note that $\bar{U}_t(Q)$ 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 from Table A. Also, define

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

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, $u_t\left(q^P\right)$, 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

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

subject to (4) and

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

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 play 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

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

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.[16] Henceforth, we denote $k_v$ by *k* and drop $k_0$ from the model.

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[16]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.

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

## 3. Comparative Statics Results

In this section, we provide propositions that have empirical counterparts, some of which we will also take to the data. The first two propositions are interesting but difficult to test with our data. Similarly difficult are elements of later propositions that discuss the probability of a sale, since we have only completed transactions. These propositions however are important in explaining the logic of our optimal contracts and may apply more broadly. Many of the other ideas can be tested on our data as we will see below.

As suggested by our analysis of the equilibrium problem above, a critical element in many of the propositions is the relative magnitudes of $\alpha q^S$ 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, $\alpha q^S$ tends to become smaller than $q^P$, since $\alpha < 1$. Thus, we expect condition (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.[17] 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 ($\alpha$ 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, $\bar{U}_{T-1}(Q) = E^S\left(w\left(\tilde{q}^{P\prime}\right)|Q\right)$, 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 assume that there are only two periods, i.e., $T = 2$.

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

$$\delta_1(Q) = (1+\beta)w(q^P) - \beta\bar{U}_1(Q) = w(q^P) + \beta\left[w(q^P) - E^S\left(w\left(\tilde{q}^{P\prime}\right)|Q\right)\right]. \tag{21}$$

Note that, since *w* is increasing and convex and *S* is more optimistic than *P*, $w(q^P) \leq E^S\left(w\left(\tilde{q}^{P\prime}\right)|Q\right)$. It follows from (21) that $\delta_1(Q) \leq \delta_2(Q) = w(q^P)$ with strict inequality whenever $q^P < q^S$. Using the distribution of $\tilde{Q}'$ calculated in Table A (in appendix A), we have

$$\bar{U}_1(Q) = \left[rq^S sw(1) + (1-r)(1-q^S s)w\left(z(q^P)\right) + \left(1-\gamma(q^S)\right)w\left(F(b,q^P)\right)\right]. \tag{22}$$

Before we proceed, we state a technical lemma useful for our comparative statics results (see the proof in appendix C):

[17] 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.

**Lemma 5.** $\frac{\partial}{\partial q^P}\delta_1(Q) \geq w'(q^P) \geq 0$,

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

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

We now analyze the impact of the various exogenous variables on the likelihood of a sale and on the equilibrium contract. [18]

***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.

**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.

**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 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.[19]

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[18] 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.

[19] 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*.

**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 less optimistic than the buyer, then the cash component will be larger for more reputable sellers. If the seller is effectively more optimistic than the buyer, then the contingency 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. Proposition 3 suggests that, if a sale does take place, then for inexperienced sellers, as reputation increases, contingency payments go up. Intuitively, since the buyer is not "convinced" that the seller is competent, he is willing to offer the larger compensation necessary to induce a sale caused by increasing the contingency payment that will be paid only if the property is produced (i.e., the signal is good). On the other hand, for sellers at a later stage of their careers, those with better reputations will enjoy greater cash payments than established sellers with lesser reputations. Indeed, inequality (19) is sure to be reversed if the reputation expectations are the same, i.e., when sellers and buyers are nearly in agreement as to the seller's competence ($q^S \approx q^P$), then risk aversion ($\alpha$) will lead to an increase in the cash payments as reputation goes up. 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.[20]

**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 $\delta_2(Q) = w(q^P) \geq c_0$) 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 (21)).■

***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.[21]

**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

[20] Testing this last prediction is difficult, because we have few observations of repeat sales by the same seller.

[21] 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.

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.

**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 $\alpha q^S < q^P$, an increase 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

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

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.

**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 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.

**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 $\delta_2$ 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.

**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.

**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.■

## *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.[22] 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. *Uncertainty regarding property prospects and contractual format*

Proposition 5 says that as the quality of the signal increases, we expect production to be more likely, and thus, we also expect smaller contingency payments. The whole idea of contingency in the current framework is to account for differing beliefs about the likelihood of production. If, exogenous to these beliefs, production becomes more likely, we can expect less contingency payments, given the risk aversion of the sellers. We proxy for the possibility of a good signal by the fuzziness of the detailed description of the property – if it is difficult to understand the screenplay, it may not be easy to produce a useful signal.

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[22] 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 $\gamma$ is increasing with respect to *q* and most of the parameters, the comparative statics are largely unaffected.

3. *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.

## *4.1. Data and background*

Our data consists of 1269 contracts for screenplay sales that occurred between 1997 and 2003. Our main source of information is the 2003 *Spec Screenplay Sales Directory*, compiled by Hollywoodlitsales.com. Selling a screenplay can be a lengthy and arduous process (See appendix D). To a large extent, decisions at every stage are based upon a "pitch,", i.e. the basic concept of the screenplay boiled down to a paragraph or two that can be delivered in writing or orally by a writer or an agent. 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.[23] We gather data on the screenplay "pitch" or "logline" (the description used to sell the script) as well as screenwriter compensation and experience, script complexity, and movie financials and characteristics. The information provided on each sale usually includes: title, pitch (presumably, as provided by the agents of the buyer or seller), genre, agent, 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.[24]

We have a purchase price for 778 scripts (61.31% of the total sample). The price may be an exact number (which we have for 224 scripts, 28.79% of scripts with available price, 17.65% sample). In other cases, *Spec Screenplay Sales Directory* may record an approximate price (554 scripts). This is generally recorded as, for example, 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).[25] Prices are adjusted for inflation. [26]

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[23] 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

[24] 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."

[25] 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.

[26] 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.

Our main focus is on the type of contract offered. The first type is a fixed payment, non-contingent contract. There are 299 such screenplays in our sample (38%). Alternatively, the screenwriter may be offered a contingent contract (*Contingent*) – 489 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. Average compensation in non-contingent contracts is (in thousands) $1,241.28 (standard deviation, 4,440.23). In contingent contracts, the average initial payment is much lower, $455.76 (standard deviation, 374.81); total compensation if the script is finally produced is $987.99 (standard deviation, 1005.38).

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 (standard deviation is 13.65 – pitches vary from 2 to 96 words). The simplest measure we use for the complexity of the script is the number of words in the logline (*LogWords*).[27]

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 create a coarse division to approximate the fundamental differences in complexity. 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.[28] 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 make 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. We create a dummy variable for the availability of additional information (*InfoDummy*), which is equal to 1 if additional information is provided and zero otherwise.

The next set of variables describes the screenwriter's reputation, experience and past success. 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 (standard deviation, 5.5593). The writers of 730 scripts (57.52% of the sample) have not sold any previous work. *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). If we cannot find any produced screenplay in IMDb and no previous sale in our database, then our *FirstMovie* variable receives a value of one. For those who have had a screenplay produced, *FirstMovie* receives a value of zero. We also measure the numbers of Oscars and other awards which the writer had won or been nominated for. *NomOscar* (*AwardOscar*)[29] takes the value 1 if the screenwriter had been nominated for (had won) an Oscar prior to the current sale. *AnyNom* (*AnyAward*) takes the value 1 if the screenwriter had been

[27] See the online Appendix for information about automated evaluation of texts.

[28] Instead of using a single categorical variable, *SoftWords*, for logline length, we tried running a dummy variable for each range. As expected, results were similar. For purposes of sensitivity analysis, we also tried different ranges, where *SoftWords* received the value of zero for loglines under 15 words, and under 25 words respectively. There was very little difference in the empirical results, including runs with the changed *TransparentScript* variable and thus we did not include these specifications in our tables.

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

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, *WriterAvgDomesticGross* .

Finally, an unknown screenwriter may use a manager to compensate for his lack of experience. *Spec Screenplay Sales Directory* reports that the screenwriters who wrote 172 of the scripts sold (13.55% of the total sample) employ a manager. 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 both the writers, and use dummies: *Writer 1 Opportunity Cost*, and *Writer 2 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, *Writer Age*. 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. 350 films have been produced as of early 2010.

Appendices E and F contain the list of variables and data bases used.

## 4.2. *Results*

### *Contract type, screenwriter reputation, and information*

Table 1 displays the descriptive statistics for all the relevant variables. Panel B in Table 1 suggests that experience and past success determine the compensation (as any model would suggest) as well as the type of contract 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 (reputation movies = 3) are much less likely to receive a contingent contract; the probability of receiving a contingent contract for screenwriters with "reputation movies"=3 is about 0.38 while for those with "reputation movies"=1 it is about 0.61. Nomination of any kind increases the writer's compensation significantly, as does winning Oscars. According to Table 1b, being nominated for an Oscar increases the average payment to the screen writer seven-fold, from $0.697 million to $5.09 million. More importantly for our model, it 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 show this more formally below. We also note that as experience increases, a larger percentage of cash contracts lead to actual production. This seems to agree with proposition 5.

Also, if a contingent contract is awarded to a very experienced writer, then there must be a large disparity in views on competence. Table 1 shows that the writer tends to be over optimistic.

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 (here the separation is between 0, 1, and 2 vs. 3). Again, our empirical implications are supported – if there is more clarity before a signal is received, then the assessments are more similar, and cash is more likely. Less fuzziness leads to more cash contracts. 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. In summary, the first three panels of Table 1 seem to suggest that screenwriter reputation and signal variables are priced in the manner we hypothesized and that they are important in determining the type of contract offered to a screenwriter. 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.

### *Tests of some of the propositions*

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 all other 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, although if run without other experience variables it is significant. 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). This measure of "competence" however, is significant in determining prices paid as we see in table 3b. This is consistent with the model, but it is not a unique implication.

Table 4 restricts the analysis (OLS) to the subset of contingent contracts, and here we see 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, supporting our previous analysis.

In summary, the empirical findings so far support our first implication – reputation and experience change the contractual format, and as reputation increases, contingent contracts become less likely.

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, supporting our second empirical implication. 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). This supports our earlier conjecture that "iffier" projects tend to be sold on a contingency basis.

Thrillers and comedies seem to be less likely to result in contingent contracts (Models 3 and 4 in 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.[30]

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 Holmstrom and Milgrom (1992) 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.[31]

In summary, the results so far suggest that contract design in the movie industry as it relates to sales of screenplays, is heavily dependent on both the identity of the writer (reputation of the seller) as well as the signals contained in the description of the project, even at the point of sale, complementing the findings by Eliashberg, et al. (2007).

Our third empirical implication suggests that the opportunity cost of the seller is important in determining the mix between cash and contingency payments. The results of this analysis are reported in Table 5, Models 1 and 2. We see that in Table 5, Model 1, as the opportunity cost of the writer increases, the probability of receiving a contingent contract for the project also increases. The coefficient of *Writer 1 Opportunity Cost* is positive but not significant. Most of the other variables do not change their expected signs. When we run OLS regressions on price paid to the writers (Model 2), results show that opportunity cost has a negative impact on compensation received, but the coefficient is not significant. In conclusion, the opportunity costs results are harder to interpret – we suspect that our proxy is very noisy.

Table 6 runs a probit of production on various variables. The main result in this table is the negative correlation between the probability that a screenplay is produced and whether the contract includes a contingency payment, controlling for various other factors, especially reputation. In our model, both the production probability and whether the contract includes a contingency payment are endogenous variables, driven by the various exogenous parameters. Depending on which of these parameters vary to produce the data, this correlation could be positive or negative. The negative correlation, controlling for reputation, could result from variation in the success rate of competent screenwriters, $s$, or the accuracy of the producer's signal, $r$, since these two variables affect the probability of production and the likelihood of contingent contracts in opposite directions. In particular, increases in $s$ increase the probability of production but reduce the minimum current payment the contract must provide the seller, $\delta_t(Q)$ (see Lemma 5). Since contingent contracts are optimal only when $\delta_t(Q)$ is

[30] We repeated all specifications (not reported), with the addition of a *Large_studio* 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.

[31] 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.

sufficiently large (see Table B), an increase in *s* reduces the likelihood of contingency. Similarly, increases in *r* also increase the production probability[32] and reduce $\delta_t(Q)$.

## 5. Conclusions

This paper is first and foremost a model of contracts in an environment without moral hazard on the part of the risk-averse party and the other party 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 without moral hazard on the part of the risk-averse party. 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 choices contracts with a risk neutral buyer.

Our model determines when 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.

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.

[32] This requires that the unconditional probability that the property is good, $qs$, exceeds one-half, where $q$ is the true probability that $S$ is competent.

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# 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."

$\alpha$ 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 $Q$.

$\beta$ 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 $z(q^i)$, 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 $F(b, q^i)$. We can summarize player *i*'s distribution of $\tilde{Q}'$, given *Q* and that the property is sold, denoted $p_i(\tilde{Q}'|Q)$, in the following table.

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

**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

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

$$\delta_t\left(Q\right)<c_0, \tag{23}$$

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 (23) is not satisfied and (19) is satisfied, the solution is $c_t\left(Q\right)=c_0$,

$$k_t\left(Q\right)=\frac{\delta_t\left(Q\right)-c_0}{\alpha rsq^S}\text{, and} \tag{24}$$

$$V_t\left(Q\right)=\gamma\left(q^P\right)\left[G\left(g,q^P\right)v-e\right]-\left[\frac{q^P}{\alpha q^S}\delta_t\left(Q\right)+\left(1-\frac{q^P}{\alpha q^S}\right)c_0\right]. \tag{25}$$

Finally, if both (19) and (23) 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

$$\gamma\left(q^P\right)\left(G\left(g,q^P\right)v-e\right)-c_0\geq\max\left\{\delta_t\left(Q\right)-c_0,0\right\}\min\left\{\frac{q^P}{\alpha q^S},1\right\}. \tag{26}$$

Note, a necessary condition for (26) 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 (23) 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.[33]

Suppose the problem is feasible, and (23) 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 (24) and $V_t\left(Q\right)$ given by (25). 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 (26) is satisfied.■

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

| $\gamma\left(q^P\right)\left(G\left(g,q^P\right)v-e\right)-c_0$ | $\delta_t\left(Q\right)$ | $\alpha q^S$ | **Outcome** |
|---|---|---|---|
| $\geq \max\left\{\delta_t\left(Q\right)-c_0,0\right\}\min\left\{\frac{q^P}{\alpha q^S},1\right\}$ | $\geq c_0$ | $\geq q^P$ | $c_t\left(Q\right)=c_0$ <br> $k_t\left(Q\right)=\frac{\delta_t\left(Q\right)-c_0}{\alpha rsq^S}$ <br> $V_t\left(Q\right)=\gamma\left(q^P\right)\left[G\left(g,q^P\right)v-e\right] -\left[\frac{q^P}{\alpha q^S}\delta_t\left(Q\right)+\left(1-\frac{q^P}{\alpha q^S}\right)c_0\right]$ |
| | | $< q^P$ | $c_t\left(Q\right)=\delta_t\left(Q\right)$ <br> $k_t\left(Q\right)=0$ <br> $V_t\left(Q\right)=\gamma\left(q^P\right)\left[G\left(g,q^P\right)v-e\right]-\delta_t\left(Q\right)$ |
| | $< c_0$ | NA | $c_t\left(Q\right)=c_0$ <br> $k_t\left(Q\right)=0$ <br> $V_t\left(Q\right)=\gamma\left(q^P\right)\left[G\left(g,q^P\right)v-e\right]-c_0$ |
| $< \max\left\{\delta_t\left(Q\right)-c_0,0\right\}\min\left\{\frac{q^P}{\alpha q^S},1\right\}$ | 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: Proof of Lemma 5

For the first result, from (21), it suffices to show that $\frac{\partial}{\partial q^P} E^S\left(w\left(\tilde{q}^{P\prime}\right)\middle|Q\right) \le w'\left(q^P\right)$. Now

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

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

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

This completes the proof of the first statement.

For the second statement,

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

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

For the third statement,

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

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

# 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,[34] 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.[35] 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.[36]

[34] See WGA.org.

[35] 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."

[36] 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.

# Appendix E: Variable Definitions

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.
- *HardIndex* = *RepnMovies* + *AnyNom*, with a value between 0 and 4.

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.

# Appendix F: Data Bases and Variables

## *Spec Screenplay Sales Directory, 2003 Edition*

**Database Description**: Compiled by Hollywoodsales.com, *Spec Screenplay Sales Directory* contains approximately six years of screenplays sales, covering 1,269 scripts. The information provided on each sale includes: title, pitch (presumably, as provided by the agents of the buyer or seller), genre, agent, producer, date-of-sale, purchase price, and buyer. Sometime the directory provides additional information regarding the particular screenplay. This additional information may include parties who are interested in the project, or information about the screenwriter, etc. The information may be tentative (e.g. a possible director for the script), or more definite (e.g. a star actor or director that that has already confirmed his participation).

**Variables Included in the study:**

Script Complexity Variables: *LogWords , SoftWords, HighWords, InfoDummy, TransparentScript, SoftGenres, SoftLogMovies.*

Compensation – Contractual Variables: *Price, Cont.*

Additional Control Variables: *Genre Dummies, Manager.*

## ***IMDb (Internet Movie Data Base)***

**Database Description**: IMDb includes comprehensive information about a large number of movies. We gather data from IMDb and IMDb-PRO on our "hard information" variables, including screenwriter's experience and past success. To measure the screenwriter's experience, we search for the number of scripts previously sold by the screenwriter and produced. (If we find no entries in IMDb, we also search our own database to see if this writer had previously sold any screenplay).

We also use IMDb to check whether the screenwriter had been previously nominated for (had won) an award in any of the major festivals tracked by IMDb: Oscars, Golden Globe, British Academy Awards, Emmy Awards, European Film Awards, Cannes, Sundance, Toronto and Berlin. Alternatively, we use the IMDb Starmeter measure to classify an actor as a star. Starmeter uses proprietary algorithms that take into account several measures of popularity for people and titles. The primary measure captures who or what is being viewed on the public imdb.com website. Other factors include box office receipts and user quality votes on a scale of 1-10. The rankings are updated on a weekly basis. We classify an actor as a star if he or she has a Starmeter ranking higher than 150 in the first entry in January of the year the movie is released.

**Variables Included in the study:**

Experience Variables*: NumberMovies, ReputationMovies, FirstMovie, NomOscar (AwardOscar), AnyNom (AnyAward).*

[redacted]

## Table 1: Summary Statistics Variables Description

Table 1 summarizes the relationship between screenwriter compensation, screenwriter reputation and script complexity. The **Price** and **Cont**, columns give the means or medians of those variables as classified by the variables and values in the first two columns. The last column analyzes how screenwriter reputation and script complexity influence the type of contract offered to the screenwriter. 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). **cashp** is the percentage of cash contracts produced and **contp** and 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. We also include several variables that try to capture soft information or script complexity. **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).

**Table 2. Descriptive statistics for the variables**

| Variables | N | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| ***Signal variables*** | | | | | |
| LogWords | 1217 | 25.92 | 13.66 | 2 | 96 |
| InfoDummy | 1268 | .45 | .50 | 0 | 1 |
| SoftLogMovies | 1217 | .07 | .25 | 0 | 1 |
| SoftWords | 1217 | 1.03 | 1.06 | 0 | 3 |
| ***Screenwriter Reputation*** | | | | | |
| NumberMovies | 1268 | 2.03 | 5.56 | 0 | 82 |
| ReputationMovies | 1268 | .61 | .83 | 0 | 3 |
| Firstmovie | 1268 | .57 | .50 | 0 | 1 |
| NomOscar | 1268 | .02 | .14 | 0 | 1 |
| AwardOscar | 1268 | .01 | .10 | 0 | 1 |
| Anynom | 1268 | .05 | .21 | 0 | 1 |
| Anyaward | 1268 | .02 | .14 | 0 | 1 |
| WriterAvgRev | 225 | 4.67e+07 | 6.05e+07 | 3902 | 5.81e+08 |
| ***Screenwriter Opportunity Cost*** | | | | | |
| Writer 1 Opportunity Cost | 1264 | .08 | .32 | 0 | 3 |
| ***Screenplay genres*** | | | | | |
| Action | 1268 | .15 | .36 | 0 | 1 |
| Comedy | 1268 | .45 | .50 | 0 | 1 |
| Drama | 1268 | .20 | .40 | 0 | 1 |
| Romance | 1268 | .14 | .35 | 0 | 1 |
| Thriller | 1268 | .18 | .38 | 0 | 1 |
| ***Contract variables*** | | | | | |
| Price ('000) | 777 | 770.54 | 2789.43 | 26 | 53500 |
| Contingent (dummy) | 787 | .62 | .49 | 0 | 1 |
| ***Control variables*** | | | | | |
| Writer Age | 343 | 38.46 | 13.65 | 16 | 94 |
| Manager | 1268 | .14 | .34 | 0 | 1 |
| Largebuyer | 1268 | .56 | .50 | 0 | 1 |
| Top6 | 1268 | .38 | .49 | 0 | 1 |

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

**TABLE 3.Probit Regression for The Type Of Contract: Contingent Vs. Non-Contingent (Dependent Variable = Cont.)**

| | **Model 1** | **Model 2** | **Model 3** | **Model 4** |
|---|---|---|---|---|
| | **Coefficient(S.E)** | **Coefficient(S.E)** | **Coefficient(S.E)** | **Coefficient(S.E)** |
| ***Screenwriter Reputation*** | | | | |
| ReputationMovies | | | | |
| 1 | -.05(.14) | -.05(.10) | -.07(.11) | -.07(.11) |
| 2 | .10(.16) | .08(.16) | .05(.17) | .04(.17) |
| 3 | -.63**(.28) | -.62**(.31) | -.58(.37) | -.60*(.37) |
| AnyNom | | -.22(.22) | -.26(.21) | -.26(.22) |
| Screenwriter Competency | | | 4.9e-10 (4.2e-09) | 7.4e-10(2.3e-09) |
| ***Signal Variable*** | | | | |
| TransparentScript | | .03(.14) | .31*(.18) | .31*(.19) |
| SoftGenres | | | -.09(.14) | -.09(.13) |
| HighWords | | .29**(.14) | | |
| SoftWords | | | .12***(.05) | .12***(.05) |
| InfoDummy | | | -.21*(.12) | -.24*(.13) |
| | | | | |
| ***Screenplay generes*** | | | | |
| Action | | | .14(.16) | .15(.16) |
| Comedy | | | -.24*(.14) | -.24*(.14) |
| Drama | | | -.08(.17) | -.08(.17) |
| Romance | | | .28(.18) | .28(.18) |
| Thriller | | | -.36**(.16) | -.36**(.16) |
| ***Control Variable*** | | | | |
| Top6 | | | | .08(.09) |
| ManagerDummy | | | | .15(.15) |
| ***Constant*** | .33***(.06) | .31***(.06) | .43***(.13) | .39***(.15) |
| Number of obs | 787 | 759 | 756 | 756 |
| Wald chi2(15) | 5.75 | 10.03 | 25.95 | 27.61 |
| Prob> chi2 | .12 | .12 | .026 | .035 |
| Pseudo R2 | .006 | .01 | .027 | .029 |

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

**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.

**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.**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.

**TABLE 3b. OLS Regression For Competent Writers**
**(Dependent variable = log price)**

| | **Model 1** | **Model 2** |
|---|---|---|
| ***Contract Type*** | | |
| Contingent | -.43***(.13) | -.47**(.13) |
| | | |
| ***Screenwriter Reputation*** | | |
| NumberMovies | .002(.008) | |
| AnyNom | .65***(.21) | .63***(.22) |
| ReputationMovies | | .15(.09) |
| | | |
| ***Signal Variables*** | | |
| TransparentScript | .36(.23) | .31(.23) |
| SoftLogMovies | | .45***(.18) |
| SoftGenres | .10(.17) | .12(.17) |
| HighWords | | -.04*.17) |
| | | |
| ***Screenwriter Competency*** | | |
| Writer Average Domestic Gross | 4.42e-09*** (1.87e-09) | 3.88e-09** (1.65e-09) |
| | | |
| ***Screenplay Genres*** | | |
| Action | -.13(.20) | -.13(.20) |
| Comedy | .02(.20) | -.00(.20) |
| Drama | .06(.20) | .04(.19) |
| Romance | -.12(.20) | -.12(.19) |
| Thriller | -.10(.24) | -.09(.24) |
| | | |
| ***Control Variables*** | | |
| ManagerDummy | -.34(.21) | -.33(.20) |
| Top6 | .24**(.12) | .23*(.12) |
| | | |
| **Constant** | 6.48***(.20) | 6.30***(.24) |
| | | |
| Nos. of Obs. | 123 | 123 |
| F-value | 4.31 | 4.70 |
| Prob > F | 0.00 | .00 |
| R-Sq | .34 | .36 |

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

Dependent variable is log of **Price** is the price paid to the screenwriter.

**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. **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. **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.

**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.

**WriterAvgDomesticGross** is the average domestic revenues of all movies that were made out of the screenwriter's scripts in the past.

**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.

**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.

**TABLE 4. Regression For The Cash Ratio:**
**(Dependent Variable = Proportion of Cash Payment over Total Payment=price/priceifmade )**

| | Model 1 | Model 2 | Model 3 | |
|---|---|---|---|---|
| | **Coefficient(S.E)** | **Coefficient(S.E)** | **Coefficient(S.E)** | **Coefficient(S.E)** |
| ***Contract Type*** | | | | |
| Cont. | -.51***(.01) | -.51***(.01) | -.51***(.01) | -.51***(.01) |
| | | | | |
| ***Screenwriter Reputation*** | | | | |
| ReputationMovies | .02***(.01) | .02***(.01) | | |
| AnyNom | -..002(.006) | -.00(.02) | | |
| NumberMovies | | | .00(.00) | .00(.00) |
| FirstMovie | | | -.03***(.01) | -.03**(.01) |
| | | | | |
| ***Signal Variable*** | | | | |
| TransparentScript | | | .03**(.01) | .03**(.02) |
| SoftGenres | | | .02(.02) | .02(.02) |
| HighWords | | | -.04**(.02) | -.04**.02) |
| SoftWords | | -.02***(.00) | | |
| InfoDummy | | -.01(.01) | -.02*(.01) | -.02(.01) |
| | | | | |
| ***Screenplay generes*** | | | | |
| Action | | | -.01(.01) | -.01(.01) |
| Comedy | | | .01(.02) | .01(.01) |
| Drama | | | -.01(.02) | -.01(.01) |
| Romance | | | -.01(.02) | -.01(.02) |
| Thriller | | | -.00(.02) | -.00(.02) |
| | | | | |
| ***Screenwriter Opportunity*** | | | | |
| *Writer 1 Opportunity Cost* | | | | -.01(.01) |
| | | | | |
| ***Control Variable*** | | | | |
| LargeBuyer | | | | .01*(.00) |
| ManagerDummy | | | | .01(.01) |
| | | | | |
| ***Constant*** | .98***(.01) | 1.01***(.01) | 1.01***(.01) | |
| Number of obs | 741 | 741 | 738 | 735 |
| F-value | 947.00 | 1079.33 | 486.88 | 397.73 |
| Prob > F | .00 | .00 | .00 | .00 |
| R-sq | .79 | .80 | .80 | .80 |
| | | | | |

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

**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.

**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.

**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.

**TABLE 5. Probit and OLS Regression For Opportunity Cost Of Writers**

| | **Model 1: Probit Analysis Dep. Var=Cont** | **Model 2: OLS Dep. Var=log(price)** |
|---|---|---|
| ***Contract Type*** | | |
| Contingent | | -.44***(.05) |
| | | |
| ***Screenwriter Reputation*** | | |
| NumberMovies | -.02*(.01) | |
| AnyNom | -.30(.23) | .42***(.14) |
| ReputationMovies | | .29***(.03) |
| | | |
| ***Signal Variables*** | | |
| TransparentScript | .04(.14) | .04(.07) |
| SoftLogMovies | -.11(.18) | .03(.08) |
| SoftGenres | -.10(.18) | .05(.08) |
| HighWords | .27*(.14) | -.02(.07) |
| | | |
| ***Screenwriter Opportunity Costs*** | | |
| *Writer 1 Opportunity Cost* | .25(.16) | -.05(.07) |
| | | |
| ***Screenplay Genres*** | | |
| Action | .17(.16) | .02(.07) |
| Comedy | -.26*(.14) | -.03(.06) |
| Drama | -.09(.17) | .02(.08) |
| Romance | .28(.18) | .06(.08) |
| Thriller | -.35**(.17) | .07(.08) |
| | | |
| ***Control Variables*** | | |
| ManagerDummy | .08(.14) | -.20***(.06) |
| LargeBuyer | .13(.09) | .16***(.05) |
| | | |
| **Constant** | .35**(.15) | 6.09***(.07) |
| | | |
| Nos. of Obs. | 753 | 742 |
| Chi-sq | 29.70 | |
| Prob>Chi-sq | .00 | |
| F-value | | 11.56 |
| Prob > F | | .00 |
| R-Sq | | .26 |

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

**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. **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. **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.

**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.

**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.

**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.

**TABLE 6.Probit Regression for Films Produced**
**(Dependent variable = Produced)**

| **variables** | **Coefficient (S.E)** |
|---|---|
| Cont | -.19**(.10) |
| ***Screenwriter Reputation*** | |
| ReputationMovies | .14**(.06) |
| AnyNom | .51**(.22) |
| ***Screenplay genres*** | |
| Action | -.03(.14) |
| Comedy | -.09(.13) |
| Drama | .20(.16) |
| Romance | .16(.15) |
| Thriller | -.28(.16) |
| ***Control Variables*** | |
| Top6 | -.07(.09) |
| ManagerDummy | .26*9.14) |
| ***Constant*** | -.59***(.15) |
| Number of obs | 787 |
| Wald Chi-sq | 29.11 |
| Prob. > Chi-sq | .00 |
| LogLikelihood | -438.89 |

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

**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.

**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.**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.