An Empirical Analysis of Strategic Contracts[1]

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Abstract

This article investigates the use of strategic contract clauses such as most-favored-customer clauses, rights of first refusal, rights of first offer, first negotiation rights in bio-tech R&D contracts between pharmaceutical firms and bio-tech agents. It is shown that these strategic rights are more likely adopted when potential entry threat from other pharmaceutical firms are larger. This result is consistent with the prediction from the literature: strategic contracts can increase the joint benefit of contracting parties by extracting rent from entrants and/or protect investments by contracting parties. Furthermore, strategic rights and termination rights held by pharmaceutical firms are shown to be substitutes, and the level of substitution is affected by the uncertainty of the R&D activities involved and the previous relationship between contracting parties. These results can be explained by a multi-task theory where bio-tech agents allocate effort between R&D activities specified in contracts and non-contracted R&D activities.

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1. Introduction

Strategic contracts are widely adopted in various industries for sales, acquisitions, and strategic alliances. As shown by the literature following Aghion and Bolton (1987), a common feature of strategic contracts is that they can extract more rent from potential entrants and/or protect investments taken by contracting parties. In reality, many contract clauses can have such strategic effects.

For examples, *breakup fees* are often designed to prevent contracting parties from breaching their contracts, and therefore such clauses can force entrants to offer better deals in negotiating with one of the initial contracting parties. *Most-favored-customer clause* and *the right of first refusal* signed between a seller of an asset and a buyer typically specify that, if the seller receives an offer from another buyer, he must inform the initial buyer, who has the right to obtain the asset by matching the outside offer. A related but different clause, *the right of first offer,* often requires that the seller should first make an offer to the initial buyer, and if the buyer rejects, the seller can look for other buyers but cannot sell the asset at more favorable terms than the offer made to the initial buyer. There are also clauses such as the *right of first negotiation*, which only requires the seller to negotiate first with the right holder before searching for other buyers, but does not set any restriction on the terms of sales. Except for breakup fees, the above strategic contract clauses and other similar clauses are commonly employed in R&D agreements between pharmaceutical firms and bio-tech agents, regarding the sales of licensing rights for R&D discoveries not specified in their initial contracts.

Although there is a large theoretical literature on strategic contracts, empirical studies have been very limited.[2] In this paper, we provide both theoretical and empirical analysis of strategic contracts. We formulate a multi-task model where an agent can allocate effort between one R&D activity specified by the contract between the agent and a client, and another non-contracted R&D activity. A potential entrant may compete for the licensing right of non-contracted R&D discoveries. We show theoretically that strategic contracts not only help the contracting parties to extract more rent from the entrant, but also mitigate multi-task agency problems by reducing the agent's outside option. These effects imply that strategic contracts are more likely adopted when

[2] There is one interesting experimental study on the right of first refusal by Grosskopf and Roth (2009).

there is (larger) entry threat. We also show the substitution between strategic contract rights and unconditional termination rights which allow the client to terminate the R&D project.

Following the model predictions, we conduct empirical analysis on the adoption of strategic rights, using a rich dataset of R&D agreements between pharmaceutical firms and bio-tech agents. We construct a dummy variable, as the main dependent variable, to capture whether an agreement contains strategic rights. We also create two other dependent variables reflecting the different strength levels of various strategic rights. For each agreement about R&D activities of a certain disease type, several entry threat measures are created based on other pharmaceutical firms' R&D projects and clinical trials of the same disease type in the previous years, and based on Herfindahl index (HHI) of generic drugs of the same disease type.

In the first part of empirical analysis, after controlling characteristics of projects, clients and agents, we show that entry threat significantly increases the adoption of strategic rights in R&D agreements. The adoption of strategic rights by a client and an agent is also influenced by the client size, the agent's R&D experience, and whether the client and the agent have previous relationship in R&D cooperation.

In the second part of empirical analysis, we also consider unconditional termination rights which allow pharmaceutical clients to terminate R&D projects without any justification. It is shown that there is a negative relationship between the adoption of unconditional termination rights and the adoption of strategic rights. Strategic rights and termination rights are substitutes in addressing multi-task agency problems. We also find that such substitution becomes more pronounced in early R&D stages when there is larger uncertainty. Similarly, such substitution becomes more pronounced when contracting parties have previous relationship in R&D cooperation. Previous relationship between contracting parties allows for more information learning about agents' ability and behavior, so that clients are more likely to observe intermediate (or more accurate) signals about the progress of R&D projects. In such scenarios, termination rights are more effective in motivating agents. Therefore, the potential benefits of using strategic rights are smaller.

We also discuss alternative theories such as uncertainty, asymmetric information and screening, and relational contracts which may explain some but not all of the empirical results.

Our paper mainly contributes to the literature on strategic contracts. Contracts can be used as strategic tools to deter entry or to extract rent from entrants (Aghion and Bolton, 1987). Strategic contracts could also preserve incentive for relationship-specific investments (Rogerson, 1984, 1992; Chung, 1991; Spier and Whinston, 1995; Che and Chung, 1999; Che and Hausch, 1999; Segal and Whinston, 2000; Che and Lewis, 2007) or facilitate trade by imposing lower values on outside options (Hua 2007; Matouschek and Ramezzana, 2007). Many of the above studies focus on the effects of breakup fees and termination penalties. Choi (2009) show that he right of first refusal could strategically extract rent from future buyers, but cause asset misallocation. Other studies on the right of first refusal and right of first offer include work by Bikhchandani, Lippman, and Ryan (2005), Kahan, Leshem, and Sundaram (2008), Grosskopf and Roth (2009), and Hua (2012). There are also studies on most-favored-customer clauses (Butz, 1990; Cooper and Fries, 1991; Neilson and Winter, 1994; Spier, 2003, and Daughety and Reinganum, 2004). Our paper contributes to the above literature in two dimensions. First, we show theoretically that strategic contracts not only extract more rent from entrants, but also mitigate multi-task agency problems. Second, and more importantly, our paper is the first study providing empirical evidence about the adoption of various strategic rights in contracts, as well as the relationship between strategic rights and termination rights.

There is limited literature on empirical analysis of contracts. Lafontaine and Slade (2008) summarize the empirical findings on exclusive contracts and competitiveness in markets. An interesting study by Lafontaine (1992) tests various agency-theoretic explanations for franchising, including risk sharing, one-sided moral hazard, and two-sided moral hazard models. She finds that the two-sided moral hazard model explains the data best.[3] Gil and Marion (2013) show that informal and relationship contracts lead to more entry and lower bids in the highway procurement market. A few empirical studies (Lerner and Merges, 1997; Arrunada, Garicano, and Vazquez, 2001; Elfenbein and Lerner, forthcoming) have examined allocation of control rights in contracts. Lerner and Ulrike (2010) provide important evidence on incomplete contracts. By using data from bio-tech R&D agreements, they show that less contractibility of R&D activities leads to more adoption of termination rights. Our paper uses a similar source of data. Different from the literature, our paper mainly addresses the adoption of strategic contract.

[3] Fan, Kuhn, and Lafontaine (2013) provide evidence that potential franchisees' financial constraints affect franchisors' entry into franchising.

Our paper is also related to the literature on stage financing and project termination in venture capital investments. As predicted by the theoretical literature, stage financing can motivate agents to exert effort or mitigate entrepreneurs' hold-up problems (Neher, 1999; Cornelli and Yosha, 2003). Option to terminate the venture may also screen out low-quality projects (Dewatripont and Maskin, 1995; Qian and Xu, 1998). Information learning in stage financing is valuable for venture capitalists to make decisions (Bergemann and Hege, 1998). Empirical examinations justify the linkage between agency issues and stage financing strategies (Gompers, 1995; Kaplan and Stromberg, 2003; Bergemann et al, 2009). In our paper, the role of unconditional termination rights held by pharmaceutical clients is similar to that of stage financing, in solving agency issues. However, our paper focuses more on strategic rights, and the substitution between termination and strategic rights, which have not been studies before.

Section 2 presents the theoretical model and derives predictions about the usage of strategic rights. Section 3 describes the data. The empirical specification and results are discussed in Section 4. Section 5 checks the robustness of the results by using alternative measures of entry threat and discusses some alternative theories. And Section 6 provides the concluding remarks.

2. Model and Predictions

There are two risk-neutral players as initial contracting parties in the model: a client P, and an agent A. With probability $\theta > 0$, there is another risk-neutral firm E as the potential entrant. The client P hires the agent A to conduct a R&D project C and devotes initial investment I, which is essential for any research activity. Given the nature of the project C, the corresponding R&D outcome is verifiable and contractible. After receiving the initial investment, however, the agent has limited time and therefore can choose his effort $e \in \{C, NC\}$ between two types of R&D activities: the activity C which may result in the contracted R&D discovery, and another activity NC which may result in a non-contracted R&D discovery.[4] For example, in reality, a bio-tech agent can use the initial investment to look for some discoveries which are not the initial objectives of the R&D project C. The initial contract between the client P and the agent A cannot

[4] For simplicity, we assume that the agent can only take effort in one of the two activities. Alternatively, the agent's effort for each activity can be $e \in \{0,1\}$, under the constraint that his total effort is 1. The intuition of our results holds with continuous effort choices.

specify all such potential discoveries. And the linkage between investments by P and the discoveries from Project NC is not verifiable. There is no difference in the agent's effort costs between the two types of activities. For simplicity, assume that the agent's effort costs are small enough and therefore can be ignored in the analysis. Agent A's effort choice cannot be observed by the other players.

If the agent chooses $e = C$, with probability $\alpha > 0$, Project C is successful; and independently with probability $\beta < \alpha$, Project NC is successful and results in a non-contracted discovery.

If the agent chooses $e = NC$, with probability $\alpha > 0$, Project NC is successful; and independently with probability $\beta < \alpha$, Project C is successful.

Since the R&D outcome from Project C is contractible, the initial contract can specify who, P or A, owns the property right of the R&D discovery from Project C. To capture the reality that R&D agents lack the necessary production and marketing resources, we assume that the realization of any benefit from the R&D discovery requires inputs from P or E. In addition, we assume that, given its investment I, the client P can make a take-it-or-leave-it contract offer to the agent A regarding Project C.[5] If the contract licenses the property right of the R&D discovery to P, the potential entrant E cannot compete to obtain the discovery. Conditional on the success of Project C, for any firm, the expected market value of the R&D discovery is $u > 0$, which is a fixed number and greater than the initial investment I.

In contrast, the R&D discovery from Project NC, if any, is observable by all players but not contractible in the initial contract. Therefore, if the potential entrant E exists, she may enter to compete for the license of the non-contracted R&D discovery. Conditional on the success of Project NC, the expected market values of the R&D discovery from Project NC are v_P for the client P and v_E for the entrant E respectively. v_P and v_E are independent and follow the same distribution $F(v)$ on $[\underline{v}, \overline{v}]$, with monotone hazard rate: $H(v) = (1 - F(v))/f(v)$ is decreasing in v. Although the distribution is commonly known to all players, v_P is privately observed by P and v_E is privately observed by E, after the R&D outcome is realized.

[5] This assumption simplifies the theoretical analysis. Our results still hold when A also has some bargaining power.

In reality, the outcome from non-contracted R&D activities is more uncertain and correspondingly has smaller expected value than the intended R&D outcome from contracted R&D activities. We assume that $u > \hat{v} = \int_{\underline{v}}^{\overline{v}} \int_{\underline{v}}^{\overline{v}} \max(v_P, v_E)\, dF(v_p) dF(v_E)$. It is socially more efficient and also more jointly beneficial for P and A to devote effort into Project C than into Project NC.

It is easy to see the potential conflicts between the client P and the agent A. Since the research discovery from Project NC is non-contracted, it is possible to have more competition over the corresponding licensing right. Given the potential competition between P and E, the agent may expect to receive more revenue from Project NC than Project C. In theory, P can offer a high payment contingent on the success of Project C, in order to motivate the agent to devote his effort in Project C. However, this high contingent payment may be too costly for P.

In the following, we will first describe the timing of the basic model where the client P cannot terminate the R&D project. Then we will generalize the model to include the possibility for P to observe some intermediate signals and terminate the project.

The Basic Model and Analysis

For simplicity, assume that, if any project is not successful, the expected market value for that project is zero. The timing of the basic model is as follows:

At Date 1, P and A have symmetric information. P offers a take-it-or-leave-it contract to A. The contract can include an upfront transfer t_0 from P to A (in addition to the initial investment *I*), the ownership or licensing right $O_C \in \{P, E\}$ of the discovery from Project C, an ex post payment t from P to A conditional on the success of Project C. The contract offer may also include a direct or indirect mechanism regarding the sales of the licensing right $O_{NC} \in \{P, E\}$ of any non-contracted R&D discovery by A from Project NC. Adding such a mechanism would increase contracting and enforcement costs for P and A by $\delta > 0$. If A accepts this contract, P makes the upfront transfer and initial investment. However, P is financially constrained by $I + k$ and therefore $t_0 \leq k$. If A rejects the contract, there is no R&D activity.

At Date 2, A chooses unobservable effort $e \in \{C, NC\}$.

At Date 3, Projects C and NC may succeed or fail. When Project NC is successful, E enters with probability θ. If the initial contract has specified a selling mechanism, the allocation of the licensing right is determined by the mechanism; otherwise, the allocation of the licensing right is determined by a standard first-price or second-price auction.

In reality, R&D agreements often use specific strategic rights such as most-favored licensee, right of first refusal, right of first offer, right of first consideration, for the sales of the licensing right of any non-contracted R&D discovery. In the analysis, however, we use the mechanism design approach to characterize the optimal contract which maximizes the joint benefits of P and A. The similar analysis has been done by Hua (2007), showing that the above-mentioned specific strategic rights have similar features as the optimal contract.[6] In particular, the optimal contract would specify a direct revelation mechanism to be used at date 3. If Project NC succeeds and E enters, then both P and E are asked to report their values of the discovery from Project NC. Given their reports v_P and v_E, the mechanism specifies winning probabilities for P and E, and ex post payments from P and E to A.

As a benchmark, assume that the contract at Date 1 does not include any mechanism for the sales of the licensing right of non-contracted R&D discoveries. Then if E enters, the allocation of the licensing right of non-contracted R&D discoveries between P and E would be determined by the standard first-price or second-price auction.

Proposition 1: Assume that the contract does not include any selling mechanism for discoveries from Project NC. (1) Under the optimal contract, P obtains the licensing right O_C, i.e., $O_C = P$. (2) If E does not enter, P always obtains the licensing right O_{NC}. If E enters, when P's virtual utility, $v_P - (1 - F(v_p)/f(v_p)$, is greater than E's virtual utility, $v_E - (1 - F(v_E)/f(v_E)$, P wins the licensing right O_{NC}; otherwise E wins the licensing right O_{NC}.

Proof: As shown in the literature on mechanism design.

[6] In this paper, we assume that P, as one of the potential buyers of the licensing right, makes the initial contract offer. In contrast, Hua (2007) assumes that a unique seller makes the initial contract offer. However, it can be shown that the optimal contract derived in Hua (2007) also maximizes the joint benefit of the contracting parties. Thus, the analysis can be applied to the current model.

Now consider the contract which includes a mechanism for the sales of the licensing right of non-contracted R&D discoveries from Project NC. The following proposition characterizes the allocation of licensing rights under the optimal contract.

Proposition 2: Assume that the contract can include a selling mechanism for discoveries from Project NC. (1) Under the optimal contract, P always obtains the licensing right O_C, i.e., $O_C = P$. (2) There exists a unique value $\lambda = \lambda(k)$, where $\lambda(k)$ is less than 1 and non-increasing in k. Under the optimal contract, if P's λ-adjusted virtual utility, $v_P - \lambda(1 - F(v_p)/f(v_p)$, is greater than E's virtual utility, $v_E - (1 - F(v_E)/f(v_E)$, P wins the licensing right O_{NC}; otherwise E wins the licensing right O_{NC}.

Proof: As shown by Hua (2007).

Propositions 1 and 2 lead to the following comparisons:

Corollary 1: Compared to the benchmark case, when the contract includes a selling mechanism for non-contracted R&D discoveries from Project NC, (1) the optimal mechanism has a strategic effect which reduces E's winning probability; (2) conditional on the existence of a non-contracted R&D discovery, the joint expected benefit of P and A from the non-contracted discovery is larger; and (3) the expected revenue for A from selling the licensing right of the non-contracted discovery becomes smaller.

The above results imply that P and A may specify a strategic selling mechanism to make P more likely to obtain the licensing right of non-contracted R&D discoveries and to increase the joint benefit of P and A by extracting more rent from E. In addition, by reducing the agent's expected revenue from non-contracted discoveries, such a mechanism also creates more incentive for A to devote his effort in the contracted project C instead of in the non-contracted project NC, which are jointly beneficial for P and A. Of course, including such a strategic mechanism would increase the contracting or enforcement costs for P and A by $\delta > 0$. Therefore,

P would offer a contract including such strategic mechanisms only when the probability to have entry threat is large enough and the contracting/enforcement costs are small enough.

Proposition 3: There exists a cut-off value $\hat{\delta} > 0$. Given any contracting and enforcement costs satisfying $\delta < \hat{\delta}$, there exists $\hat{\theta}(\delta) > 0$ such that, if the probability for E to enter satisfies $\theta > \hat{\theta}(\delta)$, P has incentive to include the optimal strategic selling mechanism for the licensing right of non-contracted discoveries.

Proof: To be added.

The Generalized Model and Analysis

In the above basic model, we assume that P can never terminate the R&D project. In reality, however, clients often hold some (unconditional) termination rights. After observing some intermediate signals about the progress of R&D projects, clients can exercise termination rights. Intuitively, such termination rights motivate agents to devote more effort into contracted R&D activities. Therefore, termination rights and strategic contract mechanisms can be substitutes. In reality, both termination rights and strategic rights are choice variables in contract design. However, in this paper, we only illustrate the correlation between these two contract terms, instead of charactering the optimal contract. Thus, we assume that the initial contract has given P an unconditional termination right. We then generalize our basic model by adding another intermediate stage between Date 2 and Date 3:

At Date 2.5, after A takes effort, with probability $\phi < 1$, P can observe a non-verifiable signal $s \in \{C, NC\}$ which perfectly reveals the agent A's effort choice. Then P can decide whether to terminate Project C. If terminated, Project C results in a residual value r which is obtained by P. If not terminated, then the game proceeds to Date 3. The following lemma shows a sufficient condition for P to exercise the termination right.

Lemma 1: If $r > \beta u + \alpha \hat{v}$, P would terminate the project when observing a signal $s = NC$.

The full-fledged analysis of the generalized model is complex. However, we can show that, if the termination right is more effective in motivating A to choose effort $e = C$, then potential benefit for P and A using strategic mechanisms is smaller:

Proposition 4: Assume that $\delta < \hat{\delta}$, $\theta > \hat{\theta}(\delta)$, and $r > \beta u + \alpha \hat{v}$. If terminate right is not included, then P and A adopt the strategic selling mechanism for non-contracted R&D discoveries. If termination right is included in the contract, there exist a cut-off value $\hat{\phi}$ and a cut-off value $\tilde{\delta} < \hat{\delta}$ such that, if contracting costs satisfy $\tilde{\delta} < \delta < \hat{\delta}$ and the probability for P to observe the signal *s* satisfies $\phi > \hat{\phi}$, then in their contract, P and A does not adopt the strategic selling mechanism for non-contracted R&D discoveries.

Proof: To be added.

Proposition 4 illustrates the substitution between termination rights and strategic rights. Furthermore, if the client and the agent have previous relationship in R&D cooperation, information learning allows the client to know more about the agent's ability and behavior. Correspondingly, the client is more likely to observe the signal *s* (alternatively, the signal is more informative about the agent's effort choice). That is, in our model, ϕ would be larger. Then Proposition 4 implies that, when P and A have previous relationship, the substitution between strategic rights and termination rights becomes more pronounced.

The substitution between termination rights and strategic rights may also be affected by the uncertainty of R&D activities, though we do not model uncertainty explicitly. Intuitively, if there is larger uncertainty, the likelihood of finding contracted discoveries would become smaller. Thus, P is more likely to exercise the termination right when observing a signal $s = NC$. Given that the termination right becomes more effective in motivating the agent, the benefit of using strategic rights to mitigate multi-task problems is smaller. That is, the substitution between termination rights and strategic rights would become more pronounced.

The theoretical analysis leads to the following predictions, which we will test empirically in the following sections:

Prediction 1: When there is larger probability to have entry threat from other firms, the initial R&D agreement is more likely to adopt strategic rights.

Prediction 2.1: The (unconditional) termination rights held by the client and the strategic rights are substitutes.

Prediction 2.2: The substitution between termination rights and strategic rights is more pronounced when there is larger uncertainty of R&D activities.

Prediction 2.3: The substitution between termination rights and strategic rights is more pronounced when the client and the agent have previous relationship in R&D cooperation.

3. Data

To test the adoption of strategic rights, we obtain a data set of R&D agreements between pharmaceutical firms and bio-tech agents, collected by Deloitte Recap (Recap), which identifies and analyzes critical terms in bio-tech contracts. Given the Freedom of Information Act (FOIA) imposed by the US Securities and Exchange Commission (SEC), Recap has access to unpublished R&D agreements in the bio-tech industry. The company has also collected information about redacted agreements from SEC filings and news.

The full data set we obtained from Recap includes 29994 bio-tech R&D agreements, signed during the period from 1974 to 2009. Within this data set, there are 1703 agreements having all contract details. Among these agreements, we took the following selection process:

First, some agreements have been included twice in the Recap dataset mistakenly. We eliminated such duplicate agreements. Second, we eliminated those agreements which did not involve any R&D activity. Third, agreements with three or more bio-tech agents were eliminated, because there would be too much heterogeneity among agents. We kept a few agreements with two bio-tech agents and took the average of the agents' characteristics when necessary.

The above selection process ended up with 1586 agreements with contract details.

Dependent Variables

We are interested in the adoption of strategic rights in R&D agreements. However, the Recap dataset does not summarize such information. We and our research assistants have read all the above agreements in details, in order to identify the different strategic rights and other useful terms. As summarized in Table 1, among 351 out of the 1586 agreements (about 22.1%) included strategic rights regarding non-contracted R&D discoveries not specified in the initial agreements. We create a dummy as one dependent variable:

"Strategic Right (Binary)" equals 1 if an agreement includes any strategic right and 0 otherwise.

Furthermore, different types of strategic rights may impose various restrictions on sales of non-contracted discoveries. For example, under the most-favored-customer/licensee clause and the right of first refusal, initial pharmaceutical clients should be offered the same terms of sales as bio-tech agents have received from entrants, and they have priority over entrants in getting non-contracted discoveries. In contrast, the right of negotiation or first discussion only asks bio-tech agents to negotiate first with initial clients, but does not impose any restriction on future sales if their negotiations do not succeed. To capture such variation in the strength of strategic rights, we create two other dependent variables as described below:

"Strategic Right 1" equals 2 if an agreement includes "most-favored licensee/company/supplier(MFN)", "right of first refusal", or "right of first offer", 1 if an agreement includes any other strategic right (e.g. "right of negotiation" or "right of first discussion/negotiation/consideration"), and 0 if no strategic contract term is included.

"Strategic Right 2" equals 2 if an agreement includes "most-favored licensee/company/supplier/MFN" or right of first refusal", 1 if an agreement includes any other strategic right (e.g. "right of negotiation", "right of first discussion/negotiation/consideration", or "right of first offer"), and 0 if no strategic contract term is included.

The difference in the above two variable definitions is about the right of first offer, which specifies that a bio-tech agent should first make a sales offer about non-contracted discoveries to

the initial client, and if the offer is rejected, the agent can sell the discoveries to other firms with sales terms no more favorable than the previous offer. The right of first offer differs from the right of first negotiation which does not impose restrictions on terms of sales. But it also differs from most-favored licensee clause and the right of first refusal which also give information advantage to initial clients. Therefore, theoretically there is some ambiguity on whether the right of first offer has the same strong strategic effects.

Entry Threat Measures

This paper tries to investigate how entry threat from other firms affects the adoption of strategic rights. We need to construct measures for entry threat. However, there is large heterogeneity in business scope among pharmaceutical firms and the number of pharmaceutical firms does not change by much over time. Therefore, we cannot simply count the number of pharmaceutical firms. Instead, we use the following approach to create measures for entry threat.

In the Recap data, each agreement is involved with R&D activities of certain disease types. There are 21 disease types in total, as shown in the following list: allergic, autoimmune inflammatory, bone, cancer, cardiovascular, central nervous system, dental oral, dermatologic, endocrinological & metabolic, gastrointestinal, genitourinary gynecologic, hematologic, infectious-bacterial, infectious-miscellaneous, infectious-viral, ophthalmic, psychiatric, renal, respiratory, transplantation, and other miscellaneous.

For a particular R&D project with a certain disease type, it is more likely that the non-contracted discoveries are of the same disease type. Thus, those pharmaceutical firms which have business or previous R&D experience of the same disease type are more likely to enter and compete for those non-contracted discoveries.[7] Using the 29994 agreements in the full Recap dataset, we construct the first entry threat measure:

[7] Firms with interests and expertise in a certain type of disease are more likely to become entrants competing for discoveries of that type. This is reasonable in the pharmaceutical industry: without relevant experience and expertise, it is difficult for a pharmaceutical firm to develop and sell medicines for a certain type of disease.

For a particular agreement, "R&D project (same type)", as entry threat measure 1, equals 1 if in all previous years **other** pharmaceutical firms have taken R&D projects of the same disease type as the particular agreement involves, and equals 0 otherwise.[8]

From Recap, we also obtained another dataset about the clinical trials and their disease types filed by pharmaceutical firms to the US Food and Drug Commission (FDC). If there have been clinical trials filed by other pharmaceutical firms for a particular disease type, it is more likely to have entrants competing for R&D discoveries of the same disease type. Therefore, based on this dataset, we construct another entry threat measure:

For a particular agreement, "clinical trial (same type)", as entry threat measure 2, equals 1 if in all previous years **other** pharmaceutical firms have filed clinical trials of the same disease type as the particular agreement involves, and equals 0 otherwise.[9]

Note that both "R&D project (same type)" and "clinical trial (same type)" are dummy variables.[10] That is, we care more about the existence of potential entry threat but do not consider the numbers of previous R&D projects or clinical trials of the same disease type. In Section 5, we will show the robustness of our empirical results by using alternative entry threat measures based on the numbers of other pharmaceutical firms' previous R&D projects or clinical trials and measures based on the numbers of other pharmaceutical firms which have done R&D projects or clinical trials of the same disease type.

The Newsmagazine for Pharmacists has been publishing sales of top 200 generic and branded drugs each year since year 2000. We identified the disease types for each drug. Then based on sales of generic drugs, we calculate Herfindahl Index (HHI) for the market of each disease type. If HHI is larger, the market tends to be more concentrated with larger firms. Correspondingly, for R&D agreements of the same disease type, entry threat tends to be larger.

[8] Pharmaceutical firms which conduct R&D projects of the same type in more recent years may bring larger entry threat. We have also tried alternative constructions for the "R&D project (same type)" by checking other firms' R&D projects in the previous year, previous 2 years, previous 3 years, and previous 5 years before the contracting year. The empirical results are robust under these alternative constructions.

[9] Some clinical trials filed may fail to result in final products. However, those firms which had failed their clinical trials can also become entry threats in competing for R&D discoveries of the same disease type.

[10] The two measures have different advantages. "R&D project (same type)" covers R&D projects with different stages of drug development, but does not include research projects done by pharmaceutical firms alone (without agents). "Clinical trial (same type)" captures both trials jointly conducted by pharmaceutical firms and agents, and trials conducted by pharmaceutical firms alone.

For a particular agreement, "HHI (same type)", as entry threat measure 3, is calculated based on sales of top generic drugs of the same disease type in the year when the particular agreement was signed.

We only have the information on HHI (same type) from 2000 to 2009. When using this entry threat measure, the number of data observations will be reduced substantially.

As a remark, in the Recap data, some of the agreements included R&D activities of more than one disease type. For such agreements, we adjust the above three entry threat measures by including all disease types involved.

Other Variables

We are also interested in the relationship between strategic rights and unconditional termination rights held by clients. In the Recap data, almost all agreements have given pharmaceutical clients certain termination rights, some with conditions and others without any condition. About 34.88% of the agreements included unconditional termination rights held by pharmaceutical clients. Intuitively, unconditional termination rights provide stronger incentive for bio-tech agents to devote effort in the contracted R&D projects. Thus, we construct the following dummy variable:

"Termination right" equals 1 if an agreement includes unconditional termination right held by pharmaceutical clients, and 0 otherwise. When there is no ambiguity, sometimes we simply use the term "termination" for unconditional termination right.

As discussed in Section 2, previous cooperation between pharmaceutical clients and bio-tech agents can facilitate information learning, which may affect the relationship between strategic rights and termination rights. In the full Recap dataset, for any particular agreement, "previous relationship" is defined as 1 if the pharmaceutical client and the bio-tech agent have cooperated in previous R&D projects and 0 otherwise.[11]

[11] We have also tried alternative constructions for "previous relationship" by looking at whether a pharmaceutical client and a bio-tech agent have cooperated in the previous 3 years or 5 years before entering into the current agreement. The empirical results are robust.

The relationship between strategic rights and termination rights may also be influenced by the uncertainty level of R&D projects. Bio-tech R&D projects are often associated with certain stages of developments. In order of timing, the typical stages include discovery (earliest test on some chemicals), lead molecule (identified possible development directions), preclinical (test on animals), phase I (starting test on human), phase II (small scale test on human), phase III (large scale test on human), formulation (final drug). The first two, discovery and lead molecule stages, involve more uncertainties. Thus, for any particular agreement, "stage", as a measure for uncertainty, is defined as 0 if the agreement only involves R&D activities in the discovery and / or molecule stages and 1 otherwise.[12]

Finally, we also include the following control variables.

For any publicly listed pharmaceutical firm, "client size" is calculated as the log of total asset in the contracting year. "ROA" is calculated as the net earnings (EBITDA) divided by total asset in the contracting year. [13] "ROA" reflects the financial status of the client while "client size" affects the pharmaceutical client's bargaining power when negotiating with the bio-tech agent. The data source for both "client size" and "ROA" is Wharton Research Data Services (WRDS).

As a proxy for an agent's research ability and experience, "agent's R&D experience" is defined as the number of R&D projects that the agent has conducted in all previous years based on the 29994 agreements in the full Recap dataset.

To control other contract or R&D project characteristics, we use "project size (in million USD)" and "royalty rate" provided in the Recap dataset.

Since our dataset covers a long period from 1974 to 2009, we construct two timing dummies: "period 90-99" equals 1 if an agreement was signed during 1990-1999 and 0 otherwise; "period 00-09" equals 1 if an agreement was signed during 2000-2009 and 0 otherwise.

Table 1 provides the summary statistics for all the variables.

(Insert Table 1 here)

[12] In our dataset, a few agreements included activities in several different stages.
[13] EBITDA: earnings before interest, taxes, depreciation, and amortization.

4. Empirical Results

As suggested in the introduction and model predictions, we are interested in two general questions in the empirical analysis. First, how entry threat from other firms affects the adoption of strategic rights in R&D agreements? Second, what is the relationship between strategic rights and termination rights held by clients? And what factors may influence the above relationship? In the following, we will first describe the econometric specifications and summarize the empirical findings about the first research questions. Then we will turn to the second question.

Strategic Right and Entry Threat

In this subsection, we will test Prediction 1 derived in Section 2: When there is larger probability to have entry threat from other pharmaceutical firms, the initial R&D contract is more likely to include strategic rights. Since we have three different measures for entry threat, we will run regressions independently with each measure. In Table 2, we use entry threat measure 1, i.e., other pharmaceutical firms' previous "R&D project (same type)". In Table 3, we use entry threat measure 2, i.e., other pharmaceutical firms' previous "clinical trial (same type)". In Table 4, we use the "HHI (same type)" for top generic drugs.

In our analysis, there is no reverse causality problem that the adoption of strategic rights might affect the likelihood of entry threat, due to two reasons. First, the entry threat measures are based on data in previous years before a certain agreement was signed, so there is some time lag. Second, most R&D contracts were confidential and could not be observed by other firms.

In each of these tables, there are three panels. The first panel (columns 1 and 2) follows logit specifications with the dummy variable "strategic right (binary)" as the dependent variable. The second panel (columns 3 and 4) and the third panel (columns 5 and 6) follow ordered logit specifications with "strategic right 1" and "strategic right 2" as the dependent variable respectively. In each panel, we start with the basic regression only controlling for project characteristics and then present the full regression controlling for characteristics of projects,

pharmaceutical clients, and bio-tech agents. We explain the role of each control variable in more details below.

First, to capture possible time trend in the usage of strategic rights, in all specifications, we include two timing dummies, "period 90-99" and "period 00-09". We do not use dummy variables for each year, given the limited data observations.

Second, if a pharmaceutical client starts a project with larger investment size, it may have more concerns about potential entry threat and bargain more aggressively for the inclusion of strategic rights. And royalty rate can affect the alignment between the client's and the agent's interests in the contracted R&D activity. Thus, we control "project size" and "royalty rate".

Third, there may be an endogeneity problem that pharmaceutical clients choose to cooperate only with bio-tech agents with more experience and better reputation. It may also be easier for a client to enter into R&D agreements with a bio-tech agent, if they have cooperated in other projects before. In particular, such previous cooperation can help the client to learn more information about the agent's ability and behavior. Such information learning mitigates asymmetric information between these two contracting parties and also reduces contracting costs. To capture all these effects, we include "agent's R&D experience" to control agents' experience and reputation, and include "previous relationship" to capture information learning.

Fourth, if a pharmaceutical client has larger size, it tends to acquire more bargaining power when negotiating with a bio-tech agent. To capture clients' bargaining power, we include "client size" in our analysis. In addition, a client's financial performance or status can affect its competition with potential entrants for non-contracted R&D discoveries. So, we use "client's ROA" as a proxy for its financial performance.

(Insert Table 2 here)

(Insert Table 3 here)

(Insert Table 4 here)

Now we discuss the empirical findings. Most importantly, in Table 2 and Table 3, when we use "R&D project (same type)" and "clinical trial (same type)" as entry threat measures, in all

specifications, the coefficient on entry threat measure is positive and statistically significant. The effect from entry threat is also economically significant. In particular, based on the results in Column 2 of Table 2, it can be calculated that, when the entry threat changes from 0 to 1, the likelihood of including strategic rights would be increased by approximately 15.06%. Similarly, based on the results in Column 2 of Table 3, when there is entry threat, the likelihood of including strategic rights would be increased by approximately 15.40%.

In Table 4, when we use "HHI (same type)", entry threat has a positive and significant effect on the adoption of strategic rights in ordered logit specifications, though we do not obtain significant results in the logit specification.

Overall, the above findings in Tables 2-4 support Prediction 1. They are the first set of empirical evidence on the adoption of various strategic rights as predicted by the theoretical literature on contracts. As shown in Section 2, strategic contracts can help contracting parties to extract more rent from potential entrants and mitigate multi-task agency problems, i.e., providing more incentive for bio-tech agents to devote effort into contracted R&D projects. When there is larger probability of entry threat, benefits from strategic rights would dominate the potential contracting and enforcement costs. Correspondingly, strategic rights are more often adopted.

The other predictions from Tables 2-4 are also intuitive. In particular, in most specifications, "client size" has positive and significant effect on the adoption of strategic rights. Larger clients tend to enjoy more bargaining power. Thus, it is tempting to argue that larger clients can force bio-tech agents to agree on strategic rights. However, when entering into an agreement, the inclusion of any term should increase the joint benefit of contracting parties. When an agent signs R&D agreement with a larger client, the bio-tech agent would have more concerns about hold up problems: for example, the client may try to renegotiation over the contract terms after the agent takes effort. Anticipating hold up problems, the agent would have less incentive taking effort in the contracted R&D project but spend more time in other R&D activities. In such scenarios, the client would have more incentive to include strategic rights in the initial agreement.

Another prediction from Tables 2-4 is that, if there is "previous relationship" between pharmaceutical clients and bio-tech agents, strategic rights are more likely adopted. In theory, the effects from previous relationship can be ambiguous. On one hand, with previous relationship,

contracting parties would trust each other more and therefore there may be no need to use strategic rights. On the other hand, as discussed in Section 2, previous relationship allows for information learning. It can also avoid negotiation failure and reduce contracting costs. Thus, contracting parties are more likely to reach agreements with strategic rights. Our empirical finding suggests that the later effect dominate in the choice of strategic rights.

Finally, in all specifications, the coefficient on "agent's R&D experience" is negative and significant. When an agent has more previous experience and better reputation, R&D agreements tend not to include strategic rights. One possible explanation is that, in order to maintain their reputation, such agents have less incentive to deviate to take effort in non-contracted activities. As an alternative explanation, agents with more experience have better research ability so that the probability for the contracted R&D project to success is larger. Therefore, clients would worry less about multi-task problems.

Strategic Right and Termination Right

Now we turn to the relationship between strategic rights and unconditional termination rights held by pharmaceutical clients. Given the theoretical analysis in Section 2, both strategic rights and termination rights provide more incentive for agents to take effort in contracted R&D activities instead of non-contracted activities. Therefore, these two types of rights should be substitutes. Furthermore, Predictions 2.2 and 2.3 state that the above substitution is affected by uncertainty in R&D projects and previous relationship between contracting parties.

Although we use "termination" as an independent variable, we do not mean that there is any causality between termination rights and strategic rights. Both contract terms are choice variables by contracting parties.

As constructed in Section 3, "stage" is a proxy for uncertainty: when "stage" changes from 0 to 1 (later stages of development), there is less uncertainty. In Tables 5 and 6, we test the effect on such uncertainty on the relationship between strategic rights and termination rights. To capture this effect, we create an interaction variable "termination*stage".

When "previous relationship" equals 1, that indicates clients and agents have cooperated before. In Tables 7 and 8, we focus on the effect of previous relationship on the substitution between strategic rights and termination rights. We use the interaction variable "termination*previous relationship" in the regressions.

We will use other pharmaceutical firms' previous "R&D project (same type)" (in Tables 5 and 7) and previous "clinical trial (same type)" (in Tables 6 and 8) as entry threat measures. We do not use the "HHI (same type)" for top generic drugs in this subsection, because the number of data observations becomes even smaller.

In each table, there are three panels. The first panel (columns 1-3) follows logit specifications with "strategic right (binary)" as the dependent variable. The second panel (columns 4-6) and the third panel (columns 7-9) follow ordered logit specifications with "strategic right 1" and "strategic right 2" as the dependent variable respectively. In each panel, we run three regressions: The basic regression only controls project characteristics and "termination"; the second regression adds the slope dummy, "termination*stage" or "termination*previous relationship"; and the last regression extends to include clients' and agents' characteristics.

(Insert Table 5 here)

(Insert Table 6 here)

Tables 5 and 6 present the empirical findings about the substitution between strategic rights and termination rights, as well as the impact from uncertainty, measured by "stage". First of all, in all specifications, the effect of entry threat measures on the adoption of strategic rights is still positive and significant, consistent with Prediction 1. In addition, client size, agent's R&D experience, and previous relationship between contracting parties still have significant effects on the adoption of strategic rights, similar to the results in the above subsection (Tables 2-4).

More importantly, in all specifications, the coefficient of "termination" is negative and significant. That is, there is a substitution relationship between unconditional termination right held by clients and strategic rights, which supports Prediction 2.1 derived in Section 2. Note that this relationship does not mean any causality between the two contract terms.

In the logit specification (Columns 2 and 3) of both Table 5 and Table 6, the coefficient of "termination*stage" is positive and significant. That is, if an R&D project is involved only with earlier stages of development, i.e., with the dummy variable "stage" changing from 1 to 0, the substitution between termination and strategic rights becomes more pronounced. This result supports Prediction 2.2. The effect is also of economic significance. Based on Column 3 of Table 5, when "stage" changes from 1 to 0, the negative correlation between termination rights and strategic rights is enlarged by about 12.92%. Based on Column 3 of Table 6, when "stage" changes from 1 to 0, the negative correlation between termination rights and strategic rights is enlarged by about 13.17%. Intuitively, in earlier stages, there is more uncertainty in the R&D projects. With more uncertainty, clients are more likely to terminate the project upon observing negative signals. Therefore, termination rights become more effective in solving the multi-task problem and motivating agents. Correspondingly, potential benefits from strategic rights are smaller. As a remark, we do not find similar evidence in the ordered logit specifications, though the p-values for the coefficients of "termination*stage" are around 15%.

(Insert Table 7 here)

(Insert Table 8 here)

Tables 7 and 8 present the empirical findings about how previous relationship between contracting parties affects the substitution between strategic rights and termination rights. Again, in all specifications, the effect of entry threat measures on the adoption of strategic rights is positive and significant. Client size, agent's R&D experience, and previous relationship between contracting parties still have significant effects on the adoption of strategic rights.

In most of the ordered logit specifications (Columns 4-8) of both tables, the coefficient of "termination" is negative and significant, implying the substitution relationship between unconditional termination rights and strategic rights. However, we do not find significant results in the logit specifications (Columns 1-3).

In both logit and ordered logit specifications of Tables 7 and 8, the coefficient of the slope dummy "termination*previous relationship" is negative and significant. That is, if contracting parties have previous relationship in R&D cooperation, the substitution between termination and strategic rights becomes more pronounced. Based on Column 3 of Table 7, when "previous

relationship" changes from 0 to 1, the negative correlation between termination rights and strategic rights is enlarged by about 24.68%. Similarly, based on Column 3 of Table 8, when "previous relationship" changes from 0 to 1, the negative correlation between termination rights and strategic rights is enlarged by about 24.61%. All these figures are of economic significance. This result supports Prediction 2.3. As discussed in Section 2, previous relationship allows for more information learning between contracting parties. Such information learning allows clients to know more about agents' ability and behavior. Thus, clients are more likely to observe intermediate signals about the progress of R&D projects or the signals become more informative. In such scenarios, termination rights become more effective in motivating agents to take effort in contracted R&D activities. Therefore, potential benefits from strategic rights are smaller.

To summarize, the empirical results in this section are consistent with predictions from the literature on strategic contracts and predictions from the multi-task agency model. In particular, contracting parties use strategic rights more often when there is entry threat, when agents have less R&D experience, or when clients and agents have previous relationship. This section also shows the substitution between strategic rights and termination rights, as well as the impact of uncertainty and previous relationship between clients and agents on such substitution. These results also imply that firms may not have to include both strategic rights and termination rights at the same time.

5. Discussions

In this section, we first show that the previous empirical findings are robust with alternative entry threat measures and then discuss some alternative theories in addition to the multi-task moral hazard theory.

5.1 Robustness with alternative entry threat measures

In Sections 3 and 4, we have constructed and used entry threat measures based on whether other pharmaceutical firms have taken R&D projects or clinical trials of the same disease type in all previous years. That is, we have not considered the level of entry threat, which may be related with the numbers of previous R&D projects or clinical trials. The numbers of other

pharmaceutical firms which have taken R&D project or trials of the same type may also have impacts. In this section, we construct the following four alternative entry threat measures to check whether the empirical findings are robust or not:

"Log # of firms (R&D)", as entry threat measure E1, is the log value of the number of other pharmaceutical firms which have done R&D projects of the same disease type in previous years.

"Log # of firms (Trials)", as entry threat measure E2, is the log value of the number of other pharmaceutical firms which have done clinical trials of the same disease type in previous years.

"Log # of R&D projects", as entry threat measure E3, is the log value of the number of other pharmaceutical firms' R&D projects of the same disease type in previous years.

"Log # of Trials", as entry threat measure E4, is the log value of the number of other pharmaceutical firms' clinical trials of the same disease type in previous years.

Using the above entry threat measures, we test all the predictions derived in Section 2 again. The results using entry threat measures E1 and E3 are summarized by Tables A1-A6 in the Appendix.[14] Tables A1 and A2 follow econometric specifications similar to those used in Tables 2 and 3, testing the effect of entry threat on the adoption of strategic rights. Tables A3 and A4 follow specifications similar to those in Tables 5 and 6, testing how uncertainty, measured by "stage", affects the substitution between termination rights and strategic rights. Finally, Tables A5 and A6 use specifications similar to those in Tables 7 and 8, testing how previous relationship between contracting parties influences the substitution between termination rights and strategic rights.

The predictions from empirical analysis using each of the four alternative entry threat measures are almost the same as those in Section 4. In particular, in all specifications, the coefficients on the entry threat measures are positive and statistically significant, implying that strategic rights are more likely adopted when entry threat is larger. In addition, in most specifications, we still obtain evidence for the substitution between termination rights and strategic rights. There is less significant evidence about the effect from uncertainty on the above

[14] The results using entry threat measures E2 and E4 are similar. The tables of results are available upon request.

substitution.[15] However, when contracting parties have previous relationship, in all specifications, the substitution between termination rights and strategic rights become more pronounced.

5.2 Discussion of Alternative Theories

In this paper, the first main empirical result is about the relationship between entry threat and the adoption of strategic rights. Our theoretical analysis in Section 2 shows that strategic rights can not only extract more rent from potential entrants, but also motivate agents to take effort in contracted R&D activities. Our theory is consistent with the existing literature.

For the second result on the negative correlation between termination rights and strategic rights, potentially there could be alternative explanations in addition to the multi-task moral hazard theory considered in Section 2. As discussed below, these alternative explanations may not able to explain the other empirical findings.

One potential explanation is purely based on uncertainty or likelihood of discoveries without moral hazard problems. When the probability of finding contracted discoveries is larger, firms may be less likely to adopt termination rights. If the probability of finding non-contracted discoveries is larger, firms would have more incentives to use strategic rights. The negative correlation between termination rights and strategic rights can be explained if the probability of finding contracted discoveries is positively correlated with the probability of finding non-contracted discoveries. However, in the early stages of drug development, the above two probabilities are often negatively correlated. Therefore, the above theory is not consistent with the empirical result on the impact of uncertainty (stage): in the earlier stages, the substitution between termination rights and strategic rights are more pronounced.

The screening theory can be used to explain the usage of termination rights when agents have private information about their abilities. This theory predicts that only those agents with high ability are willing to accept termination rights. Thus, the negative correlation between termination rights and strategic rights can be explained if agents with higher ability or expertise

[15] With "Log # of R&D projects" as the entry threat measure, the coefficient of the interaction term "termination*stage" is of 15% significance.

for contracted R&D activities have smaller chances finding non-contracted discoveries. However, this theory would also predict that, when clients and agents have previous relationship and therefore face less asymmetric information, the relationship between the two contract rights is less negative. This prediction is not consistent with our empirical finding about the impact of previous relationship.

If we consider the long term relationship between clients and agents, the relational contract theory is a potential explanation for the negative correlation between termination rights and strategic rights. To maintain future cooperation opportunities with clients, agents are more willing to accept strategic rights. At the same time, the future cooperation opportunities given by clients can motivate agents to take effort in R&D activities. Correspondingly termination right is less useful. The relational contract theory is also consistent with the empirical finding about the impact of previous relationship. However, in the earlier stages of drug development, there would be more future cooperation opportunities. This theory may predict that termination rights would be less likely used in the earlier stages. Yet Lerner and Ulrike (2010) show that firms are more likely to adopt termination rights if their R&D projects involve earlier stages of drug development. [16]

6. Conclusion

This paper has studied the adoption of strategic rights in R&D agreements. In a multi-task agency framework, we show that strategic rights not only allow contracting parties to extract more rent from potential entrants as shown in the literature, but also mitigate the multi-task agency problem by reducing agents' expected revenue from non-contracted R&D discoveries. In addition, strategic rights and termination rights are shown to be substitutes in motivating agents to take effort in contracted R&D activities. Then using a rich data set of R&D agreements between pharmaceutical clients and bio-tech agents, we find that strategic rights are more likely adopted when other pharmaceutical firms may compete for non-contracted discoveries. Strategic rights are more likely adopted when agents have less R&D experience and when clients and

[16] We do not intend to conclude for sure that the relational contract theory is not consistent with empirical findings, since under this theory there are often multiple equilibria.

agents have previous relationship in R&D cooperation. We also find evidence for the substitution between strategic rights and unconditional termination rights. This substitution relationship is more pronounced when R&D projects have larger uncertainty and/or when clients and agents have previous relationship in R&D cooperation.

There are several directions for future research. For example, it would be desirable to investigate how strategic rights affect the success of R&D projects such as patents generated. It would also be interesting to examine how entry threat and agency characteristics influence the design of other contract terms such as patent allocation in R&D agreements.

Table 1: Summary Statistics of the Variables

Dependent Variables:	0	1	2		
Strategic Right (Binary)	1235	351			
Strategic Right 1	1235	192	159		
Strategic Right 2	1235	210	141		
Other Variables	0	1			
Clinical Trial (Same Type)	239	1464			
R&D Project (Same Type)	217	1486			
Termination Right	594	1109			
Stage	756	947			
	Obs	Mean	Std. Dev	Min	Max
Previous Relationship	1703	0.068702	0.313205	0	4
Client Size	937	7.130197	3.102532	0.553885	11.65501
Client ROA	893	0.034918	0.28193	-0.9303	0.359013
Agent's R&D Experience	1703	1.810335	2.773229	0	22
HHI (Same Type)	423	0.285721	0.24684	0	1
Project Size	1511	73.18822	143.7209	0	953
Royalty	1244	0.171747	0.171144	0	0.9

Table 2: Strategic Rights and Entry Threat Measure 1 (Other Pharmaceutical Firms' R&D Projects of the Same Disease Type)

	(1)	(2)	(3)	(4)	(5)	(6)
	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right 1	Strategic Right 1	Strategic Right 2	Strategic Right 2
R&D Project (Same Type)	0.776***	1.192**	0.789***	1.194**	0.777***	1.181**
	(0.297)	(0.488)	(0.296)	(0.487)	(0.296)	(0.487)
Project Size	0.0014*	0.0007	0.0013*	0.0007	0.0014*	0.0008
	(0.0008)	(0.0011)	(0.0008)	(0.0010)	(0.0008)	(0.0010)
Royalty	0.799	0.930	0.849*	1.093*	0.781	1.027
	(0.488)	(0.674)	(0.478)	(0.654)	(0.478)	(0.651)
Stage	0.136	-0.026	0.134	-0.015	0.141	0.008
	(0.164)	(0.228)	(0.162)	(0.225)	(0.163)	(0.224)
Period 91-00	0.135	0.296	0.033	0.181	0.028	0.209
	(0.212)	(0.354)	(0.212)	(0.355)	(0.213)	(0.355)
Period 01-09	0.255	0.635	0.054	0.357	0.073	0.421
	(0.322)	(0.468)	(0.318)	(0.459)	(0.317)	(0.459)
Client Size		0.092*		0.103**		0.106**
		(0.049)		(0.048)		(0.048)
Client ROA		-0.252		-0.351*		-0.368*
		(0.211)		(0.200)		(0.201)
Agent's R&D Experience		-0.204***		-0.196***		-0.195***
		(0.062)		(0.060)		(0.060)
Previous Relationship		0.673**		0.862***		0.868***
		(0.299)		(0.284)		(0.281)
N	1070	555	1070	555	1070	555
pseudo R-sq	0.025	0.079	0.018	0.065	0.018	0.067
P- value for Ch2	0.0001	0.0000	0.0001	0.0000	0.0002	0.0000

(***: 1% significance; **: 5% significance; *: 10% significance)

Table 3: Strategic Rights and Entry Threat Measure 2 (Other Pharmaceutical Firms' Clinical Trials of the Same Disease Type)

	(1)	(2)	(3)	(4)	(5)	(6)
	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right 1	Strategic Right 1	Strategic Right 2	Strategic Right 2
Clinical Trial (Same Type)	0.681**	1.228**	0.689**	1.232**	0.676**	1.219**
	(0.273)	(0.486)	(0.273)	(0.486)	(0.273)	(0.486)
Project Size	0.0013	0.0008	0.0013*	0.0007	0.0014*	0.0008
	(0.0008)	(0.0011)	(0.0008)	(0.0010)	(0.0008)	(0.0010)
Royalty	0.813*	0.918	0.866*	1.082*	0.799*	1.016
	(0.488)	(0.675)	(0.477)	(0.655)	(0.477)	(0.651)
Stage	0.146	-0.025	0.144	-0.014	0.151	0.009
	(0.164)	(0.228)	(0.162)	(0.225)	(0.162)	(0.224)
Period 91-00	0.088	0.270	-0.014	0.153	-0.017	0.182
	(0.213)	(0.355)	(0.213)	(0.356)	(0.213)	(0.355)
Period 01-09	0.210	0.607	0.0104	0.327	0.0311	0.393
	(0.322)	(0.468)	(0.318)	(0.459)	(0.317)	(0.459)
Client Size		0.0923*		0.103**		0.105**
		(0.049)		(0.048)		(0.048)
Client ROA		-0.255		-0.354*		-0.370*
		(0.212)		(0.201)		(0.203)
Agent's R&D Experience		-0.204***		-0.196***		-0.195***
		(0.062)		(0.060)		(0.060)
Previous Relationship		0.672**		0.861***		0.867***
		(0.298)		(0.284)		(0.281)
N	1070	555	1070	555	1070	555
pseudo R-sq	0.024	0.080	0.018	0.066	0.017	0.068
P- value for Ch2	0.0001	0.0000	0.0002	0.0000	0.0003	0.0000

(***: 1% significance; **: 5% significance; *: 10% significance)

Table 4: Strategic Rights and Entry Threat Measure 3 (HHI for the Generic Drug Market of the Same Disease Type)

	(1)	(2)	(3)	(4)	(5)	(6)
	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right 1	Strategic Right 1	Strategic Right 2	Strategic Right 2
HHI (Same Type)	0.661	1.376	0.644	1.406*	0.677	1.406*
	(0.637)	(0.895)	(0.612)	(0.825)	(0.612)	(0.825)
Project Size	0.0018*	0.0013	0.0020**	0.0012	0.0021**	0.0012
	(0.0010)	(0.0013)	(0.0010)	(0.0012)	(0.0010)	(0.0012)
Royalty	-0.723	0.373	-0.882	0.193	-0.870	0.193
	(1.186)	(1.488)	(1.170)	(1.453)	(1.173)	(1.453)
Stage	0.112	-0.454	0.138	-0.340	0.159	-0.340
	(0.435)	(0.561)	(0.432)	(0.546)	(0.433)	(0.546)
Client Size		0.105		0.163		0.163
		(0.132)		(0.129)		(0.129)
Client ROA		-0.939		-1.294*		-1.294*
		(0.668)		(0.673)		(0.673)
Agent's R&D Experience		-0.269**		-0.277**		-0.277**
		(0.118)		(0.116)		(0.116)
Previous Relationship		1.120**		1.550***		1.550***
		(0.514)		(0.464)		(0.464)
N	159	102	159	102	159	102
pseudo R-sq	0.026	0.140	0.024	0.172	0.025	0.172
P- value for Ch2	0.303	0.0189	0.218	0.0000	0.192	0.0002

(***: 1% significance; **: 5% significance; *: 10% significance) Timing dummies are controlled.

Table 5: Substitution between Strategic and Termination Rights, and Impact from Uncertainty, with Entry Measure 1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right 1	Strategic Right 1	Strategic Right 1	Strategic Right 2	Strategic Right 2	Strategic Right 2
R&D Project (Same Type)	0.789***	0.814***	1.253**	0.801***	0.823***	1.238**	0.788***	0.807***	1.221**
	(0.298)	(0.299)	(0.493)	(0.297)	(0.298)	(0.492)	(0.297)	(0.298)	(0.492)
Project Size	0.0013	0.0012	0.0007	0.0012	0.0010	0.0007	0.0013*	0.0010	0.0007
	(0.00081)	(0.0009)	(0.0011)	(0.0008)	(0.00081)	(0.0010)	(0.0008)	(0.0008)	(0.0012)
Royalty	0.747	0.766	0.917	0.779*	0.814*	1.059	0.721	0.753	1.014
	(0.490)	(0.491)	(0.682)	(0.481)	(0.482)	(0.663)	(0.480)	(0.481)	(0.659)
Stage	0.150	-0.390	-0.516	0.152	-0.376	-0.417	0.160	-0.345	-0.369
	(0.165)	(0.282)	(0.386)	(0.163)	(0.278)	(0.375)	(0.163)	(0.278)	(0.375)
Termination	-0.306*	-0.723***	-0.831**	-0.358**	-0.765***	-0.824**	-0.364**	-0.751***	-0.794**
	(0.162)	(0.238)	(0.340)	(0.161)	(0.236)	(0.333)	(0.161)	(0.236)	(0.333)
Previous Relationship		0.145	0.635**		0.308	0.807***		0.318	0.816***
		(0.227)	(0.300)		(0.220)	(0.284)		(0.220)	(0.281)
Termination*Stage		0.782**	0.752*		0.778**	0.644		0.744**	0.606
		(0.328)	(0.456)		(0.324)	(0.446)		(0.324)	(0.446)
Client Size			0.091*			0.102**			0.104**
			(0.050)			(0.049)			(0.049)
Client ROA			-0.259			-0.358*			-0.374*
			(0.218)			(0.208)			(0.210)
Agent's Experience			-0.200***			-0.192***			-0.191***
			(0.063)			(0.061)			(0.061)
N	1070	1070	555	1070	1070	555	1070	1070	555
pseudo R-sq	0.028	0.034	0.088	0.022	0.027	0.073	0.022	0.026	0.074
P- value for Ch2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(***: 1% significance; **: 5% significance; *: 10% significance) Timing dummies are controlled.

Table 6: Substitution between Strategic and Termination Rights, and Impact from Uncertainty, with Entry Measure 2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right 1	Strategic Right 1	Strategic Right 1	Strategic Right 2	Strategic Right 2	Strategic Right 2
Clinical Trial (Same Type)	0.683**	0.708***	1.297***	0.688**	0.713***	1.287***	0.675**	0.696**	1.268***
	(0.274)	(0.275)	(0.492)	(0.273)	(0.274)	(0.491)	(0.273)	(0.274)	(0.491)
Project Size	0.0013	0.00113	0.0007	0.0012	0.0010	0.0007	0.0013*	0.0010	0.0007
	(0.0008)	(0.0009)	(0.0011)	(0.0008)	(0.0008)	(0.0010)	(0.0008)	(0.0008)	(0.0010)
Royalty	0.764	0.783	0.904	0.798*	0.835*	1.047	0.741	0.775*	1.003
	(0.489)	(0.491)	(0.683)	(0.480)	(0.481)	(0.664)	(0.479)	(0.480)	(0.660)
Stage	0.160	-0.378	-0.526	0.162	-0.366	-0.428	0.169	-0.334	-0.378
	(0.165)	(0.281)	(0.386)	(0.163)	(0.277)	(0.375)	(0.163)	(0.277)	(0.375)
Termination	-0.295*	-0.711***	-0.844**	-0.348**	-0.754***	-0.838**	-0.354**	-0.740***	-0.806**
	(0.162)	(0.238)	(0.341)	(0.161)	(0.235)	(0.334)	(0.161)	(0.235)	(0.333)
Previous Relationship		0.153	0.634**		0.316	0.807***		0.326	0.815***
		(0.227)	(0.300)		(0.220)	(0.284)		(0.220)	(0.281)
Termination*Stage		0.783**	0.767*		0.778**	0.661		0.743**	0.620
		(0.328)	(0.457)		(0.324)	(0.446)		(0.324)	(0.447)
Client Size			0.090*			0.101**			0.103**
			(0.050)			(0.049)			(0.049)
Client ROA			-0.263			-0.362*			-0.378*
			(0.221)			(0.210)			(0.212)
Agent's Experience			-0.201***			-0.192***			-0.192***
			(0.063)			(0.061)			(0.061)
N	1070	1070	555	1070	1070	555	1070	1070	555
pseudo R-sq	0.027	0.033	0.090	0.021	0.026	0.074	0.021	0.025	0.075
P- value for Ch2	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.00001	0.0000	0.0000

(***: 1% significance; **: 5% significance; *: 10% significance) Timing dummies are controlled.

Table 7: Substitution between Strategic and Termination Rights, and Impact of Previous Relationship, with Entry Measure 1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right 1	Strategic Right 1	Strategic Right 1	Strategic Right 2	Strategic Right 2	Strategic Right 2
R&D Proj (Same Type)	0.789***	0.806***	1.249**	0.801***	0.812***	1.247**	0.788***	0.801***	1.236**
	(0.298)	(0.298)	(0.491)	(0.297)	(0.297)	(0.491)	(0.297)	(0.297)	(0.491)
Project Size	0.0013	0.0010	0.0004	0.0012	0.0008	0.0004	0.0013*	0.0008	0.0004
	(0.0008)	(0.0009)	(0.0011)	(0.0008)	(0.0008)	(0.0010)	(0.0008)	(0.0008)	(0.0010)
Royalty	0.747	0.718	0.787	0.779*	0.757	0.936	0.721	0.703	0.900
	(0.490)	(0.491)	(0.681)	(0.481)	(0.482)	(0.661)	(0.480)	(0.481)	(0.656)
Stage	0.150	0.133	-0.0327	0.152	0.140	-0.0118	0.160	0.148	0.0133
	(0.165)	(0.165)	(0.230)	(0.163)	(0.164)	(0.226)	(0.163)	(0.164)	(0.226)
Termination	-0.306*	-0.228	-0.312	-0.358**	-0.266*	-0.368*	-0.364**	-0.267*	-0.348
	(0.162)	(0.167)	(0.231)	(0.161)	(0.166)	(0.228)	(0.161)	(0.166)	(0.227)
Previous Relationship		0.455	1.005**		0.617**	1.117***		0.653**	1.171***
		(0.305)	(0.420)		(0.287)	(0.368)		(0.288)	(0.371)
Termination*Previous Relationship		-1.221**	-1.497*		-1.284**	-1.453*		-1.351**	-1.597*
		(0.615)	(0.852)		(0.605)	(0.822)		(0.605)	(0.825)
Client Size			0.101**			0.111**			0.113**
			(0.050)			(0.048)			(0.049)
Client ROA			-0.244			-0.345*			-0.360*
			(0.218)			(0.207)			(0.208)
Agent's Experience			-0.207***			-0.196***			-0.196***
			(0.064)			(0.061)			(0.062)
N	1070	1070	555	1070	1070	555	1070	1070	555
pseudo R-sq	0.028	0.033	0.091	0.022	0.026	0.076	0.022	0.027	0.078
P- value for Ch2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(***: 1% significance; **: 5% significance; *: 10% significance) Timing dummies are controlled.

Table 8: Substitution between Strategic and Termination Rights, and Impact of Previous Relationship, with Entry Measure 2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right 1	Strategic Right 1	Strategic Right 1	Strategic Right 2	Strategic Right 2	Strategic Right 2
Clinical Trial (Same Type)	0.683**	0.695**	1.285***	0.688**	0.696**	1.288***	0.675**	0.683**	1.275***
	(0.274)	(0.274)	(0.490)	(0.273)	(0.273)	(0.489)	(0.273)	(0.273)	(0.490)
Project Size	0.0013	0.0010	0.0004	0.0012	0.0008	0.0004	0.0013*	0.0009	0.0004
	(0.0008)	(0.0009)	(0.0011)	(0.0008)	(0.0008)	(0.0010)	(0.0008)	(0.0008)	(0.0010)
Royalty	0.764	0.733	0.774	0.798*	0.775*	0.924	0.741	0.721	0.888
	(0.489)	(0.491)	(0.682)	(0.480)	(0.481)	(0.662)	(0.479)	(0.480)	(0.657)
Stage	0.160	0.145	-0.0316	0.162	0.150	-0.0111	0.169	0.158	0.0142
	(0.165)	(0.165)	(0.230)	(0.163)	(0.163)	(0.226)	(0.163)	(0.163)	(0.226)
Termination	-0.295*	-0.218	-0.316	-0.348**	-0.257	-0.373*	-0.354**	-0.258*	-0.352
	(0.162)	(0.167)	(0.232)	(0.161)	(0.166)	(0.228)	(0.161)	(0.156)	(0.228)
Previous Relationship		0.457	1.003**		0.619**	1.115***		0.655**	1.170***
		(0.305)	(0.419)		(0.287)	(0.368)		(0.288)	(0.371)
Termination*Previous Relationship		-1.204*	-1.496*		-1.263**	-1.452*		-1.331**	-1.597*
		(0.614)	(0.852)		(0.605)	(0.822)		(0.605)	(0.825)
Client Size			0.100**			0.111**			0.113**
			(0.050)			(0.048)			(0.049)
Client ROA			-0.247			-0.349*			-0.364*
			(0.220)			(0.209)			(0.210)
Agent's Experience			-0.207***			-0.196***			-0.196***
			(0.064)			(0.061)			(0.062)
N	1070	1070	555	1070	1070	555	1070	1070	555
pseudo R-sq	0.027	0.032	0.092	0.021	0.025	0.077	0.021	0.026	0.079
P- value for Ch2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(***: 1% significance; **: 5% significance; *: 10% significance) Timing dummies are controlled.

Appendix:

Table A1: Strategic Rights and Entry Threat Measure A1 "Log # of Firms (R&D)"

	(1)	(2)	(3)	(4)	(5)	(6)
	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right 1	Strategic Right 1	Strategic Right 2	Strategic Right 2
Log # of firms (R&D)	0.128**	0.182**	0.132***	0.185**	0.131***	0.185**
	(0.051)	(0.077)	(0.051)	(0.076)	(0.051)	(0.076)
Project Size	0.0013	0.0007	0.0012	0.0006	0.0013*	0.0007
	(0.0008)	(0.0011)	(0.0008)	(0.0010)	(0.0008)	(0.0010)
Royalty	0.777	0.926	0.823*	1.094*	0.758	1.027
	(0.488)	(0.671)	(0.478)	(0.650)	(0.477)	(0.648)
Stage	0.121	-0.036	0.119	-0.024	0.126	-0.004
	(0.164)	(0.228)	(0.163)	(0.225)	(0.163)	(0.224)
Client Size		0.090*		0.101**		0.103**
		(0.049)		(0.048)		(0.048)
Client ROA		-0.235		-0.334*		-0.351*
		(0.207)		(0.197)		(0.199)
Agent's R&D Experience		-0.209***		-0.200***		-0.200***
		(0.062)		(0.060)		(0.060)
Previous Relationship		0.668**		0.854***		0.861***
		(0.303)		(0.286)		(0.283)
N	1069	555	1069	555	1069	555
pseudo R-sq	0.024	0.077	0.018	0.064	0.018	0.066
P- value for Ch2	0.0001	0.0000	0.0002	0.0000	0.0002	0.0000

(***: 1% significance; **: 5% significance; *: 11% significance) Timing dummies are controlled.

Table A2: Strategic Rights and Entry Threat Measure A3 "Log # of R&D Projects"

	(1)	(2)	(3)	(4)	(5)	(6)
	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right 1	Strategic Right 1	Strategic Right 2	Strategic Right 2
Log # of R&D Projects	0.105**	0.153**	0.110**	0.156**	0.109**	0.156**
	(0.049)	(0.0671)	(0.045)	(0.067)	(0.045)	(0.067)
Project Size	0.0013	0.0007	0.0012	0.0007	0.0013*	0.0007
	(0.0008)	(0.0011)	(0.0008)	(0.0010)	(0.0008)	(0.0010)
Royalty	0.790*	0.929	0.833*	1.091*	0.768*	1.025
	(0.487)	(0.670)	(0.477)	(0.650)	(0.477)	(0.647)
Stage	0.125	-0.034	0.123	-0.023	0.130	-0.003
	(0.164)	(0.228)	(0.163)	(0.225)	(0.163)	(0.225)
Client Size		0.091*		0.102**		0.105**
		(0.049)		(0.048)		(0.048)
Client ROA		-0.235		-0.335*		-0.351*
		(0.207)		(0.197)		(0.198)
Agent's R&D Experience		-0.208***		-0.200***		-0.200***
		(0.062)		(0.060)		(0.060)
Previous Relationship		0.668**		0.854***		0.860***
		(0.303)		(0.287)		(0.283)
N	1070	555	1070	555	1070	555
pseudo R-sq	0.024	0.076	0.017	0.063	0.017	0.065
P- value for Ch2	0.0002	0.0000	0.0003	0.0000	0.0003	0.0000

(***: 1% significance; **: 5% significance; *: 11% significance) Timing dummies are controlled.

Table A3: Substitution between Strategic and Termination Rights, and Impact from Uncertainty, with Entry Measure E1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right 1	Strategic Right 1	Strategic Right 1	Strategic Right 2	Strategic Right 2	Strategic Right 2
Log # of firms (R&D)	0.132***	0.134***	0.194**	0.135***	0.135***	0.191**	0.135***	0.135***	0.193**
	(0.051)	(0.051)	(0.078)	(0.051)	(0.051)	(0.077)	(0.051)	(0.051)	(0.077)
Project Size	0.0012	0.0011	0.0006	0.0011	0.0009	0.0006	0.0012	0.0009	0.0006
	(0.0008)	(0.0009)	(0.0011)	(0.0008)	(0.0008)	(0.0010)	(0.0008)	(0.0008)	(0.0010)
Royalty	0.721	0.737	0.903	0.748	0.782*	1.057*	0.693	0.724	1.009
	(0.490)	(0.491)	(0.679)	(0.481)	(0.482)	(0.659)	(0.480)	(0.481)	(0.656)
Stage	0.135	-0.399	-0.509	0.138	-0.377	-0.403	0.146	-0.348	-0.361
	(0.165)	(0.282)	(0.385)	(0.163)	(0.278)	(0.375)	(0.163)	(0.278)	(0.375)
Termination	-0.314*	-0.727***	-0.828**	-0.366**	-0.762***	-0.811**	-0.374**	-0.752***	-0.791**
	(0.163)	(0.238)	(0.339)	(0.161)	(0.236)	(0.333)	(0.161)	(0.235)	(0.332)
Previous Relationship		0.131	0.628**		0.294	0.798***		0.304	0.807***
		(0.228)	(0.305)		(0.221)	(0.287)		(0.220)	(0.283)
Termination*Stage		0.774**	0.728*		0.759**	0.613		0.728**	0.581
		(0.328)	(0.456)		(0.324)	(0.446)		(0.324)	(0.446)
Client Size			0.087*			0.099**			0.101**
			(0.050)			(0.049)			(0.049)
Client ROA			-0.240			-0.339*			-0.356*
			(0.215)			(0.205)			(0.208)
Agent's Experience			-0.205***			-0.197***			-0.197***
			(0.063)			(0.061)			(0.061)
N	1069	1069	555	1069	1069	555	1069	1069	555
pseudo R-sq	0.027	0.032	0.086	0.021	0.026	0.072	0.021	0.026	0.073
P- value for Ch2	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000

(***: 1% significance; **: 5% significance; *: 11% significance) Timing dummies are controlled.

Table A4: Substitution between Strategic and Termination Rights, and Impact from Uncertainty, with Entry Measure E3

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right 1	Strategic Right 1	Strategic Right 1	Strategic Right 2	Strategic Right 2	Strategic Right 2
Log # of R&D Projects	0.109**	0.110**	0.163**	0.113**	0.112**	0.161**	0.112**	0.111**	0.162**
	(0.045)	(0.045)	(0.068)	(0.045)	(0.045)	(0.067)	(0.045)	(0.045)	(0.067)
Project Size	0.0012	0.0011	0.0006	0.0012	0.0009	0.0006	0.0012	0.0010	0.0006
	(0.0008)	(0.0009)	(0.0011)	(0.0008)	(0.0008)	(0.0010)	(0.0008)	(0.0008)	(0.0010)
Royalty	0.734	0.751	0.906	0.759	0.794*	1.054*	0.704	0.736	1.006
	(0.490)	(0.491)	(0.679)	(0.481)	(0.481)	(0.659)	(0.480)	(0.481)	(0.656)
Stage	0.139	-0.387	-0.498	0.142	-0.365	-0.393	0.149	-0.336	-0.351
	(0.165)	(0.281)	(0.385)	(0.163)	(0.278)	(0.374)	(0.163)	(0.278)	(0.374)
Termination	-0.311*	-0.717***	-0.820**	-0.363**	-0.752***	-0.804**	-0.371**	-0.742***	-0.784**
	(0.162)	(0.238)	(0.339)	(0.161)	(0.235)	(0.332)	(0.161)	(0.235)	(0.332)
Previous Relationship		0.132	0.628**		0.295	0.798***		0.305	0.806***
		(0.228)	(0.305)		(0.221)	(0.287)		(0.220)	(0.283)
Termination*Stage		0.764**	0.715		0.748**	0.601		0.717**	0.568
		(0.327)	(0.455)		(0.323)	(0.445)		(0.323)	(0.446)
Client Size			0.089*			0.100**			0.102**
			(0.050)			(0.049)			(0.049)
Client ROA			-0.239			-0.339*			-0.355*
			(0.214)			(0.205)			(0.207)
Agent's Experience			-0.204***			-0.197***			-0.196***
			(0.063)			(0.061)			(0.061)
N	1070	1070	555	1070	1070	555	1070	1070	555
pseudo R-sq	0.027	0.032	0.085	0.021	0.025	0.071	0.021	0.025	0.073
P- value for Ch2	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000

(***: 1% significance; **: 5% significance; *: 11% significance) Timing dummies are controlled.

Table A5: Substitution between Strategic and Termination Rights, and Impact of Previous Relationship, with Entry Measure E1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right 1	Strategic Right 1	Strategic Right 1	Strategic Right 2	Strategic Right 2	Strategic Right 2
Log # of firms (R&D)	0.132***	0.131***	0.188**	0.135***	0.133***	0.187**	0.135***	0.133***	0.189**
	(0.051)	(0.051)	(0.077)	(0.051)	(0.051)	(0.076)	(0.051)	(0.051)	(0.076)
Project Size	0.0012	0.0009	0.0004	0.0011	0.0007	0.0004	0.0012	0.0007	0.0004
	(0.0008)	(0.0009)	(0.0011)	(0.0008)	(0.0008)	(0.0010)	(0.0008)	(0.0008)	(0.0010)
Royalty	0.721	0.694	0.789	0.748	0.729	0.949	0.693	0.677	0.909
	(0.490)	(0.491)	(0.677)	(0.481)	(0.482)	(0.657)	(0.480)	(0.481)	(0.653)
Stage	0.135	0.119	-0.039	0.138	0.127	-0.017	0.146	0.134	0.007
	(0.165)	(0.166)	(0.230)	(0.163)	(0.164)	(0.226)	(0.163)	(0.164)	(0.226)
Termination	-0.314*	-0.240	-0.330	-0.366**	-0.277*	-0.380*	-0.374**	-0.280*	-0.366*
	(0.163)	(0.167)	(0.232)	(0.161)	(0.166)	(0.228)	(0.161)	(0.166)	(0.228)
Previous Relationship		0.428	0.976**		0.591**	1.087***		0.626**	1.140***
		(0.306)	(0.423)		(0.287)	(0.370)		(0.288)	(0.372)
Termination*Previous Relationship		-1.184*	-1.418*		-1.247**	-1.372*		-1.313**	-1.518*
		(0.615)	(0.858)		(0.606)	(0.827)		(0.606)	(0.830)
Client Size			0.097*			0.107**			0.110**
			(0.050)			(0.048)			(0.048)
Client ROA			-0.225			-0.327*			-0.343*
			(0.214)			(0.204)			(0.206)
Agent's Experience			-0.211***			-0.201***			-0.201***
			(0.064)			(0.061)			(0.062)
N	1069	1069	555	1069	1069	555	1069	1069	555
pseudo R-sq	0.027	0.031	0.088	0.021	0.025	0.074	0.021	0.026	0.077
P- value for Ch2	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000

(***: 1% significance; **: 5% significance; *: 11% significance) Timing dummies are controlled.

Table A6: Substitution between Strategic and Termination Rights, and Impact of Previous Relationship, with Entry MeasureE3

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right (Binary)	Strategic Right 1	Strategic Right 1	Strategic Right 1	Strategic Right 2	Strategic Right 2	Strategic Right 2
Log # of R&D Projects	0.109**	0.108**	0.159**	0.113**	0.111**	0.159**	0.112**	0.110**	0.160**
	(0.045)	(0.045)	(0.067)	(0.045)	(0.045)	(0.067)	(0.045)	(0.045)	(0.067)
Project Size	0.0012	0.0009	0.0004	0.0012	0.0007	0.0004	0.0012	0.0008	0.0004
	(0.0008)	(0.0009)	(0.0011)	(0.0008)	(0.0008)	(0.0010)	(0.0008)	(0.0008)	(0.0010)
Royalty	0.734	0.708	0.792	0.759	0.741	0.947	0.704	0.689	0.907
	(0.490)	(0.491)	(0.676)	(0.481)	(0.481)	(0.656)	(0.480)	(0.481)	(0.653)
Stage	0.139	0.123	-0.037	0.142	0.131	-0.015	0.149	0.138	0.008
	(0.165)	(0.166)	(0.230)	(0.163)	(0.164)	(0.226)	(0.163)	(0.164)	(0.226)
Termination	-0.311*	-0.236	-0.329	-0.363**	-0.274*	-0.380*	-0.371**	-0.277*	-0.366*
	(0.162)	(0.167)	(0.232)	(0.161)	(0.166)	(0.228)	(0.161)	(0.166)	(0.228)
Previous Relationship		0.431	0.979**		0.592**	1.088***		0.628**	1.141***
		(0.306)	(0.424)		(0.287)	(0.370)		(0.288)	(0.373)
Termination*Previous Relationship		-1.185*	-1.424*		-1.247**	-1.373*		-1.314**	-1.520*
		(0.615)	(0.858)		(0.606)	(0.827)		(0.606)	(0.830)
Client Size			0.098**			0.109**			0.111**
			(0.050)			(0.048)			(0.048)
Client ROA			-0.225			-0.327*			-0.343*
			(0.214)			(0.204)			(0.205)
Agent's Experience			-0.211***			-0.200***			-0.201***
			(0.064)			(0.061)			(0.062)
N	1070	1070	555	1070	1070	555	1070	1070	555
pseudo R-sq	0.027	0.031	0.087	0.021	0.025	0.073	0.021	0.026	0.076
P- value for Ch2	0.0001	0.0001	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000

(***: 1% significance; **: 5% significance; *: 11% significance) Timing dummies are controlled.

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