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(45 words)

SOVEREIGNTY CONDITIONS AND GOVERNANCE MODES: AN OPTION THEORY APPROACH

This study extends previous work which has examined governance decisions using option theory. In particular, it evaluates the contribution of option theory in both domestic and international environments. Empirical results from a multinomial logit model suggest that the influence of option value differs across segments.

If a firm is conceived of as having a value chain of complementary activities (Porter, 1985), such as research and development (R&D), production, marketing, and distribution; a central task of firm decision-makers is deciding which activities to source from other parties through markets or collaboration, and which activities to bring "in-house" through acquisition or internal development. Inspired by Coase's (1937) seminal work, *The Nature of the Firm*, this decision has been examined using transaction cost theory by a number of notable scholars, including Chandler (1962); Arrow (1975); Williamson (1975, 1985); and Klien, Crawford, and Alchian (1978). Recently, it has been discovered that transaction costs are particularly relevant when sourcing decisions involve a firm from another country (Gatignon and Anderson, 1988; Kogut and Singh, 1988; Hennart, 1988, 1991; Gomes-Casseres, 1989). Thus, the importance of transaction costs has been verified in both domestic and international contexts.

Unfortunately, this previous work does not consider that sourcing decisions may also be influenced by the option value associated with certain types of governance. Folta (1994) and Folta and Leiblein (1994) found that option value may offset the impact of transaction costs. While their work illuminates the importance of options on governance choice, it fails to examine whether option theory provides equal explanatory power to governance decisions in both domestic and international contexts. This shortcoming is significant in that it hinders our ability to generalize about the appropriateness of an increasingly popular tool (Kogut, 1991; Bowman and Hurry, 1993; Sanchez, 1993). As such, this limitation is the motivation for this study.

One type of activity in the value chain is examined, R&D, and the factors which lead firms to choose between partial equity investments in collaborative relationships versus outright acquisition of another firm. These equity linkages include both classic joint ventures, where two or more parties create a separate, jointly owned entity; and direct minority investments, where one party takes an equity position in its partner.

A sample of 451 transactions from the biotechnology industry is used to address the research question. A multinomial logit model was specified to estimate the impact of option value on the probability that each of the three governance structures (acquisition, minority investment, and joint ventures) would be selected. The results suggest that the influence of option value differs between transactions in domestic and international contexts.

CHARACTERIZING PARTIAL EQUITY INVESTMENTS AS CALL OPTIONS ON TECHNOLOGY

Like previous studies (Kogut, 1991; Folta, 1994; Folta and Leiblein, 1994), minority investment and joint ventures are characterized as call options, providing the right, but not the obligation, to acquire an innovative firm or joint venture, respectively, at a later date and a pre-specified price. The "rights to acquire" frequently found in minority investments and joint ventures may come in several forms: (1) the right to buy and sell equity at a certain price; (2) the right of first refusal (only in joint ventures); or (3) the right to develop, market, or license technology. These "rights" serve two functions. First, they specify the price at which the technology or the target can be purchased in the future.[1] This allows the investing firm to capitalize on the appreciation of the technology, while limiting exposure to devaluations in the technology (because the investor need not acquire). The second function is that they may create a

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[1] A "target" is defined here as a small, innovative firm which possesses the technology desired by another firm.

proprietary opportunity for the investing firm. If rivals do not share the same opportunity, they can not as easily pre-empt acquisition or subsequent discretionary investments.

Figure 1 helps to illustrate the option component found in equity collaborations. By securing the right to acquire the technology at a later date, the investing firm can commit greater resources when the technology is more promising (i.e. upon a decline in technological uncertainty and an appreciation in the value of future discretionary investments). Any loss associated with downward valuations in the technology is limited by the magnitude of the initial outlay, which may equal the equity share invested and/or the "seed" money provided to the target for research; an amount much smaller than the loss associated with outright acquisition. Investing firms may either take a loss, by divesting its stock in the target, or it may maintain the equity stake, hoping possibilities improve. Thus, like financial options, equity collaborations have considerable value when the value of the underlying asset (i.e., in the case of this study, the asset is the technology) is uncertain.

When would a firm be interested in having the "right" to acquire the target versus acquiring the target outright? Financial option models, such as the Black-Scholes model, have identified a set of variables which critically influence the value of a call option. Folta (1994) uses these models to identify five forces which influence the value of the option component in quasi-integration: (1) technology value; (2) remaining cost of the target; (3) technological uncertainty (volatility); (4) time until project completion; and (5) interest rates. Table 1 illustrates the relationship between these variables and the value of the call option. It also shows the corresponding variable influencing financial options.

A COMBINED TRANSACTION COST - OPTION THEORY MODEL

As characterized by Folta (1994) and Folta and Leiblein (1994), the choice between governance modes is critically determined by two factors: transaction costs and option value. Firms interested in accessing technology from a target are assumed to maximize utility (U) with respect to alternative modes of governance.

$$U\,(A,MI,JV) \;=\; f(\text{Transaction costs, Option value}) \qquad (1)$$

where A is acquisition, MI is direct minority investment, and JV is equity joint ventures.

The model becomes interesting when the value of the underlying technology is uncertain - when option value associated with equity collaborations is significant. During such periods of uncertainty, parties of the transaction are subject to bilateral dependency (Williamson, 1975). As a result, the transactional efficiencies of governance modes are strained, the farther they are away from hierarchies. So, while option theory suggests that equity collaboration possess an advantage relative to complete integration during periods of uncertainty, transaction cost theory predicts that complete ownership will be preferred. It has been shown, however, that option value will dominate these opposing forces as uncertainty becomes significant (Folta, 1994; Folta and Leiblein, 1994).

The model is likely to be affected significantly when transactions involve firms from different countries. Ironically, complete ownership of a foreign subsidiary invites considerable transaction costs relative to equity-based collaborations (Gatignon and Anderson, 1988). The international context ushers in two problems that play minor roles in domestic trading. The first involves culture differences; minority investments and joint ventures may be seen as a way of bridging cultural gaps. Kogut and Singh (1988) show that cultural distance decreases the probability that a foreign direct investor in the U.S. would choose a full acquisition. The second is political; equity collaborations with local investors promise to reduce political complications while diversifying against expropriation risks. Both political and cultural problems reinforce the transaction cost arguments for market mediation and weaken incentives to acquire firms in other countries. Transactions between two firms in the same country should not be exposed to such problems.

In a domestic setting, option value is predicted to dominate the effect of transaction costs. As a result, the individual variables associated with option values should be helpful in explaining governance. This may not be the case when transactions involve firms across borders. A preference for equity collaborations over acquisitions are a likely prediction from both transaction cost theory and option theory. Since variables relating to transaction cost and option theory will jointly explain governance, the marginal influence of the option variables should decrease in a multinational context.

Hypothesis 1: *The vector of option variables will be less significant in transactions involving firms in different countries than in purely domestic transactions.*

Hypothesis 2: *The individual variables relating to option value to governance decisions will be less significant in transactions involving firms in different countries than in purely domestic transactions.*

RESEARCH DESIGN

Sample

The biotechnology industry was chosen as a context for this study because of its recognized importance and the rich mixture of institutional arrangements for organization of the innovation process. A sample of minority investment, joint venture, and acquisition transactions was drawn from the North Carolina Biotechnology Center (NCBC) Actions Database. The NCBC Actions Database includes information regarding over 4,000 transactions between firms world-wide from 1978 to mid-1993. Several criteria were used to eliminate transactions: (1) transactions addressing biotechnology segments outside the scope of this study (the segments of interest include Therapeutics, Diagnostics, Ag-Bio, and Suppliers); (2) minority investments and joint ventures involving no R&D (manufacturing, distribution, or marketing agreements); (3) transactions involving two established firms; (4) mis-coded or missing data; (5) transactions dated before October 1984 and after December 1992; and (6) transactions involving academic or government agencies. This procedure uncovered a sample of 451 transactions between October 1984 and December 1992. At a later point, the sample was divided into two segments - domestic and international.[2]

The dependent variable identifies the *i*th firm's choice of accessing the *j*th R&D project through minority investment, joint venture, or acquisition. A minority investment is defined as an

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[2] Project *j* was classified as domestic if it involved two firms from the same country (eg. a transaction involved two firms from Switzerland, or two firms from the U.S.). Transactions involving two firms from different countries are considered international. Table 2 exhibits the countries involved in the transactions and the number of transaction which are domestic to that country, initiated with biotechnology firms in the U.S., or initiated with firms in countries outside the U.S. 296 out of 451 trades were considered domestic.

equity position in a firm less than 50%, while a joint ventures is the formation of a child firm by two parent firms (one of which is a biotechnology firm). These cases represent 36% and 10% of the sample, respectively. Acquisitions are defined as the cumulative ownership of 50% or more of a firm. This level of ownership gives the investor essential control of the firm. Equity investments which pushed the cumulative ownership over 50% are identified as acquisitions. Acquisitions represent 54% of the final sample.

The independent variables relate to transaction cost theory or option theory. The first variable, Potential Partners relates to transaction cost theory.

Potential Partners. The availability of partners for project j at time t, in biotechnology segment m, was measured by the number of new biotechnology firms with R&D programs in segment m at time t.[3] This measure should be appropriate because new biotechnology firms are the primary source of technology in the industry (Office of Technology Assessment, 1984). Annual data on the number of new biotechnology firms in each segment was available from the Office of Technology Assessment (1984); and the Ernst & Young surveys (Burrill, 1987, 1989; Burrill and Lee, 1990, 1991, 1992).

The number of partners increased annually from 1984 to 1992 for each segment: Therapeutic (66 to 430); Diagnostic (66 to 317); Ag/Bio (55 to 113); and Supplier (43 to 181). By incorporating annual figures, this measure improves upon that used by Pisano (1989b).

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[3] A common measure used to test the effects of "small numbers bargaining" is the four-firm concentration ratio (Levy, 1985; Caves and Bradburd, 1988). Pisano (1989b) uses a measure nearly consistent with the measure used in this study. It differs in that it does not vary by time.

Technology Value. This measure is designed to capture the value and the future promise of the target's technology. Similar to Pisano (1989b), technology is characterized broadly as the biotechnology segment in which the transaction takes place. Stock indices were developed for the four largest biotechnology segments: Therapeutic, Diagnostic, Ag/Bio, and Supplier. Each index was created from weekly returns of nine U.S. firms dedicated to biotechnology and specializing in the respective segments. The value of project *j*'s technology was measured as the value of the biotechnology index for segment *m* (when $j \in m$) at the announcement of the project.

The four indices are meant to represent the distinct promise of each technology segment. It was important, therefore, to identify a set of firms concentrating primarily in one of the four segment. Since it is common for many biotechnology firms to be active in more than one segment, every effort was made to select firms that operated in a relatively narrow technological range, representative of the segment in which it focused. BioScan was used to identify publicly traded firms, their range of research activity, and their stated strategic focus.

Technological Volatility (Uncertainty). This measure is designed to capture the volatility surrounding the technology of project *j*, in segment *m*. It has been common for researchers to employ variance measures to estimate uncertainty. However, such measures have concentrated on variance in revenues or demand in relatively mature industries. For young industries, such as biotechnology, revenue and demand are not always reasonable alternatives. This study uses stock market data to estimate volatility for the value of technology.

Technological Volatility is calculated from the 26-week standard deviation of the log of (inflation adjusted) weekly returns for each biotechnology segment index. Consistent with option pricing models in finance, the following formula was used (Cox and Rubenstein, p. 254-8):

$$\sigma_w^2 = \left(\frac{1}{26-1}\right) \times \sum_{t=1}^{26}\left[(\log R_t)^2 - \mu^2\right] \qquad (2)$$

where,

σ_w = the unbiased estimate of the 26 - week volatility.

$R_t = \left(I_t / I_{t-1}\right)$, represents the inflation - adjusted index price relative for week t.

$\mu = \left(\frac{1}{26}\right) \times \sum_{t=1}^{26} \log R_t$.

The 26-week measure was chosen because it was believed that volatility one-half year prior to the transaction accounts for most of the influence on the governance choice decision.[4] Figure 6.2 illustrates this measure over the life of the sample.

Because the announcement dates available for the transactions are monthly, a monthly measure of annualized volatility (σ_m)was calculated in the following way:

$$\sigma_m = \left(\frac{1}{k}\right) \times \sum_{w=1}^{k}(52\sigma_w) \qquad (3)$$

where, k equals the number of weeks in a month.[5]

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[4] A 52-week measure of technological volatility was also considered and tested. The coefficients for the 52-week measure were generally less significant, supporting our choice of the 26-week measure.

[5] While it is possible to calculate monthly volatility from monthly returns, that would compromise data points and reduce our confidence in true volatility. Instead, we chose to use weekly returns, allowing us twenty-six data points instead of six.

The formulation for this measure of volatility had implications for how the indices where constructed. To assure that the measures of volatility were comparable across segments and across time, each index contained nine firms throughout its life. The size of the indices (number of firms) was constrained because biotechnology was a very young industry in 1984, with relatively few public companies. Public companies were particularly rare in the Ag/Bio segment. As a result, we were limited by the population of public firms in that segment, and thus, in all segments.

Project Duration. The option framework warrants a duration measure which approximates the length of time until the option is exercised. Real options usually don't have exercise dates, but instead have some time in the future when the option disappears because uncertainty is resolved. The closer project *j* comes to commercialization, the more uncertainty is resolved surrounding an R&D project.

Unfortunately, our data was not complete in identifying the research phase for every project; therefore, making it difficult to estimate the time until project completion. However, since the sample of transactions involves only R&D projects, it is believed that the projects were initiated a relatively short time before the transaction occurred. Therefore, a relevant measure of duration is the length of time from initiation of project *j* until commercialization.

Our measure of duration is average length of time from research initiation to commercialization for each segment *m*, to which project *j* belongs. The averages were gathered from, and verified with, several sources, including OTA (1991), Burrill and Lee (1994), and Rossi

(1992). The average project duration for therapeutics is 10 years, for diagnostics is 2 years, for ag/bio is 7 years, and for supplier is 1 year.

Interest Rate. This measure is the nominal risk-free interest rate at the time of initiation of project *j*. It should influence the present value of the exercise of an option. Therefore, the relevant risk-free rate for project *j* corresponds to the duration of project *j*. Since therapeutic projects have an estimated duration of 10 years, the average monthly yield on U.S. Treasury Notes with a 10-year maturity was used for the month of project initiation. Likewise, the yield for 2-year Treasury Note maturities was used for diagnostic projects and the 1-year Treasury Note was used for supplier projects. Since data was not consistently available on maturities greater than 10 years (except the 30-year Treasury Note), the 10-year Treasury Note yield was also used for the Ag/Bio segment.[6]

Unrelated. This variable captures the difference in types of firms transacting in project *j*. It is a dummy variable, coded "1" if a large, established firm transacted with a DBF or a joint venture, "0" otherwise. Unrelated is meant to control for the types of firms involved in the transactions. Transactions where Unrelated is coded "1" involve firms that are vertically related, and those transaction where Unrelated is coded "0" involve firms that are horizontally related.

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[6] The yields included actively traded issues adjusted to constant maturities. This information was published in the *Federal Reserve Bulletin*.

Descriptive Statistics

Table 3 presents descriptive statistics for the dependent and independent variables in the sample. The means for the dependent variable represent frequencies for each governance mode. Since several of the independent variables were dummy variables, their means also represent frequencies. 66.0% of all transactions involve firms from the same country (Domestic), while 60.0% involve an established firm and a DBF or joint venture (Unrelated).

Of the remaining independent variables, several items are worth discussing. Potential Partners and Technological Value have high variances relative to their means. This may be predominantly explained by the positive skewness in these variables. Estimates of means and variance are highly dependent upon the shape of the distribution; and in particular, the mean-variance combination used to estimate the parameters behaves quite poorly when asymmetrical distributions are involved. It is common to make distributions more symmetrical through transformations, which do not alter the linear relationship, but provide a more sound basis for regression techniques which summarize the relationship. Concave functions, such as natural logarithms, are recommended for correcting right-skewed distributions (Neter, Wasserman, and Kutner, 1985). Therefore, we have taken the natural logarithm of both Potential Partners and Technology Value. Following this transformation, both the standard deviation and skewness are improved relative to the mean value of these variables.

Technological Volatility is also skewed positively. This is not surprising given the high volatility surrounding the stock market collapse beginning in October of 1987. As stated above, these extreme values are likely to reduce any significant relationship in a regression model. However, we are reluctant to transform this variable so that we may more closely approximate the variable used in the option-pricing models (recall that volatility is the most important variable in pricing models). Furthermore, the standard deviation of Volatility remains low relative to its mean.

Methodology

The multinomial logit methodology is appropriate for testing models where utility differences determine the probability of selection among a series of discrete choices, and is employed in this paper. The fundamental assumption underlying discrete choice modeling is the independence of irrelevant alternatives (IIA). The IIA assumption requires that the ratio of the choice probabilities of any two alternatives be unaffected by the systematic utilities of any other alternatives. The most widely accepted test of the validity of the IIA assumption has been developed by Hausman and McFadden (1984). Initiation of this test reveals a Hausman statistic of 3.882. This statistic falls below the critical value at the 0.001 level indicating that the estimated coefficients are stable across the choice set, thus providing statistical support for our trinomial specification.

RESULTS

The multinomial logit model was estimated using LIMDEP version 5.1 (Greene, 1992). Table 4 illustrates the results from two different segments - domestic (column 1) and multinational (column 2). Since the values of the independent variables did not differ across choice it was necessary to normalize the values of the estimated coefficients to one of the governance choices. The choice of the normalized variable has no effect on the model fit. Nor does it influence the significance of the relationships between dependent and explanatory variables. In this study, the coefficients were normalized to the choice of acquisition. All other parameters can therefore be interpreted only in reference to the acquisition choice. The significance of a coefficient indicates the extent to which the corresponding variable contributes to the utility of that choice alternative beyond the contribution that this variable would have in determining the utility of the normalize option. Consequently, the parameters explain deviation from the reference choice - acquisition.

Formal log-likelihood ratio tests were conducted to test the null hypothesis that the estimated coefficients were jointly zero. These tests, reported in Table 4, compare the incremental improvement in fit obtained in the theoretical model with respect to a null model [£(0)]. The test statistic is χ^2 distributed with degrees of freedom equal to the difference in the number of parameters in the models being compared. Both models are significant at the 0.001 level. A more rigorous test of the significance of the explanatory coefficients is one that compares the fit of the theoretical models with a constant-only model [£(c)]. This test was also conducted and is reported in Table 4. Again, both models are significant at the 0.001 level, providing support for the substantive coefficients in the theoretical model.

A test was performed to assess whether all the coefficients were equal across segments. The likelihood ratio test revealed a test statistic of 34.60 with 14 degrees of freedom. This value exceeds the critical $\chi^2_{(0.01)}$ value of 29.14. Thus, we can reject the null hypothesis, and conclude that the vector of coefficients is not equal across segments.

The main hypothesis argues that the vector of option coefficients will provide less explanatory power when transactions are multinational, than when they are domestic. To specifically examine whether the option coefficients differed across segments, a second likelihood ratio test was performed. This test was performed by comparing the full model (pooled) with an unrestricted model that is estimated with the full data set, but with a longer vector of coefficients in which the vector of option coefficients are replaced with the market segment specific subsets of coefficients. This test revealed a statistic of 17.32 with 6 degrees of freedom. Once again this statistic exceeds the critical $\chi^2_{(0.01)}$ value or 16.81. Thus, we can conclude that the vector of option coefficients is different across segments, a result which supports hypothesis 1.

It is useful to know if the rejection of the joint hypothesis (all option coefficients are equal) can be attributed to individual coefficients (Hypothesis 2). This was done by comparing individual coefficients across the Domestic and International segments. The *t*-statistic is appropriate for test whether differences exist, and is reported in column (3) of Table 4.[7] These tests revealed several interesting findings. Volatility has a significantly greater influence ($p < 0.001$) on the choice of minority investments over acquisitions for domestic transactions than for international ones. No difference exists for the impact of Volatility on the preference for joint ventures. In addition, domestic transactions involving both established firms and DBFs are more likely than international transactions to prefer minority investments and joint ventures to acquisitions. Interestingly, Project Duration has a greater influence among international transactions on the preference for minority investments over acquisition. Thus, hypothesis 2 is only partially supported.

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[7] The statistic for the asymptotic *t*-test of equality of individual coefficients between the domestic (1) and foreign (2) segments is $\dfrac{\hat{B}_k^1 - \hat{B}_k^2}{\left(\operatorname{var}\left(\hat{B}_k^1\right) + \operatorname{var}\left(\hat{B}_k^2\right)\right)^{1/2}}$.

In general, these tests reveal that the vector of coefficients differs between domestic and international settings. The impact of the option variables was shown to significantly differ across segments. While the finding for Project Duration is puzzling, the findings for Technological Volatility and Interest Rates are consistent with our expectations.

One alternative explanation for our findings may be that our measures may be inappropriate for transactions outside of the U.S. Technology Value, Technology Volatility and Interest Rates are U.S. - based measures. Of the 155 international transactions, 62 occurred without a U.S. firm as the target firm. As a result, measures which are based on the technological and financial environment in the U.S. may not be suitable. Nevertheless, it has been argued here, and elsewhere, that the prominence of U.S. biotechnology research suggests this index is representative of global biotechnology activity. Further work should attempt to verify this claim.

CONCLUSION

This study extends previous work tying option theory to governance decisions. It provides evidence that the contribution of option theory differs according to whether transactions are domestic or international. It should be noted that this study says nothing about the robustness of option theory to different settings. Indeed, joint ventures and minority investments should contain equally valuable, if not more valuable, options to acquire. This study does suggest, however, that option theory provides a smaller marginal contribution to such settings because other considerations, such as transaction costs will dominate. In addition, this study provides compelling evidence that option theory is quite helpful in domestic settings.

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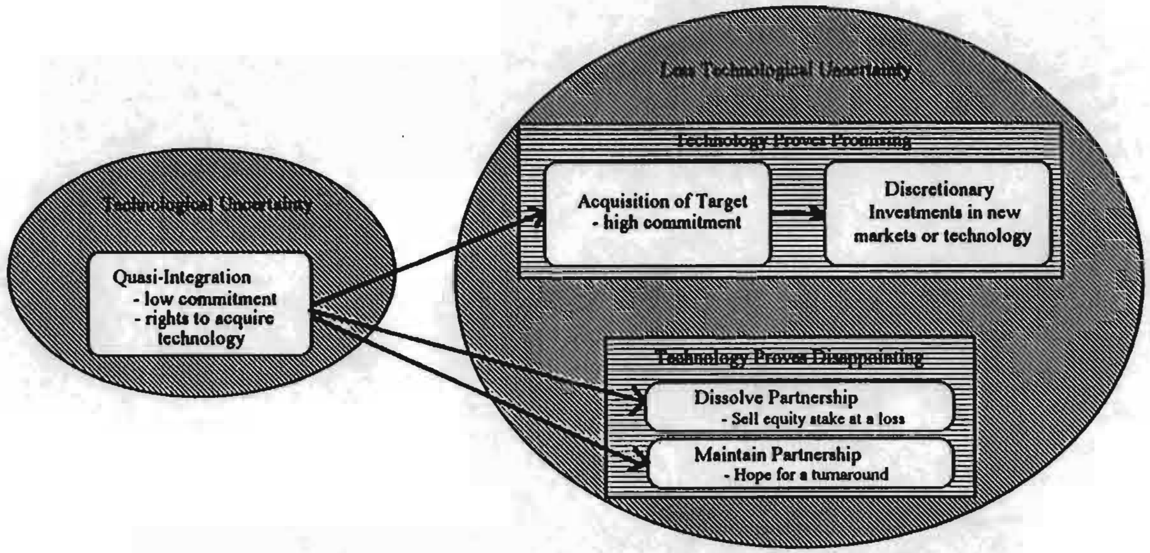

Figure 1: Flexibility Associated with Quasi-Integration

Table 1: Relationship Between Financial and Technology Options

Financial Stock Option	Value of Call Option	Option to Acquire Technology
Stock Value	+	Value of Target's Technology
Exercise Price	-	Cost of Target's Remaining Shares and/or cost of future discretionary investments
Stock Price Volatility	+	Volatility of Technology's Value
Time to Maturity	+	Time Until Project Completion or Termination
Interest Rates	+	Interest Rates

Table 2: Countries Involved in Transactions

Country of Acquirer	Country of Target Firm: Domestic	United States	Other
Australia	3	3	0
Belgium	0	1	0
Brazil	0	1	0
Canada	14	4	2
Denmark	1	1	2
Finland	1	1	1
France	7	6	8
Germany	0	8	5
Ireland	0	1	0
Israel	2	0	0
Italy	2	6	2
Japan	2	24	7
Netherlands	0	1	3
Norway	1	1	0
Singapore	0	1	0
Sweden	5	5	2
Switzerland	1	14	2
United Kingdom	10	15	3
United States	247	---	25
Totals	296	93[a]	62

[a] This number does not include the 247 transactions between firms in the U.S.

Table 3: Variable Definitions and Descriptive Statistics (451 transactions)

Variable	Total Sample n=451				
	Means	Std. Dev.	Skew.	Min	Max
Choice Variables					
1. Acquisition and Merger	0.53				
2. Minority Investment	0.37				
3. Joint Venture	0.10				
Independent Variables					
1a. Potential Partners	221.97	105.48	0.43	43.00	430.00
b. log (Potential Partners)	5.28	0.52	-0.36	3.76	6.06
2. Domestic	0.66	0.48	-0.66	0.00	1.00
3. Technological Volatility	0.33	0.12	1.10	0.14	0.72
4a. Technology Value	276.73	229.24	1.20	25.31	860.20
b. log (Technology Value)	5.26	0.90	-0.33	3.23	6.76
5. Project Duration	6.68	3.74	-0.52	1.00	10.00
6. Interest Rate	7.95	1.33	-0.39	3.30	11.86
7. Unrelated	0.60	-0.49	0.40	0.00	1.00

Table 4: Multinomial Logit Parameter Estimates - Domestic versus International Segments

Independent Variables (normalized to acquisition choice)	Parameter Estimates: Domestic (1)	Parameter Estimates: International (2)	t-test for differences (3)
Constant - specific to Minority Investment (MI)	-12.0716 ***	-4.4969	-1.7684 †
	(3.1420)	(2.9112)	
Constant - specific to Joint Venture (JV)	-3.0624	2.0155	-0.8734
	(4.4361)	(3.7580)	
log (Potential Partners) - MI	-0.6829	-0.9103	0.2207
	(0.7058)	(0.7506)	
- JV	-1.8726 †	-2.2087 *	0.2367
	(1.0165)	(0.9915)	
Volatility - MI	5.8678 ***	-0.3976	3.0336 ***
	(1.5528)	(1.3618)	
- JV	5.4165 **	2.8940 †	0.9379
	(2.0576)	(1.7319)	
log (Technology Value) - MI	1.3285 **	0.9815 *	0.5881
	(0.4065)	(0.4276)	
- JV	0.9371	0.9917 †	-0.0661
	(0.5856)	(0.5829)	
Project Duration - MI	0.0070	0.1163 **	-1.9513 *
	(0.0404)	(0.0388)	
- JV	0.0657	0.0983 †	-0.3871
	(0.0637)	(0.0551)	
Interest Rate - MI	0.5634 **	0.3138 †	1.0391
	(0.1717)	(0.1680)	
- JV	0.3425	0.2023	0.4239
	(0.2515)	(0.2148)	
Unrelated - MI	2.3512 ***	0.4805	3.4614 ***
	(0.3798)	(0.3845)	
- JV	1.0589 †	-0.7962	2.4944 ***
	(0.5562)	(0.4937)	
Log-Likelihood Fit Statistic, £(β)	-168.04	-183.07	
degrees of freedom, df	14	14	
-2[£(0) - £(β)]	206.63 ***	82.09 ***	
number of transactions	247	204	

† $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Non-segmented model: £(β) = -368.41; £(0) = -495.47; -2[£(0) - £(β)] = 254.12

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