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Measuring Agency Costs in the Presence of Incidental Truncation: Empirical Evidence from Chinese Firms

Jong Rhim[a], Andrew Brajcich[b], and Dan Friesner[c]

[a]*Professor of Finance at the University of Southern Indiana, Evansville, IN, USA.*
[b]*Assistant Professor of Accounting at Gonzaga University, Spokane, WA, USA.*
[c]*Professor of Pharmacy Practice at North Dakota State University, Fargo, ND, USA.*

ABSTRACT

Substantial literature attempts to estimate the potential and magnitude of agency costs including an agency cost function that characterizes the impact of dividend policies and insider ownership on firm debt. These approaches are problematic because they assume all firms can be aggregated, even whenthey have different approaches to resolving agency costs. Agency cost estimates tend to average out the results across firms or rely on non-linearities to identify disparate incentives leading to mixed results. This paper develops an empirical agency cost model that can account for firms which do not offer dividends or have limited insider ownership. Assuming that such discrete decisions are intentional, we model agency cost decisions within an incidental truncation framework to publicly traded Chinese manufacturing firms and find the convergence of interests theory holds when firms do not offer dividends or allow insider ownership, and entrenchment theory holds when firms pay dividends and/or allow insider ownership.

Keywords: Agency Cost, Shareholders, Insider Ownership, Dividend Policies

Ⅰ. Introduction

While the theoretical role of the corporation has been to maximize shareholder wealth, it has long been recognized an inherent conflict exists between the interests of managers and those of shareholders. Adam Smith recognized that managers do not watch over a company's resources with the same vigilance as they would watch over their own (Smith, 1937). This separation of ownership and control known as the *agency problem* results in agency costs, specifically the costs of monitoring the managers in pursuit of their obligations to the shareholders (Fama & Jensen, 1983). The managers' incentive is to grow the corporation continuously in order to increase their own influence and resources, regardless of whether growth is in the best interest of the shareholder (Jensen, 1986). As can be expected, agency costs have been found to be inversely related to the managers'share of ownership interest (Ang, Cole, & Lin, 2002).

As described in Jensen (1986), the payment of dividends to shareholders reduces the resources under managers' control. Accordingly, managers prefer to retain free cash flows—the excess of cash from operationsafter the required maintenance and expansion of assets—and use the funds for internal projects under their control, which often generate a lower return when evaluated against shareholders' directuse of the funds. Indeed, such internal financing has been often viewed as a cost-effective alternative to external financing

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† Corresponding Author - Andrew M. Brajcich, JD, LLM, CPA
Assistant Professor of Accounting School of Business Administration Gonzaga University 502 East Boone Avenue, AD 9 Spokane, WA 99258-0009, 509.313.7053 direct, 509.313.5811 fax
brajcicha@jepson.gonzaga.edu

for a firm. As a technique to decrease agency costs, Jensen (1986) advocates issuing debt in exchange for stock while keeping low levels of cash in the company. This technique reducesthe cash flow available for spending by managers and secures a promise from managers to pay out future cash flows to the shareholders surrendering stock. This approach, however, is not without its drawbacks. With limited free cash flow, the company may have difficulty issuing new debt, meeting current cash flow needs, and negotiating lower interest rates on that new debt (Smith & Stulz, 1985; Kim &Sorensen, 1986; Froot, Scharfstein, & Stein, 1993). Moreover, a highly leveraged company is at risk for underinvestment (Stulz, 1990).

Similar results can be seen outside the agency cost context. While certain tax incentives seemingly promote the use of debt capitalizationin corporations (Modigliani & Miller, 1963), companies still do not borrow as much as possible (Myers, 1977). Something external from tax considerations prevents firms from maximizing their tax benefit by maximizing certain inside debt. The level of owner sophistication, however, also has an effect on whether tax incentives induce capital investment through debt (Brajcich & Lawson, 2012).

The use of hedging transactions to decrease cash flow volatility can also have an effect on agency costs. Namely, a reduced risk of excess cash flows will reduce the opportunities for managers to use the excess cash flows inefficiently (Namjoshi, McPherson, & Friesner, 2012). In effect, the use of hedging transactions will permit the firm to borrow more in accordance with Jensen's (1986) free cash flow hypothesis (Namjoshi, McPherson, & Friesner, 2012).On the other hand, the reduced volatility in cash flow may result in an increase excess cash flow when the company hedges more than necessary (Tufano, 1998; Morellec & Smith, Jr., 2005).

A crucial issue in the agency cost literature is the means by which agency costs are quantified. Much of the established literature attempts to estimate an *agency cost function* which characterizes the impact dividend policies and insider ownership on the firm's debt position (Jensen & Meckling, 1976; Ross, 1977; Kalay, 1982; Myers & Majluf, 1984; Jensen, 1986; Morck, Shleifer, & Vishny, 1988). The majority of these studies account for the simultaneity bias that exists between debt, dividends, and ownershipusing two-stage least squares if estimating a single agency cost equation (Bathala, Moon, & Rao, 1994; Chen & Steiner, 1999) or some combination of three-stage least squares (Jensen, Solberg, & Zorn, 1992; Noronha, Shome, & Morgan, 1996; Kim, Rhim, & Friesner, 2007) orfull information maximum likelihood or generalized method of moments (Pindado & de la Torre, 2006)if estimating a system of equations. In some cases, for example Crutchley et al.(1999) and Chen and Steiner (1999), an attempt is made to explicitly specify a nonlinear agency cost function. Other studies (see many of the studies cited above) estimatea series of linear-in-parameter equations, which can be interpreted as reduced form equations which lie on a small area of the inherently nonlinear agency cost curve.

Several methodological issues arise from these specifications. First, in cases where a non-linear agency cost function is postulated, the non-linearities assumed in the cost function'sspecification can play a dominant role in shaping the results, especially in cases where sample sizes are small and/or the quality of the data is limited (i.e., if there are omitted variables or if existing data contain significant measurement error). Similarly, linear systems of equations with multiple endogenous variables require an extensive set of very strong exogenous instruments, which may or may not beavailable in all data sets, in order to generate meaningful results.

Perhaps more importantly, these types of methodologies typically assume that the endogenous variables are amenable to least squares and/or instrumental variable techniques. If the data are censored, truncated, or simply not comparable across firms in the data set, these assumptions are frequently violated and the results generated by the empirical models are suspect (Fenn & Liang, 2001). As an example, consider a measure of insider firm ownership. In many publicly traded companies in the U.S., managers commonly own stock in the company where they are employed. Thus, a variable such as the proportion of insider ownership is likely to be relatively evenly distributed across the unit interval and after transformation (for example, by using a log-odds transformation) may be amenable to standard methods of regression analysis. However, in other countries, insider ownership may not be the norm, in which case firms likely tend to clusterat the lower end of the unit interval, which implies censoring or truncation in the data. Within the context of agency costs, this is important because firms with no insider ownership, regardless of whether this is company policy or caused byregulatory considerations, are incapable of experiencing managerial entrenchment in the sense suggested by the agency cost literature. These managers may still become entrenched; however, other means besides ownership (for example, the length of time spent in a leadership position in the firm) are driving the entrenchment. Thus, these firms are fundamentally different from other corporations that do face a substantial risk of managerial entrenchment. A similar argument can be made with respect to dividend policiessince firms that make the decision not to pay dividends, whether due to corporate policy or low profitability,face fundamentally different agency cost considerations than firms that do pay dividends. Dividend data that is collected across publicly traded companies is, therefore, likely to contain censoring or truncation. It is unlikely that any type of publicly traded firm in any industry or region of operation would fail to have some amount of leverage. However, in such cases, a similar argument would apply to leverage as well.

The purpose of this paper is to develop and implement an empirical agency cost model that can account for discrete differences in firm objectives. More specifically, we assume that firms which fail to pay dividends and/or which have no insider ownership face fundamentally different agency cost decisions than those which do pay dividends and allow insider ownership. Additionally, we assume that there is an explicit rationale for these decisions, which is latent to the researcher. In such cases, it is appropriate to frame agency costs within an incidental truncation framework (Heckman, 1976, 1979; Greene, 2000).

The remainder of this paper proceeds in a series of steps. In the next section, an empirical methodology is presented which casts the incidental truncation model within an agency cost framework. The third section describes the data used asan empirical illustration, which consist of publicly traded firms in China between 1996 and 2006. The fourth section contains the empirical results. The paper concludes by summarizing the key findings, discussing the implications of those findings for financial economic policy, and suggesting directions for future work in this area.

Ⅱ. Empirical Methodology

As noted above, the empirical methodology employed in this manuscript rests on several key assumptions. First, we assume that firms which fail to pay dividends and/or which exhibit no insider ownership face fundamentally different agency cost decisions than those which do pay dividends and allow insider ownership. Second, the methodology assumes that such decisions are made explicitly and strategically, even if the rationales behind the decisions are latent to the researcher. In such cases, agency costsdecisions can be modeled using a traditional incidental truncation framework (Heckman, 1976, 1979 Greene, 2000). As an illustrative example, consider the case where a significant portion of firms neither allow insider ownership nor pay dividends. (We describe the empirical methodology for a single source of incidental truncation noting that applying it to other related situations is straightforward.) Let D_{it}^{*}be the underlying latent variable driving the decision *not* to allow dividends and insider ownership, and let D_{it} be an indicator function (which varies across firms (i = 1,⋯,n) and time (t = 1,⋯,T)) that assigns a value of one to firms in this category and assigns a value of zero to firms that allow insider ownership, pay dividends, or both. Under the assumption that the decision can be approximated by a cumulative normal distribution, this decision can be modeled:

$$D_{it}^{*} = \alpha + \sum_{j=1}^{J} \theta_j X_{it}^{j} + \sum_{h=1}^{H} \vartheta_h Z_i^h + \sum_{k=1}^{K} \varphi_k W_t^k + u_{it} \quad (1)$$

$$D_{it} = \begin{cases} 1 \text{ if } D_{it}^{*} \\ 0 \ otherwise \end{cases} \quad (2)$$

where u is a normally distributed error term with the usual assumptions; X is a series of j = 1,⋯,J explanatory variables that vary by time and firm; Z is a series of h = 1,⋯,H explanatory variables that vary by firm but not time; W is a series of k = 1,⋯,K explanatory variables that vary by time but not firm; and the remaining symbols are parameters to be estimated. Then a standard probit model can be constructed and estimated based on (1) and (2):

$$Prob(D_{it}^{\square} = 1) = \Phi(\alpha + \sum_{j=1}^{J} \theta_j X_{it}^{j} + \sum_{h=1}^{H} \vartheta_h Z_i^h + \sum_{k=1}^{K} \varphi_k W_t^k) \quad (3a)$$

$$Prob(D_{it} = 0) = 1 - \Phi(\alpha + \sum_{j=1}^{J} \theta_j X_{it}^{j} + \sum_{h=1}^{H} \vartheta_h Z_i^h + \sum_{k=1}^{K} \varphi_k W_t^k) \quad (3b)$$

where Φis the cumulative standard normal distribution, and all other variables and parameters are as defined previously.

Suppose that the researcher ultimately intends to estimate an agency cost function in which firm leverage is the dependent variable:

$$L_{it} = \beta + \sum_{j=1}^{J'} \gamma_j X_{it}^{j} + \sum_{h=1}^{H'} \Psi_h Z_i^h + \sum_{k=1}^{K'} \xi_k W_t^k + \nu_{it} \quad (4)$$

where L denotes leverage; ν is an error term; β, the γs, ψs, and ξs are parameters to be estimated; and all other variables are as defined previously. In equation (4), standardeconometric practice includes (to avoid excess multicollinearity and to ensure model identification) a set of explanatory variables that is a subset of those used in the initial (probit) selection equation. Hence H' $\leq$ H; J' $\leq$ J, and K' $\leq$ K. It then follows that decisions concerning the amount of leverage a firm incurs is relative to and conditional upon the decisions to not allow insider ownership and not to pay dividends. Heckman (1976, 1979) shows that under the assumption of normality, the following relationship holds:

$$E\left[L_{it}|D_{it}=1\right]=\beta+\sum_{j=1}^{J'}\gamma_j X_{it}^j+\sum_{h=1}^{H'}\Psi_h Z_i^h+\sum_{k=1}^{K'}\xi_k W_t^k \\ +\rho\sigma_{\upsilon}\lambda\left(\alpha+\Sigma_{j=1}^{J}\theta_j X_{it}^j+\Sigma_{h=1}^{H}\vartheta_h Z_i^h+\Sigma_{k=1}^{K}\varphi_k W_t^k\right) \qquad (5)$$

where λ is the inverse mills ratio obtained from the probit equation σ_v is the standard deviation of the error term in (4) and ρ is the correlation between the error terms of (3) and (4). Heckman (1976, 1979) and Greene (2000; pp. 926-934) suggest that (5) can be estimated with a two-step approach in which the probit equation is estimated, and the inverse mills ratio is calculated and included as an additional regressor in (4). Once the sample selection has been controlled for, ordinary least squares may be applied to estimate (4) solely for those observations in which D = 1. However, there are two difficulties with this approach. One difficulty is that the two-step approach is less efficient than a single-step approach where the two equations are estimated jointly. The other difficulty is that the two-step approach relies on trends within the data to ensure that the absolute value of the estimatedcorrelation coefficient is restricted to the unit interval. Hence, we opt to estimate (3) and (4) jointly using maximum likelihood. More specifically, the log likelihood for the joint specification of the two functions can be expressed as (SAS Version 9.3):

$$L=\sum_{D_{it=0}}\ln\left[1-\Phi\left(\alpha+\sum_{j=1}^{J}\theta_j X_{it}^j+\sum_{h=1}^{H}\vartheta_h Z_i^h+\sum_{k=1}^{K}\varphi_k W_t^k\right)\right]+$$

$$\Sigma_{D_{it=1}}\left\{\ln\phi\left(\frac{L_{it}^{\square}-\beta-\Sigma_{j=1}^{J'}\gamma_j X_{it}^j-\Sigma_{h=1}^{H'}\Psi_h Z_i^h-\Sigma_{k=1}^{K'}\xi_k W_t^k)}{\sigma_{\mathrm{v}}}\right)-\ln\sigma_{\mathrm{v}}+\right.$$

$$\left.\ln\phi\left(\frac{\alpha+\Sigma_{j=1}^{J}\theta_j X_{it}^j+\Sigma_{h=1}^{H}\vartheta_h Z_i^h+\Sigma_{k=1}^{K}\varphi_k W_t^k+\rho\left(\frac{L_{it}-\beta-\Sigma_{j=1}^{J'}\gamma_j X_{it}^j-\Sigma_{h=1}^{H'}\Psi_h Z_i^h-\Sigma_{k=1}^{K'}\xi_k W_t^k}{\rho_{\mathrm{v}}}\right)}{\sqrt{1-\rho^2}}\right)\right\} \qquad (6)$$

where $\phi(\ )$ is the standard normal probability density function, and ln( ) is the natural logarithm transformation. All other symbols and variables are as defined previously.

Once estimates are generated, their interpretation is straightforward. Each of the α, θ, ϑ, and φ parameter estimates are interpreted analogously to those of a standard probit model. The β, γ, Ψ, and ξ parameter estimates are interpreted as traditional marginal effects in the traditional (least squares) regression model. The marginal effect of the likelihood of being in the selected population (for example, being in the set of firms that does not allow insider ownership and does not pay dividends) on the dependent variable is characterized by the estimate for ρ. All estimations were conducted using SASVersion 9.3 and employ 5 percent significance levels (significance at the 10 percent level is also presented for the reader's convenience).

This very general specification can be used to test whether specific types of agency costs exist in the data in much the same manner as in the previous literature. For example, Kim, Rhim and Friesner (2007) suggest that in a regression of ownership and dividends on firm leverage, a significant, positive coefficient on the ownership variable indicates that while holding the other specified regressors constant, entrenchment theory holds a negative and statistically significant coefficient estimate implies the convergence of interest theory holds. Similarly, a negative and significant coefficient estimate for the dividend variable suggests that the convergence of interest theory holds while a positive and significant coefficient estimate suggests that entrenchment theory holds. Within our empirical framework, these estimates would be characterized by the estimate for ρ. However, the exact interpretation of $\rho$and its expected sign would be determined by the specification of the selection equation. For example, if the selection were analogous to the previous example when firms that did not pay dividends or did not have insider ownership were selected, then these firms would be unlikely to experience entrenchment. Hence, the convergence of interests theory is likely to hold, and we expect a negative coefficient estimate for ρ in this sample. That is, holding the other regressors constant, a greater likelihood of being a firm that does not have insider ownership should have lower levels of debt. The same intuition would apply in the case were selection was based on the firm's decision to pay dividends or if selection were based on both of these decisions taken jointly. Concomitantly, if the selection were based on the complement of these decisions so that firms both paid dividends and/or allowed insider ownership,it is reasonable to expect the estimate for ρ to be positive since entrenchment is more likely to occur.

When specifying an agency cost equation that uses leverage as a dependent variable, several other presumably exogenous covariates are commonly included that play supporting roles in the formation of agency costs. Within the specification of (1) – (6), these variables most frequently vary by time and firm, and thus they would be included in the X_{it} variables. An examination of the signs and significance of the corresponding parameter estimates, most notably the γs but also the θs,can be compared to prior expectations based on the literature and used to gain a more complete understanding of the formation of agency costs in these firms. One important covariate is the firm's cash flow. Myers and Majluf (1984) argue that managers typically prefer to use cash rather than leverage to make major purchases since using cashprovides management with more discretion in determining how those funds are spent. This is known as *pecking order theory.* Hence, higher levels of cashreduce the need to use leverage, and we therefore expect a negative relationship between these two variables. A similar argument can be made for other types of liquid assets on the firm's balance sheet. Hence, the relationship between a firm's current ratio and leverage is also expected to be negative. Lastly, since more profitable firms generate greater cash flow and case reserves, we also expect a negative relationship to exist between a firm's profitability and its leverage.

Ⅲ. Data

The data used in this study are drawn from the Shanghai Stock Exchange between the years 1999 and 2006. The complete (balanced) panel consists of 481 firms yielding 3,848 observations. Variables created and selected for analysis are in a manner consistent with Kim, Rhim, and Friesner (2007). Leverage (LEV) is defined as the ratio of total debt to the book value of total assets. Insider ownership (OWN) is measured as the proportion of the company's stock that is owned by employees of that firm. Dividends (DIV) are measured as the dollar value of dividends paid divided by firm operating income. A normalized measure of profitability (PRO) is constructed as the ratio of net income to the firm's sales. A measure of firm size (SIZE) is generated by taking the natural logarithm of the market value of outstanding equity. A current ratio (CR) is constructed as the ratio of current assets to current liabilities. The firm's cash flow (CF) is measured as net income and depreciation divided by total firm assets. Lastly, a series of dummy variables is created to account for each year of the analysis (DV99, DV00, DV01, DV02, DV03, DV04 DV05, and DV06). To avoid multicollinearity in the empirical results, one of these variables (DV99) is omitted hence all included dummy variables must be interpreted relative to the omitted category.

Additionally, a series of binary variables are created which quantify the extent to which sample selection might be present in the data. For example, we create a binary indicator of whether management owns none of the company's stock (OWN). We also create DIVDV which identifies those firms that donot pay dividends in a specific year. NODIVOWN is a binary variable indicating those firms that neither have insider ownership nor paid dividends in a given year. DIVOWN is a binary variable that serves as the complement to NODIVOWN. More specifically, DIVOWN identifies firms that pay dividends, allow insider ownership, or a display a combination of the two. The agency cost literature suggests that firms with more than 5 percent of outstanding stock that is owned by insiders is at elevated risk of managerial entrenchment (Florackis & Ozkan, 2009). Hence we create the binary variable ENTRENCH, which identifies firms with 5 percent or more insider ownership. POSDIVDV is a binary variable that identifies firms which pay dividends out of positive operating income. ENTDIVDV identifies those firms for which ENTRENCH equals one and PSODIV equals one.

We eliminated 32 observations for the following reasons: insider ownership greater than 100 percent of outstanding stock (8 observations), debt to equity ratios in excess of 100 (1 observation), extremely high cash flows but extremely large, negative net earnings in excess of -$10 million (1 observation), profit to sales ratiosin excess of 10 or less than -10 (15 observations), reporting a positive profit/sales ratio yet simultaneously reporting a loss of greater than $10 million in operating income (5 observations), and reporting a dividend/operating income ratio of < -10 (2 observations). As a result, we are left with an unbalanced panel of 481

Table 1. Variable Names, Definitions and Descriptive Statistics

Variablel	Definition	Mean	Std.Dev.
LEV	Total Debt/Total Assets	0.5193	0.5143
OWN	Proportion of Stock Owned by Insiders	0.0275	0.0581
DIV	Dividends/Operating Income	0.1514	1.3373
OWNDV	Binary Variable Identifying Observations with No Insider Ownership	0.1735	
DIVDV	Binary Variable Identifying Observations that Did Not Pay Dividends	0.767	
NODIVOWN	Binary Variable Identifying Observations with No Insider Ownership and Did Not Pay Dividends	0.1308	
DIVOWN	The Complement of NODIVOWN: Binary Variable Identifying Observations with Insider Ownership or Did Pay Dividends	0.8692	
ENTRENCH	Binary Variable Identifying Observations with 5 Percent or More Insider Ownership	0.1431	
POSDIVDV	Binary Variable Identifying Observations that Paid Dividends on Positive Operating Income	0.228	
ENTDIVDV	Binary Variable Identifying Observations with 5 Percent or More Insider Ownership and that Paid Dividends on Positive Operating Income	0.0432	
CF	(Net Income + Depreciation)/Total Assets	0.0358	0.1499
CR	Current Assets/Current Liabilities	1.5702	1.3796
PRO	Net Income/Net Sales	-0.0166	0.4987
SIZE	Natural Logarithm of the Market Value of Equity	21.4594	0.8196
DV99	Binary Variable Identifying Observations Collected in 1999	0.1247	
DV00	Binary Variable Identifying Observations Collected in 2000	0.1255	
DV01	Binary Variable Identifying Observations Collected in 2001	0.1253	
DV02	Binary Variable Identifying Observations Collected in 2002	0.1253	
DV03	Binary Variable Identifying Observations Collected in 2003	0.1253	
DV04	Binary Variable Identifying Observations Collected in 2004	0.1253	
DV05	Binary Variable Identifying Observations Collected in 2005	0.125	
DV06	Binary Variable Identifying Observations Collected in 2006	0.1237	
Number of Observations		3816	

firms and 3,816 observations

Table 1 contains descriptive statistics for each of the variables identified previously. The typical firm's debt load is 51.93 percent of its assets. As noted by the standard deviation for the LEV variable, there is a considerable amount of variation in this variable. The mean level of insider ownership in the sample is 2.75 percent, which is slightly lower than the literature suggests is necessary for managerial entrenchment (Florackis & Ozkan, 2009). Of these firms, 17.35 percent do not have any insider ownership (OWNDV) while 14.31 percent have 5 or more percent of equity owned by insiders (ENTRENCH). At the mean, the firms in the sample pay 15.14 cents for each dollar of operating income earned. The very large standard deviation for this variable also suggests that tremendous variation exists in dividend policies across firms. For example, 76.70 percent of firms in the sample pay no dividends (DIVDV) while 22.80 percent of firms paydividends in excess of 5 percent of positive operating income (POSDIVDV). We note in passing that a small portion of firms actually pay dividends while earning negative operating income. Approximately 13.08 percent of firms neither allow insider ownership nor pay dividends (NODIVOWN) while 4.32 percent of firms allow managerial entrenchment and also paydividends on positive operating income (ENTDIVDV). At the mean, firm cash flow (CF) is 3.58 percent of total assets while the mean value for the current ratio (CR) is 1.57. The ratio of net income to net sales is -0.0166, andits standard deviation is 0.4987. Thus, while some firms in this sample are highly profitable, other firms sustain very large losses in a given year.

IV. Empirical Results

Table 2 contains our primary agency cost equations. Consistent with the empirical methodology, all of the eligible regressors presented in Table 1ーexcept one time-oriented

Table 2: Incidental Truncation Regressions for Firms with No Entrenchment or Dividend Payments

Dependent Variables:	NODIVOWN Binary Selection Equation					DIVOWN Binary Selection Equation				
Regressor	Coefficient Estimate	Standard Error	T-Statistic	Prob.		Coefficien Estimate	Standard Error	T-Statistic	Prob.	
Binary Selection Equation										
Intercept	4.5996	0.8013	5.7400	<0.0001	**	-0.7232	0.4683	-1.5400	0.1226	
CF	-0.1416	0.1904	-0.7400	0.4571		-1.6083	0.1908	-8.4300	<0.0001	**
CR	-0.0290	0.0232	-1.2500	0.2109		0.0769	0.0247	3.1100	0.0018	**
PRO	-0.1155	0.0725	-1.5900	0.1110		0.1131	0.0536	2.1100	0.0350	**
SIZE	-0.2780	0.0374	-7.4300	<0.0001	**	0.0575	0.0218	2.6300	0.0085	**
DV00	0.0029	0.1279	0.0200	0.9818		-0.0124	0.0972	-0.1300	0.8989	
DV01	0.1296	0.1198	1.0800	0.2795		-0.1285	0.0904	-1.4200	0.1550	
DV02	0.3058	0.1136	2.6900	0.0071	**	-0.1185	0.0874	-1.3600	0.1753	
DV03	0.2781	0.1132	2.4600	0.0140	**	-0.1020	0.0865	-1.1800	0.2383	
DV04	0.2612	0.1133	2.3100	0.0211	**	-0.0117	0.0874	-0.1300	0.8937	
DV05	0.2137	0.1147	1.8600	0.0624	*	0.0117	0.0882	0.1300	0.8947	
DV06	0.6186	0.1092	5.6600	<0.0001	**	-0.1079	0.0870	-1.2400	0.2148	
LEV Equation										
Intercept	1.1092	0.1591	6.9700	<0.0001	**	0.6073	0.0250	24.2500	<0.0001	**
CF	0.0529	0.1021	0.5200	0.6046		-1.5016	0.0767	-19.5800	<0.0001	**
CR	-0.1361	0.0211	-6.4400	<0.0001	**	-0.0747	0.0058	-12.9700	<0.0001	**
PRO	-0.3121	0.0325	-9.6100	<0.0001	**	0.0825	0.0217	3.8000	0.0001	**
DV00	-0.0729	0.1043	-0.7000	0.4843		0.0081	0.0310	0.2600	0.7944	
DV01	-0.1495	0.0945	-1.5800	0.1136		-0.0218	0.0311	-0.7000	0.4844	
DV02	-0.1754	0.0892	-1.9700	0.0492	**	-0.0256	0.0313	-0.8200	0.4148	
DV03	-0.1186	0.0898	-1.3200	0.1863		0.0102	0.0314	0.3200	0.7453	
DV04	-0.1516	0.0900	-1.6800	0.0921	*	0.0283	0.0315	0.9000	0.3694	
DV05	-0.0874	0.0906	-0.9600	0.3347		0.0257	0.0317	0.8100	0.4172	
DV06	-0.0433	0.0917	-0.4700	0.6369		-0.0062	0.0319	-0.1900	0.8471	
Rho (Sample Selection Effect)	-0.4242	0.1581	-2.6800	0.0073	**	0.9926	0.0015	682.8400	<0.0001	**
Sigma (Estimated Standard Deviation of the Regression Error Term)	0.4326	0.0304	14.2400	<0.0001	**	0.4730	0.0060	78.2200	<0.0001	**
Log-Likelihood Function			-1645.0000					-2737.0000		
Restricted Log-Likelihood Function (Second Step Regressors are Jointly Insignificant)			-1729.0000					-3086.0000		
Chi-Square Statistic (10 Degrees of Freedom)			168.0000	<0.0001	**			698.0000	<0.0001	**
Total Number of Observations			3816					3816		
Number of Observations in Selection Group			499					3317		

** indicates statistical significance at a 5% level of significance or better
* indicates statistical significance at a 10% level of significance or better

Note: Maximum likelihood estimates do not provide individual equation diagnostics.

dummy variable which is omitted to prevent perfect multicollinearity—are included inthe probit equations while the CF, CR, and PRO time indicators and sample selection variables are included in the LEV equation. The latter is consistent with prior studies in the literature (Kim, Rhim, & Friesner, 2007).

We first consider the group of firms that have no insider ownership and do not pay dividends. In the probit equation for NODIVOWN, we see that several factors significantly predict the likelihood of identifying these types of firms. Larger firms are less likely to fall into this category,presumably because larger firms are also more likely to allow insider ownership. Time, especially the years 2002 through 2006, provides positive and significant predictors of these types of firms. We note in passing that these dummy variables are interpreted relative to the omitted year 1999. The year 1999 is important as it is one of the last years in which firms in China are directly and substantially impacted by the Asian currency crisis. Thus, the positive and significant coefficient estimates suggest that the firms which survived the crisis did so because they had less managerial entrenchment and therefore retained earnings rather than distributing them as dividends.

The second estimated equation predicts firm leverage (LEV) conditional upon being a firm that does not pay dividends or allow insider ownership. First, note that the sample selection effect (Rho) is negative and significant at the 5 percent level. This implies that firms which do not

Table 3: Incidental Truncation Regressions for Firms with Entrenchment and Dividend Payments on Positive Operating Income

Dependent Variables:	ENTDIVDV Binary Selection Equation				ENTRENCH Binary Selection Equation				POSDIVDV Binary Selection Equation			
	Coefficient	Standard			Coefficient	Standard			Coefficien	Standard		
Regressor	Estimate	Error	T-Statistic	Prob.	Estimate	Error	T-Statistic	Prob.	Estimate	Error	T-Statistic	Prob.
Binary Selection Equation												
Intercept	0.5270	1.0081	0.5200	0.6011	0.7737	0.6152	1.2600	0.2085	-1.9216	0.6865	-2.8000	0.0051 **
CF	5.3908	0.9025	5.9700	<0.0001 **	1.6976	0.5232	3.2400	0.0012 **	9.5503	0.6783	14.0800	<.0001 **
CR	-0.0114	0.0310	-0.3700	0.7120	0.1395	0.0179	7.8000	<0.0001 **	0.0313	0.0173	1.8100	0.0704 *
PRO	0.1782	0.1609	1.1100	0.2680	-0.0444	0.0951	-0.4700	0.6408	0.1370	0.1402	0.9800	0.3285
SIZE	-0.1192	0.0473	-2.5200	0.0117 **	-0.0872	0.0288	-3.0200	0.0025 **	0.0129	0.0323	0.4000	0.6903
DV00	0.4168	0.1287	3.2400	0.0012 **	-0.0635	0.0908	-0.7000	0.4847	0.6381	0.0916	6.9700	<.0001 **
DV01	0.2998	0.1343	2.2300	0.0256 **	-0.2426	0.0948	-2.5600	0.0105 **	0.6562	0.0931	7.0500	<.0001 **
DV02	0.0069	0.1466	0.0500	0.9625	-0.3406	0.0972	-3.5100	0.0005 **	0.4054	0.0951	4.2600	<.0001 **
DV03	-0.2235	0.1595	-1.4000	0.1610	-0.4916	0.1008	-4.8800	<0.0001 **	0.2699	0.0962	2.8100	0.0050 **
DV04	-0.1643	0.1544	-1.0600	0.2872	-0.4974	0.1018	-4.8900	<0.0001 **	0.3808	0.0960	3.9700	<.0001 **
DV05	-0.1519	0.1581	-0.9600	0.3367	-0.4710	0.1022	-4.6100	<0.0001 **	0.2672	0.1006	2.6500	0.0079 **
DV06	-1.4286	0.4299	-3.3200	0.0009 **	-0.3407	0.0981	-3.4700	0.0005 **	-2.1230	0.3448	-6.1600	<.0001 **
LEV Equation												
Intercept	0.1628	0.0872	1.8700	0.0619 *	0.1815	0.0325	5.5800	<0.0001 **	0.4049	0.0296	13.6800	<.0001 **
CF	0.0503	0.3602	0.1400	0.8890	-0.4466	0.1686	-2.6500	0.0081 **	0.3304	0.1666	1.9800	0.0473 **
CR	-0.0874	0.0116	-7.5100	<0.0001 **	-0.0335	0.0041	-8.1800	<0.0001 **	-0.0933	0.0040	-23.0900	<.0001 **
PRO	-0.3982	0.1317	-3.0200	0.0025 **	-0.0532	0.0304	-1.7500	0.0798 *	-0.1968	0.0583	-3.3800	0.0007 **
DV00	0.0752	0.0363	2.0700	0.0382 **	-0.0221	0.0250	-0.8800	0.3770	0.0457	0.0169	2.7000	0.0069 **
DV01	0.0189	0.0379	0.5000	0.6181	-0.0559	0.0272	-2.0500	0.0399 **	0.0319	0.0175	1.8300	0.0680 *
DV02	-0.0073	0.0415	-0.1800	0.8600	-0.0515	0.0287	-1.7900	0.0729 *	0.0173	0.0176	0.9800	0.3254
DV03	-0.0784	0.0462	-1.7000	0.0895 *	-0.0658	0.0313	-2.1100	0.0353 **	0.0058	0.0179	0.3200	0.7463
DV04	-0.0515	0.0440	-1.1700	0.2426 *	-0.0565	0.0316	-1.7900	0.0738 *	0.0255	0.0177	1.4400	0.1497
DV05	-0.0187	0.0461	-0.4100	0.6840	-0.0345	0.0311	-1.1100	0.2676	0.0274	0.0187	1.4600	0.1434
DV06	-0.1976	0.1258	-1.5700	0.1162	-0.0013	0.0296	-0.0500	0.9638	-0.1321	0.0784	-1.6900	0.0919 *
Rho (Sample Selection Effect)	0.9669	0.0164	58.7900	<0.0001 **	0.9642	0.0115	83.9300	<0.0001 **	0.8733	0.0312	27.9900	<.0001 **
Sigma (Estimated Standard Deviation of the Regression Error Term)	0.2307	0.0265	8.6900	<0.0001 **	0.2590	0.0160	16.1700	<0.0001 **	0.1573	0.0086	18.2900	<.0001 **
Log-Likelihood Function			-465.7931				-1132.0000				-947.6479	
Restricted Log-Likelihood Function (Second Step Regressors are Jointly Insignificant)			-506.7544				-1172.0000				-1189.0000	
Chi-Square Statistic (10 Degrees of Freedom)			81.9226	<0.0001 **			80.0000	<0.0001 **			482.7042	<.0001 **
Total Number of Observations			3816				3816				3816	
Number of Observations in Selection Group			165				546				870	

** indicates statistical significance at a 5% level of significance or better
* indicates statistical significance at a 10% level of significance or better

Note: Maximum likelihood estimates do not provide individual equation diagnostics.

pay dividends or have insider ownership also have less leverage. Not surprisingly, this finding supports the convergence of interest theory in these firms. Consistent with the pecking order theory of Myers and Majluf (1984),we also find a negative and significant relationship between profitability (PRO) and leverage (estimate: -0.3121; prob.: <0.0001) as well as between the current ratio (CR) and leverage (estimate: -0.1361; prob.: <0.0001). Lastly, at the 5 percent level, we find that firms operating in 2002 are associated with significantly less leverage than in 1999 (estimate: -0.1754; prob.: 0.0492).

The final columns in Table 2 provide estimates assessing those firms that do allow insider ownership and/or do pay dividends (DIVOWN). This set of results represents an analysis as the complement to the NODIVOWN model discussed previously. The results are quite different for this group of firms. Once again, we consider the probit equation that predicts DIVOWN. None of the time-based binary variables are statistically significant. The SIZE variable, which was negative and significant in the previous regression, is now positive and significantly different from zero (estimate: 0.0575; prob.: 0.0085). Thus, larger firms (conditional upon being in the DIVOWN group)are more likely to allow insider ownership, pay positive dividends, or do both. The coefficient estimates for profitability (PRO) (estimate: 0.1131; prob.: 0.0350) and the current ratio (CR) (estimate: 0.0769; prob.: 0.0018) are both positive and statistically significant. However, the coefficient estimate for cash flow (CF) (estimate: -1.6083; prob.: <0.0001) is negative and significant. Taken cumulatively, these results imply that firms with cash flow problems are less likely to pay dividends or to reward managers with insider ownership. However, controlling for cash flow, if a firm has greater profitability and/or greater liquid assets, it is more likely to allow insider ownership and/or to pay dividends ostensibly toalleviate agency costs.

The remainder of the results provides estimates for the LEV equation conditional upon being in the DIVOWN category of firms. The coefficient estimate for the sample selection effect (Rho) is positive and significant at the 5 percent level. This implies that firms which do pay dividends and/or have insider ownership also have greater leverage. Not surprisingly, this finding also supports the existence of entrenchment theory in these firms. The LEV equation results find a positive and significant relationship between profitability (PRO) and leverage (estimate: 0.0825; prob.: 0.0001). However, the estimated relationship between the current ratio (CR) and leverage (estimate: -0.0747; prob.: <0.0001) and between cash flow and leverage (estimate: -1.5016; prob.: <0.0001) are both negative. While the estimates for CR and CF are both of the expected sign and support the pecking order theory, the sign of the coefficient estimate for profitability (PRO) is not of the expected sign. However, itis important to note that the PRO variable not only exhibits substantial variation (see Table 1) but also includes firms whose profit may be negative. In such situations, the traditional interpretation of the PRO coefficient estimate as it relates to pecking order theory may not be applicable. If profit is negative, there is no cash available to use in place of leverage. However, holding profit constant and thus controlling for situations where profit is negative, an increase in cash flow and other types of liquidity may allow for less leverage, which can be interpreted in a traditional context and is consistent with pecking order theory.

Table 3provides a similar analysis but disaggregates the firms based on whether they show significant insider ownership (ENTRENCH), they pay dividends on positive operating income (POSDIVDV), or they do both (ENTDIVDV). First, we consider the ENTDIVDV analysis. In the binary probit equation, firms operating in 2006 are significantly less likely than firms operating in 1999 (estimate: -1.4286; prob.: 0.0009) to fall into this category of experiencing entrenchment or paying dividends on positive income. However, firms operating in 2000 and 2001 are significantly more likely than in 1999 to either pay dividends or allow greater insider ownership. Given that the Asian currency crises dramatically affectedthe profitability of firms in the sample, we attribute the latter estimates primarily to improving economic conditions, which encourage firm profitability and the incentive to pay dividends. The coefficient for firm size (estimate: -0.1192; prob.: 0.0117) is negative and statistically significant indicating that smaller firms are more likely to allow either a greater risk for entrenchment or to pay dividends on positive income. Lastly, the coefficient estimate for cash flow is positive and statistically significant indicating that firms with greater cash flows are more likely to either pay dividends or award greater managerial ownership in the company.

The second component of this analysis examines the impact of firm membership in the ENTDIVDV group on firm leverage. The coefficient estimate for Rho is positive and significant (estimate: 0.9669; prob.: <0.0001) indicating that entrenchment theory holds. Firms in this group that operated in 2000 held significantly more leverage than firms in 1999 (estimate: 0.0752 prob.: 0.0382). Lastly, the estimated relationship between profitability (PRO) and leverage (estimate: -0.3982; prob.: 0.0025) as well as between the current ratio (CR) and leverage (estimate:

-0.0874; prob.: <0.0001) is negative, which supports the pecking order theory.

Next, we consider the analysis of only those firms which have the potential of becoming entrenched. In the probit equation, we see that each of the time-related binary variables between 2001 and 2006 exhibit negative and statistically significant coefficient estimates. This implies that in each of these time periods, the likelihood of entrenchment is substantially diminished relative to 1999 (the omitted category). Additionally, larger firms, as measured by the SIZE variable, are less likely to be classified as entrenched (estimate: -0.0872; prob.: 0.0025). However, firms with greater cash flow (estimate: 1.6976 prob.: 0.0012) and higher current ratios (estimate: 0.1395 prob.: <0.0001) are more likely to have internal ownership shares of 5 percent or more, which raises the possibility of managerial entrenchment.

In the LEV equation, the coefficient estimate for Rho is once again positive and significant indicating that entrenchment theory is, indeed, applicable to these firms. The coefficient estimates for the years 2001 and 2003 are negative and statistically significant at the 5 percent level indicating that firms used less leverage in these years. Lastly, the estimated relationship between the current ratio (CR) and leverage (estimate: -0.0335; prob.: <0.0001) and between cash flow (CF) and leverage (estimate: -0.4466; prob.: 0.0081) are both negative, which supports the pecking order theory.

The final set of results in Table 3 examines agency costs conditional on those firms thatpay dividends on positive operating income (POSDIVDV). The results are strikingly different from those in the entrenchment analysis. In the binary probit equation, for example, each time-oriented dummy variable's coefficient estimate is positive and statistically significant at the 5 percent level. This implies that, holding the other regressors constant, firms were much more likely to pay dividends on positive income after 1999. Additionally, the coefficient estimate for cash flow is positive and significant (estimate: 9.5503; prob.: <0.0001), which indicates that firms with greater positive cash flow were more likely to pay dividends in an effort to reduce excess liquidity, which managers might spend inappropriately.

In the LEV equation, the coefficient estimate for Rho is positive and significant (estimate: 0.8733; prob.: <0.0001) indicating that entrenchment theory is appropriate. Hence, firms are paying dividends and using leverage as a means to reduce the amount of cash that is available to managers. Moreover, the coefficient estimate for CF (estimate: 0.3304; prob.: 0.0473) suggests that the larger the cash flow, the more these firms (that also pay dividends) use leverage to reduce these flows. The estimates for the current ratio (estimate: -0.0933; prob.: <0.0001) and profitability (estimate: -0.1968; prob.: 0.0007) are both negative, which supports the pecking order theory.

V. Discussion and Conclusions

In this manuscript, a new method of estimating agency cost equations is proposed to estimate these costs in situations where legal, ethical,or firm policies restrict or prohibit a firm from allowing insider ownership and/or paying dividends. Like much of the existing literature, we find evidence that different sources of agency costs, namely the convergence of interests theory and entrenchment theory, exist simultaneously within a sample of firms in a given economy. However, we also find that the mix of incentives can be disaggregated across firms if one allows the empirical agency cost function to account for discrete firm decisions. In our analysis of Chinese firms, we find evidence that the convergence of interests theory holds when firms do not offer dividends or allow insider ownership. Entrenchment theory holds when firms do pay dividends and/or allow insider ownership. Thus, rather than aggregating firms and allowing the results to average out or eliminating firms from the data set if they do not pay dividends or allow insider ownership or rather than postulating a non-linear cost function to capture these incentives, one can gain more accurate and precise empirical insights if these discrete incentives are explicitly accounted for in the specification of the agency cost function.

A second consideration of the analysis are issues related to agency costs such as the pecking order theory. We find evidence in support of the pecking order theory, particularly among firms that have positive cashflow to spend on major purchases. Thus, the ability to control for incidental truncation in a sample of firms when incidental truncation is an issue can provide additional, cleaner insights into the formation of management's financial decisions.

While our study provides an interesting methodological advance and an interesting application of that methodology, it is not without its drawbacks. Perhaps most importantly, our methodology will provide better empirical estimates only when incidental truncation exists in the model. Thus, the methodology is much more appropriately applied in international settings where firms are much more likely to fail to pay dividends or fail to allow insider ownership. When the vast majority of firms do pay dividends and do allow insider ownership,as is the case in most publicly traded corporations in the U.S., the use of an incidental truncation will provide no additional advantages over traditional methods of estimating agency cost functions. We note in passing, however, that such approaches are very useful in industry-specific agency cost studies where there is a mix of firms. In many industries in the U.S. (for example, in the health care industry), there is often mixed competition where publicly traded companies compete with non-profit firms. Clearly, the former will pay dividends and allow insider ownership while the latter will not. Adopting our methodology to allow incidental truncation along the lines of profit status will allow for an examination of agency costs that can directly compare for-profit and non-profit firms in a single agency cost model (and without having to completely separate the for-profit and noon-profit firms into separate samples).

Another possible limitation of the empirical analysis is the selection of the sample. This manuscript uses a panel of Chinese firms operating between 1999 and 2006. This panel is interesting to study, particularly given the fact that the existence and magnitude of agency costs appear to vary over time. For example, the results in Table 3 suggest that firms are much more likely to exhibit lower levels of leverage after 1999 and also exhibit significantly lower likelihoods of managerial entrenchment after 1999. This implies that Chinese firms that survived the Asian currency crisis of the late 1990s did so by altering their behavior in a manner that reduces the likelihood of specific types of agency costs. However, the fact that the formation of agency costs evolve over time also suggests that the results of this analysis may not be generalizable to very different time periods within the Chinese economy or to firms located in different countries.

A third major limitation of the manuscript is that beyond the point of incidental truncation, the specification of the agency cost function is linear in parameters. Indeed, in certain industries it is possible that an agency cost function exhibits both incidental truncation and non-linearity. In such cases, future research is necessary to extend this methodology to account for these additional, more nuanced aspects of agency costs.

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