Characteristics of S&P 500 Companies with Captive Insurance Subsidiaries

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Abstract

This study examines the overall characteristics of large-cap Standard & Poor's (S&P) 500 companies that own captive insurance subsidiaries to manage and fund their retained risks. Understanding why firms choose risk retention over risk transfer is important because it offers an example of how firms make choices for risk management strategies. Using a panel data set from 2000 to 2016, the logistic regression results provide evidence that larger firms are more likely to form a captive insurance company as an alternative method of risk financing. Of relevance to the use of captives is the finding that firms with captives maintain lower cash reserves than their counterparts. This partly reveals the strategic use of capital by the parent company that allocates a portion of internal funds to its captive insurer for operation and coverage. Finally, nonfinancial companies with smaller proportions of intangible assets and capital expenditures are associated with captive utilization. The use of captives is related to the New York Stock Exchange (NYSE)-listed status, particularly for firms that formed captives before 2000.

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1. Introduction

In the face of diverse loss exposures, corporations must choose a risk-financing technique to pay for losses. The most intuitive, mainstream solution is to purchase commercial insurance as a risk transfer technique. This is the essential tool through which a firm transfers the financial responsibility of loss payments to insurance companies by paying upfront premiums. Towards the other end of the risk-financing spectrum is a captive. A captive is an insurance company owned by a parent company or group of parent companies to insure the risks of its owner(s). The momentum of using captives as a means of risk retention has been growing (Cole and McCullough, 2008).

A captive offers several benefits: 1) improved coverage; 2) access to reinsurance markets; 3) potential for a profit center; and 4) lower costs (Culp, 2006; Rejda and McNamara, 2017). The use of a captive can also increase the efficiency of insurance (*Colaizzo, 2009;* Holzheu et al., 2003). It can be cost-efficient because the parent company avoids paying an insurer for profit, overhead, state premium taxes and other charges. The parent also exercises more control over all aspects of the risk-financing program. In addition, captives help the parent mitigate market inefficiencies related to moral hazard and adverse selection. In short, the parent company retains the cost of coverage through its own insurance subsidiary instead of paying premiums to a third-party insurer for commercial insurance.

The objective of this study is to examine the overall characteristics of companies that establish a captive. According to a captive report by Marsh (2017), increasing captive formations in the past few decades reflects a long-term trend that corporations are more sophisticated and proactive in their risk management strategies. Captives help parent companies better manage a growing range of both conventional and emerging risks, such as cyber risk. Along with Hall (2012), the Marsh report indicates that the majority of Fortune 500 companies, including privately and publicly held entities, have captive subsidiaries. Captives also provide companies with tremendous flexibility in terms of how they structure risk-financing options and manage retained loss exposures. Therefore, there should be observable differences in companies that use captives relative to those that transfer risk to third-parties by insuring their risks.

Most existing studies on captive insurance focus on the tax deductibility of premiums paid to captive insurers (Cross et al., 1988; Han and Lai, 1991; Hofflander and Nye, 1984; Lai and McNamara, 2004; Lai and Witt, 1995; Smith, 1986). For instance, Scordis and Porat (1998) attributed the growth of captive insurance subsidiaries to income tax savings. This favorable tax treatment may be the main reason for captive utilization in the 1980s and 1990s. However, recent professional reports do not document tax benefits as a key incentive for captive utilization nowadays. The report by Marsh (2017) showed more than half of the captives under its management do not take a U.S. tax position. According to the Captive Insurance Companies Association's (CICA) study (2016), the benefit of income taxation is not

considered one of the eight values that captives can create for firms.[1] In addition, a research report by Willis Towers Watson (2017) highlighted that captives are now an established part of the employee benefits landscape for multinational companies.[2] The extant literature falls short of explanations for the use of captive structures in practice since 2000. However, it opens an area of research for this study to explore the factors of corporate decision-making in recent captive usage.

The empirical analysis starts with a comparison of firms with and without captive arrangements in a univariate setting. On average, firms with captives are larger in size. They are more likely to pay dividends and be listed on the NYSE when compared to companies that do not use captives. On the other hand, firms with captives spend less in capital expenditures, possess less in intangible assets, have lower revenue growth, hold less in cash reserves and have lower market-to-book ratios than those without captives.

The logistic regression analysis is estimated in the multivariate condition with the full sample and a survival data set. The findings further confirm that larger firms are more likely to own captive insurers. Firms with captives also tend to have lower cash holdings. The implications suggest that the use of captives is significantly related to lower levels of the most liquid assets in the parent companies.

This study adds to the literature on the characteristics associated with a firm's decision to use a captive by providing evidence of the characteristics of large-cap U.S. companies that choose to establish captives. The results of this work complement studies concerned with tax regulations by explaining the rationale behind a firm's risk-financing choice between a traditional risk transfer technique and an alternative risk transfer (or a captive insurance structure). Understanding why firms form captives as risk-financing tools presents an important example of how firms make choices in risk management strategies that reflect their managers' risk appetite.

The remainder of this paper proceeds in the following manner. Section II presents a brief review of the literature and the empirical evidence. Section III describes the data, sample and methods used for analysis. Section IV provides statistical results based on the univariate and multivariate analysis. Section V concludes this paper and suggests avenues for future research.

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1. As noted in the 2016 CICA study, "Values created by captives (from highest to lowest) are: (1) plug holes in insurance program; (2) recapture insurance premiums; (3) unique coverage solutions; (4) access reinsurance market; (5) fund retention/centralize buying; (6) build cash reserves; (7) fund safety/risk control programs; and (8) fund risk transfer pricing."

2. This report is based on data submitted by 203 multinational companies operating multinational pools and/or benefit captive programs. The number of employee benefit captives has doubled in the last five years. There are now approximately 85 (i.e., 42% of the participating companies). Using captives for employee benefits was not permitted before 2000. According to Lai and McNamara (2004), Columbia Energy Group is the first U.S.-based company to be granted by the U.S. Department of Labor (DOL) in 2000 to use its captive insurance subsidiary for the coverage of its long-term disability income risk. The year 2000 can be viewed as a regulatory turning point in the history of captive formations.

2. Literature Review

Risk financing is concerned with the payment of losses via risk transfer and/or risk retention techniques. Companies may prefer to reduce cost certainty for their loss exposures by purchasing insurance policies because premiums are paid in advance of losses. On the other hand, some companies may prefer to handle loss exposures through forming captives, which can be more cost-efficient. Deciding which technique should be used is an indispensable subject of risk management for all managers with varying levels of risk preference.

Risk management can create shareholder value when the benefits outweigh the costs. For example, by lowering the cash-flow volatility, risk management can reduce the expected cost of financial distress (Mayers and Smith, 1982; Smith and Stulz, 1985). It can also reduce expected taxes due to the convex tax structure (*Dionne and Garand, 2003;* Graham and Smith, 1999; Mayers and Smith, 1982; Smith and Stulz, 1985). Alternatively, risk management can increase firm value via increased debt capacity (Graham and Rogers, 2002; Leland, 1998). It can also relieve the problem of underinvestment when external cost of financing is more expensive than internal cash flows and when investment opportunity is inversely related to cash flows (Froot et al., 1993).

Risk management decisions can be affected by managerial motives and attitude toward risk. Nocco and Stulz (2006) suggested that a firm should implement its risk management based on its risk appetite to reach the organizational benefits between risk and return. Managers may take on risk management activities if their wealth is concentrated in their firm's equity, thus reducing the volatility of the firm's value and personal wealth (Smith and Stulz, 1985; Stulz, 1984).

Nevertheless, using captives for retained risks comes at a price. Perhaps the most complicated self-funding mechanism, captives tie up the parents' internal funds. Companies risk the capital required to form a captive instead of simply paying commercial insurance premiums in exchange for coverage promised by third-party carriers. Furthermore, parent companies are engaged in both their core business and insurance operation. The potential benefits relative to traditional commercial insurance should be substantial enough to justify the outlays of operating a captive insurance subsidiary.

The key value driver for forming captives is to fund corporate retained risks. With a captive insurance subsidiary, companies have a great deal of latitude to adjust risk retention strategies in response to changing market environments. According to the CICA, "Captives create value in the following ways: 1) plug holes in the insurance program; 2) recapture insurance premiums; and 3) provide unique coverage solutions." As a result, firms with captives should be characterized by features that distinguish them from their counterparts because of divergent strategies in capital allocation.

3. Data, Sample, Method

This empirical study is intended to test whether some characteristics are linked to captive utilization using financial data from COMPUSTAT for companies that comprise the S&P 500 index. The initial data set included annual observations for all S&P 500 firms in COMPUSTAT from 2000 to 2016. Those with missing data on basic accounting variables and stock prices that are used to calculate market-based measures were removed. This left 7,780 observations. Finally, following Laeven and Levine (2007), extreme outliers were excluded by eliminating observations where the basic accounting variables were more than four standard deviations from the sample mean. The final panel data set contained 7,513 firm-year observations for large-cap S&P 500 companies from 2000 to 2016.

The information on whether firms have captive insurance subsidiaries is obtained from the Captive Insurance Database (CID) managed by Captive Review.[3] This database contains details on captive parents, date licensed and captive type. Table 1 presents the distribution of all captives formed by S&P 500 companies by year and by type. This sample includes five captives structured in the form of either group or special purpose vehicle (SPV) ownership. A group captive is an insurer owned by a group of companies and used to insure the risks of its member companies. SPVs are captives created for reinsurance, securitization or reserve financing. Pure captives are the dominant type of ownership; more than half were formed before 2000. The growth of captives has been steady.[4] This observation is in line with the 2007 Aon report that the growth in the number of captives formed by Global 1500 firms (i.e., firms with revenues of at least $4 billion) has been constant despite changes in underwriting cycles.

The analytical method of this work employs a logistic regression model to explore the relationship between captive utilization and firm characteristics. The specification of the regression model is formulated as follows:

Captive$_{it}$ = f (Operating Characteristics, Financial Characteristics, Market Characteristics, Control Variables)$_{it}$ + ε$_{it}$

where a captive insurance subsidiary dummy (*Captive*) is the binary dependent variable that takes the value of one if a firm has a captive insurance subsidiary in a year and zero otherwise. Thus, it is equal to one for firm-years starting with the year that a firm creates a captive insurer. It is equal to zero in all prior firm-years. The explanatory variables, hypothesized to be indicators of a firm's choice to have a captive insurance subsidiary and discussed thereafter, are classified into operating, financial and market characteristics.

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3. Special thanks to Courtney W. Claflin, executive director of Captive Programs at the University of California, who guided the author to locate this database on May 2, 2018.

4. According to Table 1, 83 out of 170 pure captives (i.e., 49%) are licensed after 2000 in comparison with 87 pure captives (i.e., 51%) licensed before 2000.

Table 1:
Captives Licensed by Year and by Type

Year \ Type	Pure[a]	Group/Cell[b]	SPV[c]	NA[d]	Dormant[e]
1967–1974[f]	11	0	0	1	0
1975–1979	13	0	0	0	1
1980–1984	9	0	0	0	0
1985–1989	12	2	0	0	1
1990–1994	18	0	0	2	0
1995–1999	24	0	0	5	0
2000–2004	48	0	0	3	1
2005–2009	23	0	2	2	0
2010–2016	12	0	1	0	0
Total	170	2	3	13	3

Throughout this study, a captive is referred to as any captive insurance company in the types of pure, group/cell, special purpose vehicle (SPV) and unknown (NA) ownership. [a]A pure captive is an insurance company owned by one parent company and formed to insure the risks of its parent. [b]A group captive is an insurance company owned by a group of parent companies and formed to insure the risks of its parents. A cell captive is an insurer in which one or more sponsors segregate each participant's liability through protected cells or separate accounts where those assets are not subject to the liabilities of the other cells. [c]SPVs refer to captives created particularly for reinsurance, securitization or reserve financing purposes. [d]NA represents captives with missing data on the type of ownership. [e]As of Feb. 10, 2018, three captives are dormant. Captives in dormant status can buy insurance from the traditional market but return to the captive when the market fluctuates. Firms with a dormant captive are not treated as firms with a captive insurance company. [f]1967 is the earliest year in which a captive insurance subsidiary was formed by Ford Motor Co. (a Standard & Poor's [S&P] 500 company in the sample).

Operating Characteristics

Size

Firm size is an important factor for risk retention (Chang, 2008; Chang, 2013a, b; Chang and Weiss, 2011; Chang et al., 2018; Feldman, 2012). Larger corporations are more capable of putting aside capital to form a captive and experiencing the cost-effectiveness of scale economy. The proxy is the natural logarithm of the book value of assets. The sign of this variable should be positive.

Capex

Capital expenditures are indicative of how firms invest capital for future investment opportunities. The proxy used is the ratio of capital expenditures to total assets. The expected sign for this variable is negative because a firm with a higher ratio may be less likely to establish a captive due to the constraint on its financial resources.

Opacity

A firm's asset structure may affect its risk-financing decisions. According to Pagach and Warr (2011), assets that are opaquer are more difficult to liquidate at the time of financial distress. Opacity, which is used as a measure of tangibility of

corporate assets, is calculated as the ratio of intangible assets to the book value of total assets. It is expected to have a negative coefficient because a firm with more intangible assets should be less likely to retain its risks.

Sales Growth

Firms with higher growth rates may focus most of their operating attention on generating revenues. Thus, captives may be favored by firms with stable growth rates. This measure is the percentage growth in annual sales from the prior year to the current year. The coefficient is expected to be negative.

Financial Characteristics

Cash

The level of a firm's cash holdings is associated with the use of a captive finance subsidiary among U.S. industrial firms (Bodnaruk et al., 2016). Thus, the ratio measures the amount of cash and cash equivalents that the firm has on hand. It is computed by cash and marketable securities divided by total assets. A negative sign of this variable is expected because companies must use some of their internal funds to operate their captives.

Dividend

Firms are more likely to have the capital to form a captive by keeping internal funds without paying out as dividends. A dividend dummy equals one if the firm pays dividends on common equity in that year. The sign of this variable is expected to be negative.

Leverage

A firm's capital structure may affect its decision to own a captive. Highly levered firms are more likely to suffer from financial distress than lowly levered ones. Thus, captives may be out of favor by firms with greater leverage that would rather transfer risks than retain on their own. A leverage variable, defined as the book value of long-term debt over the market value of common equity, is expected to have a negative sign.

Profitability

Profitable firms are more likely to generate cash flows available for the establishment of a captive insurer. The return on assets (ROA) is used as a proxy, calculated as the ratio of net income to total assets. A positive coefficient is expected on this variable.

Market Characteristics

Market-to-Book (MB)

A higher MB ratio suggests that the firm has been more effective at investing and added value for shareholders. Cross et al. (1986) asserted that the stock price of a parent company reacts positively when a captive is formed. Thus, a positive sign is expected for this variable.

Price-to-Earnings (PE)

A firm with a higher PE ratio shows greater confidence among investors. However, it remains to be observed whether a higher ratio is associated with the use of captives. Therefore, no priors are expected on the sign of this variable.

NYSE

Firms listed on the NYSE are well-established and financially strong. This dummy variable takes the value of one if a firm is listed on the NYSE and zero otherwise. This variable is expected to have a positive sign.

Control Variables

Age

A firm with a lengthy business history is more experienced with handling its commercial risks. Therefore, it is more likely to set up a captive as a risk retention tool. Following Kieschnick and Moussawi (2018), the authors used the length of time that a firm has been a public firm as a proxy for firm age. This variable is the log of the number of years since a firm's initial public offering. Firms with a greater number of years as publicly traded businesses should be more confident to form captives.

Foreign Tax

Taxes may play a role as one of the incentives for captive utilization.[5] Firms with foreign tax burdens may be motivated to use captive structures. This dummy variable equals one if the firm pays foreign income taxes in that year.

Diversification

Following Hann et al. (2013) and Pagach and Warr (2011), the authors include the number of operating segments to control for diversification of various risks within the firm. This variable can capture substitution effects between captive use and diversification as tools for risk management.

Finally, the equation controls for time and industry fixed effects. Year dummies are included to control for the impact of cyclical, economic trends on the use of

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5. Due to the high correlation between a firm's assets and its domestic taxes paid, the study uses this variable as the best alternative to control for tax incentives.

captives over the sample period. Industry dummies are based on the two-digit North American Industry Classification System (NAICS) codes.[6] All variables are defined in Table 2. Their expected signs and sources are also displayed.

Table 2:
Variable Definitions

Variable	Definition	Sign	Source
Captive	= 1 if a firm has a captive insurance subsidiary in a given year, and 0 otherwise		Captive Insurance Database
Operating characteristics			
Size	Ln(assets) = Ln(AT)	+	Compustat
Capex	Capital expenditure/total assets = CAPX/AT	-	Compustat
Opacity	Intangible assets/total assets = INTAN/AT	-	Compustat
Sales growth	Percentage growth in annual sales (REVT) from the prior year to the current year	-	Compustat
Financial characteristics			
Cash	Cash and short-term investments/total assets = CHE/AT	-	Compustat
Dividend	= 1 if the firm paid dividends (DVT) in that year, 0 otherwise	-	Compustat
Leverage	Book value of long-term debt/Market value of equity = DLTT/(PRCC_C*CSHO)	-	Compustat
ROA	Net income/total assets = NI/AT	+	Compustat
Market characteristics			
Market-to-book (MB)	Stock price per share /Book value per share = PRCC_C/((AT-LT)/ CSHO)	+	Compustat
Price-to-earnings (PE)	The year-end stock price/earnings per share for the fiscal year = PRCC_C/(NI/CSHO)	+/-	Compustat
NYSE	= 1 if a firm is listed on the New York Stock Exchange, and 0 otherwise	+	Compustat
Control variables			
Age	Ln (the number of years since a firm's initial public offering)	+	CRSP
Foreign Tax	= 1 if a firm paid foreign income taxes (TXFO) in that year, and 0 otherwise	+	Compustat
NoSeg	The number of operating segments reported in Compustat	+/-	Compustat

Summary statistics are reported in Table 3. As can be seen in this table, firms with captive structures make up 35% of all firm-year observations. Firms, on average, have 12.2% of assets in cash and cash equivalents. About three-quarters of S&P 500 companies are listed on the NYSE.

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6. Industries with the two-digit NAICS codes 81 (other services except public administration), 92 (public administration) and 99 (unclassified) are left out of the industry fixed effects. Most industry dummies are positive and significant in the multivariate analysis.

Table 3:
Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Captive	7,513	0.000	1.000	0.350	0.476
Operating characteristics					
Size	7,513	1.586	6.410	4.086	0.673
Capex	7,513	0.000	0.236	0.040	0.040
Opacity	7,513	0.000	0.907	0.198	0.207
Sales growth	7,513	-0.927	2.790	0.098	0.227
Financial characteristics					
Cash	7,513	0.000	0.715	0.122	0.135
Dividend	7,513	0.000	1.000	0.768	0.422
Leverage	7,513	0.000	640.8	0.571	7.645
ROA	7,513	-0.394	0.503	0.059	0.068
Market characteristics					
Market-to-book	7,513	-280.4	321.7	3.746	12.36
Price-to-earnings	7,513	-694.3	697.5	19.77	49.57
NYSE	7,513	0.000	1.000	0.759	0.428
Controls					
Age	7,513	0.000	4.182	1.503	0.314
Foreign tax	7,513	0.000	1.000	0.680	0.467
NoSeg	1,530	2.000	22.000	6.170	2.664

Captive is a dummy variable that equals 1 for a firm-year in which a captive is used, and 0 otherwise. *Size* is measured as the natural log of the book value of total assets. *Capex* is computed as capital expenditure divided by total assets. *Opacity* is measured as the ratio of intangible assets to total assets. *Sales growth* is the percentage growth in annual sales from the prior year to the current year. *Cash* is computed as cash and short-term investment divided by total assets. *Dividend* dummy equals 1 if the company paid out dividends for that year, and equals 0 otherwise. *Leverage* is equal to the ratio of book value of long-term debt divided by the market value of equity. *Return on assets (ROA)* measures accounting performance and is equal to net income divided by total assets. *Market-to-book (MB)* is the ratio of market equity to book equity. *Price-to-earnings (PE)* is the ratio of stock price to earnings per share for the fiscal year. The *New York Stock Exchange (NYSE)* equals 1 if a firm is listed on the NYSE, and 0 otherwise. *Age* is the log of the number of years of a firm's initial public offering. *Foreign tax* is a dummy variable that takes a value of 1 if a firm paid foreign income taxes in that year, and 0 otherwise. *NoSeg* is the number of operating segments for each self-reported firm.

Table 4 shows the correlation matrix of captive use and its determinants. The use of captives is negatively correlated with all explanatory variables except for size, dividend and the NYSE. Additionally, multicollinearity does not pose an issue in the regression analysis due to a lack of high correlation coefficients between the independent variables.[7]

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7. Variance inflation factors (VIFs) for all variables are examined if the problem of multicollinearity exists. VIF statistics are below two, indicating no existence of multicollinearity.

Table 4:
Correlations among Regression Variables

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Captive	(1)	1														
Size	(2)	0.386**	1													
Capex	(3)	-0.140**	-0.163**	1												
Opacity	(4)	-0.041**	-0.128**	-0.225**	1											
Sales growth	(5)	-0.101**	-0.167**	0.035**	0.051**	1										
Cash ratio	(6)	-0.135**	-0.205**	-0.084**	-0.096**	0.113**	1									
Dividend	(7)	0.223**	0.366**	-0.071**	-0.127**	-0.215**	-0.311**	1								
Leverage	(8)	-0.007	0.033**	0.009	0.003	-0.016	-0.026*	-0.017	1							
ROA	(9)	-0.055**	-0.234**	0.125**	0.047**	0.097**	0.230**	-0.013	-0.097**							
MB	(10)	-0.039**	-0.061**	0.032**	0.016	0.015	0.066**	-0.029*	-0.013	0.083**	1					
PE	(11)	-0.037**	-0.058**	-0.012	0.02	0.073**	0.051**	-0.029*	-0.015	0.091**	0.032**	1				
NYSE	(12)	0.211**	0.246**	-0.031**	-0.036**	-0.135**	-0.427**	0.361**	-0.023*	-0.119**	-0.051**	-0.045**	1			
Age	(13)	0.181**	0.188**	0.075**	-0.122**	-0.126**	-0.136**	0.287**	-0.049*	0.014	-0.039**	-0.050**	0.213**	1		
Foreign tax	(14)	0.048**	-0.075**	-0.02	0.354**	-0.018	0.220**	-0.086**	-0.046**	0.232**	0.055**	0.008	-0.090**	-0.023*	1	
NoSeg	(15)	0.253**	0.288**	-0.038	-0.170**	-0.02	-0.050*	0.115**	0.165**	-0.143**	-0.059*	-0.05	0.101**	0.179**	-0.023	1

Captive is a dummy variable that equals 1 for a firm-year in which a captive is used, and 0 otherwise. *Size* is measured as the natural log of the book value of total assets. *Capex* is computed as capital expenditure divided by total assets. *Opacity* is measured as the ratio of intangible assets to total assets. *Sales growth* is the percentage growth in annual sales from the prior year to the current year. *Cash* is computed as cash and short-term investment divided by total assets. *Dividend* dummy equals 1 if the company paid out dividends for that year, and equals 0 otherwise. *Leverage* is equal to the ratio of book value of long-term debt divided by the market value of equity. *Return on assets (ROA)* measures accounting performance and is equal to net income divided by total assets. *Market-to-book (MB)* is the ratio of market equity to book equity. *Price-to-earnings (PE)* is the ratio of stock price to earnings per share for the fiscal year. The *New York Stock Exchange (NYSE)* equals 1 if a firm is listed on the NYSE, and zero otherwise. *Age* is the log of the number of years a firm's initial public offering. *Foreign tax* is a dummy variable that takes a value of 1 if a firm paid foreign income taxes in that year, and 0 otherwise. *NoSeg* is the number of operating segments for each self-reported firm. ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). The number of observations for each variable is the same as in Table 3.

4. Results

Univariate Analysis

This section compares firms with and without the presence of a captive insurance subsidiary. These univariate results are presented in Table 5. In general, firms with captive structures are larger in size, more likely to pay dividends and NYSE-listed. They also tend to become publicly traded earlier, pay foreign taxes and manage more operating segments.

It is noteworthy that capital expenditures and opacity make a crucial distinction between firms that use and those that do not use captives. Consistent with the hypothesis, firms with captives have a smaller proportion of capital expenditures and intangible assets than firms without captives. Firms with captives also have lower growth rates and cash and cash equivalents than their counterparts. Consistent with the negative correlation between captive usage and profitability from Table 4, firms with captives tend to be less profitable in this analysis. Finally, firms with

captives have lower MB and PE ratios. It remains to be seen whether these univariate findings can hold up in the multivariate settings.

Table 5:
Mean Comparison of Firms with and Without Captives

Variable	N	Firms with Captives	N	Firms Without Captives	Mean Difference	*p*-value
Operating characteristics						
Size	2,610	4.443	4,903	3.897	0.546	0.000***
Capex	2,610	0.032	4,903	0.044	-0.012	0.000***
Opacity	2,610	0.186	4,903	0.204	-0.018	0.000***
Sales growth	2,610	0.067	4,903	0.244	-0.048	0.000***
Financial characteristics						
Cash	2,610	0.097	4,903	0.135	-0.038	0.000***
Dividend	2,610	0.897	4,903	0.700	0.198	0.000***
Leverage	2,610	0.499	4,903	0.610	-0.111	0.418
ROA	2,610	0.054	4,903	0.061	-0.008	0.000***
Market characteristics						
Market-to-book	2,610	3.088	4,903	4.097	-1.008	0.000***
Price-to-earnings	2,610	17.26	4,903	21.11	-3.846	0.000***
NYSE	2,610	0.882	4,903	0.693	0.190	0.000***
Controls						
Age	2,610	0.710	4,903	0.660	0.047	0.000***
Foreign tax	2,610	1.581	4,903	1.462	0.119	0.000***
NoSeg	683	6.920	847	5.570	1.355	0.000***

Captive is a dummy variable that equals 1 for a firm-year in which a captive is used, and 0 otherwise. *Size* is measured as the natural log of the book value of total assets. *Capex* is computed as capital expenditure divided by total assets. *Opacity* is measured as the ratio of intangible assets to total assets. *Sales growth* is the percentage growth in annual sales from the prior year to the current year. *Cash* is computed as cash and short-term investment divided by total assets. *Dividend* dummy equals 1 if the company paid out dividends for that year, and equals 0 otherwise. *Leverage* is equal to the ratio of book value of long-term debt divided by the market value of equity. *Return on assets (ROA)* measures accounting performance and is equal to net income divided by total assets. *Market-to-book (MB)* is the ratio of market equity to book equity. *Price-to-earnings (PE)* is the ratio of stock price to earnings per share for the fiscal year. The *New York Stock Exchange (NYSE)* equals 1 if a firm is listed on the NYSE, and 0 otherwise. The *p*-value is based on a *t*-test on the difference in means that assumes unequal variances. *Age* is the log of the number of years of a firm's initial public offering. *Foreign tax* is a dummy variable that takes a value of 1 if a firm paid foreign income taxes in that year, and 0 otherwise. *NoSeg* is the number of operating segments for each self-reported firm.

Multivariate Analysis

To test whether the firm's decision to use a captive insurance subsidiary for retained risks is associated with certain operating, financial and market characteristics, a logistic regression is conducted in a multivariate condition with time and industry fixed effects. Table 6 presents the results for the full sample with various sets of variables.

Table 6:
Logistic Regression Results for the Characteristics of Firms with Captives

Variable	(1)	(2)	(3)
Operating characteristics			
Size	1.484***	1.409***	1.282***
	(0.000)	(0.000)	(0.001)
Capex	-11.14***	-11.94***	-8.407
	(0.004)	(0.003)	(0.323)
Opacity	-1.349**	-1.458**	-2.864*
	(0.040)	(0.025)	(0.090)
Sales growth	-0.291	-0.180	-0.270
	(0.101)	(0.297)	(0.479)
Financial characteristics			
Cash	-2.092**	-2.273**	-2.448
	(0.021)	(0.013)	(0.179)
Dividend	0.333	0.231	-0.025
	(0.192)	(0.375)	(0.957)
Leverage	-0.073	-0.049	-0.029
	(0.174)	(0.292)	(0.815)
ROA	1.423	1.130	1.463
	(0.261)	(0.353)	(0.470)
Market characteristics			
Market-to-book	-0.005	-0.005	-0.005
	(0.113)	(0.103)	(0.423)
Price-to-earnings	-0.000	-0.000	-0.002*
	(0.503)	(0.731)	(0.072)
NYSE	0.784***	0.734**	0.154
	(0.009)	(0.014)	(0.775)
Controls			
Age		0.747**	0.746
		(0.044)	(0.328)
Foreign tax		0.422	-0.500
		(0.130)	(0.367)
NoSeg			0.132
			(0.112)
Intercept	-8.786***	-9.936***	-4.939**
	(0.000)	(0.000)	(0.010)
No. of observations	7,513	7,513	1,530

Captive is a dummy variable that equals 1 for a firm-year in which a captive is used, and 0 otherwise. *Size* is measured as the natural log of the book value of total assets. *Capex* is computed as capital expenditure divided by total assets. *Opacity* is measured as the ratio of intangible assets to total assets. *Sales growth* is the percentage growth in annual sales from the prior year to the current year. *Cash* is computed as cash and short-term investment divided by total assets. *Dividend* dummy equals 1 if the company paid out dividends for that year, and equals 0 otherwise. *Leverage* is equal to the ratio of book value of long-term debt divided by the market value of equity. *Return on assets (ROA)* measures accounting performance and is equal to net income divided by total assets. *Market-to-book (MB)* is the ratio of market equity to book equity. *Price-to-earnings (PE)* is the ratio of stock price to earnings per share for the fiscal year. The *New York Stock Exchange (NYSE)* equals 1 if a firm is listed on the NYSE, and 0 otherwise. *Age* is the log of the number of years a firm's initial public offering. *Foreign tax* is a dummy variable that takes a value of 1 if a firm paid foreign income taxes in that year, and 0 otherwise. *NoSeg* is the number of operating segments for each self-reported firm. The model also controls for year and industry dummies at the two-digit North American Industry Classification System (NAICS) level. Standard errors are adjusted for firm-level clustering. P-values are in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Specification (1) of Table 6 reports the results for the entire sample without control variables. Three operating variables (*Size*, *Capex* and *Opacity*) are significantly related to the use of captives. Consistent with the hypothesis that size should be positively related to captive formation, the result shows that larger firms are more likely to use captives. Also consistent with the hypotheses are the findings that the use of captives is inversely related to capital expenditures and opacity.

The level of cash holdings is the only financial characteristic significantly associated with the use of captives. The coefficient for *Cash* is significant and negative. This finding is consistent with the hypothesis that firms with captives should have lower cash reserves. The implication may indicate that firms using captive structures can maintain lower cash balances in operation. This result reveals a difference between firms with and without captives related to capital allocation strategies. At first glance, a firm provides capital to form a captive and pays premiums to its captive subsidiary. As a result, the firm with a captive operates with a lower level of cash and its equivalents. The lower level of the most liquid assets could indicate that the firm is susceptible to liquidity problems. In reality, the firm with a captive can readily handle these problems because some of the cash holdings are strategically stored in its captive subsidiary. Captive shareholder funds can serve as backstops for a variety of risk management needs from the parent company. This is evidenced by the 2017 Marsh report in that its managed captives currently have more than \$110 billion in shareholder funds.[8] In other words, with some cash reserved in its captive, the parent company protects the cash for future risk management needs and reduces the agitation for distributing cash from its shareholders.[9] In addition, the coefficients for *Dividend*, *Leverage* and *ROA* variables are not significant.[10] These findings suggest that the use of captives is not driven by corporate dividend policies, leverage structure and profitability.[11]

The market characteristics are insignificant except for the NYSE variable. Firms that are listed on the NYSE are more likely to have captives. Neither the market-to-book ratio nor price-to-earnings ratio come into play in the choice of captive formation. A reasonable inference to be drawn is that the use of captives may not serve as a driving force toward the firm's long-term stock price, although the stock price reacts positively to the formation of a firm's captive (Cross et al., 1986).

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8. This report suggests that captive shareholder funds provide their parent companies with the means to reduce their total cost of risk in creative ways. For example, parent companies can use captive shareholder funds to underwrite an array of new and nontraditional risks, including cyber, supply chain, employee benefits and terrorism.

9. Special thanks to Harold A. Weston for this insightful comment made on Feb. 27, 2018.

10. As a robustness test, two variations of the dividend dummy are considered. First, "dividend dummy" is defined as one if the firm has paid dividends in the past two years and zero otherwise. Next, it is defined using a three-year window. The results hold true for the relation between *Dividend* and the use of captives.

11. The authors only keep ROA as a measure of profitability throughout the paper. The results do not change when the return on equity (ROE) is used as an alternative measure of profitability.

Specification (2) of Table 6 shows the results for the full sample, with *Age* and *Foreign Tax* included as control variables. They continue to support the findings in column (1). The firm age variable is positive and significant. That is, more established firms are more likely to use captives. The relationship between captive utilization and foreign tax payments is insignificant.[12]

The authors included *NoSeg* as a control variable in specification (3) to examine the relationship between captive use and diversification.[13] The coefficient is insignificant, failing to suggest that firms with more operating segments are inclined to form captives for risk management purposes. Due to the available segments data for the firms in this sample, the sample size with *NoSeg* as a control variable decreases dramatically, only making up one-fifth of the full sample. As a result, the specification with *NoSeg* carries less weight in the rest of the analysis.

To determine whether the logistical results are robust across industries, multivariate analysis is conducted based on two subsamples of financial firms that have the two-digit NAICS codes of 52 and 53 (equivalent to the Standard Industrial Classification [SIC] codes between 6000 and 6999) and nonfinancial firms.[14] Specifications (1) and (2) in Table 7 report estimates of logistic regressions for financial firms; specifications (3) and (4) report for nonfinancial firms. According to Marsh (2017), financial institutions make greater use of captives, accounting for about one-quarter of captives under its management. As a result, the disaggregated subsamples may explain any dissimilarities between financial and nonfinancial firms when it comes to captive utilization. Consistent with the results for the full sample reported in this section, firms with larger assets, lower cash reserves and the NYSE-listed status continue to be more likely to use a captive structure.[15] Moreover, results differ for financial firms and nonfinancial firms with respect to capital expenditures, opacity, firm age and foreign taxes. Nonfinancial companies with smaller proportions of capital expenditures and intangible assets are more likely to engage in risk retention in the form of captive insurance subsidiaries. In addition, the use of captives among nonfinancial companies is significantly and positively related to firm age and foreign tax payments.

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12. The authors also estimated the model with domestic tax rates as an alternative to foreign taxes. The results continue to show no statistical effect of tax incentives on captive formations.

13. The segments data is self-reported by the companies. Many missing observations exist for the firms in the sample. Thus, this control variable is included separately for testing the diversification issues.

14. Of the firms included in the sample, 33% of nonfinancial firms have captives in comparison with 42% of financial firms.

15. These results continue holding up when the one-year lagged values of the explanatory variables have been used in the regression for the entire sample and disaggregated subsamples. The results based on lagged values are not reported. They are available upon request.

Table 7:
Logistic Regression Results for Financial and Nonfinancial Firms

Variables	Financial Firms		Nonfinancial Firms	
	(1)	(2)	(3)	(4)
Operating characteristics				
Size	1.528***	1.485**	1.581***	1.941***
	(0.000)	(0.024)	(0.000)	(0.000)
Capex	-3.880	14.40	-14.97***	-21.72**
	(0.706)	(0.334)	(0.000)	(0.016)
Opacity	0.975	-0.826	-2.233***	-5.084***
	(0.410)	(0.632)	(0.002)	(0.001)
Sales growth	0.0863	0.518	-0.287	-0.698
	(0.821)	(0.326)	(0.140)	(0.147)
Financial characteristics				
Cash	-4.140**	-6.970	-2.453**	-2.908
	(0.034)	(0.162)	(0.024)	(0.171)
Dividend	0.0995	-1.443***	0.276	0.837*
	(0.871)	(0.009)	(0.334)	(0.099)
Leverage	-0.0997	-0.182	-0.007	0.270
	(0.121)	(0.488)	(0.827)	(0.227)
ROA	3.713	3.863	0.788	2.646
	(0.435)	(0.592)	(0.532)	(0.230)
Market characteristics				
Market-to-book	0.0314	0.0140	-0.006*	-0.006
	(0.311)	(0.775)	(0.070)	(0.446)
Price-to-earnings	-0.0002	-0.001	-0.000	-0.003*
	(0.866)	(0.551)	(0.681)	(0.073)
NYSE	0.946*	1.584*	0.672*	-0.122
	(0.094)	(0.054)	(0.058)	(0.847)
Controls				
Age	0.994	0.761	0.683*	0.685
	(0.271)	(0.705)	(0.098)	(0.392)
Foreign tax	-0.141	-1.433*	0.654*	0.658
	(0.759)	(0.063)	(0.078)	(0.464)
NoSeg		0.173		0.079
		(0.208)		(0.463)
Intercept	-9.345***	-7.532	-10.87***	-7.906***
	(0.000)	(0.118)	(0.000)	(0.000)
No. of observations	1,633	345	5,880	1,185

Captive is a dummy variable that equals 1 for a firm-year in which a captive is used, and 0 otherwise. *Size* is measured as the natural log of the book value of total assets. *Capex* is computed as capital expenditure divided by total assets. *Opacity* is measured as the ratio of intangible assets to total assets. *Sales growth* is the percentage growth in annual sales from the prior year to the current year. *Cash* is computed as cash and short-term investment divided by total assets. *Dividend* dummy equals 1 if the company paid out dividends for that year, and equals 0 otherwise. *Leverage* is equal to the ratio of book value of long-term debt divided by the market value of equity. *Return on assets (ROA)* measures accounting performance and is equal to net income divided by total assets. *Market-to-book (MB)* is the ratio of market equity to book equity. *Price-to-earnings (PE)* is the ratio of stock price to earnings per share for the fiscal year. The *New York Stock Exchange (NYSE)* equals 1 if a firm is listed on the NYSE, and 0 otherwise. *Age* is the log of the number of years a firm's initial public offering. *Foreign tax* is a dummy variable that takes a value of one if a firm paid foreign income taxes in that year, and 0 otherwise. *NoSeg* is the number of operating segments for each self-reported firm. The model also controls for year and industry dummies at the two-digit North American Industry Classification System (NAICS) level. Standard errors are adjusted for firm-level clustering. P-values are in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Robustness Tests[16]

In response to the criticism in the literature for the use of binary choice models, a survival data set is constructed to test the robustness of the results (Berry-Stölzle and Xu, 2018; Pagach and Warr, 2011). Firm-year observations are removed from the data set once a captive is formed. A firm with a captive has a maximum of one observation with *Captive* equal to one. Firms with captives licensed before 2000 are also dropped from the sample. This survival data set facilitates the investigation into the determinants of the decision to add a captive over the sample period rather than simply the characteristics of the firms with captives. However, this approach results in both a decrease in sample size and statistical power. The study re-estimates the logistic model with this survival data set that contains 4,683 firm-year observations.

Table 8 reports the results of the logistic regression model with the survival data set. For specifications (1) and (2), the coefficients and signs of *Size* and *Cash* are like those estimated with the full sample. That is, the study finds a significantly positive relation between captive use and firm size. Firms with captives maintain lower levels of cash reserves. Two major findings stand out from the survival data set. First, the coefficients for *Cash* are approximately twice as large as those in the full sample. The implication is that firms with captives formed over the sample period hold less cash when compared with the estimates from the full sample. Second, the NYSE-listed status is not significant in the survival data set. One plausible explanation is that firms with captives formed before 2000 tend to be listed on the NYSE. In turn, firms that added captives in the 2000s are not listed on the NYSE. This may also explain a regulatory change indicated by Lai and McNamara (2004) that using captives for employee benefits has been permitted by the U.S. Department of Labor (DOL) since 2000.

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16. Most companies rely on third-party administrators (TPAs) for captive operations. There are only three companies with captives with the self-managed status in the sample. The authors have removed these three companies and re-estimated the model. The results are still consistent with the main results from the entire sample.

Table 8:
Logistic Regression Results for Survival Data Set

Variable	(1)	(2)	(3)
Operating characteristics			
Size	1.032***	0.986***	0.404
	(0.000)	(0.000)	(0.352)
Capex	-8.338	-8.061	-1.008
	(0.101)	(0.117)	(0.941)
Opacity	-1.980**	-2.103**	-3.213
	(0.039)	(0.027)	(0.245)
Sales growth	0.464	0.434	1.44
	(0.160)	(0.198)	(0.152)
Financial characteristics			
Cash	-4.280***	-4.475***	-4.870**
	(0.002)	(0.002)	(0.019)
Dividend	0.024	0.088	-1.937**
	(0.945)	(0.801)	(0.015)
Leverage	0.002	-0.014	0.0177
	(0.943)	(0.779)	(0.733)
ROA	5.385***	5.156***	2.873
	(0.007)	(0.01)	(0.522)
Market characteristics			
Market-to-book	-0.008*	-0.007*	-0.017
	(0.098)	(0.094)	(0.318)
Price-to-earnings	0.003	0.002	0.005
	(0.157)	(0.191)	(0.474)
NYSE	0.265	0.306	-0.684
	(0.391)	(0.338)	(0.270)
Controls			
Age		-0.589*	-0.0383
		(0.066)	(0.970)
Foreign tax		0.266	-0.639
		(0.388)	(0.352)
NoSeg			0.279***
			(0.004)
Intercept	-20.880***	-21.220***	-3.549
	(0.000)	(0.000)	(0.248)
No. of observations	4,683	4,683	519

Captive is a dummy variable that equals 1 for a firm-year in which a captive is used, and 0 otherwise. *Size* is measured as the natural log of the book value of total assets. *Capex* is computed as capital expenditure divided by total assets. *Opacity* is measured as the ratio of intangible assets to total assets. *Sales growth* is the percentage growth in annual sales from the prior year to the current year. *Cash* is computed as cash and short-term investment divided by total assets. *Dividend* dummy equals 1 if the company paid out dividends for that year, and equals 0 otherwise. *Leverage* is equal to the ratio of book value of long-term debt divided by the market value of equity. *Return on assets* (*ROA*) measures accounting performance and is equal to net income divided by total assets. *Market-to-book (MB)* is the ratio of market equity to book equity. *Price-to-earnings (PE)* is the ratio of stock price to earnings per share for the fiscal year. The *New York Stock Exchange (NYSE)* equals 1 if a firm is listed on the NYSE, and 0 otherwise. *Age* is the log of the number of years a firm's initial public offering. *Foreign tax* is a dummy variable that takes a value of one if a firm paid foreign income taxes in that year, and 0 otherwise. *NoSeg* is the number of operating segments for each self-reported firm. The model also controls for year and industry dummies at the two-digit North American Industry Classification System (NAICS) level. Standard errors are adjusted for firm-level clustering. P-values are in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

5. Conclusion

A captive insurance company is a wholly owned subsidiary created to provide insurance to its parent company (or companies) and meet the risk management needs of its owner(s). Captives are held by the vast majority of Fortune 500 companies as an alternative solution to risk transfer. A report by Marsh (2017) pointed out that the number of captives has grown every year since 1994 (with the exception of 1996). However, the existing literature has not explored the use of captives among large-cap, publicly traded companies.

This study investigates the general characteristics of firms that do or do not own a captive. It uses a data set of S&P 500 companies from 2000 to 2016. The analytical approach applies a logistical regression model to estimate the indicators of a firm's decision to use a captive structure. Explanatory variables are divided into operating characteristics (i.e., size, capital expenditures, opacity and sales growth), financial characteristics (i.e., cash, dividend, leverage and ROA), and market characteristics (i.e., MB, PE and the NYSE). The study also controls firm age, foreign tax payments and operating segments in the model.

This work adds value to the literature by providing evidence that firms with greater size and lower cash reserves are more likely to own a captive insurer for retained risks in logit model results. In addition, nonfinancial firms with smaller proportions of capital expenditures and intangible assets tend to use captives. The results of this research complement studies primarily concerned with the treatment of tax deductibility for the premiums paid to captives by their parent companies.

Although this study offers insight into the decision of firms to employ a captive insurance structure, there are some limitations on the inference of the results. There is a lack of full disclosure of a firm's risk management programs. This study identifies the decision to use a captive as a risk retention strategy. A company may use a mix of risk retention and risk transfer tools in its risk management program. For example, The Walt Disney Co. has formed two captives and purchased commercial insurance from third-party carriers for different types of risks.[17] A clear-cut dichotomy between risk retention and risk transfer for a company is not easy to find. Further research is needed to incorporate the details of risk-financing programs within the firm.

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