**Firm Value and Self-Insurance: Evidence from Manufacturers in California**

5/31/2017

**Abstract**

This paper explores whether the alternative risk-transfer technique in the form of self-insurance can add value to the manufacturers that have self-insured for workers’ compensation (WC) losses. We focus on publicly owned manufacturers with at least 1,000 employees in California over the period 1970–2015 to examine the value implications of self-insurance adoption. Our study employs a treatment-effects model to simultaneously estimate the determinants of self-insurance and the effect of self-insurance on firm value. We find the relationship between firm value and self-insurance is time dependent. Risk preference for self-insurance reflects in higher market valuation among manufacturers over the periods of 1970–1983 and 1986–1999. This result suggests that self-insurance has a positive impact on firm value in the 1970s through the 1990s except for the liability crisis years 1984–1985. However, the benefits of self-insurance fail to materialize for self-insured manufacturers in the 2000s.

1. **Introduction**

Workers’ compensation (WC) liability is one of the major loss exposures modern corporations in United States (U.S.) have to manage. WC coverage is mandatory in all states but Texas and Oklahoma (Sengupta and Baldwin, 2015). The full cost of WC coverage is usually financed by employers. As a matter of risk-financing choice, they can choose between the purchase of insurance and the use of self-insurance for WC losses.[[1]](#footnote-1) Typically, employers transfer to an insurer the financial responsibility for payment of WC losses by paying premiums upfront for an insurance policy. Premiums are tax-deductible in the tax year they are paid. Alternatively, employers may retain their WC risk by self-insuring, take a key role in loss control activities, and exercise greater control over their claims. Self-insured employers can only take tax deductions in the year when losses are actually paid. That is, self-insurers actively engage in risk retention rather than risk transfer as a financing tool even though their tax deductions may be delayed. The preference for different risk management strategies reveals employers’ risk attitude toward WC loss exposure. In 2013, self-insured employers paid $24 out of every $100 of WC benefits paid in the United States (Sengupta and Baldwin, 2015). Self-insurance is most prevalent in WC risk management—and it accounts for about three quarters of the total alternative risk transfer market (Holzheu et al., 2003). Thus, an investigation into the impact of self-insurance on firm value can shed light on how adopters benefit from alternative risk transfer techniques.

Self-insurance offers several potential benefits over market insurance. Chang and Weiss (2011) mention that the primary driver for self-insurance is its capacity to lower costs and mitigate inefficiencies in the WC insurance market (e.g., the high transaction costs of dealing with the insurance industry related to adverse selection, moral hazard, and other imperfections). The fundamental rationale behind self-insurance is the belief that it will be less expensive in the long run (Vaughan, 1997). Some employers may adopt this alternative approach in the quest for cost-effectiveness. The Self-insurance Institute of America, a trade association for self-insured WC programs, indicates that the self-insurance option helps control cost and maximize cash flow.[[2]](#footnote-2) Self-insurance allows employers to assume the financial responsibility for WC losses that do occur—and thus gain better control over claims.[[3]](#footnote-3) In order to provide a better understanding of why firms use self-insurance to mitigate WC losses in the nation, this study analyzes firm values of manufacturers that have self-insured for WC risk in California (CA).

The objective of this study is to examine the relationship between the use of self-insurance and the market value of large manufacturers that hire 1,000 or more workers in CA. Manufacturers have been selected as the subject because their workplaces are subject to a very high risk of occupational injury.[[4]](#footnote-4) According to Chang et al. (2016), 28 percent of employees in the manufacturing industry in CA are covered by self-insurance programs. We focus on the manufacturing industry to control for differences that might arise because of regulatory and market divergence across industries. In addition, we select publicly traded manufacturers so that we can collect market-based measures to observe whether an alternative risk transfer technique improves firm value.

In a classic world with perfect capital markets based on Modigliani and Miller’s (M&M) model, risk management should be irrelevant. Without information asymmetries, taxes, and transaction costs, self-insuring for WC risk should not add value to the firm. Neither tax provisions nor risk preferences are able to explain observed variations in corporate policies (Smith and Watts, 1992). In practice, inefficiencies in the WC market related to adverse selection, moral hazard, and other imperfections may drive firms to self-insure because market insurance is unaffordable or unavailable. As Butler and Worrall (1993) assert, understanding why firms choose to self-insure is important because this decision process offers an example of how firms make choices in the midst of uncertainty. That is why it is valuable to examine whether self-insurance affects firm value among manufacturers confronted with substantial WC loss exposure.

Our paper helps open the door to the value relevance of alternative risk transfer in the form of self-insurance. To our knowledge, this is the first attempt to assess the self-insurance premium. Arguments of self-insurance based on market inefficiencies imply that self-insurance provides a potential benefit of better loss control, so this technique may increase the firm’s market value. To test this hypothesis, we examine the self-insurance activities of 70 publicly traded manufacturers from 1970 to 2015 with a sample of 2,030 firm-year observations. A treatment-effects regression model is used to examine the relationship between self-insurance adoption and firm value. Tobin’s Q is used as the dependent variable, while self-insurance is employed as the variable of interest in the model along with several control variables, such as firm size, profitability, investment growth, leverage, and dividend.

The empirical analysis starts with a comparison between self-insurers and firms that do not self-insure in a univariate setting. On average, self-insured manufacturers are much larger in size, but their Q ratios are lower than those of the manufacturers that do not self-insure. Then, we conduct multivariate analysis but find no evidence that self-insurance increases firm value over the entire sample period 1970–2015. However, when focusing on the manufacturers over different time periods, we find a positive relation between firm value and self-insurance over the years of 1970–1983 and 1986–1999. Nevertheless, this positive relationship does not hold up over the years of 2000-2015. In conclusion, our results suggest that whether self-insurance enhances firm value is time dependent.

The rest of this paper is organized in the following manner. Section II presents a brief review of risk management theories and the empirical evidence. Section III describes the data, sample, and methods used for analysis. Section IV provides statistical results. Section V concludes and suggests avenues for future research.

1. **Risk Management Theory and Empirical Evidence**

Corporate risk management can be achieved via insurance purchase or alternative risk transfer vehicles, such as using self-insurance. There are two strands of theories that explore the relation between risk management and firm value. The first is to maximize shareholder value, while the second is to maximize personal utility.

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 (Mayers and Smith, 1982; Smith and Stulz, 1985). Alternatively, risk management can increase firm value via increased debt capacity (Leland (1998)), or by relieving 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, Scharfstein, and Stein, 1993).

On the other hand, risk management can stem from personal motives, and is therefore not necessarily value-enhancing. For example, managers may take on risk management activities if their wealth is concentrated in the companies they manage, thus reducing the risk of their investment portfolio at the cost of shareholders (Stulz, 1984; Smith and Stulz, 1985). Alternatively, risk management can increase the conflict between owners and managers, when managers are able to take on pet projects (those with negative NPV but can increase managers’ personal utility) from internally generated cash flows. This is achieved without having to access external financial market so managers avoid being monitored by outside investors (Tufano, 1998).

Empirical evidence shows mixed support to the value maximization theory. In terms of corporate hedging through derivatives use, there are some studies that find that corporate derivatives use is related to higher firm value (Allayannis and Weston, 2001; Graham and Rogers, 2002; Carter, Rogers and Simkins, 2006; Bartram, Brown and Conrad, 2011). On the other hand, other studies suggest that the effect of derivatives on firm value is small (Guay and Kothari, 2003), or that there is no relationship between the derivatives usage and firm value (Jin and Jorion, 2006). Along the line of research relating risk management to managerial motives, studies of the gold mining industry and oil and gas industry support the view that corporate derivatives usage is related to managerial risk-aversion (Tufano, 1996; Rajgopal and Shevlin, 2002). More recently, results of a survey of 700 CFOs from around the world suggests that executive risk aversion in combination of other personal characteristics play a crucial role in risk management decisions (Bodnar, Graham, Giambona and Harvey, 2015). Under this premise, it is not clear that risk management results in higher firm value.

One of the major loss exposures for modern businesses is their workers’ compensation liability. In order to manage their WC liability, companies can choose between buying WC insurance from the market place and self-insuring for WC risk. On the one hand, risk management can be achieved through the purchase of insurance. Aside from a risk aversion incentive to buy insurance, MacMinn and Garven (2000) indicate that corporate insurance contracts can be used to reduce bankruptcy costs, agency costs and tax costs in their theoretical model. However, there has not been much empirical research on the direct relation between insurance purchase and firm value. One exception is a study of the Chinese firms, which found that the use of property insurance is related to higher firm value, potentially by helping firms secure new debt financing and enhance investment (Zou, 2010). On the other hand, risk management can be accomplished by an alternative risk transfer technique in the form of self-insurance. Vaughan (1997) suggests the principal reason that firms elect to self-insure certain exposures is that they believe it will be cheaper to do so in the long run. As a result of better control over claims and improved efficiency compared to the WC insurance market, self-insurance can potentially lead to higher firm value.

1. **Data, Sample, and Method**

This empirical analysis of self-insured manufacturers started with the *2013 California Manufacturers Register and Databases*. The original database contains 121 large firms (76 publicly-owned and 45 privately-owned) with at least 1,000 employees in CA. Then, market data for publicly-traded firms are obtained from COMPUSTAT. The self-insurance status of each manufacturer was provided by the Office of Self-insurance Plans of the CA Division of Workers’ Compensation.[[5]](#footnote-5) This process results in 70 publicly-traded manufactures with 2,030 firm-year observations over the years from 1970 to 2015. We then test the hypothesis of shareholder value maximization by examining whether the use of self-insurance is associated with higher firm values.

Following Hoyt and Liebenberg (2011), we use a treatment effects model to assess the value implications of self-insurance programs. Tobin’s Q is used as the dependent variable, while self-insurance is employed as the variable of interest in the model along with several control variables. In other words, this model estimates the impact of self-insurance on firm value, conditional on other determinants of Q. The regression model is specified as follows:

*Q = α + β Self-insurancei + λi Ωi + ɛ*  (1)

where *Self-insurancei* represents whether the self-insurance treatment is assigned to the *i*th firm in year *t* and the observed status of self-insurance in a particular year has a value of one if the firm self-insured, and zero otherwise. That is, *Self-insurance* equals 1 for firm-years beginning with and subsequent to the first year that firms became self-insured, and 0 for firm-years prior to the use of self-insurance. So a firm that self-insures in 1990 is assigned *Self-insurance* = 1 for firm-years 1990–2015 and *Self-insurance* = 0 for firm-years 1970–1989. *Ωi* is a vector of control variables that are hypothesized to explain differences in firm value. In particular, the binary decision to self-insure is modeled as the outcome of an unobservable latent variable $Self-insurance\_{i}^{\*}$. We assume that $Self-insurance\_{i}^{\*}$ is a linear function of the coefficient vector $ω\_{i}$ that contains hypothesized determinants of self-insurance choice.

$Self-insurance\_{i}^{\*}= δω\_{i}+µ$ (2)

We estimate Equations (1) and (2) simultaneously using maximum-likelihood estimation to control for potential selectivity bias that arises due to the likely endogeneity of self-insurance decision. As in Hoyt and Liebenberg (2011), we jointly estimate the decision to self-insure and the effect of that decision on Q in a two-equation model. The determinants of Tobin’s Q (denoted by the vector *Ωi*) and the determinants of self-insurance (denoted by the vector $ω\_{i}$) are listed in the functions below and discussed thereafter.

*Q = f (Self-insurance │Size, Profitability, Investment growth, Leverage, Dividend, Complexity)* (3)

*Self-insurance = f (Size, Headquarter dummy, Subsector dummy, Opacity, Slack)* (4)

***Determinants of Tobin’s Q***

Each firm’s market value is measured using Tobin’s Q. Following Hoyt and Liebenberg (2011), this measure is calculated as the ratio of the market value of equity plus the book value of liabilities to the book value of assets. Following previous work, we include the following control variables in the model.

1. *Firm size*: Previous studies are not conclusive about the effect of firm size on firm value. However, plenty of research links frim size to the use of self-insurance. Therefore, it is important to control for size because large firms are more likely to self-insure than small firms. The proxy is the natural logarithm of total assets.
2. *Profitability*: Profitable firms are more likely to trade at a premium than less profitable firms. The ROA is used as a proxy, calculated as the ratio of net income to total assets. A positive coefficient is expected on this variable.
3. *Investment growth*: Firm value may also be related to future investment opportunities. The proxy used is capital expenditures over total assets. The expected sign for this variable is positive.
4. *Leverage*: A firm’s capital structure may affect its value. A leverage variable is defined as the book value of long-term debt over the market value of common equity.
5. *Dividend*: Previous empirical evidence is mixed regarding the relationship between dividend payment and firm value. On the one hand, dividends may reduce free cash flows available for capital projects. Therefore, the sign of the coefficient should be negative. On the other hand, dividends can be perceived as a positive signal from management and thus increase firm value. A dividend dummy is included and equals one if the firm paid dividends on common equity in the current year. No priors on the sign of this variable are expected.
6. *Complexity*: Prior studies are not conclusive about whether diversification adds value. However, it is important to control for diversification because diversified manufacturers may be less likely to self-insure for WC risk than specialized ones as a result of heterogeneous risks in various industries. We use a dummy variable (*Complexity*) that equals one if a firm has a SIC or NAICS code beyond the manufacturing sector (NAICS 31-33 or SIC 20-39). We do not have specific expectation on the sign of this variable.

Finally, we also include year dummies in the Q equation to control for the impact of cyclical, economic trends on Q values over the sample period.

***Determinants of Self-insurance***

1. *Firm size*: Large firms are more likely to handle WC losses via self-insurance because they can support and justify the administrative cost of a self-insurance program. We use the natural logarithm of total assets as a proxy for firm size. The sign of this variable is expected to be positive.
2. *Headquarter dummy*: The headquarter dummy equals one if the owner of a manufacturer is headquartered in CA. Since WC laws are enacted at the state level, the regulations governing self-insurance may vary from state to state. Chang (2008) indicates that firms with a single-state operation tend to self-insure because they just need to conform to one jurisdiction’s WC regulation. A parent company headquartered in another state may have to deal with the burden and difficulty of complying with heterogeneous regulatory requirements for self-insurance in different jurisdictions. Therefore, we expect the coefficient on Headquarter dummy to be positive.
3. *Opacity*: According to Pagach and Warr (2011), assets that are relatively more opaque are more difficult to liquidate in the face of financial distress. Opacity, a measure of tangibility of assets may, may indicate the organizational structure of manufacturers. We measure opacity as the ratio of intangible assets to the book value of total assets. Manufacturing firms with a larger proportion of intangible assets may be associated with a larger percentage of workers dedicated to research and development who are less vulnerable to occupational injuries and illnesses than those workers who are physically involved with the production of goods in the manufacturing environment. Consequently, self-insurance may be out of favor due to less risky workplace. It is expected to see a negative sign for this variable.
4. *Slack*: If self-insurance helps employers maximize cash flow, cash reserves may be associated with the use of self-insurance. Thus, slack is measured as the ratio of cash and marketable securities to total assets.
5. *Subsector dummy*: The competitive structure of the industry may play a role in a firm’s risk management strategies. Firms in the same manufacturing subsector are exposed to similar loss exposures and therefore are more likely to adopt the same risk-financing technique for WC losses. Chang et al. (2016) suggest that self-insurance is widely accepted in the production of wood, paper, beverage, and petroleum products. Accordingly, this dummy variable is set to equal one if a firm is affiliated with these four subsectors. We expect this variable should have a positive coefficient.
6. **Results**

**A. Univariate Analysis**

In this section, we test the main hypothesis, which is whether self-insured firms have higher market values than the firms that do not self-insure. Univariate results are presented in Table 3. We find statistically significant differences in firm values between self-insured and unself-insured manufacturers. However, self-insurers have lower Q ratios than those firms that do not self-insure. The Q ratios of self-insured firms are, on average, lower than those of unself-insured firms’ by 0.5.

Consistent with the previous literature, self-insured firms are much larger than their counterparts that do not self-insure. Self-insured manufacturers are about twice the size of unself-insured manufacturers in terms of book value of total assets. The former also paid more dividends than did the latter. However, self-insurers are not significantly more profitable than firms that do not self-insure.

We also find that the mean of subsector dummy is higher for self-insurers, indicating that food, paper, beverage and petroleum products manufacturers are more likely to self-insure. In addition, companies with more intangible assets tend not to self-insure, as the average opacity ratio is higher for those that do not self-insure. Interestingly, we find that self-insurers have less cash and marketable securities compared to firms that do not self-insure.

**B. Multivariate Analysis**

In order to test whether self-insurance is value-enhancing, we use a maximum-likelihood treatment effects model that simultaneously estimates the decision to self-insure and the effect of such decision (treatment) on Q in a two-equation system. Table 4 shows correlation between variables and Table 5 presents the results for the full sample.

The first column of Table 5 reports the results for the self-insurance equation. Consistent with our conjecture, size is positively related to self-insurance, suggesting that larger firms are more likely to self-insure. Also consistent with our hypothesis is the finding that opacity is negatively related to the decision to self-insure. Manufacturers with a larger proportion of intangible assets are less likely to self-insure partly because their workers are less subject to work-related injuries. We also find weak evidence that firms headquartered in California are more likely to self-insure. In addition, firms in the food, paper, beverage and petroleum products sector are more likely to self-insure. On the other hand, we find that firms with more cash are less likely to self-insure. This result is the opposite of Chang (2008) that self-insurance is widely used by nonprofit hospitals with large cash reserves. This difference may be due to the fact that all manufactures are purely for-profit and characterized by alienable residual claims to cash flows. One possible conjecture is that firms with higher cash and marketable securities may be more financially conservative, reflecting risk aversion from the management’s side. The risk-averse management is more likely to transfer the liability risk by purchasing insurance, than to self-insure.

The second column of Table 5 reports the effect of self-insurance on firm value, measured by Q ratio. The results show that for the full sample over 1970-2015, self-insurance is negatively related to Q but the coefficient is not statistically significant. This suggests that self-insurance appears not to have any positive effect on firm value. If self-insurance has no positive impact on firm value, the motivation for self-insurance may be attributable to managers’ risk preference for personal utility maximization purposes. However, as we explore the effect of self-insurance on Q over different time periods, we find that the effect is time-varying.

In order to check whether our results are consistent throughout the entire sample period, we further estimate the model for each of the following four time periods that carry different economic characteristics: 1970–1983 (pre-crisis years), 1984–1985 (crisis years), 1986–1999 (post-crisis years), and 2000–2015 (new millennial years). According to Chidambaran et al. (1997), 1984 and 1985 are generally viewed as liability insurance crisis years, so we treat these two years as a stand-alone period. In fact, the manufacturing workforce has dwindled in the past several decades. For instance, in the 1970s, the manufacturing industry is so critical to the U.S. economy that about one in every four employees in the U.S. is hired by manufacturing companies.[[6]](#footnote-6) The ratio of manufacturing employment in the nation drops to just 15% in 1999 and further to 8.8% in 2015. Nowadays, fewer than one out of ten American employees works in this sector. By contrast, the choice of self-insurance has experienced a steady increase over the sample period. The share of WC benefits paid by self-insured employers grows from 14.3% in 1970 to 18.5% in 1983 in the pre-crisis period according to Sengupta and Baldwin (2015). The growth slows down in the post-crisis period as this share reaches at 21.6% in 1999. In the new millennial period, this share is pretty stable and stagnant, hovering between 22% and 24%. In addition, the subsequent years after the liability crisis (1986 through 1999) reflect the development of the insurance cycle as the insurance industry recovered from the trough of the cycle. The new millennial period features a different manufacturing landscape as the internet and innovation in technology pose new challenges and opportunities for manufacturers in the U.S. According to McKinsey 2012 report on manufacturing, manufacturing employment in advanced economies, including the U.S. has declined, while manufacturing productivity kept rising. The long-term trends that shape manufacturing in developed countries are innovation and productivity as many labor-intensive manufacturing jobs disappear thanks to productive automation and outsourcing to developing countries.

Table 6 presents the results for these four time periods. Panel A shows the Q equation results. We note that there is strong evidence showing that self-insurance increases firm value over the time periods of 1970–1983 and 1986–1999, but decreases firm value over the period of 2000–2015. The results also suggest that self-insurance is negatively related to firm value over the liability crisis period of 1984–1985, although the coefficient is not statistically significant. One implication from this conflicting effect of self-insurance on firm value may be due to different economic environments facing manufacturers over the years. The cost-effective benefit of self-insurance is not sufficient to enhance firm value of self-insured manufacturers in the new millennial period as a result of declining manufacturing employment. Among the control variables, we find that ROA is positively related to firm value and the results are consistent across all sub-sample periods. In addition, we note that size and leverage seems to be negatively related to firm value.

Panel B of Table 6 shows the self-insurance equation results. Size is positively related to self-insurance, and the effect is consistent and statistically significant across all sub-sample periods. Opacity is negatively related to self-insurance, although the relation is statistically significant only after 1985. Slack is negatively related self-insurance, and the relation is statistically significant during 1984-85 and after year 2000. Companies with a higher slack can also be viewed as financially more conservative. This may be due to managers’ risk aversion. Risk-averse managers may choose not to self-insure but rather purchasing insurance instead to transfer the liability risk. There is also some evidence that after year 2000, firms with headquarters in California are more likely to self-insure.

1. **Conclusion**

WC is one of main property/casualty loss exposures that challenge employers in America. One way or the other, employers have to make a decision on whether to purchase insurance or self-insure. The traditional risk-financing method is to purchase market insurance and transfer the financial responsibility for WC losses to carriers. Alternatively, the employer may retain WC risk by putting a self-insurance program in place. The key belief behind self-insurance is that it will be cheaper in the long run. Cost control is the main benefit of this alternative risk transfer technique. However, it is not clear whether using self-insurance as an alternative risk financial tool enhances firm value. This research examines the impact of self-insurance on firm values among publicly traded manufacturers with at least 1,000 employees in CA.

This empirical study employs a maximum-likelihood treatment effects model that jointly estimate the determinants of self-insurance and the effect of self-insurance on firm value. We particularly select publicly traded manufacturers so we are able to calculate Tobin’s Q as a proxy for firm value for each firm in our sample over the years 1970 through 2015. We find a positive relationship between firm value and self-insurance implementation among the manufacturers during the pre-crisis period of 1970–1983 and the post-crisis period of 1986–1999. However, this result does not hold up in the crisis period of 1984–1985 and the new millennial period of 2000–2015.

Our study breaks new ground in whether alternative risk transfer in the form of self-insurance is conducive to higher market valuation among manufacturers in CA. Much of the prior work provides valuable information about the corporate characteristics of self-insurers and economic factors associated with a higher self-insurance level in a state. However, it does not answer the key question of whether there exists a relation between self-insurance and firm value. Our research is essentially limited by a couple of factors: (1) a small number of publicly owned manufacturing companies and (2) the manufacturing industry in a single state. These factors may reduce the extent to which our results address the value implication of self-insurance nationwide. Therefore, additional research using aggregate data across all jurisdictions in the U.S. would contribute to a better understanding of whether an alternative risk transfer in the form of self-insurance is related to firm value at the national level.

**References**

Allayannis, G., and J. Weston, 2001, The Use of Foreign Currency Derivatives and Firm Market Value, *Review of Financial Studies*, 14: 243–276.

Bartram, S. M., G.W. Brown, and Conrad, J., 2011, The effects of derivatives on firm risk and value, *Journal of Financial and Quantitative Analysis*, 46: 4, 967–999.

Bodnar, Gordon M. and Giambona, Erasmo and Graham, John R. and Harvey, Campbell R., A View Inside Corporate Risk Management (July 13, 2015). Available at SSRN: [http://ssrn.com/abstract=2438884](http://ssrn.com/abstract%3D2438884) or <http://dx.doi.org/10.2139/ssrn.2438884>

Butler, Richard J. and John D. Worrall, 1991, Claims reporting and risk bearing moral hazard in workers’ compensation, *Journal of Risk and Insurance*, 58: 191–204.

Butler, Richard J. and John D. Worrall, 1993, Self-insurance in workers’ compensation, *Workers’ Compensation Insurance: Claim Costs, Prices, and Regulation*, edited by David Durbin and Philip S. Borba,Norwell, Mass.: Kluwer Academic Publishers, pp. 129–146.

Carroll, Anne M., 1994, The role of regulation in the demand for workers’ compensation self-insurance, *Journal of Insurance Regulation*, 13: 168–184.

Carter, D.A., D.A. Rogers, and B.J. Simkins, 2006, Does Hedging Affect Firm Value? Evidence from the U.S. Airline Industry, *Financial Management* 35: 53–86.

Chidambaran, N. K., Thomas A. Pugel, and Anthony Saunders, 1997, An Investigation of the Performance of the U.S. Property-Liability Insurance Industry, *Journal of Risk and Insurance*, 64: 371–382.

Chang, Mu-Sheng, 2013, Characteristics of self-insurers for workers’ compensation losses: Evidence from manufacturers in Pennsylvania, *Journal of Insurance Issues* 36 (2): 175–193.

Chang, Mu-Sheng, 2012, Alternative risk transfer via self-insurance for workers’ compensation losses among nursing homes in Pennsylvania, *Review of Management Innovation and Creativity*, 5 (17): 79–99.

Chang, Mu-Sheng, 2008, Alternative risk transfer: Evidence of self-insurance among hospitals in Pennsylvania for workers’ compensation liability, *Journal of Insurance Regulation*, 27 (2): 59–94.

Chang, Mu-Sheng and Mary A. Weiss, 2011, Characteristics of U.S. self-insurers for workers’ compensation losses, *Journal of Insurance Regulation*, 30: 139–170.

Chang, Mu-Sheng, Hsin-Hui Chiu, and Yanbo Jin, 2016, Characteristics of California Manufacturers that Self-Insured for Workers’ Compensation, working paper, California State University, Northridge.

Culp, Christopher L., 2006, *Structured Finance and Insurance: The ART of Managing Capital and Risk*, New Jersey: John Wiley & Sons, Inc.

Danzon, Patricia M. andScott E. Harrington, 2001, Workers’ compensation rate regulation: How price controls insurance costs, *Journal of Law & Economics*, 44: 1–36.

Feldman, Roger, 2012, Why do employers self-insure? New explanations for the choice of self-insurance vs. purchased health insurance, *Geneva Papers on Risk and Insurance Issues and Practice*, 37: 696–711.

Froot, Kenneth, David Scharfstein, and Jeremy Stein, 1993, Risk management: Coordinating corporate investment and financing policies, *Journal of Finance*, 48: 1629-58.

Graham, John, and Daniel Rogers, 2002, Do firms hedge in response to tax incentives? *Journal of Finance*, 57: 815–39.

Guay, Wayne, and S.P. Kothari, 2003, How much do firms hedge with derivatives? *Journal of Financial Economics*, 80: 423–461.

Harrington, Scott E. and Patricia M. Danzon, 2000, Rate regulation, safety incentives, and loss growth in workers’ compensation insurance, *Journal of Business*, 73: 569–595.

Holzheu, Thomas, Kurt Karl, and Mayank Raturi, 2003, *The picture of alternative risk transfer (ART)*, Swiss Re, Sigma No. 1/2003.

Hoyt R., and A. P. Liebenberg, 2011, The Value of Enterprise Risk Management, *Journal of Risk and Insurance*, 78: 795–822.

Jin, Y. B., and P. Jorion, 2006, Firm Value and Hedging: Evidence from U.S. Oil and Gas Producers, *Journal of Finance*, 61: 893–919.

Kwon, Wook Jean and Martin F. Grace, 1996, Examination of cross subsidies in the workers’ compensation market, *Journal of Insurance Regulation*, 15: 256–289.

Leland, Hayne, 1998, Agency cost, risk management, and capital structure, *Journal of Finance*, 53: 1213–43.

McShane M. K., N. Nair, E. Rustambekov, 2011, Does Enterprise Risk Management Increase Firm Value? *Journal of Accounting, Auditing & Finance*, 26: 641–658.

Pagach, D., and R. Warr, 2011, The Characteristics of Firms That Hire Chief Risk Officers, *Journal of Risk and Insurance*, 78: 185–211.

Mayers, David, and Clifford Smith, 1982, On the corporate demand for insurance, *Journal of Business*, 55: 281–296.

McKinsey & Company, 2012, *Manufacturing the Future: the Next Era of Growth and Innovation*, November.

Rajgopal, S., and Shevlin, T., 2002. Empirical evidence on the relation between stock option compensation and risk taking. *Journal of Accounting and Economics*, 33: 145–71.

Sengupta, Ishita and Marjorie Baldwin, 2015, *Workers’ Compensation: Benefits, Coverage, and Costs, 2013*, Washington, DC: National Academy of Social Insurance.

Smith, Clifford, and René Stulz, 1985, The determinants of firms' hedging policies, *Journal of Financial and Quantitative Analysis* 20: 391–405.

Stulz, René, 1984, Optimal hedging policies, *Journal of Financial and Quantitative Analysis* 19: 127–40.

Tufano, Peter, 1996, Who manages risk? An empirical examination of risk management practices in the gold mining industry, *Journal of Finance* 51: 1097–137.

Tufano, Peter, 1998, Agency Costs of Corporate Risk Management, *Financial Management*,27: 67–77.

Vaughan, Emmett J., 1997, *Risk Management*, New York: John Wiley & Sons, Inc.

Zou, H., 2010, Hedging Affecting Firm Value via Financing and Investment: Evidence from Property Insurance Use, *Financial Management*, 39: 965–996.

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| **Table 1****Variable Definitions** |
| Variable | Definition  | Source |
| Tobin's Q  | (Market value of equity + Book value of liabilities)/Book value of assets |  Compustat  ((PRCC\_C\*CSHO)+LT)/AT |
| Self-insurance | = 1 if the firm self-insured, 0 otherwise | Office of Self-insurance Plans, the CA Division of WC |
| Size  | ln (Book value of assets) | CompustatLn(AT) |
| ROA | Net income/assets | Compustat(NI/AT) |
| Leverage  | Book value of long-term debt/Market value of equity | Compustat [DLTT/(PRCC\_C\*CSHO)] |
| Inv\_growth  | Capital expenditure/total assets | Compustat (CAPX/AT) |
| Dividends | = 1 if the firm paid dividends in that year, 0 otherwise | Compustat (DVT) |
| Headquarter dummy | = 1 if the owner of a manufacturer is headquartered in CA | Compustat |
| Opacity | Intangible assets/total assets | Compustat (INTAN/AT) |
| Slack  | Cash and short-term investments/ total assets | Compustat (CHE/AT) |
| Subsector dummy | = 1 if the firm is affiliated with the production of wood, paper, beverage, and petroleum products | Compustat  |
| Complexity dummy | =1 if a firm has a SIC or NAICS code beyond manufacturing sector (NAICS 31-33 or SIC 20-39) | Compustat |

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| **Table 2** |
| **Descriptive Statistics** |
|  |  |  |  |  |  |
| Variable | N | Mean | Std. Deviation | Minimum | Maximum |
| Tobin's Q  |  2,300  | 2.35 | 2.50  |  0.58  |  48.84  |
| Self-insurance | 2,300 | 0.25 | 0.43 | 0.00 | 1.00 |
| Total assets  |  2,300  | 17,324 | 36,869  |  1.78  |  402,384  |
| Size | 2,300 | 8.21 | 2.05 | 0.58 | 12.91 |
| Net income  |  2,300 | 1,152 | 3,102  | -12,650 |  53,394  |
| Sales  |  2,300 | 14,405 | 28,295  | 0.00 |  262,394 |
| ROA  |  2,300 | 0.07 | 0.09  | -1.01 |  1.11  |
| Leverage  |  2,299  | 0.27 | 1.09  | 0.00 |  30.04  |
| Inv\_growth |  2,289  | 0.06 | 0.05  | 0.00  |  0.54  |
| Dividend dummy |  2,287  | 0.99 | 0.10  | 0.00  | 1.00 |
| Headquarter dummy |  2,300 | 0.39 | 0.49 | 0.00 | 1.00 |
| Opacity |  2,040 | 0.14 | 0.18 | 0.00 | 0.87 |
| Slack |  2,300 | 0.17 | 0.17 | 0.00 | 0.95 |
| Subsector dummy | 2,300 | 0.08 | 0.27 | 0.00 | 1.00 |
| Complexity dummy | 2,300 | 0.02 | 0.14 | 0.00 | 1.00 |

*Notes*: The data on publicly traded manufacturers in CA cover the years 1970 through 2015. Tobin’s Q is used as a proxy for firm value and is calculated as ([Market value of equity + Book value of liabilities]/Book value of assets). Self-insurance is a dummy variable that equals 1 if the company self-insures for that year; otherwise it equals 0. Total assets is the book value of total assets as reported in Compustat. Size is measured as the natural log of book value of total assets. ROA measures accounting performance and is equal to net income divided by total assets. Leverage is equal to the ratio of book value of long-term debt divided by market value of equity. Inv\_growth measures investment growth and is computed as capital expenditure divided by total assets. Dividend dummy equals 1 if the company paid out dividend for that year; and equals 0 otherwise. Headquarter dummy equals 1 if the owner of the manufacturer is headquartered in California; otherwise it equals 0. Subsector dummy takes the value of 1 if the firm is affiliated with the production of wood, paper, beverage, and petroleum products. Opacity is measured as the ratio of intangible assets to total assets. Slack is computed as cash and short-term investment divided by total assets. Complexity dummy takes the value of 1 if a firm has a SIC or NAICS code beyond manufacturing sector (NAICS 31-33 or SIC 20-39); otherwise it equals 0.

|  |
| --- |
| **Table 3** |
| **Comparison of Manufacturers that self-insure and Manufacturers that Do Not** **Self-insure** |
|  |
|  | Self-insurers |  | Firms that Do Not Self-insure |  |  |  |
| Variable | No. | Value  |  | No.  | Value | Mean Diff  | *p*-Value  |   |
| Tobin's Q  |  574 |  1.976 |  | 1,726  |  2.476 | -0.500 | 0.00 |  |
| Total assets  |  574 | 27,824  |  |  1,726 | 13,833  | 13,992 | 0.00 |  |
| Net income  |  574 |  1,727  |  | 1,726 |  961  | 765 | 0.00 |  |
| Sales  |  574 | 25,345  |  |  1,726 | 10,767  | 14,579 | 0.00 |  |
| Size | 574 | 9.283 |  | 1,726 | 7.859 | 1.425 | 0.00 |  |
| ROA  |  574 | 0.070  |  | 1,726 |  0.067  | 0.003 | 0.48 |  |
| Leverage  |  574 |  0.248  |  | 1,725  |  0.284  | -0.035 | 0.28 |  |
| Inv\_growth  |  574 | 0.063  |  | 1,715  | 0.056  | 0.007 | 0.00 |  |
| Dividend dummy  |  571 | 0.852  |  | 1,716  | 0.630  | 0.222 | 0.00 |  |
| Headquarter dummy |  574 | 0.380 |  | 1,726 | 0.393 | -0.014 | 0.56 |  |
| Opacity |  517 | 0.123 |  | 1,523 | 0.148 | -0.025 | 0.00 |  |
| Slack |  574 | 0.113 |  |  1,726 | 0.195 |   -0.081 | 0.00 |   |
| Subsector dummy | 574 | 0.233 |  | 1,726 | 0.028 | 0.205 | 0.00 |  |
| Complexity dummy | 574 | 0.000 |  | 1,726 | 0.025 | -0.025 | 0.00 |  |

*Notes*: Self-insurance is a dummy variable that equals 1 if the company self-insures for that year; otherwise it equals 0. Tobin’s Q is used as a proxy for firm value and is calculated as ([Market value of equity + Book value of liabilities]/Book value of assets). Total assets is the book value of total assets as reported in Compustat. Size is measured as the natural log of book value of total assets. ROA measures accounting performance and is equal to net income divided by total assets. Leverage is equal to the ratio of book value of long-term debt divided by market value of equity. Inv\_growth is computed as capital expenditure divided by total assets. Dividend dummy equals 1 if the company paid out dividend for that year; and equals 0 otherwise. Headquarter dummy equals 1 if the owner of the manufacturer is headquartered in California; otherwise it equals 0. Subsector dummy takes the value of 1 if the firm is affiliated with the production of wood, paper, beverage, and petroleum products. Opacity is measured as the ratio of intangible assets to total assets. Slack is computed as cash and short-term investment divided by total assets. Complexity dummy takes the value of 1 if a firm has a SIC or NAICS code beyond manufacturing sector (NAICS 31-33 or SIC 20-39); otherwise it equals 0. P-value is based on a t-test on difference in means.

**Table 4**

**Pearson Correlation Matrix**



*Notes*: Tobin’s Q is used as a proxy for firm value and is calculated as ([Market value of equity + Book value of liabilities]/Book value of assets). Self-insurance is a dummy variable that equals 1 if the company self-insures for that year; otherwise it equals 0. Size is measured as the natural log of book value of total assets. ROA measures accounting performance and is equal to net income divided by total assets. Leverage is equal to the ratio of book value of long-term debt divided by market value of equity. Inv\_growth is computed as capital expenditure divided by total assets. Dividend dummy equals 1 if the company paid out dividend for that year; and equals 0 otherwise. Headquarter dummy equals 1 if the owner of the manufacturer is headquartered in California; otherwise it equals 0. Subsector dummy takes the value of 1 if the firm is affiliated with the production of wood, paper, beverage, and petroleum products. Opacity is measured as the ratio of intangible assets to total assets. Slack is computed as cash and short-term investment divided by total assets. Complexity dummy takes the value of 1 if a firm has a SIC or NAICS code beyond manufacturing sector (NAICS 31-33 or SIC 20-39); otherwise it equals 0. \* denotes significance at the 5% or lower. The number of observations for each variable is the same as in Table 2.

**Table 5**

**Full Sample Maximum-Likelihood Treatment Effects Estimates (1970**–**2015)**

|  |  |  |
| --- | --- | --- |
|  | Self-insurance (Equation 2) | Q (Equation 1) |
| Self-insurance |  | -0.7755 (0.6200) |
| Size | 0.3784 (0.0931)\*\*\* | -0.1866(0.0962)\* |
| ROA |  | 7.4797 (1.6533)\*\*\* |
| Investment growth |  | 3.4327 (2.7107) |
| Leverage |  | -0.0751 (0.0456)\* |
| Dividends |  | -0.6393 (0.3081)\*\* |
| Complexity |  | -0.7931 (0.3355)\*\* |
| Headquarter | 0.6768 (0.3743)\* |  |
| Opacity | -1.9216 (0.6282)\*\*\* |  |
| Slack | -4.1047 (1.0978)\*\*\* |  |
| Subsector | 1.1620 (0.6737)\* |  |
| Constant | -3.3828 (0.8861)\*\*\* | 3.9991 (0.8744)\*\*\* |
| No. of observations | 2030 |
| No. of clusters | 66 |
| Log pseudolikelihood | -5361 |
| Wald test of independent equations | 2.16 |

*Notes*: We analyze the data using a maximum-likelihood treatment effects model that simultaneously estimate the determinants of Q and the determinants of self-insurance. Tobin’s Q is used as a proxy for firm value and is calculated as ([Market value of equity + Book value of liabilities]/Book value of assets). Self-insurance is a dummy variable that equals 1 if the company self-insures for that year; otherwise it equals 0. Size is measured as the natural log of book value of total assets. ROA measures accounting performance and is equal to net income divided by total assets. Leverage is equal to the ratio of book value of long-term debt divided by market value of equity. Inv\_growth is computed as capital expenditure divided by total assets. Dividend dummy equals 1 if the company paid out dividend for that year; and equals 0 otherwise. Headquarter dummy equals 1 if the owner of the manufacturer is headquartered in California; otherwise it equals 0. Subsector dummy takes the value of 1 if the firm is affiliated with the production of wood, paper, beverage, and petroleum products. Opacity is measured as the ratio of intangible assets to total assets. Slack is computed as cash and short-term investment divided by total assets. Complexity dummy takes the value of 1 if a firm has a SIC or NAICS code beyond manufacturing sector (NAICS 31-33 or SIC 20-39); otherwise it equals 0. Year dummies for 1970-2015 are included in Equation 1 but are not reported. Standard errors are adjusted for firm-level clustering, and reported in the parentheses. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.

**Table 6**

**Maximum-Likelihood Treatment Effects Estimates (Varying Sample Periods)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Panel A: Q Equation Results | 1970–1983 | 1984–1985 | 1986–1999 | 2000–2015 |
| Self-insurance | 1.9029(0.3913)\*\*\* | -0.5988(0.4120) | 4.0229(0.7091)\*\*\* | -1.0942(0.4795)\*\* |
| Size | -0.4487(0.1361)\*\*\* | 0.0821(0.1035) | -0.7001(0.2378)\*\*\* | -0.1444(0.1093) |
| ROA | 8.2308(1.7309)\*\*\* | 0.6845(1.2568) | 15.5497(3.1294)\*\*\* | 4.9383(1.4771)\*\*\* |
| Investment growth | 0.9966(1.9156) | 2.1742(1.2723)\* | -5.4481(3.6416) | 8.5756(5.4987) |
| Leverage | -0.0246(0.0286) | -0.5105(0.1365)\*\*\* | -0.7991(0.3775)\*\* | -0.2809(0.2109) |
| Dividends | -0.1702(0.3594) | -0.8211(0.5185) | -0.9153(0.5310)\* | -0.3931(0.2777) |
| Complexity |  |  | 0.1683(0.5544) | -0.6648(0.4446) |
| Constant | 3.8752(0.8680)\*\*\* | 1.6215(0.5301)\*\*\* | 9.4848(2.2485)\*\*\* | 3.5853(1.0061)\*\*\* |
| Observations | 439 | 68 | 539 | 984 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Panel B: Self-insurance Equation Results | 1970-1983 | 1984-1985 | 1986-1999 | 2000-2015 |
| Size | 0.3892(0.0976)\*\*\* | 0.6548(0.2301)\*\*\* | 0.3323(0.0790)\*\*\* | 0.3581(0.1276)\*\*\* |
| Headquarter | 0.4070(0.1916)\*\* | 0.7229(1.1876) | 0.1175(0.1370) | 0.8071(0.3982)\*\* |
| Opacity | -1.7974(1.4876) | -0.8681(10.5307) | -1.2058(0.4669)\*\*\* | -1.8927(0.8216)\*\* |
| Slack | 0.4183(0.4056) | -11.7669(4.7955)\*\* | -0.0994(0.4168) | -4.8562(1.2188)\*\*\* |
| Subsector | 0.7416(0.3235)\*\* | 0.6316(0.5204) | 0.6300(0.2994)\*\* | 0.7900(0.7055) |
| Constant | -3.3608(0.7898)\*\*\* | -4.9647(1.9592)\*\* | -3.1175(0.6746)\*\*\* | -3.1420(1.3614)\*\* |
| Observations | 439 | 68 | 539 | 984 |

**Notes:** In Panel A, the dependent variable is Tobin’s Q. In Panel B, the dependent variable is self-insurance. Tobin’s Q is used as a proxy for firm value and is calculated as ([Market value of equity + Book value of liabilities]/Book value of assets). Self-insurance is a dummy variable that equals 1 if the company self-insures for that year; otherwise it equals 0. Size is measured as the natural log of book value of total assets. ROA measures accounting performance and is equal to net income divided by total assets. Leverage is equal to the ratio of book value of long-term debt divided by market value of equity. Inv\_growth is computed as capital expenditure divided by total assets. Dividend dummy equals 1 if the company paid out dividend for that year; and equals 0 otherwise. Headquarter dummy equals 1 if the owner of the manufacturer is headquartered in California; otherwise it equals 0. Subsector dummy takes the value of 1 if the firm is affiliated with the production of wood, paper, beverage, and petroleum products. Opacity is measured as the ratio of intangible assets to total assets. Slack is computed as cash and short-term investment divided by total assets. Complexity dummy takes the value of 1 if a firm has a SIC or NAICS code beyond manufacturing sector (NAICS 31-33 or SIC 20-39); otherwise it equals 0. Year dummies are included in Q equation regression but not reported. Complexity is omitted in 1970-83 and 1984-85 regressions due to collinearity. Standard errors are adjusted for firm-level clustering and appear in brackets below each coefficient estimate. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.

1. In the context of this paper, “market insurance” (or traditional insurance) means insurance purchased from private carriers or state insurance funds. The difference between self-insurance and market insurance has become blurred over the years because self-insurers buy excess insurance for risk beyond what they are prepared to retain and hence do not assume all the risk, and because large deductibles are available that in effect make employers self-insurers for the amount up to the deductible limit. Thus, there is no simple dichotomy between pure self-insurance and pure market insurance when it comes to risk retention. However, discrepancies still exist between self-insurance and market insurance. Each employer’s self-insurance program must be approved by the state authorities. There is no need for such permission if an employer purchases market insurance for WC losses. In addition, under a deductible policy, the insurance company controls claims, while under a self-insurance program, the self-insurer decides how to investigate claims and have better control over the litigation process. The term “risk-financing” is used interchangeably with “risk transfer” throughout this work. [↑](#footnote-ref-1)
2. Self-insurance Institute of America, [*http://www.siia.org/i4a/pages/Index.cfm?pageID=4547*](http://www.siia.org/i4a/pages/Index.cfm?pageID=4547). [↑](#footnote-ref-2)
3. Vaughan (1997, p. 324) addresses the fact that self-insurers can exercise a greater degree of discretion regarding the claims that are paid and those that are contested. [↑](#footnote-ref-3)
4. Kwon and Grace (1996) define dangerous businesses as those in the construction, manufacturing, and transportation industries. Butler and Worrall (1991) use a risky employment variable (i.e., the proportion of employment in manufacturing and construction) to control for workplace risk in their study on moral hazard in WC losses. [↑](#footnote-ref-4)
5. The self-insurance status data on manufacturers were provided by Mr. Jon Wroten, Chief of the Office of Self-insurance Plans, on January 2, 2014. [↑](#footnote-ref-5)
6. Source: Bureau of Labor Statistics [↑](#footnote-ref-6)