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The Financial Leverage of Insurers Subject to Price Regulation: Evidence from Canada

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Abstract

The variation in the degree of price regulation in the property-liability insurance market in Canada varies across time and space, creating an opportunity to test a recurring theory in regulatory economics: that price regulated firms have higher levels of financial leverage. Using an instrumental variable for the stringency of price-regulation, this paper utilizes a panel data set of Canadian property-liability insurers over ten years of time, 1997-2006. The results support the theory but do not conclude on whether the increase in financial leverage is a strategic decision or a natural reaction to worsening business conditions brought-on by price-regulation.

Keywords: Price Regulation, Insurance, Financial Leverage, Capital Structure, Bankruptcy

JEL Codes: G22, G28, G32, G33

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1. Introduction

Rate-regulated (i.e., price-regulated) firms may alter their capital structure for strategic purposes as argued by Spiegel and Spulber (1994). The argument is one of *strategic brinksmanship*; that is, a price-regulated firm may alter its capital structure in order to increase its probability of bankruptcy with the anticipation that the regulator will be concerned about the firm's participation constraint and, therefore, not be as severe in suppressing prices since a harsh suppression would cause the firm to exit the market due to bankruptcy.

With *strategic brinksmanship*, inefficiencies are created because of the increase in the probability of bankruptcy. The inefficiencies occur because of the assumption that bankruptcy costs are positive. As the probability of bankruptcy increases, the expected bankruptcy costs increase.

This paper uses panel data from Canada to replicate a study by Klein, Phillips and Shiu (2002), on the effect of price-regulation on the financial leverage of property-liability insurers in the US.

Section 2 discusses the theoretical literature related to the determinants of capital structure, financial leverage, and the probability of bankruptcy. Section 3 discusses related empirical literature as it applies to other industries besides the insurance industry. Section 4 briefly discusses price-regulation of insurance. Sections 5, 6, and 7 cover the data sources used in this paper, the empirical specifications, and the results. Section 8 concludes.

2. Theoretical Determinants of Capital Structure

Spiegel and Spulber (1994) argue that a firm's capital structure has a significant effect on the regulated price that the firm receives from the regulator. In a three-stage bargaining game, Spiegel and Spulber (1994) find that firms will issue debt in order to increase their probability of bankruptcy and therefore force the regulator (who cares about market participation) to provide a regulated price which is not as severe as it might otherwise have been. By providing the firm with a higher regulated price, the regulator saves the firm from bankruptcy. The partition of funds between debt holders and equity holders does not, as shown by Modigliani and Miller (1958), affect the value of the firm. The issuance of debt, however, is not the only way to increase the probability of bankruptcy.

In addition to the issuance of debt, a price-regulated firm can increase its probability of bankruptcy by increasing other liabilities. By increasing its *general accounts payable*, *unearned revenue* and *other obligations*, a firm can increase its probability of bankruptcy. In specific relation to the insurance industry, liability accounts include *unpaid claims* as well as *prepaid premiums* (premium money that has been paid to the insurer which the insurer has not yet earned). An interesting question arises when recognizing that a firm can increase its probability of bankruptcy by means other than an issuance of debt securities—does the firm increase its probability of bankruptcy strategically or is it merely a natural response to worsening business conditions in which revenue is decreased because of price-regulation?

A firm facing worsening business conditions (decreased per-unit revenue because of price-regulation) might take longer to pay claims and require consumers to pay their premiums earlier in advance. It is also reasonable to think that a firm might issue debt in order to meet short-term cash-flow challenges that might result because of price-regulation.

While a number of empirical studies find a positive relationship between price-regulation and financial leverage (as discussed in the next section), the underlying theory is not conclusive enough to rule-out the possibility that an increase in financial leverage could be a reaction to worsening business conditions...especially when considering a price-regulated industry that is naturally competitive.

Spiegel and Spulber (1994), Dasgupta and Nanda (1993), and Taggart (1981) argue that firms alter their capital structure out of strategy. In addition to this argument, it is possible that firms alter their *general accounts payable* and other liabilities out of strategy as well. If a price-regulated firm expects the regulator to base its decision (the choice of regulated price) even in-part on the firm's probability of bankruptcy, the decision to alter any determinant of the probability of bankruptcy (*debt* or *payables*) could be partly strategic. Nevertheless, it does not matter for the purposes of estimating the coefficients in this paper. It does, however, matter for the interpretation of the results. Primarily, the estimation can proceed so long as financial leverage (the dependent variable) is a function of price-regulation and that price-regulation is not a function of financial leverage (i.e., no endogeneity).

It is possible, however, that price-regulation could be a function of financial leverage. Taking financial distress as exogenous (and assuming that financial leverage would then be high), it may be the case that firms increase prices as a response to their distress. If the regulator then bases its decision to regulate or not on the current price level, it could inadvertently be the case that price-regulation is a function of financial leverage.

While it is remotely possible that price-regulation could be a function of financial leverage, it is more likely that the decision to regulate prices or not is exogenous since such decision may be a political decision whereas financial distress would more likely be endogenous. Furthermore, the possibility of endogeneity is controlled for through the use of an instrumental variable which is explained in more detail in the empirical section. In short though, the variance in the cost structure of the insurance industry across space and time implies that a fixed price-regulation becomes more stringent as costs increase and less stringent as costs decrease. The instrumental variable helps control for this.

Assuming property liability insurance companies are competitive and earn zero economic profit, they might reduce their costs (and corresponding service/ product quality levels) when revenue is reduced because of price-regulation. As noted, costs could be decreased by increasing the time to pay liabilities. Increasing the average wait-time before paying a bill would increase the size of an insurer's different liability accounts and might include *unpaid claims* and *unearned premiums*.

There are efficiency losses from binding price-regulation in a naturally competitive market such as the property-liability insurance market in Canada. Regardless of whether firms respond to price-regulation strategically or as a natural business response to less revenue, efficiencies are lost. Firstly, service quality might be lowered because the insurer might adjust costs in order to offset the revenue reduction from price-regulation.² Further, an increase in the probability of bankruptcy increases expected bankruptcy costs.³ Lastly, insurers hold equity capital as a guarantee

² Although the prior-to-price-regulation equilibrium might involve a given level of service, the post-price-regulation equilibrium could involve lower service levels as price regulation would affect all insurers and all insurers would need to reduce costs.

³ If bankruptcy costs are even just fixed (that is, they don't increase/ decrease in proportion to firm size), an increase in the probability of bankruptcy necessarily increases the *expected* bankruptcy costs.

that they will be able to pay claims even if claims are larger than expected/ larger than premium revenues. One of the ways in which insurers can increase their financial leverage is to reduce their equity. If they reduce their equity, then, *ceteris paribus*, their financial quality is lowered and the resultant guarantees that they make to their insureds are less valuable. On the other hand, financial leverage can be increased by issuing more debt. If the capital structure is assumed to be competitive, without price-regulation, then the additional debt creates an additional inefficiency because of its costs. And lastly, there are inefficiencies that could result because of the inefficient price signal that binding price-regulation in a competitive market creates.

Lastly on the topic of theory, Klein, Phillips and Shiu (2002) use cross sectional data which does not provide for the possibility that firms may alter their exposure to different lines of business and/ or different jurisdictions over time (perhaps in response to price-regulation). The current paper with panel data does capture such changes.

3. Price-regulation and Financial Leverage in Other Industries

Hagerman and Ratchford (1978) investigate the impact that economic and political variables have on the allowed rate-of-return for electric utility companies. Using data from seventy-nine US electric utility companies in thirty-three states, Hagerman and Ratchford (1978) find that the financial leverage of electric utility companies (measured by debt/ equity) has a significant and positive impact on the allowed rate-of-return.

Taggart (1985) finds that the establishment of rate regulation is associated with a “discernible increase in utility debt proportions.” Taggart finds that the effect is primarily as a result of regulation’s tendency to reduce business risk but that the so called “price influence” effect of price-regulation on the choice of capital structure cannot be rejected.

Dasgupta and Nanda (1993) argue that firms increase their debt in order to increase their bargaining power with the regulator. They find evidence that regulated US electric utility companies in the period 1972-1983 increased their financial leverage when they were subject to more hostile regulatory environments.

4. Price-regulation of Insurance

Assuming that the property and liability insurance markets are competitive, Cummins (2002), inefficiencies are created through price-regulation. In the property and liability insurance markets, price-regulation might result in decreased coverage availability, lower product quality and service, higher required return on investment (due to an increase because of regulatory uncertainty), lower incentive to control costs, greater moral hazard on the part of insured consumers, and less market participation by insurers.

Even given the negative efficiencies created by price-regulation, insurance markets are still often price-regulated. Klein, Nordman and Fritz (1993) show that price-regulation is most likely during periods of time when costs are escalating.

5. Data

Data comes from two sources. Data at the observational level of the firm comes from *MSA Research Inc.* and data on the size of the residual automobile insurance market in each province (used to compose the instrument for regulatory price stringency) comes from the *Facility Association*, an unincorporated Canadian association that administers the risk-sharing pools (residual markets) in Canada for personal automobile insurance⁴. The data is similar to that used by Klein, Phillips, and Shiu (2002) with three main exceptions: (1) it is panel data for 1997-2006 instead of cross-sectional data for 1997, (2) it is for Canada instead of the US, and (3) the Canadian data does not contain information on the worker's compensation insurance market as it is monopolized by provincial governments in Canada.

Three-hundred sixteen (316) property-liability insurance companies had operations in Canada during the years 1997-2006 inclusive. This includes all property-liability insurers in the *MSA Research Inc.* data set regardless of the type of property-liability insurance products they sold. Some of the 316 insurers entered after 1997 and some left the market during this ten-year period of time. As such, this data set was originally unbalanced; all observations not present for the entire ten-year period of time have been dropped. The selection/attrition bias is briefly addressed in the Results and Conclusion sections of the paper. After dropping firms that were not present for the entire ten year

⁴ The risk-sharing pools (a.k.a. residual markets) in Canada are organized as a last resort for consumers who cannot get coverage from competitive insurers. The *Facility Association* then shares the losses and/ or gains from the pool among insurers (thus creating the possibility for subsidies to flow from lower-risk consumers to higher-risk consumers).

period of time, only one-hundred-thirty-two (132) firms remained. Over ten years, this amounts to 1320 observations.

6. Empirics

The theory tested is that firms with greater price control have higher levels of financial leverage. An instrumental variable for the stringency of price-regulation is first introduced. Fixed-effects for each firm are used to control for idiosyncrasies that are not captured by the data points available and dummy variables are used to control for each of the years in the panel.

The instrumental variable for price-regulation is replicated from Klein, Phillips, and Shiu (2002) as follows⁵,

$$\text{REGSTRINGENCY}_{ik} = \sum_{j=1}^{11} \frac{\text{RSIZE}_{jkm} \times \text{NPW}_{jmi}}{\text{NPW}_{ik}}$$

Where $\text{REGSTRINGENCY}_{ik}$ is the instrumental variable for the stringency of price-regulation experienced by each i insurer in each k year. RSIZE_{jkm} is the variable for the size of the residual automobile insurance market (denoted by m) for each j province in each k year. NPW_{jmi} is the variable for *net premiums written* for each i insurer in each j province's automobile insurance market (denoted by m). NPW_{ik} is the variable for net-premiums-written for each i insurer in all lines of business (including automobile insurance) for each k year. Binding price-regulation in the automobile insurance market will be positively correlated with the size of the residual automobile insurance market. Furthermore, it will also be positively correlated with rising costs (even as binding price-regulations remain fixed).

⁵ Note that the Northwest Territories, Nunavut, and the Yukon have been joined into one j province/ territory because of data limitations.

The risk-sharing pools (a.k.a. residual markets) for automobile insurance in Canada and the US are generally the last resort for consumers who desire to purchase automobile insurance but for whom competitive insurers will not provide coverage. As the stringency of price-regulation increases (description: for more consumers and for more companies, the regulated price is below cost)⁶ the size of the residual market (in that province) will increase and the instrumental variable for price-regulation (for the firms affected) will also increase.

The instrumental variable for the stringency of price-regulation is more efficient than the actual price vector chosen by the regulator since it also varies in response to the cost structure in each province in each year. For insurance, the cost structure is largely composed of costs to pay claims. For claims related to liabilities, these claims costs can vary from year to year and province to province (given that each jurisdiction can have different tort/ no-fault legal jurisdictions and/ or different precedents for the indemnification of injured parties and that these factors can change over time). Given that the legal/ tort system is not set or chosen (generally) as a function of the insurance market, the instrumental variable is more efficient than the use of a vector of regulated prices.

As discussed in section 2, a firm's financial leverage can increase because of an issuance of debt, a decrease in equity, or an increase in other liabilities including *unpaid claims*, *prepaid premiums*, and *general accounts payable*. These theories are tested in multiple model specifications that all involve fixed-effects at the firm-level, dummy variables for the years, and adjusted standard errors for each of the one-hundred-thirty-two (132) insurance company clusters.

Dependent Variables

Six specifications with different dependent variables are used to test the theory. The most straightforward variable is the ratio *total liabilities/ total equity*. *Total equity* was used instead of *total surplus* (as was used by Klein, Phillips, and Shiu (2002)) because the data source's definition of surplus changed in 2003—as such, the variable for *surplus* would have been inconsistent over the time-period analyzed.⁷

⁶ NB: Consumers of automobile insurance typically face differentiated costs based on their risk-type.

⁷ According to MSA Research Inc., *statutory surplus* was defined as: [*Assets- Liabilities- Reserves Required*] prior to 2003 when it was discontinued and replaced with *adjusted equity* defined as: [*Total Equity - Capital Required for Catastrophes and Reinsurance Ceded to Unregistered Insurers.*]

The second variable is the ratio *total liabilities/ liquid assets*. The estimated coefficient is expected to be larger than it will be for *total liabilities/ total equity* since *liquid assets* can be liquidated and adjusted faster than other assets.

The third dependent variable is the ratio *unearned premiums/ equity* and is expected to increase with the stringency of price-regulation as price-regulated insurers may demand/ require more premiums be paid in advance by their consumers.

The fourth dependent variable is the ratio *unpaid claims/ equity* and is expected to increase with regulatory price stringency since insurers may take a longer time to pay claims as a means of increasing financial leverage and/ or responding to worsening business conditions brought on by price-regulation.

The fifth dependent variable is the ratio *payables/ equity* where *payables* is defined as money owing to Agents, Brokers, Policyholders, Other Insurers, Subsidiaries and Affiliates. The *payables/ equity* variable is similar to the second, third and fourth dependent variables but more broad.

The sixth and final dependent variable is the ratio *total net premiums written/ equity* and is particular to the insurance industry.

Independent Variables

The only variable used for regulatory price stringency is the $REGSTRINGENCY_{ik}$ variable identified above.

Fixed-effects for the individual firms as well as dummy variables for the years help to control for unobserved variance. Klein, Phillips, and Shiu (2002) use four different dummy variables to control for firm-characteristics which are not replicated in this paper given that fixed-effects are used to control for firm-specific unobserved variation.

Some of the variables used by Klein *et al.* were not replicated in this paper because the data did not exist or did not span the entire period of time considered. These variables include the non-debt tax shield variable, volatility of

earnings, Herfindahl indexes, free cash flow variable, average maturity of liabilities, and variables meant to control for risky investment strategies.

The variable *return on assets* is used as a control variable since firms with higher profits may have more equity and, therefore, lower financial leverage. Likewise, the *natural log of assets* was used in order to control for the possibility that larger firms may have a lower probability of bankruptcy because of their size and might therefore have higher levels of financial leverage.

Table 1. Summary Statistics

Summary statistics based on all observations from the 132 (balanced) Canadian property-liability insurers in the panel data set over the time period 1997-2006 inclusive. 1320 observations in total. Dummy variables for years have been omitted to save space. Data from *MSA Research Inc.*

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
<i>Dependent Variables</i>					
Total Liabilities to Equity	1320	2.179	1.959	-0.106	12.66
Total Liabilities to Liquid Assets	1320	0.628	0.324	-0.17	2.184
Unearned Premiums to Equity	1320	0.634	0.653	-0.626	3.971
Unpaid Claims to Equity	1320	1.300	1.312	0	12.622
Total NPW to Equity	1320	1.130	4.576	-1.264	164.034
<i>Regulatory Variable</i>					
Regulatory Stringency	1320	0.147	0.026	-0.162	0.261
<i>Control Variables</i>					
Return on Assets	1320	0.029	0.1	-1.897	1.291
Natural Log of Assets	1320	11.634	1.955	6.314	15.648
The negative values of the various variables are a result of accounting procedures and are still valid for the analysis.					

7. Results

The primary fixed-effects regression results are in Table 2 while OLS regression results showing the effect of regulatory price stringency on the various components of the dependent variables (without controls for fixed-effects or year effects) are in Table 3. Table 3 may be useful in interpreting Table 2.

Table 2. Results, Fixed-Effects Regression Analysis

Results based on all observations from the 132 (balanced) Canadian property-liability insurers in the panel data set over the time period 1997-2006 inclusive. 1320 observations in total. Dummy variables for the years and firm-specific fixed-effects have been omitted to save space. Standard Errors have been adjusted for 132 clusters. Data from *MSA Research Inc.*

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
	Liabilities to Equity	Liabilities to Liquid Assets	Unearned Premiums to Equity	Unpaid Claims to Equity	Total NPW to Equity
Regulatory Stringency	10.537 (2.15)**	0.748 (1.54)	3.675 (2.59)**	4.998 (1.67)*	-0.207 (-0.06)
Return on Assets	-1.675 (-2.35)**	-0.185 (-2.63)***	-0.332 (-2.82)***	-1.365 (-2.26)**	12.526 (0.95)
Natural Log of Assets	0.519 (4.41)***	0.083 (4.69)***	0.115 (3.12)***	0.361 (4.51)***	-0.436 (-0.79)
Constant	-4.009 (-3.02)***	-0.335 (-1.67)*	-0.764 (-1.81)*	-2.957 (-3.27)***	5.605 (0.94)
Observations	1320	1320	1320	1320	1320
Number of Insurers	132	132	132	132	132
R-squared	0.16	0.15	0.13	0.12	0.07
Robust t statistics in parentheses					
* significant at 10%; ** significant at 5%; *** significant at 1%					

The results show support for the theory that firms increase their financial leverage when faced with stringent price-regulation. Specification 1 supports the theory that insurance firms with higher levels of stringent price-regulation have higher levels of financial leverage. Specification 2's estimated coefficient for the regulatory stringency variable is not significant (the reason for this is not known).

Specification 3 supports the theory and suggests that firms request/ require their consumers to pay their premiums farther in advance than they do in the absence of binding price-regulation. This is confirmed by noting in Table 3 that *total equity* is positively correlated with *regulatory stringency*. *Unearned premiums* may be increasing because of strategy or as a natural reaction to worsening business conditions—the results are not conclusive in identifying the motivation for the change (strategic or natural response).

Table 3. OLS Regression Results

OLS results (without fixed-effects or dummy variables for years) based on 1320 observations (ten years of pooled data from all 132 firms). Data from *MSA Research Inc.*

	Total Liabilities	Total Equity	Liquid Assets	Unearned Premiums	Unpaid Claims	Total NPW
Regulatory Stringency	4,868,015	1,073,170	4,948,130	1,330,708	3,088,357	2,075,254
	(8.10)**	(4.93)**	(7.15)**	(7.25)**	(7.80)**	(7.32)**
Constant	259,889	111,888	334,483	73,620	162,922	121,868
	(14.31)**	(17.00)**	(15.91)**	(13.27)**	(13.61)**	(14.23)**
Observations	1320	1320	1315	1320	1320	1320
R-squared	0.05	0.02	0.04	0.04	0.04	0.04
Absolute value of t statistics in parentheses						
* significant at 5%; ** significant at 1%						

Specification 4 (Table 2) supports the theory and suggests that insureds may receive their claim money later than they would without binding price-regulation. Table 3 shows that the coefficient on unpaid claims is much larger than that on total equity and that both are positively correlated with regulatory price stringency, confirming that unpaid claims do actually increase as a result of binding price-regulation. Nevertheless, the results are not conclusive since it may be the case that the absolute number of accidents that an insurer adjusts might increase with price-regulation. It is quite possible that in a price-regulated market the inefficient price signal may encourage more motorists to enter the market. As such, there may be more accidents to adjust and insurers may not be able to adjust them in as timely a way as they might otherwise (over the short term, until they can hire and train more adjusters). Combined with worsening cash flows, insurers may take longer to pay claims because they have more work to do and less revenue to do it with.

Specification 5 (in Table 2) is insignificant and therefore neither supports nor disproves the theory. Although Klein, Phillips and Shiu (2002) found support for a relationship between binding price-regulation and the ratio *premiums/surplus*, the insignificance of the result in this estimation is more likely due to Canadian solvency regulations rather than theory. The Office of the Superintendent of Financial Institutions (OSFI) for Canada regulates capital requirements for federally regulated property-liability insurance companies and requires that insurers hold a margin that is a linear function of *unearned premiums* (OSFI Minimum Capital Test, 2003, p. 18). Since the margin would be linearly associated with *equity* and since *unearned premiums* is linearly associated with *total premiums*, it is not surprising that Specification 5 is not significant. In short, federal regulations governing

solvency of property-casualty insurers restrict the relationship between premiums and equity and may likely account for the insignificance of the result in Specification 5.

In specifications 1-4, the coefficient for the *return on assets* variable is significant and negative, controlling for the possibility that firms with high profitability are more likely to have more *equity*. Also, the coefficient on the variable for the *natural log of assets* is as expected; it supports the theory that larger firms have lower (unitary) bankruptcy costs and/ or lower expected probabilities of bankruptcy and can, therefore, have higher financial leverage ratios.

It is worth noting that Canadian property-liability insurers are restricted in their ability to use debt obligations to finance their operations. *The Insurance Companies Act* combined with the *Property and Casualty Companies Borrowing Regulations* restrict insurers from having debt obligations which, in total, would be greater than two percent of the company's assets.⁸ This lends some support to the position that the increase in financial leverage is a natural response to worsening business conditions (brought on by price-regulation) rather than a strategic action on the part of insurers to counter the ability of the regulator to be stringent.

It is worth noting that there is likely a bias in this estimation and the one conducted by Klein, Phillips and Shiu (2002). The attrition/ selection bias that occurs is such that if it was corrected for, the coefficients for the regulatory stringency variable would likely be larger. Since price-regulation impacts the probability of bankruptcy, it would be correct to assume that some firms exit the market (at least in-part) because of binding price-regulation. When firms exit the industry because of price-regulation, their financial leverage number does not show-up in the data set; thus, a selection bias is likely present. It is likely that the coefficients for regulatory stringency would be larger since it is highly likely that firms which are about to go bankrupt would have very high levels of financial leverage. This selection bias does not change the qualitative results, but it does bias the quantitative results. The empirical correction for this selection/ attrition bias is left for future research.

⁸ Insurance Companies Act, Section 476; Property and Casualty Companies Borrowing Regulations, Section 7.

8. Conclusions

This brief paper has replicated Klein, Phillips and Shiu (2002) using Canadian panel data and found similar results. Although the effect of binding price-regulation on the financial leverage ratios of insurers is positive and significant, the interpretation of these results is not conclusive as two possible explanations exist. Insurers may increase their financial leverage strategically in order to mitigate the ability of the regulator to cut prices (strategic brinksmanship), and/ or, insurers may have increasing financial leverage ratios as a natural reaction to lowered revenue due to price-regulation. Either way, there are inefficiencies that are created because of binding price-regulation in this market.

A bias was also identified that is likely present in both this and Klein, Phillips, and Shiu (2002). Although the bias does not negate the qualitative results, it implies that the effect is likely stronger than estimated.

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