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The General-Liability Reform Experiments and the Distribution of Insurance-Market Outcomes

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Many states enacted tort liability-reform laws in the late 1980s to limit liability costs and stabilize insurance markets. This article uses firm-level data from two states that enacted reforms over the 1984–1991 period—New York and Colorado—to assess the effect of reforms on general-liability insurance. The liability-insurance performance in Pennsylvania and Kentucky—two states that did not adopt reforms—provides a reference point for how insurance markets might have performed otherwise. The quantile regression models indicate that the improvement in insurer profitability was substantial. This improvement, however, appears to be largely attributable to a secular trend rather than to the effect of liability reforms.

KEY WORDS: Insurance; Liability; Quantile regression.

In the mid-1980s, the insurance industry underwent a particularly acute crisis that entailed more than a cyclical swing arising from interest-rate fluctuations. The courts had greatly expanded the circumstances under which the firms could be found liable for injuries. The emergence of mass toxic torts (e.g., asbestos) and the rise of design-defect and hazard-warning cases greatly extended the domain of tort liability. As was reviewed by Viscusi (1990, 1991) and the American Law Institute (1991), liability-insurance purchasers faced a tripling of premiums over the 1984–1986 period, as well as denials of insurance coverage. Writing insurance became unprofitable because losses greatly exceeded the value of insurance premiums. When interest rates fell, insurance companies were no longer able to offset inadequate premium rates with investment income.

The insurance-market disruptions in the mid-1980s generated substantial pressure for states to enact reforms to restrict the role of liability. Although some states undertook such reforms in 1985, it was in 1986 that there was a widespread effort to restructure state liability laws. These reform efforts consisted of measures designed to restrict the circumstances under which firms could be found liable and to reduce the amount of damages defendants were required to pay. Reforms to limit damages were more prevalent because widespread publicity given to the multimillion-dollar tort liability awards focused public attention on the perceived excesses of the court system.

The main matter of interest is the effect of liability reforms on insurance markets in two states that adopted reforms in 1986, New York and Colorado. We will compare the performance of insurance in these reform states with two states—Pennsylvania and Kentucky—that did not enact tort reforms. In particular, we will examine the effect of liability reforms on the distribution of insurance-market outcomes for the general-liability line. This insurance is purchased by businesses for product liability or accidents occurring on business property. To explore these issues, we will introduce into the insurance literature the use of quantile regressions to distinguish the effects of liability reforms on different segments of the market.

After introducing the sample in Section 1, we present the quantile regression results for the main measure of insurance profitability—loss ratio—in Section 2. As we indicate in the concluding Section 3, the market improvements seem to be largely attributable to the influence of secular trends rather than liability reforms.

1. LIABILITY REFORMS AND SAMPLE DESCRIPTION

1.1 Nature of the Liability Reforms

The surge in liability costs from 1984–1986 led several different states to enact liability reform measures. Although these efforts were spread across the 1985–1987 time period, most of these reforms were concentrated in 1986, the last year in which there was a national liability-premium surge.

This article considers the reform laws of two states, New York and Colorado, because these states enacted relatively discrete reform efforts in 1986, thus facilitating the empirical analysis of their effect on insurance-market performance. In contrast, states such as Florida enacted a wide range of liability reforms that cut across several years, making analysis of the effect of these reforms on insurance-market outcomes more difficult. Liability-law reform has occurred at the state

rather than the federal level, so individual states are our unit of analysis.

New York's liability reforms were most concentrated. For our sample period 1984–1991, the only general-liability reform measures enacted in New York took place in 1986. The liability-reform legislation enacted in that year affected both the circumstances under which plaintiffs could receive compensation and the character of compensation they could receive (NY SB 9391). The two liability-law features targeted by the reform were those that figured most prominently in the national tort liability reform debate—joint and several liability and collateral-source rules. Joint and several liability provides for sharing in the liability costs among all responsible parties, including damage amounts by other parties that are insolvent. The New York reforms limited joint and several liability so that defendants who were 50% or less at fault could be found to be severally liable for noneconomic damages, which is to say that they would have to pay their share based on their degree of responsibility, but they would not be responsible for paying the losses attributable to the actions of other parties.

The other major component of the New York liability law pertains to various aspects of damages and attorneys' fees. Perhaps the most important was the treatment of collateral sources. Victims of accidents often receive compensation from a variety of sources other than tort liability judgments, such as disability compensation and health-insurance benefits. Under the New York reforms, the litigants could now introduce evidence and obtain an offset of collateral benefits received by the accident victim, with the only exception being that workers' compensation benefits may not be offset.

The reforms in Colorado also were concentrated in 1986. In Colorado, however, there was some anticipation of the joint and several liability reforms in an act (CO HB 1231) put into place in 1985, and there was some refinement of the 1986 reforms in a minor revision (CO HB 1184) that was enacted in 1987. The major reform effort undertaken by Colorado took place in 1986, however, and was quite sweeping in its scope. The act completely abolished joint and several liability (CO SB 70) so that defendants would only be liable for their proportional share of the negligence. Noneconomic damages for pain and suffering, which typically average one-third or more of all product liability awards, were capped at $250,000. The Colorado law also reduced awards by the amount of all collateral sources, including such compensation as health insurance and workers' compensation.

The reform measures in both states decreased the circumstances under which plaintiffs will prevail and reduced damages amounts for cases won by plaintiffs. The expected result is that these reforms should reduce liability costs and increase insurers' profitability. Moreover, to the extent that these limitations pertain to aspects of liability law most closely associated with very large losses—punitive damage awards, pain and suffering, and joint and several liability—one would expect the effect of these liability reforms to differ across various segments of the insurance market. The empirical analysis will distinguish these differences.

When making our assessment of the influence of the liability reforms, we will analyze not only the within-state influence of these reforms, but we will make across-state comparisons as well. In particular, there were four states that did not adopt general-liability reforms in the mid-1980s—Pennsylvania, Kentucky, Arkansas, and North Carolina. Pennsylvania has geographical proximity to New York, and it is also a large insurance market and Kentucky has an insurance market of roughly comparable size to that of Colorado.

1.2 Sample Description

The data set used for the analysis will be the files of the National Association of Insurance Commissioners. These data provide information on premiums and losses by state by firm over the years 1984–1991. The unit of observation is the insurance performance by company, by line, by state, in each year. Because companies report this information as part of the ratemaking process, the data set includes information on every firm writing insurance in Colorado, New York, Pennsylvania, and Kentucky over that time period. These data represent the most refined data base available because it differs quite starkly from the usual insurance-literature data base of statewide averages for all firms writing insurance. Because our analysis is concerned with reforms and general-liability laws, we restrict our analysis of insurance lines to general-liability-insurance data.

Table 1 summarizes the sample characteristics for the general-liability (G.L.) sample. For New York, there is information on 241 firms in each of the eight years, and for Colorado there is information on 179 firms. Because the various regression models will include a lagged dependent variable and firms are not in the sample in all years, the number of observations will be 1,684 for the New York sample, 1,254 for Colorado, 1,774 for Pennsylvania, and 1,247 for Kentucky.

The data set includes company data on the key insurance magnitudes of interest, notably the dollar value of premiums earned and the dollar value of losses incurred. Loss development factors based on *A. M. Best's Aggregates and Averages* are used to calculate the ultimate value of these losses. Using these data, we calculate the value of the loss ratio (LR), or

$$\text{LR} = \frac{\text{losses incurred}}{\text{premiums earned}}. \tag{1}$$

The LR, which can be viewed as the inverse of the ex post price of insurance, is the principal measure of insurance profitability used throughout the insurance-economics literature. An LR below 1.0 indicates that the firm is making an underwriting profit with premiums in excess of losses. It is still possible for a firm to be profitable with an LR above 1.0 because premiums are invested and there is a lag time before losses must be paid.

The level of the insurance variables reflects the greater scale of operations in the state of New York. The other variables in Table 1 pertain to liability reform, rate regulation, and the rate of interest. The liability-reform variable assumes a

Table 1. Sample Statistics 1985–1991 for NAIC General-Liability Insurance Sample

	Mean (standard deviation)			
Variable	*New York*	*Colorado*	*Pennsylvania*	*Kentucky*
G.L. premiums earned$_t$	9,272,918.50	1,070,545.50	3,824,827.84	818,392.45
	(29,312,644.00)	(2,749,548.06)	(11,017,971.21)	(1,921,604.23)
G.L. losses incurred$_t$	7,122,371.21	824,921.08	2,761,166.95	446,825.20
	(20,236,237.00)	(2,328,688.46)	(7,922,076.16)	(1,073,032.40)
G.L. loss ratio$_t$	.768	.771	.722	.546
	(.845)	(1.324)	(.817)	(.702)
Reform	.863	.855	.000	.000
	(.344)	(.352)	(.000)	(.000)
Number of companies (average)	241	179	253	178
Number of observations	1,684	1,254	1,774	1,247

value of 1 beginning in the year of the reform and a value of 0 earlier. Just over 70% of the observations for New York and Colorado are in the post-liability-reform era.

One key variable that did not vary over time but did vary across states pertains to the price regulation regime in place in a particular state. New York and Pennsylvania had noncompetitive rate-regulation regimes. The Pennsylvania insurance regulations require prior approval of rates, and New York had a regulatory system that required prior approval of major rate changes. In contrast, Colorado and Kentucky have relatively less stringent regulations that require either filing of the rate change with the regulatory bureau after it is used (Kentucky) or being able to use the new rate immediately after it is filed (Colorado).

2. EFFECT ON LOSS RATIOS

A primary objective of liability reforms was to stabilize insurance markets and limit the cost imposed by liability. To obtain an overview of these profitability trends and their distribution, consider the data in Tables 2, 3, and 4 which provide loss-ratio information for the mean, median, and the 75th percentile for each state. LR's pertain to the level of losses incurred relative to premiums earned and serve as a measure of the inverse of the price of insurance. The main difference is that this price is observed on an ex post basis after the losses for a policy have been generated.

There is considerable variation in the LR values over time and across the market. In the case of New York, the mean LR dropped from 1.46 in 1984 to .82 in 1991. The median LR exhibited a similar decline, and the LR at the 75th percentile of the LR distribution exhibited an even starker decline from its extremely high 1984 level of 2.28. The other reform state, Colorado, also exhibited a substantial decline in the mean LR, as did the 75th percentile of the LR distribution, each of which was in excess of 2.10. The median LR, which was below 1.0 in 1984 in Colorado, also exhibited a decline over the time period.

Even the nonreform states had substantial declines in the LR over the 1984–1991 period. Pennsylvania, for example, experienced a decline in the mean LR of 1.62 to .82 from 1984–1991, and there was also a substantial LR decline in Kentucky. In every case, the 75th percentile of the LR distribution is extremely high but exhibits a decline to a value in the vicinity of 1.0 by 1991. The sources of improvement in the values of the LR include not only the effect of tort liability reforms but also changes in the economy more generally. In particular, with the decline of interest rates in the mid-1980s, premium investments earned a lower rate of return so that the rate competition that took place during the early 1980s was no longer profitable.

To analyze these relationships more formally, we will adopt the following autoregressive model of the general form

$$\begin{aligned} LR_{it} = {} & \beta_0 + \beta_1 LR_{it-1} + \beta_2 \text{ reform}_t \\ & + \beta_3 \log \text{ state aggregate income of firm's state}_i \\ & + \beta_4 \text{ state}_i + \beta_5 \text{year}_t + \epsilon_1, \end{aligned} \tag{2}$$

Table 2. Mean Loss Ratios for General-Liability Insurance in the Four-State Sample

	Mean loss ratio			
Year	*New York*	*Colorado*	*Pennsylvania*	*Kentucky*
1984	1.461	2.144	1.615	1.089
1985	1.390	1.393	1.394	.888
1986	.792	.891	.825	.618
1987	.695	.611	.604	.464
1988	.558	.626	.580	.505
1989	.711	.713	.599	.527
1990	.715	.681	.628	.503
1991	.822	.747	.823	.582

Table 3. Median Loss Ratio for General-Liability Insurance in the Four-State Sample

	Median loss ratio			
Year	*New York*	*Colorado*	*Pennsylvania*	*Kentucky*
1984	1.235	.978	1.031	.780
1985	.974	.721	.777	.609
1986	.671	.464	.576	.497
1987	.574	.458	.472	.435
1988	.471	.383	.462	.363
1989	.488	.405	.423	.385
1990	.466	.425	.415	.429
1991	.626	.522	.479	.527

Table 4. 75th-Percentile Loss Ratio for General-Liability Insurance in the Four-State Sample

	75th-percentile loss ratio			
Year	New York	Colorado	Pennsylvania	Kentucky
1984	2.283	2.105	2.058	1.604
1985	1.644	1.597	1.606	1.451
1986	1.150	.853	1.021	.784
1987	1.049	.792	.864	.759
1988	.867	.843	.824	.720
1989	.990	.823	.839	.715
1990	.969	.862	.863	.802
1991	1.192	1.177	.996	1.067

where the reform variable is a 0–1 dummy variable that assumes a value of 1 beginning in 1986 and i indexes firm i so that, for example, state_i is the state dummy variable for the state in which firm i operated. We estimate variants of this equation for the pooled sample of four states. The inclusion of the lagged dependent variable controls for firm-specific effects regarding the mix of policies insured in the particular state, which reflects both the character of the state's liability regime and the riskiness of the firms being insured in that state. Although the state dummy variable captures state-specific effects, changes in state insurance-market characteristics will be captured in the lagged-dependent variable. The mix of policies in a state will affect the subsequent profitability of insurance unless there is a change in the state's legal regime or in the nature of the operations of firms being insured. The time dummy variables capture cyclical effects, such as interest-rate fluctuations, which will affect the pricing of insurance.

Although LR equations estimated by ordinary least squares OLS will provide an overall assessment of the effect of liability reforms on the insurance market, our principal concern is with the effect on different segments of the market. To explore these issues, we will use quantile regression models to analyze the factors influencing LR's at different quantiles of the loss distribution. This approach, which is based on the work of Koenker and Bassett (1978, 1982), Chamberlain (1991), and Buchinsky (1994), considers the effect of a vector of explanatory variables x on the conditional distribution of the dependent variable, which in this case is the LR. The pertinent regression equation for the τth quantile of LR can be characterized by

$$\text{quant}_\tau(\text{LR} \mid x) = \beta_\tau' x, \tag{3}$$

where the vector of coefficients to be estimated for the τth quantile is denoted by β_τ. To estimate the value of β for

Table 5. Direct and Long-Term Effects of Reform on Loss Ratios With State and Year Effects (bootstrap standard errors in parentheses)

	(1)	(2)	(3)	(4)	(5)	(6)
Variables included in the model	Direct effects state effects	Long-term effects state effects	Direct effects year effects	Long-term effects year effects	Direct effects state & year effects	Long-term effects state & year effects
Intercept	2.555*	2.555*	1.816*	1.837*	2.556*	2.551*
	(.411)	(.413)	(.146)	(.147)	(.597)	(.599)
LR_{t-1}	.008*		.008*		.008*	
	(.001)		(.001)		(.001)	
Reform	−.437*	−.446*	.188*	.191*	−.025	−.012
	(.223)	(.224)	(.113)	(.114)	(.290)	(.292)
Log state aggregate income	−7.1E−6*	−6.9E−6*	7.0E−7*	7.9E−7*	−4.8E−6	−4.5E−6
	(2.0E−6)	(2.1E−6)	(4.2E−7)	(4.3E−7)	(3.3E−6)	(3.3E−6)
Dummy variable Colorado	−.501	−.487			−.539	−.522
	(.429)	(.431)			(.582)	(.584)
Dummy variable New York	1.850*	1.856*			1.139*	1.101*
	(.318)	(.319)			(.533)	(.535)
Dummy variable Kentucky	−1.033*	−1.026*			−.696	−.666
	(.333)	(.334)			(.506)	(.509)
1986			−.395*	−.409*	−.233	−.254
			(.194)	(.195)	(.235)	(.236)
1987			−.786*	−.806*	−.577*	−.605*
			(.194)	(.195)	(.237)	(.238)
1988			−.970*	−.991*	−.695*	−.726*
			(.192)	(.193)	(.245)	(.246)
1989			−1.046*	−1.074*	−.697*	−.738*
			(.191)	(.192)	(.261)	(.262)
1990			−.952*	−.970*	−.540*	−.574*
			(.192)	(.193)	(.281)	(.282)
1991			−.803*	−.811*	−.355	−.379
			(.194)	(.194)	(.294)	(.296)

NOTE: Asterisks denote coefficients that are statistically significant at the 95% confidence level, one-tailed test.

Table 6. Quantile Regression Results: Department Variable = Loss Ratio (bootstrap standard errors in parentheses)

Variables included in the model	OLS	.10	.25	.50	.75	.90
Intercept	2.556*	.260*	.497*	.915*	1.738*	3.525*
	(.597)	(.065)	(.072)	(.105)	(.265)	(1.015)
LR_{t-1}	.008*	.000	.000	.006	.040	.184*
	(.001)	(.003)	(.006)	(.017)	(.043)	(.092)
Reform	−.025	−.101*	−.105*	−.152*	−.018	−.018
	(.290)	(.040)	(.049)	(.078)	(.188)	(.701)
Log state aggregate income	−4.8E−6	−5.2E−7	−7.1E−7*	−8.6E−7*	−1.2E−6	−3.9E−6
	(3.3E−6)	(3.2E−7)	(4.3E−7)	(5.1E−7)	(1.2E−6)	(4.9E−6)
Dummy variable Colorado	−.539	.006	−.052	−.020	−.160	−.498
	(.582)	(.066)	(.072)	(.101)	(.287)	(.999)
Dummy variable New York	1.139*	.213*	.248*	.360*	.334	1.234
	(.533)	(.056)	(.086)	(.120)	(.251)	(1.043)
Dummy variable Kentucky	−.696	−.094*	−.149*	−.176*	−.252	−.676
	(.506)	(.051)	(.066)	(.083)	(.199)	(.805)
1986	−.233	−.035	−.054*	−.201*	−.625*	−.876*
	(.235)	(.023)	(.030)	(.061)	(.127)	(.417)
1987	−.577*	−.031	−.099*	−.285*	−.730*	−1.429*
	(.237)	(.024)	(.027)	(.060)	(.111)	(.416)
1988	−.695*	−.044*	−.105*	−.340*	−.808*	−1.660*
	(.245)	(.025)	(.029)	(.059)	(.118)	(.421)
1989	−.697*	−.052*	−.113*	−.333*	−.765*	−1.556*
	(.261)	(.026)	(.032)	(.063)	(.115)	(.437)
1990	−.540*	−.050*	−.104*	−.303*	−.706*	−1.533*
	(.281)	(.024)	(.033)	(.070)	(.117)	(.453)
1991	−.355	−.015	−.038	−.208*	−.487*	−.962*
	(.294)	(.029)	(.038)	(.065)	(.140)	(.461)

NOTE: Asterisks denote coefficients that are statistically significant at the 95% confidence level, one-tailed test.

each of the τth quantiles, we used a least absolute deviations estimator given by

$$\min_{\beta} \frac{1}{n} \sum_{i=1}^{n} [\tau\rho(\mathrm{LR}_i \geq \beta' x_i) + (1-\tau)\rho(\mathrm{LR}_i < \beta' x_i)]|\mathrm{LR}_i - \beta' x_i|, \quad (4)$$

where n is the sample size, i denotes insurance firm i, and ρ is an indicator function that takes on a value of 1 provided that the event characterized by the specified inequality in Equation (4) holds and 0 if it does not. We used a bootstrap estimator (see Buchinsky 1994) to calculate the value of the asymptotic standard errors associated with the coefficients.

Table 5 reports a series of different OLS equation specifications. Equation (1) reports the equation with the explanatory variable set and the state dummy variables, and Equation (2) omits the lagged dependent variable. In each case, the liability-reform variable has a significant negative effect. If one omits the state-specific effects and adds the year effects in Equations (3) and (4), the liability-reform effect becomes positive. The results obtained, including both state and year effects in Equations (5) and (6), suggest that the effect of the reforms appears to be largely due to the influence of a more general secular trend. Once this trend is accounted for, there is no reform effect.

The pattern exhibited by the time-dummy variables is also of interest. All temporal effects beginning in 1986 are negative and statistically significant when 1985 is the omitted year. The post-reform shift in insurance-market forces could be due to changing insurance-market conditions or it may be attributable to the general effects of the liability-reform effort even in states that did not adopt explicit legislative reforms. The finding that state differences in liability-reform measures appear to be inconsequential does not imply that a more general shift in the liability climate did not influence insurance-market profitability.

To explore possible differences in the reform effects across the insurance-market distributions, Table 6 reports the quantile regression results for the analog of Equation (5) in Table 5. Both year-specific and state-specific effects are included. The reform variable is negative and statistically significant for three of the five quantiles—.10, .25, and .50. Whereas one might have expected the least profitable firms at the upper end of the loss-ratio distribution to be most affected by the reforms, for this sample the most profitable firms appear to have experienced the greatest improvement. The magnitude of the effects remains, however, considerably below the findings one obtains without the year-specific dummy variables. Secular improvements in insurance-market profitability that are uncorrelated with the liability reforms appear to be most influential.

3. CONCLUSION

The enactment of the liability reforms was followed by a period of enhanced insurance-firm profitability. Most of the

decreased losses and improved profitability reflected time-related changes in the insurance markets that were shared by states that did not adopt tort liability reforms. Indeed, in the OLS results, the inclusion of the time-specific effects eliminated the reforms effect. These results suggest that one should be cautious in attributing the improvement in insurance-market performance since the mid-1980s to state differences in tort liability reforms. One cannot, however, rule out the role of a more general shift in the liability climate that occurred even in states without explicit reform efforts.

The quantile regression results also illuminated the character of the liability-reform effects and the segments of the market that were most affected. Liability reforms appeared to exert a modest effect in improving the profitability of firms at the middle and high end of overall profitability. This pattern of influence is somewhat unexpected because one might have thought that the least profitable firms would have benefitted most. The quantile regression model also suggested that if there were a liability reform effect, it apparently was not marketwide but was restricted to the more profitable segment of insurance companies.

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