The Performance of the Liability Reform Experiments: New York and Colorado

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Abstract

This paper analyzes the effect of the New York and Colorado liability reform experiments undertaken in response to the mid-1980s insurance liability crisis. Using a large data set on individual insurance firms for 1984–1991, we consider a variety of measures of the effect of these states' reform efforts. The primary focus is on differences within the general liability line and differences between the general liability line and the automobile insurance line, which serve as a reference point for the state's liability climate. The results of this analysis suggest that the liability reform measures generated a one-time shift in the profitability of general liability insurance.

I. Introduction

More than most industries, the insurance industry often enters periods that observers designate as ones of "crisis." Because the returns on the portfolios of insurance companies are so sensitive to interest rates, and because insurance firms are subject to the effect of substantial exogenous shocks, such as losses due to earthquakes, there have been periodic financial crises that have occurred in the insurance industry.

The most recent period designated a crisis occurred during the mid-1980s. During a three-year period, from 1984–1986, general liability premiums more than tripled.1 A number of factors were at work. First, the upheaval in the insurance industry was due in part to a swing in interest rates. The early 1980s was a period of high interest rates. Insurance companies were able to earn a high rate of return on their portfolios and, as a consequence, were able to engage in rate competition, pricing insurance policies so that the premiums were below the value of the dollar losses that ultimately would be incurred under the policy. Offering such insurance was financially viable because the losses occurred with a lag, and the premiums could be invested at high rates of interest.

1. For a review of this experience and the changes in liability law, see Viscusi (1991). See also the Insurance Information Institute (various years) for discussion of insurance market conditions in each year, Harrington (1988), and Joskow and McLaughlin (1991).
Second, beginning in the 1960s there has been a dramatic shift in the extent of firms' liability. The emergence of the design defect doctrine, hazard warnings cases, and the increased role of joint and several liability increased the range of situations in which the firm could be found liable for damages. Third, toxic tort cases, particularly those involving asbestos, became salient. Unlike most liability cases in which the adverse outcome is apparent immediately after an accident, for toxic torts there is often a lag of several decades before the ill effects of a hazardous exposure become apparent. Asbestos is the most notable example, as over half of all cases in federal courts in the 1980s involve claims for asbestos. However, other kinds of toxic tort cases also emerged, particularly those related to pharmaceutical products, such as DES and the Copper-7 intrauterine device.

There is a widespread consensus that even though the cause of the mid-1980s liability crisis was not clear-cut, some measures had to be undertaken to improve insurance industry performance. Premium levels were soaring, as were losses, and there were prominent instances of denial of insurance coverage and shifts in behavior. Coney Island temporarily closed the Cyclone ride, motels removed diving boards from their swimming pools, and some municipal parks were closed because of difficulties in obtaining insurance.

Because the costs of liability ultimately are governed by the character of common law pertaining to the particular class of accidents, which vary by individual state, the reform efforts were undertaken at the state level. Beginning in 1986, many states enacted liability reform measures to stem the rise in liability costs. These reform efforts were directed primarily toward lines of insurance such as general liability and medical malpractice. Automobile insurance, which was much less affected by the various factors that contributed to the broader liability crisis, was not the subject of these reform efforts.

The focus of this paper will be on two states that enacted strong reform measures in 1986—New York and Colorado. Unlike some states, such as Florida, that have had a flurry of legislative activity, the reform efforts in New York and Colorado have been relatively discrete, so that it is feasible to disentangle the influence of the specific reform measures.

This paper will utilize two different reference points to judge the effect of these liability reform experiments. First, to what extent did these reform measures lead to a shift in the performance of general liability insurance based on a comparison of the pre- and post-reform performance of this line of insurance? Second, how did the shifts in general liability insurance, which is the target of the reforms, differ from the patterns displayed by automobile insurance, which we will utilize as our reference point for the state liability climate more generally?

In carrying out each of these assessments, we will use an unusually large database. Rather than relying on aggregative data by state, which is the dominant approach in the insurance literature, we will use information on individual firms within the state, thus providing an extremely detailed perspective on the character of the effect of the reform measures.

Section II of the paper outlines the character of the reform measures in the two states, and describes the nature of our insurance sample. In Section III we provide a series of detailed comparisons of the performance of general liability
and automobile insurance, focusing on a variety of insurance variables. These include measures of the profitability of insurance (loss ratios), as well as the value of losses and premiums experienced under the policies. This analysis suggests that there was a discontinuous shift in insurance market behavior that occurred with the enactment of the reforms.

II. Reform Efforts and Sample Description

Reform Measures

The character of the reform efforts differs substantially across states. These legislative enactments often embodied a variety of provisions for which it is difficult to establish a quantitative metric regarding their stringency. Moreover, most reform measures do not consist of a single measure, but rather multiple provisions intended to restrain liability costs.

Table 1 summarizes the character of the reform efforts in New York and Colorado. In the state of New York, the reform effort was all concentrated in the year 1986. There were four components to this reform measure, at least two of which are likely to be of substantial consequence for the liability costs that would ultimately be borne by insurance companies and defendants in liability suits.

The first of these provisions pertains to joint and several liability. The effect of this doctrine upon one's liability can be illustrated with the following example. Suppose that there are multiple defendants to an accident, where defendant A is found to be 80% liable, defendant B is 19% liable, and defendant C is 1% liable. Although firms would generally split these damages proportionally, if defendants A and B are not financially solvent, then defendant C is liable for the entire damage amount, even though this defendant was only 1% at fault for the accident. This outcome will also occur if one of the parties responsible for the accident is the plaintiff. Thus, the plaintiff could be found to be contributorily negligent and to be largely accountable for the accident, but nevertheless it is the corporate deep pockets who will be held responsible for the liability costs. The appropriate role of joint and several liability was at the forefront of the liability debate, and was a major issue in most states.

The second major component of the New York liability reform pertained to collateral sources. A party injured in an accident can potentially receive compensation from private insurance, a variety of government programs (e.g., workers' compensation and disability programs), as well as through a tort liability judgment. Although the collateral source provision in the 1986 New York act did not permit the offset of workers' compensation benefits, lawyers could raise the issue of collateral sources and obtain an offset for other kinds of collateral ben-

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2. Many of these reforms pertain to liability structures that have been analyzed in the pre-crisis period by Viscusi (1990), and for the mid-1980s, using aggregative data by state, in Blackmon and Zeckhauser (1991).

Table 1: Summary of Reform Efforts in New York and Colorado

New York
1985: No activity
1986: joint & several liability:
   Limits joint and several liability; a defendant who is 50% or less at fault is only
   severally liable for noneconomic damages, with some exclusions [NY SB 9391].
   collateral source:
   Admission of evidence and offset of collateral benefits is now provided; workers’
   compensation benefits may not be offset [NY SB 9351].
   structured or periodic payments:
   Mandates periodic payment of future damages over $250K [NY SB 9391].
   frivolous suits/attorney fees:
   Provides for assessing attorney fees as sanctions for frivolous suits and defenses
   [NB SB 9351].
1987: no activity

Colorado
1985: joint & several liability:
   In multiple tortfeasor cases, the liability of a tortfeasor has been limited to the
   pro rata share of damages attributable to him, provided his degree of negligence
   is not as great as the plaintiff’s [CO HB 1231].
1986: joint & several liability:
   A measure completely abolishing joint and several liability enacted, defendant is
   liability for his proportionate share of negligence. Effective 7/1/86 [CO SB 70].
   noneconomic damages:
   Caps at $25K noneconomic damages, although court may award up to $500K
   if it finds “clear and convincing evidence,” effective 7/1/86 [CO SB 67].
   collateral source:
   Reduces awards by amount of collateral sources, effective 7/1/86 [CO SB 67].
   statute of limitations:
   Statute of limitations for civil actions shortened from four year to two years
   [CO SB 69].
   frivolous suits:
   Provides for assessment of attorney fees against any party whose action lacks
   substantial justification, effective 7/1/86 [CO SB 70].
   punitive damages:
   Punitive damages may be awarded if injury was the result of fraud, malice, or
   willful and wanton conduct.
   Limitations on punitive damages enacted; punitive awards may not exceed the
   amount of actual damages awarded; state fund receives one-third of punitive
   damages award.
   Effective 7/1/87 [CO HB 1197].
   dram shop:
   A $150K cap on damages in dram shop actions; limits liability for servers [CO
   SB 86].
   limits on liability:
   Clarifies immunities of governmental entities and their employees, effective
   7/1/86 [CO HB 1196]. A Good Samaritan provision enacted [CO SB 76].

(continued on next page)
(Table 1 continued)

1987: joint & several liability:

- Modifies the 1986 standard such that it allows for joint liability for persons who consciously plan to commit a tortious act [CO HB 1184].

- frivolous suits:
  - Permits awards of attorneys' fees in personal injury and wrongful death actions dismissed prior to trial [CO HB 1304].

alternative dispute resolution:

- Established procedures for mandatory arbitration of claims $50K or less [CO SB 22].

benefits. Before enactment of this provision, defense lawyers were not even permitted to indicate to the jury that the plaintiff might receive compensation from some source other than the tort liability award, much less have a formal mechanism for obtaining an offset.

The third provision of the New York act provides for structured or periodic payments in cases involving damages of over $250,000. If defendants remain solvent over the time during which damages are paid, and if damages are appropriately adjusted for life expectancy, then this provision should be inconsequential. However, many corporate defendants believe that it is difficult for juries to adjust appropriately for lower life expectancies of people who have suffered injuries, since there is a chance that the plaintiff will live a normal life and need more than the expected damage award based on an objective assessment of future life expectancy.

The final provision in the New York liability reform act provides for sanctions to discourage frivolous lawsuits. This measure is likely to be more of symbolic importance than of practical consequence compared to the other reforms included in the reform package.

The Colorado reform measures were much more diverse, both in terms of their time frame and content. The focal point of the Colorado liability reform effort also was 1986, in which there was a major overhaul of the liability structure. The 1985 reform measure was anticipatory in nature with respect to part of the overhaul of joint and several liability in 1986, and the 1987 act refined three of the provisions of the 1986 act.

The 1986 Colorado liability reform act constituted a major overhaul of the liability structure in that state. This legislation abolished joint and several liability altogether. In addition, it capped damages for noneconomic losses, such as pain and suffering, at $25,000 except in unusual circumstances. Since pain and suffering awards typically average up to 30% of the total value of awards, this cap in all likelihood would have a constraining effect. As in the state of New

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York, Colorado also introduced a provision that would reduce court awards by
the amount received from collateral sources. There was also a provision to
shorten the statute of limitations for civil actions that is likely to be of conse-
fquence for injuries with a reasonably long gestation period.

Many of the other provisions of the Colorado reform bill addressed issues
that were long prominent in the media and garnered substantial newspaper head-
lines, but are less likely to be consequential with respect to the actual liability
costs incurred by firms. These provisions included assessment of attorneys’ fees
for frivolous lawsuits, limitations on punitive damages (which are highly pub-
licized but seldom awarded), caps on dramshop (i.e., drinking establishment) lia-
bility, and limitations on liability that will be pertinent for government entities.

Although the Colorado bill is much more sweeping and stringent than the
New York act, in each case one would expect the reform measures to have a sig-
nificant effect on the performance of the courts with respect to general liability
cases. It might be the case that juries and the courts would adjust to the chang-
ing legislative standards to offset their influence; but if the legislation has the
intended effect, there should be a cost-restraining influence on the affected class
of claims.

Sample Description

The insurance data sample that will be used for the empirical analysis is the
data set that has been developed by the National Association of Insurance Com-
mis sioners (NAIC). These data are available for 1984–1991, and provide inform-
ation on a firm level basis for each state.5 The information is available in a
panel so that longitudinal analysis of the data is possible.

For each firm, information is included in the data with respect to the key
insurance market variables for each line of insurance. The two lines of insurance
that will be the focal point of this paper are general liability coverage, which pertains to the insurance purchased by businesses to cover a wide variety of perils,
such as the risks associated with products and accidents that occur on the pre-
ises, and automobile insurance. As the summary of these data in Table 2 indi-
cates, the sample sizes are substantial in every case, as they range from 243–314
companies per year. With data available over an eight-year period, there are
always over 2000 observations for each state insurance line analyzed. As one
would expect, more companies write automobile insurance coverage than gen-
eral liability coverage.

The aggregate income variable listed in Table 2 is a measure of the aggregate
income level in the state, averaged over the sample period.6 The other variables

5. Over 2000 property and liability companies submit financial data to the NAIC on a yearly
basis. The data used for our study is drawn from the insurers’ Exhibit of Premiums and Losses,
which contains by-state, by-line premiums and losses. Our sample contains all firms writing gen-
eral liability and/or automobile insurance in Colorado and New York. Since many companies write
both lines of insurance and many write in both states, one insurance company may be represented
several times.

6. Aggregate income data is published in the U.S. Department of Commerce Survey of
Current Business.
Table 2: NAIC Sample Characteristics, 1984–1991

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<td>General liability:</td>
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<td>Premiums</td>
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<td>Number of companies</td>
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<tr>
<td>Automobile:</td>
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<tr>
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<tr>
<td>Losses</td>
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<td>Number of companies</td>
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<td>State aggregate income (in billions)</td>
<td>326.69</td>
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<table>
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<td>Premiums</td>
<td>752940.48</td>
<td>2190890.00</td>
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<td>Losses</td>
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<td>Loss ratio</td>
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<td>Number of companies</td>
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<tr>
<td>Automobile:</td>
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<tr>
<td>Premiums</td>
<td>2198187.29</td>
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<tr>
<td>Losses</td>
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<td>7700209.06</td>
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<tr>
<td>Loss ratio</td>
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<tr>
<td>Number of companies</td>
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<td></td>
<td></td>
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<tr>
<td>State aggregate income (in billions)</td>
<td>52.59</td>
<td>1.94</td>
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</table>

are on a firm-specific basis. These pertain to the total value of premiums earned in any particular year, the total value of losses incurred with respect to the policies written in that year, and the value of the loss ratio, which is the ratio of losses to premiums.

The loss ratio (i.e., Losses/Premiums) is the most widely used single measure of insurance profitability. The loss ratio can be viewed as the inverse of the ex post price of insurance, because the ratio of premiums to losses provides the dollar amount that the insured spent for each dollar of losses incurred. A loss ratio of 1.0 indicates an insurance plan that breaks even, excluding administrative costs and investment income. As the data in Table 2 indicate, the loss ratios for general liability are somewhat higher than those for automobile coverage, as they average .84-.91 for general liability, as compared with .78-.85 for auto coverage.

If the distribution of losses over time is the same in each case and there are no differences in administrative costs, then one would expect optimizing insurance companies to equate the loss ratio of the marginal policy written across states
and across lines of insurance. These data are for average loss ratios over the sample period, but one of the issues that will be explored below is the extent to which there was a movement in loss ratios for the two lines toward greater equalization.

III. Comparison of General Liability and Automobile Insurance

Loss Ratios: Means

The starting point for the empirical analysis will be a comparison of the principal measure of insurance profitability, loss ratios for each particular line of insurance. The loss ratios are calculated as within-state yearly means and standard errors of loss ratios weighted by premiums earned.\(^7\)

The loss ratios for large firms are weighted more heavily because they are believed to be more reliable and should also be of greater policy interest in assessing the performance of insurance markets. The weighted mean is equivalent to the within-state measure of total losses incurred, divided by total premiums earned. Consider first the case of New York, which is illustrated in Figure 1a. Throughout this period the loss ratio for New York is fairly steady, as it exhibits a slight upward drift over the 1984–1991 period. In contrast, the loss ratio for general liability was much higher and on the rise from 1984–1985. With the enactment of the 1986 liability reform bill, however, there was a stark drop in the loss ratio for general liability coverage, and after the 1986 period, general liability insurance loss ratios exhibited the modest upward trend, as did automobile insurance, as the loss ratios for general liability are above those for autos in 1987 and 1989, and below those for autos in 1989, 1990, and 1991. Thus, there was a long-run equalization of the profitability of the two lines of coverage.

Tables 3a and 3b present statistical evidence of the effects of reforms through an analysis of changes in loss ratios over time.\(^8\) The first two sets of data in

\(^7\) Thus, if \(M_w\) is the mean, \(S_w\) is the standard error, and \(w_i\) is the weight on firm \(i\) based premiums earned,

\[
M_w = \frac{\sum_{i=1}^{N} w_i LR_i}{\sum_{i=1}^{N} w_i}
\]

and

\[
S_w = \frac{\sum_{i=1}^{N} w_i (LR_i - M_w)^2}{\sum_{i=1}^{N} w_i}.
\]

\(^8\) Let the insurance line (general liability, auto) be denoted by \(l\), the state (Colorado, New York) be denoted by \(s\), and the year be \(t\) \((t = 1, \ldots, 8)\). We begin by assuming a structure with two fixed components determining state mean loss ratio. Thus, the formulation is

\[
LR_{lst} = \alpha_{st} + \mu_{st} + \gamma_{ts} + \epsilon_{lst}.
\]
**Table 3a:** New York Loss Ratios, 1984–1991, General Liability v. Automobile

<table>
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<tbody>
<tr>
<td>Mean</td>
<td>1.008</td>
<td>1.166</td>
<td>0.783</td>
<td>0.788</td>
<td>0.674</td>
<td>0.864</td>
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<td>0.779</td>
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<td>Std. error</td>
<td>0.055</td>
<td>0.068</td>
<td>0.055</td>
<td>0.046</td>
<td>0.038</td>
<td>0.083</td>
<td>0.048</td>
<td>0.044</td>
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<tr>
<td>Automobile</td>
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<tr>
<td>Mean</td>
<td>0.736</td>
<td>0.748</td>
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<tr>
<td>Std. error</td>
<td>0.014</td>
<td>0.020</td>
<td>0.019</td>
<td>0.013</td>
<td>0.013</td>
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<td>0.015</td>
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<tr>
<td>G.L.-auto</td>
<td>0.272*</td>
<td>0.418*</td>
<td>0.013</td>
<td>0.074</td>
<td>-0.061</td>
<td>0.068</td>
<td>-0.052</td>
<td>-0.058</td>
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<tr>
<td>Std. error</td>
<td>(0.057)</td>
<td>(0.071)</td>
<td>(0.058)</td>
<td>(0.048)</td>
<td>(0.040)</td>
<td>(0.084)</td>
<td>(0.050)</td>
<td>(0.046)</td>
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<tr>
<td>G.L. mean</td>
<td>-0.383*</td>
<td>-0.378*</td>
<td>-0.492*</td>
<td>-0.302*</td>
<td>-0.383*</td>
<td>-0.387*</td>
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<tr>
<td>Std. error</td>
<td>(0.087)</td>
<td>(0.082)</td>
<td>(0.078)</td>
<td>(0.107)</td>
<td>(0.083)</td>
<td>(0.081)</td>
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<td>Auto mean</td>
<td>0.022</td>
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<td>0.087</td>
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<tr>
<td>G.L.-auto</td>
<td>-0.405*</td>
<td>-0.344*</td>
<td>-0.479*</td>
<td>-0.350*</td>
<td>-0.470*</td>
<td>-0.298*</td>
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<tr>
<td>Std. error</td>
<td>(0.091)</td>
<td>(0.085)</td>
<td>(0.082)</td>
<td>(0.110)</td>
<td>(0.087)</td>
<td>(0.085)</td>
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*Denotes significance at .05 level, one-tailed test, using the two sample z test.

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**Table 3b:** Colorado Loss Ratios, 1984–1991, General Liability v. Automobile

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<tr>
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<td>1.478</td>
<td>1.169</td>
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<td>Std. error</td>
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<td>0.055</td>
<td>0.051</td>
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<td>Automobile</td>
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<tr>
<td>Mean</td>
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<td>0.264*</td>
<td>0.072</td>
<td>-0.124</td>
<td>-0.043</td>
<td>-0.064</td>
<td>-0.170*</td>
<td>-0.141*</td>
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<tr>
<td>Std. error</td>
<td>(0.210)</td>
<td>(0.125)</td>
<td>(0.115)</td>
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<td>(0.094)</td>
<td>(0.058)</td>
<td>(0.058)</td>
<td>(0.053)</td>
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<td>-0.487*</td>
<td>-0.424*</td>
<td>-0.373*</td>
<td>-0.436*</td>
<td>-0.465*</td>
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<td>Std. error</td>
<td>(0.166)</td>
<td>(0.143)</td>
<td>(0.154)</td>
<td>(0.135)</td>
<td>(0.135)</td>
<td>(0.133)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auto mean</td>
<td>-0.106*</td>
<td>-0.099*</td>
<td>-0.117*</td>
<td>-0.045</td>
<td>-0.002</td>
<td>-0.060*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Std. error</td>
<td>(0.032)</td>
<td>(0.030)</td>
<td>(0.026)</td>
<td>(0.028)</td>
<td>(0.027)</td>
<td>(0.026)</td>
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</tr>
<tr>
<td>G.L.-auto</td>
<td>-0.192</td>
<td>-0.388*</td>
<td>-0.307*</td>
<td>-0.328*</td>
<td>-0.434*</td>
<td>-0.405*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Std. error</td>
<td>(0.169)</td>
<td>(0.146)</td>
<td>(0.156)</td>
<td>(0.138)</td>
<td>(0.138)</td>
<td>(0.136)</td>
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</tr>
</tbody>
</table>

*Denotes significance at .05 level, one-tailed test, using the two sample z test.
Table 3a present the information corresponding to that in Figure 1a. The differences in the loss ratios for general liability and auto constitute the third set of information presented in Table 3a. As is apparent, these differences were quite large, and were positive and substantial in 1984 and 1985. However, none of these differences is statistically significant in 1986 or thereafter.

The bottom panel in Table 3a considers the differences between the loss ratios for the two lines over longer periods of time, as opposed to the within-year differences. By using 1985 as a base year, these comparisons provide differences for varying year time horizons ranging from one to six years after the base year. The striking result is that the differences between the general liability loss ratios and the automobile loss ratios over all these time frames are not statistically distinguishable. This pattern seems to suggest that there was no rebound in the insurance market after a short-term effect. Rather, the effect of the liability reform measure was to lead to a one-time, permanent shift in the relationship between general liability and automobile insurance profitability.

The character of the loss ratio pattern exhibited by the Colorado reform efforts in Figure 1b is similar in nature, given the slight difference in these reform efforts. The Colorado reforms were concentrated in 1986, but included measures in 1985 and 1987 as well. In the case of Colorado, there is a drop in the loss ratios for general liability coverage in each of these years, after which the loss ratios for general liability insurance remain similar to those exhibited by automobile insurance, which exhibits a relatively stable trend throughout the 1981-1984 period.

Table 3b presents the within-state differences of the mean loss ratios for general liability and automobile coverage in Colorado. These differences decreased in 1985, 1986, and 1987, although it is only in 1984 and 1985 that there is a significant positive discrepancy between general liability and automobile insurance. Indeed, by 1990 and 1991, general liability insurance had become more profitable than automobile insurance, although the extent of the differences was not as great.

which includes a time-specific effect \( \alpha_{st} \), an error term \( \epsilon_{s,t} \), and the state fixed effect that is decomposed into a time-varying trend, \( \mu_{st} \), and a line-varying effect, \( \gamma_{st} \). The line-varying effect represents characteristics particular to writing insurance for line \( l \) in state \( s \). Administrative (i.e., licensing) expenses, for example, do not vary over time. The time-varying effect represents state factors, such as aggregate personal income and market size.

To assess the effects of reform on the performance of general liability within a particular state, we must control for these additional effects. Denote the auto line by \( a \) and general liability \( g \). The time-varying state effect is eliminated by differencing the loss ratio between lines, within the state:

\[
LR_{gst} - LR_{st} = \alpha_{st} + \gamma_{st} + \epsilon_{s,t} - \epsilon_{st}.
\]

Then, the time-varying effect is eliminated by “differencing the differences”:

\[
(LR_{gst} - LR_{st}) - (LR_{gst} - LR_{st,t-1}) = (\alpha_{st} - \alpha_{s,t-1}) + (\gamma_{st} - \gamma_{s,t-1}) + \epsilon_{s,t} - \epsilon_{st},
\]

where \( \epsilon_{s,t} = \epsilon_{s,t} - \epsilon_{st} - \epsilon_{s,t-1} - \epsilon_{st,t-1} \). The differences-in-differences estimates generate more accurate comparisons of the performance in general liability before and after the reform efforts, because we assume all other institutional and state effects are netted out.
as the positive discrepancies in 1984 and 1985. The duration of this discrepancy is not clear, since the sample does not continue after 1991.

The bottom panel of Table 3b explores the differences with respect to the base year of 1985, which was before the major reforms in liability were enacted in Colorado. These differences are consistently negative, and the confidence intervals around these differences are sufficiently large that there is no firm evidence that the extent of the effect of the liability reform in Colorado changed over time. Moreover, the point estimates suggest, if anything, that there was a widening discrepancy between general liability and auto in which general liability had become more profitable than auto. There is no evidence that there was a rebound in the insurance market loss ratios for general liability that would undercut the dampening influence of the liability reform measures on insurance costs.

**Loss Ratios: Medians, 75th Percentiles**

Particularly in the case of insurance markets, mean loss ratios may be deceptive. Large loss claims may distort loss performance, given the stochastic nature of insurance markets. To reduce the influence of potentially distorting claims of this type, we also consider the trends for two key quartiles of the loss ratio distribution. Table 4a presents the median and 75th percentile loss ratios for New York, and Table 4b presents the analogous statistics for Colorado. The 75th percentile was chosen as being of substantial interest because it is the upper end of the loss ratio distribution that is of greatest economic interest, particularly with respect to insurance solvency problems and the viability of insurance market operation. The differential effect on the upper end of the distribution is often viewed as a cause of denial of coverage and other extreme types of market responses to the insurance market stability in the 1980s.9

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9. Two alternative methods were used to calculate the standard errors of the quartiles. The first method uses the asymptotic normality of the distribution of loss ratios:

\[ n \text{Var}(\text{median}) \to \frac{1}{4f^2(\mu)} \]

and

\[ n \text{Var}(\text{75th percentile}) \to \frac{1}{5.33f^2(s)} , \]

where \( n \) is the number of observations, \( \mu \) is the mean, \( s \) is the 75th percentile, and \( f \) is the normal density function. Because the distributions of loss ratios have long tails to the right of the median, this method may overstate the true standard error of the median; in the general liability lines, especially, more observations are concentrated at the median than at the mean.

The second approach uses the histogram method, and takes into account both the interquartile range and the number of observations in the vicinity of the quartile (see Silverman, 1986). A bandwidth is chosen according to the formula:

\[ h = 0.9n^{-1/5} \cdot \min(\text{standard deviation, interquartile range}/1.34) . \]

The histogram is then defined by:

\[ \hat{f}(x) = \frac{1}{n} \cdot \frac{\text{no. of } X_i \text{ in same bin as } X}{h} , \]

where \( x \) is the median or the 75th percentile. Then,
Table 4a: New York Loss Ratios: Medians and 75th Percentiles
(standard errors in parentheses)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>0.852</td>
<td>0.815</td>
<td>0.661</td>
<td>0.639</td>
<td>0.561</td>
<td>0.557</td>
<td>0.507</td>
<td>0.570</td>
</tr>
<tr>
<td></td>
<td>(.046)</td>
<td>(.024)</td>
<td>(.050)</td>
<td>(.028)</td>
<td>(.024)</td>
<td>(.024)</td>
<td>(.028)</td>
<td>(.023)</td>
</tr>
<tr>
<td>75th percentile</td>
<td>1.636</td>
<td>1.386</td>
<td>1.144</td>
<td>1.176</td>
<td>1.027</td>
<td>1.178</td>
<td>1.084</td>
<td>1.073</td>
</tr>
<tr>
<td></td>
<td>(.040)</td>
<td>(.021)</td>
<td>(.044)</td>
<td>(.025)</td>
<td>(.021)</td>
<td>(.024)</td>
<td>(.020)</td>
<td>(.020)</td>
</tr>
<tr>
<td>Auto:</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Median</td>
<td>0.725</td>
<td>0.720</td>
<td>0.699</td>
<td>0.682</td>
<td>0.727</td>
<td>0.708</td>
<td>0.724</td>
<td>0.774</td>
</tr>
<tr>
<td></td>
<td>(.010)</td>
<td>(.013)</td>
<td>(.009)</td>
<td>(.004)</td>
<td>(.006)</td>
<td>(.007)</td>
<td>(.017)</td>
<td>(.010)</td>
</tr>
<tr>
<td>75th percentile</td>
<td>1.030</td>
<td>0.979</td>
<td>0.946</td>
<td>0.891</td>
<td>0.987</td>
<td>1.015</td>
<td>0.986</td>
<td>1.052</td>
</tr>
<tr>
<td></td>
<td>(.007)</td>
<td>(.005)</td>
<td>(.008)</td>
<td>(.007)</td>
<td>(.004)</td>
<td>(.008)</td>
<td>(.004)</td>
<td>(.006)</td>
</tr>
</tbody>
</table>

Table 4b: Colorado Loss Ratios: Medians and 75th Percentiles
(standard errors in parentheses)

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>0.641</td>
<td>0.599</td>
<td>0.461</td>
<td>0.505</td>
<td>0.451</td>
<td>0.459</td>
<td>0.448</td>
<td>0.460</td>
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<tr>
<td></td>
<td>(.034)</td>
<td>(.032)</td>
<td>(.024)</td>
<td>(.022)</td>
<td>(.018)</td>
<td>(.009)</td>
<td>(.014)</td>
<td>(.009)</td>
</tr>
<tr>
<td>75th percentile</td>
<td>1.435</td>
<td>1.390</td>
<td>0.838</td>
<td>0.873</td>
<td>0.985</td>
<td>0.914</td>
<td>0.911</td>
<td>1.026</td>
</tr>
<tr>
<td></td>
<td>(.029)</td>
<td>(.028)</td>
<td>(.021)</td>
<td>(.019)</td>
<td>(.016)</td>
<td>(.007)</td>
<td>(.012)</td>
<td>(.008)</td>
</tr>
<tr>
<td>Auto:</td>
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</tr>
<tr>
<td>Median</td>
<td>0.808</td>
<td>0.834</td>
<td>0.710</td>
<td>0.728</td>
<td>0.700</td>
<td>0.717</td>
<td>0.720</td>
<td>0.661</td>
</tr>
<tr>
<td></td>
<td>(.008)</td>
<td>(.005)</td>
<td>(.009)</td>
<td>(.008)</td>
<td>(.005)</td>
<td>(.009)</td>
<td>(.005)</td>
<td>(.006)</td>
</tr>
<tr>
<td>75th percentile</td>
<td>1.109</td>
<td>1.159</td>
<td>1.020</td>
<td>1.057</td>
<td>1.066</td>
<td>1.070</td>
<td>1.074</td>
<td>0.907</td>
</tr>
<tr>
<td></td>
<td>(.007)</td>
<td>(.005)</td>
<td>(.008)</td>
<td>(.007)</td>
<td>(.004)</td>
<td>(.008)</td>
<td>(.004)</td>
<td>(.006)</td>
</tr>
</tbody>
</table>

The results of the fractiles reported in Table 4a for New York closely parallel the patterns displayed by the means. The automobile insurance loss ratios are steady, both in terms of the median loss ratio and the 75th percentile of the loss ratio distribution. In contrast, the loss ratios for general liability exhibit a very

\[ n \text{Var}(\text{quartile } p) = p(1-p)/n^{1/2}(x), \quad p = 0.5, 0.75. \]

The resulting standard errors, \( \sqrt{\text{Var}/\sqrt{n}} \), are in most cases smaller than those calculated from the normal approximation. In the case of general liability, the estimates for the standard error of the median are an order of magnitude smaller, confirming the concentration of loss ratios at the median. The standard errors reported in Tables 4a and 4b are from the normal approximation.
stark drop beginning in 1986, the year of the major reform effort. There was also a smaller drop in the loss ratios in 1985, the year of the preliminary reform efforts. After the reforms were completed in 1987, there was apparently an additional drop in the median loss ratio, although the 75th percentile remains relatively stable throughout the late 1980s.

The findings in Table 4b for Colorado are similar in character. For automobile insurance coverage, the 75th percentile of the distribution is steady throughout. There was, however, a decrease in the median loss ratios for automobile insurance, which declined by .14 over the 1984–1991 period.

The drop in the general liability loss ratios was, however, much greater. Once again the year of the most precipitous drop in the loss ratios was 1986, the year of most of the liability reforms. The median loss ratio remains relatively invariant in the post-1986 period, and there was some upward drift of the 75th percentile loss ratio, but even in 1991 it remained .35 below its 1985 level and .40 below its 1984 value. These results are quite consistent with the liability reform efforts shifting the distribution of loss ratios in 1986, with some possibility that there was a modest effect of the initial reforms in 1985 as well.

**Losses and Premiums**

Loss ratios are the most informative statistic, since they are an overall measure of profitability. One can also examine the value of total losses and premiums, which are of interest in that they reflect the scale of insurance. However, the interpretation of these measures is more difficult, since what would be observed in the case of premiums is the joint effect of price and quantity, but not the isolated component contributors to the premium level. For example, if losses and premiums decline in a state because of quantity rationing, one cannot conclude that insurance market functioning has been enhanced, whereas if losses decline because of the decrease in liability costs and premiums decline because of a decrease in the rate charged for coverage, then one would view these phenomena more favorably. Notwithstanding the limitations of analyzing loss and premium data independently, in conjunction with the earlier results on loss ratios, they provide a more comprehensive perspective on the ramifications of the liability reform measures.

Table 5 reports the trends in general liability and automobile insurance losses and premiums over the 1985–1991 period, as well as the differences between these lines for each of the two states. In the case of New York, there is a decrease in the growth of losses beginning in 1986, when the percentage change in losses dropped from 92 to 25. There is a continuation in this pattern, and for the period after the reforms were enacted, the percentage changes in losses incurred are evenly divided between positive and negative effects. The comparison with automobile insurance is even starker in terms of the apparent effect of the liability reform measures, as the percentage growth in premiums drops from .78 in 1985 to a difference of approximately 0 in 1986 and 1987. In the 1988–1991 period the difference between the percentage change in losses for general liability and auto is consistently negative.
Table 5: Patterns of Mean Levels of Losses and Earned Premiums, 1985-1991

General liability v. Auto:
Differences in losses incurred $\frac{L_t - L_{t-1}}{L_t}$

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<tbody>
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<td>New York</td>
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</tr>
<tr>
<td>GL</td>
<td>0.92</td>
<td>0.25</td>
<td>0.07</td>
<td>-.18</td>
<td>0.06</td>
<td>0.00</td>
<td>-.06</td>
</tr>
<tr>
<td>AU</td>
<td>0.14</td>
<td>0.23</td>
<td>0.02</td>
<td>0.06</td>
<td>0.12</td>
<td>0.13</td>
<td>0.06</td>
</tr>
<tr>
<td>GL-AU</td>
<td>0.78</td>
<td>0.02</td>
<td>0.05</td>
<td>-.24</td>
<td>-.06</td>
<td>-.12</td>
<td>-.12</td>
</tr>
<tr>
<td>Colorado</td>
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<td></td>
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</tr>
<tr>
<td>GL</td>
<td>0.07</td>
<td>0.08</td>
<td>-.25</td>
<td>-.06</td>
<td>-.09</td>
<td>0.14</td>
<td>-.12</td>
</tr>
<tr>
<td>AU</td>
<td>0.33</td>
<td>0.10</td>
<td>0.13</td>
<td>0.01</td>
<td>0.17</td>
<td>0.11</td>
<td>0.02</td>
</tr>
<tr>
<td>GL-AU</td>
<td>-.25</td>
<td>-.02</td>
<td>-.38</td>
<td>-.07</td>
<td>-.26</td>
<td>0.03</td>
<td>-.13</td>
</tr>
</tbody>
</table>

General liability v. Auto:
Differences in premiums earned $\frac{P_t - P_{t-1}}{P_{t-1}}$

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<tbody>
<tr>
<td>New York</td>
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<tr>
<td>GL</td>
<td>0.61</td>
<td>0.82</td>
<td>0.10</td>
<td>-.04</td>
<td>-.08</td>
<td>-.03</td>
<td>-.04</td>
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<tr>
<td>AU</td>
<td>0.12</td>
<td>0.19</td>
<td>0.10</td>
<td>0.03</td>
<td>0.04</td>
<td>0.07</td>
<td>0.05</td>
</tr>
<tr>
<td>GL-AU</td>
<td>0.49</td>
<td>0.62</td>
<td>-.01</td>
<td>-.07</td>
<td>-.11</td>
<td>-.10</td>
<td>-.09</td>
</tr>
<tr>
<td>Colorado</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GL</td>
<td>0.55</td>
<td>0.53</td>
<td>0.08</td>
<td>-.08</td>
<td>-.04</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>AU</td>
<td>0.19</td>
<td>0.26</td>
<td>0.12</td>
<td>0.04</td>
<td>0.06</td>
<td>0.06</td>
<td>0.10</td>
</tr>
<tr>
<td>GL-AU</td>
<td>0.36</td>
<td>0.27</td>
<td>-.04</td>
<td>-.12</td>
<td>-.11</td>
<td>-.03</td>
<td>-.07</td>
</tr>
</tbody>
</table>

The results for Colorado are somewhat different, as the biggest drop in the percentage change in losses for general liability occurs in 1987, the last year of the reform effort and one year after the major wave of reforms. Percentage changes in losses for automobile coverage are consistently positive, and the differences between the percentage changes in losses for general liability and auto suggest that there is a narrowing discrepancy beginning in 1985, the year of the initial reform measures.

The results for premium growth indicate that for both states automobile insurance premiums grew somewhat more in the 1985-1987 period than thereafter, but the percentage increases were generally positive. In contrast, there was a surge in premiums for general liability coverage in 1985 and 1986, which abated thereafter. Unfortunately, it is not possible to distinguish whether the increase in pre-
miums is due primarily to a change in the premium rate or a decrease in insurance quantity rationing that was said to have been of substantial importance.

IV. Conclusion

Examination of the liability reform efforts in New York and Colorado indicates that the insurance markets in these states perform quite differently in the wake of liability reforms. The intended effect of these efforts was to control liability costs, which had led to unprofitable loss ratios, as well as evidence of quantity rationing. The results here indicate a marked shift in the performance of insurance markets, particularly with respect to the profitability of insurance, which has been the main focus of the insurance regulation literature.

The approaches used to assess the effect of the reform experiments in New York and Colorado included examination of the following performance measures: within-state differences in the means for general liability coverage over time, comparison of the differences in the means for general liability coverage with the reference insurance category of automobile insurance, and within-state differences in the general liability insurance medians and 75th percentiles. The results of these investigations were quite consistent, as they indicated a stark shift in the performance of general liability insurance in the wake of the reform measures.

Whether these reform efforts are necessarily socially desirable is beyond the scope of the paper. They appear to have achieved their intended objective of increasing the profitability of insurance and stabilizing insurance markets, but cost reduction efforts also reduce the amounts that plaintiffs may receive in liability judgments, so that any assessment of whether these measures are desirable, as opposed to simply being effective, involves a broader analysis than was undertaken here. What is clear is that by utilizing these diverse approaches to assessing the impact of these liability reform experiments, one can obtain a detailed perspective on the implications of liability reform legislation.

References


