Price and Availability Tradeoffs of Automobile Insurance Regulation

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Abstract

Early analyses of automobile insurance regulation and deregulation efforts have yielded mixed results, in part because of the small number of completed deregulation experiments. This analysis focuses on a 30-state sample from 1974 through 1981 and on the experience in 11 deregulated states. Overall, regulation decreases the unit price (i.e., inverse loss ratio), but the effect is disproportionately concentrated in a small number of heavily regulated states. For these states, insurance regulation increased the size of the involuntary market by an average of 17 percent. Substantial subsidies to drivers in the involuntary market were found, possibly as great as \$292 per year in Massachusetts. The states that undertook deregulation over the past two decades experienced reduced unit prices and decreases in the size of the involuntary market.

Introduction

The automobile insurance industry has long been one of the principal targets of rate regulation efforts. To avoid the antitrust violations that would arise from price fixing through insurance rating bureaus, the McCarran-Ferguson Act of 1945 granted the insurance industry an antitrust exemption if it were regulated by state law.¹ Extensive insurance rate regulation followed in all states within the next five years.

Since the late 1960s there has been a gradual movement toward deregulation consistent with the trend toward deregulation in several other industries. At present, states vary greatly in the degree of automobile insurance rate regulation. At one extreme, some states require prior approval of all rates or mandate bureau rates for all insureds (for example, Massachusetts, New Jersey, and North Carolina). At the other end of the spectrum, some states

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¹ 59 Stat. 33, codified at 15 U.S.C. 1011-1015 (1976).

have had no rate regulation for the past 15 years or longer (for example, California and Illinois).

The 1988 referendum in which California voters chose to impose price decreases on automobile insurance rates may signal a return to a more aggressive regulatory era. From an external vantage point it appears that this vote to increase regulatory controls may have been driven by a perception of an economic free lunch—a drop in insurance prices with no loss in coverage. Whether regulation yields such costless dividends is the main subject of this article.

Our statistical analysis of the recent experiences of regulated versus unregulated states addresses the following questions: does regulation result in higher or lower insurance rates? If rates are lower, what has been the effect on the availability of insurance in these states? Furthermore, what has been the experience of those states that have deregulated their automobile insurance rates? What do comparisons of the pre- and post-regulatory experiences for these states imply regarding the above questions?

These are interesting issues given the developments in automobile insurance and other regulated industries over the past decade and a half. In particular, automobile insurance rates have been deregulated completely in several states. Furthermore, the insurance industry, which was traditionally viewed as a strong beneficiary of regulation through the maintenance of bureau rates and other cartel-like practices, has become a strong advocate of deregulation in those states where regulation has persisted. This latter fact may be a signal that automobile regulation has shifted over time from being price-increasing to price-restraining in nature. Paul Joskow found evidence of such a shift in regulatory behavior for electric utilities during the seventies. Recent studies of automobile insurance are consistent with the price-restraining hypothesis, but the evidence is far from conclusive.

The econometric analysis undertaken in this article relies on insurance rate and availability data that have been assembled from insurance industry source documents by Best Insurance Service and the Automobile Insurance Plans Service. One novel aspect of this work is that it not only focuses on insurance rate and availability differences between regulated and unregulated states, but also examines post-deregulation experience relative to pre-deregulation ones in states that deregulated. These natural experiments are likely to be particularly instructive insofar as they help to isolate the effects of the regulation variable *per se*, as opposed to the influence of variables correlated with regulation.

This article focuses on the joint effects of regulation on the price and availability of insurance using two complementary data sets. The first sample consists of price and availability data for the 30 largest states from 1974 through 1981. This sample includes 17 states with prior approval regulation²

²The regulated states were: Alabama, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, New Jersey, New York, North Carolina, Oklahoma, Pennsylvania, Tennessee, Texas, and Washington.

and 13 states with competitive rating systems.³ The second sample focuses exclusively on the 11 states that deregulated during the 1970s and examines the before and after experiences in these states with respect to price and insurance availability in the voluntary market. This latter sample allows one to investigate some cumulative effects of deregulation that may not be evident in a cross-sectional panel of all states.

The following section reviews previous work on automobile insurance regulation and examines various methodological issues pertinent to this analysis. A pooled cross-sectional analysis of regulated versus competitive rating states is then presented. The next section focuses on the pre- and post-deregulation experiences in the 11 states that deregulated during the 1970s followed by a brief conclusion.

Background and Basic Methodology

Previous Studies

The literature on automobile insurance regulation is quite extensive and has included a major survey by Harrington [9]. Here we will review some of the key studies in the literature as they relate to the present investigation. The first major economic analysis of insurance industry regulation was by Joskow [12]. His model of regulation-induced cartel behavior derived most of its empirical support from the greater adherence to bureau rates in New York, which was regulated, versus California, which had moved to deregulation. He also found economies of scale for direct writers (insurance sold through exclusive agents) relative to agency writers (insurance sold through agents who handle a number of firms).⁴ While Joskow's analysis provided suggestive evidence for the "excessive price" hypothesis, his study was inherently limited in its empirical scope by the fact that the main wave of deregulation had not yet occurred.

A study by Ippolito [11] was the first to address the differences between states that were regulated and those that had been deregulated (or not regulated at all) in a multiple regression framework. His mixed results weakly supported the existence of a distorting effect of regulation. In particular, his study found that regulation resulted in an increase of premiums, relative to losses, for the larger, more efficient, firms (especially direct writers). In addition, regulated states had proportionally larger assigned risk pools of drivers who could not obtain insurance in the open market. Somewhat surprisingly, Ippolito did not find a general effect of regulation on the overall price levels, as reflected in either average premiums or loss ratios (losses relative to premium payments).⁵

³The deregulated states and years of deregulation were: Arizona (1980), California (1948), Colorado (1972), Connecticut (1969), Florida (1967), Georgia (1967), Illinois (1971), Minnesota (1969), Missouri (1972), Ohio (1953), Oregon (1970), Virginia (1973), and Wisconsin (1969).

⁴Other researchers have also found direct writers to be lower cost producers of insurance than are agency writers, J. David Cummins and Jack Van Derhei [3].

⁵One should, however, be cautious in drawing inferences from Ippolito's work since his sample period covered only the years 1966 through 1972, which was before most deregulation actions had

One study that did find support for the excessive price hypothesis was preformed by Frech and Samprone [5]. Based on a simple comparison of mean loss ratios for regulated and unregulated states in 1973, they found that states that regulated automobile insurance had significantly lower loss ratios, or stated differently, higher unit prices (i.e., prices relative to insurance benefit payments).

Pauly, Kunreuther, and Kleindorfer [15] addressed the more recent experience in a study of the period from 1975 through 1980. Their analysis focused on the effects of states with prior approval laws (in particular, those in effect for at least two-thirds of the period analyzed). Pauly, et al. found that regulation actually boosted the loss ratios, or reduced unit prices, for both collision and liability insurance. The price-reducing effects were especially strong for agency writers, which have traditionally been higher price suppliers of insurance. There was also some evidence that regulation reduced the market share of direct writers in the collision benefit market.

A study by Harrington [10] of the period from 1976 through 1981 likewise found that prior approval regulation increases average loss ratios. This study employed a random coefficient model that allowed for a differential impact across states. Harrington found qualitatively similar results for all regulated states (higher loss ratios and lower unit prices), but the impact was markedly greater in roughly a half dozen states, such as Massachusetts and New Jersey. An extension of this work by Harrington [7] found that, on average, rate regulation increased loss ratios by 0.03 to 0.05. Another study by Harrington [8] has been concerned with the consumer pressure hypothesis, whereby consumers advocate regulations that reduce insurance rates and raise loss ratios. Using data from 1976 through 1981, Harrington found results that were consistent with this hypothesis on average over this period. Results for individual years were less strong.

Somewhat surprisingly, D'Arcy [4] reached the opposite result from the Pauly et al. [15] and Harrington [7], [8], [10] articles using a 1973–1980 sample for private passenger auto insurance. In particular, D'Arcy found loss ratios were negatively related to a measure of regulatory stringency based on Conning and Company surveys of managerial opinion. This article will also explore this stringency measure.

Overall, the existing evidence on the effect of automobile insurance regulation is quite mixed. There appears to be no “generic” time-invariant effect of regulation on the automobile insurance industry. However, studies focusing on more recent periods suggest that regulation now constrains rather than increases unit prices, with this effect particularly concentrated in a small number of states. In addition, there has been some speculation that regulation lowers insurance quality. Pauly *et al.*, [15] note that the assigned risk pools, on

occurred. Of the ten states in the sample, only four had switched from prior approval ratings to competitive ratings during the time period he analyzed, and for these four states there was little time for the impacts of deregulation to be generated.

average, are larger in regulated states, but this hypothesis has not been explored in the same detail as has the impact of regulation on loss ratios.

General Hypothesis To Be Tested

A possible interpretation of the mixed findings of the existing literature is that the nature of regulation itself has undergone significant change since the early 1970s, a period of rapid growth in automobile premium and benefit payments in both nominal and real terms. In this environment, it is reasonable to expect regulators to feel increasing political pressure to restrain rather than increase prices. One possible response was to deregulate and let the market bring prices down. Another response would be to use regulatory procedures to keep prices below rather than above competitive market levels.

This effect of deregulation on prices is the basic issue for investigation in this paper. If regulators attempt to keep prices below competitive market levels, some individuals will have difficulty obtaining insurance at these prices. For familiar reasons, holding the insurance price below the market clearing price will create an excess demand for insurance, leading to quantity rationing.

The actual rationing that will take place differs in terms of its general character from what would happen for a conventional good. Suppose for simplicity that consumers are purchasing the same levels of coverage for identical model cars. Even in this instance, purchasers of insurance are not buying the same product. The amount of expected insurance payments associated with the policy will be greater for higher risk drivers so that they, in effect, are getting more product than are safer drivers. In the absence of regulation these drivers would be charged a higher price for otherwise identical coverage. The unit price measured in terms of expected dollar cost to the firm will be equalized across all driver groups in a competitive market. Regulations that limit the price of insurance and the degree to which the unit price can be varied for high risk drivers will consequently have a quantity rationing impact that becomes increasingly great for higher risk drivers.

This rationing will be manifested in the market through an expected increase in the number of individuals in the involuntary market or assigned risk pools. Virtually all states maintain some kind of assignment or reinsurance program for the provision of basic minimum levels of insurance to high risk individuals, usually at subsidized rates. If prices in the voluntary market are reduced significantly below competitive levels, however, insurance companies have an incentive to place additional drivers from the high end of their risk spectrum into the involuntary market, thereby raising the premiums paid by these individuals. *Ceteris paribus*, one can expect to see a larger percentage of individuals therefore in assigned risk plans (as well as a higher rate of uninsured motorists) in regulated states that constrain prices below competitive levels. In addition, one might expect insurance firms in regulated states with below average prices to adjust downward average quality and service levels in its claim services, promotion and advertising expenditures, etc.

The dependent variable examined in the previous literature has been either average premiums or premiums per unit of benefit payments to the insured population (i.e., the inverse of the "loss ratio").

The standard economic relationship governing the loss ratio is that in perfectly competitive insurance markets. If the insurance market were perfectly competitive, then equilibrium premium payments would equal expected losses plus the expenses necessary for servicing these losses efficiently (i.e., sales expenses, loss adjustment expense, etc.) plus a return that adequately compensates insurers for risk bearing. Hence, one has in equilibrium:

$$P_{ij} = L_{ij} + e_{ij}P_{ij} + r_{ij}P_{ij},$$

where

P_{ij} = premiums in state i for category j drivers,

L_{ij} = expected losses to insurers (or benefit payments to insureds) in state i for category j drivers.

e_{ij} = other insurance expenses in state i for category j drivers (as a proportion of expected premiums),

and

r_{ij} = competitive return for risk bearing in state i for category j drivers (as a proportion of expected premiums).

Equation (1) can alternatively be expressed as:

$$p_{ij} = P_{ij}/L_{ij} = \frac{1}{1 - e_{ij} - r_{ij}} \quad (2)$$

where

p_{ij} = unit price of insurance for category j drivers.

If binding regulations reduce average premiums in state i below competitive equilibrium levels, they will also reduce unit prices or the ratio of premiums to expected losses given in equation (2). Consequently, below-market prices mandated by regulation can be expected to lead to a lower return to insurers. It also may cause firms to reduce quality and service levels, thereby reducing the expense premium ratio. These responses include placing marginal risks in the assigned risk pool, thereby offsetting some of their expected decline in per unit premium price and returns. Hence, if regulation reduces prices below competitive level, declines would be expected in the unit price in regulated states accompanied by increases in the allocations to the assigned risk pool. This key hypothesis will be examined in the empirical analysis.

In analyzing the effects of regulation on price, separate regression equations are run for property and bodily injury or liability insurance. Although insurers should equalize the profitability of policies across product lines, the interest of regulators has been more focused on bodily injury and liability insurance than on property and collision insurance. Furthermore,

state practices differ with respect to no-fault provisions, and this variation will influence expenses and unit prices across states. The present study controls for this factor explicitly in the case of bodily injury insurance. In addition, it includes some other control variables in the price equations to reflect likely differences in expense ratio or profits from factors independent of regulation.

Pooled Time Series and Cross-Sectional Analysis of Thirty Largest States

This analysis focuses on the 30 largest states for two reasons. First, these are the states for which data are available to construct a measure of regulatory stringency, which will be a principal regulatory variable in the analysis below. In particular, insurance managers in these states are queried in periodic surveys by Conning and Company [2] as to their freedom to manage personal business lines. Second, the use of the largest 30 states significantly attenuates the heteroskedasticity problem that occurs when all 50 states are included. This latter problem, of course, can be addressed through weighting schemes, but such corrections can also introduce an element of uncertainty into the analysis since the true functional form of the heteroskedasticity is unknown. The 30 largest states that account for over 90 percent of the total premiums written nationally provide a very comprehensive data sample, and analysis of this group avoids the distortions from giving very small states an equal weight.

The 30 state sample also includes a good balance between regulated and competitive rating states. Twelve of the states had competitive rating for the entire period of our sample from 1974 through 1981, one state (Arizona) changed during this period, and the other 17 states were regulated for the entire period. Detailed information on the characteristics of regulation in these 30 states is presented in an Appendix available from the authors.

Empirical Analyses of Unit Prices

It is instructive to begin the analysis with the data base that most closely parallels existing studies, after which additional tests of regulatory effects that have not been considered in the literature will be introduced. As discussed above, the principal dependent variable in our price equations is price per unit of benefit payments to insurance holders.⁶ Because of likely differences in the determinants of loss ratios for different lines of insurance, separate regressions are always run for liability (bodily injury) and property insurance and also disaggregate direct writers and independent agency writers in cases where the available data permit.

The basic regression estimated in this section is:

$$P_{it} = \alpha_0 + \sum_{t=1}^9 \alpha_{2t}TD_t + \alpha_3WAGE_{it} + \alpha_4PCI_{it} + \alpha_5NOFAULT_{it} + \alpha_6REG_{it} + \alpha_7STRING_{it} + v_{it} \quad (3)$$

⁶The unit price variable was constructed using information contained in A.M. Best Company, The Best Executive Data Service, Ten-Year Totals Tape, Property-Casualty, 1974-1983.

where

p_{it} = unit price of the i th state in year t ,

TD_t = time intercept dummy variable which takes the value 1 in year t and zero otherwise,

$WAGE_{it}$ = real wage rate of production workers in i th state in year t ,

PCI_{it} = real per capita income of i th state in year t ,

$NOFAULT_{it}$ = dummy variable that takes the value 1 if state has a no-fault system in year t ,

REG_{it} = dummy variable which takes the value 1 if i th state is regulated in year t

$STRING_{it}$ = dummy variable which takes the value 1 if state ranks high on Conning & Co. measure of regulatory stringency,

and

v_{it} = random error term for i th state in year t .

Specification of a complete "fixed effects" model is preferable where state and year effects are extracted through a series of dummy variables. However, since only one state switched regulatory schemes within the period of analysis, the state effects are extremely collinear with the regulatory dummy variable. Consequently, only the year effect can be estimated.

Two measures of regulation are employed with this sample. First, the conventionally employed dummy variable (REG) is used, which takes on a value of one for each year that a state had prior approval regulations and zero otherwise. Second, within the class of 14 regulated states a measure of regulatory stringency is employed which is constructed from the Conning and Company rating.⁷

In exploratory runs, the results were not sensitive to different reasonable specifications of the stringency measure. One obvious variable was apparent from the rankings. Specifically, three of the states (North Carolina, Massachusetts and New Jersey) were ranked at the very bottom in terms of freedom to manage personal business lines in the three questionnaires undertaken by Conning and Company [2] between 1975 and 1980. Furthermore, these three states were the only states to average above 10 points on a 12-point scale (where 1 represents the most freedom and California achieved a 1.39). They were also placed in the 10- to 12-point range by 90 percent or more of the managers surveyed. Clearly, one measure of regulatory stringency was to place these states in a separate category, which was done using a dummy variable ($STRING$) that assumed a value of 1 for these states only. The other regulatory states were grouped in different blocks (e.g., the upper quartile, etc.). Thus, no attempt was made to impose an arbitrary

⁷ An alternative measure of regulatory stringency was employed by Smallwood [16] in an early study of loss ratios for automobile insurance. In particular, a state was classified as stringent if the Commissioner had disapproved a rate filing as excessive or had otherwise intervened in a case important enough to generate prominent discussion in the trade press. This stringency measure was found to have a significant positive relation with loss ratios in the late 1960s.

quantitative metric on the qualitative responses. The results of these alternative formulations are discussed below.

In the case of the price equations involving bodily injury insurance, a 0–1 dummy variable was included denoting whether a state did or did not have a no-fault program ($NOFAULT$).⁸ Half of the 30 states in this sample had a no-fault program during this sample period. In general, one might expect states with no-fault plans to have lower unit prices since the main purpose of such plans is to reduce or eliminate loss adjustment expenses associated with court litigation, lawyer fees, etc. Past studies, such as the analysis by Harrington [8], have tended to find that the no-fault states do in fact have significantly lower price-loss ratios.

As discussed above, formulation of the dependent variable as a price-loss ratio directly controls for differences in individual risk across states. Since the price-loss ratio incorporates sales and loss adjustment expenses, it is useful to include some determinant variables to control for possible interstate variations in this factor. Inclusion of such factors was a principal innovation of the study by Pauly *et al* [15]. In this regard, average wage rate is included for production workers ($WAGE$) as a measure of input prices to insurers.⁹

A second control variable included in the price regression was the state's per capita income (PCI).¹⁰ It has been postulated (Pauly, *et al.* [15]) that a wealthier and better educated populace will generally have better information on insurance policies and that this in turn will tend to lower overall prices. High per capita income is also a factor that may lead to some operating economies for insurers if it results in more developed distribution outlets, more extensive advertising media, etc. Other variables pertaining to state differences have been suggested in the literature, such as the degree of urbanization, but these measures do not greatly affect the estimates of regulatory effects (see Harrington [7]) and have not been included.

Finally, since this study deals with a pooled, cross-section sample, it includes time dummies for each year to pick up business cycle effects and other shocks that are specific to a particular period, but which affect the states in this sample similarly.¹¹

⁸ The $NOFAULT$ variable was constructed with information from State Farm Insurance Companies' Handbook of NO-FAULT Regulations.

⁹ The average wage for production workers ($WAGE$) can be found in the U.S. Bureau of Labor Statistics, Handbook of Labor Statistics (various years), and the U.S. Dept. of Labor, Employment and Earnings (various years).

¹⁰ The per capita income (PCI) information can be found in the U.S. Bureau of Labor Statistics, Handbook of Labor Statistics (various years).

¹¹ It may be instructive to compare this specification with one of those in the literature, such as Harrington [7]. Both studies have the same dependent variable and include a wage variable and a regulatory dummy variable. Whereas this analysis includes a nofault dummy variable, his includes two continuous insurance variables. Our only state difference variable was per capita income, whereas Harrington analyzed the average expected loss per insured vehicle. The current analysis excluded the loss measure, but the income and loss variables may be capturing similar influences since they are positively correlated. This study also included the year-specific dummy variables, whereas Harrington's did not.

The regression results for the first set of unit price equations are presented in Table 1 which is based on liability insurance coverage for state-wide aggregates of direct and agency writers as well as for the combined case involving both types of insurers. The regulation variable, REG, has a negative and statistically significant coefficient overall and for direct and agency writers separately. This result implies that the states with non-competitive rating systems had lower unit prices after taking into account the other factors included in these equations.

Table 1

Liability Insurance Unit Price Regression Equations
1975 - 1981

Independent Variables	Coefficients and Standard Errors					
	Aggregated Liability		Direct Writers		Agency Writers	
INTERCEPT	1.924 (0.086)	1.954 (0.085)	2.016 (0.090)	2.020 (0.091)	1.834 (0.097)	1.897 (0.093)
PCI	-6.4E-5 (1.4E-5)	-4.9E-5 (1.5E-5)	-6.0E-5 (1.5E-5)	-5.8E-5 (1.6E-5)	-6.5E-5 (1.7E-5)	-3.9E-5 (1.7E-5)
WAGE	7.0E-4 (0.021)	-0.029 (0.023)	-0.027 (0.021)	-0.031 (0.246)	-0.027 (0.024)	-0.026 (0.025)
NO FAULT	-0.117 (0.021)	-0.121 (0.021)	-0.130 (0.022)	-0.130 (0.022)	-0.106 (0.024)	-0.112 (0.023)
REG	-0.087 (0.020)	-0.064 (0.021)	-0.078 (0.021)	-0.075 (0.023)	-0.102 (0.023)	-0.060 (0.023)
STRING	—	-0.105 (0.037)	—	-0.014 (0.039)	—	-0.189 (0.040)
R ²	.36	.39	.36	.35	.32	.38

Note: Time dummies for all but one of sample years are also included in the above regressions but are not reported.

In addition, the regulatory stringency measure based on Conning and Co. rankings, STRING, was negative and highly significant in two of the three equations, where it was included along with the REG variable. As discussed above, the STRING variable involves a separate grouping of the three states (Massachusetts, New Jersey and North Carolina) that had extreme scores on Conning's survey of insurance managers. The coefficient of this variable in the aggregate liability equation for this variable indicates that regulation in these three states had an impact on prices more than twice that in other regulated states.¹² An interesting difference across the equations is that the STRING variable has a very small coefficient and is not statistically significant for the direct writers equation. This result may indicate a greater

¹²The behavior of STRING variable is generally consistent with the findings of Harrington [10] who employed a random coefficient model and found regulation in these three states had significantly greater impact on loss ratios than the average for other prior approval states.

relative effect of stringency on agency writers¹³, but since the REG coefficients are fairly similar across all equations estimated, it is not clear whether the differences stem from regulatory stringency or some omitted characteristics of the three states with stringent regulation.

Several other variables were also influential. The NOFAULT variable was highly significant, with the expected negative sign. The per capita income variable, PCI, is statistically significant and negative. This effect is consistent with the hypothesis that higher income groups have better information on insurance values. There also may be scale economies in servicing higher income groups. The WAGE variable has an inconsistent sign and is never close to being statistically significant. This weak result may be due to the inadequacy of production worker wages as a proxy for input prices to insurers.

Analogous results for property insurance coverage appear in Table 2. The overall equation performance is similar, so here the focus is on only the regulatory variables. The REG variable has comparable magnitude across all equations, and it is only for agency writers that STRING is negative and statistically significant. Based on the aggregative regressions and the STRING coefficients for agency and direct writers, it appears that automobile insurance regulators are more concerned with lowering the prices of liability insurance than property insurance. The results for the REG variable do not reflect such differences so that the differential emphasis may be reflected only through the character of regulation.

Empirical Analysis of Insurance Availability

As discussed in Section I, if regulation operates to lower insurance prices below competitive market levels, corresponding increases are expected in the number of drivers assigned to the involuntary market in regulated states. Moreover, the analysis in the previous section indicates the effect of regulation on unit price is particularly severe in a few states. Consequently, the effect of regulation on the percentage of individuals in the involuntary market should also be much stronger for these states.¹⁴

This issue is investigated in Table 3, where the dependent variable is the percentage of a state's drivers in the involuntary market.¹⁵ In addition to the REG and STRING variables used in the price equation, a number of

¹³One should be somewhat cautious in interpreting these results since the direct (before reinsurance) loss ratios used to calculate unit prices could exceed the net (after reinsurance) loss ratios for agency firms and be less than the net loss ratios for direct writers in states with reinsurance facilities. These and other complications are discussed by Harrington [7, 10].

¹⁴A study of the percentage of individuals in the involuntary market was recently performed by Hammit et al. [6]. Their study examines the effect of regulation on the involuntary market using a multiple regression analysis. They find that regulation has a positive effect on involuntary market share. They do not explicitly consider the effect of regulatory stringency. Ippolito [11] also found that states that regulated auto insurance had larger involuntary markets in the early 1970s.

¹⁵Information pertaining to the percentage of drivers in the involuntary market was found in Automobile Insurance Plans Service Office, *AIPSO Insurance Facts* (various years).

Table 2

Property Insurance Unit Price Regression Equations
1974 - 1981

Independent Variables	Coefficients and Standard Errors					
	Aggregated Liability		Direct Writers		Agency Writers	
INTERCEPT	1.799 (0.069)	1.797 (0.069)	1.734 (0.071)	1.725 (0.072)	1.862 (0.082)	1.878 (0.083)
PCI	-4.0E-5 (1.1E-5)	-4.1E-5 (1.2E-5)	-3.8E-5 (1.2E-5)	-4.2E-5 (1.2E-5)	-4.6E-5 (1.3E-5)	-3.8E-5 (1.4E-5)
WAGE	-0.008 (0.016)	-0.006 (0.019)	0.002 (0.017)	0.011 (0.019)	-0.010 (0.020)	-0.026 (0.022)
REG	-0.058 (0.016)	-0.060 (0.018)	-0.060 (0.017)	-0.066 (0.018)	-0.072 (0.020)	-0.060 (0.021)
STRING	—	0.007 (0.030)	—	0.030 (0.031)	—	-0.055 (0.036)
R ²	.45	.45	.42	.42	.47	.47

Note: Time dummies for all but one of sample years are also included in the above regressions but are not reported.

additional explanatory variables are employed in this equation relating either to the general riskiness of the states's population or to the various programs and legislative requirements affecting the involuntary market in a particular state. These variables were not needed earlier because of the properties of the loss ratio information.

In an analysis of the population of the shared market, the Automobile Insurance Plans Service [1] found the demographics of the involuntary market mirrored that of the competitive market with two exceptions: a greater portion of young male drivers are insured through the shared market, and there is a slightly greater portion of urban drivers assigned to the residual market. To control for these two events, the variables YMALE (the percentage of licensed drivers that are males under the age of 25) and URBANP (the percentage of miles driven in urban areas) were included in the assigned risk regressions.¹⁶ The coefficient on the YMALE and the URBANP variables should both be positive, reflecting the tendency to insure young males and urban drivers through the involuntary market. Since drivers with previous accidents tend to be insured through the residual market, the variable INJURYR (the automobile injury rate per hundred million miles of travel) was also included to control for the inherent riskiness of a state's driving population.¹⁷

¹⁶Information on these variables can be found in Federal Highway Administration., Highway Statistics (various years). The YMALE was constructed using two different series: the number of young drivers and the number of male drivers (all ages) in a state. It is assumed that the percent of young drivers that are male equals the percent of all drivers that are male in a state.

¹⁷Information on the variable INJURYR can be found in Federal Highway Administration Highway Statistics (various years).

Table 3

Ratio of Drivers in Involuntary Market to Total Market Regression Results
for 30 Largest States
1974 - 1981

Independent Variables	Coefficients and Standard Errors	
	(1)	(2)
INTERCEPT	0.079 (0.065)	0.062 (0.054)
YMALE	-1.309 (0.427)	-0.892 (0.358)
URBAN	0.121 (0.036)	0.036 (0.031)
INJURY	1.0E-4 (6.6E-5)	1.6E-4 (5.5E-5)
COMPLIAB	0.021 (0.007)	0.013 (0.006)
LIABONLY	-0.017 (0.011)	-0.002 (0.009)
JOINT	0.021 (0.012)	0.026 (0.010)
REINSURE	0.187 (0.014)	0.043 (0.019)
REG	0.026 (0.008)	0.010 (0.006)
STRING		0.170 (0.017)
R ²	.63	.75

Note: Time dummies for all but one of sample years are also included in the above regressions but are not reported.

A number of regulation dummy variables were also included in the shared market regressions to control for the type of residual market operations. Most states operate their assigned risk plans through the Automobile Insurance Plans Service Office (AIPSO). Under the AIPSO arrangement, each firm is responsible to service a percentage of the drivers in the assigned risk plan equal to their market share in the voluntary market.¹⁸ There are two major alternatives to the AIPSO-type residual market: reinsurance facilities and joint underwriting associations. The two alternative residual markets are similar in that the total losses, and not individual drivers, are apportioned to firms. However, the disposition of claims differs between the two alternative mechanisms. Reinsurance facilities are considered a "take all comers" operation where individual firms cannot refuse to underwrite an individual

¹⁸A comprehensive description of the operation of the residual market can be found in J. Finley Lee [14].

driver. If a firm under a reinsurance arrangement does not wish to underwrite a particular driver through the voluntary market, the firm simply cedes some of the premiums to the residual market. If a firm incurs losses on a driver in the residual market, the firm is reimbursed through pooled funds. Under joint underwriting, drivers in the residual market are serviced through a small number of highly subsidized carriers. The losses for the residual market carriers are subsidized by firms operating in the voluntary market, where subsidies are apportioned according to the firm's voluntary market share.

To control for the alternative mechanism, dummy variables for reinsurance facilities (REINSURE) and joint underwriting associations (JOINT) were included in the assigned risk regressions.¹⁹ Two other dummy variables are included in the assigned risk regressions to control for interstate differences in regulation that might affect the size of the involuntary market. The variable COMPLIAB²⁰ measures whether a state has a compulsory liability statute and LIABONLY²¹ measures whether only liability insurance is available to drivers in the assigned market. In states with no-fault insurance, individuals essentially insured themselves against the risk of personal injury. To guarantee that the individual driver would purchase individual coverage, all no-fault states passed compulsory liability laws mandating that drivers maintain a minimal level of personal liability coverage.²² In addition to no-fault states, a few other states also passed compulsory liability statutes. One might expect compulsory liability laws to increase the involuntary market share, since those who purchase insurance because of the law are likely to have a higher probability of being unable to obtain coverage in the voluntary market.

The inclusion of this variety of regulatory variables is intended to better capture the character and stringency of the regulation in different states and the magnitude of the cross subsidies. For example, states with reinsurance facilities tend to have large subsidies, which is the key variable reflecting the size of the residual market.

The results in Table 3 indicate that regulation does have the expected positive and statistically significant effect on the size of the involuntary market. Moreover, this effect is especially pronounced for the three-state grouping captured by the regulatory stringency variable. The effect of regulation is to increase the involuntary market in these three states by 17 percentage points holding other factors constant, whereas the effect in 11 other states is on the order of only 1 percent. The regulatory impact when

¹⁹ Construction of the REINSURE and JOINT variables is outlined in the Appendix available from the authors.

²⁰ The compulsory liability (COMPLIAB) variable was constructed with information contained in the Alliance of American Insurance Companies, Handbook of State Regulators (1981).

²¹ The liability only (LIABONLY) variable was constructed with information in Automobile Insurance Plan Service Office, AIPSO Insurance Facts (various years).

²² In this respect, the COMPLIAB and NOFAULT variables are highly collinear. Therefore, NOFAULT and COMPLIAB were never included together in the same regression. The NOFAULT variable was believed to be more appropriate for price regressions and the COMPLIAB variable more appropriate for the availability results.

averaged over all states is 2.6 percent (from equation 1). The role of stringent regulation is rather striking, but this effect is fully consistent with the two to three times larger effect of regulation on price for the states exhibited in the previous tables.

The other variables in Table 3 generally take on the expected sign and several are statistically significant. The variables of greater interest are those pertaining to other aspects of regulation. Re-insurance facilities are associated with larger involuntary markets, while there is only a moderate relation observed for joint underwriting associations. Compulsory liability increases the size of the residual market, while the LIABONLY coefficient was negative but statistically insignificant.²³

Estimation of Subsidies to Involuntary Market Drivers

Assigned risk pools were originally established to provide high-risk drivers an opportunity to purchase an adequate level of insurance. So as not to encourage these individuals to drive uninsured, all states regulate the prices in the involuntary market, with price held below market clearing levels. Because of the high-risk nature of the involuntary market drivers in many instances, operations in the residual market produce deficits.²⁴ In this section, the size of the deficits in the 30-state sample is measured.

The total deficit (surplus) in the involuntary market for state j and year t is defined as:

$$DEF_{jt} = EP_{jt} - IL_{jt} - OE_{jt}, \quad (4)$$

where EP is total earned premiums, IL is total incurred losses, and OE is the total operating expenses associated with servicing the shared market. Unfortunately, data on operating expenses are not available for the shared market. OE can be estimated based on the volume of earned premiums. The expected loss ratio (ELR) is defined as the percentage of premium dollars available for underwriting losses once operating expenses have been paid. The Automobile Insurance Plans Service Office (AIPSO) has estimated an expected loss ratio for each state and each line of insurance, basing their calculations on the variable costs associated with servicing each policy.²⁵ With an estimate of the ELR, operating expenses are estimated by AIPSO

²³ On explanatory variable, YMALE, has an unexpected negative coefficient which is statistically significant. The effect of an increased number of young males might be captured by one of the other variables in this equation with the negative coefficient on YMALE reflecting some omitted factor.

²⁴ For the legislative history surrounding the regulation of the involuntary market, see J. Finley Lee [14].

²⁵ The variables EP , IL and ELR are all found in Automobile Insurance Plans Service Office, AIPSO Insurance Facts (various years). The approach to estimating subsidies presented here is derived from J. Finley Lee, Servicing the Shared Automobile Insurance Market (Prepared for the Automobile Insurance Plans Service Office, 1977). The estimates presented in recent AIPSO publications also embody this estimation approach.

according to the equation²⁶

$$OE_{jt} \cong EP_{jt}(1 - ELR_j). \quad (5)$$

Total deficits (surpluses) in each state's residual market are now defined as:

$$DEF_{jt} = (ELR_j)EP_{jt} - IL_{jt} \quad (6)$$

Letting INVOL represent the number of drivers in the involuntary market, then the average subsidy received by each driver in the residual market SUBINVOLV is represented by:

$$SUBINVOL_{jt} = DEF_{jt}/INVOL_{jt}. \quad (7)$$

Table 4 presents estimates of DEF and SUBINVOL for 28 of the 30 largest states from 1975 through 1981.²⁷ In the final column of Table 4, surpluses are represented as negative values. As the table indicates, 21 states ran deficits in the involuntary market. Deficits range from \$26,000 per year in Arizona to over a quarter of a billion dollars per year in New Jersey. Equally variable are the positive totals for SUBINVOL, with average subsidies received per driver ranging from \$2.07 per year to \$292.37 per year.

The states of Massachusetts, New Jersey, and North Carolina account for one half to three fourths of the total deficits from 1975 to 1981. The size of this deficit has been increasing rapidly over time, as it nearly doubled in real terms over the six-year period considered here.

The share of the market affected by these subsidies is also increased by regulation. The percentage of drivers in the involuntary market is three and one half times greater in regulated states in comparison to their unregulated counterparts, and the subsidy per driver in the involuntary market is nearly twice as great, \$97.31 to \$57.98.

In sum, there appears to be a significant and growing regulatory problem related to the size of the involuntary market and the level of subsidies which are required. Moreover, this problem is heavily concentrated in a few states which rank high in terms of our regulatory stringency variable.

Analysis of States that Deregulated During the 1970s

This section focuses on the sample of eleven states that deregulated during the 1970s and how price and availability changed in the post-regulation period compared with the pre-regulation one. Such an analysis has not been previously undertaken, in part because earlier authors did not have an extensive experience with the deregulation case to examine.

²⁶ This calculation is not necessary for states that operate alternate involuntary markets such as reinsurance and joint underwriting associations because operating expense data was obtained for these states. Therefore, for Florida, Massachusetts, Missouri, and North Carolina, the subsidies and deficits are actual and not estimated using the expected loss ratio procedure. Data on OE for these four states was located in Automobile Insurance Plans Service Office, *supra* note.

²⁷ Because of data inadequacies, deficit and subsidy calculations could not be made for Maryland and Texas.

Table 4

Losses and Subsidies Associated with the Involuntary Market Yearly Averages
Over 1975 - 1981 For 30 Largest States

STATE	Relative size of involuntary market (INVOLP**)	Subsidy per driver in involuntary market (SUBINVOL*)	Deficit in thousands of dollars (DEF*)
Alabama	.008	2.98	52
Arizona	.001	53.63	26
California	.028	87.55	22075
Colorado	.001	-46.60	-45
Connecticut	.009	109.27	15879
Florida	.100	55.44	21910
Georgia	.042	16.61	1439
Illinois	.007	140.30	5090
Indiana	.001	-21.74	60
Iowa	.001	-44.20	-65
Kansas	.033	60.06	2790
Kentucky	.016	16.73	305
Louisiana	.094	44.23	7382
Maryland	.049	NA	NA
Massachusetts	.308	292.37	222972
Michigan	.024	92.85	10131
Minnesota	.009	2.07	449
Missouri	.009	26.70	1510
New Jersey	.267	246.78	252327
New York	.121	134.24	22331
North Carolina	.240	53.38	39057
Ohio	.001	-12.33	-65
Oklahoma	.002	30.64	53
Oregon	.002	-116.91	-220
Pennsylvania	.049	190.15	56827
Tennessee	.030	3.37	265
Texas	.048	NA	NA
Virginia	.080	27.27	5825
Washington	.013	-15.65	-558
Wisconsin	.002	-23.26	-107

* 1983 Dollars

** INVOLP is the ratio of drivers insured in the involuntary market, to total insured drivers.

This analysis is also of considerable substantive interest because as noted in Section I, some of the studies of the automobile insurance experience in the early 1970s found support for the traditional hypothesis of Stigler [17] and of others that regulation resulted in higher prices to consumers. However, as the intensive inflationary environment persisted in the 1970s, regulators and legislators came under increasing pressure to hold down insurance prices. They could respond in one of two very different ways: to institute competitive rating through deregulation or to undertake price-restraining regulation. The preceding analysis provides support for the hypothesis that regulation in those

states maintaining it after 1975 was price restraining. It does not indicate, however, what happened to prices in those states that deregulated relative to the pre-deregulatory period. This is the object of this section.

Table 5 shows the eleven states that deregulated between 1971 and 1980. This table also shows unit prices in each state for a two- to three-year period preceding deregulation and the corresponding national average for the same period. The most interesting result emerging from this table is that, in the case of liability insurance, nine of the 11 states had unit prices in excess of the national average at the time of deregulation. For four states (Illinois, Missouri, Hawaii, and Arkansas), the differences were quite substantial (in excess of 10 percent). A quite different pattern is exhibited for property insurance, which has been less affected by regulation. The 11 states were evenly divided relative to the national average with six states above and five below. In addition, the unweighted mean for the 11 states was virtually identical to the national mean in the case of property insurance.

Table 5

Characteristics of States Shifting to Competitive Rating Systems
1971 - 1980

State	Year Deregulated	Average Unit Prices Before Deregulation ¹			
		Liability		Property	
		State Average	National Average	State Average	National Average
Illinois	71	1.75	1.59	1.50	1.47
Nevada	71	1.33	1.59	1.56	1.47
Missouri	72	1.86	1.64	1.76	1.79
Colorado	72	1.66	1.64	1.76	1.79
Utah	73	1.67	1.64	1.74	1.79
Virginia	74	1.62	1.56	1.82	1.56
New Mexico	75	1.53	1.52	1.60	1.47
Hawaii	75	2.05	1.52	1.61	1.47
South Dakota	78	1.64	1.53	1.46	1.49
Arkansas	79	1.80	1.54	1.43	1.52
Arizona	80	1.46	1.52	1.56	1.51
UNWEIGHTED MEAN		1.67	1.57	1.61	1.58

¹Averages are calculated over 2 or 3 year periods depending on data availability.

The fact that nine of the 11 states had above average unit prices for liability insurance in a period of inflationary pressure adds further credence to the hypothesis that legislators in these states may have been pushed toward deregulation as a means to lower prices.²⁸ This pattern also raises some sample

²⁸In the post deregulation period, prices in these eleven states moved back toward the national average and the unweighted mean price is very close in value to the national average (1.58 to 1.54). A multiple regression analysis of the effects of regulation on these price changes is developed in the remainder of this section of the paper.

selection issues. The states choosing to deregulate during the 1970s may have not been randomly selected, but rather were concentrated among those in which regulation had a positive effect on prices. If this is the case, it would be difficult to generalize to future deregulations from the experience of these states, since our cross-sectional results indicate that automobile liability insurance regulation had a predominantly negative effect on prices after 1975.

Whatever the representativeness of these states, the purpose of the analysis in this section is not to generalize from them to future deregulations. Rather, it is to investigate what actually occurred in the states that chose to deregulate during the 1970s. This is an interesting question in its own right. It should shed some light on the complex, evolving nature of insurance regulation.

This analysis of price behavior in the 11 states shifting to competitive rating during the 1970s employed a pooled cross-sectional sample with individual state and time dummies. This approach will control for all time-specific and state-specific effects and yield unbiased estimates of the effect of deregulation. Unlike earlier results for 30 states, the switch in regulatory regime allows inclusion of state effect dummy variables, since REG and the individual state dummies are no longer perfectly collinear. The state-specific dummy variables are included in lieu of substantive variables such as the state's average wage rate because of problems of data availability. If, however, time invariant state-specific variables were included, the regulatory coefficients would be the same as those that are obtained by simply including a state dummy variable.

Accordingly, the following functional form was estimated:

$$p_{it} = \alpha_0 + \sum_{i=1}^{10} \alpha_{1i} SD_i + \sum_{t=1}^9 \alpha_{2t} TD_t + \alpha_3 NOFAULT_{it} + \alpha_4 DERE_{it} + \alpha_5 YDEREG_{it} + v_{it} \quad (8)$$

where

p_{it} = unit price of the i th state in period t ,

SD_i = state intercept dummy variable which takes the value 1 for the i th state and zero otherwise.

TD_t = time intercept dummy variable which takes the value 1 in year t and zero otherwise,

$NOFAULT_{it}$ = dummy variable that takes the value 1 if the i th state has no-fault system in year t ,

$DEREG_{it}$ = dummy variable which takes the value 1 if the i th state has converted to competitive rating in year t and 0 if it's regulated,

$YDEREG_{it}$ = the number of years that i th state has had competitive rating at the beginning of time period t ,

and

v_{it} = random error term for state i in year t .

Under this methodological approach, which involves a standard analysis of co-variance, the state dummy's variables are used to control for the omitted fixed effects, including all factors influencing prices that are specific to each state. The time dummy variable DEREK then captures the effect of deregulation on prices in the post- versus pre-deregulation period, holding these statewide and time-dependent factors constant.²⁹ Since the effects of deregulation cannot be expected to become fully effective immediately during the first year of deregulation, the variable YDEREG, which is the number of years that a state has had competitive rating, is also included to pick up effects that are cumulative in nature. The STRING variable used earlier cannot be employed for the deregulation experiment analysis because none of these heavily regulated states deregulated during the period under study.

The results of estimating equation (1) for the 11-state sample are presented in Table 6. The dependent variable here is unit prices averaged over all of the insurers in a particular state (i.e., combining agency and direct writers). Ordinary least squares estimates are presented and, because of the longer time domain, generalized least squares estimates that adjust for auto-correlation are also presented.³⁰ Auto-correlation may be more a problem in this analysis because there is less of a cross-sectional sample and a longer time series for each state.

Table 6

Unit Price Regressions For Eleven State Deregulated Sample
1973 - 1983

Independent Variables	Coefficients and Standard Errors			
	Liability		Property	
	OLS	GLS	OLS	GLS
NOFAULT	-0.227 (0.048)	-0.179 (0.051)	— —	— —
DEREG	-0.094 (0.042)	-0.100 (0.047)	-0.090 (0.051)	-0.082 (0.056)
YDEREG	-0.022 (0.012)	-0.020 (0.014)	0.0006 (0.0149)	0.0011 (0.0179)
R ²	.99	.99	.99	.99
RHO	—	.39	—	.37

Note: State and time intercept dummies are included in all regressions but are not reported separately.

²⁹The DEREK variable simply equals 1-REG.

³⁰The RHO was constrained to be equal across states and estimated using the Durbin procedure. For an outline of the procedure, see Judge, et al. [13]. The data in the GLS routine was transformed so as not to lose the first observation in each data block.

The results in Table 6 indicate that the switch to competitive rating resulted in lower unit prices in the case of liability insurance, and this negative price effect of deregulation became more pronounced over time. The coefficients of these variables are statistically significant at normal confidence intervals (except in one instance). The NOFAULT variable is also statistically significant with the expected negative sign.

For property insurance, DEREK also has a negative estimated coefficient, but one that is not statistically significant. The cumulative time deregulation variable has a positive sign, but the standard error is quite large. Hence, these results indicate that the effects of regulation were much more substantial in the case of liability insurance versus property insurance. This result may be due in part to the closer relationship between national and local rates for property insurance in the states that deregulated than for liability insurance. This result is also consistent with the findings in the previous section.

Table 7 presents the results of estimating equation (1) separately for agency and direct writer liability insurance. These results are also quite interesting. They indicate the coefficient on the deregulation variable is statistically significant for direct writers but not agency writers. These results are therefore consistent with the hypothesis that regulation operated to produce price floors in these states, and this affected the impact on the prices for the low-cost, more efficient direct writers much more than those of agency writers. Under this hypothesis, one would expect direct writers to decrease prices relative to agency writers' prices after the introduction of competitive rating, and this is what the results in Table 7 indicate happened.

Table 7

Unit Price Liability Insurance Regression For Direct Writers and Agency Insurers,
1975 - 1983

Independent Variables	Coefficients and Standard Errors			
	Direct Writers		Agency Insurers	
	OLS	GLS	OLS	GLS
NOFAULT	-0.221 (0.078)	-0.172 (0.097)	-0.044 (0.095)	-0.027 (0.246)
DEREG	-0.138 (0.060)	-0.127 (0.065)	-0.064 (0.073)	-0.104 (0.078)
YDEREG	-0.035 (0.025)	-0.028 (0.023)	0.009 (0.029)	0.004 (0.034)
R ²	.99	.99	.99	.99
RHO	—	.21	—	.39

Note: State and Time intercept dummies are included in all regressions but are not reported separately.

If this interpretation is a correct one, one might also expect direct writers to increase their market share after deregulation. In Table 8, the effect of

deregulation on the market share of direct writers in our 11-state sample is examined.³¹ Any market share effects of deregulation would be expected to be cumulative over time so that YDEREG is more relevant in this equation than is the DERE variable. The estimates in Table 8 (equation 3) indicate that deregulation does have a cumulative positive effect on the market share of direct writers. The variable YDEREG is statistically significant in the OLS case when it is included in the equation, but DERE is omitted. The magnitude of the coefficient indicates that the share of direct writers would increase approximately 3.5 percentage points after five full years of competitive rating—a substantial effect. The GLS estimates are of comparable magnitude but not statistically significant at the usual confidence intervals. Some non-linear versions of this equation were also examined by adding polynomial terms, but these were not significant over the period examined here. Eventually, of course, one would expect to observe a diminishing effect with time in a market share relationship.

Table 8

Direct Writers Market Share of Liability Premium Writer Insurance
Eleven State Deregulation Sample, 1975 – 1983

Independent Variables	Coefficients and Standard Errors			
	OLS	GLS	OLS	GLS
NOFAULT	0.631 (1.351)	-0.699 (1.353)	0.641 (1.329)	-0.720 (1.340)
DEREG	0.051 (1.039)	-0.167 (0.852)	—	—
YDEREG	0.667 (0.421)	0.545 (0.428)	0.657 (0.353)	0.547 (0.426)
R ²	.99	.99	.99	.99
RHO	—	.85	—	.85

Note: State and Time intercept dummies are included in all regressions but are not reported separately.

The last issue examined was the effect of deregulation on the size of the involuntary market. In addition to the variables on deregulation, two other explanatory variables were included in this specification. These were COMPLIAB (compulsory liability insurance) and ALT (an alternative insurance arrangement for the involuntary market in the form of either reinsurance facilities or joint underwriting). The results are reported in Table 9.

Deregulation also results in a decline in the size of the involuntary market. In particular, the DERE variable is negative and statistically significant for

Table 9

Percentage of Drivers in the Involuntary Market
Eleven State Deregulation Sample, 1972 – 1982

Independent Variables	Coefficients and Standard Errors	
	OLS	GLS
ALT	0.73 (0.36)	0.37 (0.43)
COMPLIAB	0.36 (0.36)	0.13 (0.37)
DEREG	-0.75 (0.27)	-0.64 (0.29)
YDEREG	-0.11 (0.07)	-0.05 (0.10)
R ²	.95	.84
RHO	—	.61

Note: State and Time intercept dummies are included in all regressions but are not reported separately.

both the ordinary and generalized least squares estimates.³² However, the estimated size of the coefficient is quite small in both instances. The coefficients imply only a 0.75 percentage point decline for the OLS case and a 0.64 percentage point decline for the GLS case. These small estimates reflect the fact that the involuntary market in these states was very small both before and after deregulation; the sample mean is less than 2 percent. Nevertheless, a small but statistically significant decline in the involuntary market did occur even in the face of declining prices after deregulation. This finding is consistent with the hypothesis that regulation can be excessively restrictive on insurers in the make-up of risk categories. Hence, one might expect to see more innovative rate structures under deregulation (e.g., student discounts, mileage-based insurance rates, etc.), and this may explain the moderate declines in assigned risk allocations observed here.

Conclusion

Because of the mixed and generally inconclusive character of the findings in much of the literature on automobile insurance rate regulation, one might be led to conclude that this form of regulation was not of substantial economic consequence. The results of these earlier studies can, however, be refined by including a larger sample of states and a longer and more recent time frame for analysis. Exploration of regulatory intensity, as opposed to the simple

³¹ For an earlier analysis of direct writer market share, see Pauly, et al. [15].

³² The ALT and COMPLIAB variables take on the expected positive sign, consistent with the earlier results in Table 3, but only the ALT variable in the OLS case is statistically significant.

presence of regulation, and analysis of the deregulation experience also has furthered understanding of the regulatory effects.

The general character of the results suggests substantial and far-reaching impacts of insurance rate regulation. The stated policy intent of insurance rate regulation is to hold prices down and make insurance more affordable. At least superficially, there appears to be some support for this view. Regulation lowers unit prices, particularly for liability coverage. This effect is not uniform and increases to an effect that is three to four times as great for a few states with stringent state regulation.

This interference with insurance market operations has the expected ramifications in terms of quantity rationing. For highly regulated states, the percentage of drivers in the involuntary market is boosted by 18 percent. Regulation may push almost one fifth of consumers into the involuntary market, leading to extensive subsidies to unsafe drivers. For the heavily regulated states, these subsidies can be quite substantial. For the extreme case of Massachusetts, the subsidy is \$292 for drivers in the involuntary market. Other forms of quantity rationing and quality declines might be expected to occur as well.

Governmental regulation may set a price ceiling, as is intended, or it may set a price floor. For the states that deregulated between 1971 and 1980, the dominant influence is the role of the price floor for liability coverage, which is the primary focus of regulation. After deregulation occurred, there was a substantial liability insurance price drop. Because these states are a self-selected sample of regulated states with high rates, it would not be appropriate to generalize this price effect to future deregulation cases; but, it does suggest that deregulation during the 1970s was basically a strategy for lowering prices rather than raising them. Deregulation also led to a moderate drop in the size of the involuntary market, in all likelihood because the freedom to vary rates across different driver groups reduced the size of the involuntary market by more than the drop in price would tend to increase it. As with other attempts to control price levels administratively, insurance rate regulation will lead to complex and widespread ramifications for market performance.

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