AN EMPIRICAL INVESTIGATION OF THE COSTS OF ADOPTING NOFAULT INSURANCE SYSTEMS: 1971-1980

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The first state to adopt nofault automobile insurance was Massachusetts in 1971. At this writing twenty-four states have some sort of nofault law. For this study, states are classified into groups: traditional fault, true nofault, add-on nofault, and optional nofault.

The automobile insurance environments of the fifty states are unique. Each state has its own combination of approaches to residual markets, unsatisfied judgments, collateral sources, contributory negligence, and fault or nofault. Commonly recognized characteristics of nofault insurance are (1) first party insurance—that is, insurance that will pay for the insured's losses even if someone else is at fault, (2) exemption to some degree of drivers from lawsuits arising from their automobile tort liability, and (3) some device to encourage (compel) the purchase of insurance for all automobiles. In this report, a state insurance system with the presence of all three of these will be categorized as true nofault. in cases where compulsory first party and liability insurance is the rule but where there are no restrictions on lawsuits, the term add-on nofault will be used; with add-on nofault, the first party benefits exist and drivers must have them, but there is no interference with the right to seek further remedy in civil court. In cases where legislation requires that nofault insurance benefits be made available but does not require that the coverages be purchased, the term optional nofault will be used. The fourth group of systems (or states) is the traditional fault states where the fault system has not been changed.

This research considers only nofault as it applies to bodily injury reparations, not to property damage. Three states (Michigan, Massachusetts, and Florida) originally enacted nofault for bodily injury and property damage. The Florida Supreme Court later ruled property damage nofault to be unconstitutional. The logical underpinnings of nofault make it an idea best suited to bodily injury liability insurance problems rather than to property damage liability problems. Absent in the property damage area are the ubiquitous problems associated with the traditional fault system, such as heavy attorney involvement, lengthy settlement periods, and ambiguity and subjectivity about loss amount determination. Moreover, the problem of uncompensated victims is less compelling because of the ready availability of physical damage insurance. Likewise, the collateral source problem is eliminated because of subrogation provisions in automobile physical damage insurance. For all these reasons property damage nofault insurance plays no role in this study.

PROBLEM STATEMENT

Numerous arguments for nofault have been adduced by proponents. These include social adequacy, fairness and equity, and promptness of reparation, but the most frequently propounded advantage is cost. Nofault should reduce the cost of the automobile insurance system because the persons who would otherwise seek recovery in civil court from careless drivers are not given this opportunity. A multitude of legal system related activities and associated costs are eliminated under nofault. Perhaps the most important dimension of nofault in this respect is the limitation of recovery to actual economic loss and the reduction in the amount of litigation that ensues from automobile accidents. For this reason, it has been asserted that a nofault system will reduce the cost of automobile insurance. It is the purpose of this study to evaluate and test the a priori reasoning regarding the cost of liability insurance and fault systems.

In Table 1, the states are classified according to the nofault categories cited earlier. Those states that do not appear on the list are traditional fault states. Along with each state is listed the date the nofault legislation became effective. The last adoption was Kentucky in 1976.

The objective of this research is to investigate the incremental cost of adopting nofault insurance for automobile bodily injury losses. The dependent variable is bodily injury reparations pure premium which includes bodily injury liability incurred losses, medical payments incurred losses, uninsured motorist incurred losses, underinsured motorist incurred losses, and personal injury protection incurred losses. Included in all the above are loss adjustment expenses. The total is divided by the number of exposure units, earned car years. Thus the pure premium amounts to the cost of all automobile bodily injury reparations on a per automobile basis.

The independent variables for this study consist of extraneous variables whose possible contaminating effects must be controlled and explanatory variables that define the fault system and are the focal point of this study. The first group of independent variables are

1. Year: The data base captures a period of ten years. The variable *controls* for time series and price level effects over time.
2. Population per square mile: This variable is a measure of population density and thus serves as a measure of congestion. One would expect *fewer* bodily injury reparation losses in less congested areas.
3. Average hourly manufacturing wages: This variable is used as a proxy for differences in price level between states. There is no consistent available state by state price level index. The underlying assumption is that there would be a close correlation between prices and wages.
4. Motor vehicle fatalities per registered vehicle: The variable is used as a measure of the relative safety or danger of the driving environment in each state.

TABLE 1 IS OMITTED FROM THIS FORMATTED DOCUMENT

State by state and year by year measurements of the dependent and independent variables constitute cases of the data set. The second group of independent variables are dummy variables representing the three categories of nofault systems: true nofault, add-on nofault, and optional nofault.

The null hypothesis tested in this study is:

There is no significant difference in automobile bodily injury reparations system pure premium costs between traditional fault and the various nofault automobile insurance systems.

RESEARCH METHODOLOGY

A longitudinal ex post facto statistical study of automobile bodily injury pure premiums was chosen as the research design to explore the marginal effects of adopting various nofault insurance systems on automobile insurance costs. Data on units of exposure and incurred losses for private passenger automobile insurance for forty-seven of the fifty states covering the years from 1971 to 1980 were obtained from the Insurance Services Office (ISO). (The Insurance Services Office is the leading national data gathering and statistical organization for the insurance industry. Three states, Texas, South Carolina, and Massachusetts, did not consistently report data to the ISO from 1971 to 1980.) Seventeen out of 470 (forty-seven states over ten years) of the observations, only 4 percent, had missing data for the calculation of the automobile bodily injury reparation system pure premium measures. The ISO data is self-reported by a sample of automobile insurance companies. There is no reason to believe it is not representative of the population of all automobile insurers. Demographic and economic data on population per square mile, average nourly manufacturing wages, and motor vehicle fatilities per registration were obtained from the Bureau of Labor Statistics, the Department of Transportation, and the Bureau of the Census.

A longitudinal study over the period from 1971 to 1980 provides data for investigating the effect of nofault insurance systems on automobile bodily injury reparations system pure premiums during a period when most nofault adoptions occurred. Further, by 1980, there had been sufficient time for the effects of most nofault adoptions to be accounted for in bodily injury pure premium measures. States were recorded as effecting nofault according to the compilations of the Insurance Information Institute. (The source for the state by state classifications was Insurance Facts, an annual publication of the Insurance Information Institute.)

The ex post facto nature of a multigroup time series quasi-experimental design such as used in this study prohibits direct control over the experimental variables in terms of when and who receives a nofault insurance system treatment. However, it is possible to determine when and which states to measure and to hold other demographic factors "constant" by statistical manipulation of the experimental results.

Multiple regression was performed to analyze the data. Multiple regression provides a means of estimating the magnitude and statistical significance of the pure premium effects of adopting the various nofault insurance systems while controlling for the confounding effects of extraneous demographic variables.

The multiple regression model specified for this study is:

$$Y_i = B_1 + B_2\,Year_i + B_3\,PSQM_i + B_4\,AHMW_i + B_5\,MVFATR_i + B_6\,DF1_i + B_7\,DF2_i + B_8\,DF3_i + u_i$$ where:

i	=	1 to 453 state observations,
Year	=	Pure premium for year for state observation i,
PSQM	=	Population per square mile for state observation i,
AHMW	=	Average hourly manufacturing wages for state observation i,
MVFATR	=	Motor vehicle fatalities per registration for state observation i,
DF1,DF2,DF3	=	0 or 1 dummy variables indicating absence or presence of nofault insurance systems, "true nofault," "add-on nofault," "optional nofault," respectively, for state observation i,
B_1 ,...B_8	=	Partial regression coefficients, and
u	=	Error term for state observation i.

The partial regression coefficients estimate the (partial) influence of each independent variable on the pure premium with the influence of the remaining independent variables held constant. Three of the independent variables are dummy variables that take on the values 0 or 1 to measure the absence or presence of one of the types of nofault insurance systems. The intercept term, B1, provides the estimate of pure premiums when all independent variables take on a zero value. The absence of any of the nofault systems dictates the presence of the traditional fault system; therefore, B1 provides a baseline for comparing estimates for fault system pure premiums. The coefficients associated with the dummy variables are estimates of the marginal pure premium costs of the associated types of nofault systems relative to the traditional fault system. As an example, the estimated marginal pure premium costs of the add-on nofault system relative to the fault system is B7. The estimated total pure premium costs of the add-on nofault system equals B, + B7. The sign and size of the dummy variable regression coefficients are of principal interest for this study. The sign indicates the direction of change in pure premiums associated with true nofault, add-on nofault, and optional nofault systems relative to traditional fault systems. The size indicates the magnitude of that change. Further, the differences between the coefficients B6, B7, and B8 may be used to compare the relative incremental pure premium costs between nofault systems.

The inclusion of the extraneous controllable independent variable year and the use of dummy variables to specify the nofault systems result in multicollinearity in the data matrix. When multicollinearity exists, the regression coefficients of the collinear variables may fluctuate widely. Instability in the independent variables used to control for contaminating influences is of little concern since the research objective was to control for the effects as a group. As a group, their explanatory power or effect is not affected by multicollinearity. However, the possible instability of the regression coefficients of the nofault system dummy variables is critical to the research objective. The use of ridge regression indicates that the regression coefficients of the nofault systems are relatively stable and insensitive to the multicollinearity of the data matrix. Both ordinary least squares regression and ridge regression results are presented. Since repeated

measures over time of insurance system pure premiums are used there is no reason to believe that the assumptions of homoscedasticity and zero autocorrelation of the error terms for the regression analysis are seriously violated. The regression coefficients were cross-validated by performing the regression analysis on the first six years and the last four years. These estimates were found to be consistent with the ten year regression results.

RESULTS

The results of the ordinary least squares regression and ridge regression models are provided in Table 2. The F-tests for the overall relationship between automobile bodily injury reparation system pure premiums and the independent nofault system explanatory and extraneous demographic variables are significant at the .001 level for both models. In addition, the R2 of .49 for the models indicates that 49 percent of the variation in automobile bodily injury reparations pure premiums over the period from 1971 to 1980 can be explained by these independent variables.

The ridge regression results indicate that the regression coefficients are stable except for the two extraneous explanatory variables, year and motor vehicle fatalities per registration. The high collinearity between year and motor vehicle fatalities per registration causes this instability. After adjusting for this collinearity with the ridge regression, the explanatory nofault system dummy variables remain statistically significant. As indicated by the statistical significance of the nofault system coefficients, the null hypothesis that adopting nofault systems does not increase premiums can be rejected. After controlling for the contaminating effects of the extraneous demographic variables (population density, price differences between states, and accident rates) and for the effects of the extraneous time series variable (year), any nofault system adoption has statistically significant marginal pure premium costs relative to the traditional fault system. The true nofault system is the most costly with an estimated marginal pure premium during the period from 1971 to 1980 period ranging from $12.66 to $13.63. Tests of the add-on and optional nofault system marginal pure premiums indicate no significant differences between these systems at the .01 level. The marginal pure premiums of add-on nofault and optional nofault are statistically different from the true nofault marginal pure premium.

SUMMARY AND CONCLUSIONS

The purpose of this study was to evaluate the marginal cost impact of the adoption of one of three nofault systems relative to traditional fault. Data on total automobile bodily injury reparations costs were collected for a ten year period for forty-seven of the fifty states.

The dependent variable is total automobile bodily injury reparations costs per earned car year. The loss information was provided by the Insurance Services Office.

Table 2

REGRESSION COEFFICIENTS FOR AUTOMOBILE BODILY INJURY

PURE PREMIUMS

(Regression Coefficients)

Variable	OLS	Ridge*
Intercept	-13.666	-29.010
YEAR	.089	.419
PSQM	.048***	.044***
AHMW	.072***	.062***
MVFATR	30.240***	22.658***
DF1	13.626***	12.658***
DF2	6.247**	6.243**
DF3	6.661***	5.159***
R^2	.494	.492
F	57.500****	56.830****

*Degree of bias introduced where estimates stabilize.
**Significant at the .10 level. ***Significant at the .01 level. ****Significant at the .001 level.

The study seeks to explain variation in the total pure premium variable by the existence of one of the three nofault systems in the state in question for the year in question. The three systems are called true nofault, add-on nofault, and optional nofault. It is necessary to control for extraneous factors that could contaminate the relationship between premium costs and reparation system. Four such factors are controlled for with the independent variables year, population per square mile, average hourly manufacturing wages, and motor vehicle fatalities per registered automobile.

The results of the study provide dramatic evidence that states which adopt nofault insurance must be prepared to accept marginal cost increases. Moreover, the cost increases are higher for states that adopt the stronger form of nofault (true nofault) than for those that adopt the weaker add-on or optional nofault forms.

It is characteristic of nofault insurance that benefits be provided for more persons who have losses and that the benefits be both more equitable and more adequate. It is intuitive then that nofault should cost more by virtue of its providing better coverage for more persons. On the other hand, when tort restrictions are included in nofault systems one would expect cost reductions, ceteris parabus. The findings of this study are highly counterintuitive in that the predicted pure premium for add-on nofault with no tort restrictions is lower than the predicted pure premium for true nofault characterized by the presence of tort restrictions. One possible

explanation for these results is the differences in thresholds within the group of states called true nofault states. Some have specified dollar amounts for losses after which tort restrictions no longer apply. The existence of such thresholds may encourage loss inflating by injured parties seeking to profit from their misfortune. Another possible explanation is the existence of different levels of benefits in various nofault states. Those states with very high or unlimited benefit levels may cause the entire true nofault class to have higher cost—just as low thresholds in some states could cause the whole class of true nofault states to have higher pure premiums. A direction for future research is to incorporate these two factors in the analysis.

In conclusion, it should be emphasized that although the study was based upon a large and reliable data set and the statistical results are robust and strong, the findings are not necessarily an indictment of nofault. The study is strictly a cost analysis. It is beyond the scope of this study to consider or measure the benefits of nofault systems and whether the costs are justified by these benefits.