Reprint from

Journal of Insurance Regulation

Published by the National Association of Insurance Commissioners

Driver Record: a Political Red Herring That Reveals the Basic Flaw in Automobile Insurance Pricing

Patrick Butler

Twiss Butler

Journal of Insurance Regulation
December, 1989, Vol. 8, No. 2

CONTENTS

EXHIBITS

Distributed by:
NOW Insurance Project

Driver Record: a Political Red Herring That Reveals The Basic Flaw in Automobile Insurance Pricing‡

*Patrick Butler**
*Twiss Butler***

ABSTRACT

Surcharges or discounts based on driver records are politically promoted as a substitute for classes such as sex and territory. This paper reviews a frequently-cited industry study produced in 1979 to persuade the NAIC that Driver Record surcharges are justified for use by insurers on a discretionary basis, but can not replace driver sex. The study's data, however, compel the conclusion that use of driver records contravenes the principle of insurance by varying prices at random. Although accidents (and traffic convictions) are random events, cars driven more miles than the average for their price class are more exposed to chance of accident and will be over-represented in the class minority that is surcharged. The review concludes that 1) it is not "bad drivers" but over-representation of higher-mileage cars that produces the higher accident-averages the study invokes to justify the surcharging, 2) these higher averages are evidence of the basic flaw in pricing—failure to proportion class premiums to actual miles of exposure as measured by the car's odometer, 3) unlucky lower-mileage insureds, already overcharged at the class premium, are more heavily overcharged by surcharges. "Actuarial justification," professional responsibility and the political utility of Driver Record pricing are examined.

‡ Communications regarding the paper and requests for reprints should be addressed to the first author, National Organization for Women ("NOW"), Suite 700, 1000 16th Street, N.W., Washington, DC 20036. (202) 331-0066.

* Ph.D. (Geochemistry), Harvard University; M.Sc., New Mexico Institute of Mining & Technology; A.B., Harvard University. The author is on the staff of NOW. Responsibilities include development of information on sex discrimination in insurance and pensions, and on the Equal Rights Amendment. The author was formerly a research scientist with the Nat. Aeronautics and Space Administration's Apollo program and was the Curator of Lunar Samples at the Johnson Space Center.

** B.A. (English Literature), Vassar College. The author is on the Action Staff of NOW, with responsibility for analyzing institutional promotion of sex discrimination in the areas of pregnancy, insurance, pornography, and communication and education media.

INTRODUCTION

The use of driver records to surcharge and discount prices for automobile insurance has long been an unsettled issue for some actuaries who continue to raise objections to it because it violates the principle of insurance: the uncertainty of large accidental loss is exchanged for the certainty of a smaller payment. One actuary has defined the use of past accidents and traffic convictions to set future prices as an "organized renunciation of insurance."[1]

It is well known among insurance professionals that there are no "safe" drivers because even "at fault" accidents and traffic convictions are mostly random events—the luck of conditions existing when a mistake is made. Only a small minority of all drivers have accident involvements or convictions of any kind entered on their state driver records in a year. It is thus impossible for Driver Record or "merit" pricing to lower premiums significantly for the many lucky "safe" drivers by unjustifiably punishing the few unlucky "unsafe" drivers. The reckless driver is a serious public safety problem that higher premiums won't solve.

The thesis of this paper is that it is professionally dishonest to use "identical driving records" to excuse charging the same premiums for insuring cars driven different mileages. Insurers know and regulators should know that higher-mileage drivers (predominantly men) have greater exposure to risk of accidents and, as a group, are more costly to insure than lower-mileage drivers (predominantly women and older men). Paying premiums not proportioned to odometer miles forces low-mileage drivers to subsidize the higher costs of insuring the cars of high-mileage drivers, most of whom are simply lucky.

In making its challenge to discrimination against women through insurers' refusal to proportion premiums at class rates to driving exposure, Pennsylvania National Organization for Women did not raise the issue of Driver Record pricing, nor was the issue raised or examined at trial by the insurer defendants or by the insurance department as an official participant.[2] Nevertheless, the Insurance Commissioner's final Adjudication reasoned that:

> [T]o the extent that low mileage drivers have fewer accidents than high mileage drivers . . . mileage would also be an implicit consideration in the

1. An unattributed quotation provided by J. LEMAIRE in AUTOMOBILE INSURANCE, (1985) at 118.

2. Butler, Butler & Williams, *Sex-Divided Mileage, Accident, and Insurance Cost Data Show That Auto Insurers Overcharge Most Women*, 6 J. OF INS. REG., Part I, 243 and Part II, 373 (1988). (Presents evidence used in the lawsuit.) (Reprints combining the two parts are available from the first author, National Organization for Women, Suite 700 1000 16th St., N.W., Washington, DC 20036, tel. (202) 331-0066.)

grant of good driver discounts to accident free drivers and surcharges applicable to drivers with accident records.[3]

In this instance, the Commissioner used Driver Record pricing as an excuse to block acceptance of the cents-per-mile remedy to the overcharging of women as the predominant group of below-average mileage drivers in each pricing class. An insurance department fact sheet invoked it again to discourage complaints from young women, whose annual premiums increased contrary to group cost as much as 70 per cent after prohibition of sex-divided pricing in Pennsylvania: "With genderless rates, people with like circumstances pay the same rates. The cost of auto insurance will not be determined by gender, but by driving records and other factors."[4]

Although insurance companies seem to support Driver Record pricing by touting it in sales campaigns advertising "good rates for good drivers," the industry objects to politically mandated "good driver discounts" and occasionally will make a clear statement on the basic defect in pricing by driver record whether mandated by law or chosen for use by insurers. "[E]ven a relatively high-risk driver is unlikely to have an accident in any given year; on the other hand, in any given year some low-risk drivers will have accidents."[5]

---

3. Foster, *Commissioner's Opinion: Pennsylvania NOW v. State Farm*, 7 J. OF INS. REG. 5, 8 (1988).

Although it appears in the record for the first time in the regulator's opinion quoted above, the utility of Driver Record pricing as a red herring is evidenced by the language of the Commonwealth Court Opinion rejecting NOW's appeal: "We agree with the Commissioner that . . . by providing for certain discounts in their *merit factor rating*, the intervenor insurance companies have given all the consideration that is due to mileage." 551 A2d. 1162, 1166 (1988) (emphasis added).

Analysis of the impossible burden of proof (required non-existent claim cost data on a per-mile basis) placed on the consumer-plaintiffs by the *Commissioner's Adjudication in Pennsylvania NOW v. State Farm* appears as: Butler, Butler & Williams, *Insurance Department 'Catch-22' Shields Auto Insurers From Consumer Challenges*, 7 J. OF INS. REG. 285 (1989).

4. Pennsylvania Ins. Dept., *Insurance Facts: Questions and Answers About Genderless Insurance*. Jan., 1989.

Prohibition, effective March 1, 1989, of driver sex to price automobile insurance was in response to a successful challenge under the Pennsylvania Equal Rights Amendment brought on behalf of a young man in *Bartholomew v. Insurance Commissioner*, 541 A2d. 393 n. 7 J. OF INS. REG. 11 (1988). The decision was affirmed without opinion by an equally divided Pennsylvania Supreme Court, Nos. 17–21, M.D. Appeal Dkt. 1988, filed Oct. 3, 1989.

5. Insurance Information Institute ("I.I.I."), 1989 booklet, *Auto Insurance Issues* at 62. This 67-page free booklet was issued Jan. 1989, and widely advertised as a defense against adoption in other states of provisions on automobile insurance like those enacted by California's successful Proposition 103.

To deny the truth of this observation would be to deny the random nature of automobile accidents and the need for insurance protection against resulting losses. Further, given this truth, any use of Driver Record pricing is unjustified whether used extensively as urged by some insurance commissioners and consumer advocates, or used at their own discretion as preferred by automobile insurance companies. Nevertheless, insurance professionals continue to assure the public that the use of Driver Record surcharges and discounts is actuarially justified. This paper's review of an industry study examines the basis of this justification in light of insurance principles.

In 1979, the Industry's Sex-Rating Compilation presented an actuarial study of Driver Record pricing[6] (hereinafter "industry study" or "study") to demonstrate to the National Association of Insurance Commissioners ("NAIC") that such pricing on a group basis could only account for less than one-third of the nearly 100 per cent difference between the average costs of insuring cars driven by women and by men, where those costs are kept. This paper reviews the industry study and presents logical conclusions it avoided: 1) Driver Record sets prices at random and is therefore the antithesis of insurance. 2) Current use of the year as the exposure measure for accident probability absolutely guarantees progressive over-representation in the surcharge categories of cars driven higher annual mileages. 3) The extent to which Driver Record surcharges are supported by cost differences demonstrates the extent of variation among cars in annual exposure and consequent extent of overcharges and subsidies at the class price set by territory, driver age, etc. 4) Surcharging has a much more adverse impact on low-mileage than on high-mileage

6. The section on "Driving Record" is pages 43–66 of the 1979, 432-page compilation in defense of sex-divided pricing provided by the industry to NAIC. Entitled *Private Passenger Automobile Insurance Risk Classification, A Report of the Advisory Committee [to NAIC]*, it was prepared in response to a recommendation by an NAIC committee that "sex and marital status be prohibited as rating factors, but that operator age be retained." It was prepared by 14 employees of insurance companies and their trade associations.

The industry study ostensibly is an argument against "substitution" of Driver Record for driver sex as a pricing factor. The study ignores the fact that 80% of cars, mainly in the Adult unisex classes, traditionally have never been charged by driver sex despite the fact that the ratios of men's to women's average mileage exposure and average accident involvement is approximately 2:1 at all ages. To discuss "substitutes" for a pricing method—driver sex—without specifying that it applies to only 20% of cars appears disingenuous if not deliberately misleading.

Information and discussion included in this study continue to be used by auto insurers in testimony against mandated Driver Record pricing. For example, some statements from the 1979 industry study are used verbatim in written testimony by the National Association of Independent Insurers presented June 1989 before the California Insurance Department.

drivers and has particular impact on women as a group of predominantly low-mileage drivers.

The paper concludes with consideration of the utility of Driver Record pricing. Analysis of limits to the possible effects of the "20 per cent good driver discount" mandated by Proposition 103 for automobile insurance in California emphasizes the inability of Driver Record pricing to produce significant savings for any consumer. Nevertheless, Driver Record continues to be used by insurers and regulators as a political red herring to divert attention from the basic flaw in current pricing: use of the year to "measure" the car's exposure to chance of accident rather than use of odometer miles. Current pricing misinforms consumers that how they drive, not how much the car is driven, should ultimately determine what they pay for automobile insurance.

REVIEW OF 1979 INDUSTRY STUDY

In 1979, the automobile insurance industry presented to the NAIC an actuarial study intended to discourage political demands for more extensive use of Driver Record pricing.[7]

According to the industry study: "Driving Record rating plans (merit rating) use the number of accidents and/or traffic convictions incurred during some prior period to determine an insured's premium, in whole or in part."[8]

The industry case against using Driver Record to determine an insured's premium "in whole" is summarized by the study: "Although there is a relationship between prior accidents and/or convictions with future accidents, the relationship is not strong enough to allow its substitution for existing variables."[9]

The technical reason given by the industry study for the use by "almost all companies" of Driver Record to determine an insured's premium "in part" is: "The advantage of using a driver record system is that it contributes to more accurate pricing by further refining existing class plans."[10]

To show under controlled conditions why Driver Record works to "further refine" existing class prices, the industry study posits hypothetical model groups of "low-risk" and "high-risk" drivers with known accident probabilities per year. Comparison of observed Driver Record data

7. *Id.*
8. *Id.* at 43.
9. *Id.* at 48.
10. *Id.* at 46.

The non-technical reason listed by the study is: "It is generally accepted that accident free drivers should pay less than those with accidents." *Id.* at 46.

from an insurance pricing system and from state accident records with the study's models allows deductions about probability variation for actual populations of cars and drivers.

Driver Record Data Calculated for Three Model Groups

The industry study uses the Poisson probability formula to calculate accident records for hypothetical groups of drivers.[11] Use of a probability formula necessarily assumes that the accident process is random. Therefore, the industry study emphasizes the established fact that automobile accidents are random.

> There is a large element of chance involved in automobile accidents, which is the reason for buying insurance.[12]
>
> Luck often plays a major part in whether one has an accident or not. Bad weather, poor conditions of the road, the chance positioning of other cars on the road in relation to the driver's vehicle, momentary inattention, all affect whether an accident will occur. This element of luck or chance is reflected in a driver's accident history.[13]
>
> A weakness of any merit rating plan is that it cannot predict who will have an accident, that is people who have not had accidents or convictions in the past *do* have accidents in the future and the *majority* of people who had an accident or conviction in the past do not have an accident in the future time period. . . . Many accidents are the result of chance. The problem becomes—how can insurers identify the "bad" drivers from the "good" drivers who were unlucky?[14]
>
> Any driver may, on occasion, use poor judgment or perform imprudently or be unlucky. In fact, persons who are involved in accidents over a period of several years are not necessarily high risk drivers, nor are those who are accident free necessarily low risk drivers. On the basis of probability theory, low risk drivers will sometimes have accidents, and high risk drivers will sometimes go without an accident for a long period of time.[15]

---

11. The Poisson probability model applied to calculating the chances of 0, 1, 2, 3, . . . accidents in a year assumes that the probability of having an accident is unaffected by having accidents. This means that an accident results in no reduction in annual driving mileage or any other change affecting chance of accident. With exposure periods measured in years, the Poisson model, therefore, is inappropriate for accidents serious enough to reduce the on-the-road exposure to accidents. This is not a restriction with exposure periods measured in miles, as discussed, *infra*, text at Note 30. See Note 16, *infra*, for a description of the Poisson model in operation.
12. Study, *supra* Note 6 at 43.
13. *Id.* at 44.
14. *Id.* at 47 (emphasis original).
15. *Id.* at 43.

EXHIBIT A
Data for Three Models

	Prior Three-Year Record				
	0 Acc.	1 Acc.	2 Acc.	3 Acc.	4+Acc.
Populations by prior 3-year record					
Model I (lower prob.) 10,000 drivers	8,607	1,291	97	5	0
Model II (higher prob.)1,000 drivers	549	329	99	20	3
Model III (Models I & II combined)	9,156	1,620	196	25	3
Accidents per driver in 4th year					
Model I (lower prob.) defined .050	.050	.050	.050	.050	.050
Model II (higher prob.) defined .200	.200	.200	.200	.200	.200
Model III (Models I & II combined)	.059	.080	.126	.170	.200
(Ratio to 0-acc. value, 0.059)	(1.00)	(1.36)	(2.13)	(2.88)	(3.39)

Source: 1979 Industry Study at 45.

The industry study develops three hypothetical model groups of drivers, which are distinguished in this review as Model I, Model II, and Model III.

The study's Model I ("low-risk") group consists of 10,000 drivers, each having the same low annual accident probability that the study specifies as producing 0.05 accidents per driver-year. In the three-year period used to develop a driver record, the Model I group produces 1,500 accidents ($10{,}000 \times 0.05 \times 3 = 1{,}500$). The distribution of drivers by number of accidents is calculated by the Poisson probability formula (**Exhibit A**). The study emphasizes that, although 8,607 of the drivers are accident-free after three years:

> No one of the 1,291 drivers having one accident, or the 97 having 2 accidents, or the 5 having 3 accidents can be categorized as a high risk driver because, by definition, all drivers in this sample are low risk drivers. They might better be categorized as unlucky drivers.[16]

16. *Id.* at 44.

This emphasis on luck is given meaning in regard to insurance prices by comparing the fourth-year accident averages for drivers grouped by number of accidents in the prior three years. In the fourth year, the groups of unlucky drivers with prior accidents will each average the same 0.05 accidents per driver as the zero-accident group (Exhibit A). Therefore, in this hypothetical situation there is no basis for using the number of accidents incurred during the prior three years to determine fourth-year premiums.

The study's Model II ("high-risk") group consists of 1,000 drivers, each having the same higher accident probability that the study specifies as producing 0.20 accidents per driver-year, a value four times more than the Model I value. In the three-year period used to develop a driver record, the Model II group produces 600 accidents ($1{,}000 \times 0.20 \times 3 = 600$). Nevertheless from the Poisson probability formula, 549 of the drivers are lucky and have no accidents during this period (Exhibit A).

As with the Model I drivers, emphasis on luck as the only distinction among Model II drivers has significance for insurance prices. None of the lucky 549 Model II drivers who is accident-free can be categorized as having a lower accident probability than any other driver because, by definition, the accident probability for all drivers in this sample is the same. Further, as with the three-year records of the lower accident probability drivers of the Model I group, there is no justification for discounting the fourth-year premium of the lucky drivers. In the fourth year, the accident average of the lucky drivers in the zero prior-accident category will be identical to the average of 0.20 accidents per driver for the unlucky groups in the prior-accident categories (Exhibit A). The results of grouping drivers by prior-accident number in both the Model I and Model II groups, therefore, completely fail to provide any justification for "refining" class prices by Driver Record.

As apparent justification for discretionary use of Driver Record to modify class prices, the industry study creates Model III by combining

---

The Poisson model in this application may be pictured as placing 10,000 black balls (drivers) in a jar. One ball is drawn at random to represent each accident involvement and then replaced in the jar and stirred prior to the next draw so there is a chance of individual balls being drawn more than once (having multiple accidents). Before a ball is replaced, however, its color is changed from black to white (first accident), then from white to red if drawn a second time, then from red to green for a third draw of the same ball. After 1,500 draws and replacements are made (500 accidents a year for three years), the balls are counted by color: probability theory predicts that, provided the draws are random (color-blind), about 86% of the balls will be black (no accident), 13% white, 1% red, and 0.05% green. According to the law of large numbers, as the number of balls in the jar is increased, and the number of draws is kept at 15% of the number of balls as before, the experimental proportions of colors would get closer and closer to the proportions of the calculated numbers in Exhibit A.

the Model I and Model II prior-accident populations. In each prior-accident category of Model III, a group of drivers that averages 0.05 accidents per year (accident frequency) (Model I) is mixed for the fourth year with a group of drivers that averages 0.20 accidents per year (Model II). The effect on calculated ("expected") fourth-year averages by prior-accident category is described:

> Because the high risk drivers are expected to have a higher percentage of accidents than low risk drivers, they are overrepresented in the groups that have 1, 2, 3, or 4 accidents, and hence the average expected frequencies of those groups are higher than the frequency of the zero accident group.[17]

In the Model III accident record categories, the combined average of the Model I drivers (0.05 accidents per driver-year) and the Model II drivers (0.20 accidents per driver-year) progressively increases from 0.059 in the zero-accident category up to 0.20 in the four-accident category, where virtually all are Model II drivers (Exhibit A). In anticipation of its presentation of an insurance Driver Record pricing plan with the surcharge for one prior accident set at 1.40 times the zero prior-accident price, the industry study notes:

> Thus the "group" of people in the one accident category have an expected frequency 1.36 times the zero accident group for the next year [Exhibit A]. It should be pointed out that no one's frequency actually increased or decreased by having an accident.[18]

The apparent intent of the first part of the above statement is to justify a premium surcharge for drivers with one prior accident. The concluding part of the statement, however, correctly points out that having an accident does not change an individual's accident probability, as if to caution that there is no cost justification for raising an individual's price following an accident. This caution is presumably intended to allow insurer discretion in limiting the use of Driver Record pricing.

Driver Record: Discounts/Surcharges vs. Accident Differences

To show the actual effects of a Driver Record system on prices, the industry study presents data from the Driver Record system of the In-

17. *Id.* at 46.
18. *Id.* at 45.

surance Services Office, Inc. ("ISO").[19] The ISO system has five Driver Record categories for modifying a class price: one discount and four surcharge levels that are equivalent to the study's five prior-accident categories (0, 1, 2, 3, and 4+ accidents). Under the ISO system, according to the study, 85 per cent of the cars qualify for a seven per cent premium discount as being accident free[20] in the prior three years. The remaining cars are surcharged large, progressively increasing amounts, which offset the discount and balance the total income for the price class.[21] The 13 per cent of cars with one prior accident are surcharged 31 per cent, while the remaining two per cent of cars which have had multiple accidents in the prior three-year period are surcharged from 77 to 199 per cent for two to four or more prior accidents (**Exhibit B**).[22]

In presenting model and actual accident averages to compare with prices, the industry study follows a procedure that conforms with the ISO Driver Record procedure: 1) calculate or observe the number of accidents each driver has within a three-year period, 2) on the basis of this accident record, assign each driver to a prior-accident category, and 3) calculate or observe for the fourth-year the accident average, relative to the average for all of the drivers together, for the drivers in each of

19. Rules for Driver Record pricing, called "Safe Driver Insurance Plans" (SDIP), vary somewhat among insurers. Accidents that are counted are usually those with a liability insurance claim involving the insured car. Convictions, when used, are those above a seriousness threshold that appear on the records of drivers in the household that owns the car. Although driver-to-car assignment rules for multi-car, multi-driver households also vary among insurers, Driver Record accident and conviction counts ("points") for discounts and surcharges may be cumulative among drivers, and may be applied to the premium for more than one car.

The three-year experience period usually is ended three months before the start of the new policy year to give time for incidents to appear on the record and to bill the renewal premium two months in advance. The three-year period is a moving period so that a qualifying accident in one year would modify the premium for the next three years.

Although the ISO system defines discount and surcharge categories by the combined total of specified types of traffic convictions and accidents, for simplicity this review will refer to them collectively as "accidents."

20. Only the surcharges are identified in the ISO Manual because the zero accident discount level is treated as the base price level. The actual base level as the average price for all cars in a class would be about 7% greater, approximately the amount industry professionals agree can be saved for cars not surcharged. (*See* text at Note 49, *infra.*) Inconsistent with the size of this small discount is the 20 percentage point increase to all price multipliers specified by the ISO Manual when the Driver Record system is not used.

21. This review presumes that the discount and surcharges are based on actual differences experienced by insurers in the fourth-year claim costs by prior-accident category.

22. Because the discount value is taken as the base multiplier 1.00, the percentage point surcharges given in the ISO Manual are somewhat larger than shown in Exhibit B. The ISO Manual's percentage point surcharge values compare with the Exhibit B values in parentheses: first surcharge 40% (31%), second 90% (77%), third 150% (133%), and fourth 220% (199%).

EXHIBIT B
Distributions, Prices, and Accidents by Driver Record

	Prior Three-Year Record				
	0 Acc.	1 Acc.	2 Acc.	3 Acc.	4+Acc.
Distribution by prior 3-year record	%	%	%	%	%
Model I (lower prob.) - drivers*	86.1	12.9	1.0	0.05	0.00
Model II (higher prob.) - drivers*	54.9	32.9	9.9	2.0	0.3
Model III (mixed prob.) - drivers	83.2	14.7	1.8	0.2	0.03
ISO price system - insured cars	85.0	13.1	1.6	0.2	0.1
North Carolina - drivers	84.4	13.0	2.1	0.4	0.1
Difference from class price or whole-group average in the 4th year.					
Model I - accidents per driver	no dif	no dif	no dif	no dif	no dif
Model II - accidents per driver	no dif	no dif	no dif	no dif	no dif
Model III - accidents per driver	- 7%	+26%	+ 98%	+167%	+214%
ISO - discount (-) or surcharge (+)	- 7%	+31%	+ 77%	+133%	+199%
North Carolina - acc. per driver	-13%	+55%	+145%	+259%	+375%

Source: 1979 Industry Study

* The distribution percentages are also the accident probabilities (of 0, 1, 2, 3, and 4+ accidents) at the end of three years for each driver in this group, as shown in Exhibit D.

the five prior- accident categories. In general, the fourth-year average for the zero prior-accident category is somewhat less than the average for all drivers together, and the fourth-year averages for the one, two, three, or four prior-three-year accident categories are progressively greater than the average for all of the drivers together.

The calculated fourth-year accident averages for the study's three models described above (Exhibit A) give important information about variation of accident probability within the ISO price classes to which

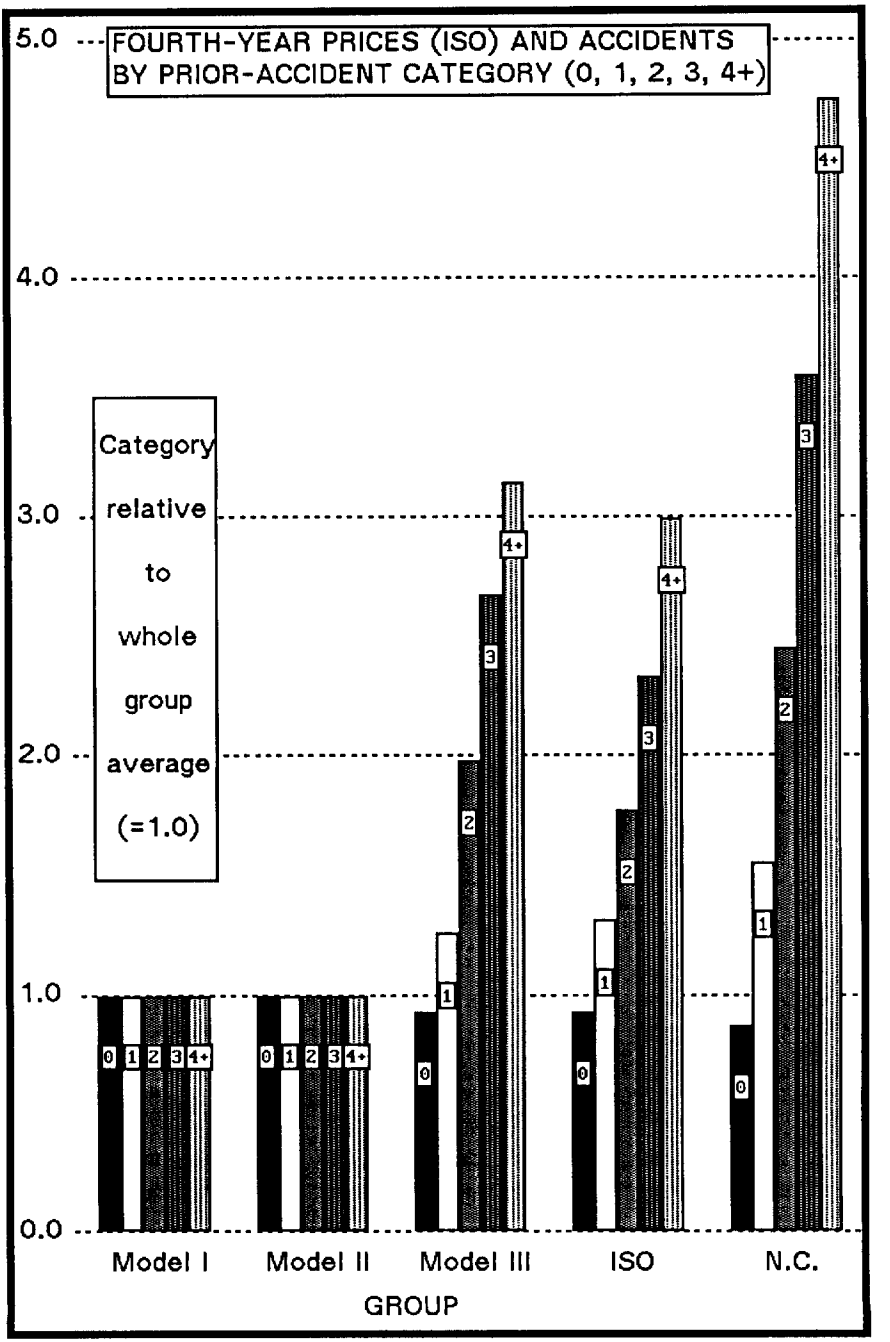
its Driver Record discount-surcharge system is applied. Although Models I, II, and III all build significant populations of drivers with single and multiple accidents in three years, neither the Model I (lower accident probability) drivers nor the Model II (higher accident probability) drivers show any differences in fourth-year averages among prior-accident categories (Exhibit B). The common characteristic of both of Model I and II is that by definition all of the drivers within each model share the same set of probabilities—the probability of zero, one, two, three, and four accidents. Since these probabilities are unaffected by having an accident, there can be no difference in future averages among drivers categorized by prior accidents if the accident probability is the same for all of the drivers.

The variation in subsequent accident averages for Model III, however, do match the ISO Driver Record discount and surcharge data. In all five prior-record categories, the differences from the total average in the fourth year are similar to the sizes of the ISO Driver Record discount and surcharge values for the same categories (Exhibit B and **Exhibit C**). For drivers with no accidents in the prior three years, for example, accidents in the fourth year average seven per cent less than the average for all drivers together, which matches ISO's seven per cent discount for insureds who are accident-free in the preceding three years. For the drivers that had accidents in the first three years, both the Model III accident averages in the subsequent year and the ISO surcharges progressively increase by about the same amount with the number of prior accidents. In the four prior-accident category, at the top of the prior-accident number scale, the amount by which the accident average exceeds the total Model III average and the size of the ISO surcharge are both approximately 200 per cent (Exhibits B and C).

The agreement of the ISO Driver Record discount-surcharge system with the Model III data indicates that there is a similar range of individual accident probabilities within the ISO price classes to which ISO applies its Driver Record system. Although the ratio of accident averages for Models I and II is 1:4, within each model the individuals have identical accident probability and neither model matches the ISO Driver Record discount and surcharges. Only when the models are combined—thus mixing individuals having very different accident probabilities—is reasonable agreement between model data and the Driver Record data on ISO classes achieved. The fact that the Model III accident averages match the ISO Driver Record discount and surcharges leads to the inescapable conclusion that each ISO price class must encompass a wide range in individual accident probability.

Further perspective on variation in accident probability within insurance pricing classes is provided by the Driver Record data on North

EXHIBIT C
Prices and Accidents by Driver Record



Carolina ("NC") drivers presented by the industry study. For the NC drivers, the differences in the fourth-year accident averages by prior-accident category (relative to the total average for the NC drivers) are almost twice the amounts shown by the ISO Driver Record discount and surcharges (Exhibit B). Fourth-year accidents for the drivers in the NC sample with no accidents in the first three years average 13 per cent less than the average for all drivers, compared with the seven per cent ISO accident-free discount. Similarly the fourth-year differences in accidents from the total average for the prior-accident categories are nearly twice the differences represented by the ISO surcharges. The fourth-year average for the NC drivers with one prior accident is 55 per cent greater than the population average, compared with the equivalent 31 per cent ISO price surcharge. The same relationship of approximately twice the difference in the NC averages by number of prior accidents continues through the four prior-accident category: the accident average in the fourth year for this category is 375 per cent more than the population average, whereas the equivalent fourth-year value of the ISO surcharge is 199 per cent (Exhibits B and C). The NC data, therefore, indicate an even larger variation in accident probability among individual NC drivers than the probability variation existing within the ISO pricing classes as deduced by comparison with the Model III data.

The fact that the NC data indicate an even larger range in accident probability among drivers than the ISO data indicate is consistent with the fact that the ISO Driver Record system is applied to pricing classes already defined by territory and driver age.[23] The NC example consists of all 2.5 million North Carolina drivers licensed over the four-year study period who were at least 18 years old at the beginning of the period. The North Carolina drivers, therefore, are virtually unclassified and the population includes drivers from all territories and nearly all driver ages. Territorial differences and driver age differences must contribute to the wider variation in individual accident probability indicated by the NC driver record data than the variation indicated by the ISO Driver Record data.

The express purpose of classification in all insurance pricing is to group the claim costs of insureds subject to the same probability of accident. The industry study states:

23. Differences in class prices (presumably cost-based) for insuring cars according to driver age and garaging territory suggest the magnitude of these effects. In Pennsylvania ISO's unisex price multiplier for cars owned by 17-year-old drivers who are unmarried is 3.4 times the Adult unisex price, all else equal. For range in prices by age from sex-divided youth to unisex Adult prices, *see* Butler, Butler & Williams, *supra* Note 2 at 253. The total price for all minimum required coverages is 3.9 times more in ISO's highest-priced Pennsylvania territory than in its lowest priced territory. 1988 Buyer's Guide, Pennsylvania Insurance Department.

> One of the important tasks of insurance companies is to categorize groups of drivers based on their loss potential. Risk classification reflecting these differences in loss potential allows insurers to price their products based on expected loss costs.[24]

The important effect of territory on probability of accident with all else equal is noted:

> [D]ifferent regions within a state pose different degrees of risk to drivers. A driver with a certain potential for loss who spends most of his driving time in densely populated areas will probably have more accidents over a period of time than a driver with the same loss potential who spends most of his driving time in sparsely populated areas.[25]

The study emphasizes the importance of driver age on accident probability by citing large differences by age in the subsequent average claim experience for drivers who have all been accident-free in a prior period: "[E]ven the group of youths who have demonstrated a 'good' driving record in the past have substantially poorer experience than adults who have been accident-free."[26]

The study argues that a Driver Record system is only applied to "refine" pricing classes which are already defined by territory and driver age. Nevertheless, the close match of the Model III data to ISO's Driver Record pricing data demonstrates the existence of a large range in accident probability within fully classified pricing classes. The pricing classes used in automobile insurance do remove some of the variation in accident probability among cars placed in the same premium class, but to judge from the scale of the Driver Record discount-surcharge values approximately half the variation remains.

The variation in annual accident probability could be reduced further after classification by territory and driver age through consistent classification by driver sex.[27] Nevertheless, insurers traditionally have chosen not to classify the large majority of cars driven by adults according to

---

24. Study, *supra* Note 6 at 43.

25. *Id.* at 44.

The industry study gives recognition in this passage to the importance of the amount of "driving time"—exposure—to the probability of accident. For discussion of the importance of measuring actual exposure to determine accident probability, see text at Note 30, *infra.*

26. Study, *supra* Note 6 at 48.

27. The industry study calculates from California state records that Driver Record surcharging for accidents and convictions, in the absence of sex-pricing for young drivers, would increase the average premium for men 25% from the unisex value, while men's accident average is 83% greater than women's at the same age. The study concludes that Driver Record can not replace sex-pricing. *Id.* at 65.

driver sex. About 80 per cent of the cars to which the ISO Driver Record system is applied are unisex-priced. Even state driver records classified by sex, however, demonstrate that there is broad variation among individuals of the same sex in annual accident probability with considerable overlap in the annual probabilities of women and men drivers, as discussed, *infra*, in the text at Note 43.

The conclusion compelled by the industry study is that the better the pricing system matches accident probabilities, the less will be the apparent cost justification for the discount and surcharge values. The progression of decreasing range in probabilities is from the NC example to the Model III and ISO values toward the perfect pricing possible for the Model I and Model II which develop no justification for any refinement of prices according to prior-accident records (Exhibit C).

The extent to which cost differences support Driver Record discounts and surcharges demonstrates the extent to which cars are being overcharged and subsidized at the class price. In other words, the worse the pricing is at matching individual accident probabilities, the greater are the discount and surcharge values that are apparently justified.

Exposure Period Measured in Years or Miles

The industry study stresses that accident probability for an individual is not an inborn or inherent characteristic: "Some people incorrectly believe that . . . drivers are either inherently 'good,' that is, low risk drivers, or 'bad,' that is, high risk drivers."[28]

The study does not explain, however, the source of the difference between the hypothetical "low-risk" and "high-risk" groups of drivers it combines as Model III to model the ISO Driver Record pricing data. Nevertheless, it is possible to make a simple interpretation of the difference represented by the 1:4 ratio of the accidents per driver-year values between the two levels of risk. Accident probability increases with length of exposure. If a group's exposure is quadrupled, then the accident average of the group is quadrupled.

The industry study chooses to reference the probability of an accident to fixed periods of time because premiums are referenced to a fixed time-period, the year. The physical reality of an individual's probability of an accident in any year's time, however, is very dependent on the amount of driving done that year. If no driving is done, the accident probability for the year must be zero regardless of any other condition that might affect accident probability such as territory or age of driver. If the amount of driving is doubled from one year to the next, the accident probability

28. *Id.* at 43.

for the year is increased so as to double the accident average,[29] if all other conditions are kept the same. All else made equal by classification, risk increases proportionally with physical exposure, a characteristic that is measured by the insured car's odometer. Each additional mile driven increases the probability of accident and therefore the cost of providing insurance protection against loss from an accident. (If it were otherwise, driving—which is simply adding one mile to another—would pose no risk of accident and there would be no reason to buy automobile accident insurance.)

Therefore the mystery of an assumed but undiscussed difference in "risk" is easily solved by using the single assumption that the drivers in both Models I and II (and therefore Model III) have the identical average of one accident per 100,000 miles.[30] As expressed in annual accidents-per-driver, the difference in "risk" between the two models that is assumed by the industry study thus becomes simply a difference in annual mileage-per-driver. The accident involvements per driver-year specified by the study translate into specified annual mileages: for the lower-risk group of drivers, 0.05 (accidents per driver-year) × 100,000 (miles per accident) = 5,000 miles per driver-year; for the higher-risk group of drivers, 0.20 × 100,000 = 20,000 miles per driver-year.

---

29. Since the Poisson model predicts multiple accidents, an individual's probability does not double on changing from a group of individuals with the same accident probability that produces 0.05 accidents per driver-year to one with 0.10 accidents per driver-year. For individuals in the first group, the probability of having one or more accidents in a year is 4.88%, while in the second group with double the accident average, the individual accident probability is 9.52%, not double 4.88% which is 9.76%. Examination of the relationship between exposure length and accident probability shown in Exhibit D, *infra*, especially for the longer exposure periods, makes this evident. Although the average number of accidents increases in direct proportion to the length of exposure, the individual probability of having an accident (which is 100% minus the probability of being accident-free) increases with the length of exposure in the Poisson model but not proportionally.

30. This value, assumed for numerical convenience, realistically approximates the adult driver (age 25–64) averages per 100,000 miles of 1.2 for women and 1.1 for men presented by the 1981 California Driver Fact Book, and compares with the results of higher accident counts by the National Safety Council that show about two accidents per 100,000 miles for both women and men of all ages nationwide over several decades. (The California Fact Book data are reproduced in Butler, Butler & Williams, *supra* Note 2 at 264 and the National Safety Council annual data over the years 1962–1986, *id.* at 260.)

Adoption of a single assumption conforms to the scientific principle of economy in the use of assumptions and factors to explain an observed phenomenon. The industry study seems to appeal indiscriminately to all explanations for difference in risk by making mysterious references to "good" and "bad" drivers who can not be "recognized." The annual mileage of cars (and of drivers as well) is known to vary widely (*see*, Butler, Butler & Williams, *supra* Note 2 at 377), and thus constitutes wide variation in "risk" for insurers because premiums are not proportioned to miles driven. All of the other variations, to the extent that they cannot be "recognized," are of no value in relating insurance premiums to the costs of insuring individual cars.

The industry study presents the Poisson accident probabilities in terms of exposure periods measured in years. There are separate tables for the 0.05 ("low-risk") and 0.20 ("high-risk") drivers. Each table gives the per cent probability for zero, one, two, three, and four accidents at the end of exposure periods ranging in length from one to 12 years. (The per cent probability values for a three-year exposure period multiplied by the total drivers in a model group gives the number of drivers in the three-year prior-accident categories used by the study for the Model I and Model II examples (Exhibit A, supra).

The two tables share probability values, however, and can be combined (**Exhibit D**). The probability values at the end of four-, eight-, and 12-year periods for the industry study's 0.05 table are identical to the accident probability values at the end of one-, two-, and three-year periods, respectively, of its 0.20 table. The study's Poisson calculations, therefore, show that the accident probabilities of the Model I and II groups differ only in the length of time (the length of the exposure period in years) needed to attain a given set of accident probabilities. The Model I probabilities become identical to Model II probabilities in an exposure period that is four times longer. For example, the 16.37 per cent chance of having had one accident at the end of a one-year exposure period for the Model II individuals is reached by the Model I individuals at the end of four years. The exposure for both is 20,000 miles (Exhibit D). When the exposure period is measured in miles rather than in years, the accident probabilities for both groups of drivers are identical at the end of each exposure period (Exhibit D).

At the end of a three-year exposure period, the study's "high-risk" drivers have travelled 60,000 miles, and 55 per cent have remained accident-free. This same probability is reached in 60,000 miles by the "low-risk" drivers, but in 12 years (Exhibit D). Insurers have, therefore, collected 12 years of premiums from the low-risk drivers compared with three years of premiums from the so-called high-risk drivers for a length of exposure that is identical if measured in miles rather than years.

Differential Impact on Low-Mileage Cars

To show how Driver Record pricing "refines" class prices, the industry study combines into a single price class two hypothetical groups of cars[31] with very different annual accident averages. This means that by being charged identical annual premiums, the individuals that drive 5,000 miles

31. Since cars are the unit of reference for insurance pricing, the examination of the effects of pricing by Driver Record will be in terms of cars rather than drivers. The formal analysis by the industry study of the hypothetical models is unaffected by what amounts to a name change from driver to car.

EXHIBIT D
Accident Probability by Length of Exposure

Length of Exposure p			Probability of n accidents				
Years		Miles	n = 0	n = 1	n = 2	n = 3	n = 4
a = 0.05*	a = 0.20*	a = 0.00001**					
1	1/4	5,000	95.12%	4.76%	0.12%	0.00%	0.00%
2	1/2	10,000	90.48	9.05	0.45	0.02	0.00
3***	3/4	15,000	86.07	12.91	0.97	0.05	0.00
4	1	20,000	81.87	16.37	1.64	0.11	0.01
5	1 1/4	25,000	77.88	19.47	2.43	0.20	0.01
6	1 1/2	30,000	74.08	22.22	3.33	0.33	0.03
7	1 3/4	35,000	70.47	24.66	4.32	0.50	0.04
8	2	40,000	67.03	26.81	5.36	0.72	0.07
9	2 1/4	45,000	63.76	28.69	6.46	0.97	0.11
10	2 1/2	50,000	60.65	30.33	7.58	1.26	0.16
11	2 3/4	55,000	57.69	31.73	8.73	1.60	0.22
12	3	60,000	54.88	32.93	9.88	1.98	0.30

Source: 1979 Industry Study at 50 (tables for 0.05 & 0.20 combined).

* accidents per driver-year.
** accidents per driver-mile (= 1 accident per 100,000 driver-miles).

Poisson formula for probability:
Probability of n accidents in p period (years or miles) at a accidents per driver-year or per driver-mile.

$$\text{Prob.} = (ap)^n e^{-ap}/n!$$

*** Example: Probability of 2 accidents
in 3 years at 0.05 acc. per driver year: ap = 0.15
in 3/4 years at 0.20 acc. per driver year: ap = 0.15
in 15,000 miles at 1 acc. per 100,000 miles: ap = 0.15

$$\text{Prob.} = (0.15)^2 e^{-0.15}/(1x2) = 0.97\%$$

= nearly a 1% chance of having had two accidents in the time or mileage exposure period.

per year (and as a group average 0.05 accidents, Model I) are being overcharged while the individuals that drive 20,000 miles per year (and average 0.20 accidents, Model II) are being subsidized relative to their costs.[32] Given this situation the greatest need for "refinement" would be to correct for the overcharging. Nevertheless, the study (understandably in light of results) does not consider how the premium changes (surcharges and a discount) produced by Driver Record pricing affect subsidies and overcharges for individuals with and without prior accidents.

Use of Driver Record subdivides a price class into five categories. In the industry study's Model III, each of the prior-accident categories contains cars driven 5,000 miles and cars driven 20,000 miles during the annual premium period. Therefore, there are potentially five overcharge-subsidy pairs to examine and compare with the original overcharge and subsidy amounts. To provide a cost basis for the premium of each of the five prior-record categories, and to assess the individual contributions to that cost in order to determine overcharge and subsidy amounts, this review assumes an arbitrary $10,000 average cost of accidents.[33] An accident cost of 10 cents per mile is obtained through division of the $10,000 average by 100,000 miles per accident. The average annual mileage for each Driver Record category determines the average accident cost and thereby the surcharged premium for the category. At an accident cost of 10 cents per mile, the cost-based premiums for the cars driven 5,000 miles and 20,000 miles annually are $500 and $2,000.[34]

The concentrating effect of using prior-accident categories to subdivide a pricing class, which the industry study describes in terms of

32. To put the discussion on an objective basis, the levels of risk ("low" and "high") examined by the industry study will be expressed in terms of miles of exposure, which can be related to insurers' costs. Further, although accident and conviction records are tied to individual drivers, the pricing "refinements" are applied to premiums on the cars in the driver's household. (Under ISO manual rules, the surcharge from the record of one household driver applies to the two household cars paying the most premium.) The miles-of-exposure will refer to the miles recorded on the odometers of the insured cars.

33. The cost amount was chosen to facilitate following the calculations. The 1987 countrywide average cost to insurers of settling an automobile liability claim was $1,410 for property damage coverage and $7,847 for bodily injury coverage. I.I.I., 1988–89 *Property/Casualty Fact Book* at 84. Property damage liability claims are roughly two to four times more numerous than bodily injury liability claims in Pennsylvania.

34. This is just the part of the premium to pay claim costs for on-the-road coverages. Premium for coverages such as theft and hail damage and for expenses would be additional amounts.

The premiums calculated from the annual-mile values are the same as obtained using the industry study's accident rate-per-car. For example, with the "low-risk" class, the rate times average cost (0.05 × $10,000) gives $500 per car. For the mixed probability example (Model III), the industry study's 0.0636 accidents per driver-year means an annual premium of 0.0636 × $10,000 = $636 per car-year.

EXHIBIT E
Driver Record Pricing Applied to Model III

	Whole Class	Discount/Surcharge Category				
		0 Acc.	1 Acc.	2 Acc.	3 Acc.	4+Acc.
Distribution after three years						
5,000-annual-mile cars	10,000	8,607	1,291	97	5	0
20,000-annual-mile cars	1,000	549	329	99	20	3
Proportion of 20,000-mile cars	9%	6%	20%	51%	80%	100%
Average annual mileage	6,360	5,900	8,050	12,580	17,000	20,000
Annual premium*	$636	$590	$805	$1,258	$1,700	$2,000
Cents per mile charged to individuals for identical coverage+						
5,000-annual-mile cars	12.7	11.8	16.1	25.2	34.0	
20,000-annual-mile cars	3.2	3.0	4.0	6.3	8.5	10.0

Source: 1979 Industry Study at 45.

* Average annual mileage x 10 cents per mile.

\+ Equals the annual premium divided by individual annual mileage.

accident averages, can be expressed in terms of annual mileage averages. Since the 20,000-mile cars each year have a four times longer exposure period measured by miles and resulting annual accident average than the 5,000-mile cars, however, larger proportions of the 20,000-mile group than of the 5,000-mile group enter prior-accident categories in three years. The proportion of the 20,000-mile cars, which is nine per cent of Model III overall, increases to 20 per cent in the one prior-accident category and reaches 100 per cent of the 4+ prior-accident category (**Exhibit E**). Concurrently the proportion of the 20,000-mile cars in the zero prior-accident category decreases to six per cent. The effect is that the average

annual mileage is 5,900 miles in the zero prior-accident category, and progressively increases with number of prior accidents from 8,050 miles in the one prior-accident category, to 20,000 miles in the four (or more) prior-accident category (Exhibit E).

Before subdivision by accident record, the overall Model III average mileage of 6,360 miles (at 10 cents-per-mile accident cost to insurers) requires a premium of $636. The individual price per-mile resulting from this premium for each of the 5,000-mile cars is 12.7 cents ($636 divided by 5,000), a 27 per cent overcharge relative to the 10 cents-per-mile class accident cost. The same $636 premium, however, is a price of only 3.2 cents per mile for the 20,000-mile cars. This is a 68 per cent subsidy for each of these cars with respect to the 10 cents-per-mile accident cost (Exhibit E).

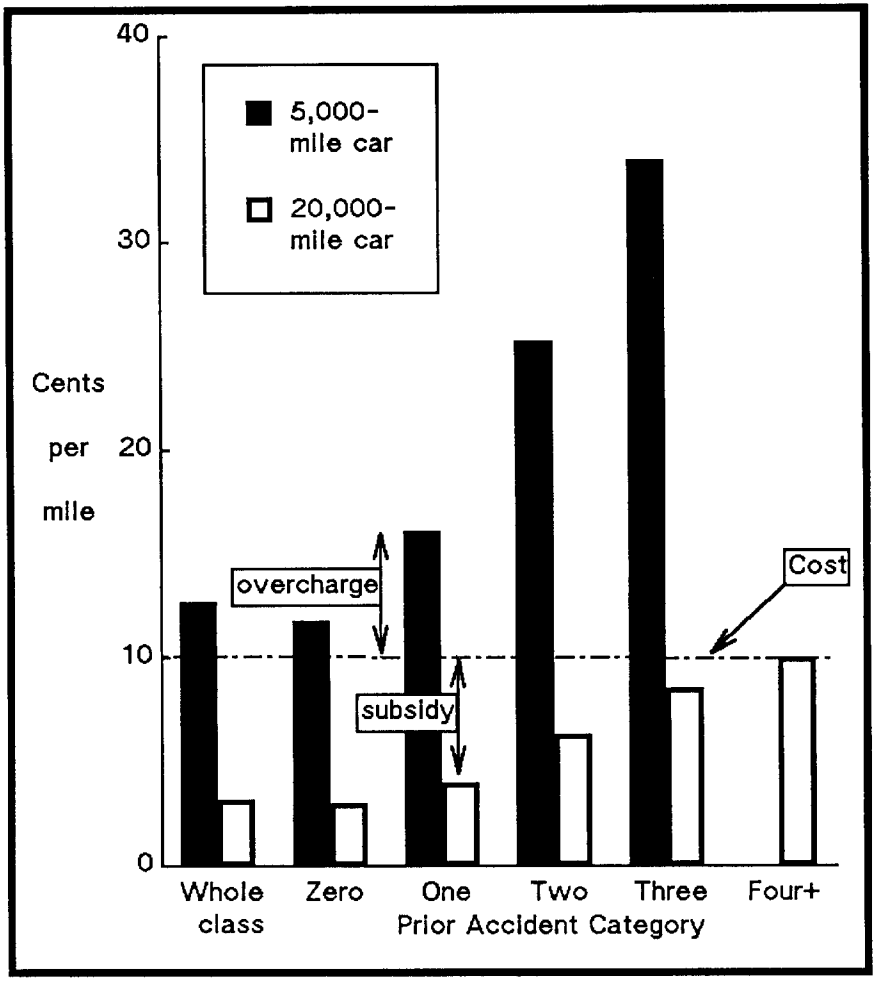
After assignment of cars to Driver Record categories, the lower average mileage in the accident-free category lowers its premium. The cents-per-mile prices are thereby lowered for all of the cars without accidents in the previous three years, which are 86 per cent of the 5,000-mile cars and 55 per cent of the 20,000-mile cars. The overcharging of the 5,000-mile cars is reduced slightly while the subsidy for the 20,000-mile cars is increased slightly (Exhibit E and **Exhibit F**).

The slight decrease in overcharges for the lucky 5,000 annual mile cars without prior accidents, however, is made at the cost of enormously increased overcharging of the unlucky 5,000-mile cars. This overcharging progressively increases with number of prior accidents from 61 per cent (16.1 cents per mile in the one prior-accident group) to 240 per cent (34.0 cents per mile in the three prior-accident group) (Exhibits E and F). Far from doing anything to reduce overcharging, pricing by Driver Record greatly intensifies it for the already overcharged cars whose drivers have had accidents. On the other hand, the only "cost" to the 20,000-mile cars with prior accidents is a progressive loss of subsidy by number of prior accidents. In fact, in the industry study's Model II ("high-risk") group, a very small minority of cars, three out of 1,000, are sufficiently "unlucky" in having had four or more accidents in the prior three-year period to be actually charged correctly at the cost-based price of 10 cents per mile (Exhibits E and F). Although both happen at random, loss of subsidy is not an equivalent harm to an increase in overcharges. The negative impact of Driver Record pricing is much greater on low-mileage than on high-mileage drivers.

Discussion of the Industry Study

The industry study does not provide logical conclusions based on what its probability models show, but such conclusions do appear in the ac-

EXHIBIT F
Cents-per-Mile for Model III Cars



tuarial literature. As the study's reticence demonstrates, however, professional criticism of Driver Record pricing appears to be muted by pressure from sales and political interests, as discussed in the concluding section.

Random pricing. The industry study, as reviewed above, makes a strong point that automobile accidents are random, and that having an accident has no effect on future accident probability. Since future accident probability is supposed to determine premiums, it is logical to conclude that accident record should not be used at all to modify insurance prices. Undoubtedly the study avoids any clear expression of this conclusion

because it is making a case for continued discretionary use of Driver Record pricing by insurers. In general, professional criticism on this point has been ongoing but tentative.

In 1959, F. Harwayne observed that:

> Part of the uneasy feeling in the United States with respect to merit rating rests on ... the fact that an individual is involved in an accident in a particular year is considered fortuitous and ought not to be given special consideration for the purpose of adjusting the rate charged to that risk.[35]

Lemaire, in 1985, noted objections to Driver Record pricing:

> Some actuaries have categorically rejected the idea ... of a rebate of part of the premium to a good (or simply lucky) insured. ... [T]here is a certain contravention of the fundamental idea of insurance when the premium depends on the individual results.[36]

As a further consideration, prices presumably set to cover the cost of accidents cannot be surcharged when an accident occurs without calling into question the correctness of the original price. In 1952, a negative evaluation of Driver Record pricing by the two rating bureau predecessors to ISO stated that:

> There is a question of propriety with respect to penalizing an insured for the very occurrence for which he purchased insurance. ... Question may arise as to the soundness of penalizing such an insured when he is unfortunate enough to have the accident for which he is insured against.[37]

Simply expressed: Aren't accidents what premiums are supposed to pay for?

Measurement Unit for Driving Exposure. The industry study tacitly accepts the basic assumption governing the setting of future premiums

---

35. 46 PROC. CASUALTY ACTUARIAL SOC'Y at 190.

36. LEMAIRE, Note 1 *supra* at 118. Lemaire does not offer any rebuttal to this or other actuarial objections, but notes that "favorable reactions of the public" help to outweigh the actuarial "drawbacks."

37. National Bureau of Casualty Underwriters and Mutual Insurance Rating Bureau, *Best's Insurance News* (Fire Casualty Ed.), Jan. 1952. Reprinted in H. W. SNIDER, READINGS IN PROPERTY AND CASUALTY INSURANCE, (1959) at 349.

The 1952 publication reviews the history of merit rating and lists 20 serious continuing problems, which are mainly due process and administrative. The paper concludes with the criticism that element of chance in accidents is so great that prices can not be determined by individual accident records with any statistical reliability: "The extremely small exposure in a single private passenger car risk does not lend itself to self-analysis in terms of rate making as the element of chance overshadows a credibility expectancy." *Id.* at 351.

In 1959, the president of the Casualty Actuarial Society quoted this statement, calling it "profoundly actuarial." Pruitt, *infra* Note 63 at 152.

by past driver record: that the accident probability of each individual is unvarying from year to year. The weakness of this necessary assumption is clear from a 1960 actuarial review of the effectiveness of merit and class rating which states: "[T]he evidence strongly supports the conclusion that the individual risk's chance of having an accident does vary significantly from year to year."[38]

If the individual chance of accident varies from year to year, then there will certainly be variation among individuals in any given year. A discussion of a paper on Driver Record pricing observes that: "One of the important results of Mr. Dropkin's paper is a realization of the large amount of variation among individual risks. Automobile risks even within a single class or merit rating group are far from being all alike."[39]

The current car-year exposure measure, despite overwhelming evidence to the contrary, treats all cars in each insurance price class as if they were all alike in having the same on-the-road exposure and therefore the same annual probability of an accident.[40] The large range of "risk" to insurers within actual classes is simply an artifact of using the year rather than the mile as the unit to measure length of exposure for calculating premiums.

Although the industry study combines drivers with a four-fold difference in accident averages to make the successful Model III for ISO price classes, the study claims that these large differences between drivers are "not readily identifiable."[41] The actuarial profession, however, has

---

38. Bailey & Simon, 47 PROC. CASUALTY ACTUARIAL SOC'Y 1 at 5 (1960).

39. Discussion by Robert Bailey, 74 PROC. CASUALTY ACTUARIAL SOC'Y 406 (1987) (reprinted from the 1960 Proceedings) of Dropkin, *Some considerations on automobile rating systems utilizing individual driving records*, 74 PROC. CASUALTY ACTUARIAL SOC'Y 391 (1987) (also reprinted from 1960).

40. The question of the proper measurement of exposure is recognized as an actuarial one. For example in a transcribed discussion of automobile insurance pricing in 1939, Van Tuyl observed that:

> [T]here are a great many other things which I think we all agree, as practical matters, do affect the hazard, to which the underwriters don't seem to be able to give any weight. It seems to me the matter of mileage is one of the most important things; except for two or three broad classifications we fight shy of using mileage, at least in the case of private passenger risks. . . . (Chairman Barber: Mr. Van Tuyl is calling for the actuarial approach.)

26 PROC. CASUALTY ACTUARIAL SOC'Y 373.

41. Study, *supra* Note 6 at 43.

Even though women and men are "readily identifiable," insurers decline to classify by driver sex the 80% of cars driven by adults. Although the approximately 2:1 ratio of men's to women's annual accident averages is consistent at all ages, insurers recognize this large-scale difference through pricing by driver sex for only 20% of cars. Driver sex is quietly ignored by labeling the unisex pricing applied to the large majority of cars the "Adult class." The difference concealed is implicitly acknowledged, however, when insurers threaten that

long understood that such large differences in risk are expected because cars within every pricing class are known to span a wide range in miles driven annually. A 1960 actuarial assessment of Driver Record pricing, in fact, describes the effect of variation in mileage as a cause of variation in accident probability among insured cars ("risks"):

> [C]lass rating [is] quite ineffective in separating the better risks from the poorer risks.... The distribution of risks according to mileage is widely dispersed.... Accident frequencies (and even conviction frequencies) are a crude indication of mileage.... [T]he evidence supports the conclusion that mileage is a very significant cause of variation among individual risks.[42]

The ineffectiveness of classification to reduce the variation of accident probability referred to exposure measured in years is demonstrated through a study of state driver records divided by sex. The 1976 study by the Stanford Research Institute ("1976 SRI study"), sponsored by the industry, found that classification by driver sex for the assessment of risk is "one of the simplest dichotomies . . . though very powerful compared to much more refined classification systems."[43] The 1976 SRI study of

---

conversion of Youth class prices to unisex would raise young women's premiums. Strong evidence indicates that insurers' "failure" to identify driver sex in pricing consistently at all ages facilitates price competition for adult men by merging their greater group accident costs with the lower group costs of women. *See*, Butler, Butler & Williams, *supra* Note 2 at 405.

42. Bailey & Simon, 47 PROC. CASUALTY ACTUARIAL SOC'Y 4 and 6 (1960). The authors identify nothing besides miles driven to account for variation of accident probability within price classes, which then as now accounted for territory, car type and use, and driver characteristics. The authors also conclude that class refinement by Driver Record is "quite ineffective in separating the better risks from the poorer risks."

Actuaries have long been sensitive to possible public recognition of the connection between risk and the amount of driving exposure and that large variations in "risk" are subject to identical premium charges. In 1939 the president of the Casualty Actuarial Society asked a society panel:

> You'd have a man driving twenty-five thousand or more miles a year—and the man next door . . . driving two or three thousand miles a year.... The natural thing would be for the man in the street to say . . ." There seems to be an obvious difference in the risk, yet the insurance companies want to charge us all the same." My question was: Are we making any progress with these rating plans? Do they represent a real advance toward getting some proper differentials, or are these plans merely a flare-up of competitive conditions, etc.?

Perryman, 26 PROC. CASUALTY ACTUARIAL SOC'Y 379. (The president's question went unanswered and concluded the meeting.)

43. *The Role of Risk Classifications in Property and Casualty Insurance*, produced by SRI International (formerly Stanford Research Institute). Sponsors of the study, which included a range of topics such as pricing by territory, were ISO, State Farm, Amer. Ins. Ass'n, Amer. Mutual Ins. Alliance, and Nat'l Ass'n of Independent Insurers. The results of

California driver records found that, although men's annual accident average over nine years was nearly double women's, the individual probabilities of having an accident for both the 23,872 women and the 30,293 men spanned the range from the lowest to the highest probabilities. Further, 28 per cent of men had lower annual probabilities than at women's accident average, and 13 per cent of women had higher annual probabilities than at men's accident average.

Comparison of the distributions of the women and men drivers at each accident probability, calculated through use of the Poisson formula combined with a distribution function and fitted to the observed driver records by the 1976 SRI study, are shown to give excellent agreement with the distributions of the women and men drivers at each annual mileage from a national survey sample.[44]

Two groups of drivers represented by insurers as being most different in "risk" are women and men. The ratio of men's to women's annual accident involvement is about 2:1 at all driver ages. Since the ratio of men's to women's annual mileage is also approximately 2:1 at all driver ages, however, men's annual accident average is much greater than women's simply because of much greater average exposure. Since women and men have about the same accident averages at all ages on an equal mileage basis, however, driver sex is not material to a car's probability of accident if its odometer is the measure of exposure.

Driver Record Cost Differences Prove Overcharging at Class Price. Insurers commonly demonstrate the effectiveness of Driver Record pricing by reference to progressively higher subsequent costs by number of prior accidents. The industry study reviewed, *supra*, shows that such differences develop only when a pricing system is deficient in matching prices to individual costs. It would not "work"—that is would not show cost differences according to prior-accident category—if the pricing system were accurate. Lemaire describes this essential relationship:

> If all of the factors influencing the risk could be detected, measured, and introduced into the tariff [pricing system] . . . fluctuations of the individual results around the average would exist only by chance and could not lead

---

the study were published in three documents dated May, 1976: *Executive Summary Report* (26 pp), *Final Report* (108 pp), and *Supplement* (240 pp). (The 26-page Summary was included in the industry's 1979 compilation in defense of sex-divided pricing at 127. For a description of the compilation, see, *supra* Note 6).

44. *See*, Butler, Butler & Williams, *supra* Note 2 at 395 for mileage distributions and the overlap of accident and mileage averages.

> to a readjustment of the premium. . . . But this conclusion no longer holds if the tariff disregards an important factor.[45]

Unacknowledged in the above quotation is what the industry study's data establish: the greater the disregard of an important factor (such as how much a car is driven, or whether it is driven at all) in the pricing system, the greater will be the cost results leading to a greater "readjustment of the premium" by Driver Record categories. The industry study demonstrates that where annual premiums can be exactly matched to individual costs in the hypothetical Model I and II groups, the Driver Record results do not lead to any "readjustment of premium." Where there is a large mismatch of premium to the individual costs established for the Model I and II groups by combining them into the same pricing class as Model III, the Driver Record results do lead to a large "readjustment of the premiums" (up to a 214 per cent premium surcharge) for the unlucky drivers with prior accidents (Exhibit B, *supra*).[46]

It is clear from the industry study's data that the more important the factor is that is ignored, the larger will be the cost "justification" for readjustment of premiums based on Driver Record data. The more important the factor that is ignored, however, the larger will be the overcharges and subsidies.

Differential Impact on Low-Mileage ('Low-Risk') Drivers. The industry study's Model III mixture of lower- and higher-accident-probability drivers gives the evidence that the unluckiest lower-probability drivers (five out of 10,000, Exhibit A, *supra*) will reach the three accident category in three years. The ISO system surcharges this category 150 percentage points over the discount price for the zero-accident category. Actuarial and insurance literature makes scant acknowledgement of this

45. LEMAIRE, *supra* Note 1 at 117. The important (and unmeasurable) factors suggested by Lemaire are "individual abilities of each driver: accuracy of judgment, swiftness of reflexes, aggressiveness at the wheel" and similar characteristics, but not the annual mileage recorded by the odometer of the insured car. Elsewhere in the book, an evaluation of variables affecting the annual number of claims finds that the annual distance traveled is a "very important" variable. *Id.* at 99.

46. A smaller 83% is the equivalent maximum surcharge obtained from a model based on Poisson calculations developed by Bailey & Simon, 46 PROC. CASUALTY ACTUARIAL SOC'Y 159 (1959). Their model mixes Model I (0.05) and Model II (0.20) drivers, but also includes a group of drivers with identical probabilities that average 0.10 accidents per year. The mixture (cast in terms of annual miles and cars) is: 100,000 cars at 5,000 annual miles, 100,000 cars at 10,000 annual miles, and 50,000 cars at 20,000 annual miles. The addition of the 10,000-mile cars reduces the extreme effect that Driver Record has on raising the average annual mileage by prior-accident category. This smaller 83% value emphasizes the very broad range of accident probabilities that insurance price classes must encompass to develop the surcharges exceeding 200% as the ISO Driver Record system does.

adverse effect of Driver Record pricing on drivers with lower-accident probabilities. In 1989, however, the I.I.I.'s defensive response to a "good driver" discount mandated by California Proposition 103 does appear to acknowledge such an adverse effect on "low-risk" drivers:

> Conceivably, greater use of accident experience would produce rates that are too high relative to expected claim costs for low-risk drivers ... [U]nlucky recent history would overshadow the other factors which make it less likely the driver will have an accident in the future.[47]

When insureds by definition have the same accident probability, whether "high risk" or "low risk," there is no future cost justification for "refinement" of price by discounts and surcharges on the basis of driver record. Since accidents are random, such "refinement" is knowingly and arbitrarily discriminatory. Even when price correctly matches cost for cars driven the class average annual mileage, application of Driver Record pricing arbitrarily provides nominal discounts for the lucky majority at great expense to an unlucky minority.

As a group of low-mileage, therefore low-risk drivers, women are more apt to be severely overcharged for being unlucky than men. Men, as a higher-mileage group, when unlucky are more apt under Driver Record pricing to "suffer" only loss of an automobile insurance subsidy.

WHAT IS DRIVER RECORD PRICING FOR?

Despite the fact that Driver Record pricing contravenes basic insurance principles, discount and surcharge schemes tied to driver records have been in use on and off since first introduced in 1929. It is therefore reasonable to ask how Driver Record pricing is useful to the automobile insurance industry.

Effectiveness of Driver Record in Lowering Prices

While the public is led to expect that Driver Record pricing keeps prices down for good drivers, it can actually do very little for the large majority of insureds. The 1979 industry study reviewed, *supra*, presented ISO data showing that 85 per cent of insureds are receiving only a seven per cent discount from what their price would be without the Driver Record surcharges. Even this small discount, however, would require full collection of surcharges ranging from 40 to 220 percentage points over class prices, an expectation that is probably not realistic.[48] Intensified surcharging to

47. I.I.I., *supra* Note 5 at 62.

48. See, *infra* Note 57 for a study finding that a large portion of policyholders eligible for surcharges are not being identified.

support increased discounts creates more resistance to payment of the surcharges and greater enforcement expense. In 1981 an actuarial paper on rating classification observed that: "[Through] rating by past accident record . . . accident-free or claim-free drivers usually save at most 5% over the cost of not having such a program."[49]

A regulator in 1979 emphasized the surcharge side of the equation of good rates for good drivers:

> A generally good driver whose rare instance of misjudgment causes an accident should not necessarily pay significantly higher premiums during subsequent years. Yet, if such unlucky drivers are not severely surcharged, a merit rating plan is not likely to save good drivers much money.[50]

For years, however, insurers have assured the public that good drivers deserve to get good rates. Some regulators and governors have fostered that assumption. Insurance professionals who know that Driver Record pricing can do nothing useful for the large majority of consumers—and much that is harmful to the unlucky few—have remained silent in the face of these unrealistic promises.

In 1988 the California public apparently believed arguments that the insurance establishment was not delivering on the promised benefits of Driver Record pricing. That year the voters adopted Proposition 103, which mandates, effective Nov. 8, 1989, that the most important factor for rates and premiums shall be "[t]he insured's driving safety record" and that:

> Every person who (A) has been licensed to drive a motor vehicle for the previous three years and (B) has had, during that period not more than one conviction for a moving violation . . . shall be qualified to purchase a *Good Driver Discount* policy. . . . The rate charged . . . shall be at least 20% below the rate the insured would otherwise have been charged.[51]

This provision appears to promise "good" drivers in California a 20 per cent reduction in premiums while the "discount" language allays fears

49. Walters, 68 PROC. CASUALTY ACTUARIAL SOC'Y at 16 (1981).

The question of effectiveness in providing meaningful discounts is omitted from the list of 20 administrative and actuarial problems considered in a 1952 paper on Driver Record pricing. Experience data for the only plan cited in the paper—95.2% penalty-free, 2.7% surcharged by 10% and 2.1% surcharged by 15%—shows by calculation that the penalty-free insureds gained a 0.6% premium savings from the surcharge plan. Snider, *supra* Note 37 at 344.

50. Massachusetts Division of Insurance, *Automobile Insurance Risk Classification: Equity & Accuracy* (1978) at 56. (The paper, sponsored by the insurance commissioner, offers no excuse for not repudiating such an abusive scheme.)

51. Proposition 103, CAL. INSURANCE CODE (new) § 1861.02 (b) (emphasis added).

EXHIBIT G
Surcharges Produced by a "20% Discount"

Proportion of cars: surcharged / discounted		0.5 / 0.5	0.3 / 0.7	0.2 / 0.8	0.15 / 0.85	0.1 / 0.9
20% off original price						
Original price level	Surcharge	+20%	+47%	+80%	+113%	+180%
	Discount	-20%	-20%	-20%	-20%	-20%
20% off surcharged price						
Original price level	Surcharge	+11%	+16%	+19%	+20%	+22%
	Discount	-11%	- 7%	- 5%	- 4%	- 2%

of price increases for those who might not expect to qualify for the "discount." It is a classical "something for nothing" promise. Owing to the arithmetic of discounts—as distinct from price reductions—the two expectations are in conflict: a discount necessitates a surcharge, an increase in the undiscounted price, to maintain the average price level.

The straightforward interpretation of the Proposition 103 discount requirement is that the discount is a 20 per cent reduction of the prediscount price. The magnitude of the surcharge to offset the discount, however, is determined by the size of the minority ineligible for the discount (**Exhibit G**).[52] California conviction records suggest that the proportion of non-"good" drivers would be about 0.15 of drivers.[53] At this proportion, the surcharge would have to be about 100 per cent of the premium (Exhibit G). If the prospect of being surcharged were to make drivers extremely law-abiding so that the proportion of non-"good" drivers decreases to 0.1, the surcharges would nearly triple the premium (Exhibit G).[54]

52. If the undiscounted price were not raised, the insurer would have to absorb the cost, which would amount to a price level reduction. The California Supreme Court ruled in May, 1989, that insurers are exempt from any price level reduction mandated by Proposition 103 to the extent that it would not allow a company to get a "fair and reasonable return." Califarm Insurance v. Deukmejian, slip. op. 5000738 (Cal. S.Ct. May 4, 1989) n. 8 J. OF INS. REG. 90 (1989).

53. The industry study notes that California's level of traffic enforcement is high among the states. It presents California driver conviction record data for three years on a random sample of 113,525 driver records, in which about 14% of the drivers were in the two or more convictions category in the three-year period 1972–74 and thus would be surcharged for failing to meet the Proposition 103 definition for the mandatory 20% "good driver" discount. INDUSTRY STUDY, *supra* Note 6 at 55.

54. Large insurance surcharges tied to traffic violations may cause enforcement to

To lessen the impact of surcharges on those not qualified for the "good driver" discount, a politically accommodating interpretation is likely to be adopted that does not reference the discount to the pre-discount price level at all. Instead it would require only that "good" drivers pay 80 per cent of what non-"good" drivers pay. Under this interpretation, the large majority of lucky drivers would get a five per cent (or less) actual reduction from what is designated as a "20% discount," while the minority of cars would be surcharged about 20 per cent to pay for the discount (Exhibit G). The beneficiaries of the discount will be unable to detect its effect, while the second traffic conviction, even at a 20 per cent surcharge over the three years applicable, can result in hundreds of dollars of additional automobile insurance costs.[55]

Of all of the mystification surrounding Driver Record pricing, the very simple fact that it can not lower prices significantly for the lucky majority no matter how much the unlucky minority may be surcharged is the best kept secret.

What Purpose Does Driver Record Pricing Serve For Insurers and Regulators?

Given the fact that Driver Record pricing is clearly not beneficial to consumers, the continued support it nevertheless receives from insurers and regulators indicates that there are reasons for its survival.

Underwriting Selection. For insurers, Driver Record provides a useful excuse for cancellation or non-renewal of policies held by customers no longer deemed desirable. A schedule of severe surcharges makes convenient refusal prices. A summary of a 1960 Casualty Actuarial Society Seminar on Merit Rating indicated this purpose:

> Statements were made to the effect that the real purpose of stock agency companies in going into merit rating was to reshuffle the business and get back some of the cream that had gone to the low-rate companies.[56]

Insurers are aware that accidents are random and that desirable customers may have accidents or convictions. It is therefore important to have some

---

decline. Traffic officers in Pennsylvania are objecting to the insurance commissioner's relatively modest $30 insurance surcharge on traffic fines (to pay for a catastrophic injury fund deficit) as leading to more contested citations, more time spent in court and less time available for enforcement. Harrisburg, Pa., *Patriot News* (July 14, 1989). "Police oppose fines for CAT Fund."

55. Under a 20% surcharge system tied to two or more traffic convictions, the second conviction in a year would mean that an existing $1,000 premium would be surcharged $200 annually for three years. Since individual premium amounts depend on coverage and territory, the insurance surcharges to traffic fines would show large variation for an identical infraction. Moreover, stiffer penalties bring greater enforcement cost, probably less enforcement, and, as noted by S. Mooney (I.I.I., AUTO INSURANCE CHOICES, (1989) at 37), an increase in the number of uninsured drivers.

56. 47 PROC. CASUALTY ACTUARIAL SOC'Y 230, summation by William Gillam.

discretion in administering a Driver Record system. Verification may be left in the hands of agents, who would be motivated to protect good customers from the "second accident."[57] Insurers nevertheless understand that those who have had an accident can be made to feel guilty enough to pay an arbitrary surcharge, misrepresented as actuarially sound.[58]

Blaming the Consumer for Insurance Prices. That auto insurers can get policyholders to accept the idea of being surcharged for an accident confirms that auto insurance consumers are not told that accidents are random events or given a clear picture of what their premiums pay for. Insurers and regulators are equally responsible for the information gap which prevents consumers from linking cost quantitatively to mileage exposure and thus to premiums.

People seek personal control over their routine expenditures and Driver Record pricing offers a moralistic illusion of control. In a newspaper report headlined "Unisex Insurance Rates Hit Hard," a Pennsylvania insurance department representative explained "You will pretty much individually determine what happens to your rates."[59]

Personal control also, of course, means personal responsibility so "those who cause very serious accidents pay" for the cost of insurance along with a fine for speeding.[60] Punitive pricing carries power to intimidate, as well as to pit consumers against each other. Drivers who have not had accidents may be more easily reconciled to high prices if they

---

57. The reluctance of insurers to have Driver Record discount/surcharge systems rigorously enforced is evidenced in the difficulty that a data service company has experienced in marketing a clearing house service to let insurers share claim and traffic violation records between companies and across state lines. An actuarial study commissioned by the service company shows that the Driver Record information would provide a return of $4 in missed premium surcharges for every $1 spent on the service. That insurers are hesitant to adopt such a profitable service suggests that they may be reluctant to collect all of the surcharges owed. They may well be concerned about "adverse reactions" from customers who pay large premiums not only for automobile insurance, but possibly for other personal and business coverages. (The same motivation for avoiding knowing what could easily be known evidently applies to the current refusal to measure odometer mileage or sex-divide Adult prices.) Information from "How to Rate an Auto Policy: Database Provides the Clue," *Journal of Commerce* (June 15, 1989).

58. The accident-free category is taken as the base price to which the surcharges are related. Discounts are not named in the Driver Record pricing systems of most insurers because competitive pressures on agents lead to overuse of any price adjustment called a "discount."

59. Erie (Pa.) *Times News*, June 25, 1989.

60. *Patriot News, supra* Note 54.

think that "bad" drivers are paying even more. Price variation in itself implies an actuarial precision that the consumer has no way to evaluate.

The political utility of Driver Record surcharge systems was inadvertently described by an insurance expert in 1979. The Massachusetts state-mandated plan was characterized as "just a punitive measure" used for "placating a political goal to try to keep the rates down for some people and tell the population at large that people are being made to pay by the way they drive."[61]

Nevertheless, insurers and regulators implicitly blame the public for high premiums by stating that individuals can control their premiums. According to these authorities, it is "how" you drive, not how much the car is driven, that determines your cost to insure. Consumers are thus made responsible for random events they can not control while being prevented from exercising the same control over auto insurance expense that they have over gasoline expense.

'Actuarial Justification' Relies on Professional Dishonesty

Insurers and regulators publicly defend Driver Record surcharging as "actuarially justified" because the categories of people with prior accidents show progressively higher accident or claim averages in the future than the large accident-free classes from which they are drawn.[62] Professionals know, however, that what such "justification" actually shows is the inability of the pricing system to match prices to costs within separate price classes.

Thus, what is offered as proof that Driver Record surcharging is justified is what in fact proves the pricing system to be basically flawed. As demonstrated by the industry study reviewed, *supra*, the development of large cost differences according to Driver Record proves that the pricing system overcharges some and subsidizes others. All else made equal by classification, those overcharged at the class price are those whose cars are driven less than the class average annual mileage. Those subsidized at the class price are those whose cars are driven more than the class average. While denying the effect of individual mileage on accident probability, insurers use a random sampling of it in the accident and conviction statistics to surcharge some drivers.

---

61. Testimony by an expert for the Hartford Insurance Company before the Pennsylvania Insurance Department in *Mattes v. Hartford*, Tr. 111 (1979). The testimony opposed putting more emphasis on Driver Record pricing as a substitute for driver sex in the Youth classes.

62. An insurers' association reportedly said that: "[I]t is actuarially justified in general that motor vehicle offenders pay more for insurance." "Mass. Weighs 'Good Driver' Plan." *J. of Commerce* (Sept. 18, 1989).

Professional promotion of Driver Record pricing, or even silent acquiescence to it, is actuarial shysterism[63] that serves to cover up the overcharging of all owners of cars driven low annual mileages, predominantly women and older men.

63. "Actuarial shysterism" is "to become the protagonist who uses his skill to argue his client's cause regardless of merit," as described in the 1959 Casualty Actuarial Society presidential address concerning merit rating, *St. Vitus's Dance*, Pruitt, 46 PROC. CASUALTY ACTUARIAL SOC'Y 149, 155. (The society's current president ordered this 1959 address reprinted in the Spring, 1989, CASUALTY ACTUARIAL SOC'Y FORUM, explaining that it is "particularly interesting in view of Proposition 103 and the pressures expected in the personal lines of insurance in 1989 and 1990.")