Why Low Credit Scores Predict More Auto Liability Claims: Two Theories

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Abstract. The paper considers two explanations for why liability claims vary inversely with credit scores. The accepted Theory 1 attributes the correlation to an association between financial negligence and driving negligence, which is given scholarly support by Brockett and Golden, 2007. But the present article identifies difficulties for Theory 1 that have not been addressed before and offers an alternative explanation. Theory 2 proposes that people with low credit scores must economize and many do this by sharing cars. Such economizing raises the average miles per car and consequently the number of liability claims per 100 cars. Both theories are also considered with respect to explaining traditional predictors such as driver sex and accident record. At stake is an effective policy response to the conflict between mandatory insurance and insurance affordability problems for financially-pressed drivers. Scholars are urged to engage in evaluating the two theories as each calls for a different public policy response. One involves increased rate regulation and the other works to create an informed, free market demand by consumers for an odometer mile exposure unit as an optional alternative to insurers' traditional car year unit.

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This paper addresses the conflict between free-market pricing and mandatory auto liability insurance. Mandatory auto insurance has long been demanded by the public and, despite steadfast opposition by insurers, has been increasingly adopted over time by state legislatures. Besides enforcing the mandate, legislators are concerned that insurance prices be affordable to facilitate compliance. However, this concern leads to regulation of some pricing variables. A recent example is the effort by many states to prohibit or regulate insurers' use of credit scores. In response, automobile insurers commissioned a study by Miller and Smith (2003) of a random sample comprising nearly 2.7 million car-year records from the files of national insurers. The sample shows that the cars owned by drivers with the lowest credit scores produce 2.5 times as many liability claims per 100 car-year exposure units as the cars owned by the highest score drivers (Figure 1). But this also means that credit score pricing charges most to those generally on the tightest budgets, which contributes to pressure for regulating prices.

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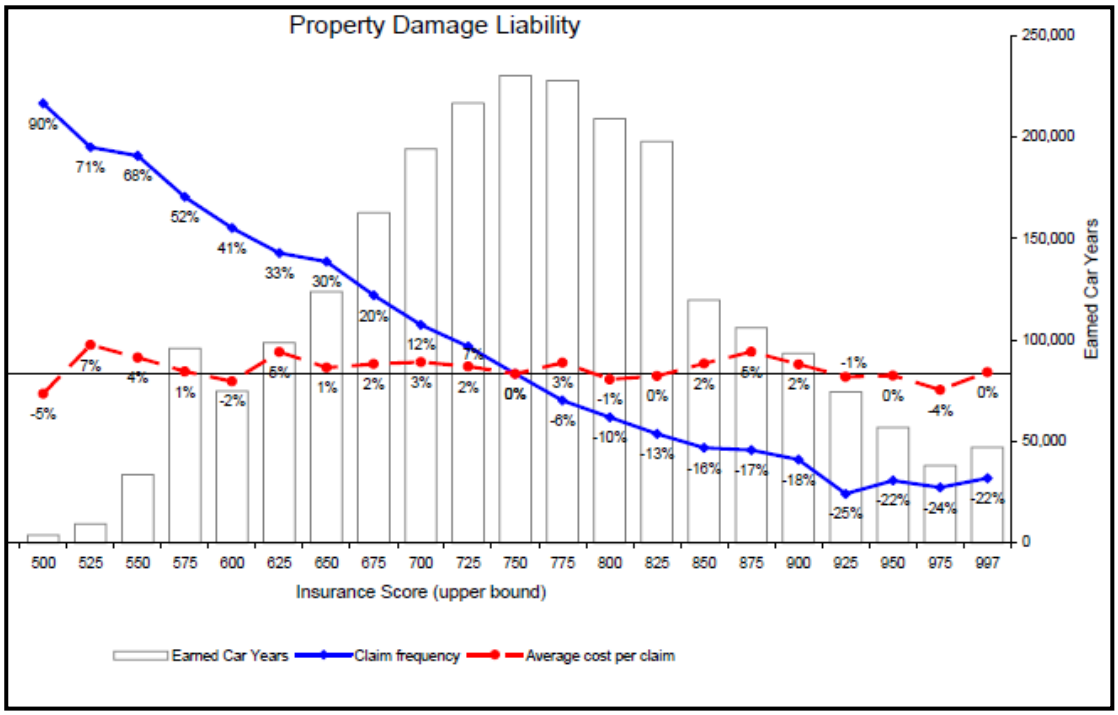

Figure 1. Variation of relative claim frequency and average claim size with credit-based scores. Figure is from Miller and Smith 2003.

To help resolve the conflict between affordability and free-market pricing, this essay further examines *why* lower credit scores predict more liability claims. Two theories are brought to bear on this question. The prevailing explanation, Theory 1, is that a lower credit score predicts more driver negligence. The basis is that each liability claim requires a negligent act by the insured car's driver to cause the accident. Since the cars of low credit score drivers produce more liability claims, it is assumed that these drivers perform more negligent acts and therefore on average are more negligent drivers. In a 2002 report on credit-score pricing to the National Association of Insurance Commissioners (NAIC), the American Academy of Actuaries (AAA) (2002) likens the way credit scores work to the way driver records work in identifying such drivers.

> [H]istories of past accidents and violations do not *cause* drivers to have more accidents. The rating practice that does exist is based on the fact that, as a group, drivers who have been accident-prone in the past are likely to be accident-prone in the future. [Emphasis original.]

The AAA report is explaining here why, as an actuarial principle, a *cause* for a correlation need not be established as a condition for regulatory approval. Nevertheless, regulators, consumer advocates, and legislators continue to call for an explanation for the credit score correlation.

As the first academic response to these calls, Brockett et al. (2005, 2007) provide scholarly support for Theory 1's driver negligence explanation. They review studies about how the "characteristics of individual risk taking . . . affect both

financial decision making and risky driving habits." Brockett and Golden (2007) conclude that the research examined by their article

> suggests that the discussed individualized biological and psychobehavioral correlates provide a connection between credit scores and automobile insurance losses. Credit scores, like good student discounts and marital status, tap a dimension of responsibility and stability for the individual that can permeate multiple areas of behavior.

But this support entails unaddressed issues. One is that the studies reviewed by Brockett and Golden rely on accident data referred to the *driver year*, whereas insurance claim data refer to the *car-year* exposure (statistical) unit and to the driver-type classification of the car rather than to the driver driving at the time the car was involved in an accident. Moreover the review takes no notice that according to periodic federal travel surveys (Hu and Reuscher, 2004) different categories of drivers and cars represent a wide range in average annual miles and, furthermore, that within the categories themselves drivers and household cars individually traveled from zero to 50,000 miles and more in the years surveyed, Figure 2. Differences in annual mile averages can readily match reported ranges in liability claims per 100 car years from the lowest to highest credit score categories. For instance, the 2.5 times difference in annual liability claims reported by Miller and Smith can be matched by the 2.5 times difference in annual miles from 6,000 miles to 15,000 miles. According to the 1995 travel survey, 30% of cars were driven less than 6,000 miles and 25% of cars were driven more than 15,000 miles, Figure 3. Characterizing those with low credit-scores as "high risk drivers" on the basis of insurance records misleadingly implies that the high risk must be on a statistical per-driver-mile basis[1] rather than as possible consequences of large annual-miles-per-car differences among car categories defined by insurers' classification and underwriting rules.

1. According to Williams (1999), risk rates per mile vary strongly with driver age. Age 17 drivers average about 30 state-reported accident involvements per million miles compared with adult driver involvements of 4-5 per million miles. Drivers over age 79 average about 18 reported involvements per million miles.

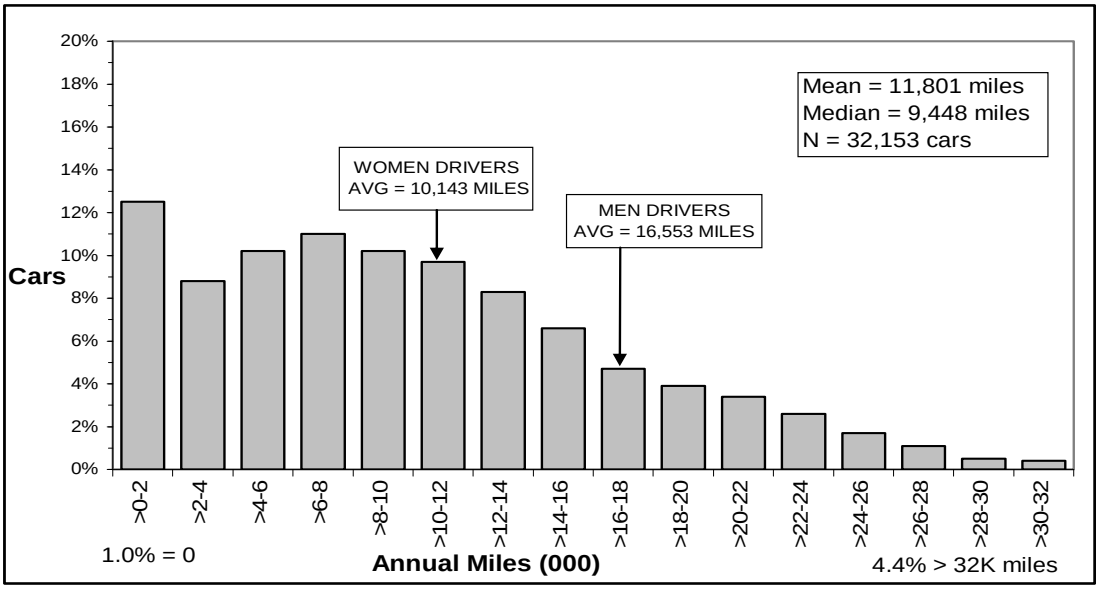

Figure 2 Distribution of cars by annual miles. Calculated from 1995 Nationwide Personal Transportation Survey data. See Hu and Reuscher, 2004.

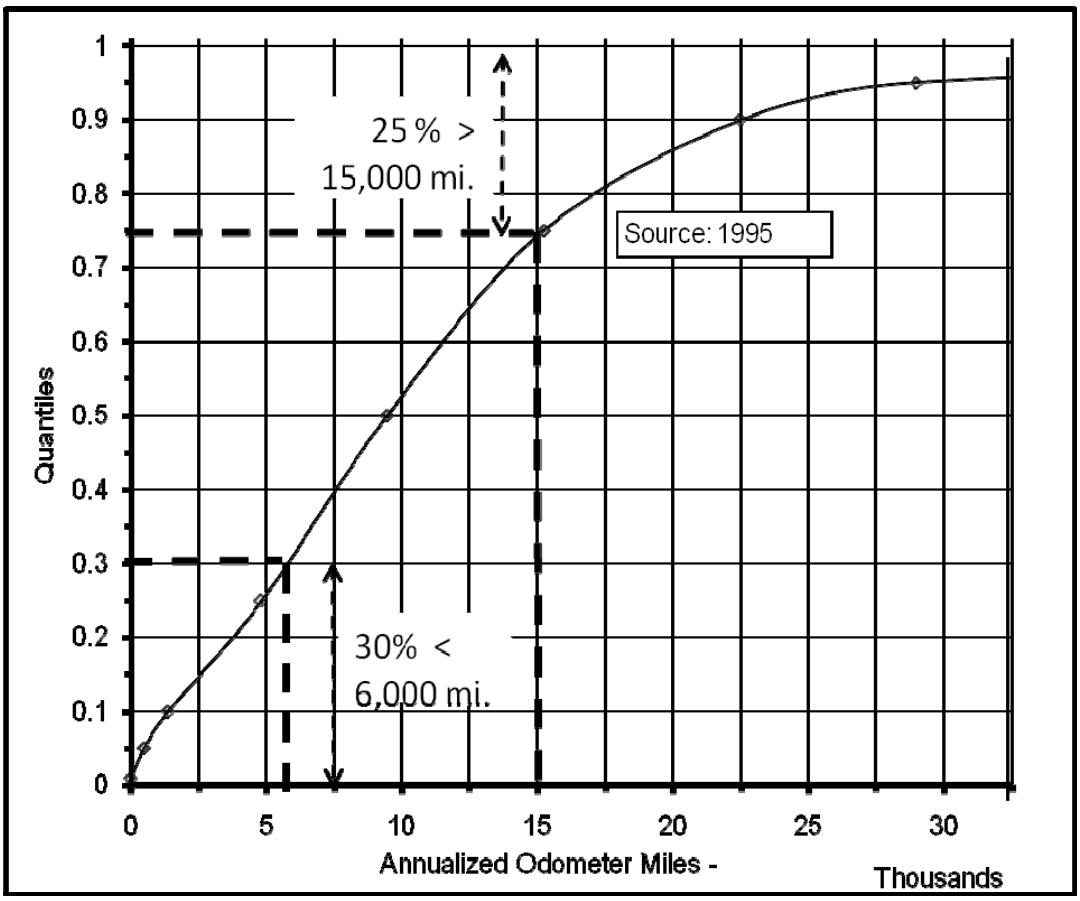

Figure 3. Recasting of Fig. 2 data to show the cumulative distribution of cars, and the percents driven less than 6,000 miles and more than 15,000 miles.

Theory 1 also entails generally unaddressed problems. One is that drivers subject to tighter budgets as indicated by lower credit scores should be more risk averse and should be, therefore, if anything, less negligent. Moreover, insurers report that lower credit scores also predict more uninsured motorist claims. These claims require as a condition of payment the non-negligence of the insured car's driver. Lower credit score drivers must therefore be both more negligent and more non-negligent in accidents.

As an alternative to the driver negligence explanation, Theory 2 proposes that low credit scores predict more miles per insured car. Significantly, the uninsured motorist claims problem for Theory 1 is actually a requirement for Theory 2: liability and uninsured motorist claims must correlate positively. The more miles a group of cars averages, the more accident involvements and claims per 100 car years the group must produce, which will include both more negligent (liability) claims and also more non-negligent (uninsured motorist) claims. Consequently, this means that the cars of financially-constrained drivers must be averaging more miles per car.

The logical basis of Theory 2 is supported by several easily verified givens. First, accidents are a cost of operating cars. Parked cars rarely cause accidents, and liability claims historically vary directly with the amount of driving as negatively affected by sharp increases in gasoline prices and unemployment (Gragnola, 1984; Butler et al. 1988). Second, as demonstrated by consulting an agent's manual of rates and rules, premiums are charged not as a cost of operating cars but of owning them. As long as classification and coverage are unaffected, adding or subtracting cars from a policy results in a proportional change in premiums. Finally, premiums are paid in advance of coverage and are never readjusted at the end of the policy period regardless of how many, few, or no miles the car was actually driven.

Nevertheless, it is sometimes asserted in the academic literature that, if auto insurance is cross-subsidized, the undercharged "high-cost drivers will have an incentive to drive more" and the overcharged low-cost drivers "will drive less than under competitive rating." Although there are many papers estimating the elasticity of vehicle miles on the price of gasoline, I know of none estimating the elasticity of vehicle miles on the price of auto insurance—but of course invite correction about this.

In fact, as several economists have observed, premiums are clearly a cost of car owning and therefore affect the number of cars owned.[2] Earlier criticisms of auto insurance premiums as lacking an incentive bearing on how much to drive were made by Williamson, Olson, and Ralston, (1967:248), who wrote that "the auto insurance premium . . . acts as a lump-sum rather than a marginal tax." and by Vickrey (1968:470), who concluded that insurance rates "provide incentives that are largely inappropriate at the margins where decisions are actually made as to . . . whether to make a given trip by car."

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2. Blackmon and Zeckhauser, 1991, report for Massachusetts: "The demand for insured vehicles per household was estimated as a log-linear (constant elasticity) function of income, price, and household density." And "Our estimated coefficients were income 0.477, price –0.569, and density –0.044." This large negative effect of per-car insurance prices on car registrations has been confirmed nationally by Pritchard and DeBoer (1995) and for California by Jaffee and Russell (1998).

According to Theory 2, traditional pay-per-car premiums must *cause* adverse selection under certain circumstances. Per-car prices allow only one certain way to economize on mandatory insurance: drive fewer cars more miles each. Inconvenience keeps most drivers from doing this—until the pressure to economize is great. When drivers start to share cars, average miles-per-car rises. The result is that insurers correlate more liability claims per 100 car years with lower credit scores and raise prices accordingly (if for no other reason than fear of being adversely selected against by a competitor that is pricing according to the credit score indications).

The basis for the sharing-insured-cars explanation was described in 1968 by Vickrey. In enumerating obvious economic harms caused by charging insurance as a cost of owning a car for coverage of losses resulting from driving the car, he included these two: "The premium structure thus has the general effect of promoting excessive use of a given stock of cars and undue stinting on the ownership of cars," (1968:471). Although Vickrey noted the harm to automobile manufacturers, neither he nor any other economist since has identified the apparently not-so-obvious harmful feedback effects the premium structure must have on some of the insurance prices themselves.

The first theoretical description of how "undue stinting on ownership of cars" and "excessive use of a given stock of cars" must cause high insurance prices in low income zip codes was published in a report to the Texas Legislature by Butler in 2000 (pp. 18-19). Drivers who want to economize on automobile insurance buy less of it. Since the purchase unit is a car year (divisible into car days), these drivers first take their less-driven, marginal cars out of insurance pools and then they share cars kept insured. But each action constitutes adverse self-selection against the pools: first by taking more premium than miles out of the pools, and then by adding miles without premium to the pools through sharing insured cars. When insurers react to the inevitable more claims per 100 car years by increasing the price per car of coverage in low income zip codes,[3] the price increase can set off an upward spiral of fewer insured cars, more average odometer miles per insured car, more claims per 100 insured car years, and further increases in the per-car price of insurance.

Theory 2 also explains other predictors of liability claims insurers use. Just as more liability claims correlate with lower credit scores, more claims are predicted for the cars of residents of lower-income zip codes, more claims for the cars of drivers with lower educational and occupational levels, more for installment plan premium payers, and more for cars newly insured after having been uninsured for a period—the so-called no-prior-insurance variable. Generalizing from these predictors, any group marker of a need to economize predicts more liability claims per 100 car years. (See the first group in Table 1 below.)

In arguing the Theory 1 explanation that low credit scores identify negligent drivers, both Brockett and Golden (2007) and the American Academy of Actuaries

3. The price increase may not be directly targeted at a zip code. Instead the increase results from standard companies using proprietary underwriting criteria that refuse insurance to most car owners in the zip code. Therefore, these owners are forced to buy higher-priced insurance from so-called non-standard companies. In some cases, the companies with higher prices are members of the same corporate group as the lower-priced standard companies. (See for example the two Allstate and two Geico companies in Table 2 below.)

(2002) validate this new variable with the effectiveness and public acceptability of traditional variables such as driver sex and accident record. For each of these validating variables, however, the logic of Theory 2 provides an alternative explanation, as shown in Table 1. For example, men average more driving than women the same age and therefore the observed annual involvement of men in more state-reported accidents on a per-100-licensed-drivers basis should be no surprise.

Table 1. Two explanations for why credit scores and other predictors work.

Predictor variable (of liability claims per 100 car years)	Correl-ation	Theory 1 (Variable proxies for driver negligence)	Theory 2 (Variable proxies for avg. miles per car year)
Credit score	negative	"Lack of stability and impulsive behavior affect both driving and credit history."*	Variables are measures of need to economize on liability insurance, which can be done directly by giving up cars and driving the cars remaining insured more miles each.
Zip code income	negative		
Education and occupation levels	negative		
Installment plan	positive		
No prior insurance	positive		
Driver sex – man (Controversial for adults. Used where allowed, mainly for cars accessible to young drivers)	positive	"[T]he psychobehavioral characteristics of risk-taking are related to impulsivity, sensation seeking, aggression, and sociability with men engaging in more overall risky behavior than women."**	At every age men average more miles than women, and presumably so do the cars they drive relative to the cars women drive.
At-fault accident	positive	"[D]rivers [who were] accident prone in past are likely to be accident prone in the future"***	As sub-pools, "accident-sampled" cars continue to average more miles per car than the main pools from which they are separated.
Not-at-fault accident (Controversial, but may or may not be used where allowed)	positive		
Car age (not disallowed but never used for liability prices)	negative		Annual mile averages decrease with car age

* Brockett and Golden, 2007
** Brockett et al., 2005
*** American Academy of Actuaries, 2002.

When it comes to Theory 2 explaining why past accidents are predictors of more claims per 100 car years, accidents may be realistically modeled as random sampling—not of car year records from company files as employed in the Miller and Smith (2003) study—but perforce of cars that are on the road (Butler and Butler, 1989). Although low- and average-miles cars are sampled by accident involvement, this sampling obviously will be biased to those cars in the insurance class that spend the most time on the road. This biased sampling process raises the average odometer

miles of the sub-classes defined by accident involvement. Rather than identifying accident prone drivers in the future—as the AAA report (2002) explains it—accident records actually define subgroups of cars that average more miles per car year in the future.

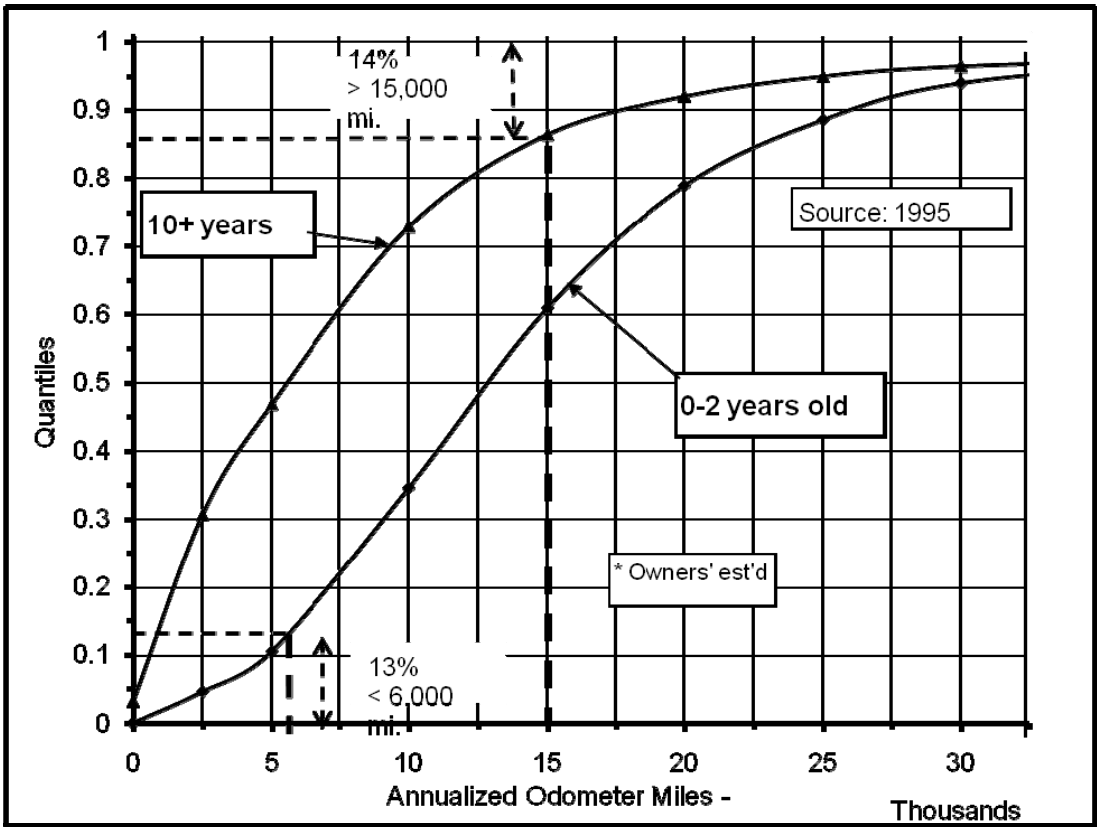

Figure 4. Annual mile distributions of cars in two age groups. The 0-2 year cars averaged nearly twice as many miles as the 10+ year old cars in 1995, 16,092 versus 8,798 miles.

In addition to the established predictors cited by Brockett and Golden (2007) as validating Theory 1, however, are equally reliable predictors that if used would raise difficult questions for auto insurers. A noteworthy example is that car age is not used for liability insurance pricing even though liability claims per 100 car years decrease with car age (McNamara, 1987; Pinquet, 1999). If this correlation were used in pricing, liability premiums would increase for a driver who trades an older for a newer car. But it would be difficult for Theory 1 to explain how buying a newer car causes a driver to become more negligent. However, Theory 2 explains that since annual mile averages decrease with car age, so must claims per 100 car years also decrease with car age. Trading an older for a newer car does not necessarily change the number of miles a driver drives whether many or few, but the car they drive definitely changes to a younger car age group that averages more miles per car.

In 1994 Harrington examined the case that mandatory auto insurance is "taxing low income households in pursuit of the public interest." But the case presented against such taxing is weakened by the implication that low income drivers pay the same insurance prices as higher income drivers. More recent work by Harrington and Niehaus (1998) confirms that the cars of lower income drivers produce more liability

claims[4] and consequently are charged higher "taxes" per car year for mandatory liability insurance. In agreement with these findings, SRI International (1979:77) describes the findings of a 1978 Massachusetts Institute of Technology doctoral thesis: "In Massachusetts, the correlation between territorial rate relativities and median income is –0.978; between such relativities and percent black, 0.532; both sets of figures are stunningly high." In a study of auto insurance cross-subsidies that Massachusetts regulations require across territories, driver sex, and other groups, Blackmon and Zeckhauser (1991:68) confirm that lower income drivers produce higher costs *per car year* than higher income drivers because the "subsidy of Boston and other cities tends to flow from high-income towns to low-income towns."

Moreover, according to the present study's Theory 2, Harrington's case (1994) misidentifies the law-abiding choice as "pay or take the bus," i.e., pay the price of mandatory insurance or give up driving. Instead, the law-abiding choice that pay-per-car pricing actually offers is not giving up *driving* and taking the bus, but giving up *cars* and driving the remaining ones more. Hence more miles per car, more claims, and higher prices must follow in what insurers term "hard to serve markets." Theory 1 suggests that more driver negligence in these markets causes the higher prices. But this suggestion means that—other than to repeal mandatory insurance as auto insurers would have it—there is no alternative to regulating prices to maintain affordability for the presumed negligent driver groups insurers identify.

Table 2. Range in premium quotes—lowest and highest with selected intermediate values—that insurers offer for one customer profile in Albany, New York.

Insurance Company	Premium*
ALLSTATE PROP & CAS INS CO	258
GEICO	318
PROGRESSIVE NORTHEASTERN	326
STATE FARM MUT AUTO INS CO	375
GEICO IND CO	492
METROPOLITAN GRP P&C INS CO	641
AUTOONE INS CO	854
ALLSTATE IND CO	1,136
* Dollars per car year for the minimum coverage required to register a car. From the New York State Insurance Department's *2006 Customer Guide to Automobile Insurance.*	

Instead of these undesirable alternatives, however, the strong demand by the public for enforcing mandatory auto insurance could be accompanied by a strong demand informed by Theory 2 that automobile insurers provide the audited odometer mile exposure unit (an option insurers offer to some fleet owners) as an option for private passenger car owners. At competitive cents-per-odometer-mile class prices this option would constitute a free-market remedy for the upward cost-price cycle

4. In the lower-income Missouri zip codes studied, liability claims per 100 car years were 8.25 which is 36% more than the 6.06 claims the higher-income zip codes averaged.

that the traditional car-year exposure unit sets off for groups of economizing drivers. With this option drivers could car pool or take the bus to save on insurance while still keeping their own cars legally insured and available for use.

Critical to informing a public demand for a remedy to mandated car insurance which many drivers cannot now afford is engagement by scholars with the explanation offered by Brockett and Golden (2007) and the alternative explanation provided by this essay for why low credit scores predict more liability claims. Each theory could be called speculative and confirmation of each would require measurement of miles. Just as meaningful differences in accident involvement rates among driver age groups have been established on a per million mile basis, meaningful differences in driver negligence for cars grouped by their drivers' credit scores would have to be established on a per million mile basis. Table 2 shows the reality that challenges each theory: how to explain the wide range in premiums that different companies are charging year in and year out to what appear to the public to be identical customers. Are the premiums responding to a wide range in driver negligence or to a wide range in miles per car year?

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