
CONFERENCE REPORT

**The Benefits of Mileage
Based Auto Insurance Policies**

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In December 1998, the Economic Policy Institute, with funding from the U.S. Environmental Protection Agency, held a conference, “The Benefits of Mileage Based Auto Insurance Policies.” The conference brought together researchers, government agencies, insurance executives and non-governmental organizations to discuss the potential for auto insurance policies that assess premiums by the numbers of miles driven, rather than by year some other period of time. At the conference, four papers were presented and discussed; two papers dealt with some of the more technical aspects of mileage based policies, while the other two focused on some of the practical issues surrounding the implementation of these policies.

The idea behind mileage-based insurance is simple. Currently, auto insurance premiums are almost exclusively assessed over some period of time, often over a year or half-year. While insurance companies take care to include several risk factors (such as driving history, make and model of car, urban vs. suburban vs. rural location, etc.) in determining a driver’s premium, the premium is largely independent of the number of miles driven. If the probability of an accident is positively correlated with miles driven, then insurance companies are missing an important indicator of accident risk. This fact leads to several outcomes which may not be socially desirable. Because insurance premiums are paid independent of the number of miles driven, drivers do not face the true marginal cost of their driving behavior. Two otherwise identical drivers, one of whom drives to work, the other of whom uses mass transit pay largely the same insurance premiums. The transit cormnuter, however, has a substantially lower probability of being involved in an accident than her counterpart. If her premiums do not reflect this lower accident risk, she is effectively subsidizing the higher risk behavior of her neighbor who drives to work every day. Under the current system, the one who drives to work every day does not face the appropriate incentive to reduce his driving and to take the subway or bus to work. This

imposes a cost to society in terms of more congestion, pollution, auto accidents, and infrastructure deterioration, to name a few. An insurance system that maintained the current risk classifications but assessed premiums according to the number of miles driven could reduce or eliminate this implicit subsidization and would bring the incentives to drive more in line with its true cost. While the basic principles behind mileage-based insurance are fairly intuitive, there are several complicated issues that must be addressed if such policies are to become a viable alternative.

The first paper, by Todd Littman of the Victoria Transportation Institute is entitled “Distance-Based Vehicle Insurance – Potential for Implementation.” Using data from the Insurance Corporation of British Columbia, Littman details the average accident risk and other important factors by mileage and other driver categories. Littman’s evidence indicates that accident risk does indeed rise with the number of miles driven. The relationship between mileage and accidents, however, is not simple. The data show that crash rates per mile tend to decline as mileage increases, so that as mileage increases, accident risk also increases but at a decreasing rate. This indicates that charging a fixed per-mile premium may not accurately capture true accident risk, although it would be an improvement over the existing system.

The evidence is complicated, however, by the fact that the data presented compares accident rates between drivers in different mileage categories, rather than individual drivers as their mileage increases. The data thus shows that people who drive more tend to have fewer accidents per mile. This is not equivalent to showing that as an individual drives more, his accident rate per mile decreases. It is possible that high mileage drivers tend to be safer drivers per mile, but that their accident rate per mile is the same at their first mile as it is at their last mile. If this is true, then fixed per-mile premiums could accurately capture accident risk. In

theory, this could easily be true if, for example, drivers who are more accident prone choose to drive less, leaving safer drivers in the high mileage category, or if driving skill increases with miles driven, so that high mileage drivers tend to be higher skilled and thus safer on average. Unfortunately, the data as presented are unable to determine if this is indeed the case.

Several conference participants commented on the relationship between mileage and accidents. While all seemed to agree that the number of accidents should increase with miles driven, some questioned how robust the relationship was. Littman's paper makes no attempt to rigorously test the relationship between accidents and miles driven. Such a test would be important in determining how great a factor mileage is in determining accidents. It would also be useful if such a test could determine whether and how the per-mile accident rate changes with miles driven by an individual as well as by mileage classes. Charging a constant per-mile premium would be simpler for insurance companies and easier for drivers to understand. It is unlikely that the true relationship is linear, but if it is reasonably constant, insurance companies could use a constant rate. The issue is further complicated by the fact that the low per-mile accident rates for higher mileage drivers are probably due (at least in part) to their driving more miles on highways which have lower per-mile accident rates. However, highway mileage is probably dispersed throughout an individual's mileage distribution, so that lower per mile rates for miles driven in excess of a certain level would probably be applied to both highway and local mileage and would thus not capture the actual marginal risk.

Another important complicating factor is that Littman's analysis is based on the number of accidents per mile driven. If, for example, highway accidents tend to be more severe and more costly than accidents on local roads, then insurance premiums should be higher for highway miles than would otherwise be the case. The reduced per-mile accident rate for higher

mileage drivers would then be at least partially offset by the higher average per-accident costs. If this is the case, then the relationship between miles driven and expected accident costs per mile would vary less, and a constant per-mile premium would be less problematic. Clearly, further statistical research is needed to determine how important each of these factors is.

The second paper of the conference, by Aaron Edlin of the University of California at Berkeley and Georgetown University Law Center, is entitled “Per-Mile Premiums for Auto Insurance.” In this paper, Edlin constructs an analytical model to examine the economic consequences of the current auto insurance system and the potential effects of switching to mileage-based premiums. Edlin begins by noting that the efficacy of any insurance system is influenced significantly by the legal system, particularly tort law.. The tort system covers civil matters such as suits to recover accident-related damages. According to Edlin, the current tort system does not produce the correct incentive structure for driving. The problem is that drivers are not always held fully liable for the damages they cause in an accident. Insurance companies thus do not charge their drivers enough to cover the full expected cost of driving. The current system is based on a negligence standard, by which drivers are held liable only if they do not take sufficient care when they drive. This can induce people to drive more carefully, but does not provide the incentive to drive fewer miles. Even if she drives perfectly safely, a driver’s presence on the road increases the probability that she will be involved in an accident due to someone else’s negligence. Had the safe driver chosen to drive less, the accident may not have occurred, but since she is at least partially compensated for her losses, she does not face the full social cost of her driving activity and thus tends to drive too much. By converting premiums to a marginal cost, per-mile auto insurance can increase the incentive to drive fewer miles, thus increasing the efficiency of the insurance system. However, it will not fully correct the problem.

In his paper, Edlin constructs a model that formalizes this driving ‘externality.’ Using this model, Edlin is able to generate estimates of the societal gains from switching to a per-mile insurance system as well as other types of premium structures. The externality problem that Edlin identifies is important because it allows him to capture more accurately the benefits of reduced driving that a per-mile insurance system would generate. Reducing miles driven by an individual reduces not only the probability that that individual will be in an accident but also that someone else will be in an accident as well. Failing to account for the reduction in this second probability would lead to an underestimation of the benefits of reduced driving.

Edlin finds that while nationally, insurance costs about 4¢ per mile driven, the marginal cost (the cost if one more mile is driven) is about 7.5¢. In states with higher traffic density, such as New Jersey, the marginal cost is about twice that. A universal system of per-mile auto insurance would reduce driving nationally by about 9% and would reduce insured accident costs by about \$17 billion. Subtracting the lost benefits from foregone driving, net social benefits would be about \$12.5 billion. These estimates do not take into account the fact that riskier drivers and drivers in riskier areas would face higher per-mile premiums, and these numbers thus underestimate the benefits of per-mile insurance.

The analysis may also provide insights into why per-mile policies are not widely available. If Company A were to institute per-mile policies, it would have to incur the costs of monitoring its drivers and would gain benefits to the extent that its drivers were driving less and getting into fewer accidents. However, a significant portion of the benefits would accrue to other insurance companies because of the reduced probability that their drivers would be involved in accidents with Company A’s drivers. Taking this into account raises the estimated social benefits by about \$9 billion. This indicates the potential for beneficial policy intervention. If the

government were to bear the cost of monitoring the mileage of all drivers, regardless of insurance company, then individual companies would not have to bear the costs of reducing accidents of all drivers.

None of the analysis above includes the potential benefits of reducing other driving-related costs such as congestion, pollution, and highway maintenance fees. Including estimated congestion costs alone increases the net social benefits by a further \$5.5 billion.

The third paper, by Roland Hwang of the Union of Concerned Scientists, is entitled “The Impact of ‘Pay-at-the-Pump’ Auto Insurance on Low Income Drivers: A Comparison of Two Studies.” In this paper, Hwang examines a different system that attempts to turn auto premiums from a lump-sum to a marginal cost. Under a pay-at-the-pump system, some or all of auto insurance premiums are assessed as a surcharge on gasoline. This has the benefit of making the link between driving and insurance costs more clear to drivers than the mileage-based policies discussed above. Because it effectively increases the price of gasoline, a pay-at-the-pump system has the added environmental benefit of inducing people to drive more fuel efficient cars. A significant advantage of pay-at-the-pump insurance is that by bundling auto insurance with gasoline, it can eliminate or greatly reduce the uninsured motorist problem; it would become extremely difficult to drive without buying insurance. There are certain drawbacks of pay-at-the-pump insurance, however. One conference participant from the insurance industry raised concerns that the induced move to more fuel efficient cars, which tend to smaller and lighter, would reduce the safety of the auto fleet and result in more severe accidents.

There are also technical issues with pay-at-the-pump insurance which were raised at the conference. Because only liability insurance is mandatory, consumers would still have to send in annual or biannual payments to their insurance companies for any optional coverage they choose.

Additionally, unless there were some way to distinguish drivers when they bought gasoline, the portion of the insurance bought at the pump could not be adjusted for the risk characteristics of the driver and could only charge the minimal level of liability insurance. Drivers in all but the lowest risk categories would have to make an additional payment to cover their liability insurance, complicating the system somewhat. Finally, one conference participant noted that gasoline consumption is only a rough proxy for miles driven and varies with the type and condition of car driven, the conditions under which it is driven and the driving style of the operator.

A version of pay-at-the pump auto insurance was introduced as a ballot initiative in California in 1994. The proposal would have required a \$141 annual lump-sum payment and a 25¢ charge per gallon of gasoline. (A slightly different proposal was considered by the 1993 California Senate but did not pass the Senate Judiciary Committee). Concerns were raised that this proposal would be regressive in because lower income drivers may end up paying a larger percentage of their income on the insurance than would higher income drivers. Energy taxes in general are often considered to be regressive because lower income people tend to spend a higher proportion of their income on energy products than higher income groups. A per-gallon charge would act like a tax on gasoline, and could thus also be regressive.

Two studies were conducted in order to determine whether or not the California proposal would be regressive. One study was conducted by the Union of Concerned Scientists (UCS); the other was conducted by the American Petroleum Institute (API). The two studies, examined in Hwan's paper, came to very different conclusions about the regressivity of the proposal. The UCS study found that it would benefit low-income drivers, and the API study found insurance

expenditures of the lowest quintile income group would go up by about 29%. Hwang attempted to assess the reasons why the two studies came to such opposite conclusions.

The differences in results appear to be due in large part to the data used in each study and various assumptions underlying the studies. The information required to do an ideal assessment of the policy was unavailable to the authors of either study. This is simply because the data is not collected; information about the fuel-efficiency and driving behavior of various income groups, for example, is difficult to ascertain; both studies were therefore forced to use imperfect data sets.

The UCS study used insurance premium information by zip code and matched it with median income by zip code reported by the 1990 Census. UCS found that under the current system, residents of the lowest income areas faced the highest rates for the legal minimum level of insurance. This was particularly pronounced in certain areas like Los Angeles, likely because of the concentration of lower income people in urban areas where accident rates tend to be higher. Using data on gasoline consumption from the Department of Energy, the UCS study tried to determine whether or not switching to a pay-at-the-pump system would exacerbate or mitigate the regressivity of the current system. Because lower income people tend to buy less gasoline, their costs per vehicle were lower than higher income groups. While the percentage of income going towards auto insurance would still be higher for lower-income drivers, the pay-at-the-pump system would substantially improve the regressivity of the current system. This does not take into account the fact that people would drive less due to the effective increase in the price of gasoline.

Using nationwide data from the Consumer Expenditure Survey on insurance and gasoline expenditures by income group, the API study found that insurance expenditures for the lowest

quintile income group would increase by about 29%, directly contrary to the results of the UCS study. A principal cause of this difference appears to be the fact that the API study included the increased insurance expenditures of the currently uninsured in calculating their impacts. Since uninsured drivers tend to have disproportionately lower income, including these drivers disproportionately increases the insurance costs of the lower income groups. While it is appropriate to consider the impact of the policy on the currently uninsured pool, the API cost estimate is biased upward because it does not account for the benefits that currently uninsured drivers would receive if they were to become insured. Uninsured drivers choose to be uninsured because to them, the value of being insured is less than the value of the other goods and services that the insurance premiums could buy them. Given their income constraints, some therefore choose to trade insurance for other things. The amount of loss for these people under a pay-at-the-pump system is not the amount of money they would have to spend on insurance, as API reports, but rather the difference in benefits of insurance and the other goods and services they would have bought. Additionally, the API study assumed that all households would pay a fixed vehicle premium of \$140 (essentially the same as the \$141 in the ballot initiative) as well as the gasoline excise. It is possible, however, that some currently uninsured drivers would avoid the \$140 annual premium by not registering their vehicle. This is more risky than merely driving without insurance, so the number of people doing this would probably be smaller, but it is a possibility that should be accounted for.

An additional shortcoming of the API study is that it did not evaluate a uniform insurance product, such as the legal minimum liability coverage analyzed in the UCS study, but rather used data on total insurance coverage, including comprehensive and voluntarily higher levels of collision and liability coverage. Because these types of insurance are disproportionately

consumed by higher income drivers, this can substantially influence the distribution of insurance costs across income groups. The API study assumed that all drivers under a pay-at-the-pump system would consume only the annual \$140 plus 25¢ per mile. This is a serious flaw because it invalidates comparisons between the current premiums which include optional coverage and the pay-by-the-mile proposal which does not. The problem is more serious at the upper end of the income distribution because higher income drivers tend to consume more optional coverage under the current system.

An important shortcoming of both studies is the fact that neither took account for the reduced driving that would likely result from a pay-at-the-pump system. Since the elasticity of driving with respect to gasoline prices is likely to change significantly over different income groups, this factor could have substantial influence over the regressivity of the proposal. If lower income people are more responsive to increases in gasoline prices (as evidence cited by Hwang indicates), this would tend to reduce regressivity.

The final paper of the conference, by Dean Baker and James Barrett of the Economic Policy Institute, is entitled: "The Feasibility of Pay by the Mile Insurance." This paper reviews some of the evidence of potential gains from charging auto insurance premiums on a per-mile basis. It also examines issues regarding the implementation of such a system and several policy options that various levels of government could take to help promote mileage-based insurance.

Nationwide, drivers paid an average of \$782 insurance per car in 1996, while the average number of miles driven in 1995 was 12,226 per car. This means that if all types of insurance were assessed by the mile, the average charge would be about 6¢ per mile. If drivers reacted to this the same way they react to gasoline taxes, this could reduce driving by 1520%. While it may seem inappropriate to charge certain types of optional insurance, such as theft and

vandalism, on a per-mile basis, evidence presented in Littman's paper shows that comprehensive insurance claims actually do increase with miles driven. This could be due to the fact that increased driving means that cars spend more time away from the owner's residence, perhaps in less a secure environment. A related issue is the charging of overhead costs on a per-mile basis. Since these costs do not vary with the number of miles driven, including them in a per-mile premium may be inappropriate. These problems could be avoided by charging comprehensive premiums and overhead fees on an annual basis, but given Littman's evidence that comprehensive claims increase with mileage and that overhead costs tend to be a very small portion of the insurance premium, including them in a per-mile charge would likely result in only a slight distortion. Additionally, given the accident externalities identified by Edlin as well as the environmental externalities involved with driving, it is highly unlikely that including these costs in the per-mile charge would raise the marginal cost of driving above the socially optimal level.

One of the major impediments to mileage-based insurance is mileage verification. There are various ways to approach this problem ranging from voluntary reporting to government-sponsored odometer readings. Approximately half of the states require some sort of annual vehicle inspection (either safety or emissions). A simple solution may therefore be to ask states to check odometers at the time of inspection and report mileage to the appropriate insurance company. States currently coordinate with insurance companies in reporting traffic violations; passing along this additional information does not appear to be a terribly onerous task.

Alternately, insurance companies could require their customers to bring their car to a certified mechanic for an annual odometer reading. This is somewhat redundant in states where annual inspections are already required, and some potential customers may see it as an imposition. This

could potentially be overcome with inducements such as a free oil change, although the insurance company would then have to bear the costs of these inducements.

On the surface, voluntary reporting of mileage may appear to be an invitation to cheat the system. This is not necessarily true, however. Odometers can be checked whenever a claim is filed. Charges for unreported miles can be deducted from the claim, possibly with penalties for higher levels of underreporting, and the insurance company can refuse to honor the claim if underreporting is high enough to indicate the intent to defraud. Approximately 8% of all drivers file an accident claim and about 12% file a comprehensive claim in a given year, so that close to 20% of all vehicles could be subjected to these kinds of odometer readings in a year.

Even with a relatively high per-mile charge, a driver would have to substantially underreport miles to see a substantial benefit. If a driver underreports mileage in one year he would have to underreport by the same amount in each successive year to realize a one time gain from cheating the system. To consistently realize gains, a driver would have to underreport increasing amounts each year, so that after a few years, the driver is running a substantial risk of not being covered in the event of an accident. While verification would present a new set of issues for insurance companies to address, they do not appear to be significant enough to make pay-by-the-mile policies impractical.

The paper also includes a substantial index that details various government policy options to help foster a pay-by-the-mile insurance system. One conference attendant asserted that if pay-by-the-mile insurance was indeed a good idea, then the insurance market would already be offering such policies and government intervention would not be necessary. Other attendants pointed out that the market failures represented by the accident externalities identified in Edlin's paper and the well-known environmental externalities of driving indicate a positive role for

government intervention in the market. At one end of the policy spectrum, the federal or state governments could mandate that insurance companies offer pay-by-the-mile policies. This option seems unlikely, however, unless, for example, the locational regressivities of the current system identified in Hwang's paper are seen as redlining, and thus in violation of anti-discrimination laws. Less assertive policies include changes in federal or state government procurement policies to have all their vehicles covered by mileage-based policies. The federal government owns about 450,000 vehicles, and state and local governments nationwide own about 3.2 million; requiring mileage based coverage for these vehicles could help foster a market for mileage-based insurance for private vehicles.

A different type of government policy could include converting other auto related fees from a lump-sum to a per-mile basis. Average state annual auto registration fees are about \$230, which would average about 1.9¢ per mile. The same could be done for sales taxes on cars, although these would have to be pro-rated over the life of the car, and personal property taxes, which are assessed annually on cars in several states, could also be charged on a per-mile basis. These types of policies could help align private incentives to drive more closely with the social costs of driving. They could also be used to establish an odometer reading and reporting infrastructure to remove that burden from insurance companies, thus facilitating the development of the market for pay-by-the-mile insurance.

Taken together, the papers presented at the conference indicate that there are potentially large societal gains from switching to a system of mileage-based insurance premiums. Questions still remain regarding the extent of the potential gains, the equity implications of such a system and various costs of implementing and maintaining a the system. There is the additional question of whether or not such a system would be more or less profitable for insurance

companies than the current system. This question can only be answered with more detailed information on the driving behavior and the business model of insurance companies under the current system. It was noted at the conference that at least one private insurance company is conducting a test market for pay-by-the-mile insurance. While private companies are often reluctant to share the detailed results of such experiments, the revealed outcome of such tests may provide an indication of the answer to this question which, given the profit motive of the industry, may be the most important determinant of whether or not pay-by-the-mile policies will be offered in the future.