

Pay-at-the-Pump (PATP) Auto Insurance: Criticisms and Proposed Modifications

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Abstract

In 1998 the U.S. Environmental Protection Agency sponsored an effort to examine the criticisms and concerns expressed about Pay-at-the-Pump (PATP) auto insurance and explore the reformulation of PATP, taking into account these concerns. This paper provides a brief exposition of PATP and its main advantages followed by a review of its criticisms and concerns. We outline a reconstituted PATP proposal emerging from the review of these criticisms: a hybrid system that merges the best features from PATP and the existing insurance system. It retains what is consistent with the free market operation and market incentive in the existing system. At the same time it restores the price signal, the sine qua non for economic efficiency, where it has been extinguished in the existing insurance system. The reconstituted proposal capitalizes on the pricing efficiency feature that characterizes PATP, which in turn leads to a reduction in insurance cost, enhanced safety, elimination of resource misallocation, enhanced equity and reduction (possibly elimination) of accident-cost externalities. In addition, it benefits society at large with improved environment, improved balance of payments, enhanced U.S. security, and a redress to the human dimension of the uninsured motorist problem.

Key Words: Pay at the pump; distance-based insurance; efficient pricing of auto insurance; conversion of fixed to variable cost; loss on insuring the uninsured motorist; pay at the pump and the poor; environmental benefit of pay at the pump; vehicle fuel-efficiency and safety; vehicle miles traveled; traffic density; and accident risk.

JEL Classification Numbers: L1, L5, L8, L9, M2, Q2, Q4, R4

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J. Daniel Khazzoom¹

Summary

I. Preliminaries

Background

During the last thirty years or so since Moynihan and Vickrey published their Pay-at-the-Pump (PATP) proposals, much research has been done regarding its efficiency and effectiveness.

In the interim, several states have considered PATP insurance. Yet in spite of all the attributes and the societal benefits researchers have reported for PATP, the insurance industry took the lead in mounting major campaigns against PATP in every state where it was proposed. As a result, PATP failed to be adopted. Maybe PATP is viewed in the wrong way. It may be necessary to curtail basic research on PATP and its attributes and instead, start thinking in terms of what it takes to make PATP palatable to those who will be affected by, and might benefit from, its adoption. The time has come to open doors and explore areas of concern we may not be aware of, or which we may not see in the same light as they are seen by those affected by PATP.

The U.S. EPA sponsored a workshop under the auspices of Resources for the Future to address these issues in the hope that a workshop planned in consultation with and attended by organizations affected by PATP would serve as a good vehicle for focusing our effort on addressing the concerns expressed about PATP and making it more palatable to the public and to the industry.²

In planning the workshop, we make no assumption that an insurance reform of any kind accompanies or must accompany the switch from the present lump-sum payment of premium to a PATP system.

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² The workshop was held at RFF on January 11, 1999.

(However, the reconstituted PATP proposed in this paper can be implemented directly in states that have no-fault insurance, since all no-fault states have a significant element of tort liability.)

We assume PATP's coverage follows the state's mandatory insurance requirement: bodily injury liability only, or bodily injury plus property damage liability. We exclude diesel from PATP's surcharge and assume alternative fuels are subject to the surcharge.

This discussion paper will be circulated first for review and feedback. A revised paper will be sent to each participant in the workshop.

What This Paper Is Not

This paper is not a survey of PATP proposals. It is also not a full (not even a partial) exposition of PATP's advantages as compared to that of the existing system (although it does address extensively PATP's limitations as perceived by PATP's opponents). Its purpose is very limited: (1) to address the criticisms and concerns expressed about PATP and (2) to explore ways to make PATP more responsive to those concerns and criticisms, without impairing its potential contributions.

Some reviewers of this paper felt that preoccupation with the criticisms does injustice to PATP and diverts attention from the enormous contributions it can make. Indeed, there is no question that PATP can make significant contributions, minimally by virtue of the fact that it restores the price signal, the central ingredient in an efficient market. Substantial benefits flow from the use of the price signal. Many of these are discussed in Sugarman's excellent monograph. (Sugarman 1994; Khazzoom 1998). But in spite of our sympathy with these reviewers' comments, we decided against broadening the paper to include an exposition of these benefits. Our fear is that focusing on PATP's benefits might detract attention from the main purpose: to explore what it takes to make PATP more responsive to the concerns expressed by those affected by it without inhibiting its potentially beneficial contributions. We did add, however, a one-page section (section I.4) on the arguments in favor of PATP.

II. Classification of PATP's Criticisms

Criticisms of PATP fall into several categories, some of which overlap. We address extensively two categories of criticisms:

1. Criticisms directed at PATP's design. These criticisms (i.e., PATP restricts the household's choice of insurance company and creates a government bureaucracy) go to the heart of PATP.
2. Criticisms focused on the consequences of adopting PATP, such as possible adverse effects on the poor.

There are other types of criticisms: those that depend on "quantitative" magnitudes but are stated with no evidence on their quantitative importance; those based on fictitious "findings" of experiences with PATP's operation; and those lacking substance. These are reported in greater detail in Appendix A.

This paper considers first the criticisms that fall into category 1, and then makes some proposals as to how PATP might be reconstituted to deal with those criticisms. There is nothing immutable about these proposals; they should be viewed as starting points in a brainstorming process. Following that,

the discussion turns to the criticisms that fall into category 2. We address the issues these raise and attempt to put them in a context that hopefully lends itself to a thoughtful discussion.

III. Criticisms Directed at PATP's Design

The following criticisms fall into this category.

- Choice: PATP restricts the household's choice of insurer.
- State Bureaucracy: PATP creates state bureaucracies. State encroachment may also result in state takeover.
- Territory: PATP disregards the impact of territorial differences on risk and insurance cost.
- Driver: PATP imposes a statewide uniform rate that ignores risk differences among individual drivers.
- Vehicle: Under PATP motorists face a diminished incentive for buying safe vehicles and vehicles that are less damageable or less costly to repair.
- Insurers' Income: Insurers' income would suffer or might be subject to uncertainty.
- Actuarial Data: PATP ignores actuarial data compiled over decades and replaces the principle of prices based on costs by a flat fuel surcharge.
- Vehicle Miles Traveled; Traffic Density: PATP is based on the false premise that VMT is a determinant of accident cost and insurance premium. It is traffic density rather than miles traveled that determines accident costs and insurance premiums.
- Rural Drivers: Rural drivers pay disproportionately more to eliminate the problem of uninsured motorists than they would to ignore it.
- Long Distance Motorists: PATP penalizes long distance motorists.
- Cost- Shifting: Much of the cost-savings claimed for PATP results from shifting the cost of treating auto injuries from auto insurance to health insurance.
- Insurance Agents: Insurance agents will lose their jobs. (This criticism was never mentioned publicly).
- Geographical Issues: PATP poses geographical problems of border crossing, bootlegging, out-of-state driving, and out-of-state drivers.

Choice; State Bureaucracy; Territory; Driver; Vehicle; Insurers' income; Actuarial Data

What emerges from evaluating the above criticisms is a proposal for a hybrid system that retains what is consistent with free market operations and market incentives in the existing system while restoring the price signal. In that sense, the emerging hybrid system merges the best features from PATP and the existing system.

The proposed system avoids unnecessary changes in the existing system. At the same time, it contains the pricing-efficiency feature that characterizes PATP, which leads to a reduction in

insurance cost (due to the reduction in exposure risk and in the number of uninsured motorists); enhanced safety; elimination of resource misallocation; enhanced equity (which results from the elimination of the existing cross subsidies); environmental benefits; reduction (possibly elimination) of accident-cost externalities; and benefits to society at large, such as improved balance of payments, enhanced U.S. security, and last but not least, a redress to the forgotten human dimension of the uninsured motorist problem (i.e., the social ill which mandatory insurance initiates but which is enlarged and aggravated by the current method of pricing the insurance services).

We propose that motorists continue to choose their insurers the same way they do today, directly or through an agent. Similarly, insurance companies will continue to bill motorists directly for insurance as they do today, except that the premium will exclude an amount equal to the base rate times the territory relativity calculated for a good driver.³ This amount, which varies by territory (see below), is collected at the pump and is intended to cover the BI/PD mandatory coverage for a good driver. Thus, assuming a rate base of \$200 and a territory relativity of 1.2, an amount equal to \$240 ($\200×1.2) will be excluded from direct billing and collected at the pump.

In California, for example, the amount collected at the pump would represent 36% to 37% of the total premium revenue of California's insurance companies in the years 1993– and 1995. For 1993 and 1994, respectively, this translates to a surcharge with an upper bound of 52.1¢ and 52.6¢ per gallon and a lower bound of 46.9¢ and 47.4¢ per gallon.

In the proposal, the insurance companies' billing includes extra charges to drivers not considered 'good,' determined in the same way they are determined today (see below). Similarly, it includes supplemental charges (as it does to-day) for medical, extra BI/PD liability and collision/comprehensive. In short, all charges included in the insurance companies' billing will be calculated in the same way, as they are calculated today. The revenue collected at the pump is channeled to the insurance companies in proportion to the number of motorists choosing those companies. Drivers who fail to sign up are assigned to companies in proportion to the companies' market share.

We also propose that the insurance industry elects from within its own ranks a board that manages and polices itself, in the same manner as the securities industry. Otherwise, all existing state safeguards for monitoring and auditing individual companies would remain in place. Under this "reconstituted" PATP, state insurance commissions would continue to do their regulatory and monitoring work in the same manner as they do it today.

In addition, the PATP should be modified to give recognition to the importance of territorial differences by allowing the fuel surcharge to vary among reasonably large regions. Clearly, states

³ In California, for example, this corresponds to drivers with zero violations over the past three most recent years. These "good" drivers account for 82% of the drivers in California. Drivers with one or no violations over the past three years account for 92% of the drivers in California (California Department of Insurance (CDI) 1994). Many insurance companies do not charge higher premiums for drivers with one violation than they do for drivers with no violation.

where territory is not a powerful factor do not need to adopt this modification should they opt for PATP.

The idea of setting different regional fuel taxes (or different county fuel taxes) is not new. Several counties in the United States and Canada levy their own fuel tax. Experience suggests that when a fuel surcharge is introduced, some border crossing to adjacent counties with lower gas taxes takes place among people living close to the county border. But the numbers are not massive. Moreover, they tail off as time goes by.

The experience with gas price differentials among counties (where the differentials are not due to fuel tax) is similar. Also, differences of 10¢, 15¢, or 20¢ in the posted gasoline price in gas stations located in the same street are not uncommon. Yet these price differentials do not seem to cause a stampede away from the higher-priced gas stations.

The modification we propose is that the fuel surcharge be calculated so that it reflects the territory factor only (base rate times territory relativity) for a reasonably large region to minimize the border crossing effect, and so that it covers the mandatory premium for BI/PD for good drivers. A region is a grouping of contiguous counties that have similar loss characteristics. California's Department of Insurance (CDI) did such a grouping.

CDI's work shows that the transition from one region to an adjacent one tends to be gradual, even though the range (the difference between the highest and the lowest regions) might be large. The same probably holds for the grouping we propose. In the case of California, for example, where the statewide average surcharge is approximately 50¢, the range could conceivably reach 50¢ or more. But as CDI's work indicates, regions that have the highest and lowest surcharge (and in general, regions with wide surcharge differentials) are not likely to be adjacent. In our case, this means a region with a 55¢ territory surcharge may be adjacent to one with, say, 35¢, 45¢, or 75¢, but probably not a 10¢ or 15¢ surcharge.⁴

One additional mitigating factor is the fact that when demand is price elastic, as it is at the region's border, the price increase will be much smaller than the magnitude of PATP's surcharge (see Figure III.3.1). This means the price differential across adjacent regions will be smaller than what the surcharge differential in these regions would suggest.

Payments for drivers' characteristics and vehicle characteristics, if any, will continue to be made in the same way as they are made today. Motorists receive a bill for the premium from the insurance

⁴ Lyn Hunstad of CDI calculated the surcharge for a three-region grouping. His results showed a range of 22¢, which also coincides with the maximum difference between two adjacent regions. Grouping by counties (which yields 58 regions) resulted in a range of 47¢. Even with this fine grouping the highest surcharge differential between any two adjacent counties turned out to be 35¢, between Los Angeles and Kern counties. (As it happened, the two counties are separated by a wide strip of uninhabited land). For an eight to ten region grouping one would expect the highest surcharge differential between any two adjacent regions to be larger than 22¢ but smaller than 35¢ (Khazzoom 1999b, Appendix B).

company they choose, which includes, among other things, the extra charges for driver and vehicle characteristics.

Additionally, insurance companies continue to give weight to factors that affect the risk of loss such as driver training, possession of multiple cars, and type of use.

This arrangement capitalizes on the existing know-how and administrative system developed by the insurance industry. It also preserves the mechanism that allows insurance companies to customize PATP according to the profiles of their customers and structure their plans to draw the customer base they want.

There will probably be fewer premium notices to send out to motorists under this system than under the current system, since the vast majority of drivers are good drivers. A good driver who chooses not to buy supplemental coverage and who does not have to pay charges for unsafe car characteristics will not receive a bill from the insurance company.⁵ The motorist will pay only at the pump.

On the other hand, the system will pick up some additional motorists that are currently uninsured, who will be drawn into the system due to the implementation of PATP.

The possibility exists that some of those who are uninsured under the existing system may choose not to pay the additional premium (to their insurer) to cover the extra charges for unsafe drivers or car characteristics. We refer to this group as “semi-uninsured” motorists, in the sense that, like the rest of the motorists, they do pay for their BI/PD at the pump but choose not to make the additional required payment to their insurance company. One way of dealing with this group is to stipulate that those who fail to pay their insurers the amount due will face some version of “no-pay no-play”. For example, they can be subject to a deductible five or ten times the payment they owe their insurer, whenever they are entitled to a recovery for BI or PD inflicted on them by an at-fault motorist.

One additional feature we propose, which relates to vehicle characteristics, is to tag on to the proposed system the measures proposed by Sugarman to deal with the problem of market failure in vehicle crash-worthiness, since the existing liability system does not encourage sufficiently the purchase and production of safer vehicles.

We also propose that the reconstituted PATP incorporate provisions that insure the surcharge collected at the pump is transferred in a timely manner to the insurer, in order to avoid the loss of investment revenue. In fact, with the help of computerized procedures, there is no reason why the revenue cannot be transferred electronically to the accounts of the insurers even within the same day it is collected.

We also propose that provisions be incorporated in the plan to allow for the automatic upward as well as downward adjustment of the surcharge as fleet fuel efficiency goes up or down.

Vehicle Miles Traveled; Traffic Density

⁵ In some states such as California, the driver will still have to receive a statement from the insurance company that confirms coverage. (This requirement may act as a check on the number of those who might otherwise opt for becoming semi-uninsured.)

Vehicle Miles Traveled (VMT). The industry's argument that VMT does not affect accident frequency and cost is counterintuitive and is not empirically based. Insurance companies have poor information on the mileage of the vehicles they insure. Data compiled by the Auto Club of Southern California, based on actual mileage driven by its insured motorists indicate a significant positive relationship between miles driven and accidents. This is shown in Figure 1 below. This estimated relationship, however, needs further work primarily because it does not allow for the other factors that determine the accident rate, except for driving record.

Traffic Density

PATP's critics are correct in pointing out that traffic density is an important determinant of accident frequency and insurance cost. Traditionally insurance companies have included the effect of traffic density on cost in their territory charges. Under our reconstituted PATP (which allows for territory charge), insurers are free to continue this practice.

We note in passing that the fact that traffic density is an important determinant of accident frequency and cost is evidence in and of itself that VMT is an important determinant of accident frequency and cost. This is so because traffic density is simply the ratio of VMT (in 100,000 miles) to road capacity (measured in lane miles). In fact, a study by Lawrence Berkeley Laboratory (1995) found that when traffic density is decomposed into two separate variables, VMT and lane miles, and a parameter is estimated separately for each one of the two variables (in an equation in which the dependent variable is the level of insurance premium), the two estimated parameters turn out to be of the same magnitude. The Lawrence Berkeley Laboratory study used the same data used by the American Petroleum Institute (API) in 1994 to estimate the impact of traffic density on insurance cost and premium.

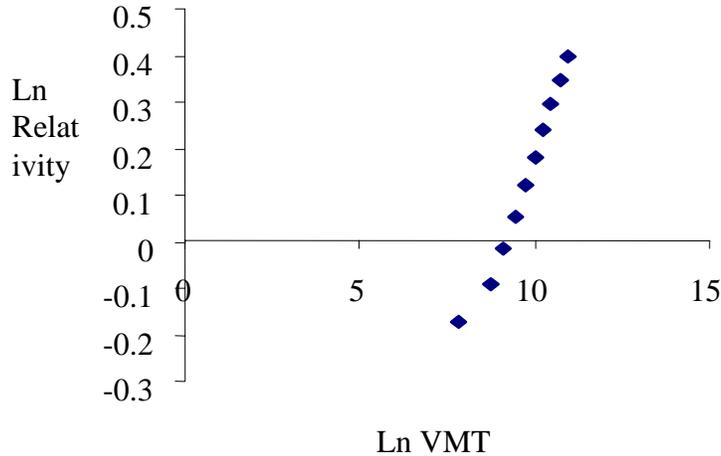
Rural Drivers; Long Distance Drivers

Some critics note that uninsured motorist premiums are higher in urban than in rural areas. They conclude under PATP that rural drivers will bear a disproportionate share of the burden of eliminating the uninsured motorists problem.

The criticism is not valid. The extra payment by rural motorists is not enough to solve the uninsured motorist problem. No one has proposed nor designed a PATP that incorporates a charge to pay for eliminating this problem. Under PATP, those who pay for this elimination are the uninsured motorists themselves.

Rural drivers will see smaller savings from the elimination of the uninsured motorist coverage than their urban counterparts will. But that is because rural drivers pay less to protect themselves against uninsured motorists than their urban counterparts do to begin with.

Figure 1. Logarithmic Scatter Diagram of Relativity vs. VMT



Source: Auto Club of S. California, 1/1/98

Note also that when PATP's surcharge is allowed to vary with the region, as it is with the reconstituted PATP we propose, the extra payment by the high-mileage driver, rural or otherwise, is not a payment to solve the uninsured motorist problem or any other problem. It is a payment to compensate the insurance companies for the extra risk of accidents that comes with higher VMT. This is how it should be. On the other hand rural motorists pay less, perhaps a great deal less, than urban drivers for territory charge (because of the lower frequency of accidents, etc.).

In short, rural drivers get a break on what they are entitled for, such as territory, and pay more for what they should pay more for, such as more miles driven.

With regard to long distance travelers, it is true that under PATP they pay more than those who drive fewer miles. Note, however, under a system in which PATP's surcharge takes into account regional differences and the insurance premium includes charges for drivers' and vehicles' characteristics, the extra payment by long distance travelers is a payment for the extra risk of accidents, which comes with higher mileage. (This is separate from the question of whether the marginal cost increases linearly or nonlinearly.)

Cost-Shifting

Critics argue that much of the cost-savings attained by PATP results from shifting cost to health insurance.

This criticism is only partly valid only for some proposals. It is not even partly valid for the rest. In any case, cost-shifting is absolutely not inherent in or necessary for PATP to produce savings. PATP results in cost-savings minimally because of reduced VMT and exposure risk, elimination of the premium for uninsured motorist coverage, and substantial elimination of resource misallocation. A reasonably designed PATP plan need not engage in any cost- shifting. On the contrary, we want the

cost to the motorist to reflect the true (social) cost in order to eliminate the externalities associated with accident cost under the existing system (e.g., Vickrey 1969).

The reconstituted PATP proposed in this paper is not subject to this criticism. The plan is not involved in any cost-shifting to health insurance or any other source.

Insurance Agents

Under the reconstituted PATP we propose, there will probably be some overall reduction in the total number of agents needed. However, because choice is maintained, some motorists may still want to use the agents' services in selecting carriers and learning about the finer points of coverage. The option to buy excess liability, collision, comprehensive, medical, and umbrella coverages provide an additional opportunity for agents to earn a livelihood.

Under the reconstituted PATP, agents will also remain as a medium through which insurance companies entice good drivers. Additionally, under PATP there will be an additional demand for agents' services as uninsured motorists join the insurance system.

Geographical Issues

Border crossing induced by price differentials across regions cannot be dismissed. Experience suggests, however, that its magnitude is not likely to be large (see the discussion on page 5).

Gasoline might be bootlegged into a state that adopts PATP from another state without the surcharge. However, it is unlikely that this would happen on a large scale. Gasoline is a bulky item, not easily hidden in large quantities.

Out-of-state driving can be accommodated in the same way auto insurance policies accommodate motorists today when they drive out of state.

Out-of-state drivers would contribute to PATP. Those covered in their own state would be paying, in a way, twice for auto insurance — which is inequitable. On the other hand, what they pay at the pump would probably involve very small amounts. The equity problem this raises and the adverse effect this may have on tourism in the PATP state should not be exaggerated.

IV. Criticisms Related to the Consequences of Adopting PATP

The following criticisms fall in this category:

- Fuel-Efficient Vehicles: PATP stimulates the demand for new fuel-efficient vehicles. This affects safety adversely.
- Burden on the Poor: PATP places an unfair burden on the poor.
- Loss on Insuring Uninsured Motorists: The loss cost that results from insuring the uninsured motorists as a group will exceed the contribution of that group to revenue and drives up the premium for those who are currently insured.
- Funds for Transportation Projects: PATP decreases the amount of money available for transportation projects.

Fuel-Efficient Vehicles

This criticism centers on PATP's stimulating effect on the demand for fuel-efficient vehicles. The argument is that in order to make the vehicle more fuel-efficient, the manufacturer has to reduce its weight. Critics argue that:

1. Heavier vehicles are safer than lighter vehicles. The increased sale of fuel-efficient vehicles will affect safety adversely.
2. The acceleration of vehicle replacement induced by PATP's surcharge will add further fuel to the fire and increase fatalities even more.

Both parts of the criticism are not valid. First, evidence does not support the hypothesis that the increase in vehicle fuel-efficiency affects safety adversely. It may in fact enhance it. This is so because:

- Recent evidence, which is based on studies that are better designed than the earlier ones, does not support the theory that reducing car weight is a detriment to safety. Much of the benefit attributed to weight derives from confusing weight with size. (Weight is also a hostile characteristic for the occupants of the other vehicle in the case of a collision. Size is not.)
- Even when increased fuel efficiency involves downweighting, it need not be accompanied by downsizing. Vehicles can be built with lighter material, so that they are both lighter and larger, which makes them both more fuel-efficient and safer.
- Enhanced fuel efficiency can be achieved also by a means that involve neither downweighting nor downsizing, simply by reducing car performance. High performance vehicles are gas-guzzlers. They are also deadly. Reducing car performance improves fuel efficiency and has the potential side effect of reducing fatalities.

With regard to the second part of the criticism, we note that new cars do not come only with higher fuel efficiency. They come with a bundle of attributes that affect safety, of which enhanced fuel efficiency is only one. Some of these new-car attributes include safety features not possessed by the vehicles they replace. These attributes cannot be unbundled. They come together, and together they shape the overall safety of the vehicle.

When we take into account the combined effect of all attributes that influence safety, we find that, even if we assume along with the critics that fuel efficiency affects safety adversely, the results are the opposite of what critics would lead one to expect. Simulation results also suggest that the faster the accelerated vehicle replacement proceeds, the safer the resulting fleet is.

Burden on the Poor

PATP is criticized on the grounds that converting the insurance premium from a lump-sum payment to payments per gallon does nothing to make insurance more affordable. A variant of this criticism makes the point that poor households generally drive older cars that are gas-guzzlers. Consequently, PATP would hit the lower-income households much harder than it would hit the wealthier households.

However, critics offer no empirical evidence to support those claims. The claim that converting the insurance from a lump sum payment to a payment per gallon of gasoline would do nothing to make insurance more affordable for low wealth households is untenable. It is also not supported by the available studies. In fact, it is more likely that low-wealth households will not suffer as big a financial sacrifice under PATP as they do under the current regime, in which the *premium is decoupled from the intensity of car use*. Let me explain.

We all face prices that we take as given. However, we normally control how many units we buy, and what we spend on any item is governed by our ability to pay. The low-wealth household may want to regulate the amount of driving it does by limiting its car use only to the essential — for example, driving to work only — in the same way we regulate the amount of food we buy to make our food expenses fit our budget. But under the current regime the household is not allowed that choice. It is not allowed to buy in accordance to what it can afford to pay for. It either pays for the full insurance, regardless of whether or not it needs it all, or else goes uninsured. Nothing in between. It is as if you either find the money to buy all the food in the grocery store or go without food.

The sacrifice this imposes on the low-wealth motorist is thus made unnecessarily onerous by the inflexibility of the current method used in pricing the insurance service. This puts the insurance payment beyond the reach of an unnecessarily larger segment of the population and results in a greater number of uninsured motorists than would have been the case otherwise.

Under PATP, low wealth individuals need not scramble to find the \$1000 or more to be insured, but can tailor their insurance outlay to their ability to pay. It is no longer an either-or proposition — either you pay the full \$1000 or more in premium or else you do without insurance. The poor can pay for their insurance in increments at the pump. They can choose how much driving to do, and will thus have a say in how much to pay for auto insurance.

This is not to say that low-wealth individuals will no longer have a difficult choice to make between paying for the insurance and driving or paying for other necessities. They do. But the choice is not as stark, as black and white as before. There is now a range of car-use intensity from which to choose.

It is of more than passing interest to note that several low-income groups in California are among PATP's strongest supporters. Additionally, in a survey, 799 low- and moderate-income Californians were asked their opinion on PATP as an alternative to the present insurance system. The results showed 89% of those surveyed favored PATP, 8% opposed it, and 3% had no opinion. See the text for details.

From society's point of view, not the least important consideration is PATP's contribution to the human aspect of the uninsured motorist problem, which has been overlooked in the criticisms of PATP's effect on the poor. PATP corrects a social ill that mandatory insurance initiates, but which is unduly enlarged and aggravated by the rigidity of the current method of pricing the insurance service.

Inner cities, where most uninsured motorists reside, have the highest insurance rates. But, at the risk of being repetitive, what makes those rates particularly unbearable is the fact that auto insurance cannot be broken up into affordable increments, and that as a result the motorist's required payment for insurance is totally unrelated to her ability to pay. With the threshold set higher than what many can reach, a larger segment of the population than otherwise would have been the case ends up breaking the law by driving uninsured vehicles. As a result of PATP, a segment of the population

(primarily low-income households) will no longer have to live under the stigma of being characterized as scofflaws. The special significance of this societal and in a very real sense human dimension of the problem does not seem to have been appreciated, as evidenced by the often repeated pronouncements that the uninsured motorist problem has been solved by the availability of the uninsured motorist coverage.

Finally there is a claim that because poor people drive gas-guzzlers while the wealthy people drive highly fuel-efficient vehicles, the poor will suffer proportionately more than the well-to-do. This claim lacks empirical support. In 1993 (the latest year for which we have the necessary survey data), average vehicle fuel efficiency for households with \$15,000 or less income was 19.8 miles per gallon, practically the same as the 20.1 miles per gallon for households with family income in excess of \$50,000.

It is also of more than passing interest to note that lower-income households drove 49% less on the average than their well-to-do counterparts: 14,109 miles as opposed to 27,740 miles. Under the existing regime, low-mileage motorists subsidize the higher-mileage motorists. Given that lower-income individuals drive half as much as higher-income individuals, the existence of this cross subsidy amounts to a subsidy by the low-income household to the high-income households. PATP does away with this cross-subsidy. Rather than penalizing low-income households disproportionately, as claimed by critics, PATP actually enhances their welfare by freeing them from this inequitable burden of subsidizing the well-to-do.

Loss on Insuring the Uninsured Motorist

Some insurance companies project that they will incur losses if they provide coverage to uninsured motorists, and that this will drive up the premium for those currently insured. How likely is this to happen? If insurance companies do incur losses on insuring uninsured motorists, part of the savings achieved from eliminating the need for uninsured motorist coverage would be eroded. And if the losses are high enough, then all the savings would be wiped out. Two questions that logically precede these concerns are: What level of loss will actually offset all the savings on uninsured motorist premiums? And how does this level compare with the loss ratio insurance companies project will result from insuring uninsured motorists?

Our results show that the savings achieved from eliminating the uninsured motorist premium will be large enough to more than offset the effect of the highest loss ratio predicted by insurance companies. Our results are based on the restrictive assumption that no savings are achieved by PATP from any source other than the elimination of premiums for uninsured motorist coverage. They are also based on the austere assumption that PATP consists of a flat surcharge at the pump that ignores all risk differentials. Of course, both of these assumptions are unreasonably restrictive. (And in any case, under the reconstituted PATP we propose, insurance companies can charge higher premiums for higher risks.) But even under these unreasonably restrictive assumptions, our results show that neither the problem of loss cost exceeding the revenue from insuring the uninsured motorists nor, by implication, the problem that insuring the uninsured motorists will drive up the average insurance premium for those who are presently insured — neither one of these problems actually arises.

Funds for Transportation Projects

By reducing miles traveled and by encouraging motorists to switch to more fuel-efficient vehicles, PATP reduces gasoline consumption. This is feature of PATP contributes to a cleaner environment and reduces global warming. However, by reducing gasoline consumption, PATP also reduces the revenue available from excise and sales tax. This in turn reduces the funds available for road maintenance and for the design and construction of new and better highways, particularly interstate highways, which tend to be safer but more expensive to build than other types of highways.

The revenue-reduction effect will probably be mitigated by the impact of two factors: (1) The reduction in travel density increases the life expectancy of the highway infrastructure and reduces the required maintenance and repair work; (2) Available estimates suggest that to the extent that PATP's surcharge itself is subject to sales and excise tax, the tax revenue from the sale of gasoline may actually increase. I suspect, however, that the increase in gasoline price due to PATP's surcharge may decrease the public's willingness to accept a tax on the surcharge itself. If that happens, there probably will be a reduction in gasoline tax revenue (albeit the reduction will be smaller than the available estimates would suggest), and some adverse effect on transportation projects will probably result.

Pay-at-the-Pump (PATP) Auto Insurance: Criticisms and Proposed Modifications

J. Daniel Khazzoom

I. Brief Historical Background

Pay-at-the-Pump (PATP) is a proposal to replace the current insurance system of lump-sum payment for automobile insurance by a mechanism whereby motorists pay for their insurance as they buy fuel for their vehicles. This usually takes the form of a surcharge on fuel price. The typical surcharges proposed have been in the range of 30 to 50 cents per gallon. The surcharge depends on the coverage (whether it is bodily injury (BI) liability only or BI plus property damage (BI/PD) liability, for example) and the dollar value of the coverage.

There are several PATP proposals. They vary in design, scope, coverage, and other details.¹ But they all have in common the same basic idea: replacing most or all of the fixed auto insurance cost by a variable cost, a surcharge on fuel price.

The idea of PATP insurance has been around for some time. The first published reference to the subject appears to have been in an address given in 1925 by Henry Swift Ives before the Safety Committee of the Cincinnati Automobile Club. It is remarkable that the idea of converting the fixed auto insurance cost into a variable cost was promoted at such an early date and that people actually began to question the justification for charging for auto insurance on a lump-sum basis even as far back as 1925. Ives, who was Vice President of Casualty Information Clearing House, questioned the logic of requiring the motorist to pay for insurance in a lump sum, adding "why bother with insurance policies, certificates and all that sort of things." He proposed to double the two cents gasoline tax levied at the time to "make the collection system as simple, easy and painless as possible" and use the proceeds to finance auto insurance (Ives 1925).

Four years later, Mayor Lawrence F. Quigley of Chelsea, Massachusetts presented a bill to the Massachusetts legislature to establish a state fund to provide compensation for motor vehicle accidents. He proposed that the fund be financed by a three-cent surcharge on the price of gasoline (Quigley 1929).

¹ See, for example, Karcher (1986); Rothkrug (1990); Sugarman (1994, 1990); Tobias (1993); El Gasseir (1990). All, except for El Gasseir include a no-fault provision. El Gasseir retains the tort system as is. For a review of selected PATP proposals see Allen, Hwang, and Kelley (1994); Gruenspecht et al. (1994); Lawrence Berkeley Laboratory (1995).

It is not clear if the idea of PATP insurance was proposed at any other time in the four decades or so following the introduction of Quigley's bill. But in an August 1967 article published in the New York Times magazine, Senator Daniel Patrick Moynihan revived the idea. He proposed a PATP system as part of a scheme for overhauling the auto insurance system in the United States. To finance the new system, Moynihan proposed using profits from the highway-user tax (which was voted by Congress to finance the Interstate system) to invest in the new Federal insurance system.

A proposal for a privately run PATP system was made by the late William Vickrey of Columbia University's Economics Department almost at the same time Moynihan published his New York Times article. Vickrey pointed out that the cost of accidents is only partially borne by motorists, and that much of it (\$1 billion to \$3 billion according to Vickrey's estimate) is borne by the victims or other segments of the community. He proposed a surcharge on gasoline prices as a way of internalizing the costs of accidents that are not borne by motorists (Vickrey 1969).

During the last thirty years or so since Moynihan and Vickrey published their proposal, much research has been done on PATP, and much has been written about its attributes. During the same period, several states considered PATP insurance. In spite of the attributes and the societal benefits researchers have reported for it, the insurance industry took the lead in mounting major campaigns against PATP in every state where it was proposed. As a result, PATP failed to be adopted. There was a feeling among some researchers (including the author), that the time has come to stop piling up the stock of basic research on PATP and its attributes and start thinking in terms of what it takes to make PATP more responsive to the concerns expressed about it. In January 1998, the U.S. Environmental Protection Agency (EPA) sponsored an effort with two goals: (1) To examine and evaluate the criticisms and concerns expressed about PATP; (2) To explore ways of reworking, modifying, or redesigning PATP in order to make it more responsive to those concerns, but without destroying its ability to make beneficial contributions.

This paper reports on this effort. But to put the presentation in proper perspective, we provide in the next section a summary of PATP's attributes. Then we categorize the criticisms and concerns expressed about PATP. The next section focuses on concerns connected with PATP's design, and the following focuses on concerns connected with the consequences of adopting PATP. In the final section we conclude with the broad outline for the reconstituted PATP that emerges from analyzing all of these criticisms.

II. PATP's Attributes

Although different researchers emphasize different benefits as motivations for adopting PATP, the most basic of all arguments in favor of PATP is economic efficiency. Almost all other PATP benefits are byproducts of achieving economic efficiency. Below are the most common benefits advocates associate with PATP.

Economic Efficiency. In a market economy, consumers communicate with producers through the price signal. Freedom of the price mechanism to transmit the signal is the sine qua non for an efficient market outcome. Anything that impairs that freedom impairs the ability of the market to produce optimal results.

The present method of paying for automobile insurance is an inefficient way of pricing insurance services because it freezes the price signal. Under the current regime, the expense for auto insurance is of a fixed-cost nature. This severs the relationship between vehicle use, a main source of exposure risk, and insurance payments. The result is higher mileage, resource misallocation, and associated ills, including higher insurance cost.² PATP changes all that by converting the premium from a fixed to a variable cost and by restoring to life the price signal, which is essential for the efficient operation of the market.

Cost-Savings. The insurance costs would decrease due to the reduction in vehicle miles traveled (VMT) and the concomitant reduction in exposure risk.

Coverage. PATP draws into the payment system motorists who, for one reason or another, choose not to purchase auto insurance. This results in additional savings on insurance premium since under PATP it becomes unnecessary to insure against uninsured motorists.

Equity. With the use of the price signal under PATP, the existing cross-subsidies are substantially eliminated. The result is a more equitable system.

Safety. PATP contributes to safety by reducing travel and risk exposure (which is reflected in reduced insurance costs) and by reducing the demand for high performance automobiles (which are not only gas-guzzlers but deadly, as well).

Environmental Benefits. Reduced gasoline consumption prompted by reduced travel and enhanced fuel efficiency (both a result of higher gasoline prices) help improve air quality and combat global warming.

Incorporation of Transportation Externalities. PATP can reduce (and possibly eliminate) transportation externalities that occur in the form of accidents by incorporating those externalities in the surcharge. At present, the cost of accidents is only partially borne by motorists. Much of it is borne by the victims or by other segments of the community.

Benefits for the Balance of Payments and U.S. Security. PATP contributes to a reduction in oil imports and improves the balance of trade. It also reduces U.S. vulnerability to cutoffs in oil imports.

Redress to the Human Aspect of the Uninsured Motorist Problem. If PATP is implemented, a segment of the population (primarily low-income households) will no longer have to live under the stigma of being characterized as scofflaws. The special significance of this human dimension of the problem seems to have been overlooked.

III. Addressing PATP's Criticisms

The concerns and criticisms expressed about PATP fall into several categories. We address two categories:

² Appendix A provides a diagrammatic illustration of this result for the simple one-insured motorist case.

1. Criticisms directed at PATP's design. Examples are: restriction on the household's choice of insurance companies, creation of a government bureaucracy, etc.
2. Criticisms focused on the consequences of adopting PATP. Examples are: adverse affects on the poor and increased insurance costs due to insuring uninsured, etc.

There are other categories of criticisms, including those whose significance depends on their “quantitative” magnitudes, but which are stated with no evidence on their quantitative importance; criticism based on fictitious “findings” about the experience with PATP’s operation;³ ; and so on. We do not address these here. For more details, see Khazzoom (1999a), Appendices A and B.

In the following we consider the criticisms that fall into category 1, and makes some suggestions as to how PATP might be reconstituted to deal with those criticisms.⁴ Following that, we turn to those criticisms that fall into category 2 and address the issues these raise.

What emerges from analyzing PATP’s criticisms is a proposal for a hybrid system, which enhances the market operation by merging the best features from PATP and those from the existing system. The reconstituted proposal avoids unnecessary changes in the existing system. It retains what is consistent with market incentives and free market operations in the existing system, but restores the price signal where it has been extinguished in the existing insurance system.

Under the reconstituted proposal, motorists will continue to choose their insurers the same way they do in the existing system, directly or through an agent. Similarly, insurance companies will continue to bill motorists directly for insurance, except that the premium would exclude an allowance for the region’s territory factor calculated for good drivers. This amount (which varies by territory — see below) is collected at the pump from all drivers.

³ In their eagerness to discredit PATP, some insurance companies report “findings” by scholars about failed experiences with PATP’s operation, when in fact no such findings ever existed. For example, in his February 24, 1994 testimony before the Hawaii House Committee on Finance, State Farm's representative, Rick Tsujimura testified: “Paying at the Pump has been evaluated in both British Columbia and Ontario, Canada. The most telling statement on this topic is the conclusion of Herbert G. Grubel, Professor of Economics, Simon Fraser University, British Columbia. Professor Grubel's findings were that the empirical evidence clearly showed that after 12 years of operation the 'Pay at the Pump' automobile owners paid on average 2 percent more for their insurance than privately insured Canadians. He also found that the average compensation to the 'Pay at the Pump' staff was 43% above the private firms” (Tsujimura 1994). Actually Grubel never reported any findings about PATP. There was never a PATP in operation in British Columbia, much less one “12 years of operation.” The “findings” about PATP were manufactured. Tsujimura’s testimony gave no reference to the Grubel work he quoted.

⁴ We make no assumption that no-fault insurance reform accompanies or must accompany the switch from the present lump-sum payment of premium to a PATP system. However, the reconstituted PATP we propose can be implemented directly in states that have no-fault insurance, since all no-fault states have a significant element of tort liability. We also assume PATP's coverage follows the state's mandatory insurance requirement, bodily injury liability (BI) only or bodily injury plus property damage liability (BI/PD). We exclude diesel fuel from the surcharge and assume alternative fuels are subject to the surcharge.

A. Criticisms Directed at PATP's Design

Choice

PATP is criticized on the grounds that it restricts the household's choice of insurer.

This criticism is valid in regards to one plan only, as described by Tobias (1994). But in general, anything that can be accomplished by a plan that restricts choice, like Tobias's, can be accomplished by a plan that preserves freedom of choice. Sugarman's plan, which did away with restrictions on the motorist's choice, demonstrates just that (Sugarman 1994).

We propose that motorists continue to choose their insurers in the same way they do in the existing system, directly or through an agent. The revenues collected at the pump get channeled to the insurance companies proportionately to the number of motorists choosing those companies. If 30 % of the motorists choose State Farm, 30% of the revenue goes to State Farm.⁵ And so on. This will obviate the need, criticized by some, to have a state agency develop and administer a bidding program for the awarding of claim service contracts, as required under Tobias's plan (Tobias 1994). It should also eliminate the concern that the impact of bidding for large blocks of drivers would weaken competition and increase concentration in the insurance industry (National Association of Independent Insurers 1993).

State Bureaucracy

PATP is criticized on the grounds that it creates state bureaucracies, and that state encroachment may also result in state takeover.

As in the case of restrictions on the motorist's freedom of choice, there is really nothing essential or indispensable about having the plan managed or overseen by a government agency. A board made up of members of the insurance industry could achieve anything that a government agency could achieve. Why not have the insurance industry elect from within its own ranks a board that manages whatever needs to be managed, in the same manner as a stock exchange or, in general, the securities industry manages and polices itself.⁶

Some may say that a government agency is needed to monitor the collection and distribution of the funds and protect against fraud. But what is it about PATP that makes it one only a government agency can deal with? Under the existing system, motorists pay premiums to insurance companies or agents. No one seems to think it necessary to place a government agency between the paying public and the insurance companies. If the argument is that under PATP, money intended for individual companies might not reach those companies, one can counter by pointing out that this is a matter of equal concern to the insurance companies. In the final analysis it is their money that is at stake. One

⁵ Drivers who fail to sign up will be assigned to companies in proportion to the companies' market share.

⁶ One reviewer, Terry Mobilio, suggested that it might actually be even more cost-effective to capitalize on the existing structure of the State's Assigned Risk Plan for administering PATP. He argued that the implementation of PATP might actually reduce the policy counts of the assigned risk plan and free up capacity for expansion of the Plan's functions to include those of PATP.

would think that the insurance companies would be no less motivated to devise the necessary safeguards to protect against fraud and ensure fairness for their membership than any government agency set up for that purpose.

As it is, the work of transferring the funds collected at the pump and channeling them to the individual insurance companies can be done electronically anyway, once the percent motorists choosing each company has been calculated.

Otherwise, all existing state safeguards for monitoring and auditing individual companies remain in place. Under the "reconstituted" PATP we propose, state insurance commissions would continue to do their regulatory and monitoring work in the same manner as in the existing system.

Territory

PATP is criticized on the grounds that it ignores the territory-rating factor, in which insurers take into account allowances for the impact of traffic density and other locational differences on insurance cost.

For some states, the omission of the territory is not consequential. This happens when the territorial differences in those states are not powerful, due to homogeneity within the state, or when state legislation restricts the extent to which territory may be used in setting premiums (e.g., API 1994; Woll 1991).

Although territorial differences exist among urban areas, most of the territory-related criticisms center on urban/rural contrasts. Within this domain, there are variations in the specifics emphasized. For more details, see Khazzoom (1999a).

Woll's study of auto insurance rates in California finds that territory ranks high among the factors affecting insurance cost. But he also finds that the variance in territorial loss cost is not so much affected by the difference in accident rates between territories as much as by a tendency to file bodily injury claims (Woll 1991). Mooney reported similar results (Insurance Information Institute 1992).

Coalitions of minority, low wealth, and other consumer groups have consistently opposed territorial rating on the grounds that it is discriminatory (e.g., Attorneys for Minority/Low-income/Consumer Coalition 1992).

We are not aware of any PATP proposal that incorporates a provision for territorial differences as an integral part of the proposal. However, Sugarman's proposal, which is the most comprehensive of the PATP plans, leaves the door open for incorporating in the driver's license fee an allowance to account for the driver's place of residence, if such a charge were deemed desirable (Sugarman 1994). The Union of Concerned Scientists (UCS) broach the idea that PATP's surcharge may be allowed to vary in different regions of the state based on the region's risk characteristics (UCS 1994).

The idea of setting different county gasoline taxes or different county sales taxes is not new. Several counties in the United States set their own sales tax level. Similarly, several counties in the United

States and Canada levy their own county gasoline tax.⁷ Staff members of some county governments explain that at the time when the county fuel tax was introduced, there was some indication of border crossing to adjacent counties with lower gas tax by people living close to the county line. But the numbers appeared to be small, and they appeared to have tailed off as time went by.

Experiences with gas price differentials that are not induced by fuel tax differentials have been similar. Differences of twenty cents or more in the posted gas price in gas stations located on the same street are not uncommon. On University Avenue in Berkeley, California, for example, two adjoining gas stations, ARCO and Union, currently have a twenty-five cent differential in the posted price for unleaded gas. Further down the same street, several stations located within less than two-tenths of a mile from each other have posted prices for unleaded gas that differ by as much as thirty cents. Yet these price differentials do not seem to cause a stampede away from the higher-priced gas stations to the lower priced ones.

Given this experience with regional gas price differentials, it seems that modifying PATP by allowing the fuel surcharge to vary among reasonably large regions provides an attractive solution for the territory problem. Clearly, states where territory is not a powerful factor do not need to adopt this modification should they opt for PATP.

The modification we propose is that the surcharge be calculated so that it reflects an allowance for the region's territory, calculated for good drivers.⁸

The first task in deriving the surcharge is to group contiguous counties that have similar loss characteristics into regions. Such a grouping was done, for example, by CDI. The result of CDI's grouping shows that the transition from one group to an adjacent group tends to be gradual (CDI 1994).⁹

We stop here to address one question. One may agree that a differential of 25¢ among counties (or among stations on the same street of a given county) may not induce much border crossing. But what if the differential is 40¢? In the case of California, for example, where the statewide average

⁷ For example, Cook County in Illinois has a 6¢ gasoline tax, which has been in effect since 1989 (Cook County Board of Commissioners 1989). DuPage, Kane, and McHenry Counties in Illinois have had 2¢ to 4¢ fuel taxes since 1991 (Chicago Area Transport Study 1997). California's Revenue and Taxation Code, Section 9501 authorizes counties to have its own gas tax. Recently the legislature passed Assembly Bill 595, which authorizes the Bay Area Metropolitan Transportation Commission to place on the ballot a proposal to levy a gasoline surcharge of up to 10¢ per gallon in all eight counties that fall within the Metropolitan Area (California Assembly 1997).

British Columbia's Greater Vancouver Regional District Public Transportation levies a surcharge of 8¢ per gallon on gasoline purchased within the District. Apparently, there has been no noticeable border crossing from within the district to take advantage of the lower gas price elsewhere.

⁸ In California, for example, this corresponds to drivers with zero violations during the three most recent years. These "good" drivers account for 82% of the drivers in California. Drivers with one or no violation during the three most recent years account for 92% of the drivers in California (CDI 1994). Many insurance companies charge the same premium for drivers with one violation as they do for drivers with no violations.

⁹ See also the color-coded maps for injury and collision losses reported in Highway Loss Data Institute (1995).

surcharge is (approximately) 50¢ (see below), the range could conceivably reach 40¢ or more. We keep in mind, however, that regions that have the highest and lowest surcharges (and in general, regions with wide surcharge differentials) are not likely to be adjacent. As the results of CDI's grouping for California showed, the transition from a region to an adjacent one tends to be gradual, even though there might be a big difference between the highest and the lowest surcharges in the state's regions taken as a whole. In a case involving six or eight regions for California, this would probably mean that a region with a 50¢ territory surcharge may be adjacent to one with, say, a 35¢, 45¢, 65¢, or 75¢, but probably not a region with 10¢ or 15¢ surcharge.¹⁰

One more mitigating factor is the fact that gasoline prices at the region's border will not go up by the full amount of the surcharge, precisely because gasoline demand at the region's border is likely to be elastic.¹¹ Figure 1 illustrates this result.

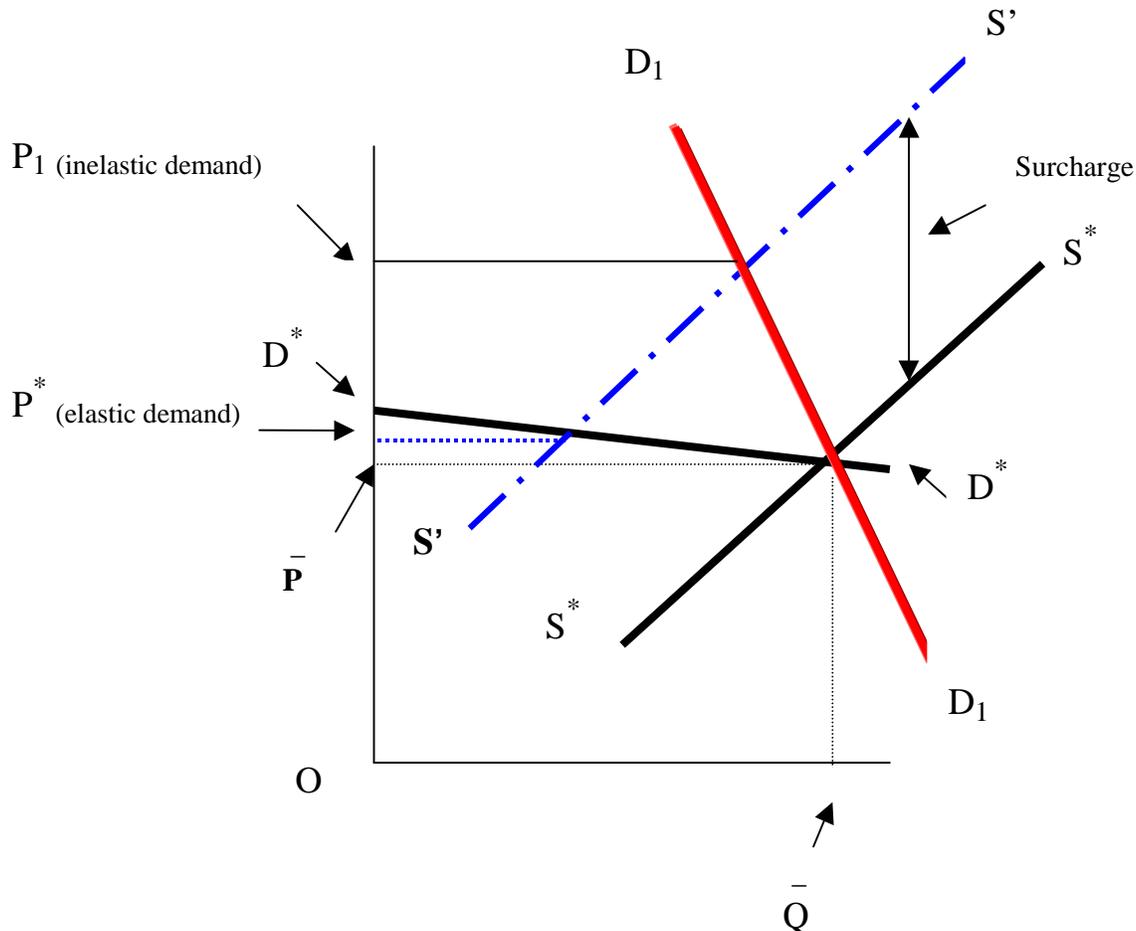
The (price elastic) demand for gasoline is represented by $D^* D^*$ and the supply is represented by $S^* S^*$. \bar{P} and \bar{Q} are the equilibrium price and quantity pair, respectively. In the diagram, the effect of PATP's surcharge is represented by a parallel upward shift of the supply curve to $S'S'$ by an amount equal to the surcharge. (The effect of the surcharge can also be represented by a shift of $D^* D^*$ to the left. The result will be the same.) The new equilibrium price is P^* . By comparison with \bar{P} , the net price increase the consumer faces is the line segment $\bar{P} P^*$, which is seen to be much smaller than the magnitude of the surcharge.

¹⁰ Lyn Hunstad of CDI calculated the surcharge for a three-region grouping he attempted for California — including Southern California, Greater San Francisco, and the rest of California — using a surcharge of 65¢, 57¢ and 43¢, respectively. See Hunstad's "Estimating Pay-at-the-Pump's Surcharge for Different Insurance Coverage in California" in Khazzoom (1999b), Appendix B. The range of the surcharge turned out to be 22¢. Because of its large size, the rest-of-California region, which includes forty-one counties, is adjacent to both of the other regions. Hence the range of 22¢ coincides with the difference between Southern California and the Rest of California. But even so, this difference is of the same magnitude as the difference in the posted prices we reported in the previous page.

Hunstad grouped also by county and estimated a surcharge for each one of California's 58 counties. The surcharge's range for the 58 counties turned out to be 47¢. With this finer grouping, the highest surcharge differential for any two adjacent counties turned out to be 35¢, between Los Angeles County's 71¢ and Kern County's 36¢. As it is, however, a wide strip of uninhabited land separates these two counties.

¹¹ It will not go up by the full amount of the surcharge in the interior of the region either, unless demand in the interior is perfectly inelastic (which is unlikely), but it will go up by more than it does at the region's border.

Figure 1. Impact of PATP's Surcharge on Gasoline Price When Demand is Price Elastic (D^*D^*) and Price Inelastic ($D_1 D_1$)



Suppose instead that the demand for gasoline is price inelastic as shown by $D_1 D_1$ (as, for example, when the seller does not face significant competition). For simplicity's sake, suppose that $D_1 D_1$ intersects $S^* S^*$ at the same point as before, resulting in the equilibrium pair (\bar{P} , \bar{Q}) as before. With the same surcharge as before, the new equilibrium price is P_1 . This represents a price increase equal to the segment $\bar{P} P_1$, which is less than the full extent of the surcharge, but which can be seen to be considerably greater than the price increase $\bar{P} P^*$ when demand is price elastic.

The main message of the diagram should be clear: a mitigating factor to PATP's surcharge differential across adjacent regions is the fact that gasoline price will increase at the border by much less than the full extent of PATP's surcharge. Hence the difference in gasoline price across the border will be less pronounced than would have been the case otherwise.

We calculate what the surcharge (denoted below by S^*) would translate to if PATP is implemented in California, with the state treated as one region. (For estimates by region, see Hunstad's paper in Khazzoom (1999b), Appendix B.) We also calculate what the surcharge would be on the assumption

that uninsured motorists drive on the average half as much as insured motorists, and that diesel-fueled passenger vehicles constitute 2% of the fleet of vehicles.¹² We denote the resulting estimate by S**. We also calculated the share of capped BI/PD premium for good motorists as a percentage of aggregate earned premiums in California. (This percentage needs to be adjusted downward to back out the premium payment by owners of diesel-fueled vehicles.) The following shows the results.¹³

Table 1. Surcharge Revenue from PATP’s Surcharge

	(cents per gallon)		(% of earned premium)
	S*	S**	
1993	54.9¢	46.9¢	37.2%
1994	55.4¢	47.4¢	36.7%
1995	not available		36.6% ¹⁴

Source: Gasoline Consumption by private passenger vehicles – files of the California Energy Commission; Liability and Property Damage Earned Income for all coverage and BI/PD Earned Premium Capped – files of the California Department of Insurance.¹⁵

We note in passing that the fact the initial surcharge is derived from historic premium data does not mean the surcharge will be etched in stone or that the existing conditions will be cemented forever. The surcharge can and should be adjusted periodically as circumstances warrant, and as is done currently under the auspices of the regulatory agencies (which are preserved under the reconstituted PATP proposed in this paper). But whatever the case may be, this initial surcharge, as we calculated it, will always lead to savings on the insurance bill, because of the reduction in VMT and attendant exposure risk that are results of the increase in gasoline price induced by the surcharge.¹⁶

¹² Due to space limitations we do not discuss here the detailed steps for calculating the initial surcharge for individual regions. The interested reader is referred to Khazzoom (1999a), pp. 14-16.

¹³ To arrive at these estimates, we use a discount factor of 0.918 for drivers with zero point relativity for California, supplied to us from the files of California Insurance Department). We use also the June 1, 1998 estimate of 0.226 for the ratio of the uninsured vehicles in California, as reported in a recent study by CDI (CDI 1998).

¹⁴ By zip code, the lower and upper quartiles of the percent earned premiums in California for 1995 are 35.0% and 38.8%, respectively. The smallest ratio is 9.2%; the highest is 77.6%.

¹⁵ I am indebted to Chris Kavalec of the Demand Program, California Energy Commission and Ben Gentile and Maria Teruya of the Statistics Department, CDI for making these data available.

¹⁶ For a brief discussion of how the initial surcharge is revised in subsequent periods following the initiation of PATP, and keeping in mind the price elasticity of gasoline demand, see Khazzoom (1996).

The advantage of including the surcharge as part of the region's territory factor rather than tagging it onto, say, car registration is that it eliminates the motorist's temptation to not register the vehicle and evade the payment for the territorial factor. Paying for the territorial factor as part of the gasoline surcharge has one additional advantage: it enables the low wealth motorist to buy insurance in affordable increments. Low wealth individuals now have the choice of regulating how much they drive – for example, by confining driving to the essential, such as driving to work only – in order to fit insurance expenditures within specific budget constraints.

Driver Characteristics

PATP is criticized on the grounds that it imposes a statewide uniform rate that ignores risk differences among individual drivers. Other critics echo variants of this criticism. They argue that under PATP “there's no incentive to avoid speeding tickets, accidents, or even worse violations” (Gruenspecht et al. 1994) and (American Insurance Association 1990).

It stands to reason that bare bones PATP with a flat surcharge that does not recognize variations among individuals will have the adverse effect just described. See also the results reported in Devlin (1990). (Glick contested the validity of the methodology used by Devlin (Glick 1997)). We note, however, that no PATP has been proposed as a bare bones flat surcharge at the pump without additional safety stipulations that take driver characteristics into account. All PATP proposals have in one way or another been concerned with safe driving much more than their critics would lead one to believe, and include measures to accomplish that.¹⁷ However, even though the various PATP plans do make provisions for driver's risk differentials, it is probably preferable to allow for risk differentials by direct payments to the insurance companies. (We propose the same thing for dealing with vehicle characteristics. See the next section, “Vehicle Characteristics.”) Motorists receive a bill for the premium from the insurance company they choose, a practice used in the current insurance system, but the premium will now exclude an allowance for the territory factor calculated for good drivers. The latter is collected automatically at the pump. A driver with zero point relativity would not receive a notice from the insurance company to pay anything (unless excess liability or other optional coverage is bought, or unless a car surcharge is owed due to unsafe car characteristics.¹⁸ See next section). A driver with a higher relativity (because of an unsafe driving record, etc.) will receive a

¹⁷ For example, Sugarman's proposal includes various charges imposed on drivers according to their driving record and experience (Sugarman 1994). The same is true of PAYD (Pay As You Drive) for California (El Gasseir 1990).

The Fund for the Rescue of the Environment proposes that drivers are classified on the basis of their driving record as A, B, C, D. Drivers A get a 10¢ discount on gasoline, drivers B pay the advertised rate, while drivers C and D pay a 10¢ and 20¢ penalty, respectively. The Fund argues that tying the safety charge (or discount) to gasoline purchases is an effective way of keeping safe driving in focus, since the driver goes to the pump a lot more often than the one time when he or she writes a check for premium liability. This gives the driver a constant reminder to drive safely. To implement their idea, the Fund proposed to use a magnetic strip on the driver's license, which could be run through a checking unit at the DMV. DMV's computer would tell the pump the customer's rating (Rothkrug 1990).

¹⁸ In the estimates of the surcharge per gallon shown above, we made the calculations for a driver with zero point relativity.

bill for the premium from the insurance company in the same way a notice of payment is received under the current system. For the analytical implications of this design strategy, see Khazzoom (1999a), Appendix C.

Under the reconstituted PATP we propose, insurance companies are also free to continue to give weight to such factors that affect the risk of loss, as driver training, multi-car usage, and type of use.¹⁹

This arrangement capitalizes on effective policies within the existing administrative system developed by the insurance industry. It also preserves the mechanism that allows insurance companies to customize PATP according to the profiles of their customers, and structure their plans so that they draw the customer base they want.

There will probably be fewer premium notices to send out to motorists under this system than under the current system, since the vast majority of drivers are good drivers (See footnote 9). As noted, a good driver who chooses not to buy supplemental coverage and who does not have to pay charges for car characteristics will not receive a bill from the insurance company.²⁰ Individuals will pay only at the pump. On the other hand, the system will pick up motorists that are currently uninsured, but who will be drawn into the system thanks to the implementation of PATP.

The possibility exists that some of those who are uninsured under the existing system may choose not to pay the additional premium to their insurer that is required to cover charges for drivers' characteristics or car characteristics. We refer to this group as "semi-uninsured" motorists,²¹ in the sense that, like the rest of the motorists, they do pay for their mandatory BI/PD coverage at the pump, but choose not to make the additional required payments to their insurance company to cover the extra charge for their unsafe driving record. One way of dealing with this group is to stipulate that those who fail to pay their insurers the amount due will face some version of "no-pay, no-play." For

¹⁹ Recent findings by the Auto Club of Southern California cast doubt on the validity of the generally held belief by insurance companies that car use is a legitimate rating factor. The Auto Club finds that once normalized for VMT, the relativities of business, pleasure, and commute use all turned out to be the same. They were all equal to 1 (Baker 1998).

²⁰ In some states such as California, the driver will still receive a statement from the insurance company confirming coverage. (Incidentally, this requirement may act as a check on the number of those who might otherwise opt for becoming semi-uninsured. See below).

²¹ In his review of this paper, Greg Harper took issue with the idea of pitching the surcharge to the good driver. Instead, he proposed to set the charge at a level determined by the bad driver's (presumably the worst driver's) relativity, and then post-credit all better drivers with the extra payment. A similar proposal was made by Art Rosenfeld: "Pay per Gallon, Refund per Mile" (Khazzoom 1999b).

There is a lot to be said for Greg Harper's idea. Everyone will pay the full charge, including the charge for a bad driving record. There will be no semi-uninsured motorists. The main drawback of the idea is that while it sets the surcharge at an optimal level for the bad drivers, it results in a suboptimal (excessive) surcharge for the rest of the drivers. These good drivers constitute the overwhelming majority of the motorists. Because they face a surcharge higher than what is warranted by their marginal risk exposure, their driving level will be lower than the optimal VMT. The refund they receive will boost their driving level some because of the income effect, but generally it will not boost it by the full difference between the actual and optimal level (Khazzoom 1999a).

example, they can be subject to a deductible five or ten times the payment they owe their insurer, whenever they are entitled to a recovery for BI or PD inflicted on them by an at-fault motorist

Vehicle Characteristics

Critics argue that under PATP there is no longer an incentive for an individual driver to select vehicles which are less damageable or less costly to repair (Allstate 1990). Others argue that under PATP motorists face a diminished incentive to buy safer cars (API 1994).

With respect to vehicle damageability and repair cost, it is true that no PATP proposal makes provisions for encouraging the purchase of vehicles that are less damageable or less costly to repair. On the other hand, vehicle damageability and repair cost fall under collision and comprehensive coverage, which no PATP system has intended to cover.²² PATP cannot in fairness be criticized for failing to accommodate issues that lie beyond what it encompasses.

The same is applicable to the criticism concerning vehicle safety, since under the current insurance regime, vehicle safety characteristics are barely given consideration outside collision and comprehensive coverage. We note that although PATP does not purport to provide coverage for collision and comprehensive, all PATP proposals, except for Karcher (1986), go to great lengths to provide incentives for buying and driving safer vehicles.²³

The contrast with the existing insurance regime is instructive. Under third-party liability, which is what most states have, the purchaser of a safer vehicle does not get a reward from the insurer for operating a safer vehicle.²⁴ This is so because the benefit of a safer vehicle accrues instead to the insurance company of the at-fault motorist: at-fault motorists will do less harm to motorists in safer vehicles, and their insurance company will be less liable financially for compensating the occupants of the safer vehicle – a classic case of externality. Under third-party liability, insurers will encourage vehicle safety features only to the extent that these features will contribute to a lowering of the number of accidents in which the insured will be at fault. But insurers will not lower the liability premium for a vehicle with passive restraints, because passive restraints do not reduce the risk of injuring others, which is what liability insurance pays for.

²² The one conceivable exception is the PAYD proposal, which left the door open for the possibility of including collision coverage on an optional basis (El Gasseir 1990).

²³ For example, Sugarman's proposal for California gives people a direct financial reason for buying cars that are crashworthy. It imposes two types of charges on the ownership of a vehicle. On the annual registration of an auto, the owner is required to pay a sum based on the model's safety record. And on the purchase of a new car, a one-time safety fee is imposed. The new-car charge is to be posted on the sticker, and is varied to reflect the accident history of the model in question. The purpose is to "reward manufacturers and consumers of safer cars and impose higher costs on cars that are more often involved in accidents and tend to lead to more bodily injury when they are involved in accidents." The reward is motivated by the argument that the owners of safer vehicles deserve to pay less, because they and their passengers are likely to suffer both fewer and less damaging accidents (Sugarman, 1990). Sugarman's proposal also offers "whistle-blowers financial awards . . . [to] bring vehicle dangers to the attention of . . . the board, which information could then be used by the board in constructing . . . vehicle safety charges" (Sugarman, 1994, p. 22). See also El Gasseir (1990).

²⁴ Except for a minimal discount that she would get if she happened to have opted for collision and/or medical coverage.

Several researchers call attention to this manifestation of market failure under third-party liability with respect to vehicle safety (American Enterprise Institute 1978; Rea 1986-87; Mashaw and Hafst 1990; and Sugarman 1992). This market failure is a major drawback of the existing system. It diminishes the incentive to acquire safer vehicles, and results in fewer safe vehicles than would have been the case otherwise. PATP's critics do not seem to be aware of this major drawback in the present insurance system.

The attempt of the PATP proposals to tie the charges for new and old vehicle ownership to vehicle crashworthiness encourages motorists and manufacturers to purchase and produce safer vehicles much more so than under the current regime. This is a far cry from the criticism that under PATP, motorists face a diminished incentive to buy and drive safe vehicles.

To conclude, vehicle safety characteristics play a central role primarily in collision and comprehensive coverage. Greater rigidity of the car frame, for example, affects the incidence of bodily injury among vehicle occupants struck by another vehicle. Such characteristics should be taken into account in designing the reconstituted PATP. (The same can be said of vehicle weight.) In states where mandatory coverage includes property damage, such characteristics that inflict damage on other vehicles would be incorporated in the reconstituted PATP.

In general, whenever vehicle characteristics are relevant, we propose that the same procedure of direct payment to the insurance company we proposed for driver's characteristics are applied to vehicle characteristics, as well. The one additional feature we tag onto the reconstituted PATP is Sugarman's proposal to encourage the purchase and production of safer vehicles in order to deal with the market failure discussed earlier (see footnote 24).

Insurers' Income

Critics argue that under PATP, insurers' income will suffer. It will also be subject to uncertainty. The following specific concerns have been expressed in different forums by the insurance industry.

1. One source of insurers' income is investment income. Under PATP, insurers do not receive immediately the surcharge collected at the pump. This deprives insurers of investment income, and results in an increase in insurance premium (Alliance of American Insurers 90).
2. A state-run fund is a major source of concern for insurers' solvency. During periods of state budget shortfall, lawmakers may be tempted to tap into the PATP funds for other uses, thus increasing the likelihood of future insolvency (American Insurance Association 1995).
3. When cars become more fuel-efficient, either because of the stimulating effect of higher gasoline price on the demand for fuel-efficient vehicles or because of Congress's mandate of higher CAFÉ standards, insurers' revenue will fall (Coopers & Lybrand (C&L) 1988).

4. When vehicle fuel-efficiency goes up, the fleet becomes less safe. Injuries will go up and so will insurers' loss cost. See the discussion below about the safety implications of higher fuel efficiency.

5. When gas prices go up, people will drive less and insurance revenue will drop (C&L 1988).

Concerns 1 and 2 relate to the case in which PATP is government-administered. The reconstituted PATP plan we propose is not government-administered and does not have this problem. However, even under this plan it is necessary to incorporate provisions that insure the surcharge collected at the pump is transferred in a timely manner to the insurer. With the help of computerized procedures, there is no reason why the revenue cannot be transferred electronically to the accounts of the insurers within the same day it is collected.

Concern 3 is well taken. Provisions need to be incorporated in the plan to allow for the automatic upward (and downward) adjustment of the surcharge as fleet fuel-efficiency goes up (or down).

Concern 4 is based on the premise that the new more fuel-efficient vehicles are less safe than the vehicles they replace. As Khazzoom (1997) points out, even if we assume that enhanced fuel-efficiency affects safety adversely, overall the new fuel-efficient vehicles are safer than the vehicles they replace, because they come with a bundle of new safety attributes not possessed by the older vehicles. Hence, the notion that the new fleet will be less safe than the fleet it replaces is false. What is more, recent evidence based on studies that are better designed than the earlier ones does not support the flat assertion that enhanced fuel-efficiency affects safety adversely in the first place. Depending on how enhanced fuel-efficiency is achieved, safety might even be enhanced (Khazzoom 1997).

Concern 5 is a valid argument, but it overlooks the fact that as VMT drops, not only revenue will drop, but so will the accident rate and loss cost. Insurance companies' income may drop nonetheless. But it may also go up. This is an empirical question; perhaps it can be better addressed as experience with PATP's implementation builds up.

One issue that was never brought up in the discussions of the revenue effect is the seasonality of gasoline consumption – increasing during the summer months and dropping during the winter months.²⁵ Although here, as in the case of other discussions of revenue collected at the pump, the revenues involved constitute only about one third of the premium collected by insurance companies, which does require companies to plan their finances in a manner that keeps the seasonality of the PATP revenues in mind.

Finally, the existing regulatory setup should be maintained as proposed in our reconstituted PATP, and the surcharge level should be adjusted periodically as conditions warrant, and as is done currently with insurance rates.

²⁵ I am indebted to Peter Orszag for calling this point to my attention.

Actuarial Data

PATP is criticized on the grounds that it ignores "detailed and valuable actuarial data compiled by insurance companies over decades," which guide these companies in rate setting. Hence if PATP is implemented, too little weight would be given to important differences among drivers and vehicles, and premiums would be set too high in rural areas and too low in urban areas (API 1994).

There is an element of truth in the criticism, although the criticism is not entirely valid. As I pointed out earlier, no PATP was proposed as a bare-bones surcharge at the pump.

The reconstituted PATP we propose is not subject to this criticism. It incorporates territorial differences in setting the surcharge. It also leaves the insurance companies free to use their actuarial data, as they presently do, in order to give weight to differences among drivers and vehicles and to account for other factors that affect the risk of loss, such as persistency, multi-car usage, and package pricing. Our proposal goes one step beyond the present regime. It proposes that measures be adopted to overcome the extant market failure in vehicle safety, in order to encourage motorists to buy and manufacturers to produce safer vehicles.

Vehicle Miles Traveled and Traffic Density

PATP's critics argue that PATP is based on the false premise that VMT is a determinant of accident cost and insurance premium. It is traffic density rather than miles traveled, they point out, that determines accident cost and insurance premium (API 1994).

Vehicle Miles Traveled

The argument that VMT is not a determinant of accident frequency and cost is counterintuitive. It is also not empirically based.

API is the only critic that attempted a "test" of the relationship between miles traveled and accident costs. API carried out the test in two stages. First, they estimated a regression equation of the average premium per passenger vehicle against the average loss cost per passenger vehicle, using a cross-section of state (aggregate) observations for 1989 for 48 states. In the second stage, API regressed the average premium per passenger vehicle on VMT per vehicle,²⁶ using 1991 cross section observations by state (not clear how many states were included in this sample).

API's first-stage estimation revealed a significant linear relationship between insurance premiums and insurance losses. API then reasoned that if vehicle miles traveled were an important determinant of accident cost, then the results of the second-stage estimation should show that states with high miles traveled per vehicle would tend to have a high average insurance premium per vehicle, and vice versa. But the second-stage regression estimates found no such relationship. API concluded that PATP's premise is false and should be rejected (API 1994).

API's results should not come as a surprise; they are tautological. Let us explain.

²⁶ This includes all types of vehicles combined together, since VMT per passenger vehicle is not available.

Almost all insurance companies set their premium on the assumption that miles traveled and accident rates are unrelated. “On the assumption” is italicized because insurance companies have poor information on the mileage of vehicles they insure, much less the relationship between mileage and accident costs of these vehicles. What they know about mileage is self-reported by the motorists they insure, and is often unverified. In short, the lack of relationship postulated by the insurance companies between miles traveled and accident costs is definitional. It also follows trivially that premiums designed to reflect the impact of accident costs will, also by definition, show no relationship with miles traveled. The premium design was made to yield these results.

What happens if we turn things around? Suppose we use observations of the premiums to “uncover” the relationship between premium and VMT, as API did. What will we find? We will find that premium is not affected by VMT. Startling? Of course not. The way the premiums are designed guarantees that this result will always follow. Since premiums are designed in such a way that they display no relationship with miles traveled, when we regress premium on miles traveled, we simply “formally” discover this lack of relationship that is built into their design. This is tautological; –it defines the problem in such a way that certain results will follow and then proceeds to formally derive those results. This is why API’s results on the lack of a relationship between premiums and miles traveled do not come as a surprise. They are tautological.²⁷

The availability of hard (as opposed to self-reported) data is a sine qua non for a quantification of the relationship between miles traveled and the risk of accidents. Fortunately, the Auto Club of Southern California has compiled such data.²⁸ Figure 2 plots the most recent data available from the Auto Club. These data show a statistically significant positive relationship between accidents and VMT. Nonetheless, we are still not quite where we would ideally like to be because the relationship shown in Figure 2 does not take into account the other factors that affect accident rate, except for driving record (which was netted out by the Auto Club, using sequential methods). Additionally, the factor of proportionality implicit in the relationship is less than 1. Ideally we would like it to be 1, once the effect of the other factors has been netted out.

²⁷ To give a more concrete example: a study by CDI reports the mileage rating practices of twelve insurance companies. The group included the eleven largest insurance companies in California. CDI’s report shows that except for one company, which used 10 VMT categories, the relativity used by the remaining eleven firms showed no substantial variations. Additionally, four of the 12 companies used only two mileage categories. And in the case of one company, the two categories were 0 to 20,000 miles and 20,001 miles and over with a relativity of 1.00 and 1.05, respectively. Ninety nine per cent of the vehicles insured by that company reported mileage in the first category (CDI 1994). Given the huge size of each mileage category, as well as the stipulated relativity, a researcher looking for a clue on the relationship between VMT and premium will never find one.

²⁸ Every two years, Californians take their cars for a smog check. The garage performing the test is required to report to DMV the odometer reading for the car being smog-checked. DMV maintains these odometer readings in its data bank. Auto Club of Southern California, which is connected to California’s DMV data system, has been collecting the odometer readings for the motorists it insures. Auto Club uses these data to estimate the impact of VMT on accident cost and calculate corresponding relativities. It used these estimates to determine the premium it charges its customers.

What is needed is a model that estimates the relationship between VMT and accidents in the broader context of the variables that jointly affect accidents. This should be our next research task. When this is done we would not be surprised if it turns out that the factor of proportionality turns out to be 1. Empirical evidence from Europe corroborates these expectations. The European results may in a way be even more relevant to PATP, since they relate the accident rate to the amount of gasoline consumed. Let me briefly summarize these results.

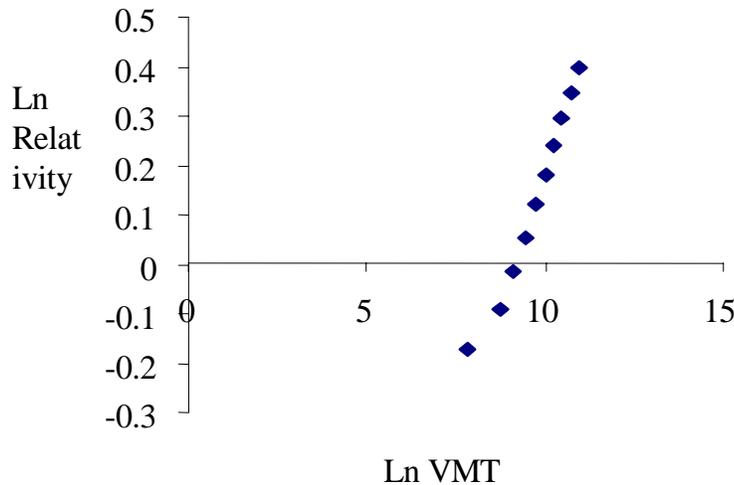
Fridstrom, Ifver, Ingebrigtsen, Kulmala, and Thomsen estimate a generalized Poisson model of road accidents in four countries (Denmark, Finland, Norway, and Sweden), using monthly time series of cross-section observations for the period from the early seventies to the late eighties. Among their explanatory variables, the authors used the amount of gasoline consumption as a proxy for exposure. Their estimates showed almost exact proportionality between the amount of gasoline consumption and the expected number of injury accidents in every one of the four countries (Fridstrom et al. 1995).

Traffic Density

PATP’s critics are correct in pointing out that traffic density is an important determinant of accident frequency and insurance cost. Traditionally insurance companies allowed for traffic density through their territory charge.

The reconstituted PATP we propose incorporates explicitly in the surcharge an allowance for the territory factor. Under the reconstituted PATP, insurers are free to continue to include a territory charge in their cost calculations the same way as in the existing system.

Figure 2. Logarithmic Scatter Diagram of BI Relativity vs. VMT



Source: Auto Club of Southern California, 1/1/98

We note in passing that the fact traffic density is an important determinant of accident frequency and cost is evidence in and of itself that VMT is an important determinant of accident frequency and cost. This is so because traffic density is simply the ratio of VMT (in 100,000 miles) to road capacity (measured in lane miles).²⁹

Rural Drivers

PATP is criticized on the grounds that rural drivers will bear a disproportionate share of the burden of eliminating the problem of uninsured motorists even though uninsured motorists tend to be concentrated in urban areas. Rural drivers would pay disproportionately more because of their higher mileage compared to urban drivers (Insurance Institute for Highway Safety (IIHS 1995)).

This criticism is not valid. The extra payment by rural motorists is not a payment to solve the uninsured motorist problem. No surcharge, under any of the known PATP proposals, includes a component to pay for the elimination of the uninsured motorist problem. Under PATP, those who pay for the elimination of the uninsured motorist problem are the uninsured motorists themselves.

Rural drivers will see smaller savings from the elimination of the uninsured motorist coverage than their urban counterparts will. But that is because rural drivers pay less to protect themselves against uninsured motorists than their urban counterparts do to begin with.

Note also that when PATP's surcharge is allowed to vary with the region, as it is with the reconstituted PATP we propose, the extra payment by the high-mileage driver is a payment to compensate the insurance companies for the extra risk of accidents that comes with higher VMT. This is as it should be. On the other hand, rural motorists receive a more favorable treatment than urban motorists do on the territory charge (because of lower frequency of accidents in rural than in urban areas, etc.)

In short, rural drivers get breaks in areas in which they are entitled to get a break – i.e. territory, and pay more where they should be paying more – i.e. miles traveled.

Long Distance Motorists

PATP is criticized on the grounds that it penalizes long distance drivers. A variant of this criticism focuses on the trip's purpose: PATP is unfair to those who must drive versus those who use their vehicle for pleasure (Alliance of American Insurers 1990).

With regard to the first criticism, it is true that under PATP long distance travelers pay more than those who drive fewer miles. But under a system — such as the reconstituted PATP proposed in this

²⁹ A study by Lawrence Berkeley Laboratory (LBL) decomposes the traffic density into its two ingredients, VMT and lane miles, and estimates a parameter separately for each one in an equation with insurance premium as the dependent variable. The parameters estimated for the two variables turn out to be of the same magnitude. The LBL study used the same data as used in API's 1994 study to estimate the impact of traffic density on insurance cost and premium (Lawrence Berkeley Laboratory 1995).

paper, in which PATP's surcharge takes into account regional differences, and the insurance premium includes charges for drivers' and vehicles' characteristics — the extra payment at the pump by the higher mileage driver is a payment for the extra risk of accidents that comes about with higher mileage.³⁰

The second criticism, business versus pleasure driving, is of dubious value. Under the current regime, insurance companies formally differentiate between pleasure and business travel. But the distinction is of questionable merit because the miles driven are self-reported and are unverified. Additionally, results reported by the Auto Club of Southern California cast doubt on the value of the distinction between pleasure and business travel. The Auto Club of Southern California found that when they normalized their mileage data, the relativities for business, pleasure, and commute use were the same and were equal to 1. Auto Club also reports that when normalized for miles driven, the relativities for gender also became close to 1 (Baker 1998).

Cost-Shifting

Critics argue that much of the cost-savings PATP achieved come from cost-shifting, and that it is predicated on health insurance becoming the primary source for treating auto injuries (Beck 1993).

This criticism is only partly valid for some proposals.

Cost-shifting is neither inherent in nor necessary for PATP to produce savings. PATP results in cost-savings minimally because of reduced VMT and exposure risk, elimination of premiums for uninsured motorist coverage, and substantial elimination of cross subsidies and resource misallocation. A reasonably designed PATP plan need not engage in any cost-shifting. On the contrary, we want the cost to the motorist to reflect the true (social) cost in order to eliminate the externalities associated with auto accidents (Vickrey 1969).

The reconstituted PATP we propose is not involved in any cost-shifting to health insurance.

Insurance Agents

The implicit criticism is that insurance agents will lose their job. However, this criticism was never talked about in public.³¹

In a system in which all needed insurance coverage is paid for at the pump and motorists cannot choose their insurance company, insurance agents would be cut out of the picture. This concern was not talked about in the open apparently for fear of public backlash, but it seems to have fuelled the campaign against PATP by agents' trade associations. It is significant that PATP had a friendlier

³⁰ Trucks pose a difficult problem for any insurance regime. In the reconstituted PATP proposed in this paper, diesel is exempt from the surcharge. Hence, trucks continue to be insured as they are presently. For a discussion of some of the fairness issues in truck insurance, see Sugarman (1994).

³¹ See Khazzoom (1999a), Appendix B for excerpts from the letter of American Agents Alliance to its members warning them about the impending loss of jobs.

reception among insurance agents whose livelihoods did not depend on auto insurance commission (Berg et al. 1994).

Under the reconstituted PATP, choice is maintained. Hence, motorists will still use the agents' services in selecting carriers and learning about the finer points of coverage. The option to buy excess liability, collision, comprehensive, medical, and umbrella coverages provides an additional opportunity for agents to earn their livelihood. Agents will also exist as the vehicle through which insurance companies will entice good drivers. Under the reconstituted PATP, there will also be an additional demand for agents' services as uninsured motorists join the insurance system.

Overall, the demand for agents' services may actually increase under the reconstituted PATP. But in any case, if it does decline, the reduction is not likely to be massive.³²

Geographical Issues

PATP is criticized on the grounds that it poses geographical problems of border crossing, bootlegging, out-of-state driving, and out-of-state drivers.

Border crossing. When we discussed territory rating, we addressed the issue of border crossing. We noted that while such crossing cannot be dismissed, its magnitude is not likely to be massive. It is also of interest to note that when a significant increase in cigarette tax was proposed in California in 1988, a debate raged on about border crossing from California to Nevada. Interestingly, eight months after the passage of the stiff cigarette tax in California, Nevada matched the California tax (Sugarman 1994).

Bootlegging. Gasoline can be bootlegged. However, it is unlikely that this would happen on a large scale. Gasoline is a bulky item, and is not easy to hide in large quantities.

Out-of-state driving and out-of-state drivers. Out-of-state driving can be accommodated in the same way auto insurance policies currently accommodate motorists when they drive out of state.

Out-of-state drivers would contribute to PATP. Those covered in their own state would be paying twice for liability insurance, which is inequitable. On the other hand, what they pay at the pump covers only their liability coverage for the duration of their stay in the PATP state, and this will involve probably very small amounts. The equity problem and the adverse effect this may have on tourism in the state should not be exaggerated.

³² In the long run, as information on premium, coverage, charges for drivers, charges for vehicles, etc. become increasingly computerized and accessible to motorists on a standardized basis, it will become increasingly feasible for the motorist to shop for carriers that offer the best deal without agents' help. To that extent, the demand for the agents' services is likely to decline over time, with or without PATP.

B. Criticisms Related to Consequences of PATP

Enhanced Fuel-Efficiency

This criticism centers on PATP's stimulating effect on the demand for fuel-efficient vehicles. The argument is that in order to make the vehicle more fuel-efficient, the manufacturer has to reduce its weight. Critics argue that:

1. Heavier vehicles are safer than lighter vehicles. They conclude that the increased sale of fuel-efficient vehicles will affect safety adversely.
2. The acceleration of vehicle replacement induced by PATP's surcharge will add further fuel to the fire and increase fatalities even more. Some members of the insurance industry predict carnage and destruction on the highways (Snyder 1990).

Khazzoom dealt with this subject in great detail in "Impact of PATP on Safety through Enhanced Vehicle Fuel Efficiency," published in the July 1997 issue of the Energy Journal. Here I summarize only the main points.

1. The argument that enhanced fuel-efficiency affects safety adversely is not valid for three reasons:

Confusion of Weight with Size. Recent evidence based on improved studies that are better designed than the earlier ones, does not support the flat assertion that reducing car weight is a detriment to safety (e.g., U.S. General Accounting Office 1991). Much of the benefit attributed to weight derives from confusing weight with size. Weight is also a hostile characteristic for the occupants of the other vehicle in case of a collision. Size is not.³³

Downweighting without Downsizing. Even when increased fuel-efficiency involves downweighting, it need not be accompanied by downsizing. Vehicles can be built with lighter material,³⁴ so that they are both lighter and larger, which makes them both more fuel-efficient and safer.

Enhanced Fuel Efficiency Without Downweighting or Downsizing. Enhanced fuel efficiency can be achieved also by a means that involves neither downweighting nor downsizing, such as by reducing car performance.³⁵ High performance vehicles are gas-guzzlers. They are also deadly.³⁶ Reducing car performance improves fuel-efficiency, and has also the potential side effect of reducing fatalities.

³³ It is also instructive to note in passing that the fatality rate for light trucks was 3.1 per 100 million VMT in 1992. During the same year, the fatality rate for passenger vehicles was 1.9 per 100 million VMT. Yet passenger vehicles are much lighter than light trucks. The picture was the same throughout the 1975–1992 period (National Highway Traffic Safety Administration 1994).

³⁴ The use of lighter material need not increase the cost of production as it may lead to savings elsewhere in the assembly. The 1989 Corvette was made with all plastic bumpers, and the structural beam was also of plastic composite material. It is reported that GM achieved an 18% weight reduction in this application. At the same time, its labor and material cost reductions were 14% in this application. (Energy and Environmental Analysis 1990).

³⁵ Heavenrich and Hellman calculate that the MPG for new 1995 vehicles would have been 5 miles higher had the 0-60 performance of the new vehicles been kept the same as in 1984 (Heavenrich and Hellman 1996).

In short, evidence does not support the hypothesis that the increase in vehicle fuel-efficiency affects safety adversely. It may actually enhance it.

2. With regard to the impact of accelerated replacement on fleet safety, we note that new cars do not come only with higher fuel-efficiency. They come with a bundle of attributes that affect safety, of which enhanced fuel-efficiency is only one. Some of these new-car attributes include safety features not possessed by the vehicles they replace. These attributes cannot be unbundled. They come together, and together they shape the overall safety of the vehicle. When we take into account the combined effect of all attributes that influence safety, we find that, even if we go along with the critics and assume that enhanced fuel-efficiency affects safety adversely, the results are the opposite of what critics would lead one to expect. The acceleration of auto replacement results in a safer fleet. Simulation results also suggest that the faster the accelerated vehicle replacement proceeds, the safer the resulting fleet is.³⁷

Burden on the Poor

PATP is criticized on two grounds:

1. Converting the insurance premium from a lump-sum payment to payments per gallon does nothing to make insurance more affordable (American Insurance Association 1990).
2. Poor households generally drive older cars that are gas-guzzlers. Consequently, PATP would hit the lower-income households much harder than it would hit the wealthier households (Alliance of American Insurers 1990; Beck 1993).

Critics offer no empirical evidence to support either one of these two claims.

PATP would do nothing to make insurance more affordable for low-wealth individuals. This claim is untenable. It is also not supported by available studies. More likely, low-wealth households will not suffer as big a financial sacrifice under PATP as they would under the current regime, in which the premium is decoupled from the intensity of car use.

We all face prices that we take as given. However, we normally control how many units we buy, and what we spend on any item is governed by our ability to pay. The low-wealth household may want to regulate the amount of driving it does by limiting its car use only to the essential, for example, driving

³⁶ According to the Insurance Institute for Highway Safety (IIHS), four out of the five cars with the highest death rate are high performance vehicles (IIHS 1990). Khazzoom's estimates show increased engine size (which also implies increased performance) exerts a significant upward pressure on highway fatalities (Khazzoom 1994).

³⁷ The general idea that vehicle replacement enhances fleet safety appeared in other studies, as well. For example, in evaluating programs of accelerated scrapping of older vehicles, the Office of Technology Assessment points out that a "by product of the program is likely to be a positive impact on fleet safety, primarily because of the improved safety design of newer cars and the likelihood that brakes and other safety systems on the vehicles retired will be in worse condition than those on the replacement vehicles" (Office of Technology Assessment 1992).

to work only, in the same way we regulate the amount of food we buy to fit our budget. But the current regime does not allow that choice. Motorists are not allowed to buy only what they can afford. They either pay the full insurance, regardless of whether or not it is needed, or else go uninsured. Nothing in between. It is as if you either find the money to buy all the food in the grocery store or go without food.

The sacrifice this imposes on the low-wealth motorist is thus made unnecessarily onerous by the inflexibility of the current method used in pricing the insurance service. This puts the insurance payment beyond the reach of an unnecessarily larger segment of the population than would otherwise have been the case. It also results in a higher number of uninsured motorists.

Consider a supermarket that sells melons. A melon costs \$5 whole. Three patrons, A, B, and C walk in. Each one wants to buy a melon. A is well to do; B can afford to spend \$2 on a melon; C can afford only \$1. If the store insists on selling the melon whole, only A will be able to satisfy her desire for melon. B and C will have to do without. The store's insistence on selling the product in one piece put the melon beyond the reach of the patrons with more limited resources. But if the store sells the melon in slices and charges each customer by the weight of the slice, A would still be able to buy melon, but so would B and C, although B would be able to buy a slice twice as big as C's. But the point is that no one now will have to do without. Both B and C are able to satisfy their need for melon, and each one is doing so in accordance with his/her ability to pay.

Under PATP, low-wealth individuals need not scramble to find \$1000 or more to be insured, but can tailor their insurance outlay to their ability to pay. The poor can pay for their insurance in increments at the pump. They can choose how much they will drive, and thus how much they will pay for auto insurance.

This is not to say that low-wealth individuals will no longer have a difficult choice to make between paying for the insurance and driving, on the one hand, and paying for other necessities, on the other. They do. However, there is now a range of car-use intensity from which to choose. The choice set is now bigger than before, a fortiori, the welfare level of the low-wealth individual must be at least as high as, but more likely higher than under the current regime.

It is of more than passing interest to note that several groups representing low-income citizens in California were (and still are) among PATP's strongest supporters.³⁸ A study by the UCS found that under PATP the poorest households continue to spend a greater percentage of their income on auto insurance than do those of middle and upper incomes. However, that percentage represents a

³⁸ These include: Black Chamber of Commerce, Sacramento Urban League, Phoenix Urban League, Oakland Committee for Urban Renewal, New Bayview Committee, Mexican-American Political Association, League of United Latin American Citizens, Latino Issues Forum, Interdenominational Ministerial Alliance, Hermandad Mexicana Nacional, Filipino-American Political Association, Comision Femenil Mexicana Nacional, Chinese for Affirmative Action, Center for Southeast Refugee Settlement, Mexican American Political Action Network, and Mexican GI Forum (Gruenspecht et al. 1994).

dramatic reduction from its current level under the existing auto insurance (UCS 1994; Sugarman 1994).

It is also of interest to note the results of a 1993 survey of 799 low- and moderate-income Californians who were asked their opinion on PATP as an alternative to the present insurance system. The results showed 89% of those surveyed favored PATP, 8% opposed it, and 3% had no opinion. Among the uninsured motorists who made up a little more than half of those surveyed, the percentage favoring PATP was 96% (Public Advocates et al. 1993). These results are consistent with a 1991 survey conducted by Consumer Union and Latino Issues Forum (ibid., 2).

Humanitarian Concerns. A very important ancillary benefit from a societal point of view is PATP's contribution to the human aspect of the uninsured motorist problem, which has been overlooked in the discussion of PATP's effect on the poor. PATP redresses a social ill which mandatory insurance initiates, but which is enlarged and aggravated by the rigidity of the current method of pricing the insurance service.

As a result of PATP, a segment of the population (primarily low-income households) will no longer have to live under the stigma of being characterized as scofflaws. The special significance of this societal and in a very real sense human dimension of the problem does not seem to have been appreciated, as evidenced by the often-repeated pronouncements that the uninsured motorist problem has been solved by the availability of uninsured motorist coverage.³⁹

Adverse Effect of the Fuel-Efficiency Differential on the Poor. The claim that poor people drive gas-guzzlers while the wealthy people drive highly fuel-efficient vehicles (and that as a result of the implementation of PATP the cost of driving will go up proportionately more for the poor than for the well-to-do) lacks empirical foundation.

In 1990, the average vehicle fuel-efficiency for households with annual family incomes of \$15,000 or less was 18.1 miles per gallon. For households with annual family incomes of \$50,000 or more: it

³⁹ The following is an excerpt from a quote by O'Connell that should help shed some light on this aspect of the problem (O'Connell reports the original appeared in 1994 as an editorial in an African American Philadelphia newspaper). "If you just listened to the candidates for election ... you would easily think that the only issue of importance is crime.... Because state law mandates that all motor vehicle owners must have insurance to drive those vehicles ... many Philadelphians are committing a crime because they are driving without the legally required auto insurance. Curiously, none of those tough-on-crime candidates is addressing the issue of ...auto insurance rates which [have] turned thousands of otherwise law abiding Philadelphians into criminals" (O'Connell 1995).

Maril's survey of low-income households in Maricopa County, Arizona, portrays the anxiety that pervades many poor households regarding their driving of uninsured vehicles. Additionally, Maril found that the poorest members of his sample paid an average of 32% of their annual household income in order to have their vehicles insured (Maril 1994). This compares with a national average of about 2% (U.S. Bureau of Labor Statistics 1995). The next poorest group in the sample paid 14% of their annual income. The rest of the group, who earned appreciably more when compared to the poorest members of the sample paid 7% of their annual income for car insurance, still over three times the national average (Maril 1994).

was 20.2 miles per gallon. Additionally, low-income households drove 59% percent fewer miles than their upper-income counterparts (11,445 compared to 27,620 miles).

In 1993, average vehicle fuel-efficiency for households with incomes of \$15,000 or less was 19.8 miles per gallon, virtually the same as the 20.1 miles per gallon for households with family incomes in excess of \$50,000. Additionally, lower-income households drove 49% less on the average than their well-to-do counterparts: 14,109 miles versus 27,740 miles for households with annual income of \$50,000 or more (U.S. DOE 1993; U.S. DOE 1997).

Moreover, under the existing regime of fixed-cost insurance, low-mileage motorists subsidize the higher-mileage motorists (Khazzoom 1998). Given that lower-income individuals drive approximately half as much as higher-income individuals, the existence of the cross subsidy by lower-mileage drivers in favor of higher-mileage drivers amounts to a subsidy by the low-income households to the high-income households.

PATP does away with this. Rather than penalizing the low-income households disproportionately, as claimed by its critics, PATP actually enhances their welfare by freeing them from the inequitable burden of subsidizing the well-to-do.

Loss on Insuring the Uninsured Motorists

In the past, several insurance companies reported that their experience with motorists not previously insured (no-priors) indicates that these motorists are less safe drivers than those who maintained insurance (priors). Insurance companies argued that they would incur losses on insuring the no-priors and that this will drive up the average premium for those that are currently uninsured (Cleveland 1991; Wirth, 1991). Consequently, insurance companies oppose PATP on the grounds that the loss in cost resulting from insuring the uninsured motorists as a group will exceed the contribution of that group to the revenue and drive up the premium for those who are currently insured.

If insurance companies do incur losses on insuring uninsured motorists, part of the savings achieved from eliminating the need for uninsured motorist coverage would be eroded. And if the losses are high enough, then all the savings would be wiped out. Two questions that logically precede these concerns are: what level of loss will actually offset all the savings achieved from eliminating uninsured motorist premiums? And how does this compare with the loss projected by insurance companies resulting from insuring uninsured motorists? We address these questions later in this section. We note in passing that these questions do not arise if the insurance companies are free to charge extra for a driver's unsafe characteristics, as they would be under our reconstituted PATP.

The cost implications of drawing in the uninsured motorists depends on the net effect of two opposing tendencies: (1) reduced exposure due to reduced VMT and (2) changes in the driving strategy that subject the no-prior to a greater risk of accidents than before.⁴⁰ Offhand, we do not know which of

⁴⁰ The analysis in this section is highly compressed due to space limitations. The interested reader is referred to Khazzoom (1999a), pages 42 ff. for a detailed analysis.

these tendencies will prevail. The published evidence on risk exposure and insurance cost once the uninsured motorist is drawn into the insurance system is very limited, and what is known is not all that firm either. While there are results that suggest the insurance cost may be subject to an upward pressure when the uninsured motorists are drawn into the insurance system, none of these results seem firm enough to draw unequivocal conclusions.

One way to resolve the issue is to examine the historical relationship between revenue and loss cost generated by no-priors. But there are two problems with pursuing this line of analysis. One is cost. The required data have to be ferreted out from the file of each individual policyholder. The cost of such an operation is enormous. Two, the results of any such sample are bound to suffer from self-selection bias.

Fortunately, a simple alternative exists. It will not give us the wealth of information we would have liked to get in an ideal world. Nonetheless it gives us insights useful enough to help us come to a conclusion.

We assume a worst-case scenario and derive results for that scenario. The logic is that if the savings achieved from eliminating the uninsured motorist premium exceed the losses incurred on insuring the no-priors even under worst case scenario, then we are more confident our results will hold under normal, less pessimistic conditions.

With that in mind, we assume that the insurance system contains no provisions whatsoever to penalize unsafe driving or compensate insurance companies for the extra cost of insuring unsafe drivers. (This is a pivotal assumption. If the insurance companies are able to charge the motorist a premium based on risk, the issue under discussion will not arise in the first place.) We also make the (highly restrictive) assumption that the only savings achieved under PATP are on the premium for the uninsured motorist coverage. Thus, we determine a break-even point at which the losses incurred on insuring the no-priors are large enough to neutralize all the savings achieved by the elimination of the uninsured motorist premium. We express this break-even point in the form of a lower bound on the ratio of the insurance companies' loss cost to revenue. Using data on the parameters that determine this break-even point, we calculate illustrative values for the break-even ratio for a few states, and compare these with the highest known loss cost ratio predicted to result from insuring the uninsured motorists.

Let M , τ , UMP and LIP denote the number of motorists, proportion of uninsured motorists, average uninsured-motorists premium, and average third-party liability premium (hereafter referred to simply as liability premium), respectively. Assume that all priors maintain uninsured-motorist coverage. The implementation of PATP will result in savings of $(1 - \tau) M * UMP$ for the priors on their uninsured motorist premium. The insurance companies will receive $\tau M * LIP$ of new revenue from the no-priors. Suppose the insurers' loss cost on the no-priors is $(1 + \zeta) \tau M * LIP$, $\zeta > 0$, resulting in a loss of $\zeta \tau M * LIP$. The savings by the priors will be offset or more than offset when

$$\zeta \tau M * LIP \geq (1 - \tau) M * UMP$$

$$\Rightarrow \zeta \geq ((1 - \tau) / \tau) * (UMP / LIP)$$

$$\Rightarrow \xi \geq 1 + ((1 - \tau) / \tau) * (UMP / LIP) \tag{1}$$

where $\xi = 1 + \zeta$.

Using data on the ratios UMP / LIP and $(1 - \tau) / \tau$ for different states one can calculate for ξ the lower bounds determined by (1) for those states. Table 1 shows the results of our calculations, using the NAIC published data (NAIC 1993). For the states shown in the table, the ratio of the cost to the revenue required to neutralize the savings on uninsured motorist premiums ranges between 1.80 and 3.33, with the average for the United States estimated at 2.24. This means that on the average for every dollar of revenue from the no-prior, the insurance companies' cost of insuring the no-prior must exceed \$2.24 before the resulting losses can wipe out the savings achieved by the elimination of the uninsured-motorist premium. In some states the break-even value is smaller, in others it is larger than the United States's average. But even the smallest ξ in the table exceeds the highest ratio of loss cost to revenue (1.60) estimated by any member of the industry (such as Allstate) to result from insuring the no-priors at the same rate paid by the priors (Kron 1991).

Table 1. ξ : Ratio of Cost to Revenue (from Insuring the No-Priors) Required to Neutralize the Savings on UM Premium, 1986-1990

CA	1.91	NC	2.00
FL	2.18	PA	2.91
NM	2.29	RI	3.33
NY	1.80	US	2.24

Source: Compiled from National Association of Insurance Commissioners (1993).

In short, under PATP, the savings achieved by the elimination of the uninsured motorist coverage will exceed the loss estimated to result from insuring the uninsured motorists. This will be the case even if we make the worst-case assumption: that PATP is a bare bones flat rate plan that ignores all risk differentials. This of course was never true of any of the PATP plans ever proposed. Under any of the PATP plans, and particularly under the reconstituted PATP we propose, insurance companies can charge higher premiums for higher risks. Hence, the problem of loss cost exceeding the revenue from insuring the uninsured motorists does not arise, even if we ignore all other savings achieved by the adoption of PATP, nor (by implication) does the danger arise that this might drive up the average insurance premium for those that are currently insured.

Funds for Transportation Projects

PATP's opponents criticize it on the grounds that it decreases the money available for transportation projects (Association of California Insurance Companies 1990; Western States Petroleum Association 1993; California Senate Committee on Insurance 1993).

By reducing miles traveled and by encouraging motorists to switch to more fuel-efficient vehicles, PATP reduces gasoline consumption. This is an attractive feature, which contributes to a cleaner environment and reduces global warming. However, by reducing gasoline consumption, PATP also reduces the revenue available from excise and sales taxes. This in turn reduces the funds available for road maintenance and for the design and construction of new and better highways — particularly interstate highways, which tend to be safer but more expensive to build than other types of highways.

The impact of revenue reduction will probably be mitigated by the effect of two factors. (1) The reduction in travel density increases the life expectancy of the highway infrastructure and reduces the required maintenance and repair work; and (2) To the extent that PATP's surcharge itself is subject to sales and excise taxes, the tax revenue from the sale of gasoline may actually increase. Coopers and Lybrand (C&L), for example, studied the tax implications of the Uninsured Motorist Act of 1994 proposed for California. Using a price elasticity of gasoline demand of .2 and .7 for the short- and long- run, respectively, C&L predicted that the tax revenue from the sale of gasoline would drop by \$131 million in the short run and \$460 million in the long run. However, when the surcharge itself is subject to tax, C&L predicted there would be a net increase in tax revenue of \$99 million in the short run and a net decrease of \$277 million in the long run (C&L 1993).

The short- and long-run price elasticities used by C&L are too large. They also make no allowances for the rebound in gasoline demand due to PATP's income effect. With a lower price elasticity of gasoline demand, the reduction in the tax revenue would be smaller than predicted by C&L. It might even turn out to be an increase.

On the other hand, the increase in gasoline price due to PATP's surcharge may decrease the public's willingness to accept a tax on the surcharge itself. If that happens, there will be a reduction in gasoline tax revenue (albeit the reduction will be smaller than the reduction estimated by C&L) and some adverse effects on transportation projects.

C. Outline of a Reconstituted PATP

The effort to respond to the concerns and criticisms leveled at PATP results in the design of a hybrid system, which merges the best features from PATP and the existing system. It retains what is consistent with free market operation and market incentives in the existing system and at the same time restores the price signal, which is the sine qua non for an efficient market solution, where it has been extinguished in the existing system.

The reconstituted PATP we propose avoids making unnecessary changes to the existing system. At the same time, it capitalizes on the pricing-efficiency feature that characterizes PATP, which in turn leads to a reduction in insurance cost and enhanced safety; an elimination of resource misallocation and enhanced equity; and a reduction (possibly elimination) of accident-cost externalities. In addition, it benefits society at large with benefits to the environment, improved balance of payments, enhanced U.S. security, and a redress to the forgotten human dimension of the uninsured-motorist problem: the social ill which mandatory insurance initiates but which is aggravated by the inflexibility of the current method used in pricing insurance services.

The proposal calls for setting the fuel surcharge at a level that ensures BI/PD liability coverage for all.⁴¹ The surcharge is calculated for a good driver, and is allowed to vary among reasonably large regions in the state to give recognition to the importance of territorial differences. States where territory has not been an important factor need not incorporate this feature should they opt for PATP.

Supplemental BI/PD liability, collision, comprehensive, and medical coverages can be purchased from the insurance companies. Motorists continue to choose their insurance companies in the same way as they do in the existing system, directly or through an agent. Insurance companies continue to bill motorists directly for coverage, except that the premium bill will exclude an allowance for the region's territory factor calculated for good drivers. This allowance is equal to the revenue the surcharge is designed to produce at the pump. Thus, assuming a rate base of \$200 and a territory relativity of 1.2 for good drivers, an amount equal to \$240 ($\200×1.2) will be excluded from direct billing and collected at the pump.

Otherwise, all the charges included in the insurance companies' billing will be calculated the same way they are calculated in the existing system. In particular, the insurance companies' billing will include, in addition to the charge for optional coverage, extra charges to the other-than-good driver, determined in the same manner as in the current system. Insurance companies continue to give weight to factors that affect the risk of loss, such as driver training, multi-car usage, and type of use. Additionally, the bill will include charges for vehicle characteristics, such as greater rigidity of the frame, which aggravates the incidence of bodily injury and property damage to the vehicle struck by the vehicle with the rigid frame.

The revenue collected at the pump is channeled to the insurance companies in proportion to the number of motorists choosing those companies. Drivers who fail to sign up are assigned to companies in proportion to the companies' market share.

Under the reconstituted PATP, the insurance industry elects from within its own ranks a managerial board, in the same manner as the securities industry manages and polices itself. Otherwise, all existing state safeguards for monitoring and auditing individual companies remain in place. State insurance commissions would continue to do their regulatory and monitoring work in the same manner.

In short, the reconstituted proposal capitalizes on the existing know-how and administrative system developed by the insurance industry. It also preserves the mechanism that allows insurance companies to customize PATP according to the profiles of their customers and structure their plans so that they draw the customer base they want.

There will probably be fewer premium notices to send out to motorists under this system than under the current system, since the vast majority of drivers are good drivers. A good driver who chooses not

⁴¹ The fuel charge could also be set at a level that ensures just BI liability coverage, if that is all that is mandated by the state. At present, liability insurance is mandatory in 45 states and Washington, D.C. Additionally, the governor of Alabama has signed a bill recently mandating liability insurance as of June 1, 2000, which makes Alabama the 46th state. The remaining four states (Mississippi, New Hampshire, Tennessee, and Wisconsin) have financial responsibility laws (Insurance Information Institute 1999).

to buy supplemental coverage and who does not have to pay charges for unsafe car characteristics will not receive a bill from the insurance company. She/he will pay only at the pump.

On the other hand, the system will pick up some additional motorists, that are currently uninsured, but who will be drawn into the system thanks to the implementation of PATP.

The possibility exists that some uninsured motorists under the existing system may choose not to pay the additional premium to cover extra charges for unsafe drivers or certain car characteristics. We refer to this group as “semi-uninsured” motorists, in the sense that, like the rest of the motorists, they do pay for their BI/PD at the pump, but choose not to make the additional. One way of dealing with this group is to stipulate that those who fail to pay their insurers the amount due will face some version of no-pay, no-play.

One additional feature we propose, which relates to vehicle characteristics, the system of incentives proposed by Sugarman to reward auto manufacturers for producing and motorists for buying safer vehicles. Sugarman’s proposal is motivated by the need to deal with the market failure in vehicle crashworthiness, since the existing liability system does not encourage sufficiently the purchase and production of safer vehicles.

We also propose that the reconstituted PATP incorporate provisions that insure the surcharge collected at the pump is transferred in a timely manner to the insurance companies, in order to avoid the loss of investment revenue. In fact, with the help of computerized procedures, there is no reason why the revenue cannot be transferred electronically to the accounts of the insurers even within the same day it is collected.

We also propose that provisions be incorporated in the plan to allow for the automatic upward as well as downward adjustments of the surcharge as fleet fuel-efficiency goes up or down.

IV. Summary and Conclusion

This paper reviews the criticisms leveled at PATP’s design as well as the concerns expressed about the consequences of PATP. The review indicates that it is feasible to reformulate PATP in a manner that makes it responsive to those criticisms and concerns, without destroying PATP’s ability to make the contributions it can make. We propose such a reformulation.

The proposal is for a hybrid system that merges the best features from PATP and the existing insurance system. It retains what is consistent with market incentive in the existing system. At the same time it restores the price signal where it has been extinguished in the existing system, thus making it possible to benefit from the economic efficiency that characterizes PATP. Motorists benefit from reduced insurance cost, enhanced safety, the elimination of resource misallocation, and enhanced equity. Society at large benefits from reduced pollution and reduced global warming, improved balance of payments, enhanced U.S. security, and a redress to the human dimension of the uninsured-motorist problem.

Appendix

This Appendix is intended to give a very simple illustration of what economists call the “efficiency gain” under PATP. Assume, for simplicity’s sake, the marginal cost of driving a car the next mile, MC, is constant. (The results can be generalized in a straightforward manner to the case where the marginal cost rises or falls.) Here we consider the case in which the system consists of a single insured motorist. As shown in Figure I.1, with $MC = ak$, the motorist drives ag miles. Following Rea (1992), assume for simplicity’s sake a constant exposure risk per mile, ρ (which in the diagram is represented by the segment kd), and an insurance company who charges the motorist the lump-sum premium $dkfe (= \rho * ag)$. Under this regime, the consumer surplus is

$$CS_{(lump\ sum)} = ckf - dkfe = cdh - hfe \tag{A.1}$$

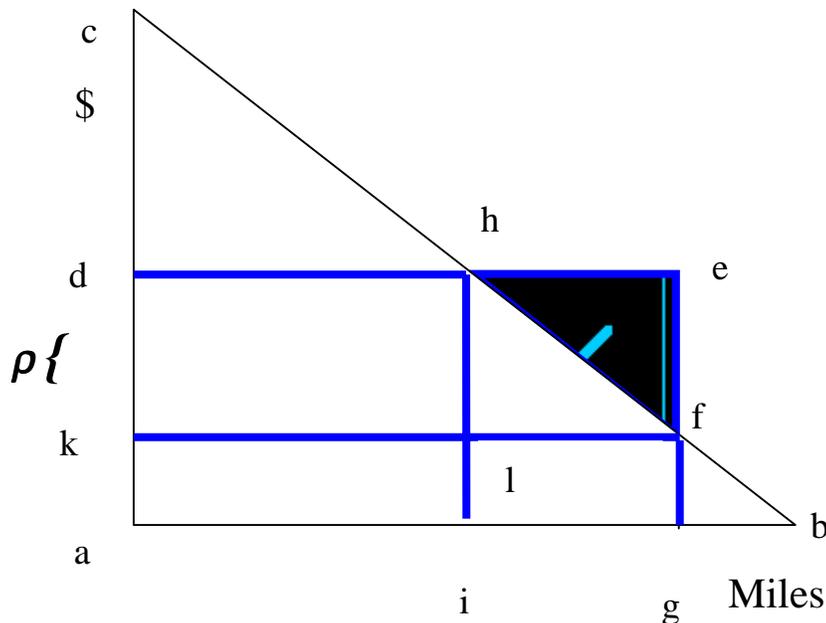
where hfe represents the misallocation of resources associated with the motorist’s VMT under the current regime of lump-sum payment.

Under PATP, the new marginal cost facing the motorist is $ak + \rho = ad$. The motorist now travels $ai < ag$, and pays insurance premium $klhd < kfed$. The consumer surplus is now

$$CS_{(PAY-AT-THE-PUMP)} = cdh \tag{A.2}$$

which can be seen to exceed $CS_{(lump\ sum)}$ by hfe . Not surprisingly, the increase in welfare, hfe , is simply the magnitude of resource misallocation eliminated under PATP.

Figure I.1 An Illustration of PATP’s Pricing Efficiency in a One-Insured-Motorist System



In summary, in the simplified system we just considered, the installation of PATP results in (1) a reduction in miles traveled, implying increased safety due to the reduction in exposure risk and environmental benefits; (2) an elimination of resource misallocation with an equal increase in welfare; and (3) a reduction in the insurance bill due to the reduction in miles traveled and exposure risk.⁴²

When more than one motorist are involved, the results for the one-motorist system will still hold. What is new in the multi-motorist case, however, is that the insurance bill will drop for some motorists and increase for others. This is so because under the current regime, some motorists subsidize others. Insurance companies act as the medium through which these cross subsidies get transferred. The insurance companies themselves may be the beneficiaries or the losers in this system of cross subsidies.⁴³ But the total insurance bill for all customers will drop, because the aggregate miles traveled will drop due to PATP's surcharge. Additionally one other new factor enters the picture in the multiple-motorist case: equity. Equity is enhanced, because PATP eliminates the cross subsidies.

These results can be extended to deal with the problem of the uninsured motorist, transportation externalities due to accidents, the problem of constant marginal exposure risk, unequal marginal exposure risk among motorists, and vehicle fuel-efficiency. These are addressed in Khazzoom (1998).

⁴² One proviso: The comparison of the outcome before and after the installation of PATP has to take into account the fact that the demand curve of the insured motorist does not stay put during the transition. It will shift to the right when PATP is introduced because of PATP's income-feedback effect, which results from saving the lump-sum insurance premium. Hence VMT under PATP will be somewhat greater than a_i (but still less than a_g). This means the extent to which safety is enhanced (and to which the insurance bill drops) will be smaller than depicted in the diagram. On the other hand, the gain in welfare will exceed the amount of resource misallocation that has been eliminated, due to the shift of the demand curve to the right.

⁴³ This can happen in the case of the one-motorist system, as well. Transfers to and from the insurer can occur by design. But they occur primarily because the insurer does not have perfect knowledge.

References

- Alliance of American Insurers. Pacific Region. 1990. Letter to Gary Klein. California Energy Commission, San Francisco, CA. Prepared by James S. Stickles. 15 June. All Industry Research Advisory Council. 1989. Uninsured Motorists. Oak Brook, IL.
- American Enterprise Institute. 1978. *Federal No-Fault Insurance Legislation*. Washington, D.C.
- American Insurance Association. 1990. Letter to Barbara Crowley, Vice Chairperson, California Energy Commission, Sacramento, CA. Prepared by Wayne D. Wilson. 14 September.
- American Insurance Association (AIA). 1995. *PAY-AT-THE-PUMP Auto Insurance: An Idea Going Nowhere Fast*. Washington, D.C.
- American Insurance Association (AIA). 1997. *Automobile Insurance Laws*. Washington, D.C.: AIA Law Publications.
- API (American Petroleum Institute). 1994. Paying for Automobile Insurance at the Pump: A Critical Review. Research Study No. 076, Washington, D.C.
- Association of California Insurance Companies. 1990. Comments on Pay-As-You-Drive Proposal. Memorandum to Barbara Crowley, Vice Chair, California Energy Commission, Sacramento, CA. Prepared by Thomas A. Aceituno. 18 June. .
- Attorneys for Minority/Low-Income/Consumer Coalition. 1992. Comments Upon Proposed Section 2646.6. Presented before the Insurance Commissioner of the State of California, December, San Francisco, CA. Public Advocates, Inc.
- Baker, Lawrence. 1998. Letter to J. Daniel Khazzoom, 9 November. Auto Club of Southern California, Costa Mesa, CA.
- Beck, Lowell. 1993. Another Perspective: Pay-at-the-Pump A Non-Starter for Auto Coverage. *National Underwriter*, 8 March, 21-22.
- Berg Douglas, Frederick Dunnbier, and Tony Litwinko. 1994. PAY-AT-THE-PUMP Auto Insurance: Could it Work? *CPCU Journal* (September): 140-151.
- California Assembly. 1997. Assembly Bill No. 595.
- California Senate. 1993. Committee on Insurance, Claims, and Corporations. Bill Analysis: Automobile Insurance Pay-at-the-Pump. 21 April.
- CDI (California Department of Insurance). Office of Policy Research. Files of California Department of Insurance. Sacramento, California.
- . 1994. *Impact Analysis of Weighing Auto Rating Factors to Comply with Proposition 103*. Sacramento, CA. December.
- . 1998. *California's Uninsured*. Sacramento, CA. September.
- Chicago Area Transport Study. 1997. State of Illinois Motor Fuel Tax Summary. Chicago, IL.

- Cleveland, Jack. 1991. Statement on behalf of the Texas Automobile Insurance Service Office before the State Board of Insurance, 26 September.
- Cook County Board of Commissioners. 1989. An Ordinance – Cook County Tax on the Retail Sale of Gasoline, Cook County, IL.
- C&L (Coopers & Lybrand Casualty Actuarial and Risk Management Consulting). 1988. A Report to the Legislature of the State of Hawaii – Study of a State Motor Vehicle Insurance Fund and Selected Insurance Issues, San Francisco, CA.
- C&L (Coopers & Lybrand Casualty Actuarial and Risk Management Consulting). 1993. The Effect of Uninsured Motorist Act of 1994 on Revenues and Costs of State and Local Government in California. Memorandum to Kirk West, Californians to Save our Economy.," San Francisco, CA. Prepared by John J. Joyce.
- Devlin, Rose Ann. Implications of no-fault Automobile Insurance. *International Review of Law and Economics* 10(2):193-205.
- Dionne, Georges, Denise Desjardins, Claire Laberge-Nadeau, and Urs Maag. 1995. Medical Conditions, Risk Exposure, and Truck Drivers' Accidents: An Analysis with Count Data Regression Models. *Accident Analysis and Prevention* 27(3)295-305.
- El-Gasseir, Mohammed M. 1990. The Potential Benefits and Workability of Pay-as-You-Drive Automobile Insurance. Docket No. 89-CR-90, in the matter of 1990 Conservation Report, California Energy Resource Conservation and Development Commission, Sacramento, CA, June.
- Energy and Environmental Analysis. 1990. Analysis of the Fuel Economy Boundary for 2010, A study prepared for Martin Marietta Energy System, Contract No. 3 X 5B 08248
- Fridstrom, Lasse, Jan Ifver, Siv Ingebrigtsen, Risto Kulmala, and Lars Krogsgard Thomsen. 1995. Measuring the Contribution of Randomness, Exposure, Weather, and Daylight to the Variation in Road Accident Counts. *Accident Analysis and Prevention* 27(1)1-20.
- Glick, Ned with assistance from Jonathan Berkowitz. 1997. Statistical Evidence of Fatality Increases in Response to 'No-fault' Insurance. Working paper, January 14.
- Gruenspecht, Howard, Bob Schmitt, and Tom Wenzel. 1994. Policy Analysis of PAY-AT-THE-PUMP for Inspection and Registration Fees and Insurance. Report prepared for the U.S. Department of Energy, Economic Analysis and Competition, Office of Policy. Washington, D.C.
- Heavenrich, Robert M. and Karl H. Hellman. 1996. Light-Duty Automotive Technology and Fuel Economy Trends Through 1996. Technical Report, EPA/AA/TDSG/96-01. Report prepared for the Office of Mobile Sources, U.S. Environmental Protection Agency.
- Highway Loss Data Institute. 1995. Atlas of Automobile Injury and Collision Loss in Large Metropolitan Areas. Research Report HDLI A46. Arlington, VA.
- IIHS (Insurance Institute for Highway Safety). 1990. Where is Safety in the Fuel Economy Debate? Status Report. Arlington, VA, September.

- . 1995. Pay-at-the-Pump: It Isn't Good Insurance, It Isn't Good Policy. Prepared by Stephen L. Oesch. Arlington, VA, July.
- Insurance Information Institute. 1992. The Cost of Urban Auto Insurance. Prepared by Sean F. Mooney. New York, NY, November.
- Insurance Information Institute. 1999. *Insurance Issues Update*. New York, NY, July.
- Ives, Henry Swift. 1925. Compensation by a Tax on Gasoline. In *Selected Articles on Compulsory Automobile Insurance: Liability and Compensation for Personal Injury*, edited by Edison L. Bowers. New York, NY: H. W. Wilson Co.
- Karcher, Alan. 1986. Overhauling the Auto Insurance Rattletrap: A Radical Remedy. *New Jersey Reporter*, January.
- Khazzoom, J. Daniel. 1994. *An Econometric Model of Fuel Economy and Single-Vehicle Highway Fatalities*. Greenwich, Connecticut: JAI Press.
- Khazzoom, J. Daniel. 1996. Safety Implications of PAY-AT-THE-PUMP. Report prepared for the Office of Economic, Electricity, and Natural Gas Analysis, Office of Policy, U.S. Department of Energy. Washington, D.C.
- Khazzoom, J. Daniel. 1997. Impact of Pay-at-the-Pump on Safety Through Enhanced Vehicle Fuel Efficiency. *The Energy Journal* 18(3) 103-133.
- Khazzoom, J. Daniel. 1998. Pay-at-the-Pump Auto Insurance. Discussion Paper 98-13, Resources for the Future, February.
- Khazzoom, J. Daniel. 1999a. Addressing the Criticisms of Pay-at-the-Pump and Exploring What it Takes to Make Pay-at-the Pump Public- and Industry-Friendly. Discussion Paper 99-14, Resources for the Future, Washington, D.C., January.
- Khazzoom, J. Daniel. 1999b. Workshop Report: A Report on a U.S. EPA-Sponsored Workshop on Criticisms of Pay-at-the-Pump and a Proposal for a Reconstituted Pay-at-the-Pump. Report prepared for the Office of Policy, Planning, and Evaluation of the U.S. Environmental Protection Agency. Washington, D.C., March.
- Kron, Joanne. 1991. Letter to Claire Koriath, Chair, Texas State Board of Insurance. Prepared on behalf of Allstate Insurance Co., Northwood, IL
- Lawrence Berkeley Laboratory. 1995. Analysis of Pay-as-you-drive Insurance Systems and Other Variable Driving Charges. Berkeley, CA, July.
- Maril, Robert Lee. 1994. *The Impact of Mandatory Auto Insurance Upon Low Income Residents of Maricopa County, Arizona*. Prepared for the National Association of Independent Insurers. Des Plaines, IL, Mashaw, Jerry L. and David L. Hafst. 1990. *The Struggle for Auto Safety*. Cambridge, MA: Harvard University Press.
- Moynihan, Daniel P. 1967. Next: A New Auto Insurance Policy. *The New York Times Magazine*, 27 August, 26-27, 76-78, 80, 82-83.

- National Association of Independent Insurers. 1993. *PAY-AT-THE-PUMP Insurance – A Recipe for National Disaster*, Des Plaines, IL.
- National Association of Insurance Commissioners. 1993. Auto Insurance Database Report. Kansas City, MO.
- National Highway Traffic Safety Administration. 1994. *Traffic Safety Facts 1993*. Washington D.C., October.
- O’Connell, Jeffrey. 1995. Allowing Motorists a Choice to Be Legally Uninsured by Surrendering Tort Claims for Noneconomic Loss. *Connecticut Insurance Law Review* (Spring) 33-66.
- Office of Technology Assessment. 1992. *Retiring Old Cars — Programs to Save Gasoline and Reduce Emissions*. Washington, D.C.
- Public Advocates, Greenlining Coalition, Hermandad Mexicana Nacional, and Mexican-American Political Association. 1993. PAY-AT-THE-PUMP In-Person Survey of 800 Californians: A Report to California Legislature, the Governor, and the Insurance Commissioner. San Francisco, CA: The Greenlining Coalition, April.
- Quigley, Lawrence F. 1929. Bill for Auto Insurance Fund. In *Selected Articles on Compulsory Automobile Insurance: Liability and Compensation for Personal Injury*, edited by Edison L. Bowers. New York, NY: H. W. Wilson Co.
- Rea, Samuel A. Jr. 1986-87. Economic Analysis of Fault and no-fault Liability Systems. *The Canadian Business Law Journal* 12: 444-472.
- . 1992. Insurance Classifications and Social Welfare. In *Contributions to Insurance Economics*, edited by Georges Dionne. Boston, MA: Kluwer Academic Publishers, 377-396.
- Rothkrug, Paul. 1990. Letter to Gary Klein, Fund for the Resource of the Environment, California Energy Commission, San Francisco, CA Snyder, David F. 1990. Comments of the American Insurance Association. Docket No.89-C.R -90, Notice of Public Hearing on the 1990 Conservation Report. Prepared for the California Energy Commission, Sacramento, CA
- Sugarman, Stephen D. 1990. Face It: The Current System for Injury Liability is a Mess. *The Sacramento Bee*, 1 April.
- . 1992. Nader's Failures: A Review of the Struggle for Auto Safety. *California Law Review* 80(1) 289-305.
- . 1994. PAY-AT-THE-PUMP Auto Insurance: The California Vehicle Injury Plan (VIP) for Better Compensation, Fairer Funding, and Greater Safety. Prepared for the Institute of Governmental Studies, University of California, Berkeley, California.
- Tobias, Andrew. 1994. *Auto Insurance Alert*. New York, NY: Simon and Schuster.
- Tsujimura, Rick. 1994. Testimony before the Hawaii House Committee on Finance on behalf of State Farm Insurance Companies. Sacramento, CA, 28 February.

- UCS (Union of Concerned Scientists). 1994. An Equity Analysis of “Pay-as You-Drive” Automobile Insurance in California. Report prepared by Jeff Allen, Roland Hwang, and Jane Kelley. Berkeley, CA
- U.S. Bureau of Labor Statistics. Consumer Expenditure Division, Department of Labor. 1995. *Consumer Expenditures Survey 1995*, Washington, D.C
- U.S. Department of Energy. Energy Information Administration. 1993. *Household Vehicles Energy Consumption 1991*, USDOE, DOE/EIA -0464(91), Washington D.C
- . 1997. *Household Vehicles Energy Consumption 1994*. USDOE, DOE/EIA -0464(94). Washington, D.C,
- U.S. General Accounting Office. 1991. Highway Safety: Have Automobile Weight Reduction Increased Highway Fatalities? Report prepared for the U.S. Congress, GAO/PEMD 92-1. Washington, D.C., October.
- Vickrey, William. 1969. Current Issues in Transportation. In *Contemporary Economic Issues*, edited by Neil W. Chamberlain. Homewood, IL: Richard D. Irwin, Inc.
- Western States Petroleum Association. 1993. SB 684: Pay-at-the-Pump Motor Vehicle Insurance. Memorandum submitted to California Senate Judiciary Committee. 14 May.
- Wirth, Charles. 1991. Testimony before the Texas Board of Insurance, 15 December.
- Woll, Richard G. 1991. Auto Insurance Rate. Unpublished manuscript prepared for Allstate Insurance Company.