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# Pricing For Traffic Safety

## *How Efficient Transport Pricing Can Reduce Roadway Crash Risk*

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## Summary

This report evaluates the traffic safety impacts of transport pricing reforms including efficient road, parking, fuel and insurance pricing, and public transit fare reductions. This analysis indicates that such reforms can provide significant safety benefits. Crash reductions vary depending on the type of price change, the portion of vehicle travel affected, and the quality of transport options available. If implemented to the degree justified on economic efficiency grounds (for example, cost recovery road and parking pricing), these reforms are predicted to reduce traffic casualties by 40-60%. The low per capita traffic fatality rates in European and wealthy Asian countries largely result from their high fuel prices. Yet, these benefits are often overlooked. Pricing reform advocates seldom highlight crash reduction benefits, and traffic safety experts seldom advocate pricing reforms. Critics claim that pricing reforms are regressive, but this is not necessarily true. This is a particularly important issue for developing countries, which are now establishing pricing practices that will affect their future vehicle travel patterns and therefore crash risks.

## Introduction

Traffic safety is an important transport planning objective. Traffic accidents cause millions of deaths and disabilities, and hundreds of billions of dollars in economic costs annually worldwide (Litman 2009; WHO 2004). As a result, safety is a paramount consideration in roadway design and operation, and many consumers willingly pay a premium for optional safety features. Traffic safety experts are continually searching for new ways to increase traffic safety.

Many factors affect traffic risk, including the amount and type of travel that occurs, roadway and vehicle type, and driver behavior. One important but often overlooked factor is *transportation pricing*, that is, the fees charged for vehicles, road and parking facilities, fuel, insurance and public transport fares. Analysis described in this report indicates that various transport pricing reforms can significantly increase traffic safety. However, these impacts are generally overlooked, both when evaluating pricing reform benefits and when searching for traffic safety strategies. As a result, such reforms are implemented less frequently than optimal.

The current traffic risk *paradigm* (the basic assumptions used to define a problem and evaluate possible solutions) tends to ignore pricing as a traffic safety strategy because it assumes that traffic crashes result primarily from special risks, such as drunk or distracted driving, unsafe vehicles and poorly designed roadways. It considers "normal" vehicle travel (a responsible, sober driver, wearing seatbelts, in a modern car, on a well-designed highway) to be a safe activity that need not be reduced. From this perspective, transport price increases are inefficient and unfair ways to increase safety because they would "punish" all motorists for risks caused by a minority. It would be an admission that traffic accidents are a general rather than a special risk. Also, the current paradigm tends to measure risk using distance-based indicators (such as fatalities per 100,000 vehicle-miles) and so does not recognize the safety benefits (reductions in *per capita* fatality rates) that result from policies which reduce total vehicle travel.

There are good reasons to question the current risk paradigm. Current traffic safety programs are not very effective. Despite billions of dollars invested to create safer roads and vehicles, and to encourage safer driving behavior, traffic risk continues to be a major cause of deaths and injuries, and the U.S. has one of the highest per capita traffic fatality rates among developed countries. Much of the reduction in traffic fatalities during the last half-century resulted from improvements in emergency response and medical treatment, rather than from safety programs that reduce crash rates (Noland 2003).

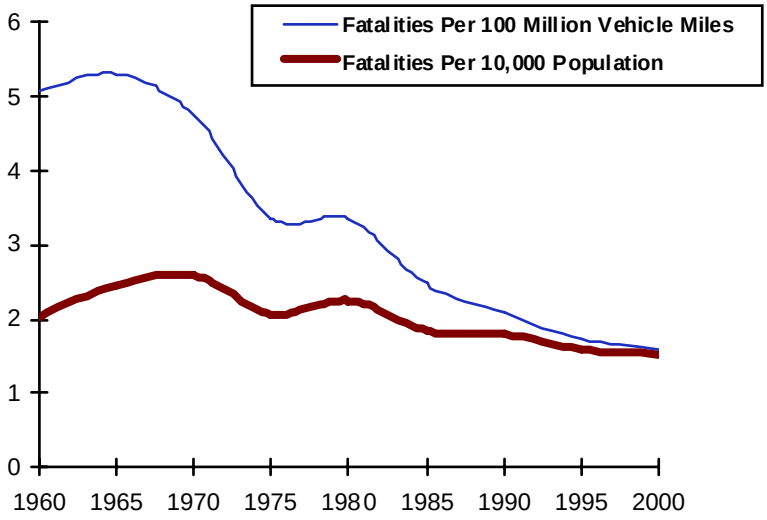
According to analysis in this report, various transport pricing reforms can provide significant safety benefits. These include increased fuel prices, road tolls, parking pricing, distance-based insurance and registration fees, and reduced public transit fares. Traffic safety is just one of several justifications for these reforms. More efficient transport pricing can help achieve various planning objectives including congestion reduction, equitable road and parking facility finance, equitable and affordable vehicle insurance, energy conservation, pollution reduction, and more efficient land use patterns. Traffic safety adds another important benefit to this list.

The follow section discusses factors to consider when evaluating the traffic safety impacts of transport pricing reforms.

## Pricing and Risk Evaluation

Traffic *crashes* (also called *accidents* or *collisions*) can be measured in various ways that lead to very different conclusions about the nature of this risk and the effectiveness of safety strategies. For example, *crash* rates tend to increase with urban density due to increased vehicle interactions, but crash *severity* and therefore *casualties* (injuries and deaths) tend to be higher in rural areas due to higher speeds. Risk analysis is affected by the *reference units* (units in the denominator) used. Figure 1 illustrates two ways to measure traffic fatality rates. When measured per unit of travel (e.g., per 100 million vehicle-miles), as traffic safety experts prefer, fatality rates declined more than two thirds during the last four decades. From this perspective, past traffic safety programs were successful and should be continued.

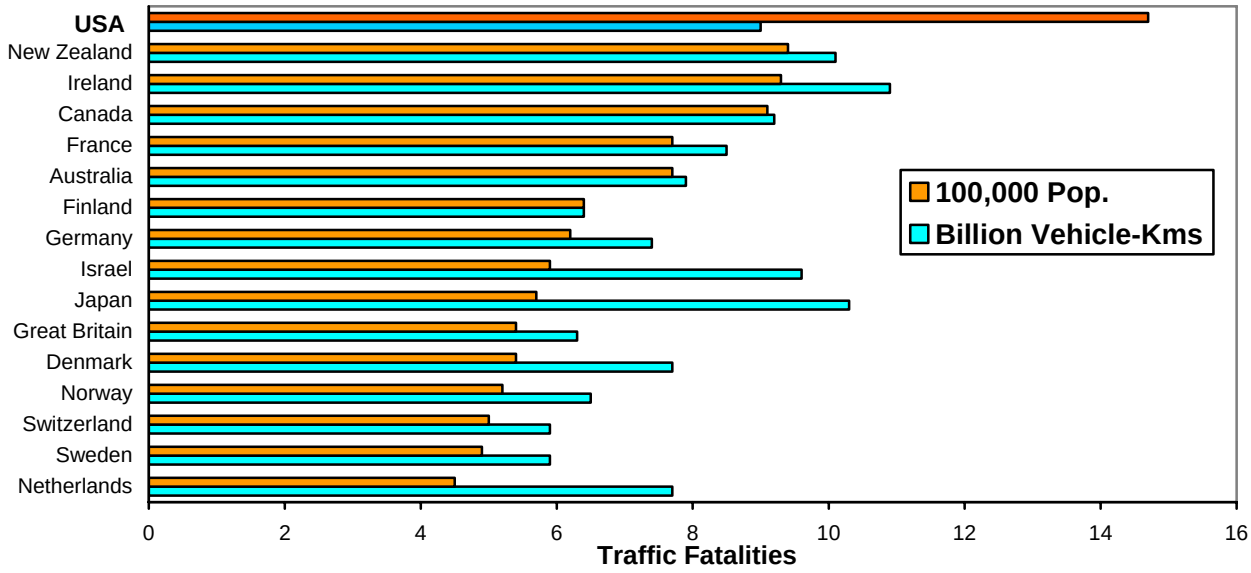
***Figure 1*** **U.S. Traffic Fatalities** (BTS 2000)




*When measured **per vehicle-mile**, fatality rates declined significantly, but when measured **per capita** they show little decline due to increased per capita vehicle travel.*

But per capita vehicle mileage more than doubled during that period, offsetting much of this decline. When measured *per capita* (e.g., per 10,000 population), as with other health risks, there was little improvement despite large investments in safer road and vehicle designs, increased use of safety devices, targeted traffic law enforcement, and better emergency response and medical care. Taking these factors into account, much greater casualty reductions can be expected (Noland 2003). For example, seat belt use increased from nearly 0% in 1960 to 75% in 2002, which by itself should reduce per capita traffic fatalities by about 33%, yet traffic fatality rates declined only 25%. Traffic crashes continue to be one of the greatest single causes of deaths and disabilities for people aged 1-44 years (CDC 2003). Although the U.S. has an average traffic fatality rate *per vehicle-kilometer*, it has one of the highest traffic fatality rates *per capita*, as illustrated in Figure 2. From this perspective, traffic risk continues to be a major problem, existing strategies are ineffective and new approaches are needed to achieve safety targets.

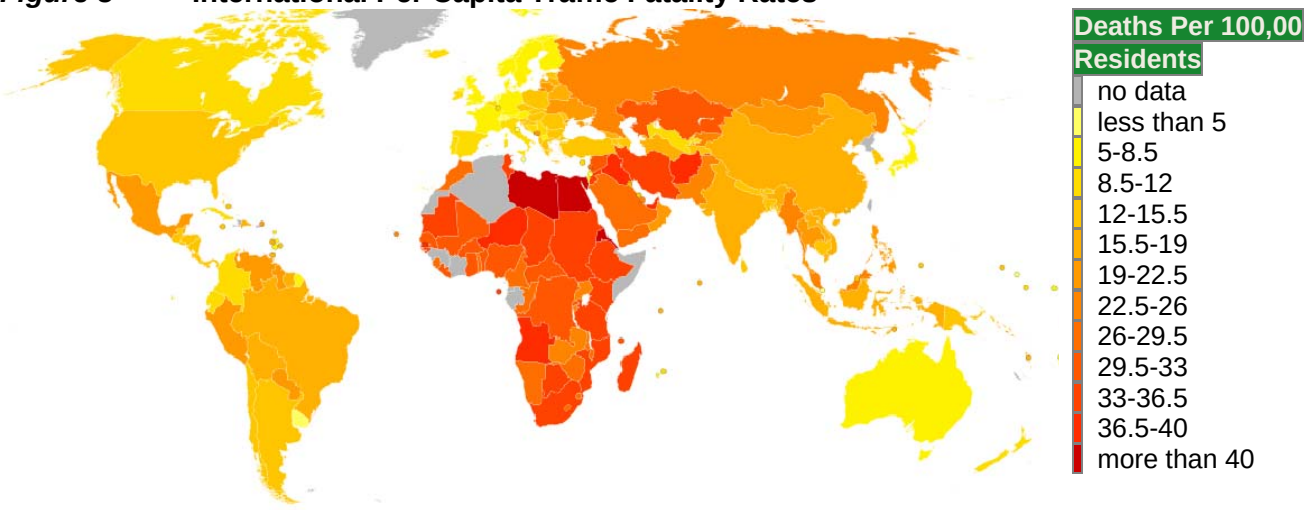
***Figure 2*** **International Traffic Fatality Rates[1]**




*The USA has the highest per capita traffic fatality rate among peer countries.*

Many less developed countries have very high per capita traffic fatality rates despite low vehicle ownership and mileage. This reflects a combination of inexperienced drivers, unsafe user behaviors (impaired driving, failure to use safety equipment such as seatbelts and helmets), inferior vehicles and roadways, ineffective traffic law enforcement, and poor emergency response and medical care.

***Figure 3*** **International Per Capita Traffic Fatality Rates[2]**

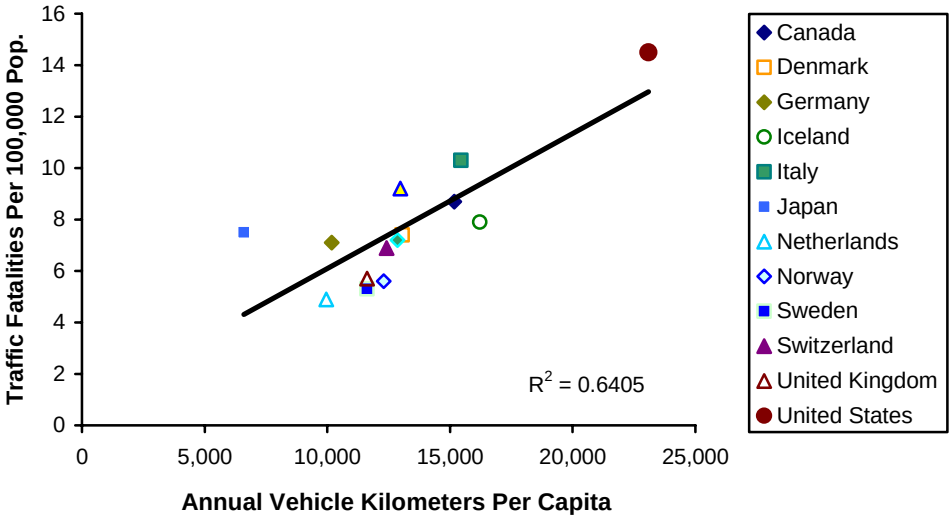



*Per capita traffic fatality rates tend to be highest in low income countries and decline as they develop.*

[1] *List of Countries by Traffic Fatality Death Rate*, Wikipedia http://en.wikipedia.org/wiki/List_of_countries_by_traffic-related_death_rate.

Traffic fatality rates tend to decline as these countries develop, despite increased vehicle travel. However, comparisons between otherwise similar countries, regions and people indicate that per capita traffic casualty rates increase with vehicle travel (Edlin and Karaca-Mandic 2006; Litman and Fitzroy 2010).

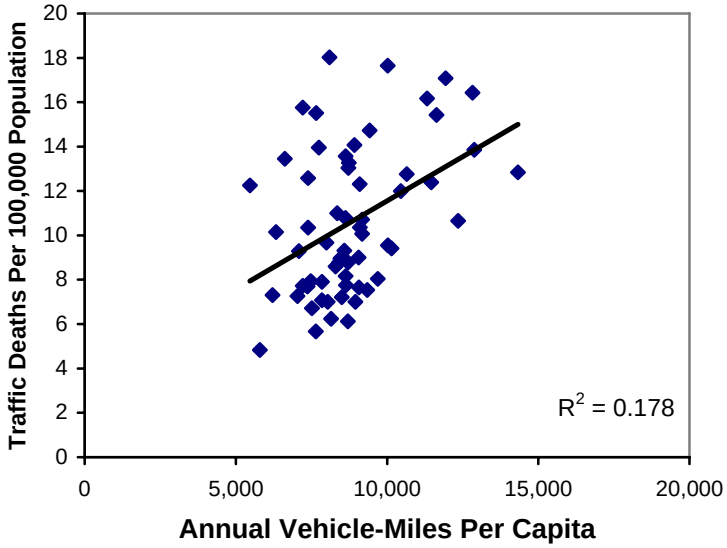
***Figure 4*** **Vehicle Mileage and Traffic Fatality Rates In OECD Countries** (OECD Data)




*Among economically developed countries, per capita traffic fatalities increace with vehicle travel.*

Figure 4 shows a strong ($R^2$=0.64) positive relationship between per capita vehicle travel and fatality rates among OECD (Organization for Economic Cooperation and Development) countries. Similarly, Figure 5 shows a positive correlation between vehicle travel and traffic fatalities for U.S. cities.

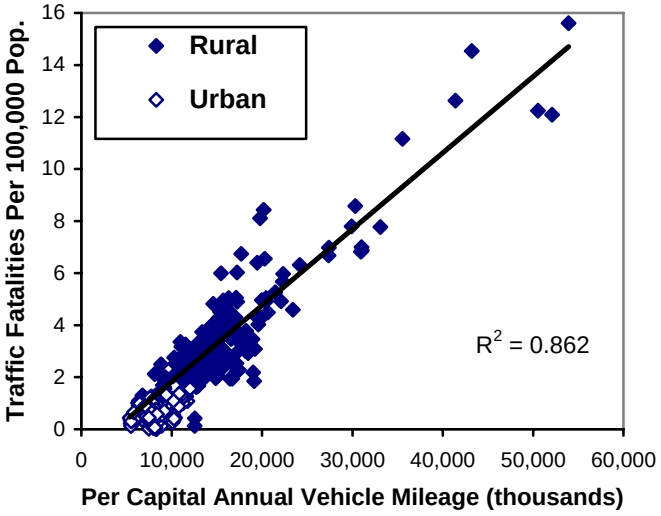
***Figure 5*** **Vehicle Mileage and Traffic Fatality Rates For U.S. Cities** (FHWA 2002)




*This graph indicates a moderate positive relationship between per capita annual vehicle mileage and traffic fatalities in U.S. cities.*

Figure 6 shows a strong positive relationship between per capita vehicle mileage and traffic fatalities for U.S. states, particularly in rural areas.

***Figure 6*** **U.S. Traffic Fatality and Mileage Rates** (FHWA 1993-2002 data)




*This graph indicates a strong positive relationship between per capita annual vehicle mileage and traffic fatalities in U.S. states, particularly in rural areas.*

The relationship between risk and mileage is strong for similar drivers and vehicles (Ferreira and Minike 2010), and for motorists who marginally reduce their mileage since most risk factors do not change. For example, a motorist who reduces mileage 20% in response to a price incentive does not usually become more hazardous. Sivak and Schoettle (2010) found that many of the factors that contributed to the decline in U.S. traffic crashes between 2005 (43,510 traffic fatalities) and 2008 (37,261 fatalities), resulted from vehicle travel reductions, including reduced commuting, long-distance leisure driving, truck transport, and driving by younger drivers.

Reductions in total vehicle travel can cause proportionally larger reductions in *total* crash damages since about 70% of crashes involve multiple vehicles, so each vehicle removed from traffic reduces both its chances of causing a crash *and* of being the target of crashes caused by another vehicle, and reducing multi-vehicle crashes reduces multiple claims (Vickrey 1968; Edlin and Karaca-Mandic 2006; Litman and Fitzroy 2010).

Traffic safety experts often emphasize that most crashes are associated with special risk factors (young and inexperienced drivers, impairment, distraction, speeding, etc.), which implies that safety programs should target this risky travel and not bother with low-risk vehicle travel. But high- and low-risk travel are complementary; policies that stimulate lower-risk driving also tend to stimulate higher-risk driving. For example, if transport policies make driving inexpensive and convenient, and land use policies encourage sprawl, it is difficult to reduce high risk driving since most destinations are only conveniently accessible by automobile, and alternative modes are inferior and stigmatized. As a result, teenagers, drunks and mentally impaired people continue to drive. Described more positively, policy reforms that reduce overall vehicle travel tend to provide proportionate or even greater reductions in crash casualties. This expands the scope of strategies that can be used to increase overall traffic safety.

## Pricing Reform Safety Impacts

*This section evaluates the impacts of various transport pricing reforms.*

A basic economic principle is that markets tend to be most efficient and equitable if *prices* (what consumers pay for a good) reflect *marginal costs*, that is, the full incremental costs of providing that good (Clarke and Prentice 2009).[2] This means, that motorists should pay directly for the costs of the road and parking facilities they use, plus fees that reflect the congestion delays, accident risk and pollution emission damages they impose on others.

These pricing reforms can significantly reduce various transport problems (or *costs*),[3] including traffic and parking congestion, accident risk, fuel production externalities, pollution emissions, land use sprawl, and inadequate mobility for non-drivers. People are sometimes skeptical that pricing affects vehicle travel – they point to situations in which a large price change caused little perceived change in travel behavior – but extensive evidence indicates that motorists do respond to prices, particularly over the long-run (Litman 2008).

The following section evaluates the travel and safety impacts of these pricing reforms. For more information see related chapters in the *Online TDM Encyclopedia* (VTPI 2011).

### *Fuel Tax Increases (www.vtpi.org/tdm/tdm17.htm)*

#### Justifications

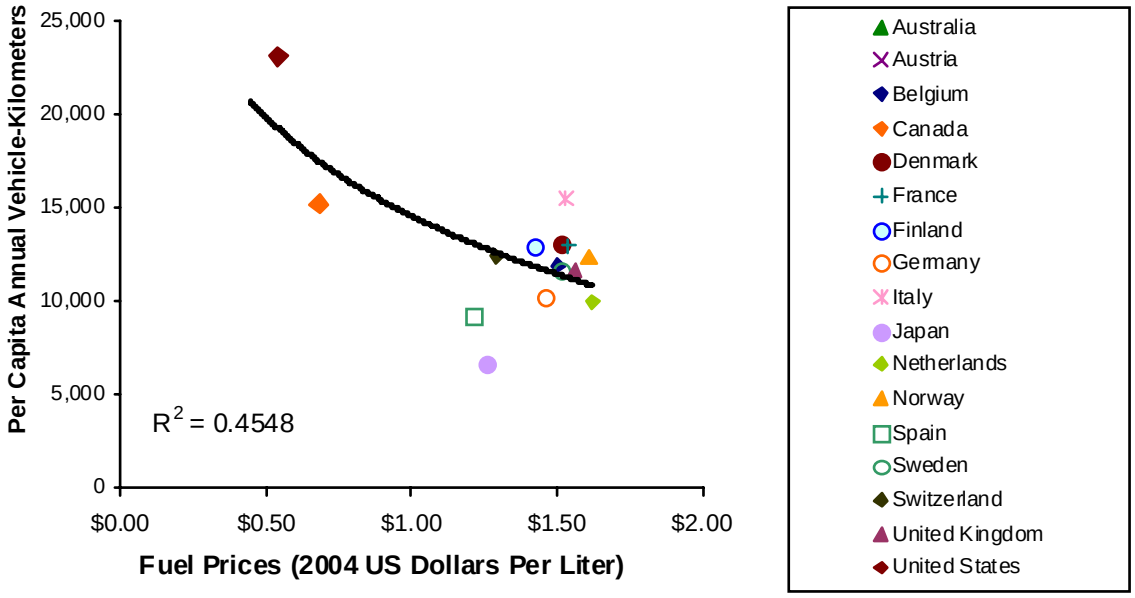
Fuel tax increases are often recommended to finance roadway facilities and other transportation improvements, and to encourage fuel conservation in order to achieve various economic and environmental objectives, including energy security, reduced trade imbalance and emission reductions (Litman 2009; Metschies 2009; Wachs 2003).

#### Travel Impacts

Fuel price increases tend to reduce overall vehicle travel. The long-term elasticity of fuel consumption with respect to price is about –0.7, so a 10% price increase causes a 7% reduction in fuel use, but about two thirds of this result from consumers purchasing more fuel efficient vehicles, and only about one third from vehicle mileage reductions, so a 10% increase in fuel price typically reduces mileage just 2-3% (Johansson and Lee Schipper 1997; Goodwin, Dargay and Hanly 2004).

[2] There are exceptions to this rule, for example, when underpricing may be justified to achieve social equity objectives, to support strategic objectives such as helping develop a new industry, to take advantage of scale economies, or as a second-best strategy to offset other market distortions such as underpricing of competing goods.
[3] What most people call a *problem* economists call a *cost*, particularly an *external cost* in which one person's activities harm other people.

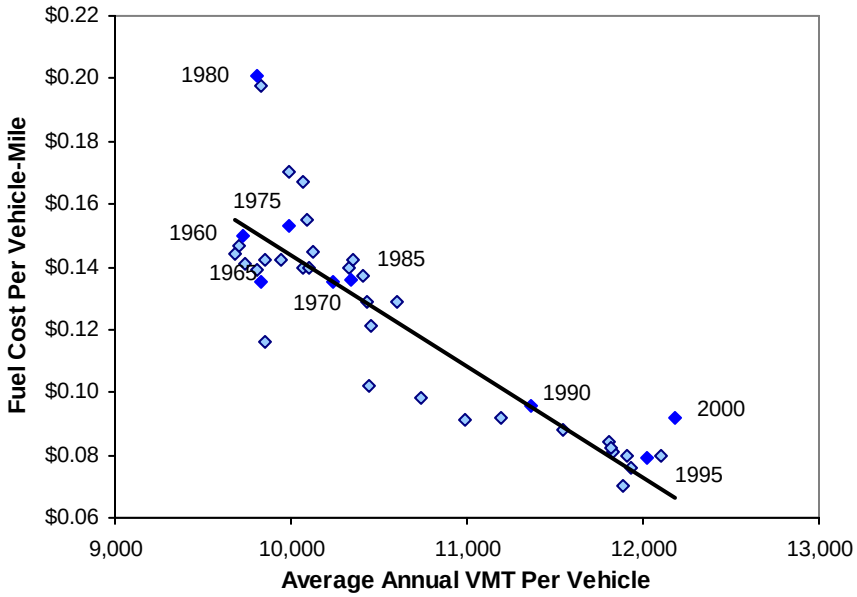
***Figure 7*** **Fuel Price Versus Per Capita Vehicle Travel** (Litman 2008)




*Higher fuel prices tend to reduce per capita vehicle travel.*

Figures 7 and 8 illustrate how changes in real fuel prices (adjusted for inflation and currency exchange) affect per capita annual vehicle travel.

***Figure 5*** **Fuel Costs Versus Annual Vehicle Mileage** (BTS 2001)

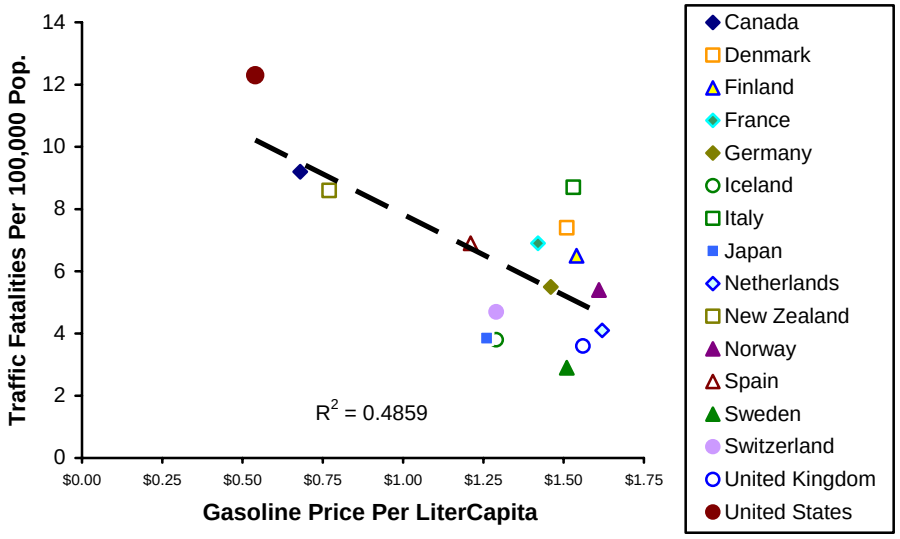



*Per capita vehicle mileage tends to increase when real (inflation-adjusted) per-mile fuel costs decline. For a spreadsheet with the source data of this graph, click here: FuelTrends*

### Safety Impacts

Various studies indicate that, all else being equal, higher fuel prices tend to reduce per capita traffic fatality rates. Figure 9 indicates that among OECD countries, per capita traffic fatality rates decline with higher fuel prices.

***Figure 9*** **Vehicle Mileage and Traffic Fatality Rates In OECD Countries[4]**




*Among economically developed countries, per capita traffic fatalities decline with fuel price.*

Sivak (2008) found that a 2.7% vehicle travel decline caused by high fuel prices and a weak economy during 2007-2008 caused a much larger 17.9% to 22.1% month-to-month traffic fatality reductions, probably due to large vehicle travel reductions by lower income drivers (who tend to be young or old, and therefore higher than average risk) and speed reductions to save fuel. Based on U.S. data, Grabowski and Morrisey (2004) estimate that each 10% fuel price increase reduces total traffic deaths 2.3%, with a 6% decline for drivers aged 15 to 17 and a 3.2% decline for ages 18 to 21 according to analysis. In follow-up research, Grabowski and Morrisey (2006) estimate that a one-cent increase in state gasoline taxes will yield a 0.25% decrease in per capita traffic fatalities and a 0.26% decrease in fatalities per VMT. Leigh and Geraghty (2008) estimate that a sustained 20% gasoline price increase would reduce approximately 2,000 traffic crash deaths (about 5% of the total), plus about 600 air pollution deaths. Based on New Zealand data, Schuffham and Langley (2002) found that per capita crash rates varied with changes in vehicle mileage, with crash reductions caused by fuel price increases.

There is some debate concerning the safety impacts of more fuel efficient vehicle fleets, which would probably result from higher fuel prices. Lighter vehicle occupants face greater risk in crashes with heavier vehicles or stationary objects, but this tends to be offset by their lower crash frequency, reduced risk to others, and safer designs (CBO 2003).

[4] Gerhard Metschies (2005), *International Fuel Prices 2005*, International Fuel Prices (www.internationalfuelprices.com); at www.international-fuel-prices.com/downloads/FuelPrices2005.pdf. *List of Countries by Traffic Fatality Death Rate*, Wikipedia http://en.wikipedia.org/wiki/List_of_countries_by_traffic-related_death_rate (9 February 2011).

## *Road Pricing (www.vtpi.org/tdm/tdm35.htm)*

### Description

Road tolls and congestion fees can be implemented to reduce traffic problems, generate revenue, or some combination of these. Road pricing tends to be more efficient and equitable than other road financing options since it test consumers' willingness to pay for such facilities and avoid imposing costs on on-users. Since highway driving tends to increase with wealth, road tolls also tend to be progressive with respect to income compared with other road financing options.

### Travel Impacts

Road pricing typically reduces affected vehicle travel 10-30%, depending on price, facility type, and type of users. In most jurisdictions only a minor portion of total vehicle travel is tolled.

### Safety Impacts

Although research is limited, available data indicate that road pricing reduces crashes. Cities with congestion fees, such as Singapore, London and Stockholm tend to have very low per capita traffic fatality rates, although factors other than tolling probably contribute to this outcome. The city of London's congestion fee reduced area vehicle trips 20%, and crashes about 25% (TfL 2004). Analyzing crash rates at a fine geographic scale, Lovegrove and Litman (2008) concluded that a typical congestion pricing program that encourages shifts to alternative modes is likely to reduce neighbourhood collision frequency approximately 19% (total) and 21% (severe).

Tolling grade-separated highways could increase per-mile crash rates if it shifts traffic to surface roads, but since many tolled facilities (particularly bridges) have few alternative routes, the magnitude of this impact is probably small and overwhelmed by reductions in total vehicle travel, so in most situations tolling probably reduces total crashes.

## *Parking Pricing (www.vtpi.org/tdm/tdm26.htm)*

### Description

*Parking pricing* (motorists pay directly for using parking facilities) can be implemented to reduce parking congestion, generate revenues or a combination of these objectives. Parking pricing is far more common than road pricing and there is considerable potential for expansion since most parking is unpriced, significantly subsidized, bundled, or rented by the month or year (which gives motorists little incentive to shift mode part-time).

### Travel Impacts

Cost recovery parking pricing (prices that reflect the full costs of providing that parking facility) and *parking cash out* (offering non-drivers the cash equivalent of the parking subsidy they would receive if they traveled by automobile) typically reduce vehicle travel 10-30%, although impacts vary depending on conditions, including the type of trips and users affected, and the availability of alternative parking and travel options (Litman 2008).

### Safety Impacts

Although there is little research specifically on parking pricing traffic safety impacts, they are probably similar to road pricing per reduced vehicle-mile. Since parking pricing could be widely applied, it has large potential safety benefits.

## *Distance-Based Pricing (www.vtpi.org/tdm/tdm10.htm)*

### Description

*Distance-based* (also called *Pay-As-You-Drive*) pricing converts vehicle insurance premiums and registration fees from fixed costs into variable costs (Ferreira and Minike 2010; Litman 1997). This gives motorists a new financial incentive to reduce their annual mileage.

### Travel Impacts

With fully-prorated vehicle insurance (total premiums are divided by average annual mileage, so a $600 premium becomes 5¢ per vehicle-mile, a $1,200 premium becomes 10¢ per vehicle-mile, and $1,800 premium becomes 15¢ per vehicle-mile) the average motorist would pay about 8¢ per vehicle-mile, which is predicted to reduce their vehicle travel by 8-12%, and somewhat more if other fixed vehicle charges, such as registration fees, are also made distance-based.

### Safety Impacts

To the degree that distance-based pricing reduces vehicle travel it reduces crashes. Crash reductions are proportionately larger than mileage reductions for two reasons. First, because this type of pricing incorporates other risk factors besides mileage, higher-risk motorists pay more per vehicle-mile and so have a greater incentive to reduce mileage. For example, a low-risk driver who currently pays $360 annual premiums would pay 3¢ per mile and so would be expected to reduce mileage by only about 5%, but a higher-risk driver who pays $1,800 in premiums would pay 15¢ per vehicle-mile and so would be expected to reduce mileage about 20%. As a result, the reduction in crashes should be larger than the reduction in risk. Some distance-based insurance pricing systems base premiums on when, where and how a vehicle is driven, which can provide additional safety benefits by discouraging particularly risky driving activity.

Second, since about two-thirds of traffic crashes involve multiple vehicles, widely-applied distance-based pricing can provide external safety benefits, that is, reduced risk to other road users regardless of whether or not drivers reduce their mileage. As a result, if fully implemented in an area, distance-based pricing can reduce traffic crashes by 12-15%, and possibly even more, depending on price structure and other factors such as the quality of transport options.

## *Transit Fare Reductions (www.vtpi.org/tdm/tdm112.htm)*

### Description

Public transport (including vanpools, buses, trains and ferries) fares can be reduced in various ways, including public funding, targeted discounts and commuter benefits (employers paying a portion of employee transit fares, often as a substitute for parking subsidies). A variation is to use increased subsidies to improve public transit service quality without raising fares.

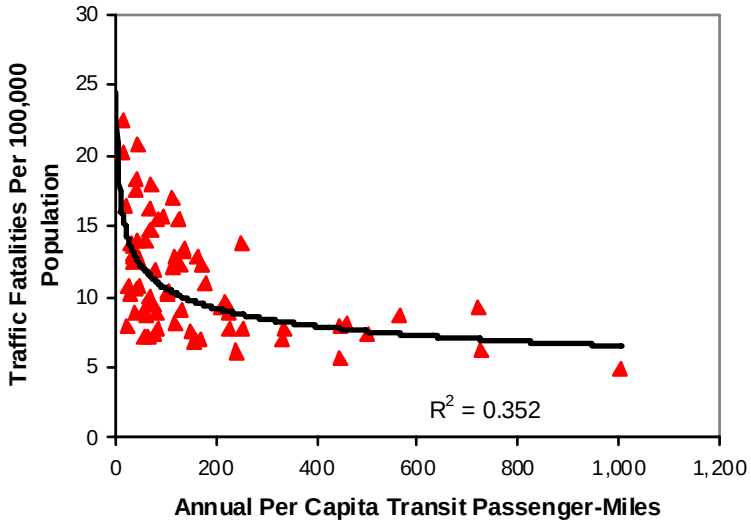
### Travel Impacts

Public transit fare reductions and service quality improvements tend to increase transit ridership. A 10% fare reduction typically increases transit ridership by 3% (Litman 2008). A portion of this transit travel substitutes for automobile travel, particularly with higher-quality public transit such as rail transit. In addition, high quality public transit service, which attracts a significant amount of discretionary travel (travel that would otherwise be by automobile) tends to leverage additional reductions in vehicle travel by affecting transport and land use patterns.

### Safety Impacts

Public transport tends to have very low traffic crash and casualty rates per passenger-mile and overall traffic fatality rates tend to decline in a community as public transit ridership increases, as indicated in figures 10 and 11.

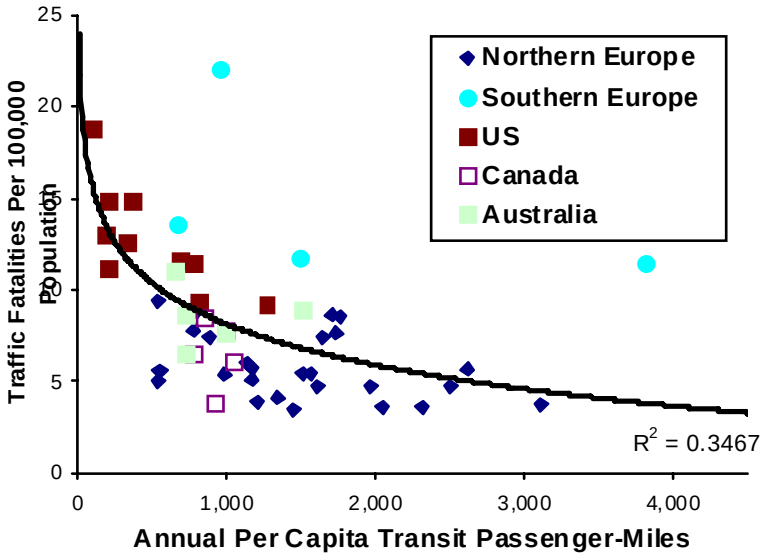
***Figure 10*** **U.S. Traffic Deaths** (Litman 2004)




*Per capita traffic fatalities (including automobile occupants, transit occupants and pedestrians) tend to decline with increased transit ridership.*

Lim, et al (2006) describes how Bus Rapid Transit improvements in Seoul, South Korea increased transit ridership more than 20%, but reduced bus casualties by 11% and total traffic crashes by 26%, indicating that crash rates per passenger mile declined by more than a third. This indicates that public transit service quality improvements can provide safety benefits.

***Figure 11*** **Traffic Fatalities Vs. Transit Travel** (Kenworthy and Laube 2000)




*International data indicate that crash rates decline with increased transit ridership.*

## *Summary*

Table 1 summarizes pricing reforms and their impacts. Total safety impacts depend on the amount and type of travel reduced. These reforms tend to be most effective and acceptable if implemented as an integrated program that includes improvements to alternative modes, encouragement programs, and smart growth land use policies. In addition to their direct impacts, pricing reforms help create political and social support for more multi-modal transport planning. Comparisons between otherwise similar geographic areas indicate that those with more efficient transport pricing have significantly less per capita vehicle travel and traffic casualties (typically 40-60% lower) than those where fuel, road and parking prices are lower.

***Table 1*** **Transport Pricing Reform Impacts**

| Pricing Type | Description | Travel Impacts | Traffic Safety Impacts |
|---|---|---|---|
| Higher fuel prices | Increase fuel prices to finance roads and traffic services, and to internalize fuel economic and environmental costs. | European-level fuel prices reduce per-capita vehicle travel 30-50% compared with North America. Affects most vehicle travel. | Vehicle travel reductions provide about proportionate or greater reductions in crashes (i.e., a 30% mileage reduction provides about 30%+ fatality reduction). |
| Road pricing | Tolls to reduce congestion and generate revenue. | Typically reduces affected vehicle travel 10-30%. Usually applies to a small portion of total travel. | Can have significant safety benefits where applied, but total impacts are generally small. |
| Parking pricing | User fees to finance parking facilities. Can also include parking cash out and unbundling. | Typically reduces affected vehicle trips 10-30%. Most common in city centers, campuses and hospitals. | Can have significant safety benefits where applied, but total impacts are usually moderate due to limited application. |
| Distance-based pricing | Prorates vehicle insurance premiums and registration fees | Fully-prorated pricing typically reduces affected vehicle travel 8-12%, although most current examples have smaller price and travel impacts. | Potentially large safety benefits to affected vehicles. If widely applied can provide large total safety benefits. |
| Public transport fare reductions | Reduce fares and commuter transit benefits to make public transit travel more attractive and affordable. | A 10% fare reduction typically increases ridership 3%, although only a portion of this substitutes for driving. | Fare reductions alone have modest impacts, but integrated programs can provide large safety benefits. |

*This table summarizes major pricing reform categories and their travel and safety impacts.*

Advocates usually focus on individual reforms intended to provide specific benefits while safety benefits are often overlooked or undervalued. For example, road toll advocates generally focus on congestion reductions and increased revenues, safety benefits are not usually mentioned. Similarly, safety benefits are seldom mentioned by advocates of efficient parking pricing, fuel tax increases or public transit fare reductions. However, virtually all of these pricing reforms provide safety benefits, and if implemented to the degree justified on economic principles, the impacts could be significant, reducing vehicle travel and crashes by 30-60% (Litman 2007).

## Comprehensive Impact Analysis

Conventional transport policy evaluation tends to be *reductionist*, that is, individual problems are assigned to specific professions and agencies with narrowly defined responsibilities. For example, transport agencies are responsible for reducing traffic congestion, environmental agencies are responsible for reducing pollution emissions, and public health agencies are responsible for improving public fitness and health. This often results in incomplete analysis of benefits and costs. For example, transport agencies highlight the congestion reduction benefits of roadway expansion, but often overlook negative impacts that may result if this induces additional vehicle travel and land use sprawl. Similarly, environmental agencies highlight the energy savings and emission reductions that result from more fuel efficient vehicles, but often overlook the negative impacts that may result if, by reducing per-mile vehicle operating costs, this induces additional vehicle travel and sprawl.

Reductionist analysis tends to undervalue pricing reforms because it overlooks many resulting benefits. For example, the more efficient strategies compared in Table 2 illustrate this concept.

***Table 2*** **Comparing Strategies Including Travel Impacts**

| Planning Objective | Roadway Expansion | Fuel Efficient Vehicles | Pricing Reforms |
|---|---|---|---|
| *Motor Vehicle Travel Impacts* | *Increased* | *Increased* | *Reduced* |
| User convenience and comfort | ✓ | | |
| Congestion reduction | ✓ | × | ✓ |
| Roadway cost savings | × | × | ✓ |
| Parking cost savings | × | × | ✓ |
| Consumer cost savings | ✓ | ×/✓[5] | ×/✓[6] |
| Reduced traffic accidents | × | × | ✓ |
| Improved mobility options | ×[7] | | ×/✓[8] |
| Energy conservation | × | ✓ | ✓ |
| Pollution reduction | × | ✓ | ✓ |
| Physical fitness and health | | | ✓ |
| Land use objectives | × | × | ✓ |

*(✓ = Achieve objectives. × = Contradicts objective.) Roadway expansion and more fuel efficient vehicles provide few benefits, and by increasing total vehicle travel they can exacerbate other problems such as congestion, accidents and sprawl. Improving travel options, more efficient pricing, and more accessible land use development tends to reduce total vehicle travel and helps achieve many planning objectives.*

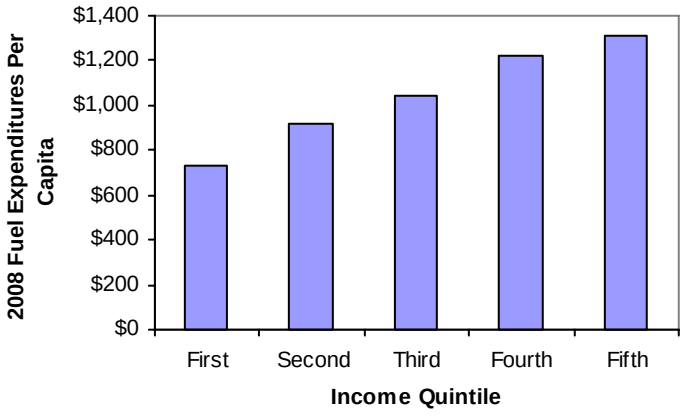
[5] More fuel efficient vehicles tend to have higher purchase costs but lower operating costs.
[6] Pricing reforms tend to increase some consumer costs but reduce others, such as road and parking fees that reduce the need to spend general taxes on roads and parking facilities, and distance-based fees that increase vehicle operating costs but reduce vehicle ownership costs.
[7] Wider roads and increased traffic speeds create barriers to walking and cycling, reducing mobility for non-drivers.
[8] Higher vehicle fees reduce the affordability of automobile travel but tend to improve travel by alternative modes by reducing vehicle traffic (which improves walking conditions), and increasing demand for public transit (which increases public transit service).

## Consumer Impacts

Pricing reforms are often criticized as harmful to consumers, particularly those with lower incomes, but such criticism often reflects incomplete analysis. Although increased vehicle user fees may harm some motorists directly, they are often less harmful than alternative funding sources, and user charges help create more efficient and diverse transport systems that benefit everybody, particularly the 20-40% of residents who either cannot or should not rely primarily on automobile travel due to disabilities or low incomes. More efficient pricing helps make alternative modes more politically and socially acceptable, resulting in more investment in these modes, better service quality, and more accessible land use policies. It can also provide various benefits to disadvantaged travelers; for example, reducing congestion delays to bus riders, and the accident risk and pollution emissions that motor vehicles impose on walkers and cyclists.

Although user fees are regressive with respect to income (a dollar of taxes or tolls is a greater share of income for a lower- than higher-income households), they are generally less regressive than other transport funding options. For example, Schweitzer and Taylor (2010) found that financing urban highway expansion with general taxes saves daily highway users about $700 annually, but imposes $5 to $80 annual costs on households that seldom use the facility. Few toll road users are low-income, so general tax financing is regressive overall, causing cross-subsidies from lower- to higher-income households. Similarly, since lower-income residents tend to own fewer vehicles, consume less fuel, and drive fewer annual vehicle-miles than average, they are generally better off with direct user fees and distance-based pricing, than with indirect and fixed pricing. At best, underpricing vehicle travel is an inefficient way to achieve equity objectives. For example, out of a dollar in fuel subsidies, only 14¢ goes to the lowest income quintile. More progressive policies would direct a greater share of subsidies to low-income households.

***Figure 12*** **Annual Fuel Expenditures By Income Class**




*Lower income consumers purchase a relatively small portion of total fuel and drive a relatively small portion of total vehicle travel, so underpricing fuel and other transport costs is an inefficient way to help poor people.*

Charging motorists directly for the facilities and services they use allows consumers to save money if they reduce consumption, an opportunity that is unavailable with indirect financing. Lower-income households can save money with unbundled parking and distance-based vehicle fees since they tend to own fewer vehicles and drive less than higher income households.

## Implications for Developing Countries

The issues discussed in this report are particularly relevant for developing countries. Although per capita traffic fatality rates are likely to decline in these countries as they develop, the speed and amount of decline will be significantly affected by the transport pricing and planning policies chosen now. Countries that follow the European and wealthy Asian country model of efficient pricing and multi-modal planning will likely achieve much lower (probably less than half) the per capita traffic fatality rates of countries that follow the North American model of low transport pricing and automobile-oriented planning. Table 3 compares these models.

***Table 3*** **Contrasting Transport Pricing and Planning Practices**

| Feature | European & Wealthy Asian | North American |
|---|---|---|
| Fuel pricing | High taxes | Low taxes and indirect subsidies |
| Road tolls | Few roads are tolled. Where tolled, revenues are often dedicated to highways. | Roads are tolled to reduce congestion and finance transport programs |
| Parking pricing | Parking is often priced | Parking is seldom priced |
| Parking requirements | Relatively low parking requirements | Generous minimum parking requirements. |
| Transport planning | Multi-modal. Considerable effort to improve walking, cycling and public transport. | Automobile-oriented. Little effort to improve alternative modes. |
| Land use planning | Creates accessible, multi-modal communities. | Creates automobile-dependent sprawl. |
| Vehicle travel | Low relative to income (5,000 to 10,000 annual kilometers per capita). | High relative to income. (15,000 to 25,000 annual kilometers per capita). |
| Walking and cycling | Moderate to high non-motorized mode share. | Low non-motorized mode share. |
| Traffic fatalities | Low (4-8 annual traffic deaths per 100,000 population) | Moderate (10-20 annual traffic deaths per 100,000 population) |

*Different transport pricing and planning models result in different transport patterns and fatality rates.*

Traffic safety is just one of many reasons that developing countries may want to implement efficient transport pricing and multi-modal planning. Others include reduced traffic and parking congestion, reduced road and parking facility costs, improved mobility for non-drivers, energy conservation, reduced economic costs of importing vehicles and fuel, emission reductions, more efficient land development, and improved public fitness and health. However, safety benefits should not be overlooked. Since traffic accidents are one of the largest costs of automobile transportation, crash reductions are among the most important justifications for pricing and planning reforms.

## Conclusions

A basic economic principle is that, as must as possible, consumers should pay directly for the goods they consume. This tends to be most efficient and equitable. Transportation markets currently violate this principle: automobile travel is significantly underpriced. A major portion of costs are external or fixed, and therefore do not reflect marginal costs. This increases various transport problems including traffic and parking congestion, facility costs, energy consumption, pollution emissions, inefficient land development patterns, and traffic accidents.

Various pricing reforms can help reduce these problems, including higher fuel prices, road tolls, parking pricing, distance-based insurance and registration fees, and lower public transit fares. Advocates generally promote individual reforms to achieve specific objectives, such as efficient road pricing to reduce congestion and generate revenues, and fuel taxes to generate revenue and encourage energy conservation. Traffic safety benefits are often overlooked. Pricing reform advocates seldom highlight traffic safety benefits and traffic safety experts seldom promote these pricing reforms. Yet, these pricing reforms can provide significant safety benefits, and may be the most cost effective safety strategies overall, considering all costs and benefits, since they provide many other economic, social and environmental benefits.

Overall, higher fuel prices and distance-based insurance and registration fees can probably provide the largest total safety benefits, because they tend to affect the largest total amount of vehicle travel. Distance-based insurance can provide additional safety benefits because it encourages the largest mileage reduction by the highest risk drivers. Road and parking pricing can provide significant safety benefits if applied more widely. Public transit fare reductions probably provide the smallest direct safety benefits, but can have much larger impacts if implemented as part of an integrated program to create more multi-modal transport systems and more accessible communities.

The much lower per capita traffic fatality rates in Northern European countries and wealthy Asian counties can be largely explained by their relatively high transport prices, which reduce vehicle travel directly and helps create more multi-modal transport systems. Yet, even these countries could implement additional pricing reforms such as distance-based vehicle insurance and registration fees, and more user paid parking, which could further reduce crash rates.

Critics often claim that pricing reforms are regressive, but they are often less regressive than alternative transport facility financing options, and more efficient pricing can provide substantial benefits to physically, economically and socially disadvantaged people by providing new opportunities to save money when they reduce vehicle ownership and use, and by helping to build political and social support to develop more multi-modal transport systems. Disadvantaged people can also benefit directly from pricing reforms that reduce traffic congestion, accident risk and pollution emissions that automobiles impose on other road users.

This is a particularly important issue for developing countries, many of which currently have high crash rates that could be reduced substantially by more efficient pricing. These countries are now establishing pricing and planning practices which will affect future vehicle travel patterns and therefore accident rates.

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