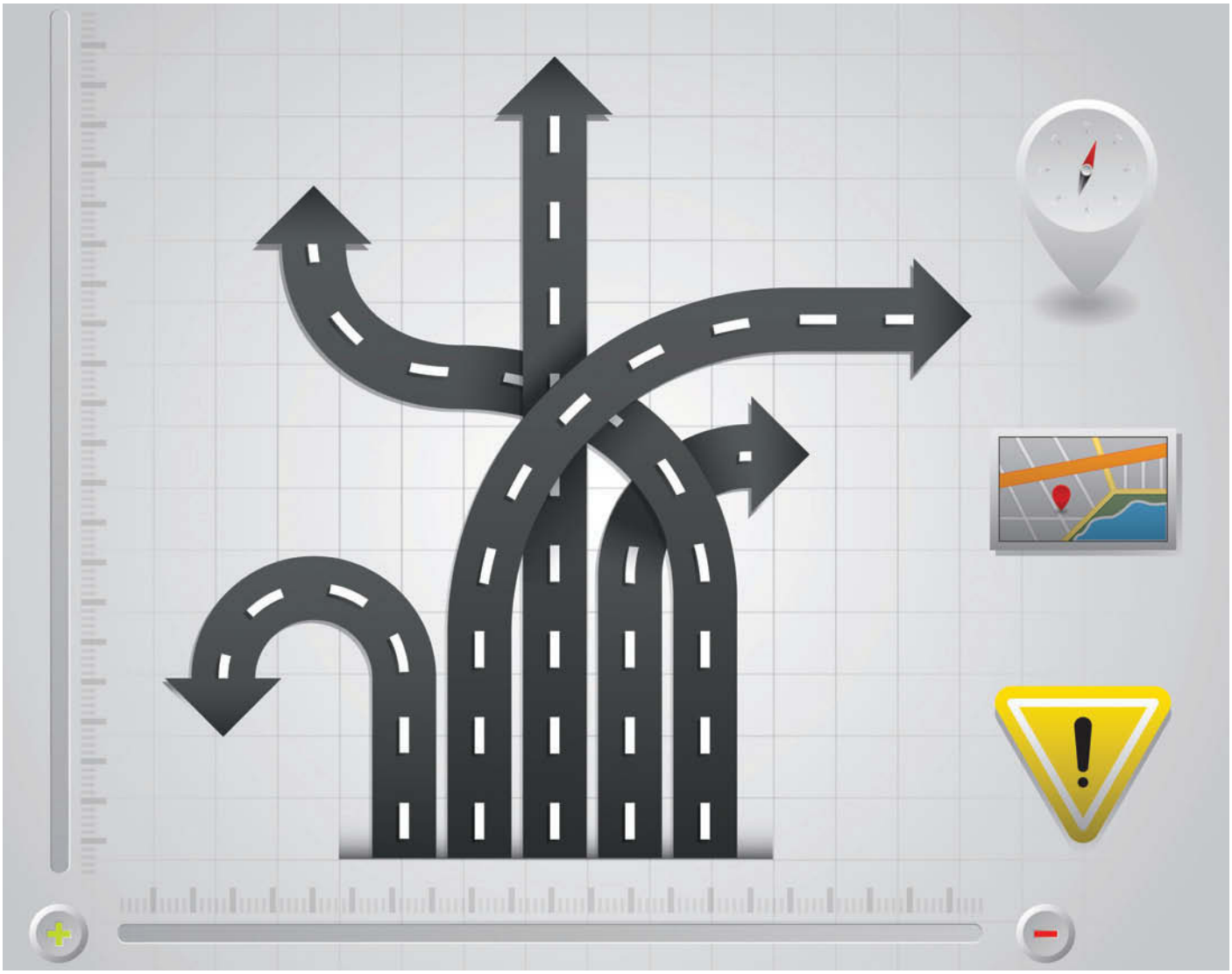
How Transport Pricing Reforms can increase Road Safety

This article investigates how transportation pricing reforms – higher fuel taxes, efficient road tolls and parking fees, distance-based pricing, and reduced transit fares – can help increase traffic safety. Research described in this report indicates that, in addition to their other economic, social and environmental benefits, these reforms tend to reduce traffic accidents. However, this benefit is often overlooked: pricing reform advocates seldom highlight traffic safety benefits and traffic safety experts seldom advocate pricing reforms. More comprehensive analysis of their safety benefits can increase support for transport pricing reforms.



Transportation pricing – the amount we pay to own, operate and park vehicles, and to use public transport – affects how we travel (Spears, Boarnet and Handy 2010). Transportation professionals increasingly advocate pricing reforms to generate revenue and help achieve various policy objectives such as reducing traffic and parking congestion, and reducing pollution emissions, as summarized in Table 1. New technologies, such as electronic tolling and parking pricing, are making these reforms easier and more cost effective to implement.

Table 1 - Transport Price Reforms (European Transport Pricing Initiatives; VTPI 2014)

Price Reform	Description	Primary Objectives
Fuel price increases	Reduce fuel subsidies and increase taxes.	Generate revenue, encourage fuel efficiency, internalize environmental costs
Road pricing	Charge tolls for using specific roads	Generate revenue and reduce traffic congestion
Parking pricing	Charge fees for using parking facilities	Generate revenue and reduce parking problems
Distance-based pricing	Prorate insurance premiums and registration fees by mileage	More accurately reflects claim costs, can help reduce accidents and other traffic problems
Public transport fare reductions	Reduced fares and other financial incentives to encourage transit travel	Increase affordability (reduced cost burdens on poor people) and encourage transit use

Various transportation pricing reforms are advocated to achieve various policy objectives

A basic economic principle is that markets tend to be most efficient if prices (what consumers pay for a good) reflect marginal costs (the total incremental costs of producing that good). Many of these transportation pricing reforms reflect this principle, they help make the prices that motorists pay more accurately reflect the full costs they impose. For example, efficient road pricing means that motorists pay for building and maintaining roadways, with higher rates under congested conditions. Similarly, efficient parking pricing means that motorists pay directly for using parking facilities, with higher rates during peak periods. Conversely, until these price reforms are fully implemented, public transit fare reductions can be considered a second-best strategy for encouraging transit as more efficient alternative to driving on congested roads.

These pricing reforms tend to provide multiple benefits: in addition to reducing traffic congestion, road tolls also tend to reduce parking problems and pollution emissions. Similarly, in addition to reducing parking problems, efficient parking pricing tends to reduce congestion and pollution. One important but often overlooked benefit of these pricing reforms is increased traffic safety. New research indicates that they can significantly reduce traffic crash rates. In fact, when all impacts are considered, pricing reforms are among the most cost-effective traffic safety strategies. However, these impacts are often overlooked: pricing reform advocates seldom highlight traffic safety benefits and traffic safety experts seldom advocate pricing reforms.

> Available data indicate that efficient road pricing tends to reduce crashes. For example, London's congestion fee reduced total vehicle travel in the charging zone about 15%, but crashes declined 28%. (Noland, Quddus and Ochieng 2008)

This article explores these issues. It describes various transportation pricing reforms, examines how they affect traffic crash risks, and discusses how transportation professionals can better incorporate safety impacts when evaluating potential pricing reforms.

Price Reform Safety Impacts

This section summarizes research concerning how transportation pricing reforms affect crash rates. For more information see Litman and Fitzroy (2010).

Fuel Price Increases

Various studies indicate that, all else being equal, higher fuel prices tend to reduce per capita traffic fatality rates (Sivak 2009). Ahangari, et al. (2014) employed a panel data model of 14 industrialized countries between 1990 and 2000. The results indicate a significant inverse relationship between gas prices and the road fatality rates: a 10% decrease

in gasoline prices resulted in a 2.19% increase in road fatalities. Similarly, using data for 144 countries from 1991-2010, Burke and Nishitateno (2014), found that a 10% increase in the gasoline prices on average reduces traffic fatalities by 3-6%.

Studies by Chi, et al. (2010a, 2010b, 2011) measured the impacts of increased fuel prices on traffic crashes in various U.S. regions. They found that fuel price increases reduce both total crashes and crash rates per million vehicle miles traveled. For example, controlling for other risk factors (total vehicle travel, seatbelt use, unemployment and alcohol consumption), they find that in the state of Mississippi, each 1% inflation-adjusted gasoline price increase reduces per mile crash rates by 0.25% in the short-run (less than one year) and 0.47% in the medium-run (more than one year). In Minnesota they estimate that a $1.00 per gallon gasoline price increase would reduce total rural crashes 28%, rural injury crashes 3.9%, and urban fatal crashes 18.4%, with particularly large reductions in drunk driving crash.

Table 2 - Transport Pricing Reform Impacts (Litman and Fitzroy 2012)

Pricing Type	Description	Travel Impacts	Traffic Safety Impacts
Higher fuel prices	Eliminate fuel subsidies. Increase fuel taxes to finance roads and internalize fuel production economic and environmental costs.	European-level fuel prices reduce per-capita vehicle travel 30-50% compared with North America. Affects most vehicle travel.	Reducing vehicle travel provide about proportionate or greater crash reductions (i.e., a 30% mileage reduction provides 30%+ fatality reduction).
Road pricing	Implement road tolls to generate revenue and reduce traffic congestion.	Typically reduces affected vehicle travel 10-30%. Usually applied on major highways, bridges and urban centers.	Can significantly increase safety where applied, but total impacts are generally modest due to the small portion of travel affected.
Parking pricing	User fees to finance parking facilities, with higher rates during peak periods.	Typically reduces affected vehicle trips 10-30%. Most common in urban centers.	Can significantly increase safety where applied.
Distance-based pricing	Prorates vehicle insurance premiums and registration fees	Fully-prorated insurance and registration fees would reduce affected vehicle travel 8-12%.	Potentially large safety benefits. If fully implemented could reduce total crashes 10-15%.
Public transport fare reductions	Reduce fares and other financial incentives to encourage public transit travel.	A 10% fare reduction typically increases ridership 3%, but 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.

Road and Parking Pricing

Although research is limited, available data indicate that efficient road pricing tends to reduce crashes. For example, London's congestion fee reduced total vehicle travel in the charging zone about 15%, but crashes declined 28% (Noland, Quddus and Ochieng 2008). Using a collision prediction model that analyzes crash rates at a fine geographic scale, Lovegrove, Lim and Sayed (2010) predict that a typical road pricing program would reduce total neighborhood collision by 19% and severe collisions by 21%. Efficient parking pricing tends to have similar impacts on vehicle travel as road pricing, so its safety impacts are probably similar.

Distance-Based Pricing

Distance-based insurance pricing can provide large crash reductions because motorists with higher risk ratings pay higher per-kilometer premiums 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 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 more than 20%.

Transit Fare Reductions

Public transport tends to have low traffic crash and casualty rates per passenger-mile and overall traffic fatality rates tend to decline in an urban area as public transit ridership increases.

Since about two-thirds of traffic crashes involve multiple vehicles, pricing reforms that significantly reduce total vehicle travel in an area tend to provide external safety benefits, that is, they reduce risk to all road users regardless of whether or not drivers reduce their mileage (Edlin and Karaca-Mandic 2006).

This suggests that if pricing reforms were implemented to the degree justified on economic principles (cost recovery of road and parking facilities, internalized congestion, accident and pollution costs), vehicle travel and crashes would decline significantly, probably 30-50%, compared with what occurs with underpriced roads and parking, and fixed insurance and registration fees.

Conclusions

Many jurisdictions are considering transportation pricing reforms in order to achieve various policy objectives including revenue generation, and to reduce traffic congestion, parking problems and pollution emissions. Another significant but often overlooked impact is increased traffic safety.

Research indicates that more efficient pricing of vehicle fuel, roads, parking facilities, vehicle insurance and registration fees can provide significant crash reductions. Fuel tax increases and distance-based pricing can probably provide the largest total safety benefits because they tend to affect the largest portion of total vehicle travel. Distance-based insurance can provide additional safety benefits because it gives higher risk drivers an extra incentive to reduce mileage. Public transit fare reductions provide smaller direct safety benefits, but can have much larger impacts if they provide a catalyst for transit-oriented development that leverages additional travel reductions and safety benefits.

If fully implemented to the degree justified by economic principles, transportation pricing reforms could reduce crashes by 30-50% compared with what currently occurs in most countries. However, these impacts are often overlooked: pricing reform advocates seldom highlight traffic safety benefits and traffic safety experts seldom advocate pricing reforms. More comprehensive analysis of their safety benefits can increase support for transportation pricing reforms.

These pricing reforms are sometimes criticized as regressive, harmful to low-income people, but they are generally less regressive than other financing options, for example, if roads are financed through property or sales taxes, or if parking costs are incorporated into building costs or taxes (Carlson and Howard 2010; Schweitzer and Taylor 2008).

These pricing reforms are particularly relevant for developing countries. Countries that establish efficient transport pricing and multi-modal planning will have much lower traffic fatality rates, than if they develop with low transport pricing and automobile-oriented planning.

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