Road Pricing and Gasoline Taxes:
A Policy Paradox Assessment

by
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1 Introduction

Various methods have been implemented throughout history to generate revenue to fund the construction and maintenance of roadways. Today, no method is more widely used in the United States than a per-unit fuel tax paid at the pump by motorists, commonly known as the gasoline tax. However, this practice is not without complications. A number of different factors have weakened the power of the gasoline tax over time, creating many different subjects of inquiry for researchers. Considerable work has been done to investigate the efficiency, efficacy, equity, and other issues central to the subject of gasoline taxes, but it does not seem to resonate outside of academia. Simply, there is no momentum driving reform, which has diminished the capacity of the gasoline tax to fulfill its intent.

In her book Policy Paradox: The Art of Political Decision Making, Deborah Stone develops a framework that explores how societal values can affect the policy process. She believes that this accounts for the presence of policy paradoxes, where society is unable to use policy to create the changes it desires. In an important departure from other theories and frameworks, Stone assumes that participants in the policy process should not be expected to approach a subject tabula-rasa; rather, personal experiences and social messages can help policymakers achieve their vision of the community by creating changes for which they can more persuasively advocate because they are not limited by objectivity concerns (358).

This paper seeks to explore the use and effectiveness of the gasoline tax as a policy tool according to Stone’s framework of the policy paradox to examine why society fails to provide adequate levels of financial support for transportation despite obvious need. Section 2 offers basic historical information on why gasoline taxes are charged and how they perform. Section 3 elaborates, focusing on how implementation is sub-optimal, why, and to what extent. Section 4 discusses some of the positive effects that could be realized from using the gasoline tax to reduce consumption, in addition to its ability to generate revenues for the transportation system. In section 5, specific pollution taxes are considered to try to understand why they are disdained and how gasoline taxes can contribute to the achievement environmental goals. Various policy reforms and alternatives are reviewed in section 6 to see how gasoline taxes measure up to other potential options, either justifying or disputing their efficacy. The performance of gasoline taxes and their alternatives in their ability to satisfy society’s preference for equity is examined in section 7 to see whether a policy is overly burdensome or inadequate. Section 8 reflects on the solutions offered by using this framework to investigate this topic, including identifying and navigating obstacles to success. Lastly, section 9 provides an assessment of the applicability of Stone’s framework to explain the development of gasoline tax policy in the United States.

2 History and Necessity

Gasoline taxation is a method widely used by governments to generate the revenue necessary to construct and maintain transportation infrastructure. Kulash (2001) and Rufolo and Bertini (2003) explain that a gasoline tax can be interpreted as a road “user fee” that aims to charge motorists for the damage they inflict on the roads. In
addition to its use by the federal government since 1932, all U.S. states currently employ a gasoline tax as a primary source of funding for its roadways (Wachs, 1).

Kulash (2001) claims the comprehensive application of transport user fees in the United States is justified by the intent of four key considerations: cost recovery, equity, efficiency, and administrative ease of implementation, revealing some overlap with the policy goals identified by Stone in *Part II of Policy Paradox* (2). Cost recovery refers to the ability of the user fee to provide a revenue source for costly government-financed projects that provide goods or services to specific groups of users. Equity is seen as an aspect of user fees because only users are charged and the revenues are used only for their stated purpose. The potential for user fees to produce an efficient outcome, such that the price of a good or service is equal to its marginal cost, is another attribute that promotes their use. However, it is important to recognize that efficiency concerns are often relaxed or modified to accommodate multiple purposes and joint costs and balance cost recovery and equity concerns. Lastly, user fees are generally seen as easy to administer because they are simple to understand and collection costs are low.

Despite the universal nature of its implementation in the United States, the gasoline tax, as with many other forms of taxation, is generally disdained by the public, which greatly contributes to the difficulty that policymakers face in increasing it. As a result of this sentiment, policymakers have not been sufficiently motivated to institute the necessary increases to the tax upon which many economists insist, including Delucchi (2007) and Parry and Small (2005). Hammar, Lofgren, and Sterner (2004) elucidate the difficulty in raising gasoline taxes through an analysis of the determinants of the tax. As it stands, the gasoline taxes in the United States do not produce enough revenue to meet the demands of the system, resulting in dwindling funds and rapidly eroding streets and highways (Delucchi, 984).

Wachs (2003) compiled a list of reasons to support higher gasoline taxes with researched explanations. One of his key points touches upon the failure of the tax to maintain its purchasing power because it has not kept pace with inflation, even as roads carry more passengers and goods than ever before (1). Ang-Olson, Wachs, and Taylor (2000) corroborate this assertion with data from the state of California, which shows “despite several statutory increases in the gasoline tax, the inflation-adjusted state gasoline tax in 1996 was essentially at the same level as the mid 1920s” (3). They also point to the fact that the costs related to transportation projects, such as the cost of materials and land, have also been exacerbated by the effects of inflation, which further reduces the buying power of gasoline tax revenues (3). Wachs (2003) refers to the Engineering Newsrecord Construction Cost Index which tracks the prices of various material inputs in several cities over time and reveals an 817% increase in these costs from 1957 to 2002 (3). Wachs (2003) also notes that the shortfall in transportation funding has led to a growing trend toward borrowing in order to finance transportation projects, which rose 18% from 1995 to 1999 (5). Porter and Kim (2008) note that compounding the effects of a low gasoline tax are the adoption of more fuel-efficient and hybrid vehicles that require less fuel to operate, resulting in fewer fuel purchases per mile (248).

In short, a system is observed in which despite an increasing need for transportation funding, the gap continues to widen, providing economists and other researchers with added motivation to investigate this subject. In terms of problem
definition, this evidence supports Stone’s observation that facts and figures are used to tell a story of decline that predicts an imminent funding crisis if there is no change to the status quo (138). This is perpetrated through the choice of words used in the literature to describe the extent of the problem, such as “disaster”, “decline”, “deficit”, “debt”, “degradation”, “erosion”, and “shortfall”, among others. Stone explains “policy stories use many literary and rhetorical devices to lead the audience ineluctably to a course of action” (145). Although some of these words may be considered technical terms, the prevalence of their use tells a story of decline “meant to warn us of suffering and motivate us to seize control” (145). Fortunately, the literature provides recommendations for how this can be achieved.

3 SYMBOLS AND NUMBERS -- The “Optimal” Tax

One area of research that has received considerable attention from economists is the determination of the “optimal” level of taxation according to concerns for both equity and efficiency. As mentioned above, the optimal level of taxation in terms of efficiency would be exactly proportional to the costs incurred by the government for the damage done to its roads, suggesting a tax on fuel is the equivalent of a “user fee”. Stone’s analysis of the use of symbols suggests that viewing the gasoline tax as “user fee” creates a more favorable perspective than if it is viewed purely as another form of taxation (137). This reveals that the thoughtful use of language has the power to alter public perception.

Kulash (2001) considers the political connotations associated with choosing between the terms “tax” and “user fee”, noting “politicians of either (the Republican or Democratic) party are apt to prefer to label an impost that they support as a user fee, and one they oppose as a tax” (3). This is observed because the term “user fee” implies not only causation of damages, but also who is to blame. Stone suggests that making a determination regarding who is at fault is important because, “in politics, we look for causes not only to understand how the world works but to assign responsibility for problems” (189). As a result, a “user fee” might garner more support due to its reliance on the “user pays” principle, while a tax may arouse suspicion and invite opposition when seen as discretionary, arbitrary, or even retaliatory.

Regardless of the terminology used to describe the problem, Delucchi (2007) finds the current level of taxation in the United States to be sub-optimal according to the 1997 Highway Cost Allocation Study produced by the Federal Highway Administration. It “indicates that “highway user fees” are about 20% below highway-related expenditures, for all levels of government and all vehicle classes in the US in 2000” (984). As a result, Delucchi discovers that the fuel tax would need to be increased by 20-70 cents per gallon to compensate for this kind of a shortfall (1001). This degree of increase may be interpreted as prohibitively large, considering the average combined federal and state gas taxes were only 38 cents per gallon in 2003 (1001).

This kind of assessment is important to defining the goals of policy. Stone claims “budgeting is another mechanism through which groups play out their claims” through their assessment of what it costs to satisfy their essential needs (100). The budgetary evidence says that the transportation system needs more funding.

Parry and Small (2005) find the optimal level of the gasoline tax in the United States to be double its current rate, but that the United Kingdom exceeds its optimal rate
by half (1286). This is a trend that extends to other European countries as well. Chouinard and Perloff (2004) find the taxes paid by US consumers are among the lowest in the industrial world, noting “European taxes per gallon average 20 times US federal rates” (56). An important distinction accounting for a part of these differences is that the U.S. uses gasoline tax revenues to fund only transportation, while many European countries do not pose similar restrictions, enabling them to use the gasoline tax as a general source of revenue. As a result, they observe that Germany, France, and Italy raise 4-5% of their national budget revenues from gasoline taxes, while revenues amount to less than 1% of the U.S. budget (56).

Parry and Small (2005) investigate other political and institutional reasons to explain such vast differences in taxation in the United States, an effort that duplicates to some degree the work by Hammar, Lofgren, and Sterner (2004). For example, both articles refer to the power of the “highway lobby” of the United States, influenced by domestic oil and auto industries. Historically, this lobby has supported policies favoring widespread use of personal automobiles and railed against vehicle and gasoline taxes. Parry and Small (2005) also point to differences in the population density between the two countries that create more demand for public transport in the UK and result in widespread vehicle use in the U.S. (1287). They also suggest that the U.S. “checks and balances” system make it difficult to justify any level of taxation beyond what is required to fund the highway system.

Stone claims that numbers are also used to tell stories that define a policy problem through measurement (163). However, there is some research to suggest that numbers can have more value than just what they explain numerically. Brunell and Glazer (2001) analyze two different ways of testing the importance of expressing the gasoline tax in nominal values, as it relates to public perception, finding most states are biased against double-digit tax increases (762). This result is interesting because it suggests that there is a psychological effect regarding the public’s willingness to accept higher prices based on the size of the incremental change. The authors posit that the public is more sensitive to some numbers than others; specifically, there is a preference for using a single digit, such as 9 over 10 (764). Evidence of this “first digit phenomenon” can be seen in any American store, where items are often priced at $9.99 instead of $10.00. This information may prove useful to policymakers to gauge the limits of their proposals.

4    EFFECTS -- Reducing Fuel Consumption

Gasoline taxes have the potential to address other policy goals in addition to providing the majority of funding for the transportation system. Microeconomic theory suggests that a tax that increases the cost of gasoline will have a negative effect on the amount of fuel purchased and consumed, as presented in Austin and Dinan (2005). There is a general consensus in the literature and among the public that supports reductions in fuel consumption for a variety of reasons. Hsing (1994), Parry (2005), and Hsu, Walters, and Purgas (2008) convey the potential homeland security benefits that may be achieved from reducing gasoline consumption by diminishing the American dependence on foreign suppliers.

The environmental benefits of reducing fuel consumption through a gasoline tax are addressed by Walls and Hanson (1999), Sipes and Mendelsohn (2001), Khazzoom
(1991), and Yohe (2007). Their argument is that polluting vehicle emissions are largely a
function of fuel usage, thus as more and more cars and trucks are added to the
transportation system each year, the environmental contribution from reducing fuel
consumption becomes increasingly salient.

One of the most important conclusions from Hammar, Lofgren, and Sterner
(2004) is their evidence to support some reverse causality in the relationship between the
level of taxation and consumption. They find “not only do low taxes and thus low (gas)
prices encourage high consumption, but high levels of consumption also lead to
considerable pressure against raising the taxes” (1). For the United States, which has low
gasoline prices and taxes relative to other countries, this explains some of the observed
resistance to changes in the level of taxation. Further, it implies that reform will likely
require significant inertia to disrupt this trend.

5 INDEUCEMENTS -- Pollution Taxes

Research suggests that the potential for gasoline taxes to reduce vehicle emissions
can also be achieved through pollution taxes, which are often seen as one of the most
cost-effective means of reducing pollution. Wachs (2003) points to a survey whose
results reveal the unanimous support of forty economists for a 25 cent per gallon fuel tax
(2). However, pollution taxes are widely opposed by individuals and government.

Hsu, Walters, and Purgas (2008) draw on behaviorist literature to generate some
theories to explain why this is so (3612). They seek to determine whether “cognitive
gaps in reasoning, and not rational decisionmaking processes, account for much
resistance to gasoline taxes,” finding that “framing effects have negatively affected the
way that people perceive and accept the concept of gasoline taxes” (3613). They mention
how the psychological effects of similar policies may be quite different. For example, a
“pull” measure, such as a subsidy, is generally preferable to a “push” measure, such as a
tax, which seem more coercive and suspect. This information recommends that
policymakers attempt to frame its propositions in the way most likely to gain the public’s
support. Polling or other methods may be a helpful means to determine how best to
emphasize the benefits that would be expected from reform.

Fullerton and West (2002) examine the potential for adjusting the gasoline tax to
create the market incentives of a pollution tax, looking at both homogeneous consumers
and heterogeneous consumers, which allows them to account for preferences regarding
engine size and miles (137). They find that vehicle age is an important determinant of
the amount of emissions from a vehicle, not only because newer cars tend to be more fuel
efficient that comparable older models, but also because emissions-control equipment
deteriorates over time. Therefore, “policies that accelerate vehicle retirement might also
reduce emissions in a cost-effective way” (155). However, one should note that the
improvement in the fuel efficiency of the nation’s fleet is one of the factors that has
weakened the effectiveness of the gasoline tax to provide sufficient revenues, reminding
policymakers that there may be conflict when the same policy is used to pursue different
goals simultaneously.

6 CHOICES -- Alternatives to Traditional Gasoline Taxes

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Many creative solutions have been suggested to help solve the problems associated with the current implementation of gasoline taxes in the United States, including alternative policies. Ang-Olson, Wachs, and Taylor (2000) review the experience with indexed gasoline taxes in the U.S., or taxes that automatically adjust with changes in some indicator. They consider taxes indexed to the price of gasoline, various construction and maintenance costs, and the consumer price index, finding that at least 15 states have tried to implement variable-rate gasoline taxes, but that in most cases, “the variable-rate taxes have been rescinded or effectively discontinued because they did not work as expected” (13).

Khazzoom (1991) considers altering the gasoline tax in another way. His paper examines changing the way the Environmental Protection Agency determines the U.S. federal tax rate from a grams (pollution)-per-gallon to a grams-per-mile calculation, which he finds superior in terms of its ability to reduce emissions (444).

Vehicle-miles traveled (VMT) taxes provide the government with a way to correct for some of the issues associated with a gasoline tax, such as its inability to collect enough revenues from more fuel-efficient and hybrid vehicles (Cone, 29). However, this method of taxation requires changes to the way taxes are collected from motorists. Essentially, instead of simply taxing each purchase of gasoline, the government must create a system to measure the miles driven by each vehicle. Porter and Kim (2008) report how this kind of system has been implemented in Oregon on an experimental basis to test its technical feasibility through the collaboration of Oregon State University, Oregon Department of Transportation, and the Road User Fee Task Force (248). This research was largely dependent upon the development of radio frequency identification (RFID) enabled on-vehicle devices that record mileage within adjustable boundaries (248). Porter and Kim note an important discovery of this experiment is the applicability of this type of system to support “road use schemes aimed at reducing congestion” (250).

Congestion is an important concern for many drivers, as well as for the government agencies responsible for engineering traffic networks and limiting its adverse environmental impacts. The costs of congestion are real, and can measure inputs such as wasted fuel and time. An article by Utah State Senator Howard Stephenson reveals that the Texas Transportation Institute found that Utahns “pay $250 million every year due solely to traffic congestion” (26). Therefore, policies that are able to address these concerns become increasingly attractive to policymakers because they can increase benefits to society.

Corporate Average Fuel Economy (CAFE) standards are a tool used by the government to reduce pollution from passenger cars and trucks in the United States. They function by specifying to automobile manufacturers the lowest level of fuel economy allowable for different vehicle classes, measured in miles per gallon. It is important to recognize that CAFE standards do not provide a source of revenue for transportation projects, and that as an alternative, they exist only to regulate vehicle emissions.

Austin and Dinan (2005) create a model to estimate the annual costs of reducing long-run gasoline consumption by 10% through a 3.8 mile per gallon increase in CAFE standards and model the potential cost savings that could be realized by allowing manufacturers to buy and sell fuel economy credits. The exchange of credits would
function such that a firm could make up for having a lower than allowable average fuel economy of its fleet by purchasing fuel economy credits from an overly compliant firm (566). They find that the maximum savings from reducing gasoline consumption are not achieved until all existing vehicles are replaced, or 14 years, as they assume for the average life of a vehicle in their model (574).

West and Williams (2005) compare the costs of reducing gasoline consumption using the CAFE standards and the gasoline tax, taking into account preexisting tax distortions. They refer to reports by the National Research Council and the Congressional Budget Office that show increasing the gasoline tax can attain a given reduction in gas consumption more cost-effectively than tightening CAFE standards, which could actually diminish welfare (294). They claim “this is because the externalities associated with miles, such as accident and congestion costs, are estimated to be much larger than those associated with gas consumption itself” (298).

Parry (2005) considers whether pay-as-you-drive insurance (PAYD) is a better way to reduce gasoline consumption than a fuel tax. He finds that the gasoline taxes are preferable in terms of cost-effectiveness because “they exploit all behavioral responses for reducing fuel demand” (288). However, Parry’s research reveals that an equal fuel reduction could be achieved with greater welfare gains through PAYD insurance, making it a more attractive policy option than a gasoline tax (292).

The alternatives presented above are important to this discussion because they remind policymakers and the public that there are many different options from which to choose. Stone says “portraying a problem as a decision is a way of controlling its boundaries” (243). This does not necessarily imply narrowing. In this case, portraying the problem as a decision shows its breadth, offering greater hope of reaching a solution that maximizes the net benefits to society.

7 IMPACTS -- Distributional Effects

Distributional effects and changes in social welfare that result from different policy choices provide a way to determine whether the policies satisfy concerns for equity. As presented above, Austin and Dinan (2005) and Parry (2005) each include a discussion on the differences in welfare effects the can be expected from choosing CAFE standards or PAYD insurance, respectively, instead of a gasoline tax.

Bento et al. (2005) and West and Williams (2004) consider the distributional effects of different aspects of gasoline taxes. Bento et al. estimate the effect of a 30 cent per gallon increase in the gasoline tax, focusing on two different ways of “revenue-recycling” (285). West and Williams (2004) compare different ways of measuring the incidence of the gasoline tax, in addition to their examination of three different revenue-recycling options that reveals using the additional gasoline tax revenue to fund lump-sum transfers actually makes the policy progressive, which is an attractive feature to policymakers (536).

West (2005) and Walls and Hanson (1999) reflect on the distributional effects of emissions taxes. West finds that “a uniform tax on miles that does not distinguish between dirty and clean vehicles is less regressive than the emissions tax” (1). Walls and Hanson (1999) analyze the distributional aspects of three options for charging emission fees for vehicles in California and compare their results with the impacts of vehicle
registration fees currently in use (54). They discover that all of the emissions-related fees that they examined are more regressive than existing registration fees, however to what degree is heavily dependent upon what measure of income is used in calculation (63).

West (2004) also compares the distributional effects of alternative vehicle pollution control policies, finding that gasoline and VMT taxes are only regressive across upper income groups (755). In terms of equity, this conclusion justifies the selection of gasoline or VMT taxes over other alternatives based on their socially acceptable distribution of benefits and costs.

8 RESULTS AND SOLUTIONS

While there have been numerous contributions to the body of work on the economic and policy impacts of gasoline taxes in recent years, there is still a considerable need for further inquiry on the subject. The issues surrounding gasoline taxes can be expected to gain more prominence and become more pressing as the funding gap for roadways continues to widen. Simply, the status quo is not sustainable. If the degradation of the American road infrastructure is to be avoided, change must inevitably come.

Stone sees value judgments as an inherent part of the policy process, and that given the proper consideration, including them can lead to better policy design and implementation than if they were simply ignored or rationed away. The evidence in this paper suggests that this is true, particularly as value judgments can be seen as a primary reason that the gasoline tax fails to provide adequate transportation funding in the United States. Specifically, there has been a consistent undervaluation of the needs of the transportation infrastructure, where no one and everyone is simultaneously and equally culpable of freeriding.

The phenomenon of a society’s failure to provide resources it considers essential for its security has long fascinated economists. The evidence for this is in the problems that persist. It is impossible to deny the presence of malnutrition and lack of access to clean water throughout the world and even in this country. How then can society be convinced to address other needs when it chooses not to provide even basic sustenance to those in desperate need? Is it even worthwhile to ask?

Stone’s chapter “Facts” suggests that there are strategies that rely on the power of persuasion to bring about changes in people’s behavior, and that utilizing persuasion as a policy instrument depends on “giving people information and letting them make up their own minds” (262). This chapter offers the best application of how this framework can be used to bring about the desired changes to the system, namely increased funding for transportation.

It is clear that without full information, there is very little motivation to change the status quo and remedy the shortfall created by sub-optimal tax payments throughout the system. There has been an overwhelming tendency for nearly all participants, save researchers on the subject, to turn a blind eye to the problem because virtually no one favors the expected solution—paying higher taxes. This is understandable, but this country can no longer continue to deny the cumulative effects of a culture of freeriding. Motorists must begin to appreciate what the potential impacts of this kind of oversight will be and how they can be prevented.
Perhaps there is some distrust of the government that prevents people from believing that increases in gasoline taxes will lead to improvements in transportation services and facilities and not be transferred out of the system, as suggested by Hsu, Walters, and Purgas (3613). This would suggest that there is a gap in the understanding of the structure of the tax, but this too can be resolved by informing the public of the dedicated nature of the tax’s revenues.

It is evident that more information must be conveyed to policymakers and the general public to provide them with the knowledge and education that will allow them to solve the problem of insufficient transportation funding. However, what may prove to be more difficult is drawing their attention away from other problems, which in this economic climate are numerous. Therefore, for this issue to gain prominence, the extent to which this country relies on its transportation system cannot be understated. Stone argues “people’s sense of deprivation or satisfaction comes in part from comparison with others” (90). This suggests another avenue to create more support for reforming the gasoline tax may lie in drawing their attention to something that they should envy—a fluid and pristine transportation system. Even if it only exists in theory, it creates a craving for more by smiting the bliss of ignorance.

Although outside the scope of this assessment, consideration should also be given to the impacts of the freight industry on the transportation system to determine whether they are paying enough to compensate for the damages they cause through diesel fuel and weight-mile taxes, for example. This serves as a reminder that even an optimized gasoline tax contributes only a partial solution to a problem with multiple causes. Thus policymakers may benefit by choosing several policies to implement collectively, rather than placing all the emphasis—and all the pressure to succeed—on a single decision.

It is also clear that ignoring the problem will only exacerbate it. This leaves the question of who should do the educating and informing. In the absence of participant-advocates willing to make an unpopular suggestion, the answer is somewhat controversial. As mentioned earlier, researchers in this field seem to be the only people paying attention to this issue. However, because they are also the source of the information, there is some debate as to whether they should influence the policy process directly through advocacy or whether this exceeds the traditional scope and oversteps the boundaries of their role as objective scientists. In this case, necessity should breed tolerance to allow for a post-normal perspective where scientists have a responsibility to propose changes to policy if society will benefit.

9 CONCLUSION – The Applicability of the Framework

This analysis draws upon Stone’s conceptual framework to explain developments in the policy surrounding the funding of transportation infrastructure in the United States, with particular emphasis on the gasoline tax. The results on the applicability of this framework are mostly encouraging, but inconclusive. This framework seems to be flexible enough not to require that all its components be investigated by this topic, simply because they are irrelevant or superfluous to the discussion. Some may interpret this as a failure of the framework to “fit” the problem, but instead this should suggest that the framework need not fit everywhere. The value of this framework is in its ability to be malleable and applied in parts, but this requires more discernment.
Stone states that *Policy Paradox* “aims to craft and teach a kind of political analysis that cherishes the richness and diversity of the human mind, that values politics and community, and that renders more visible the political claims underlying what is usually passed off as scientific proof” (xii). The framework she develops does not narrowly define how problems should be approached, rather it provides a means to explore how they are politically constructed and impacted by values. Essentially, she creates a lens through which to examine a problem by suggesting the consideration of ways it may be affected. As broadly constructed, this framework need not “fit” at all. What is paramount is not that the problem shows evidence of each component of the framework, but that one is aware of the potential impacts of the components so that they are not overlooked.
Bibliography


* Signifies that the source comes from the popular press.