Why Gasoline Prices (Dollar per Litre) Range from 0.016 to 2.963 Across Countries.*

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Abstract

Due to taxes and subsidies, gasoline prices vary dramatically across countries. Externalities, traffic congestion, Ramsey taxation, or income equality grounds cannot fully explain differences in gasoline taxes. We develop a simple political-economic model that shows that group interests, resulting from the composition of a country's car fleet, help to explain differences in gasoline taxes even among countries with identical fundamentals. In the model, citizens' car ownership is endogenous. The model has two equilibria: a low-tax equilibrium, in which a majority of citizens own a big car, and a high-tax equilibrium, in which a majority of citizens own a small or no car. Though distributional motives help to explain gasoline taxes, these taxes are not necessarily progressive.

Keywords: median voter, gasoline taxes, multiple equilibria.

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1 Introduction

In the Unites States, state taxes on gasoline are correlated with the kind of cars people buy. In 2020, the three most-sold car models were pick-up trucks in 31 states.[1] The average state gasoline tax was 28.2 dollar cents per gallon in these states.[2] In the other 19 states, the average state gasoline tax was 41.5 dollar cents per gallon. In the five states where none of the three most-sold car models were pick-up trucks, the average state tax on gasoline was 47.3 dollar cents per gallon. Between the United States and the European Union, we observe a similar pattern. In January 2022, the average total tax on gasoline was more than 4 times as high in the European Union as in the United States.[3] In 2021, the three best-selling car models were pick-up trucks in the United States: the Ford F-series, the Chevrolet Silverado, and the RAM (in this order). In the same year, the three best-selling cars in the European Union were subcompact cars: the Volkswagen Golf, the Peugeot 208, and the Dacia Sandero (in this order).[4] These cars consume about one-third of the amount of gasoline that a typical pick-up truck consumes.

Parry and Small (2005) try to explain the difference between gasoline taxation in Britain, in that year an European Union country, and the United States. They focus on three reasons for penalizing gasoline consumption: reducing emissions, reducing traffic congestion and accidents, and generating tax revenues. They derive that in 2000 the optimal gasoline tax rate would have been $0.33 per gallon higher in Britain than in the United States. The actual difference between the two taxes in 2000 was $2.40 per gallon. Thus, 87 percent of the difference between the gasoline tax in Britain and the United States in 2000 cannot be explained on the basis of efficiency grounds.

This paper presents a very simple political-economic model of gasoline taxation to explain differences in levels of gasoline taxation across countries. Our model highlights the interaction between citizens' decisions on purchasing a fuel-efficient or fuel-inefficient car on the one hand, and the median voter's decision on the gasoline tax on the other hand. In our model, a gasoline tax can correct a negative externality.

[1] https://www.visualcapitalist.com/the-best-selling-vehicles-in-america-by-state/

[2] https://www.api.org/-/media/files/statistics/state-motor-fuel-taxes-charts-january-2022.pdf .

[3] https://taxfoundation.org/gas-taxes-in-europe-2022/#:~:text=The%20average%20excise%20duty%20on,1.98%20per%

[4] https://www.best-selling-cars.com/europe/2021-full-year-europe-top-25-best-selling-car-models/

It also redistributes income from citizens who drive in fuel-inefficient cars, often big cars, to citizens who drive in fuel-efficient cars, often small cars.[5] As illustrated above, the composition of the car fleet differs dramatically between Europe and the United States. A high gasoline tax benefits a majority of small-car owners in Europe but hurts a majority of big-car owners in the United States. These redistributive consequences help to explain differences in gasoline taxes across countries. Bluntly speaking, our result rests on the idea that in democracies, visible policies often favor a majority. Importantly, our results do not imply that differences in gasoline taxes across countries can be defended on equality grounds.[6]

The composition of a country's car fleet is not exogenous, neither in the real world nor in our model. Allcott and Wozny (2014) present evidence for the United States that when citizens buy cars they take into account future gasoline costs [see also Busse et al. (2013)]. Gerlach et al. (2018) find similar results for the European Union. In our model, citizens make decisions on which cars to buy before the gasoline tax is determined. However, they anticipate the gasoline tax when they buy cars. The interaction between the composition of the car fleet and redistribution may lead to multiple equilibria. In the low-tax equilibrium, most citizens buy big cars. In the high-tax equilibrium, most citizens buy small cars.

On the basis of the parameters and the outcomes of our model, three environments can be distinguished. In the first environment, the low-tax equilibrium is unique. The conditions for this equilibrium to exist describe the kinds of environments where people drive in big cars and face low gasoline taxes. The net benefits of driving in big cars should be sufficiently high. Furthermore, citizens should not be too ambitious regarding environmental goals. In rural areas the net benefits of big cars are larger than in urban areas. These areas usually experience little traffic congestion, have plenty room for parking, and offer few alternatives for traveling by car.

The second environment mirrors the first one. The high-tax equilibrium is unique, because big cars are incovenient. In many European urban areas, public

[5]Citizens without a car belong to the latter group.

[6]The empirical evidence of the impact of gasoline taxes on the income distribution is mixed. Poterba (1991) presents evidence for the U.S. that gasoline taxes are slightly regressive. For Chile, Agostini and Jiménez (2015) find that the tax on gasoline is slightly progressive. We are not aware of empirical studies that show that gasoline taxes are highly progressive or highly regressive.

transport is an alternative for traveling by car. Furthermore, because of congestion, traveling by car is time-consuming. Strong preferences for reducing carbon dioxide emissions relax the conditions for the existence of the high-tax equilibrium.

The third environment is a mixture of the first two environments. In this environment, the low-tax and high-tax equilibrium can coexist. This result indicates that different taxes between countries cannot always be explained by differences between the fundamentals of countries. We show that generally distributional motives distort taxes on gasoline. In the low-tax equilibrium, the tax is lower than the socially efficient level, while in the high-tax equilibrium it is higher. This prediction is consistent with the empirical evidence reported by Parry and Small (2005).

A key feature of our model is that citizens buy cars before the median voter determines the gasoline tax. The motivation for this assumption is that cars are durable goods with periods between successive purchases that are usually longer than periods between elections.[7] As a result, most citizens do not buy a car in the period between two successive elections. Of course, the tax on gasoline is relevant for citizens' decisions on which car to buy. When making these decisions, citizens must form expectations about future gasoline taxes.

Another feature of our approach is that we do not explicitly model the political process. We assume that the median voter chooses the gasoline tax. In the present case, the median-voter approach seems to be a good first approximation. Citizens observe gasoline prices. Furthermore, spending on gasoline is a non-trivial share of a typical citizen's income. This makes the gasoline tax a salient issue for many citizens. In such environments, politicians cannot ignore the interests of a majority (Persson and Tabellini, 2000, chapter 6). The yellow-vest protests in 2018 in France are illustrative. They were a response to announced increases in fuel taxes. These protests forced president Macron to cancel fuel tax increases. Less-developed, oil-rich countries often subsidize gasoline. Attempts to stop or to reduce such subsidies often meet strong public resistance (see Akimaya and Dahl, 2022, who describe the Indonesian government's attempts to cut gasoline subsidies). In those countries, the distinction between owning a car and not owning a car is more relevant than the

[7] In 2019, the average age of the EU vehicle fleet is 11.5 years (ACEA vehicle in use report 2021). In the United States the average vehicle age is 12.1 years in 2021, according to IHS Markit. The average car age for how long vehicles are kept is 8.4 years in the United States.

distinction between owning a small car and a big car.

Theoretically, our paper is closest related to Alesina and Angeletos (2013). They analyze a situation where citizens can invest in a productive activity before society chooses a redistributive policy. If citizens anticipate that society chooses high redistribution, they choose low effort levels. If, by contrast, citizens anticipate low redistribution, they choose high effort levels. As in Alesina and Angeletos (2013), our multiple equilibria result hinges on the assumption that investment decisions are made before society decides on policies with redistributional consequences.

2 The Model

In this section, we present a rudimentary political-economic model of gasoline taxation. To obtain analytical results, we deliberately keep the model simple. Two simplifications are worth mentioning. First, we abstract from excise, sales, and value-added taxes on cars. These taxes vary considerably across countries in both forms and levels. Obviously, they affect citizens' decisions on which cars to buy. In the concluding section, we discuss the implications of our model for these taxes. Second, we assume that citizens can purchase either a small or big car. In the concluding section, we also elaborate on the continuous case.

Consider a society with a large number of citizens of mass 1 indexed by i. Each citizen i makes three decisions. First, before the election, citizen i buys either a small car, $x_i = 0$, or a big one, $x_i = 1$. Let b_i denote citizen i's benefit of owning a big car relative to owning a small car that is not related to fuel consumption. b_i captures a wide variety of aspects, such as comfort, neighborhood characteristics, safety, image concerns, and so on. For example, in densely populated areas, owning a big car might be inconvenient. For citizens in those areas b_i is possibly negative. A society is characterized by a density function $f(b_i)$ with cumulative distribution function $F(b_i)$. Different societies have different density functions.[8]

Citizens' decisions on x_i divide society into two groups: a group of citizens owning small cars and a group of citizens owning big cars. Once each group has

[8] In our model, b_i is independent of the share of citizens owning a big car. We ignore individual safety benefits of owning a big car. As argued by Anderson and Auffhammer (2013), the threat that citizens' decisions on which car to buy ends in an "arms race" is an important rationale for taxing gasoline.

been formed, its members have identical interests. Small and big cars differ in gasoline consumption, g_i:

$$g_i = (1 + x_i v)\, m_i,$$

where m_i is the number of miles i travels, and $v \geq 0$ is a measure of the extra gasoline a big car consumes.

After each citizen has bought a car, an election is held to determine the tax (or subsidy) on gasoline, τ. We assume that the representative of the group that forms the majority chooses τ. With two homogeneous groups, this assumption is equivalent to assuming that the median voter chooses τ. Tax revenues, $t = \tau \int g_i di$, are given back to the citizen in the form of a lump-sum transfer.[9]

Finally, after the median voter has chosen τ, each citizen i chooses how many miles she drives. If gasoline were for free, each citizen would drive μ miles, $m_i = \mu$.[10] Citizen i's preferences are represented by the utility function

$$u_i(x_i, m_i) = t + x_i b_i - \frac{1}{2}(m_i - \mu)^2 - \tau g_i - \gamma \int_0^1 g_i di. \tag{1}$$

The fourth term of the right-hand side of (1) shows that the price of gasoline solely consists of the tax on gasoline. This assumption leads to shorter expressions in the next section. The last term in (1) provides the justification for a tax on gasoline. The usual interpretation of the parameter γ is that it denotes the actual externalities of gasoline consumption, like the costs of local and global pollution, congestion and accidents.[11] When deriving the socially optimal tax, we use this interpretation. An alternative interpretation is that γ is a measure of the environmental preferences of the median voter. The median voter takes into account the costs of local emissions and congestion as these costs are borne locally. However, it is less clear to what extent the median voter takes into account the costs of global pollution, like the emissions of carbon dioxide. These costs are global and raise free-rider problems. With respect to global polution, γ measures to what extent the citizens in the

[9] Alternatively, tax revenues reduce a poll tax to finance public expenditures.

[10] Allowing for differences in μ across citizens does not affect our results qualitatively as long as owners of big cars consume more gasoline than owners of small cars.

[11] For reducing congestion and accidents, a tax on driven miles seems more effective than a tax on gasoline. A gasoline tax, however, is administrative relatively simple. Anderson and Aufhammer (2014) estimate that the accident-related externality amounts to a gasoline tax of \$0.97 per gallon.

society are willing to do their part. When explaining why gasoline taxes vary across societies, we use this interpretation of γ. Importantly, γ may vary across societies because of differences in local conditions and environmental preferences.

The timing in our model is important. Citizens buy cars before the median voter determines the gasoline tax. As discussed in the introduction, the motivation for this assumption is that citizens keep their cars longer than the time between two elections.

Our model is a simple, standard dynamic game. In the next section, we solve it by backward induction. When choosing how many miles to drive, citizen i owns a particular car, x_i, and faces a tax on gasoline, τ. Hence, m_i depends on x_i and τ. When choosing τ, the median voter observes the car fleet. Furthermore, she anticipates how citizens' decisions on how many miles to drive depend on x_i and τ. She chooses τ so as to maximize her utility. Citizens' decisions on x_i can be described by a threshold, b^T. Citizens with $b_i < b^T$ buy small cars, and citizens with $b_i \geq b^T$ buy big cars. In equilibrium, expectations must be validated. When making their decisions on x_i, citizens correctly anticipate the median voter's decision on τ and their own decisions on m_i.

Before solving the model, we first derive the social planner's decision on τ. We assume that the social planner chooses τ after citizens have bought cars. Furthermore, we assume that the social planner maximizes the sum of citizens' utility functions. In Appendix A, we show that the social planner chooses $\tau = \gamma$.

3 Analysis

We first derive how many miles citizen i drives. Maximizing[12]

$$-\frac{1}{2}\left(m_i - \mu\right)^2 - \tau\left(1 + x_i v\right) m_i$$

with respect to m yields

$$m_i = \mu - \left(1 + x_i v\right) \tau. \tag{2}$$

[12]With a large number of citizens, each citizen ignores her own contribution to the externality.

Equation (2) shows that a higher tax reduces miles of travel, especially among big car owners.[13]

To derive the equilibrium tax rate, we first write total gasoline consumption and tax revenues as a function of τ. Let κ denote the share of citizens who own a small car, $\kappa = F\left(b^T\right)$. Then, total gasoline consumption can be written as:

$$\int_0^1 g_i di = \kappa\left(\mu - \tau\right) + \left(1 - \kappa\right)\left(1 + v\right)\left[\mu - \left(1 + v\right)\tau\right], \tag{3}$$

and tax revenues equal

$$\begin{aligned} t &= \tau \int_0^1 g_i di \\ &= \tau\kappa\left(\mu - \tau\right) + \tau\left(1 - \kappa\right)\left(1 + v\right)\left[\mu - \left(1 + v\right)\tau\right]. \end{aligned} \tag{4}$$

Assumption 1 *Owners of big cars consume more gasoline than owners of small cars:*

$$\begin{aligned} \left(1 + v\right)\left[\mu - \left(1 + v\right)\tau\right] &> \left(\mu - \tau\right) \\ \mu &> \tau\left(2 + v\right) \end{aligned} \tag{5}$$

To determine the equilibrium tax rate, two cases have to be distinguished: the case that the median voter owns a small car and the case that she owns a big car. First, suppose that she owns a small car. Using (2-4) with $x_i = 0$, and maximizing

$$u_i\left(0, m_i\right) = t - \frac{1}{2}\left(m_i - \mu\right)^2 - \tau m_i - \gamma \int_0^1 g_i di$$

with respect to τ yields

$$\tau_h\left(\kappa\right) = \gamma + \frac{\left(1 - \kappa\right)v\left[\mu - \gamma\left(2 + v\right)\right]}{1 + 2\left(1 - \kappa\right)v\left(2 + v\right)}. \tag{6}$$

Condition (5) ensures that the last term in (6) is positive.[14] Equation (6) consists of two parts. The first part represents the extent to which the society wants to

[13] Estimating price elasticities is hard because of the endogeneity of prices. Trying to address this problem, Davis and Kilian (2011) estimate a price elasticity of -0.46.

[14] To see this, suppose that $\gamma \downarrow \frac{\mu}{2+v}$. Then, $\tau = \gamma$ and (5) is just satisfied. For $\gamma > \frac{\mu}{2+v}$, $\tau > \gamma$ and (5) is violated. Hence, (5) requires that $\mu > \gamma\left(2 + v\right)$.

take the externality of gasoline consumption into account. The second part represents a benefit to citizens owning small cars from the redistributive consequences of τ. Because citizens owning big cars consume more gasoline, a higher gasoline tax redistributes income from citizens owning big cars to citizens owning small cars. This redistributive part is decreasing in κ (see the right-hand side of Figure 1). To understand the intuition for this relationship consider the extreme cases that $\kappa = 1$ and $\kappa = \frac{1}{2}$. If $\kappa = 1$, all citizens own a small car. No redistribution is possible. Hence, $\tau_h(1) = \gamma$. If $\kappa \downarrow \frac{1}{2}$, almost half of the people owns a big car. Consequently, the base for redistribution is large. Furthermore, the lower is κ (given that $\kappa > \frac{1}{2}$), the lower is the share of people who benefit from redistribution. Thus, each citizen who owns a small car receives more. More generally, the higher is κ, the smaller is the base for redistribution and the higher is the number of people among whom the tax revenue is divided. Both forces reduce the benefits from redistribution.

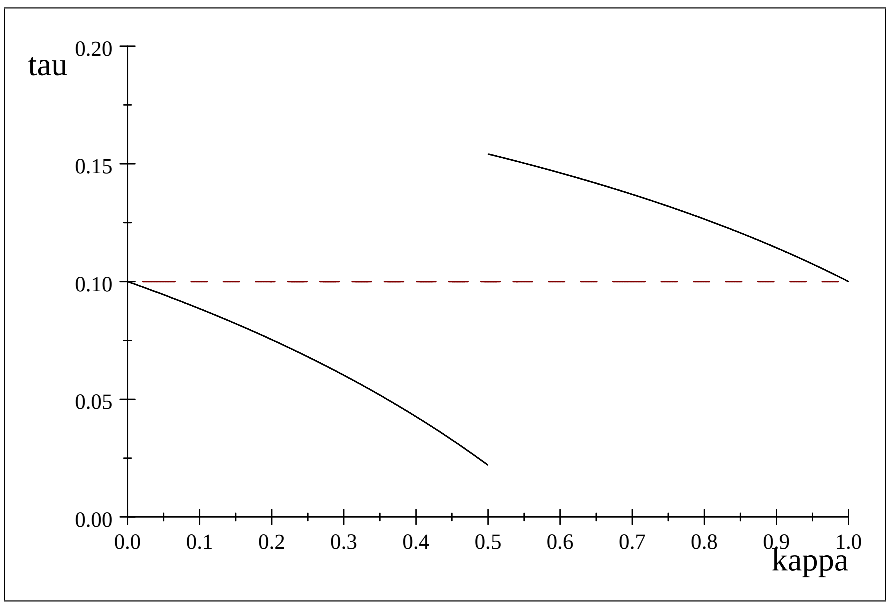

Figure 1: $\tau_h(\kappa)$ and $\tau_l(\kappa)$.

Equation (6) also shows that τ_h is increasing in μ. A higher value of μ increases traveling and thereby the tax base. The effect of an increase in v on redistribution is nonmonotonic. Redistribution requires that $v > 0$. As a result, the second term of (6) increases in v for low values of v. On the other hand, a higher value of v discourages citizens with big cars to travel. For high values of v, the latter effect dominates the former one.

Now suppose that the median voter is a member of the group of citizens who own big cars, $\kappa < \frac{1}{2}$. Using (2-4) with $x_i = 1$, and maximizing

$$u_i(1, m_i) = t + b_i - \frac{1}{2}(m_i - \mu)^2 - \tau(1+v)m_i - \gamma \int_0^1 g_i di$$

with respect to τ yields

$$\tau_l(\kappa) = \gamma - \frac{\kappa v[\mu - \gamma(2+v)]}{1 + (1-2\kappa)v(2+v)}. \tag{7}$$

Equation (7) shows that if the median voter owns a big car, she chooses a low tax to reduce redistribution from big car owners to small car owners. Equation (7) mirrors (6). Redistributive concerns do not exist if all citizens own a big car ($\kappa = 0$) and become important if κ approaches one-half (see the left-hand side of Figure 1). Furthermore, the higher is μ, the more the tax deviates from the tax rate that only targets the externality. Finally, it is worth noting that $\tau_l(\kappa)$ can be negative. Redistributive concerns can become that important that gasoline consumption is subsidized.[15]

Let us now turn to citizens' decisions on which cars to buy. As discussed above, these decisions can be characterized by a threshold, b^T. We first show that the higher is the anticipated tax rate, τ^a, the higher is b^T. For citizen i, buying a big car yields a higher utility than buying a small one if

$$b_i - \frac{1}{2}(1+v)^2(\tau^a)^2 - \tau^a(1+v)(\mu - (1+v)\tau^a) > -\frac{1}{2}(\tau^a)^2 - \tau^a(\mu - \tau^a),$$

implying

$$b_i > b^T(\tau^a) = v\tau^a\left(\mu - \frac{1}{2}(2+v)\tau^a\right). \tag{8}$$

Condition (5) guarantees that b^T is increasing in τ^a. As $\tau_h(\kappa) > \tau_l(\kappa)$, this implies that

$$b^T[\tau_h(\kappa)] > b^T[\tau_l(\kappa)]. \tag{9}$$

Hence, the share of citizens buying a big car is decreasing in the anticipated tax on gasoline.

We are now ready to identify the equilibria of our model. Let τ^* denote the

[15] In Venezuela, Libya and Iran, gasoline prices are below \$0,10 per litre, far below the market price. This shows that subsidies on gasoline are not a mere theoretical outcome.

equilibrium gasoline tax and let κ^* denote the equilibrium share of citizens who buy a small car. In equilibrium, the anticipated tax is equal to the tax chosen by the median voter, $\tau^* = \tau^a$, with $\tau^* = \tau_l(\kappa^*)$ if $\kappa^* < \frac{1}{2}$ and $\tau^* = \tau_h(\kappa^*)$ if $\kappa^* > \frac{1}{2}$. An equilibrium with a high tax requires that $F\left\{b^T\left[\tau_h\left(\frac{1}{2}\right)\right]\right\} > \frac{1}{2}$. If this condition is met, the highest possible tax induces a majority to drive in small cars. An equilibrium with a low tax requires that $F\left\{b^T\left[\tau_l\left(\frac{1}{2}\right)\right]\right\} < \frac{1}{2}$. Now the lowest possible tax induces a majority to drive in big cars. Define b_{median} implicitly as $F(b_{median}) = \frac{1}{2}$. Proposition 1 presents the main result of this paper.

Proposition 1 *If* $b_{median} > b^T\left[\tau_h\left(\frac{1}{2}\right)\right]$, *then a unique low-tax equilibrium exists, in which* $\kappa^* < \frac{1}{2}$ *and* $\tau^* = \tau_l(k^*)$. *If* $b^T\left[\tau_l\left(\frac{1}{2}\right)\right] > b_{median}$, *then a unique high-tax equilibrium exists, in which* $\kappa^* > \frac{1}{2}$ *and* $\tau^* = \tau_h(k^*)$. *If* $b^T\left[\tau_h\left(\frac{1}{2}\right)\right] > b_{median} > b^T\left[\tau_l\left(\frac{1}{2}\right)\right]$, *then there exist multiple equilibria: (i) a low-tax equilibrium with* $\kappa^* < \frac{1}{2}$ *and* $\tau^* = \tau_l(k^*)$, *and (ii) a high-tax equilibrium with* $\kappa^* > \frac{1}{2}$ *and* $\tau^* = \tau_h(k^*)$.

We now graphically illustrate how the positions $b^T\left[\tau_h\left(\frac{1}{2}\right)\right]$ and $b^T\left[\tau_l\left(\frac{1}{2}\right)\right]$ in the density function $f(b_i)$ determine which equilibria exist. In Figure 2, $b^T\left[\tau_h\left(\frac{1}{2}\right)\right]$ is smaller than the median of $f(b_i)$, b_{median}. This means that when the government imposes the highest possible tax on gasoline, a majority of citizens nevertheless buy a big car. In this situation, there exists a unique equilibrium, in which $\kappa^* < \frac{1}{2}$, and $\tau^* = \tau_l(\kappa^*)$. This low-tax equilibrium exists and is unique in an environment where the benefits of driving big cars are high and $\tau_h\left(\frac{1}{2}\right)$ is low. For example, rural areas where the population density is low are probably big-car friendly environments. As discussed above, $\tau_h\left(\frac{1}{2}\right)$ is low for low values of γ and μ.

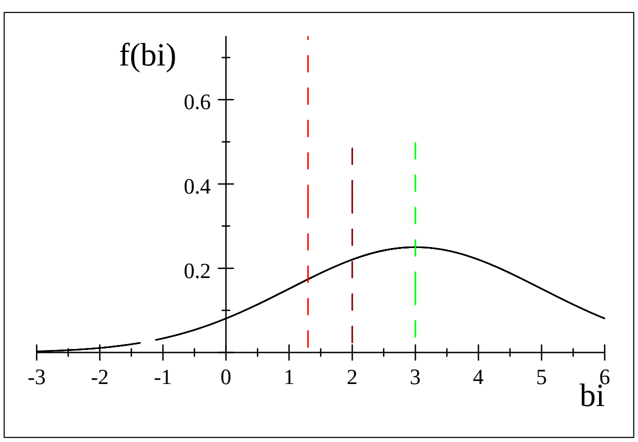

Figure 2. A unique high-tax equilibrium: $b^T\left[\tau_l\left(\frac{1}{2}\right)\right]$ (red) $< b^T\left[\tau_h\left(\frac{1}{2}\right)\right]$ (dark red) $< b_{median}$ (green).

A unique equilibrium where a majority drives in small cars, $\kappa^* > \frac{1}{2}$, and $\tau^* = \tau_h(k^*)$ exists, if $b^T\left[\tau_l\left(\frac{1}{2}\right)\right]$ is higher than b_{median} (see Figure 3). Then, even for the lowest possible gasoline tax, only a minority is willing to buy a big car. This equilibrium is likely to exist and unique in environments where big cars are inconvenient, public transport is an alternative for the car, and the costs of local pollution and congestion are high, as in densely populated areas. Uniqueness requires that μ is high. Furthermore, this unique equilibrium is more likely in societies that want to contribute to reducing global pollution (high γ).

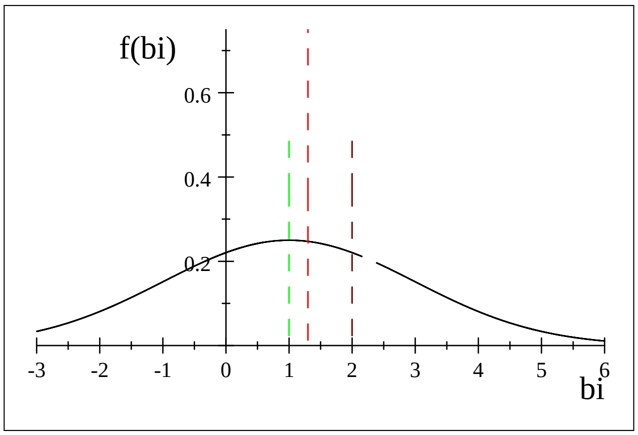

Figure 3. A unique low tax equilibrium: $b_{median} > b^T\left[\tau_h\left(\frac{1}{2}\right)\right]$ (dark red) > $b^T\left[\tau_l\left(\frac{1}{2}\right)\right]$ (red).

Finally, if $b^T\left[\tau_l\left(\frac{1}{2}\right)\right] < b_{median} < b^T\left[\tau_h\left(\frac{1}{2}\right)\right]$, for the same parameters of the model a high-tax equilibrium exists with $\kappa^* > \frac{1}{2}$ and a low-tax equilibrium exists with $\kappa^* < \frac{1}{2}$ (see Figure 4). The existence of multiple equilibria suggests that differences across countries cannot always be explained by differences in primitives. Countries that are similar in all relevant respects may end up in different equilibria. Multiple equilibria are likely to exist in environments where citizens want to travel a lot, as τ_l is decreasing and τ_h is increasing in μ. Divergence of the low and high tax widens the range between $b^T\left[\tau_l\left(\frac{1}{2}\right)\right]$ and $b^T\left[\tau_h\left(\frac{1}{2}\right)\right]$.

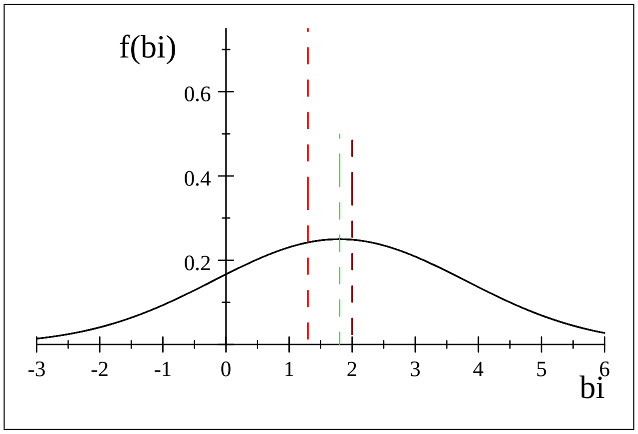

Figure 4. Multiple equilibria: $b^T\left[\tau_l\left(\frac{1}{2}\right)\right]$ (red) $< b_{median}$ (green) and $b^T\left[\tau_h\left(\frac{1}{2}\right)\right]$ (dark red) $> b_{median}$ (green).

4 Concluding Remarks

We have presented and solved a political economic model of gasoline taxation. The model has a low-tax equilibrium, in which citizens own big cars, and a high-tax equilibrium, in which citizens own small cars. Distributive motives create distortions in the gasoline tax. The tax in the low-tax equilibrium is too low from a social point of view, while the tax in the high-tax equilibrium is too high from a social point of view.

In our model, citizens can either buy a small car or a big car. We have shown that under this assumption, the composition of the car fleet is important for gasoline taxation. If we had assumed a continuum of cars in terms of fuel consumption and comfort among which citizens can choose, distributive motives would still affect taxes. As in our model, the relative positions of the mean and median citizen would be important. In an equilibrium where the median citizen consumes more gasoline than the mean citizen the gasoline tax is lower than in an equilibrium where the median citizen consumes less gasoline than the mean citizen. Again the low-tax and-high tax equilibria can be self-enforcing. This requires that for a low gasoline tax, the median citizen owns a bigger car than the mean citizen, while for a high gasoline tax, the median voter owns a smaller car than the mean citizen.

We have abstracted from sales and excise taxes on cars. A social planner would use one of these taxes to discourage citizens from buying big cars. Figure 1 shows how the median citizen would use a sale tax. In both the low-tax equilibrium and high-tax equilibrium, the median voter wants κ to be close to one-half. This enhances redistribution towards the median voter. consequently, the median voter has an incentive to use the sale tax to affect κ. To see how, consider the low-tax equilibrium, in which without a sale tax κ is close to 1. In that case, the median voter would choose a sale tax to discourage citizens to buy a big car. This would increase the distributional benefits from gasoline taxation.

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6 Appendix The Social Planner

We derive the gasoline tax a social planner chooses after citizens have made their decisions on x_i. The social planner anticipates how τ affects citizens' decisions on m_i, and how much gasoline will be consumed. The social planner maximizes

$$\int u_i(\tau) = -\kappa\frac{1}{2}\tau^2 - (1-\kappa)\frac{1}{2}(1+v)^2\tau^2 - \gamma\left[\kappa(\mu-\tau) + (1-\kappa)(1+v)(\mu-(1+v)\tau)\right]$$

with respect to τ, yielding $\tau = \gamma$.