Future of gasoline taxes -- a vertical tax competition approach

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This paper looks into the role of gasoline taxes when regional governments can easily introduce better instruments like parking charge and road pricing to address externalities.

Research questions
Gasoline taxes have been the dominant instrument to raise taxes from car users and to correct different externalities. They are the right instrument to address climate change but a very imperfect instrument to address congestion as they do not vary by time of day and by location. Over time, technological progress has made the implementation of smarter charges such as congestion charges as well as parking charges much easier and urban road tolls are already introduced in cities such as London and Stockholm. It is expected that further progress in pricing technology as well as public acceptability will lead to a generalised use of parking and congestion pricing by local governments.

This raises several research questions:

- What results can be expected from the generalised introduction of parking charges and congestion taxes by local governments on top the federal fuel taxes?
- Will the overall tax level be excessive?
- What sharing rules for the revenues of charges and taxes will generate the correct charge and tax levels at the different government levels?
- How do implementation costs affect the outcome?

Methodology
We use an algebraic model combined with numerical simulations. The model presents a country as the sum of an urban region and a rural region. The federal government maximises the welfare of the whole country while the urban and rural governments maximise the welfare in their own regions.

We first develop the case where a federal government optimises the use of three combinations of instruments: (1) a uniform gasoline tax in the whole country, (2) a uniform gasoline tax and a parking charge that can be regionally differentiated, and (3) a uniform gasoline tax and a congestion tax that can be regionally differentiated. This is the First Best.

The second step is to examine the equilibria where the regional governments can add a parking charge or a congestion tax to the uniform federal gasoline tax. Here we distinguish between alternative behaviours of the federal government: Nash and Stackelberg.
In the third step we compare the costs and benefits of policy decentralisation. We do this for different revenue sharing schemes, different implementation costs and for different marginal costs of public funds of non-transport taxes.

We use a stylised model that has gasoline related external costs and congestion externalities. Urban and Regional areas are each homogeneous and only differ in the level of congestion externalities. We check the sensitivity of the results with respect to key parameters as there are the relative size of urban and rural populations, the extent of congestion, the demand elasticity of car trips and the implementation costs.

**Results**

1. In the federal government optimum, a more complex combination of instruments increases welfare because it allows lower gasoline taxes in rural areas and better targeted congestion taxes in urban areas. This result depends mainly on implementation costs and on the level of urban congestion.
2. In the non-cooperative equilibrium, the overall tax level becomes excessive as each government level disregards the negative effect it has on the tax base of the other government levels (double marginalisation).
3. In the non-cooperative equilibrium, the tax levels of different instruments are the same as the levels in the federal government optimum, under the very restrictive assumptions that regional governments get back all the transport taxes that are paid in their region (gasoline taxes, parking charges and congestion taxes).
4. In the non-cooperative equilibrium, there is a risk that one ends up with a tax system that has too high implementation costs – local governments can increase their own tax revenue level by implementing a parking or road pricing system, a renegotiation of the division of the tax revenues over different government levels may produce the same total tax revenue at a lower total cost.
5. Reforming the tax system, also calls for changes in the investment programs of rural and urban regions. Rural regions will require more capacity but will have smaller (gas tax) revenues while the needs of urban regions may be smaller. This calls for a rethinking of investment funds based on dedicated tax revenues (Highway trust fund in the US, Germany etc.)

**Literature**


Parry, I. W. H., and Small K. A. (2005), Does Britain or the United States have the right gasoline tax?” American Economic Review, 95(4), 1276–89.