Efficient combination of taxes on fuel and vehicles

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Executive summary

Many countries have implemented taxes on fuel combined with tax-exemptions or subsidies for fuel-efficient vehicles with the aim of curbing externalities linked to both fuel (CO2 emissions) and mileage (local air pollution, accidents, congestion and noise). However, the gain in terms of reduced externalities per liter of fuel is diminished by the fact that households avoid the road user charge on fuel by purchasing more fuel-efficient vehicles. The optimal tax on fuel is reduced accordingly; see Parry and Small (2005), Anton-Sarabia and Hernandez-Trillo (2014) and Lin and Zeng (2014). Parry and Small (2005) show that the optimal uniform tax rate on gasoline in the United States is more than twice the current rate, while that for the United Kingdom is about half the current rate.

An alternative strategy consists of imposing a tax on fuel-efficient vehicles which cancels out the gains of this avoidance. The present study contributes to the literature by analyzing efficient ways to combat traffic-related externalities by combining taxes on fuel and vehicles. Theories in Innes (1996) and Fullerton and West (2002) are developed into operational tax formulas that are comparable with current taxation of fuel and vehicles. Extensions with myopic behavior and electric vehicles are included.

The comparison of optimal and current taxation of fuel and vehicles reveals substantial inefficiencies. At $0.37 per gallon, the current US tax difference between gasoline and non-polluting goods, including fees from toll roads, is substantially smaller than the optimal tax difference of $2.36 per gallon. The current UK tax difference of $2.69 per gallon is also substantially smaller than the optimal tax difference of $3.36 per gallon. The corresponding optimal tax estimates in Parry and Small (2005) are only $1.01 and $1.34 per gallon gasoline.

The study shows that the tax on fuel-efficient vehicle should exceed the tax on fuel-intensive vehicles. The intuition is that the tax on fuel is designed to curb externalities linked to both consumption of fuel and road use. The heavier tax on fuel-efficient vehicles prevents motorists from avoiding the road user charge on fuel by

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Executive summary of the article: Efficient combination of taxes on fuel and vehicles, The Energy Journal, Vol.

purchasing fuel-efficient vehicles. This result holds even when myopic households underestimate the future benefits of lower operating costs for fuel-efficient vehicles.

The study also shows that the lack of road user charges for electric cars implies that the optimal additional tax on electric cars equals their lifetime value of mileage-related externalities when other market imperfections are absent. The intuition is that the cost of CO2 emissions and mileage-related damage from fossil fuel vehicles is incorporated into the price of fuel. The cost of mileage-related damage from electric vehicles is incorporated into the price of the vehicle. Thus, the costs of externalities are incorporated when households choose between fossil fuel vehicles and electric vehicles.

In contrast, several countries have introduced CO2-based tax rebates for the purchase of vehicles, or annual CO2-based registration taxes. Tax exemptions and subsidies for electric vehicles are introduced to promote the development of clean transport technology.

Keywords: Transportation, optimal taxation, environmental taxation, global warming.