Price Effect of Domestic Oil Tax under Vertically-related Markets Structure

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Theoretically, oil price deregulation and fuel tax reform will effectively correct market distortions and improve energy efficiency.

But if considering the existing imperfect competition in international and domestic oil markets, domestic oil tax, including fuel tax, may affect international oil price, domestic oil price and the benefits of oil companies in quite different manner.

1. Introduction
So, the difference of price effects under different oil market structures, and the optimization of domestic oil market structure require in-depth research and analysis.
Some studies (e.g. Bergstrom, 1982; Singer, 1989; Bakhtiari, 1999; OECD, 2004) paid attention to the impacts of domestic tax on international oil price.

Other studies focused on tax incidence of domestic oil tax by mainly using competitive model (e.g. Chouinard and Perloff, 2004).
Main idea to inspire this study

- Global Commodity Chains (GCC) approach
- Trade Intermediation theory (TI)
- Vertically-related Markets Structure theory

In the above theories, only one intermediation was considered in TI theory, while more than one intermediations are included in vertically-related markets structure theory. Although the latter could be viewed as the development of GCC, it provided a method which can be modelized.
In this paper, we will consider only one intermediation (oil company) to expand our study based on vertically-related markets structure method, where oil companies of major importing countries was viewed as trade intermediation, which clear the market and profit by bid-ask spread and stock adjustment.
2. Theoretical Model

we have the following comparative static conditions:

\[
\begin{align*}
d \ln R &= \frac{\psi D + \alpha \epsilon B}{D + \delta D + \alpha \eta \epsilon B} \phi d \ln T \\
d \ln P &= \frac{\epsilon D (1 + \delta - \eta \psi)}{D + \delta D + \alpha \eta \epsilon B} \phi d \ln T
\end{align*}
\]
If there is imperfect competition in oil production and trade intermediation, the price effects of domestic oil tax are different.

When the demand and supply elasticity are both low, with the weakening of the production competition, oil-importing countries could more effectively influence international oil price by domestic tax, and oil producer(s) would bear more and more tax burden.
When there is no strong competition among domestic oil companies, price transmission elasticity of domestic oil tax is negative, which means that international oil price drops and the asking price of oil companies rises while imposing domestic oil tax.

If there is strong competition among domestic oil companies, price transmission elasticity of domestic oil tax is positive, which indicates that both international oil price and the asking price of oil companies fall when imposing domestic oil tax.
3. Descriptive Analysis

- U.S., EU and Japan are all the major oil-importing and oil-consuming countries in world market. Meanwhile, although these countries all depend on imported oil, their oil industries are quite different in competitiveness.

- EU’s oil industry is of less competitiveness compared with that of U.S., and Japanese oil industry was of the weakest.
4. Empirical Method

- By econometrically estimating the effects of domestic oil tax on international oil price and domestic consumer price, to measure indirectly the effects of domestic oil tax on asking price of oil companies, then to calculate the price transmission elasticity of domestic oil tax and its marginal effect on the profits of oil companies, and finally to explore the price effects of domestic oil tax and its tax incidence.
5. Empirical Results and Analyses

- By random effects variable-coefficient panel model, the results of empirical study show that the domestic tax elasticity of international oil price is significantly negative. The increase in domestic oil tax in U.S., EU and Japan will cause decrease in international oil price.

- 1% increase in domestic oil tax in EU will cause 1.41% decrease in international oil price, 1% increase in domestic oil tax in US will cause 0.9% decrease in international oil price, and 1% increase in domestic oil tax in Japan will cause 0.87% decrease in international oil price.
Price Elasticity of domestic oil tax on asking price

Figure 2. The tax elasticity of asking prices for oil companies (1970-2005)
Note: Left vertical axis is for US and EU, and right vertical axis is for Japan.
Table 7. Price Transmission Elasticity and Its Effects on Profits of Oil Companies

<table>
<thead>
<tr>
<th></th>
<th>U.S.</th>
<th></th>
<th>EU</th>
<th></th>
<th>Japan</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ρ</td>
<td>dπ/dt/Q</td>
<td>ρ</td>
<td>dπ/dt/Q</td>
<td>ρ</td>
<td>dπ/dt/Q</td>
</tr>
<tr>
<td>1972</td>
<td>1.06</td>
<td>-1.94</td>
<td>-3.48</td>
<td>1.13</td>
<td>-0.84</td>
<td>1.07</td>
</tr>
<tr>
<td>1976</td>
<td>1.46</td>
<td>0.12</td>
<td>-2.87</td>
<td>2.73</td>
<td>-0.85</td>
<td>5.41</td>
</tr>
<tr>
<td>1980</td>
<td>1.76</td>
<td>1.48</td>
<td>-2.76</td>
<td>3.14</td>
<td>-0.85</td>
<td>6.77</td>
</tr>
<tr>
<td>1984</td>
<td>1.24</td>
<td>1.24</td>
<td>-2.87</td>
<td>2.81</td>
<td>-0.85</td>
<td>6.20</td>
</tr>
<tr>
<td>1988</td>
<td>0.89</td>
<td>-0.77</td>
<td>-5.53</td>
<td>0.72</td>
<td>-0.85</td>
<td>2.68</td>
</tr>
<tr>
<td>1992</td>
<td>0.72</td>
<td>-0.82</td>
<td>-7.92</td>
<td>0.54</td>
<td>-0.85</td>
<td>2.76</td>
</tr>
<tr>
<td>1996</td>
<td>0.61</td>
<td>-0.78</td>
<td>-13.41</td>
<td>0.47</td>
<td>-0.84</td>
<td>2.04</td>
</tr>
<tr>
<td>2000</td>
<td>0.80</td>
<td>-0.62</td>
<td>-6.49</td>
<td>0.80</td>
<td>-0.84</td>
<td>2.33</td>
</tr>
<tr>
<td>2004</td>
<td>0.97</td>
<td>-0.28</td>
<td>-5.89</td>
<td>1.07</td>
<td>-0.85</td>
<td>3.01</td>
</tr>
</tbody>
</table>

Sources: Calculated by the author.
Facing the imperfect competition in oil production, the price transmission elasticity of domestic oil tax is positive in a market with relatively strong competition among domestic oil companies, or the domestic tax will cause both international oil price and the asking price of oil companies to fall, like the case in U.S.
By contrary, the price transmission elasticity of domestic oil tax is negative in a relatively monopolistic market, or the domestic tax will cause decrease in international oil price but large increase in the asking price of oil companies and consumer oil price, like the cases in EU and Japan.
Since the increase of domestic oil tax will decrease the asking price and profits of oil companies in U.S., the oil companies (energy interest group) become the main barrier to raise oil tax, and the opposition of energy interest group and consumers’ sensitivity to gasoline price make the increase of low oil tax to its optimal level lack of political support, which causes low actual oil tax in U.S.
In EU and Japan, although the increase in oil tax will make consumers to pay higher oil price, the oil tax will raise the asking price and profits of oil companies, which make oil companies benefit from the increase of oil tax, so the support from oil companies and the pressure from environmentalists push EU and Japan to take high oil tax policy.
6. Conclusions and Policy Implications

By analyzing the market structures of oil industry and oil demand elasticities in U.S., EU and Japan, the empirical study supports our theoretical conclusion.
The empirical study results for price effect of domestic oil tax can explain the deviation between the actual and optimal tax rates in U.S., EU and Japan.
Thank You!