EAGER
Policy Brief

NUMBER 15 / JANUARY 1999

Estimating Demand Curves for Goods Subject to Exice Taxes

It is important to determine what excise tax rate maximizes government revenue, if only to avoid setting tax rates too high. In order to foresee the effects of changes in excise tax rates on government revenue, it is necessary to know the form of the demand and supply curves for the good. This policy brief is based on a methodological study* that describes a straightforward procedure for estimating demand curves.

What happens to government revenue when the tax on a good is changed? What tax rate maximizes government revenue? To answer these questions, one needs to know the form of the demand and supply curves for the good. A study setting out to establish procedures for estimating demand curves was undertaken as part of the USAID-sponsored EAGER project.

Excise taxes are a type of sales tax usually applied to petroleum products, alcoholic beverages and tobacco products. The supply for these products is typically assumed to be infinitely elastic, and therefore, the supply curve is horizontal. As the cost of supplying the goods and the tax rate vary from year to year, the supply curve shifts up and down creating new equilibrium points along the demand curve.

A sensible algorithm for determining demand curves is as follows. After choosing variables based on theory and practical availability, one needs to collect data on these variables. After building the data set, one should do exploratory data analysis by determining the summary statistics (mean, standard deviation, minimum, and maximum) for each variable. The next step is to run the simplest type of regression, ordinary least squares (OLS). If the results of the linear form are not convincing, one should explore other possible functional forms, such as a logarithmic model, and choose the "best" model. Models with a logged dependent variable usually fit very well. More elaborate error-correction models are seldom feasible for lack of enough data observations. Although some authors do a lot of experimentation, this is not desirable, as it leads to over-fitting, where the reported results are not as precise as they seem.

USAID

Equity And Growth through Economic Research– an activity of USAID, Bureau for Africa, Office of Sustainable Development, Strategic Analysis Division

EAGER

In order to illustrate this process, the EAGER study estimates the demand curve for gasoline in Madagascar over the period 1978-1996. The dependent variable used is the amount of gasoline consumed per capita, while the independent variables are the price of regular gasoline, the price of diesel gasoline, and real per capita income.

There are many studies on the demand for gasoline in developed countries, but very few have focussed on less-developed countries. For developed countries, it has been determined that the price elasticity of demand is very low. This means that consumers do not adjust their buying habits greatly in response to changes in price. Therefore, the revenue-maximizing tax on motor fuel is likely to be high. However, the results show that in Madagascar if the price of gasoline were raised by 10%, the quantity demanded would fall by 2.6% in the short-run and 9.3% in the long-run. In addition, the demand for petroleum products is income inelastic, which implies that revenue from taxes on motor fuel will not rise as quickly as national income. However, the authors of the EAGER study predict that the demand for petroleum products is income elastic in most less-developed countries. Their theory is that as income rises in less-developed countries, people acquire motorbikes and cars, causing the consumption of motor fuel to rise more quickly than income. The evidence from Madagascar bears this out; a 10% rise in GDP would raise the demand for gasoline by 4% in the short-run and 15% in the long-run (i.e. after allowing enough time for consumers to fully adjust to their higher incomes).

Similar to the studies on petroleum products, there are almost no studies on the demand elasticities for cigarettes and tobacco in less-developed countries. Evidence from the US indicates that in the short-run (about one year), the demand for cigarettes is very inelastic, because the addictive qualities of cigarettes make it difficult for smokers to react quickly to a change in the price of cigarettes. However, the long-run elasticities are more substantial.

• This policy brief is based on EAGER Discussion Paper Number 12, Estimating Demand Curves For Goods Subject to Excise Taxes, 1998, by Jonathan Haughton [jhaughto@sclas.suffolk.edu], Suffolk University, Boston, Massachusetts.

To Order Policy Briefs or Other EAGER Publications

(all EAGER publications are free of charge to residents of Africa)

EAGER Publicaitons/BHM
1800 North Kent Street, Suite 1060
Arlington, Virginia 22209
tel/fax: 703-741-0900/703-741-0909
email: spriddy@eagerproject.com

All EAGER Publicaitons can be downloaded from www.eagerproject.com