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TAXATION OF ALCOHOL AND ITS IMPACT ON CONSUMPTION

Summary: Taxation of alcohol provides significant public revenues at low administrative costs. Reasons why specific types of goods are taxed more than others, and therefore it is necessary to preserve the tax and keep them at the highest level are the following: the effective increase in public revenues, addressing externalities and distributional implications. The examination of alcohol consumption from price changes is very difficult. Empirical studies using econometric methods provide estimates of price and income elasticities for various alcoholic beverages, especially wine, beer and spirits. Most of these studies indicate that the demand for alcohol, as well as for other goods, depends on price. The demand for spirits is the most sensitive to changes in prices compared with the demand for beer or wine.

Keywords: alcohol, tax, elasticity, consumption.

1. Introduction

It is well known that the consumption tax burden borne by consumers in the form of higher prices of goods or services. However, in the area of consumption exists any of the tax shifts. In terms of partial economic equilibrium consumption tax burden depends on the elasticity of demand and supply, i.e. if the demand for taxed goods and services is elastic and supply is relatively inelastic, the tax burden will be borne by more sellers and vice versa. Around the same elasticity of demand and supply means equal distribution of consumption tax burden between seller and buyer.

2. Theoretical aspects of alcohol taxation

The impact of economic variables, i.e. prices and income levels for consumption of alcohol is subject to the amount of empirical research in North America and Europe. To assess the impact of selective consumption tax on consumption is necessary to know the theoretical background to explain the economic theory of consumption.

In most EU countries are alcoholic beverages, tobacco and motor fuels are taxed more than other goods. The existence of selective excise taxes levied on the selected products dates from the period in which the general taxation of goods was less de-

veloped than today. Taxation of alcohol, tobacco and motor fuel provides significant revenue at low administrative cost. Maintaining a selected consumption tax in the current circumstances in which value added tax is a major source of tax revenues and putting pressure on a wider range of goods, may reflect the relic of the old system and the effectiveness of various economic and political obstacles to reforming the tax system. Although currently there are reasons why they selected types of goods taxed more than others, and therefore it is necessary to keep those taxes and keep them at the highest level.

Reasons for the existence of a selected consumption tax are as follows:

- A. Effective increase in government revenue.
- B. Externalities.
- C. Distribution effects.

A. Effective increase in government revenue

The main argument for different taxation of selected goods is based from Ramsey analysis. In the case of a selective consumption tax which should provide more public revenue, apart from the distribution impact, F. Ramsey states that the cost-effectiveness of raising revenue will be minimized only asymmetric taxation of selected goods, i.e. taxation of different goods at different rates. This results in the same proportional reduction in the consumption of each taxed goods. Buying a budget for public goods with the lowest tax elasticity and vice versa, and goods with high price elasticity should be taxed to a lesser extent. Excise taxes that minimize the size of dead losses are called “Ramsey tax” and are equal to the sum of the reciprocals of values of elasticity of demand and supply¹:

$$\frac{t}{p} = k \left(\frac{1}{\eta_u^d} + \frac{1}{\eta^s} \right).$$

Where k is a constant depends on the overall size of government revenue, t is the tax unit of production, p is the price after tax, η_u^d is a compensated elasticity of demand and η^s is a supply elasticity. If the supply curve is horizontal, the tax is proportional to the inverse of the elasticity of demand.

The goods, which have low price elasticity is assumed to have a low income elasticity and rule policy “perverse elasticity” implies more complex taxation of basic essential goods such as luxury goods.

If the goods are different degrees of substitutability for leisure or complementary of leisure, unequal taxation of these products reduces the cost of increasing fixed income. W.J. Corlett, D.C. Hague establish effective rule of selective consumption tax, which means that the higher tax burden will be imposed on goods that are more complementary to leisure and lower tax burden will be imposed on goods which

¹ J.E. Stiglitz, *Ekonomie veřejného sektoru*, Grada Publishing, Praha 1997.

are substitutes for leisure². It follows that leisure goods entering the utility function of individuals, but it is not taxed in the selective consumption tax system. Higher taxes on goods which are complements to leisure provide the lack of taxation of free time.

Another important event for the selective consumption tax policy is the price elasticity of different population groups. Young people are generally more price sensitive than older people and drinkers. The estimated price elasticity varies by the level of consumption. The higher price elasticity occurs in mild and rational individuals whose alcohol consumption is low and vice versa, in a more or less of alcohol dependents appears less elasticity.

It is not clear whether alcohol is complementary to leisure goods or replacement goods for leisure time. More free time means a higher consumption of alcohol and also means reducing the risk that the consequences of over-compensation will adversely affect job performance. On the other hand, a certain level of alcohol consumption may be considered as a complement to time spent at work and therefore as a substitute leisure. The reason is the possibility of release after a hard day at work or social carouse with colleagues. The balance between these two effects varies depending on the individual level of alcohol consumption. At low alcohol consumption of alcohol may be considered as a complement to work, but at higher levels of alcohol consumption may be regarded as a complement to leisure. The results of these effects are very uncertain for practical tax policy.

B. Externalities

Each of the three main excise duties on alcohol, tobacco and motor fuels can be used to target reducing the consumption of undesirable activities, particularly those that increase the total social costs. The social costs of alcohol consumption consist of a direct negative externalities (e.g. damage caused by drunk drivers other individuals) and costs borne by society as a whole (e.g. the costs of publicly funded treatment of alcoholics). In both cases, individual consumption decisions reflect the full social costs of consumption as the individual consumer is not charged to the marginal costs of direct treatment or externalities arising from alcohol consumption.

One of the possibilities of using taxes to limit socially undesirable activities is the introduction of the so-called Pigou taxes. Priority it is used in environmental policy and it means that the tax should be levied on each unit of pollution at a level to offset the marginal cost firms limit social costs.

Excise duty on alcohol is a tax imposed on the manufacture and sale of alcohol and is not imposed on alcohol consumption externalities. Charged to cost of goods, which is socially undesirable. The extent of external costs is resulting from excessive consumption of alcohol. Only some consumers may lead to externalities and the relationship between alcohol consumption and externalities may not be linear. Taxa-

² Ch. Jones, *Applied Welfare Economics*, Oxford University Press, New York 2005.

tion of alcohol reduces the external costs due to inappropriate consumer, but at a cost of reducing the consumer satisfaction of appropriate consumers.

C. Distribution effects

In general, the examination of the distribution of impacts of individual instruments in the tax system is less important than examining the distribution of the total impact of all taxes together. This means that the regressive impact of tax that falls mainly on the poorer households may be in terms of distribution effects insignificant, if in the other taxes shows the progressiveness of taxes. Despite of that the taxes, including taxes on alcohol, fall unevenly on households with the same income and the distribution must be examined separately the effects of alcohol duty as any other tax adjustments in the tax system can only be replaced by an average distribution of the tax effects of alcohol.

Taxation of consumers with high consumption of alcohol will have a much higher distribution tax effect of alcohol as a consumer who has no alcohol consumption, in which the influence of alcohol duty insignificant.

Evaluation of the impact of taxation on the distribution may be affected by long period spent in the analysis. The tax appears regressive when analyzed income households for one year, i.e. in the short term and should be seen less regressive when analyzed by income in the long term. There are two main reasons for the differences between the distribution impacts of indirect taxes, depending on the time period:

a) Alleviation of consumption over income fluctuations in short-term and predictable income changes during the life cycle and systematic changes in the propensity to consumption during the entire life cycle. For example, temporary changes in income have little impact on current consumption, because households can use savings and borrowing to maintain a constant level of consumption, despite a temporary reduction in their income.

b) The existence of predictable income changes during the entire life cycle, which may be offset by savings and loans and the possibility that consumption habits are changing throughout the life cycle.

A comparison of the distribution analysis, in which the first tax burden as a percentage of current annual earnings and then as a percentage of household consumption shows that all three major excise taxes – alcohol, tobacco and motor fuel tax burden is expressed as a percentage of current income more regressive as in the second. This means that the alcohol tax is regressive when analyzed in relation to current income and moderate progressive in terms of total household consumption.

Whether long-term perspective results in quantitative differences in the distribution analysis depends on three main factors:

- a) The extent of income volatility,
- b) The extent of changes in consumer behavior,

c) The extent to which predictable differences in lifetime consumption tendency to peak or the extent to which countervailing effects arising from changes in lifetime income.

Taxes on alcohol are regressive, because a higher proportion of poor households from the budget as the budget of other households. The net impact of alcohol taxes depends on how government revenues are spent. When used as the introduction of income exemption trimmed policy net impact will be more progressive. Costs associated with health care after drinking alcohol borne by the public spending are offset with current tax revenues.

3. Applied aspects of alcohol taxation

Examination of alcohol dependence of price changes is very difficult. Scientific studies using econometric methods provide estimates of price and income elasticity for various alcoholic beverages, especially wine, beer and spirits. Most of these studies indicated that the demand for alcohol, as well as for other goods, depends on price. Demand for alcohol is the most sensitive to changes in prices compared with demand for beer or wine. Studies also show that the less popular and favorite alcoholic beverages in the country have high price elasticity than the traditional and popular alcoholic drink typical of the country. Scientific studies, however, vary due to differences in data and analysis methods, as well as the national, regional and local differences in preferences. It follows that accurate quantitative conclusions that would apply generally can not be inferred.

Determination of price and income effects of alcoholic beverages is based mostly on aggregate data rather than data on individual consumer decisions in respect of individual brands of alcoholic beverages, for the following reasons:

a) Data on consumption and income are usually not available in terms of individuals or households. Most investigations of demand is based on data on average fuel consumption, average income and average price level for the entire population in a given geographical area (e.g. state, province).

b) Many different types of alcoholic beverages are divided into three categories: spirits, wine and beer. The amount of alcohol is measured by volume of alcohol in each category and the price of alcohol is expressed as a kind of average price index of all brands. The problem of data aggregation may be an inter-branch substitution resulting from price changes. For example, the increase in the average price of alcohol may cause a substitution of more expensive brands of alcohol a cheaper brand, thus the amount of alcohol consumed does not change despite a general increase in prices.

The estimated demand function in mathematical terms has the following form³:

$$Q = a + b_s \left(\frac{P_s}{P} \right) + b_B \left(\frac{P_B}{P} \right) + b_w \left(\frac{P_w}{P} \right) c \left(\frac{Y}{P} \right) + d_1 X_1 + \dots + d_m X_m .$$

In the function Q mean alcohol consumption per capita, P_s , P_b and P_w is the price of alcohol, beer and wine, Y is per capita disposable income, P is the consumer price index and X_1, \dots, X_m are other variables that may influence the consumption of alcohol. Some studies have used the logarithmic form of this function instead of linear forms. There are other possible mathematical transformations.

The additional appropriate figures it is to estimate the parameters of the equation by using standard econometric methods, i.e. regression analysis. The resulting values b_s , b_B and b_w prices reflect the influence of alcohol consumed in quantity. The equation of demand for alcohol is expected to be negative parameter b_s , b_B and b_w parameters are positive (assuming that these two types of alcohol are considered as substitutes for alcohol) and the parameter c is positive (assuming that alcohol is considered normal form). Regression analysis provides the basis for calculation of statistically significant range of values for each parameter (confidence interval).

Various scientific studies on the price elasticity of alcohol produce different results due to the application of different tax policies between countries. For example, the study P.F. Leung and C.E. Phelps⁴ estimate the price elasticity of demand for alcohol, namely the elasticity is -0.3 for beer, wine and -1.0 to -1.5 in alcohol. Price elasticity of demand for goods that are addictive, is higher by about 50% over the long term than short term.

The economic determinants of demand for alcohol, beer and wine examined under the influence of changes in prices, income and unemployment T. Ogowang and D.I. Cho⁵. Regression analysis was used for the period 1981 to 2004 for the ten Canadian provinces. The estimated price elasticity suggests that the increase in alcohol taxation is an effective tool to reduce alcohol consumption and even less tax revenue budget. However, the higher taxation of alcohol is less effective in reducing consumption of wine and beer. Cross-price elasticity shows that the taxation of beer and spirits may be an effective tool to encourage increased consumption of wine due to its beneficial effects on human health. Revenue acts as an important determinant of consumption of wine and spirits but not beer. On the other hand, unemployment is an important factor in consumption of beer, but wine and spirits. In the case of the impact of unemployment on alcohol consumption, the authors found significant

³ P.J. Cook, *The Effect of Liquor Taxes on Drinking, Cirrhosis, and Auto Accidents*, In: *Alcohol and Public Policy: Beyond the Shadow of Prohibition*, National Academy Press, Washington D.C. 1981.

⁴ S.F. Leung, C.E. Philops, *My kingdom for a drink ...? A review of the price sensitivity of demand for alcoholic beverages*, In: G. Bloss, M. Hilton, U.S. Government Printing Office, 1993.

⁵ T. Ogowang, D.I. Cho, *Economic determinants of the consumption of alcoholic beverages in Canada: a panel data analysis*, *Empirical Economics*, 2009, Vol. 37, No. 3, s. 599-613.

budgetary constraints in relation to consumption of beer and no relationship between unemployment and consumption of wines and spirits.

The link between alcohol price increase due to tax and consequences of alcohol consumption analyzed P.J. Cook⁶. He examined changes in alcohol taxation in the years 1961 to 1975 to determine whether a tax increase on alcohol leads to statistically significant changes not only in the consumption of alcohol but also on indicators such as death in a traffic accident and death due to liver cirrhosis. Conducted 39 of the tax increase from 0.25 to 1.75 dollar a gallon of alcohol during the 15 years. At first he calculated the percentage change in annual rates of alcohol consumption, highway deaths and deaths due to liver cirrhosis in 30 U.S. states. Then they held a change from the largest reduction (level 1), the largest increase (level 30) per year. If the tax increase has no effect on consumption or death, one would expect test cases to be evenly distributed above and below the median level. This means that each indicator, respectively about half of the 39 test cases would be above the median and half below its level.

The results suggest that relatively small changes in prices may affect not only the quantity of alcohol consumption, but also serious health consequences. Several cases in history where there has been much sustained price change, confirm these results. For example, ten times the national increase in the price of an alcoholic beverage “aquavit” in Denmark during the 1st World War due to increased taxes on alcohol, Denmark converted to a country that drinks especially beer. As a result of this measure was to reduce alcohol consumption per capita and the incidence of excessive drinking. Restrictions on these results, research based on the following facts:

- a) Consumption of alcohol by volume is the smallest compared to other alcoholic beverages in those countries.
- b) Only a quarter of highway deaths resulting from alcohol-related.
- c) Variable in liver cirrhosis death “is an indicator of long-term because long-term alcohol consumption, excluding the impact of final consumption”.

If the duty on alcohol is viewed in terms of their preventive function and not in terms of their fiscal functions, it is necessary to review the structure of tax rates among different types of alcoholic beverages. For example, alcohol is taxed at a much faster rate than beer or wine, primarily because of higher alcohol content in it. Beer and wine are less harmful than alcohol. While beer is the beverage of moderation, alcohol is causing major problems.

J.A. Johnson and E.H. Oksanen⁷ examined the demand equation separately for beer, wine and spirits, using data for 10 Canadian provinces over a period of 15 years. Each of demand equation includes the following independent variables: the price of beer, wine and spirits shares to consumer price index and real per capita

⁶ P.J. Cook, *The Effect of Liquor Taxes on Drinking, Cirrhosis...*

⁷ J.A. Johnson, E.H. Oksanen, *Estimation of demand for alcoholic beverages in Canada from pooled time-series and cross-sections*, *The Review of Economics and Statistics*, 1977, Vol. 59, No. 1.

income. Dependent variable is consumption and other variables that may affect consumption are the strength of the nationality, education, religion and so on. The result of their analysis is that short-term demand for alcohol is elastic with respect to its price, but beer and wine is inelastic. Income changes have little or no effect on consumption. Cross price effects seem to be very slight and the effect is negligible. The estimated results indicate that alcohol and beer are complements, while wine and beer are substitutes.

Bibliography

- Crossen S., *Theory and Practise of Excise Taxation: Smoking, Drinking, Gambling, Polluting, and Driving*, Oxford University Press, New York 2005, 264 s.
- Cook P.J., *The Effect of Liquor Taxes on Drinking, Cirrhosis, and Auto Accidents* In: *Alcohol and Public Policy: Beyond the Shadow of Prohibition*, National Academy Press, Washington D.C. 1981, s. 255-285.
- Johnson J.A., Oksanen E.H., *Estimation of demand for alcoholic beverages in Canada from pooled time-series and cross-sections*, The Review of Economics and Statistics, 1977, Vol. 59, No. 1, s. 113-118, <http://www.jstor.org/pss/1924911>.
- Jones C.H., *Applied Welfare Economics*, Oxford University Press, New York 2005, 280 s.
- Leung S.F., Philops C.E., „*My kingdom for a drink...? A review of the price sensitivity of demand for alcoholic beverages*”. In: G. Bloss, M. Hilton, U.S. Government Printing Office, 1993.
- Moore M.H., Gerstein D.R., *Alcohol and Public Policy: Beyond the Shadow of Prohibition*, National Academy Press, Washington, D.C.1981, 498 s.
- Ogwang T., Cho D.I., *Economic determinants of the consumption of alcoholic beverages in Canada: a panel data analysis*. In: *Empirical Economics*, 2009, Vol. 37, No. 3. s. 599-613, <http://www.springerlink.com/content/y01817422w74735u/>.
- Stiglitz J.E., *Ekonomie veřejného sektoru*, Grada Publishing, Praha 1997, 656 s.

OPODATKOWANIE ALKOHOLU I JEGO WPLYW NA KONSUMPCJĘ

Streszczenie: Podatki związane z obrotem alkoholem stanowią istotne źródło przychodów budżetowych przy niskich kosztach administracyjnych. Powodami, dla których na pewne dobra są nakładane większe podatki i w związku z tym należy utrzymywać je na wysokim poziomie, są: istotny wzrost dochodów publicznych, efekty zewnętrzne i konsekwencje redystrybucyjne. Badanie konsumpcji alkoholu przy zmianach cen jest bardzo trudne. Analizy empiryczne z użyciem metod ekonometrycznych dostarczają jednak oszacowań dla cenowych i dochodowych elastyczności różnych napojów alkoholowych, szczególnie wina, piwa i wyrobów spirytusowych. Większość tych badań wskazuje, że popyt na alkohol, tak samo jak na inne dobra, zależy od ceny. Popyt na wyroby spirytusowe jest najbardziej wrażliwy na zmiany cen w porównaniu z popytem na piwo czy wino.