

Progressiveness of the VAT and Excises in the Czech Republic – Empirical Analysis

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Abstract: Common belief is that consumption taxes are regressive. That is true if annual income is considered as a potential to consume or as a measure of taxpayer's well-being. However, there are both theoretical and empirical evidence that e.g. the VAT could be proportional or even progressive if the lifetime income is used as a measure of well-being. In this paper the both approaches to the tax incidence (lifetime incidence approach and annual income incidence approach) are discussed and comparison of their results is provided.

Keywords: progressiveness, VAT, excises, lifetime incidence, micro-simulation model

JEL Classification: H210

Introduction

It seems that progressiveness of the personal income tax is analyzed and discussed much more often than progressiveness of taxes on goods and services though they raise double revenue (in the Czech Republic). This research should be a contribution to incidence analysis and measurement of global progressiveness of taxes on goods and services levied on Czech households.¹

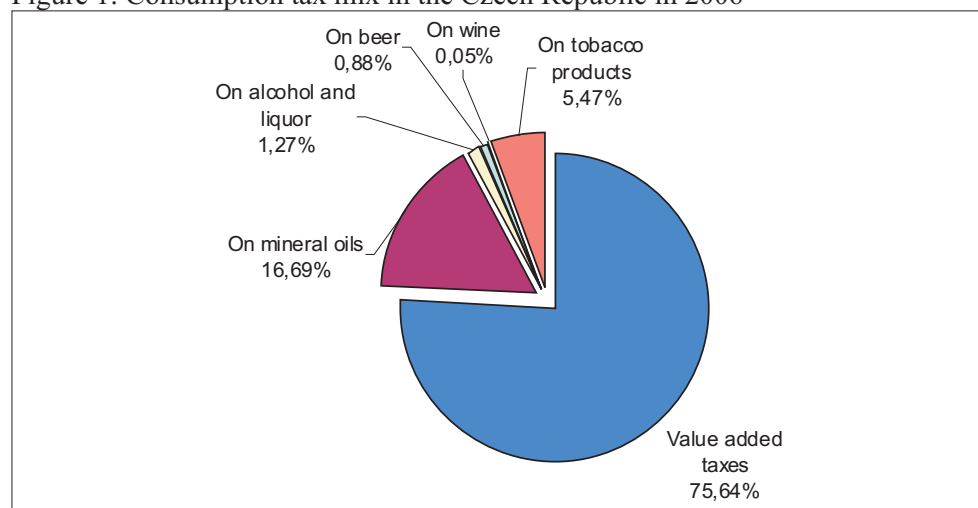
The aim of the research is to analyze impact of consumption taxes on Czech households. This paper will present the methodology and results using the expenditure data from Czech Household Budget Survey (SRU - Statistika rodinných účtů). The comparison of the empirical results will show a significant difference in the impact of taxation on goods and services under lifetime scheme of potential consumption and under classical (annual) scheme of potential consumption.

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The VAT and Excises in the Czech Republic

The Czech Republic introduced the VAT and a set of specific consumption taxes (excises) in 1993. The VAT is a general consumption tax which is directly proportional to the price of goods and services and collected on each transaction in the economic chain. The VAT is the second largest public revenue (the first is the social security contributions). On the contrary the set of excises is levied only on one instance (only defined transactions in the economic chain are taxed). The most important excises are taxes on mineral oils and then taxes on tobacco products (see Figure 1).

Figure 1: Consumption tax mix in the Czech Republic in 2006



Source: Ministry of Finance, Czech Republic.

Already initial legislation respected many of principles of functioning of the VAT common in the EU Member States and also structure of tax rate² (the standard rate as well as the reduced rate) was consistent with limits of the Sixth VAT Directive.

Right now we are at the beginning of the wide tax reform in the Czech Republic. The income taxation was reduced when previous progressive tax rate (the highest tax rate was 32 %) was substituted by 15 % flat tax rate. Consequently the burden of consumption taxes substantially increased. The reason behind was to stimulate economic growth and eliminate distortional effects of direct taxation (taxation of production factors - labour and capital).

Since the January 1st 2008 the standard rate is 19 % and applies to most goods and services. The standard rate was reduced twice from introduction of VAT in 1993:

from 23 % to 22 % on January 1st 1995 and from 22 % to current 19 % on May 1st 2004.

Since the January 1st 2008 the reduced rate changed from 5 % to 9 % and applies to certain services and goods. The main consumption items which are taxed at the reduced VAT rate in the Czech Republic are (similarly as in most EU countries): food products, water supplies, pharmaceuticals products, books and newspapers, transport of passengers, hotel accommodation or renovation and repairing of private dwellings etc.

Some development we can see also in the context of the excises. The green tax reform introduced some new ecological taxes since the January 1st 2008. Their legislations respect already many principles of the environmental taxation common in the EU Member. Nevertheless we expect some other development in this area.

Two Ways of Distributional Tax Analysis - Lifetime and Annual Framework

It is necessary to have a good estimation of distributional effect of tax changes to be able to effectively advocate all kinds of the tax reforms. All distributional analyses are based on measurement of impact on the poor and on the rich subjects (i.e. subjects on different part of well-being scales). The crucial question is what should be select as appropriate measure of well-being (of household). Metcalf (1994) showed that the VAT is more or less progressive also in dependence on a measure of well-being according to which the households are ranked. Ranking of households on annual income is not usually the same as ranking on lifetime income.

Literature provides both theoretical and practical arguments in the favour of use of both the annual and the lifetime (permanent) income. The first ones slightly prefer the lifetime income, on the contrary the latter ones recommend the annual income as an appropriate measure of well-being. Finally the researcher usually receives different results.

Sources of divergence (see also Metcalf (1994) or Fullerton-Rogers (1991, 1995)) between groupings of units of analysis in the annual and the lifetime incidence analysis are: (1) changing profile of individual income during her/his life, and (2) volatility of income between years. That patterns can ‘... put into lower-income groups measured by annual income both the rich from the lifetime perspective (i.e. young workers just starting a career, some retirees who had earned more earlier, and people who just had a bad year) and the perennially poor. Or similarly, who had a good year can be classified as rich but on the basis of his/her lifetime income he/she would be include into the lower or middle income category.’ (Slintakova et al., 2006). From the theoretical view it seems the use of lifetime income is more appropriate for all kinds of distributional analyses. Friedman’s permanent income

hypothesis also supports the lifetime income approach. This hypothesis states that people make consumption decisions on the basis of permanent (or lifetime average) income. The lifetime incidence approach assumes that consumption is relatively smooth over the life-cycle, i.e. temporary fluctuations in income should not lead to large changes in current consumption.

On the contrary from the practical view the estimation of annual income is less complicated than the estimation of lifetime income, which is in general an unobservable variable. It can be summarized both the ranking of units of analysis and consumption to income ratio depend on how the unit's well-being is measured. Consequently, incidence of a consumption tax is determined by what measure of well-being is used.

Estimation of lifetime income is the most exciting and challenging issue in up to date distributional research. Lifetime income can be measured in one of two ways: as the present discounted value of earned income and bequests (gifts) received or the present discounted value of consumption and bequests made. The available data allowed to use the consumption based approach when current consumption can serve as a proxy for the present discounted value of consumption - how proposed by Poterba (1989) and subsequently applied by Metcalf (1994) and Caspersen-Metcalf (1993).

However there are some limitations of the estimation of lifetime income. It was necessary to diverge from the strict definition of lifetime income in three situations – purchases of automobiles, imputed rental and bequests. Due to the lack of appropriate information it was not possible to adjust the data in relation to the vehicle purchases as Caspersen-Metcalf (1993) and Metcalf (1994) did. The current consumption measure was not adjusted in relation to housing because the survey doesn't report imputed rental. Bequests were ignored although are part of lifetime income. It can be guessed that ignoring of bequests did not depreciate the current expenditures as a measure for household's classification much. Metcalf (1994) supported this mentioned above by finding out that excluding of bequests in the construction of a proxy for permanent income did not affect results of incidence analysis significantly. On the other hand it was not necessary to exclude the social insurance from the data because it is not considered as consumption expenditure according to the CZ-COICOP classification.

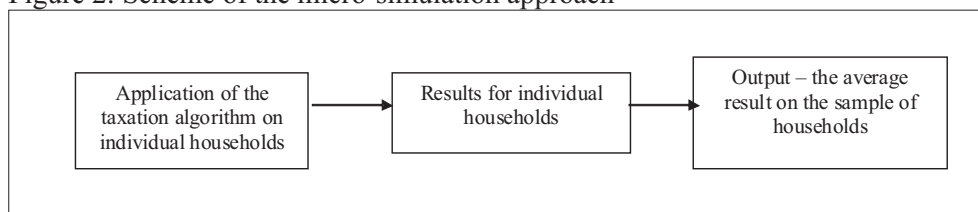
On the basis of methodology explained above we tried to compare the distribution impact of the VAT and excises under both well-being measures. The presupposed result that the consumption taxation can be considered as progressive under lifetime income framework can be interesting for the policy makers.

Micro-Simulation Model

There are two ways how to calculate tax burden for different groups of households to carry out relevant distributional analysis. One can choose the average (typical for the selected part of income scale) households and calculate their tax burden. Or, we can calculate the burden for all individual households, it means we calculate relevant tax burden for every households in the survey, and then study the differences in tax burdens. So the aggregation is postponed to the output phase. Instead of „the impact on average household“, we get „the average impact on a given group of households“. The latter approach is more suitable for our study, but this approach is also more demanding. We need to work directly with micro data if the latter approach is employed. Working with micro data enable us to (Zeleny, 2006):

- analyse not only the averages for the ex-ante defined (social) groups of households, but also its variability within these groups
- identify unusual behaviour of certain households or groups, which can otherwise be hidden (some kind of outliers)
- try to find other, not so obvious relevant variables determining the taxation of households
- use the impact of taxation itself as a classification variable (and study the characteristics of the groups with lowest/highest tax rates on expenditure)

Figure 2: Scheme of the micro-simulation approach



As a result, the model in the Visual FoxPro environment was created to calculate the estimated taxation of expenditure of individual households from the Czech Household Budget Survey (see Svatkova et al., 2007). The model is flexible in the way which will enable changing of the underlining expenditure database (household expenditure data from different survey years) and changing of the tax rates (e.g. various scenarios of the VAT or excises).

There is a brief description of algorithm used in order to create the files containing VAT rates applicable to particular statistical consumption items (for more details see Slintakova et al., 2006). A statistical consumption item is defined by a list of goods or

services which are joined together by purpose of use. Researchers faced two problems when assigning the VAT rates to the statistical consumption items.

First they had to assign a correct rate to all the commodities included in the statistical consumption items, i.e. either the standard rate or the reduced rate. The zero rate - only for purpose of our project - was assigned to either goods and services exempt from the VAT without right of deduction or goods and services which are not subject to the VAT. To simplify the work they assumed that households do shopping only at taxable persons (i.e. VAT-registered producers or traders). To do this well they had to be sure of assigning a correct rate according to the VAT act. Slintakova et al. (2007) noted that 'Problem was that the VAT act was not in certain cases so punctual to identify unambiguously at what rate a particular commodity listed in the CZ-COICOP classification is taxed. Especially goods or services listed in the appendices of the act were often indicated very shortly or even only numerically.'

On the contrary, derivation of excise tax rates was complicated in another way. The mix of relative (in % of value) and non relative (relative not to the value of consumption) rates is applied and unfortunately the statistics usually measure the expenditure only in currency units and not in physical units appropriate for calculation of excise tax duty. We succeed (with some level of inaccuracy) to convert non relative rates to equivalent relative rates (for more details see Svatkova et al., 2007).

Estimating of the VAT and Excise Burden of Czech Households

A crucial issue in the research was to estimate the burdens of the VAT and excises for each household in the statistical survey. The estimation was based on the following assumptions. In line with conventional economic wisdom it was presumed that tax is passed forward to and born by final consumers. Moreover, it was presupposed the incidence of tax in a short-term period so it was possible to omit the substitution and the income effects.

The relative tax burden (effective tax rate et) was defined as a ratio of household tax liability (T_i) to household's well-being measure (WBM_i).³ More precisely the burden can be considered as effective tax rate (et_i) applied on the total income or consumption expenditures of a household i under annual or lifetime framework respectively:

$$et_i = T_i / WBM_i.$$

The household's tax liability is a cash tax payment made during a year by a household. Well-being measure is different under the annual income and under

lifetime income framework (see discussion above, section 3). Under the annual income framework the gross income of household from all sources of activities ($Y_{gross,i}$) was chosen. For the purpose of lifetime analysis the consumption expenditures including all taxes ($C_{gross,i}$) were chosen. The effective tax rate says what portion of total well-being measure household i spends on the VAT or excises.

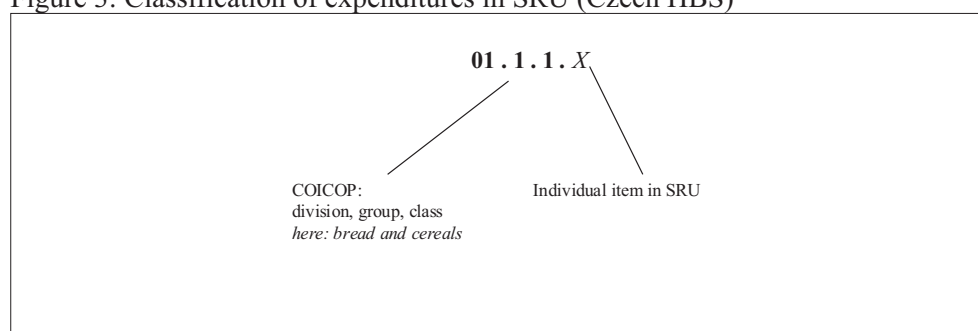
The unit of our analysis is a household. It is a good choice from consumption behaviour perspective because major decisions are typically made at the household level. ‘A household is an appropriate unit of analysis when the annual approach to the incidence analysis is used because well-being of one member of a household depends not simply on his or her own income, but rather on income of the entire household’ as stated in Slintakova et al. (2006).

The basic data source for the analysis was the 2004 Household Budget Survey conducted by the Czech Statistical Office. This is the best available database providing information on income and expenditures of the Czech households. Moreover, it provides detailed household level data on consumption patterns as well as some descriptive data on household characteristics. Detailed micro-data on 3036 households were employed in the analysis.

Household money expenditures on consumption are classified according to the CZ-COICOP (i.e. Czech version of Classification of Individual Consumption by Purpose) in the survey. Besides the consumption and the non-consumption expenditures the total household expenditures include taxes and social insurance contributions paid.

The tax burdens in the Czech Republic were analyzed on the ultimate level of classification according to which each single commodity is included into the so called individual statistical consumption item. It is so far the most precise calculation of the VAT and excises burden on the household’s level in the Czech Republic.

Figure 3: Classification of expenditures in SRU (Czech HBS)



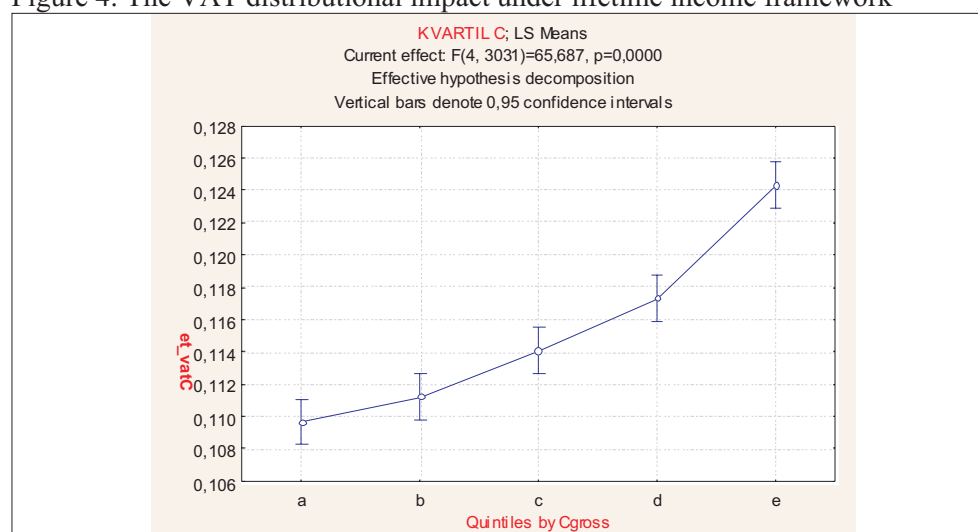
Unfortunately the tax legislation uses different classification of products and services, related to the CPA (Classification of Product by Activities) and

classification of products and services in international trade. The link between these two systems is far from being straightforward. An important part of the work was therefore creation of ‘a bridge’ between the system in tax legislation and the one in COICOP. This turned out to be in many occasions almost detective work and showed serious weaknesses in the legislation itself (see also section 4). The outcome of this task was the table with tax rates to be applied on individual items recorded in SRU.

Results of the Distribution Analysis of the Czech VAT

The (annual) propensity to consumption is usually higher for poor units under the annual income framework. It diminishes progressivity of taxes. On the contrary the design scheme of the Czech VAT and excises affect their distributional impact under both frameworks. The Czech VAT is modified with some exemptions or refundable credits focused on poor households. Also many goods supposed to be consumed relatively more by the poor households are taxed by reduced tax rate. Both can play the positive role in keeping progressivity of taxation on some level.

Figure 4: The VAT distributional impact under lifetime income framework



Note: et_vatC is computed as VAT/Cgross. Vertical bars denote 95% confidence intervals.

The (lifetime) propensity to consumption is similar (less volatile) for poor and for rich units under annual lifetime framework. So Metcalf (1994) came to the important conclusion that „the conventional wisdom that a VAT is regressive is not correct when the lifetime perspective is used...’ The results of our analysis for the Czech

VAT are shown on the next figure. The VAT is progressive when households are classified on the basis of their lifetime income (measured as annual consumption of household).

Newman-Keuls⁴ Post Hoc test were employed to find out whether the difference among the effective tax rates is statistically significant. The only difference between effective tax for 1st and 2nd quintile is not statistically significant (on 95% level of significance), all other differences are statistically significant. It means e.g. the households in 3th quintile are really taxed more heavily then the ones in the 2nd quintile. Effective tax rate is also significantly higher in 5th quintile.

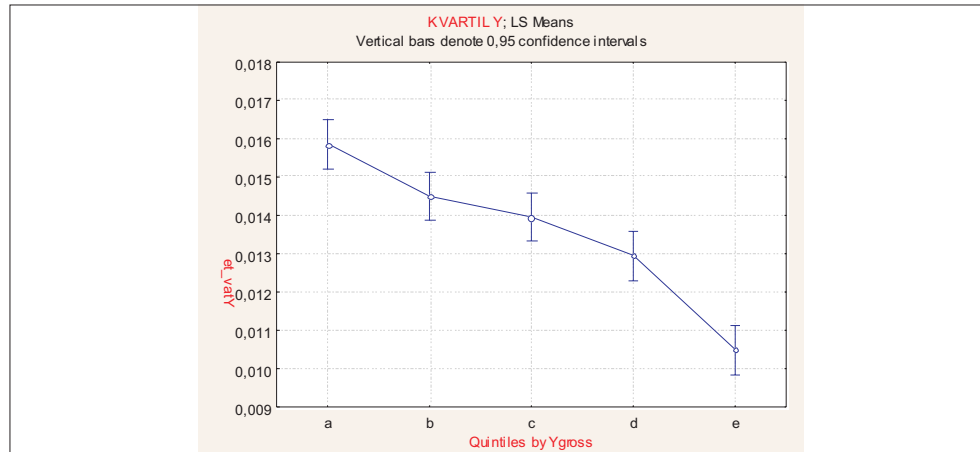
Figure 5: Results of Newman-Keuls Post Hoc test for VAT under lifetime income framework

		Newman-Keuls test; variable et_vatC (klazar1) Approximate Probabilities for Post Hoc Tests Error: Between MS = ,00031, df = 3031,0				
Cell No.	KVARTIL C	{1}	{2}	{3}	{4}	{5}
		,10970	,11121	,11409	,11731	,12433
1	a		0,135994	0,000061	0,000008	0,000017
2	b	0,135994		0,004340	0,000022	0,000008
3	c	0,000061	0,004340		0,001434	0,000022
4	d	0,000008	0,000022	0,001434		0,000009
5	e	0,000017	0,000008	0,000022	0,000009	

On the contrary the Czech VAT is regressive using annual income framework. Effective tax rate (et_vatY) is lower for the higher quintiles. All differences among effective tax rate except one (between 2nd and 3rd) are again statistically significant.

The findings for Czech Republic support the previous ones of Caspersen-Metcalf (1993) and Metcalf (1994). They conducted similar comparison of the VAT incidence when households were categorised on the basis of different well-being measures. They found out that using annual income as a measure of economic well-being of households the VAT is regressive. However if they used current consumption as a proxy for lifetime income to rank households and for calculation of the tax burden, the VAT looked proportional or progressive depending on the design scheme of the tax. This is explained by different propensity to consumption between poor and rich units and by volatility of income and age-specific effects on annual consumption: the annually-poor or very young, the retired, and anyone with a bad year can have a high ratio of consumption to income, therefore the VAT is regressive in the annual perspective. In contrast, lifetime ratio of consumption to income is more similar across lifetime income categories and the VAT looks more proportional. This is true even if the VAT is designed as a proportional tax on all consumption.

Figure 6: The VAT distributional impact and Newman-Keuls Post Hoc test under annual income framework



Newman-Keuls test; variable et_vatY (klazar1ya)						
Approximate Probabilities for Post Hoc Tests						
Error: Between MS = ,00006, df = 3031,0						
Cell No.	KVARTIL Y	{1}	{2}	{3}	{4}	{5}
1	a	,01586	0,003264	0,000124	0,000008	0,000017
2	b	0,003264		0,233523	0,002174	0,000008
3	c	0,000124	0,233523		0,029321	0,000022
4	d	0,000008	0,002174	0,029321		0,000009
5	e	0,000017	0,000008	0,000022	0,000009	

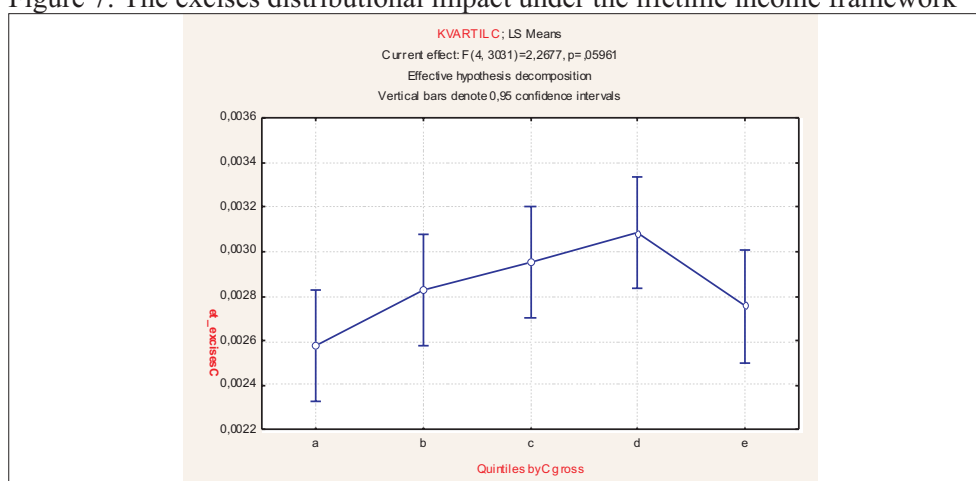
Note: et_vatY is computed as VAT/Ygross. Vertical bars denote 95% confidence intervals.

Let's remind that consumption taxes may still be regressive also in the lifetime perspective (Fullerton-Rogers (1991)). First reason can be that actual consumption tax is designed rather as a regressive tax, i.e. the lifetime poor units spend larger fractions of their income on highly taxed goods (not the case of the Czech VAT). The second reason is that the low lifetime income groups bequeath lower fraction of their lifetime income. Then event if the consumption tax is designed as a proportional tax, they bear a relatively higher burden of the tax because the bequests are excluded from a tax base. Finally, as high lifetime income groups may consume more untaxed leisure than low lifetime income groups, then even the flat tax has a regressive impact under both frameworks.

Results of Distribution Analysis for the Czech Excises

The interpretation of results for the Czech excises is not so straightforward. The differences are not usually statistically significant (see Post Hoc tests) and we must be cautious if produce some conclusions. It is understandable: the goods taxed by excises are not necessarily consumed by specific income groups of households (compare with the goods taxed by reduced VAT rate, section 2). We can only say the excises are not so progressive under lifetime income framework comparing to the VAT.

Figure 7: The excises distributional impact under the lifetime income framework

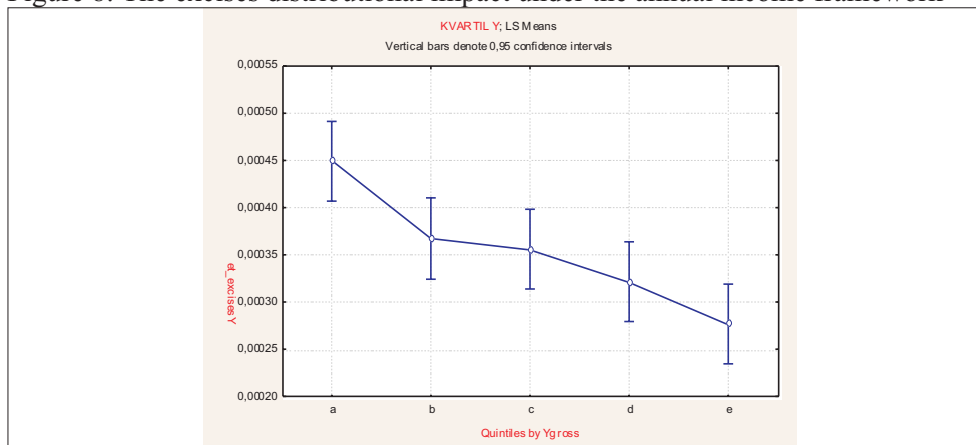


Note: $et_exciseC$ is computed as $excises/C_{gross}$. Vertical bars denote 95% confidence intervals.

The within group variation is so high so the only difference between the 1st and 4th quintile is statistically significant. There is an interesting pattern: effective tax rate for the richest units is lower then for other ones except the 1st quintile (but not statistically significant). Svatkova et al. (2007) addressed this issue in more details. She concludes there is a rapid decline in consumption of tobacco product in last decile. The only conclusion our results allow is the excise are rather progressive then regressive under lifetime income framework.

The results for the distributional impact of the Czech excises under annual framework are more statistically significant (see Figure 8 for Post Hoc tests).

Figure 8: The excises distributional impact under the annual income framework



Note: $et_exciseY$ is computed as $excises/Y_{gross}$. Vertical bars denote 95% confidence intervals.

There is statistically significant decline in the effective tax burden going from 1st to other quintiles, and from 2nd and 3rd to 5th quintile. It can be concluded the excises are regressive under annual income framework.

Conclusions

It seems that some level of progressivity of the VAT is caused especially by application of the reduced rate or exemptions on selected goods and services. In order the tax tends toward progressivity, necessities, i.e. goods expenditures on which represent higher portion of total consumption for lower income households, must be taxed by the reduced tax rate or exempt from the tax. Examining structure of consumption in particular quintiles and tax rates applied on particular items (groups of items) of goods and services consumed by the Czech households it was found out that this generally holds true for the Czech VAT but not for the Czech excises. The design of excises is generally proportional and so excises seem to be rather regressive or proportional then progressive under both the frameworks.

Moreover, it is plausible to believe that the Czech VAT looks progressive if we use the consumption expenditure for allocation of households to quintiles (and for calculation of the relative tax burden). On the contrary the tax is regressive under the annual income framework. The design of the VAT is generally progressive, but the propensity to consumption outweighs this design effect and causes the VAT to be regressive under the annual income framework.

Theoretically the lifetime income framework is more suitable and relevant for distributional analysis of the tax incidence so the conclusion about the certain level of progressivity of the VAT can be used as an argument for the policy makers. Of course there is much to do. The impact of the other kinds of taxation (especially the taxation on the savings and the heritage) needs to be analyzed we derived the appropriate tool for the evaluation of the tax reforms.

NOTES

¹ Stanislav Klazar is grateful for all kinds of support from the members of research project Consumption Taxes Levied in Households in the Czech Republic. I am indebted especially to Barbora Slintakova and Martin Zeleny for all their ideas. However, any errors are the author's responsibility.

² It was not the case for the excises. Even now (2007) the Czech Republic does not meet EU minimal tax rate for some tobacco products. For more detail see Svatkova et al. (2007).

³ The well-being measures were divided by the number of equivalent person in households. This number can be computed as $1(\text{head of household}) + 0,5 * \text{number of children} + 0,7 * (\text{number of other members minus 1 as a head})$.

⁴ Newman-Keuls Post Hoc test were chosen because it is the most conservative one from the set of all Post Hoc test in ANOVA analysis.

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