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Who Pays Indirect Taxes in Russia?

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Abstract

The interplay of a differentiated indirect tax structure and the variation in expenditure patterns across households, leads to a possibly unequal distribution of indirect tax liabilities across the population. This paper uses the ninth round of the RLMS survey to assess the distributional consequences of the two major components of the indirect tax system: VAT and excise taxes. The global indirect system can be considered to be progressive overall, according to the Kakwani index. Decomposition into constituent terms shows that this is due not only to a progressive VAT structure, but also to progressive excise taxes. This surprising result is mainly explained by the progressivity of the excise tax on car fuel, but might also be sensitive to peculiarities in the data about alcohol consumption.

Keywords: indirect taxes, microsimulation, progressivity, Russia, tax reform, redistribution
JEL classification: D12, D63, H22, H31

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1 Introduction

In this paper the technique of microsimulation is used to assess the distributional consequences of indirect taxes. It goes without saying that for this purpose *micro*simulation is not just the technique par excellence—it is indispensable. Only sufficiently detailed information about differences in expenditure patterns across individual households can reveal the distributional impact of the differentiated indirect tax structure.

The information needed for this exercise is provided by the expenditure section of the ninth round of the Russian Longitudinal Monitoring Survey (RLMS). This contains expenditures for a representative sample of households between October 2000 and January 2001. Tax liabilities have been calculated for the indirect tax code applicable in 2002 (with the nominal excise figures deflated to the price level of 1 January 2001). Variations of these tax liabilities across the population are described by means of graphs and Kakwani indices.

More detail comes at a price. As far as the underlying data weaknesses are concerned, the microsimulation technique acts as a magnifier—this paper points to some peculiarities in the data of the expenditure survey. The fact that these peculiarities mainly occur for the excise commodities, and that excises are crucial in assessing the distributional impact of indirect taxation, puts a damper on the obtained results.

The structure of the paper is as follows. Section 2 gives a brief description of the VAT and excise components of the indirect tax system in the Russian Federation. We also explain the methodology and assumptions underlying the calculations of the tax liabilities, and introduce some notation. Section 3 gives a short summary of the expenditure part of the RLMS data, while the following section explains how we have constructed the living standard concept to order households from 'poor' to 'rich'. Since the expenditure patterns are an important source of information in understanding the distributional effect of indirect taxes indicated in Section 6, we first present Engel curves in Section 5. Section 7 reports the results of simulating the distributional consequences of recent reforms in the excises. The reliability of the crucial quantities for alcohol and tobacco are discussed in Section 8, prior to the conclusions presented in Section 9.

2 The indirect tax system in Russia

Indirect taxes generate a considerable part of government revenues in Russia. This is illustrated in Table 1 for the budget year 2000. More than half of the revenue is obtained through indirect taxes, a ratio to be compared with a figure below 40 percent for most OECD countries.

Table 1: Importance of VAT and excises in total revenues (2000 consolidated budget)

	2000 Consolidated budget (in million rubles)	Share of tax revenues, %	Share of GDP, %
Taxes on goods and services	999 526	52.5	14.4
of which			
VAT	**456 907**	**24.0**	**6.6**
Sales tax	34 638	1.8	0.5
Housing and utilities tax	73 965	3.9	1.1
Federal roads fund	143 635	7.5	2.1
Excises	**166 211**	**8.7**	**2.4**

Source: authors' estimates based on budget statistics of Russia's finance ministry.

Within the revenues from indirect taxes, it is not surprising that the most important role is played by VAT and excise taxes. Together they account for about 62 percent of indirect tax revenues. It is these two components that form the focus of this paper.[1] The reason for neglecting the other indirect taxes is that our tax calculations are based on information about consumer expenditures in a household budget survey, which prevents us from taking into account indirect taxes on production or in intermediate stages of the production of final goods. Hence we will not calculate so called 'effective' tax rates by taking into account the differential tax rates at different stages of the production process. Note also that not all excises are covered, since part of the excise revenue comes from taxing commodities in the production process. Finally we do not incorporate VAT and excise revenue arising from taxing revenues in the natural resources sectors (oil, gas, and other minerals).

Tax rates for VAT and excises are regulated by Part II of the Tax Code of the Russian Federation, which became effective in 2001. We briefly summarize the most important aspects of the tax rates.

2.1 VAT

The standard rate of VAT in Russia is 20 percent. A reduced rate of 10 percent is applied to a number of commodities like basic food items and children's clothing. In addition, a number of commodities like health expenditures, housing costs, education, and expenditures for cultural events are exempt from VAT. The information is summarized in Table 2, which also indicates the way that items in the expenditure survey have been aggregated in the survey (column one of the table). For the budget of the average RLMS household, the items taxed at 10 percent make up 37.6 percent of total household expenditure. The 20 percent category constitutes 42.2 percent of the average budget, while the remaining 20.2 percent is exempt from VAT.

[1] The 'housing and utility tax' was eliminated at the beginning of 2001. 'Sales tax' is a regional tax, which in practice varies from 2 to 5 percent. The rate is set annually by each regional government. There are plans to abolish the tax by the beginning of 2004.

Table 2: VAT rates and excises on detailed commodities and commodity aggregation

	Commodity, 1st level	Commodity, 2nd level (for tax calculations)	VAT rate (%)	Excise (in 2002 rubles)
1	food	bread	10	
		meat	10	
		fish	10	
		potatoes	10	
		vegetables	10	
		eggs	10	
		dairy	10	
		sugar	10	
		fruit	20	
		fats	10	
		other food (e.g. soft drinks)	20	
2	home production		exempt	
3	restaurant		20	
4	alcohol	vodka	20	50 rubles per litre
		beer	20	1.12 rubles per litre
		wine, other alcoholic drinks	20	4 rubles per litre
5	tobacco	papyrosi, unfiltered cigarettes	20	0.0112 rubles per cigarette
		filtered cigarettes	20	0.0392 rubles per cigarette
6	clothing	adult clothing	20	
		children's clothing	10	
7	health, personal care	health expenditures	exempt	
		miscellaneous non food	20	
8	car fuel		20	2.072 rubles per litre
9	housing	rent, utilities	exempt	
		wood fuel	20	
		gas fuel	20	15% of producer price
10	services and other items	education	exempt	
		sanatorium, trips, etc.	exempt	
		tickets	exempt	
		other services	20	
		alimony, insurance, loans	exempt	
11	durables	durables and luxuries	20	

Note: tax liabilities have been calculated at the most disaggregated level. The aggregates will mainly be used for the purpose of presentation, e.g. for average tax rates.

Source: see text.

2.2 Excises

In contrast to VAT, excise duties are expressed as a fixed amount of rubles per quantity bought by the consumer.[2] They are levied on a limited number of commodities:

[2] An exception is the excise on gas fuel which is expressed as a percentage of the producer price and, hence, acts like an ad valorem sales tax.

alcoholic drinks, tobacco products, car and gas fuels. These account for 6.3 percent of the average household's budget. The last column of Table 2 briefly summarizes the, sometimes complicated, tax rule applied for the excise calculation. In some cases the accuracy of the excise tax liability estimates was limited by the available data. The excises in the table are those in force during 2002, expressed in 2002 rubles. Since our expenditure data are from 2000, a deflation factor of 1.186 was used to convert to real 2000 rubles (the inflation between 1.1.2001, the end of the survey period, and 1.1.2002 being estimated at 18.6 percent).

2.3 Notation

The relationship between the consumer price of commodity *i*, q_i, and the producer price p_i is written as:

$$q_i = (1+t_i)\cdot(p_i + a_i + v_i p_i) \tag{1}$$

where t_i denotes the VAT rate, a_i the excise per unit, and v_i the excise expressed as a percentage of the producer price. Equation (1) shows that VAT is paid on both the producer price, and the excise components. It will be convenient later to express the excise per unit (a_i) in terms of the producer price. Denoting this fraction by $\alpha_i = a_i / p_i$ allows the total tax per unit, or wedge between consumer and producer price, to be given as:

$$q_i - p_i = t_i \cdot (1+\alpha_i + v_i)p_i + (\alpha_i + v_i)p_i . \tag{2}$$

The first term in equation (2) will be referred to as the VAT component; the second one as the excise component.[3] The total tax rate on commodity *i*, denoted by τ_i, is then equal to:

$$\begin{aligned} \tau_i &= \frac{q_i - p_i}{p_i} \\ &= t_i \cdot (1+\alpha_i + v_i) + (\alpha_i + v_i) \\ &= \tau_i^{VAT} + \tau_i^{exc} \end{aligned} \tag{3}$$

In practice we are interested in the tax *liabilities* of households. These not only depend on the tax rates, but also on the expenditure pattern. If x_i denotes the quantity purchased of commodity *i*, the tax liability on commodity *i* is:

$$T_i = (q_i - p_i)x_i . \tag{4}$$

[3] Another decomposition is possible, adding the VAT paid on the excises to the excise component; but this is less congruent with the legal definitions, in which the tax base for excises is the producer price, and the tax base for VAT includes the excise payments.

The RLMS household budget survey does not, of course, observe producer prices but instead gives the expenditures of households, which are determined by consumer prices. To reformulate (4) in terms of observable expenditures, equation (1) is used to express the producer price in terms of the consumer price:

$$p_i = \frac{q_i}{(1+t_i)(1+v_i)} - \frac{a_i}{1+v_i} \tag{5}$$

and then substituted into (4). Denoting the expenditure of household h on commodity i by $e_i^h = q_i^h x_i^h$, this yields an expression for the tax liability solely in terms of the parameters of the tax system and observable expenditures:

$$T_i^h = \left(\frac{t_i}{(1+t_i)(1+v_i)}\right) e_i^h + \left(\frac{v_i}{1+v_i}\right) e_i^h + \left(\frac{a_i}{1+v_i}\right) x_i^h \tag{6}$$

Equation (6) was used to calculate indirect tax liabilities for all individual households ($h = 1,...,m$) in the RLMS survey. When separate results are reported for VAT and excises, VAT refers to the first term in (6), excise to the second and the third terms.

Since it is impractical to present the results at the detailed level of commodities used to calculate the tax liabilities, let alone at the level of the individual household, two averaging (or summation) processes have been employed. Capital letters are used to denote a commodity *aggregate*, defined by a subset of the set of commodities $\{i = 1,...,n\}$, and to denote aggregation over households, e.g. into deciles which are subsets of the population of households $\{h = 1,...,m\}$.

The 11 commodity aggregates displayed in the first columns of Table 2 are based on the following procedures. For commodity aggregate J (e.g. food, or alcoholic drinks), tax liabilities for this aggregate are first calculated for each household h as:

$$T_J^h = \sum_{j \in J} T_j^h . \tag{7}$$

Then T_J is used to denote the summation of T_J^h across households, giving the total indirect tax revenue collected on commodity aggregate J. This T_J can be used to construct average tax rates on the commodity aggregates:

$$t_J = \frac{\sum_{h=1}^{m} T_J^h}{\sum_{h=1}^{m} e_J^h - \sum_{h=1}^{m} T_J^h} = \frac{T_J}{e_J - T_J} \tag{8}$$

where e_J^h denotes expenditure on commodity aggregate J by household h, and e_J is the sum of expenditures on commodity aggregate J over all households. These average tax rates reflect the interplay of differential tax rates and excises with varying budget shares through equation (6). Estimated average rates for all commodity aggregates are presented in Section 5.1.

To reveal the distributional pattern of indirect taxation, a second averaging process has been performed over the individual households. The average share of total expenditures which goes to VAT, excises and total indirect taxes has been calculated for groups of households (e.g. deciles) classified by living standards. It is worth recalling an important assumption underlying the calculations: producer prices are assumed to be fixed, which implies a partial equilibrium framework.[4]

3 The database

The data is drawn from the ninth round of the RLMS longitudinal survey. It contains both expenditures and quantities consumed for a detailed list of items. Of course, this list does not always correspond perfectly to the disaggregation needed to calculate tax liabilities. This is especially true for calculating excise taxes. Consider, for example, the excise tax on alcohol. The expenditure part of the survey reports three consumption variables: vodka, beer and wine. But these items are too broadly defined when compared to the tax code. For instance, there are three different excise rates for wine, depending on whether it is 'dry/sparkling', 'fortified', or 'cider'. The same story applies to vodka, where the rates are differentiated according to the alcohol percentage, or to the different tobacco products. More serious is the fact that the RLMS does not always report quantities for the commodity which is subjected to an excise tax. Table 3 summarizes the available information used for the different excise commodities.

At the first stage, the recorded expenditures on alcohol have been used. For tobacco the quantity information in the expenditure survey is not detailed enough to distinguish different types of cigarettes. However, the RLMS also contains a health section containing information on smoking behaviour which differentiates between types of cigarettes for each household. We kept the total quantity reported in the expenditure survey, but distributed it over the different types of cigarettes according to the pattern observed in the health part of the questionnaire.[5] The excise tax paid on tobacco items is based on this quantity information. For 'car fuel' there is no quantity information at all.

[4] Recent research tries to link microsimulation models, characterized by very detailed micro information and, hence, well suited for distributional analysis, to less disaggregated computable general equilibrium models—see Davis (2003) for an overview of recent developments.

[5] On average the shares of the different types of cigarettes in the health questionnaire are as follows: 52.7 percent are filtered cigarettes, 38.7 percent unfiltered cigarettes, 6.8 percent papyrosi and 1.9 percent self-rolled cigarettes.

As a consequence quantities have been estimated by dividing expenditures by a fixed unit price of 8.53 rubles per litre (the average price during the period of the survey).

Table 3: Quantity information for the commodities subjected to an excise tax

Commodity		Quantity information
Alcohol	vodka	available (litres)
	beer	available (litres)
	wine, other alcoholic drinks	available (litres)
Tobacco	papyrosi, unfiltered cigarettes, filtered cigarettes	available in expenditure survey, but of little use since it only asks the number of 'packs', not differentiated according to type of cigarettes; see text for the alternative used
Car fuel		not available; quantities were calculated by dividing expenditures by a price of 8.53 rubles per litre
Housing	gas fuel	available

Source: see text.

4 From expenditures to living standards

The focus of this paper is the distributional pattern of the indirect tax liabilities. There are many ways possible to capture variation in the incidence of indirect taxes over households: by total expenditure level; by household type (e.g. composition, region, age, living standard, etc.). As a first step, we have chosen to concentrate on the variation of tax rates between households ordered by 'living standards'. Therefore, we first describe how the distribution of living standards has been constructed.

The concept of 'living standard' is one appropriately defined for individuals rather than households. We have tried to follow this starting point conscientiously, by always looking at the distribution of living standards for the individual members of the households. But of course this individual living standard depends on household characteristics, such as income or consumption. Moreover, since there is no information on the intrahousehold distribution of income or consumption, we had to assume that all persons living in a household have the same living standard.

To take account of household composition an equivalence scale m^h is used to deflate nominal expenditures, given by the parametric specification:

$$m^h = \left(a^h + \eta c^h\right)^\theta , \qquad (11)$$

where a^h stands for the number of adults in the household, c^h is the number of children, and θ is a parameter flexible enough to move from 'no adjustment' to 'per capita' values. This version of the study presents results, only for the case in which η and θ are both equal to 1, which means that we are working with per capita

expenditures. Preliminary investigations suggest that the basic findings are not very sensitive to the choice of the equivalence scale.

To approximate *life cycle* living standards we base living standards on consumption rather than income. Moreover it is well known that expenditures on durables and luxuries are a very poor measure of the services enjoyed from the stock of durables. Disregarding the cases where they are observed at the moment of replacement, most households owning a durable do not record expenditures during the relatively short period of the survey. And households who buy a durable during the survey period would be classified wrongly in a high expenditure group if we treat this outlay in the same way as other expenditures. The solution to this problem is either to omit durable expenditures, or—a more appropriate way to tackle the problem—to impute the user cost of durables. We have chosen the second track.

Table 4: Results of the imputation of user cost for durable items

	Owners		Buyers		All	
Durable item	number of households	average user cost in rubles	number of households	average user cost in rubles	number of households	average user cost in rubles
TV, VCR	3508	27	145	56	3653	28
furniture, carpeting, etc.	-	-	146	40	146	40
domestic appliances	3584	14	145	28	3729	15
motor car	992	320	36	635	1028	331
motor cycle	263	7	6	16	269	7
garage	-	-	8	113	8	113
building materials	-	-	295	23	295	23
housing	780	402	18	631	798	408

Note: total number of households in the sample = 3777.

Source: see text.

For both the buyers of a durable item and the owners of it, an estimate of the user cost has been imputed. The list of durable items taken into account is listed in the first column of Table 4. The table also shows the frequencies of households in the sample that either purchased or owned the durable. For households that bought a durable during the survey period, the monthly user cost uc_I for each durable item I was calculated according to:

$$uc_i = value_i \cdot \frac{(r + \delta_i - \pi_i)}{12} \tag{12}$$

where $value_I$ is the recorded expenditures on the durable; r is the nominal interest rate (opportunity cost); δ_i is the depreciation rate for item I; and π_i is the inflation rate for

item *i*. Appendix B explains in detail how reasonably reliable values have been obtained from equation (12). For those households who *own* a durable item, but who did not buy it within the survey recall period, the user cost formula is essentially the same as for the buyers, except that no value figure is observed. A depreciated value of this durable item was estimated based on its recorded age and on the average value for corresponding reported purchases by buyers (see Appendix B for details).

The result of the imputation procedure is given in Table 4. Compared with an average total expenditure of 4,352 rubles, most user costs are unimportant. But for cars and houses, the imputation of user cost might make a substantial difference to the estimate of living standards. From now on, reference to 'durables' (e.g. in the presentation of the budget shares) always means the user cost of durables. Summarizing, the living standard y^h for an individual living in household *h* is obtained as:

$$y^h = \frac{\sum_{i=1}^{11} q_i^h x_i^h}{m^h} \tag{13}$$

where the subscript *i* refers to the commodity index in the first column of Table 2. For distributional analysis individuals are always ordered according to the calculated individual living standard. Note that the assumption of equal intra-household distribution for all commodities naturally results in coincident individual and household budget shares. Denoting by w_i^h the budget share of commodity *i* for household *h* we have:

$$w_i^h = \frac{e_i^h}{e^h}, \tag{14}$$

whereas the budget share for an *individual* living in this household is obtained by dividing both numerator and denominator by the number of persons living in the household. Therefore we present the household budget shares, but the household's position in the distribution of living standards is always calculated by means of the ranking of the individuals living in this household in the distribution of individual living standards.

5 Engel curves

As well as different tax rates, variation in expenditure patterns across households is a major source of variation in tax liabilities. This section describes the budget shares for the eleven commodity aggregates. Two methods of presentation are possible. The average budget shares can be reported for groups of the population classified according to living standards (e.g. deciles). Or the relationship between the budget share and the notion of living standard can be assessed by means of a regression. The average budget

share by decile of living standard has useful descriptive value, and is therefore reported in the appendix.[6] But the large variation in the sample, and the possible presence of outliers, is sufficient reason to rely on statistically more sophisticated non-parametric regressions of the budget shares. This not only reveals the pattern of budget shares in a more detailed way, but also provides us with confidence bands around the budget shares.

For ease of interpretation the budget shares have been regressed, not on the living standard concept defined above, but on the logarithm of real household total expenditures (corrected for regional price differences through the price index available in RLMS), to be denoted below as *lrx*. This allows the graphs to be interpreted simply in terms of the usual definitions of 'necessities' and 'luxuries'.[7]

Non-parametric Engel curves are depicted in Figures 1a to 1k. An adaptive Gaussian kernel was used on a fixed grid of 100 values between the minimum and the maximum of *lrx*.[8] To enhance readibility, the value itself of *lrx* has been replaced on the horizontal axis by the percentile point in the distribution of *lrx*. Hence, the ordinate corresponding to a point of 2.8, say, on the horizontal axis indicates the budget share at a value of *lrx* positioned at the 2.8^{th} percentile of the distribution. Since a fixed grid was chosen, the horizontal axes of Figures 1a to 1k are not evenly distributed over the distribution of *lrx*. More points are estimated in the tails. The dotted lines represent the 99 percent confidence intervals. The small dots are the simple arithmetic averages of the budget share per decile, and can be used to assess the value added of the non-parametric regression technique.[9]

Figure 1a shows a typical pattern for the food share; it tends to decline with *lrx*. Hence, as in most other surveys and countries, food is found to be a necessity. Yet two remarks have to be made. The first concerns the high *level* of the share. On average it amounts to 44 percent, peaking in the second decile at a share of more than 55 percent. Secondly, although the confidence bands indicate caution with respect to conclusions about the

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[6] Note however that the deciles in the appendix are constructed as deciles of living standards for *individuals*, whereas the horizontal axis for the kernels refers to log real expenditures (not equivalized) for *households*.

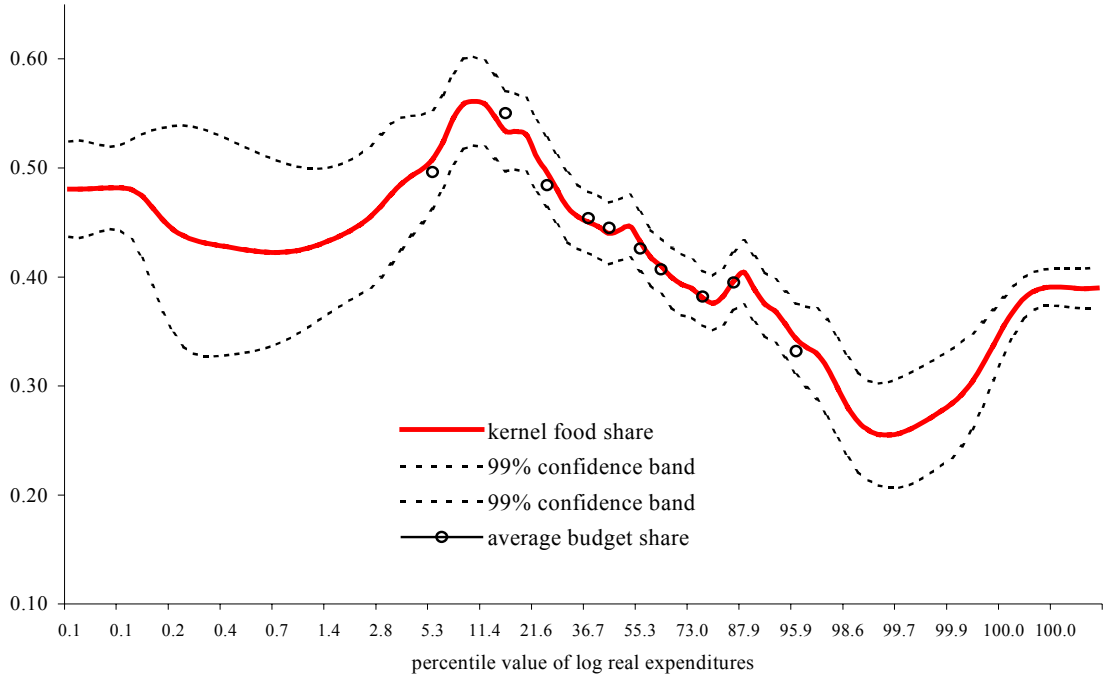
[7] A share increasing with the logarithm of total expenditures means that at this point the commodity is a luxury, whereas if it decreases, the total expenditure elasticity is smaller than one (see Deaton and Muellbauer 1980 for a basic reference).

[8] See Silverman (1986), or Blundell and Duncan (1998), for a description of the adaptive kernel method. The bandwidth was first determined by means of a cross validation technique, as described in Härdle (1990:159-60). The sensitivity parameter of the adaptive kernel was set equal to 0.5 (see Silverman 1986:103-05). The confidence bands were calculated by means of the approximation provided by Härdle (1990:100-01).

[9] We repeat (see also footnote 6) that these average budget shares are not the ones reported in the table in the appendix. The average budget shares shown in the figures are consistent with the horizontal axis defined for the kernel regressions, and hence display the average budget share per decile of *lrx* (which does not coincide with living standard deciles).

tails of the distribution, the pattern in the first decile is remarkable. At the bottom of the distribution it appears that food is a luxury. Detailed inspection shows that the share only starts to decline when we enter the second decile. Even setting aside the extreme tails of the distribution (the bottom and top percentiles, say), a clear non-monotonic pattern emerges. Food is not a necessity over the whole expenditure range, but switches character.[10]

Figure 1a: Budget share – food



The picture of the budget share of 'home production' in Figure 1b suggests that the increasing share of food in the first decile has little to do with substitution away from home production. Indeed, the share of home production is declining in the bottom decile, but then starts rising again up to the end of the third decile.[11] The real decline for home produce only starts in the seventh decile. The share is quite inaccurately estimated (the 99 percent confidence bands are rather wide).

'Eating out' is a third item with obvious links to food expenditures and home production, and this commodity clearly reveals an increasing budget share. In Figure 1c these three shares have been aggregated to form a broadly defined food share. The non-monotonicity at the bottom is again evident and, because of the increasing share of

[10] It was this observation that lead to a modification of the popular AID demand system, introduced in the beginning of the 1980s by Deaton and Muellbauer (1980), to a quadratic version called QUAIDS in Banks, Blundell and Lewbel (1997).

[11] Note that in all the figures, apart from food, the display of the results has been trimmed at bottom and top: the display starts at percentile 2 and ends at percentile 99 (the data used in the estimates, though, was not censored in this way).

home production, extends even further than the first decile. In fact, the share of the broadly defined food category only starts to decline at the beginning of the third decile. For the bottom quintile food is definitely a luxury in Russia, and the budget share reaches the astonishingly high level of 60 to 70 percent.

Figure 1b: Budget share - home production and eating out

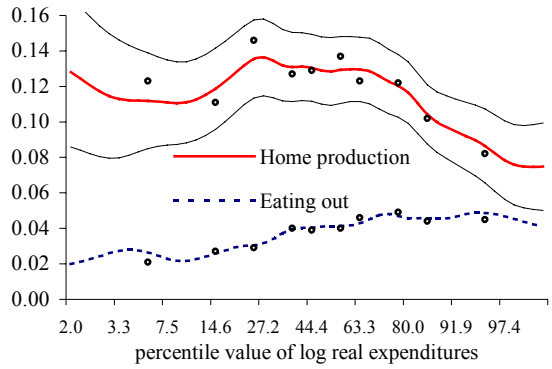
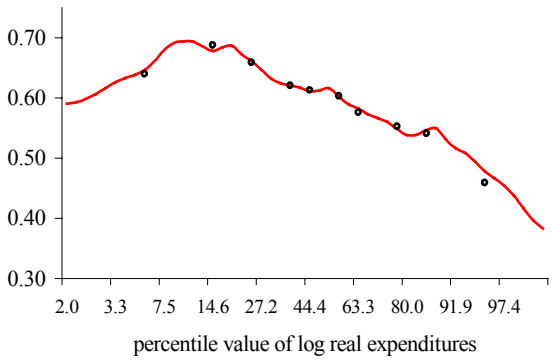


Figure 1c: Budget share - total food



Figures 1d-e present two normally behaving budget shares: clothing is a clear luxury commodity, and personal care is a necessity. Note however that the declining share of 'personal care', which comprises mainly health expenditures and miscellaneous non-food items such as soap is uncommon in developed countries.

Figure 1d: Budget share - clothing

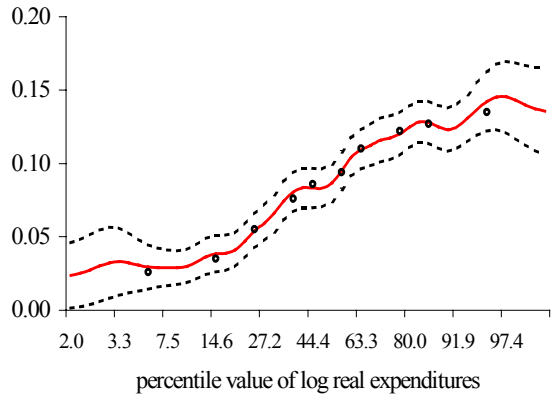
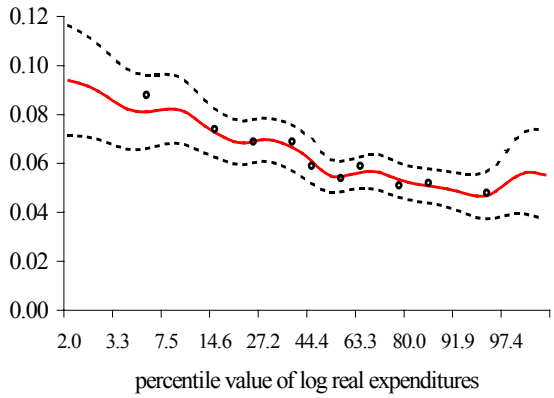


Figure 1e: Budget share - personal care



The budget share for car fuel displayed in Figure 1f is important because this is one of the commodities subject to an excise tax (albeit not levied per unit, but as a percentage of the producer price). The budget share for car fuel is not significantly different from zero in the bottom two deciles. The clear luxury pattern only starts to become apparent from the third decile onwards.

In contrast, the budget share for housing and utilities is seen to be a necessity, as expected. The low budget share for this commodity, on average 6.6 percent, is partly

explained by the considerable government subsidies for both housing and utilities. Note that these subsidies could not be included in the calculation of (net) tax liabilities because no data are available on the value amount of this subsidy at the household level.

Figure 1f: Budget share - car fuel

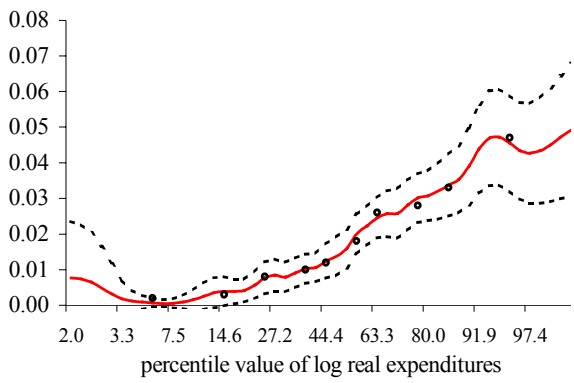
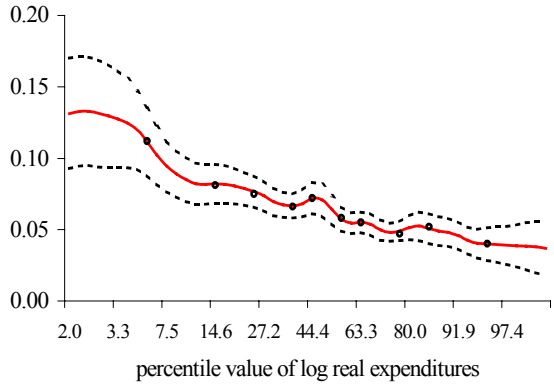


Figure 1g: Budget share - housing maintenance



The remaining commodity group is the residual category, containing everything that is not classified elsewhere. Most services (financial services, insurance, etc.) fall into this category, along with cultural expenditures, education costs, and the like. The average share of 8.1 percent indicates an important category, with, as Figure 1h reveals, a clear luxury pattern, as expected for these kinds of commodities.

The budget share for the user cost of durables (in Figure 1i) provides another example of a non-monotone pattern (see footnote 10). The commodity is neither a necessity nor a luxury over the whole expenditure range, but instead displays the pattern of a luxury from the second to the sixth decile inclusive, and the characteristic of a necessity in the top three deciles. The declining share in the bottom decile is difficult to understand.

Figure 1h: Budget share services and other items

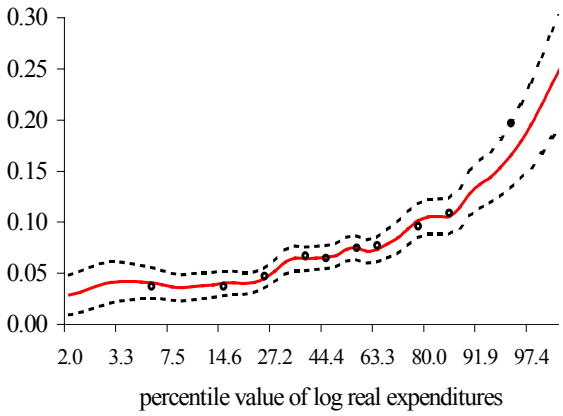
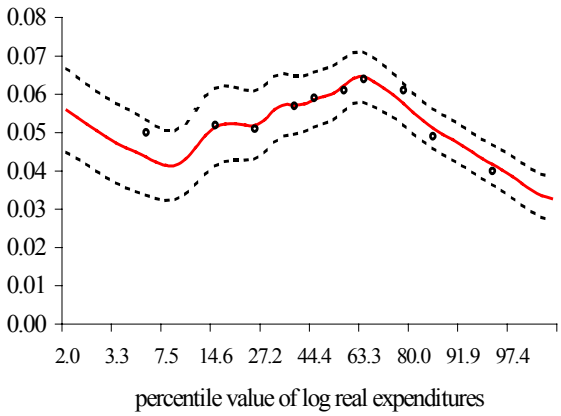


Figure 1i: Budget share user cost durables



Finally, Figures 1j-k present the budget shares for two other important commodities: the excise items alcohol and tobacco. Their importance derives from the fact that both commodities are subjected to an excise tax per unit. It is these excise taxes which account for the regressive pattern of indirect taxes in most developed countries. Moreover, as will be seen in the next section, these commodities are also subject to the highest tax rates. Besides their importance as the basis for excise taxation, both commodities have at least one other feature in common, the large confidence bands, especially in the bottom three deciles. This might have to do with the well known problem of data quality for alcohol and tobacco expenditures, a point to which we will return in Section 8.

Figure 1j: Budget share alcohol

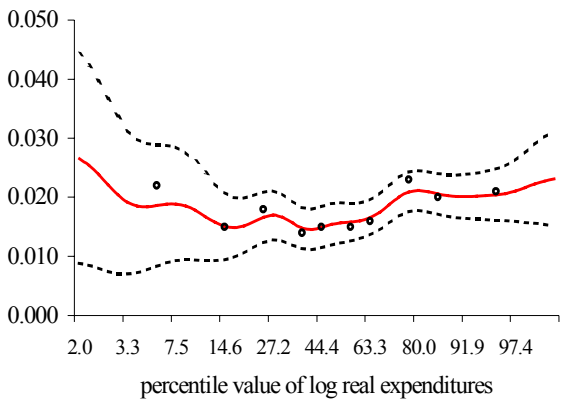
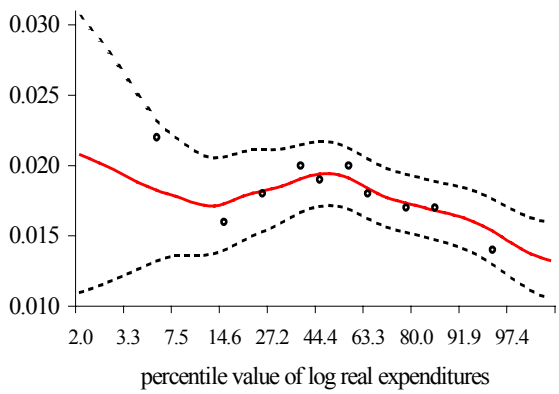


Figure 1k: Budget share tobacco



But, there is more. For alcoholic drinks, the picture is surprising. Even taking into account the wide confidence bands, it is difficult not to infer an increasing share for alcoholic drinks in a wide range of the distribution (say, from the third decile onwards). This is contrary to most evidence found in other countries. More research is clearly needed to explain this feature. Does it again point to problems with data quality? Does it point to differences in the quality of alcohol bought by different income groups? Anyway, this increasing budget share for alcohol will be one of the major explanations for the surprisingly progressive nature of excises discussed in the next section. For tobacco also the expected declining share is not evident over the whole range. There is an important part of the distribution (deciles 3 to 5) where tobacco appears to be a luxury.

6 Distributional pattern of the indirect tax liabilities

6.1 Tax rates for the average budget in the baseline scenario

Before examining the distributional pattern of tax liabilities, we first present the 'average' tax rates for the eleven commodities calculated from the expenditure pattern

of the average consumer in the budget survey.[12] These are ranked them from highest to lowest tax rate in Table 5.

Table 5: Tax rates and budget shares for the average consumer

Commodity	t_J (see equation 8)	Budget share (%)
Alcoholic drinks	83.7	1.8
Car fuel	59.1	1.9
Tobacco	35.0	1.8
Eating out	20.0	3.8
Durables	20.0	5.4
Clothing	16.6	8.7
Services and other items	13.9	8.1
Food	11.0	43.7
Health, personal care	6.7	6.2
Housing, utilities	3.3	6.6
Home production	0.0	12.0
Total expenditures	13.0	100.0

Source: see text.

Expressed as a percentage of average expenditures before taxes, the average tax rate amounts to 13 percent. But the variability over different commodities is substantial. 'Alcoholic drinks' and 'car fuel' bear by far the largest indirect tax burden—the other excise commodity 'tobacco' is also taxed considerably more than the commodities on which there is no excise. 'Home production' is the only untaxed commodity aggregate, but 'housing and utilities' and 'health and personal care' also fall far below the average.

The differentiated tax structure, reproted in Table 5, interacts with the different expenditure patterns shown in Section 5 above to generate the distributional pattern of indirect taxation. This is the topic of the next subsection.

6.2 Indirect tax liabilities across the distribution of living standards

The large variation in the tax burden across the living standard deciles is a compelling reason for using non-parametric kernel regressions to document the distributional pattern, rather than simple averages by decile. Figure 2 illustrates the point.

It shows the share of all indirect taxes in total expenditure, regressed on the logarithm of the living standard of the household (the solid line), together with the upper and lower 99 percent confidence band (the dotted lines). The dots are the averages of the tax shares by decile of living standard (to be found in Table A2 of Appendix A). As in the figures for the budget shares, the horizontal axis indicates the percentile values of the

[12] Table A3 of the appendix reports the aggregate tax revenues obtained by means of our calculations of tax liabilites by household. Around 90 percent of the revenues reported in official government statistics are accounted for, a very satisfactory result when compared with other microsimulation exercises for indirect taxes.

gridpoints at which the regression has been estimated. For the bottom and top five percent of the distribution, the confidence bands are rather large.

Figure 2: Share of indirect taxes in total expenditures

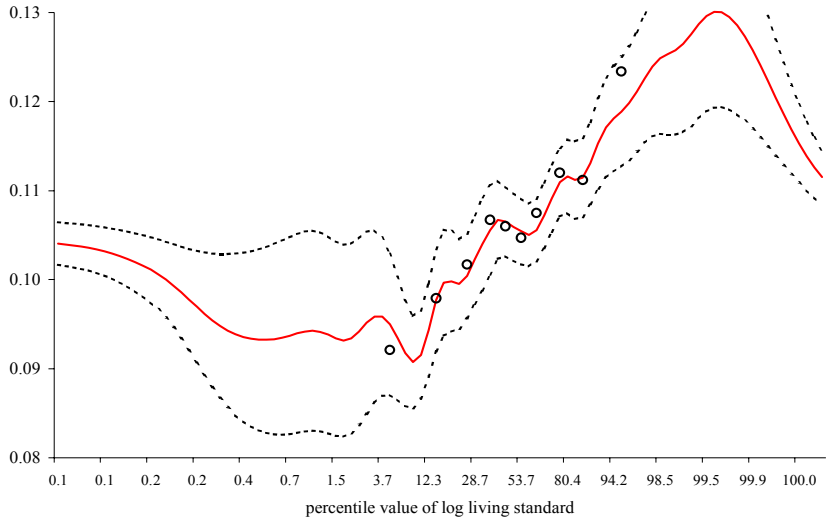
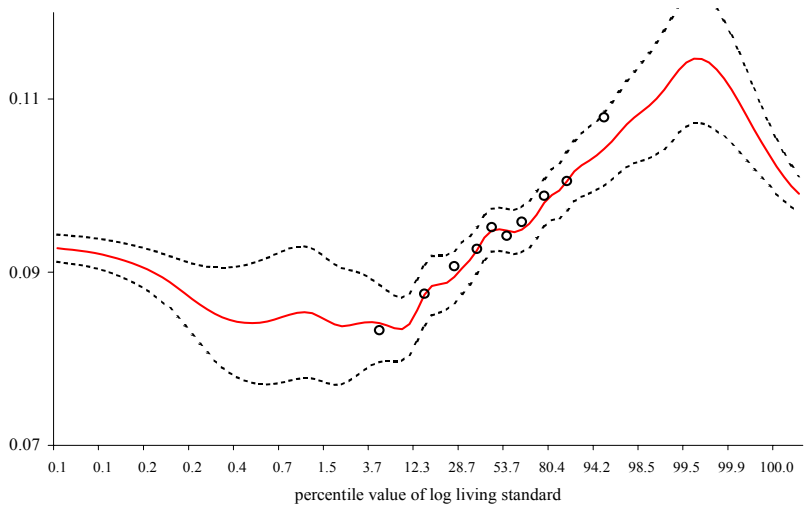


Figure 2 indicates a clear progressive pattern for indirect taxes. This finding is in sharp contrast to similar results for most other countries.[13] On average households pay 10.6 percent of total expenditures towards indirect taxes, but for the first decile the figure is only 9.2 percent, whereas for the top decile it is 12.3 percent. That VAT payments are progressive is not surprising, but often the regressive impact of excise duties more than offsets the progressive VAT structure, leading to a regressive, or roughly proportional, indirect tax structure.

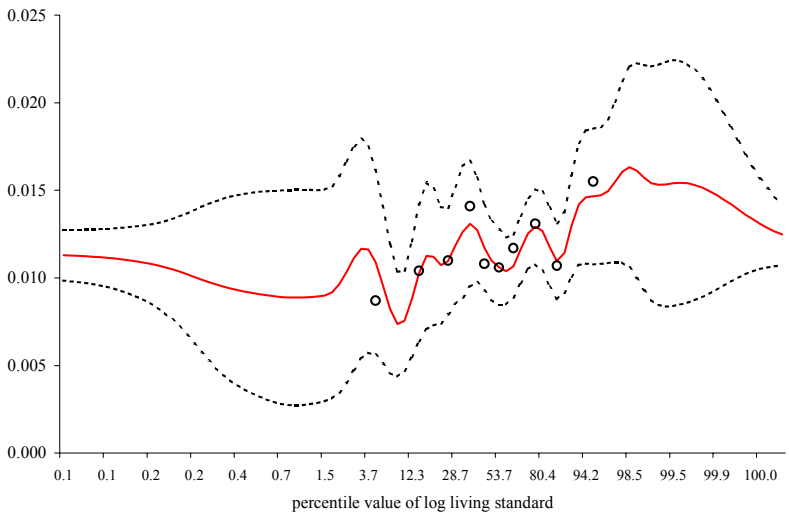
Figure 3: Share of VAT in total expenditures



[13] See e.g. Table 6 in Wagstaff et al. (1999) for recent estimates of the Kakwani index for indirect taxes in several OECD countries. Except for Spain in 1980 (0.0107), all estimates are negative, ranging from -0.1533 (Spain, 1990) to -0.0652 (Switzerland, 1982). For the US and the UK, the Kakwani index for indirect taxes is respectively -0.0674 and -0.1522.

Figure 3 confirms the progressivity of VAT, but it is Figure 4 (the share of excise taxes) which is the dissonant result. The decile averages might look quite fanciful, but the kernel regression reveals an upward sloping pattern for almost all of the distributional range.

Figure 4: Share of excises in total expenditures



To investigate the unexpected result for excises, the curve from Figure 4 has been decomposed into its three constituent parts: the excise tax on alcoholic drinks (Figure 5), tobacco (Figure 6) and car fuel (Figure 7). The figures confirm that the redistributive pattern of the excise tax liability is the net result of opposing forces. The excise paid on tobacco consumption, as a percentage of total expenditure, is clearly regressive, whereas the one paid on car fuel clearly increases with the living standard. At least for car fuel, the explanation is found in Section 4 where a share of car fuel, rising sharply with the logarithm of real expenditures, was reported.

The non-monotonicity in Figure 4 results from adding up these two opposite effects, and from the strange pattern of the excise tax on alcohol (which has very wide confidence bands). Only in the bottom one-third of the distribution is the tendency clear (and surprising): the share of alcohol taxes in total expenditures is rising. In the rest of the distribution we cannot identify a clear tendency.

The overall conclusion is that the increasing consumption of car fuel through the deciles, and the strange consumption pattern for alcohol, leads to the unusual finding of a progressive incidence of excise taxes. This reinforces the progressivity associated with the differentiated VAT. The only clearly regressive component in the indirect tax structure is the tobacco excise.

Figure 5: Share of alcohol excise in total expenditures

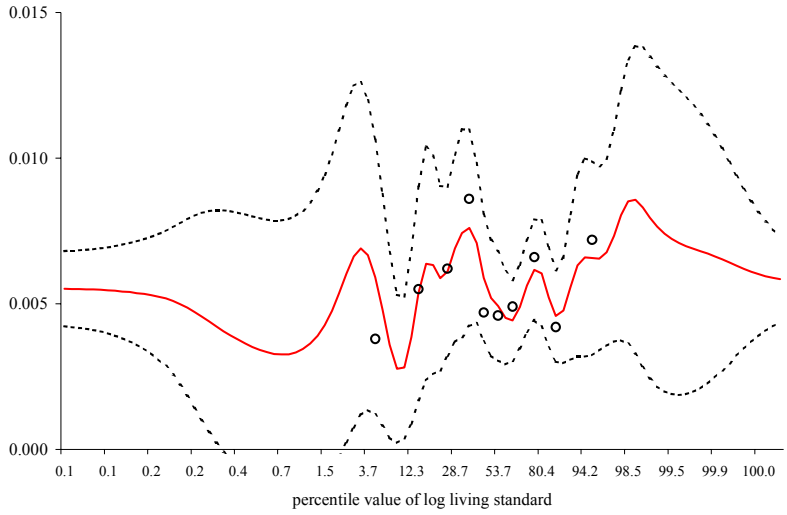


Figure 6: Share of tobacco excise in total expenditures

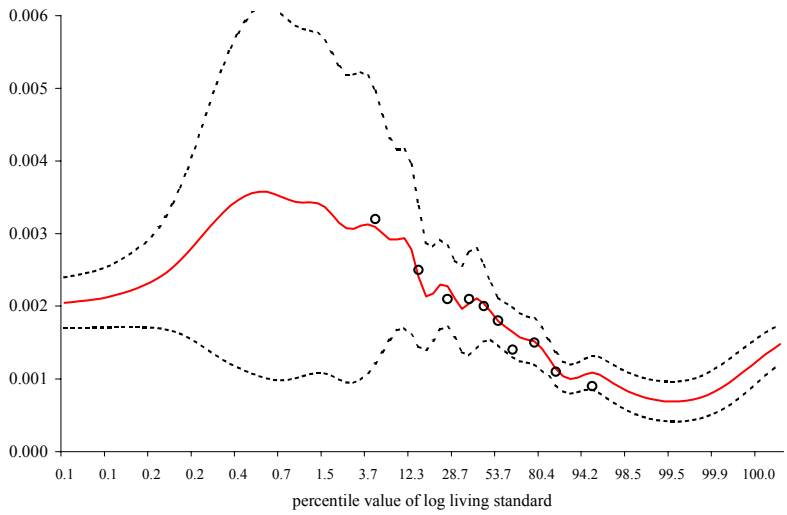
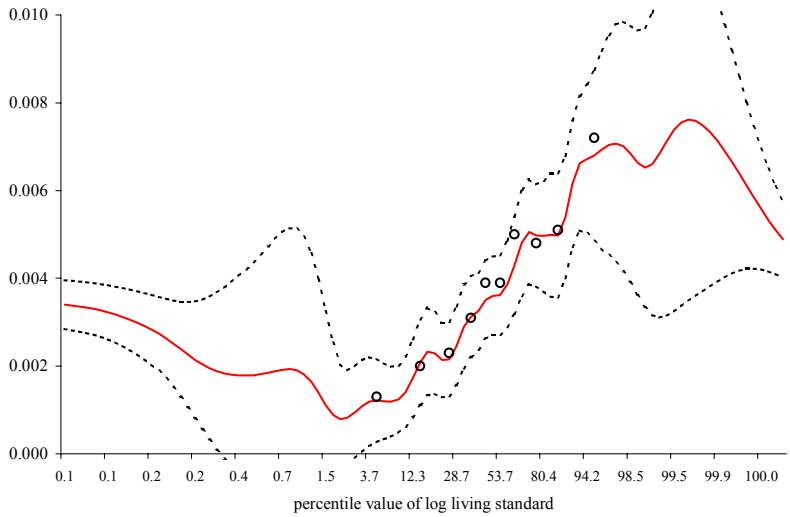


Figure 7: Share of car fuel excise in total expenditures



6.3 How progressive are indirect taxes in Russia?

Table 6 quantifies the pattern expressed in Figures 2-7 by means of the Kakwani index of progressivity. For any specific tax item the Kakwani index measures the difference between the share of total tax revenue and the share of total expenditures, averaged across deciles—see Lambert (2001:201) for a formal definition. For a proportional tax, these shares coincide for all deciles, and the index equals zero. Progressivity occurs when, for the higher deciles, the share of total tax revenue exceeds their share in the taxable base (in this case, expenditures), and the reverse holds for the lower deciles. The Kakwani index is then positive. A negative Kakwani index points to a 'regressive' tax.

Table 6: Kakwani indices for the components of indirect taxes

Tax item	Kakwani index	Share of tax revenues (%)	
Total indirect taxes	0.047	100.0	
VAT	0.044	88.4	
Excises	0.066	11.6	100.0
Excise on alcohol	0.052		43.2
Excise on tobacco	-0.203		11.4
Excise on car fuel	0.155		45.4

Source: see text.

Table 6 not only confirms that indirect taxes as a whole are progressive, but also suggests the even more surprising result that excises are more progressive than VAT.[14] The only regressive component of the indirect tax system is the excise on tobacco, but, as the last column shows, this excise is a relatively unimportant source of excise revenue (11.4 percent). The most progressive component is the excise on car fuel, with a progressivity index value of 0.155. Since it also provides 45 percent of the excise revenue, this is the major explanation for the progressivity of excise taxes, and for the progressivity of the indirect tax system as a whole.[15]

Given the increasing budget share for alcoholic drinks, the progressivity of the excise on alcohol is no longer surprising. But the increasing budget share itself is unexpected. This suggests the need for a detailed investigation of the reported quantities of alcoholic drinks consumed and the corresponding expenditures, a topic to which we return in Section 8.

6.4 A portrait of low and high taxpayers

An alternative way of capturing the variation of taxes paid by different households, is based on groups of households with high and low tax liabilities. Here the population of

[14] The index was calculated on the individual observations, not on the decile points.

[15] The Kakwani index of a sum of tax components is the weighted average of the progressivity indices of the separate components, with the weights equal to the shares of the components in total tax revenue.

households has been partitioned into five quintiles, ordered according to the share of total indirect taxes in their total household expenditures. Hence the first quintile contains the 20 percent of households which have the lowest tax burden. The fifth quintile consists of the households with the highest tax burden. Table 7 tabulates some characteristics for these five different groups.

The row showing the average living standard (expenditure per capita, corrected for regional price differences), confirms the picture of progressive indirect taxes established above. Living standards are higher for the groups that pay a larger tax share, and this is especially true for the top 20 percent of tax payers. Smaller households are found disproportionately in the lower quintiles. The same holds for households living in rural areas. The rest of the information in the table is predictable: the upper quintiles in the tax burden distribution are mainly populated by drinkers, smokers, and car drivers.

Table 7: Characteristics of quintiles of taxpayers

Characteristic	Quintile					All households
	1 (lowest tax share)	2	3	4	5 (largest tax share)	
Share of taxes in total expenditures	5.5	8.7	10.4	12.2	16.4	10.6
living standard (rubles per month)	1741	1821	2030	2263	3030	2177
household size	2.6	2.6	2.8	3.0	2.9	2.8
% of hh living in town or city	46.4	74.2	77.9	82.1	81.6	72.4
% of hh with alcohol consumption	6.9	13.4	24.2	36.7	60.9	28.4
average exp. on alcohol	12	19	38	94	265	86
% of hh with tobacco consumption	27.0	28.2	43.2	53.4	62.1	42.8
average exp. on tobacco	26	31	61	101	135	71
% of hh with car fuel consumption	7.8	8.7	18.1	27.5	49.0	22.3
average exp. on car fuel	16	27	59	102	435	128

Note: ordered by share of total indirect taxes in total expenditures.
Source: see text.

6.5 Explaining tax shares by means of regressions

Finally, Table 8 presents some simple regressions of tax liabilities and tax shares on a number of explanatory variables. After all, the discussion so far takes no account of the correlation between different household characteristics; larger households may have higher expenditures, for example. The regressions in Table 8 take this into account.

Looking at the effect of total expenditures (only corrected for regional price differences now, not per capita, since household size is taken up as a separate variable), it is clear that tax liability is positively related with the expenditure level. But expressed as a share of total expenditures, this positive relationship vanishes. It is even slightly negative, although the coefficient is not significantly different from zero. This adds some nuance to the conclusions of the previous subsections. The progressivity found there, expressed as an increase of the share of taxes throughout the distribution of living standards, does not seem very robust.

The effect of household size is significant in both regressions—ceteris paribus, larger households pay less indirect tax, both in nominal terms and as a share of total expenditure. The same clear conclusion holds for household location. Compared to households living in rural areas, and all other factors staying the same, households living in an urban environment pay more indirect tax. Finally, the effects of drinking alcohol, of smoking and of driving a car, are evident: they increase indirect tax payments, and the share of taxes in total expenditures.

Table 8: Regression of tax liabilities and tax shares

Explanatory variable	Dependent variable: tax liability			Dependent variable : Tax shares in total expenditures		
	coeff.	standard error	t	coeff	standard error	t
Constant	-116.6	10.6	-11.00	7.87	0.20	39.15
Total expenditures	0.94	0.004	23.98	-6.26e-06	1.88e-05	-0.33
Total expenditures squared	1.5e-07	3.6e-08	4.24	2.49e-10	1.49e-10	1.67
Household size	-25.0	5.2	-4.81	-0.17	0.05	-3.68
Dummy alcohol consumption	119.5	12.5	9.57	3.16	0.18	17.61
Dummy tobacco consumption	36.6	8.6	4.25	1.31	0.12	10.53
Dummy car use	128.4	13.2	9.73	2.59	0.15	17.54
Dummy living in city or town	88.9	7.4	12.03	1.68	0.15	11.04
Number of observations	3775			3775		
R^2	0.8765			0.2915		
Roots MSE	241.86			3.5488		

Source: see text.

7 Simulation of a reform of tobacco excises

7.1 The reform of excises for tax year 2003

In the new edition of the tax code for the year 2003, the excise rates for most of the commodities subjected to an excise have been revised. For example, the excise on oil products and beer, are respectively 70 and 25 percent higher compared to the previous

year. There were also important increases for tobacco products. The system of specific rates for different types of tobacco items has been replaced by combined rates for two basic tobacco categories: filtered and unfiltered cigarettes. The introduction of an ad valorem rate of 5 percent of the producer price was combined with a sharp increase in the specific rates, particularly for unfiltered cigarettes. For this type of cigarettes, the excise was increased from 11.2 rubles to 19 rubles per 1,000 cigarettes. This constitutes a 70 percent nominal increase, while for filtered cigarettes the increase only amounted to 28 percent. This differential treatment may point to a willingness on the part of the lawmakers to change the consumption pattern toward less harmful filtered cigarettes.

Part of these rises in excise duties compensates for inflation which was estimated at 15 percent for 2002. Consequently, the new excise rates have been deflated by an additional factor of 1.15, to make them comparable to the pre-reform situation in real terms.[16] Table 9 compares the pre- and post-reform excise taxes for the commodities affected.

Table 9: The real increase of excises in 2003

	Excise 2002	Excise 2003	Excise 2003 in prices of 2002*	real % change
Papyrosi, unfiltered cigarettes (per 1,000)	11.2	19.0	16.5	47.5
Filtered cigarettes (per 1,000)	39.2	50.0	43.5	10.9
Beer (per litre)	1.12	1.40	1.22	8.7
Car fuel (per 1,000 litre)	2072	3000	2609	25.9

Note: *deflated by a factor 1.15.

Source: see text.

Clearly, unfiltered cigarettes and car fuel have been most affected. In addition to the adjustment for inflation, the excise tax increases respectively by 47.5 percent and 25.9 percent. The real increases for filtered cigarettes and beer are lower (11 percent and 9 percent respectively), but not negligible. Note however that the change in the consumer price, assuming that the producer prices are fixed, will of course be smaller, and depends on the weight of the excise in the final consumer price. The consumer price for car fuel increases most, by some 7.6 percent, followed by that for unfiltered cigarettes: 4.7 percent. The excise tax increase has only a limited effect on the price of filtered cigarettes (+1.3 percent) and beer (+0.6 percent).

The new tax liabilities have been simulated under two important assumptions:

1. producer prices are fixed;
2. households do not adjust their expenditure patterns, but keep buying the same quantities as before. This is sometimes referred to as the 'morning after' or the

[16] Recall from Section 2 that our pre-reform situation concerns the legislation of 2002, but expressed in rubles of 2000 by deflating by a factor of 1.186 (to apply them to the RLMS expediture data of 2000). Needless to say, the post-reform excise taxes were also deflated by this second deflation factor, so that all results are expressed in prices of 2000.

'impact' effect. Needless to say, that this is only possible by adjusting expenditures.[17]

The second assumption has an important impact on the way in which the 'welfare' effect of reforms is measured. In the pre-reform situation, total expenditure (corrected for regional price differences, and per capita) is used as a proxy for consumption and, hence, for the living standard of the household. After a price change, the consistency would require division of an unchanged total expenditure level by a changed price index to yield the effect on 'real' expenditures, say quantities. But since quantities are kept fixed, this approach will always give unchanged welfare levels in the current period, by definition. There are two solutions to this problem. Either short-run behavioural reactions are incorporated by estimating a consumer demand model under the assumption that total expenditures are given. Or we go further and model changes in total expenditures by either building a model with endogenous labour supply, or else building a genuine intertemporal model with changes in savings. All of these are far beyond the scope of this study and, hence, we have chosen an ad hoc escape route.

If intertemporal welfare is approximated by the sum of savings and expenditures net of taxes, it is easy to show that the change in tax payment is equal to minus the welfare change. Hence, the next subsection will present the changes in tax liabilities due to the reform. This will also be expressed in relative terms by writing the change as a fraction of total pre-reform expenditure.

7.2 Distributional effects of the reform

The RLMS survey contains a considerable number of households that do not consume tobacco, alcohol, or car fuel. As a consequence, 1,581 out of the 3,755 households (42 percent) are not affected by the reform. The average loss for all households together amounts to 17.6 rubles per month, or 0.28 percent of total expenditure. But it increases to 30 rubles (0.47 percent of total expenditure) for the subset of losers. Figure 8 depicts the variation of the absolute and relative losses across the distribution of living standards.

It is clear that the distinction between absolute and relative losses is crucial. The absolute amount of extra tax (left axis) clearly increases throughout the living standard distribution, but in relative terms (right axis) the pattern is reversed. Certainly, at the lower end of the distribution of living standards, the excise increase seems to have been regressive. This is confirmed by Figure 9, which shows a kernel estimation of the percentage change on the logarithm of living standard.[18] Disregarding the first percentile, the pattern is clearly regressive for the first three deciles. But, the valued added from the kernel technique is the confidence bands. These are so wide in this part

[17] Note that this could be considered a very crude model of behavioural reactions, when all effects on this period quantities are zero, and the effect is fully transmitted to subsequent periods via an effect in savings.

[18] We again used an adaptive Gaussian kernel with window width 0.75. The dots in the picture represent the decile averages. The dotted lines are 95 percent confidence bands.

of the distribution, that the regressivity conclusion should not be regarded as robust. From about the 30th to the 85th percentile, the reform seems to be proportional, and the confidence bands become much smaller. Only at the very top of the distribution does there appear to be some progressivity, albeit again with widening confidence bands.

Figure 8: Effect of the excise increases for deciles of living standard

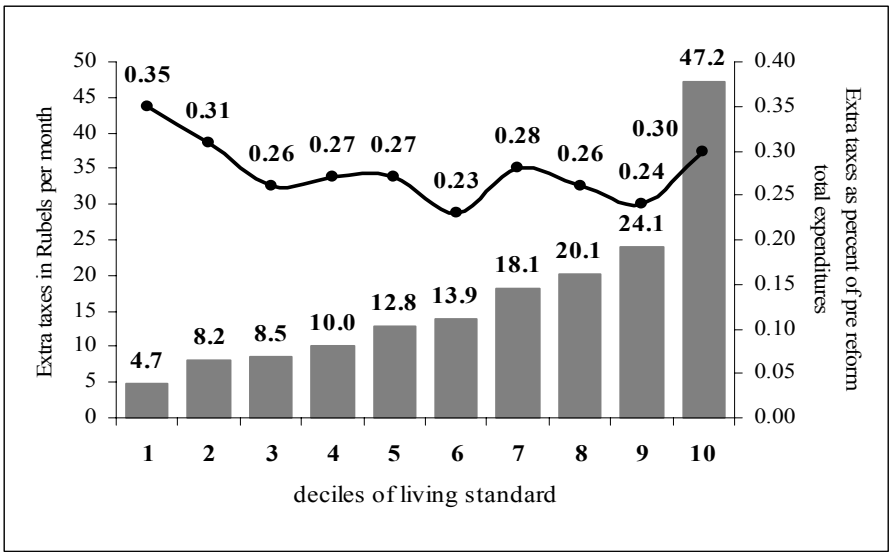
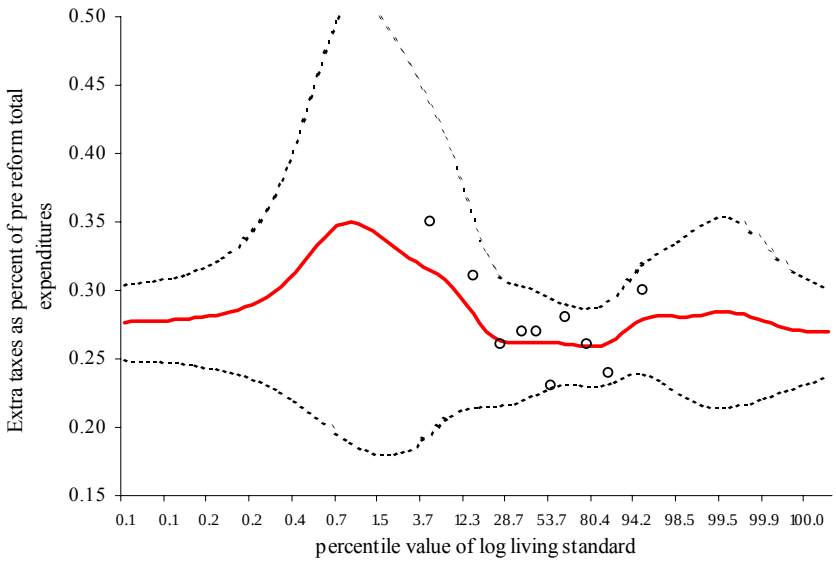


Figure 9: Non-parametric kernel estimation of the effect of the excise increases



The Kakwani index enables the effects to be aggregated across the whole distribution, and also allows insights to be gleaned from the decomposition of the total effect. Since the tobacco excise tax is an unimportant source of revenue (see Table 6 for the pre-reform share of tax revenue), a large shift in the progressivity index is not expected. Table 10 reveals that the excise reform has been a regressive move: the index for the whole indirect tax system goes down from 0.0469 to 0.0465. This means that, overall, lower income groups now bear a larger part of the tax burden. Evidently, this is entirely due to the change in the excise component, for which the (surprising) progressivity is

eroded from 0.0657 to 0.0602. Again this is the result of opposing forces. Progressivity of the alcohol excises is almost unaffected, but the regressivity of the tobacco taxes is enhanced from -0.2028 to -0.2045. This is counteracted by a considerable increase in the progessivity of the excise duty on car fuel.

Table 10: Kakwani indices for the components of indirect taxes before and after the excise increase

Tax item	Kakwani index before the reform	Kakwani index after the reform
Total indirect taxes	0.0469	0.0465
VAT	0.0444	0.0444
Excises	0.0657	0.0602
Excise on alcohol	0.0515	0.0518
Excise on tobacco	-0.2028	-0.2045
Excise on car fuel	0.1546	0.1596

Source: see text.

Table 11: Characteristics of groups of small and big losers (ordered by percentage loss)

Characteristic	Loss group (quartiles for positive losses)					
		1	2	3	4	
	No loss	Smallest loss			Largest loss	All households
Percentage loss	0.00	0.07	0.22	0.42	1.19	0.28
Living standard (rubles per month)	1842	2960	2390	2141	2185	2177
Household size	2.2	3.2	3.2	3.1	3.2	2.8
% of hh living in town or city	70.8	76.3	76.1	72.7	69.3	72.4
% of hh with alcohol consumption	7.3	59.2	41.2	38.6	35.4	28.4
Average exp. on alcohol	17	144	159	120	117	86
% of hh with tobacco consumption	0.0	57.4	81.9	80.7	74.5	42.8
Average exp. on tobacco	0	46	109	155	178	71
% of hh with car fuel consumption	0.0	10.7	28.6	44.8	69.0	22.3
Average exp. on car fuel	0	17	73	154	637	128

Source: see text.

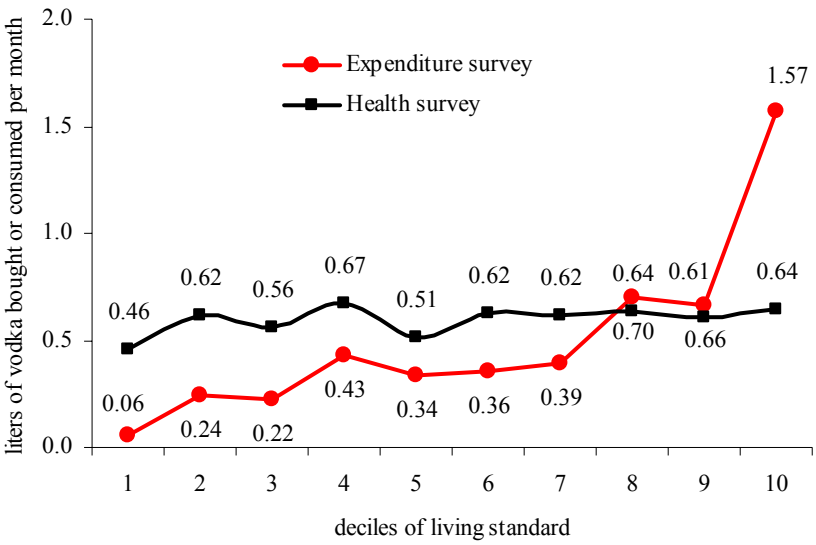
We end this section by outlining the (relative) gainers and losers from the reform, as done in Section 6.4. It gives a particularly clear answer to the question: who gains, and who loses? The answer is provided in Table 11, where the population of households has been partitioned into 5 groups. The first group consists of the 1,581 households that are

not affected by the reform: the 'gainers'. The other 2,194 households are partitioned into 4 quartiles of increasing percentage loss. As far as the loss/no loss dichotomy is concerned, the tables are very clear. The gainers are those households that do not smoke or drive a car, and drink little. On average they have a lower living standard than the households affected by the reform. They are also smaller on average, and slightly more prevalent in rural areas. Within the losers group, the living standard indicator clearly shows a regressive pattern with the richest households in the group with smallest percentage losses.

8 How reliable are the quantities for alcohol and tobacco?[19]

It has already been noted in Section 3 that the RLMS survey contains additional information on alcohol and tobacco consumption in a separate questionnaire that focuses on the health situation of individuals. Figure 10 compares the average quantities of vodka (in litres per month) in both parts of the RLMS survey. The difference is striking—in the expenditure survey the quantity of vodka increases sharply through the deciles. This contrasts with the flat pattern of vodka consumption in the health survey. The same holds true to a slightly lesser extent for tobacco consumption. As a consequence, if excise taxes were calculated from the quantity information in the health questionnaire, the typical regressive pattern would have been found instead of the surprising progressive one. The obvious question which arises here is: does this throw doubt on the reliability of the alcohol data in the expenditure survey? Or can other explanations be found for this discrepancy? And how do the possible explanations relate to the above calculation of tax incidence?

Figure 10: Comparison of quantities of vodka in the expenditure and health surveys



[19] The figures underlying the graphs in this section are in Tables A3 and A4 in the appendix.

Consider the obvious differences between the two data sources. First, there is an important distinction between 'drinking' vodka (the question posed in the health survey), and 'buying' vodka (the question in the expenditure survey). The excess of consumption over expenditure, so prominent in the bottom seven deciles of the distribution, and decreasing through the range of living standards, might be due in part by the consumption of home produced vodka and by vodka received from households in the top deciles. In these top deciles, the excessive purchases might then be explained by buying vodka as a means of exchange, for example to pay for miscellaneous labour services. This is especially important in the context of calculating the indirect tax liabilities, since home produced vodka evidently escapes tax while the vodka bought by higher deciles, but consumed by lower ones, is taxed at the moment of purchase by the higher deciles. If these are the explanations, then basing the tax calculation on the quantities recorded in the expenditure survey (as in the baseline scenario above) does indeed represent the actual incidence of alcohol excises.[20]

Second, the context in which the questions on alcohol consumption are asked is obviously very different in the two parts of the survey. The well known poor quality of tobacco and alcohol responses in budget surveys, due to the 'bad' associations with these commodities, may be less of a problem when the same question is embedded in a questionnaire examining health and illness-explaining behaviour. The plausibility of this explanation is supported by the evidence on the number of households with strictly positive quantities reported in the two surveys (see Table 12).

Table 12: Percentage of households with strictly positive quantities for vodka consumption in expenditure and health survey

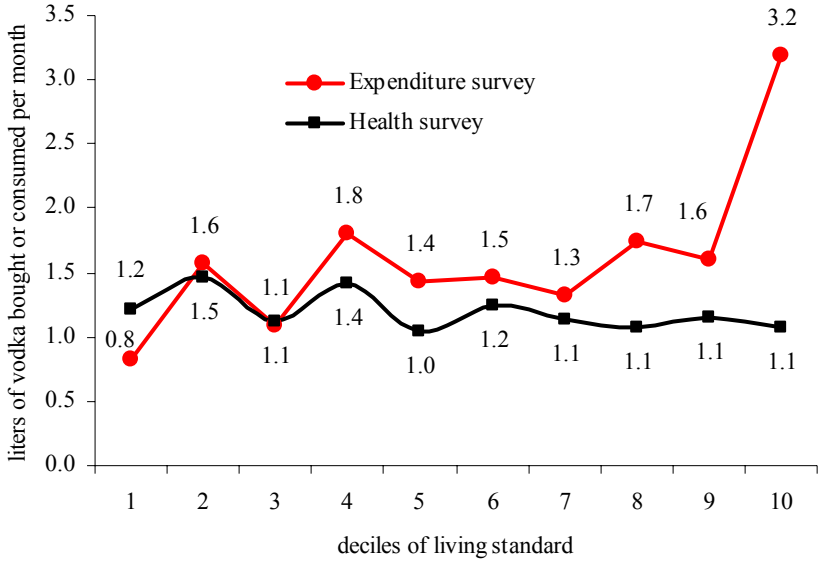
Decile	Expenditure survey	Health survey
1	6.9	37.8
2	15.5	42.4
3	20.3	49.5
4	23.9	47.3
5	23.6	49.3
6	24.5	50.3
7	29.6	54.5
8	40.0	59.1
9	41.2	53.0
10	49.3	59.9
All households	28.4	50.8

Source: see text.

[20] For the assumption of home production, we tried to find some evidence by regressing the difference between the two curves of Figure 10 on the consumption of sugar (needed for producing vodka at home), and on other sociodemographic variables (like rural/non rural area). We were however unable to find strong evidence for this assumption.

The 28.4 percent of households reporting positive quantities of vodka in the expenditure survey seems to be a suspiciously low figure. The percentages in the lower deciles are particularly implausible. In the health survey, these percentages are much higher. In contrast to the first explanation, this underreporting argument would advocate using the health data. It is this low percentage of positive quantities which mainly drives the results of our distributional analysis of the alcohol excise tax. Indeed, if we calculate the litres of vodka bought or consumed by only those households who report positive quantities, we get a picture (Figure 11) which is quite different from Figure 10. Except for the sharp increase in the tenth decile, the consumption of alcohol for the positive consumers is now much less variable through the deciles. Moreover, apart from the bottom decile, the quantity reported in the health survey now everywhere exceeds the quantity reported in the budget survey. Of course, given the small sample sizes especially in the expenditure survey (e.g. the first decile contains only 24 households with strictly positive quantities), the statistical significance of the difference should not be taken for granted.

Figure 11: Comparison of quantities of vodka in expenditure and health questionnaire, for the households with strictly positive quantities in the expenditure survey



Third, an additional argument in favour of the health survey is that the expenditure survey is completed by the household member mostly responsible for the expenditures, which most likely cases means the wife (if present). The health questionnaire is answered separately by individual household members. This might point towards more reliable data in the health survey. On the other hand the recall period for the expenditure survey is one week, whereas it is one month for the health survey.

Finally, there is the quantity of black market vodka purchases. Again, this does not undermine our estimation of the tax liabilities based on the reported expenditures. Quite the contrary; basing them on the 'true' figure for alcohol consumption recorded in the

health survey would be erroneous, since by definiton no taxes are paid on black market alcohol.

These alternative explanations have quite different impacts on the reliability of our estimates of the distributional effect of Russian indirect taxes. More research is certainly needed to assess the relative importance of the different arguments. In the absence of such research, and in order to illustrate the importance of the matter, the Kakwani indices have been recalculated under the assumption that the quantities reported in the health survey, are the ones to be used as a tax base for both alcohol and tobacco.

Table 13: Comparison of Kakwani indices for the components of indirect taxes before and after correction of quantities of alcohol and tobacco

Tax item	Kakwani index with quantities for alcohol and tobacco from expenditure survey	Kakwani index with quantities for alcohol and tobacco from health survey
Total indirect taxes	0.047	0.026
VAT	0.044	0.040
Excises	0.066	-0.075
Excise on alcohol	0.052	-0.266
Excise on tobacco	-0.203	-0.200
Excise on car fuel	0.155	0.160

Table 13 proves that the surprising findings of progressive excises is due entirely to the unexpected pattern of alcohol consumption observed in Section 4. Replacing these quantities by the more usual pattern observed in the health survey yields the familiar distributional pattern of indirect taxes in the right column of Table 13: progressive VAT combined with regressive excises. The excise on alcoholic drinks now becomes markedly regressive. The whole indirect tax system remains slightly progressive, due in part to the important progressivity effect of the excise on car fuel.

9 Conclusion

We hope that this paper has demonstrated the usefulness of microsimulation techniques to assess the distributional consequences of indirect taxes and of tax reforms. Our main result contrasts with the distributional pattern of indirect tax liabilities found in most western countries, when a progressive VAT is combined with regressive excises, leading to a roughly proportional indirect tax burden. Our calculations for Russia using the RLMS data, however, reveal a clear progressive incidence of taxes. The reason for this surprising result was found in the progressive pattern of the excises, with the progressivity of the car fuel tax more than counterbalancing the regressivity of the tobacco excises. The progressivity of the car fuel tax derives from the very clear luxury pattern of the budget share for this item in household total expenditures.

The progressivity of indirect taxes vanishes once we control, by means of regressions, for household size and rural/urban location, and use different dummies for the consumption of the excise commodities. This confirms that the distributional pattern of indirect tax liabilities is mainly due to variations in the expenditure share for the excise commodities: alcohol, tobacco, and car fuel. The 'low tax payer' is a non-drinking, non-smoking, and non-driving household, living in a rural area, with a below average living standard.

Application of our methodology to assess the distributional effects of the recent increase in excises on tobacco, car fuel and beer, shows that the reform was regressive in terms of the Kakwani index. The index, which was positive, decreased slightly. Looking in detail at the effects throughout the distribution of living standards, the pattern was found to be non-monotonic. The reform was markedly regressive within the bottom third of the distribution, and slightly progressive in the top two deciles. In between, the tax increase was more or less proportional to pre-reform total expenditure.

The important role of excises in the distribution of indirect taxes is somewhat overshadowed by doubts about the reliability of the data and/or about the assumption of full tax compliance. Preliminary analysis has shown that the regressive impact of excise taxes is sensitive to this assumption. Further research is needed to clarify this important issue. The same holds for the incorporation of behavioural effects. The absence of a demand system for Russia limits the analysis to the calculation of the impact effects of reforms. The availability of a demand system with a matrix of price and income elasticities would not only allow these behavioural reactions to be incorporated, but also to carry out a more thorough welfare analysis of the impact of indirect tax system reforms.

Appendix A

Table A1: Budget shares by deciles of living standards (in %)

	Decile of living standard										all hh
Commodity	1	2	3	4	5	6	7	8	9	10	
Food	43.9	43.8	46.1	47.0	47.5	44.9	43.4	43.5	42.2	36.4	43.7
Home production	15.9	14.3	13.1	11.4	10.8	13.1	13.1	11.3	10.3	8.5	12.0
Eating out	2.6	3.9	3.4	3.2	3.8	4.1	4.0	3.6	4.7	4.4	3.8
Alcoholic drinks	1.7	1.4	1.6	2.0	1.6	1.7	1.5	2.2	1.8	2.3	1.8
Tobacco	2.9	2.1	2.1	1.8	2.0	1.7	1.6	1.6	1.3	1.2	1.8
Clothing	6.1	6.7	6.9	7.8	7.6	8.9	9.6	9.1	11.3	11.4	8.7
Health, personal care	8.0	7.5	6.5	6.4	6.0	5.8	5.8	6.3	5.7	4.9	6.2
Car fuel	0.5	1.1	1.0	1.6	1.7	1.7	2.2	2.5	2.4	3.6	1.9
Housing, utilities	8.9	8.1	8.2	7.0	6.5	5.5	5.9	6.1	5.7	4.6	6.6
Services, other items	4.0	4.9	6.3	6.3	6.8	6.3	6.9	8.1	9.8	18.5	8.1
Durables	5.6	6.1	4.9	5.6	5.7	6.2	6.0	5.6	4.7	4.2	5.4

Source: see text.

Table A2: Tax liabilities in % of total expenditures

	Decile of living standard										all hh
Tax item	1	2	3	4	5	6	7	8	9	10	
Total indir. taxes	9.15	9.91	9.99	10.47	10.62	10.60	10.49	11.12	11.12	12.29	10.63
VAT	8.29	8.73	8.93	9.19	9.53	9.53	9.44	9.74	10.04	10.73	9.47
Excises	0.86	1.17	1.06	1.28	1.09	1.07	1.05	1.36	1.08	1.55	1.17
alcohol	0.40	0.64	0.59	0.72	0.51	0.54	0.41	0.66	0.45	0.71	0.56
tobacco	0.31	0.26	0.23	0.20	0.20	0.16	0.17	0.16	0.11	0.09	0.19
car fuel	0.11	0.23	0.20	0.32	0.35	0.34	0.44	0.51	0.49	0.73	0.39

Note: the figures in this table deviate slightly from the decile averages, plotted as dots in figures 2 to 7, because this table constructs deciles based on the ordering of *individuals*, while the regressions are run on households.

Source: see text.

Table A3: comparison of our estimates of indirect tax revenues with official budget figures (million rubles per year)

	(1) 2001 consolidated budget	(2) Total tax revenues calculated on the RLMS survey	(2)/(1) (in %)
Total indirect taxes	407 132	363 856	89.4
VAT	355 684	327 834	92.2
Excises	51 448	36 022	70.0
Vodka	26 663	13 897	52.1
Beer	4 307	944	21.9
Wine	3 187	659	20.7
Tobacco	5 107	4 099	80.3
Petrol	12 185	16 423	134.8

Source: see text.

Appendix B: Calculation of the user cost of durables

The monthly user cost uc_i for each durable item i is calculated from:

$$uc_i = value_i \cdot \frac{(r + \delta_i - \pi_i)}{12},$$

where $value_i$ is the registered outlay for the durable; r is the nominal intrestrate (opportunity cost); δ_i is the depreciation rate for item i; and π_i is the inflation rate for item i.

To simplify matters (and because of problems estimating the inflation rate for Russia), π_i has been assumed to be the same for all durable items and, more heroically, approximated by average inflation in the economy. This allows us to work with the *real* interest rate for $r - \pi_i$.

The depreciation rate has been estimated as follows. First the 'average age' of the durables was calculated by using the age-variables available for the owners. We then tried to determine how fast the commodity has to depreciate to be replaced. Since:

$$q_t = q_0 \cdot (1 - \delta)^t$$

expresses how an initial stock q_0 depreciates to q_t after t periods, we can calculate a δ so that after T periods, the remainder value of the durables is 'negligible'. Rearranging yields:

$$\delta = 1 - e^{\log \frac{q_T / q_0}{T}}$$

The 'negligible' value in the last but one sentence, has been interpreted to mean a ratio q_T / q_0 below 0.20. For T, we chose twice the average age of the durable which resulted in the following depreciation rates:

item	average age	depreciation rate, %
TV, VCR	8	10
Domestic appliances	13	6
Car	11	7
Housing	17	4.6

Except for housing, these depreciation rates seem reasonable. For housing, the rate has been reduced to 3 percent, which is equivalent to increasing the average age to 25 years (from 17 years). For furniture we took 6 percent (as for household appliances), and for

motorcycles the 7 percent of cars was used. Garage, and building materials, were depreciated at the same rate as housing.

For the owners there was the extra difficulty that we did not observe $value_i$, since there was no outlay and no information on the outlay in the past. We imputed a value by simply applying the rate of depreciation:

$$V_t^0 = p_t q_t = p_t q_0 \cdot (1-\delta)^t$$

where V_t^0 stands for the value in period t of the durable bought in period 0, and t is the age of the durable. For $p_t q_0$ we took the average value of the durables (per item of course) bought during the survey period.

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