How progressive are 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 Russian indirect tax system: VAT and excise taxes. According to the Kakwani index, the global indirect system can be considered to be progressive overall. Decomposition into constituent terms shows that this is due not only to a progressive VAT structure, but also to progressive excise taxes. This result is partly explained by the progressivity of the excise tax on car fuel, but is also sensitive to peculiarities in the data about alcohol consumption.

JEL classifications: D12, D63, H22, H31.
Keywords: Indirect taxes, microsimulation, progressivity, Russia.

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1. Introduction

Russia belongs to the set of countries where a personal income tax is either absent or only present in an embryonic form. It is not surprising, therefore, that indirect taxes generate a considerable part of government revenues. For the budget year 2000, for example, 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. Within the revenues from indirect taxes, 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.

This paper assesses the distributional effects of indirect taxes in Russia. It is well known that, from a distributional point of view, indirect taxes in the form of vat and excises are usually regressive. The average tax rate decreases with the level of total expenditures or living standard of the household. Wagstaff *et al.* (1999) present estimates of the Kakwani index of progressivity for indirect taxes in several OECD countries. Except for Spain in 1980 (index of 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.

The distributional effect of indirect taxes is the result of an interplay between a differentiated indirect tax structure and the variation in expenditure patterns between households. Hence, in addition to a description of the indirect tax structure at a detailed level, one needs sufficiently detailed information about differences in expenditure patterns across households to unveil the distributional impact of the indirect tax structure. This paper uses a recently developed microsimulation model for Russia, to calculate the indirect tax liabilities for a representative sample of the Russian population.[2]

The model runs on the the ninth round of the Russian Longitudinal Monitoring Survey (RLMS). In this paper we mainly use the expenditure part of the survey, registered 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 January 1st 2001). Variations of these tax liabilities across the population are described by means of graphs and Kakwani indices of progressivity.

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 give a short summary of the RLMS data with special attention

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[2] The microsimulation model DARTS (which stands for Distributional Analysis of the Russian Tax and Transfer System) was developed in WIDER, within the UNU/WIDER project 'Microsimulation of Tax Benefit Reform in Russia' under the direction of Tony Shorrocks.

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

	2000 Consolidated budget (in million roubles)	Share of tax revenues, %	Share of GDP, %
Taxes on goods and services of which	999,526	52.5	14.4
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: Author's estimates based on budget statistics of Russia's finance ministry.

to two possible sources of information on the quantities of tobacco and alcohol consumption. Section 3 reports the results of calculating the distributional consequences of indirect tax liabilities for the RLMS sample and Section 4 contains the conclusions.

2. The indirect tax system in Russia

Table 1 reveals the importance of VAT and excises for the government budget. 52.5 percent of the 2000 revenues are collected through taxes on goods and services. VAT and excise taxes, the two elements on which we focus in this paper, account for about 62 percent of these indirect tax revenues.[3] 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 (see Ahmad and Stern, 1984, 1991). 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.

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[3] The 'housing and utilities tax' was eliminated at the beginning of 2001. 'Sales tax' was a regional tax, which in practice varied from 2 to 5 percent and was set annually by each regional government. The tax was abolished in January 2004.

2.1 *VAT*

Table 2 summarizes the VAT and excise rates for the commodity breakdown of the microsimulation model darts. 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. 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.

2.2 *Excises*

In contrast to VAT, excise duties are expressed as a fixed amount of roubles per quantity bought by the consumer.[4] They are levied on a limited number of commodities: 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 roubles. Since our expenditure data are from 2000, we inflated them with a factor of 1.186 to convert them to 2002 roubles (the inflation between January 1st 2001, the end of the survey period, and January 1st 2002 being estimated at 18.6 percent).

2.3 *The RLMS data*

The data are drawn from the ninth round of the RLMS longitudinal survey. The budget survey part of 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, and for vodka the rates are differentiated according to the alcohol percentage. The same story applies 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

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[4] 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. The official exchange of the Rouble on January 1st 2002 was 30.14 Roubles for one US Dollar (IMF *International Financial Statistics*, February 2002).

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

	Commodity aggregate	Commodity, 2nd level (for tax calculations)	VAT rate (%)	Excise (in 2002 roubles)
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 roubles per litre
		beer	20	1.12 roubles per litre
		wine, other alcoholic drinks	20	4 roubles per litre
5	Tobacco	papyrosi, unfiltered cigarettes	20	0.0112 roubles per cigarette
		filtered cigarettes	20	0.0392 roubles 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 roubles 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.

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

| Commodity	Quantity information	
Alcohol	vodka	Available in budget survey and health questionnaire.
	beer	Available in budget survey and health questionnaire.
	wine, other alcoholic drinks	Available in budget survey and health questionnaire.
Tobacco	papyrosi, unfiltered cigarettes filtered cigarettes	Available in budget survey, but of little use since it only asks the number of 'packs', not differentiated according to type of cigarettes; in health questionnaire differentiated according to type.
Car fuel		Not available; quantities were calculated by dividing expenditures by a price of 8.53 roubles per litre.
Housing	gas fuel	Available in budget survey.

tax. Table 3 summarizes the available information used for the different excise commodities.

For the calculation of the excise duty on gas fuel (last row in Table 3), there is no problem. The budget survey records the quantity consumed. For car fuel consumption, on the contrary, there is no quantity information at all. In this case we have imputed quantities by dividing the registered expenditures by a fixed unit price of 8.53 roubles per litre (the average price during the period of the survey).

Both tobacco and alcohol products are important commodities as far as excise duties are concerned. The RLMS survey contains two sources of information for the purchase, and consumption of these two commodities: the standard budget survey, and an additional health questionnaire. First, for tobacco the quantity information in the expenditure survey is not detailed enough to distinguish between different types of cigarettes, taxed at different rates. Therefore, we have used the RLMS health section, containing smoking behaviour information which differentiates between types of cigarettes. We kept the total tobacco quantity reported in the expenditure survey and distributed it over the different types of cigarettes according to the pattern observed in the health part of the questionnaire.[5] For alcohol quantities, this was not really necessary since we observed the quantities of vodka, beer, and wine in the expenditure survey.

But the availability of two sources of information on alcohol and tobacco consumption allows us to look in more detail at a topic frequently raised in the context

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[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.

Figure 1. Comparison of quantities of vodka in the expenditure and health surveys
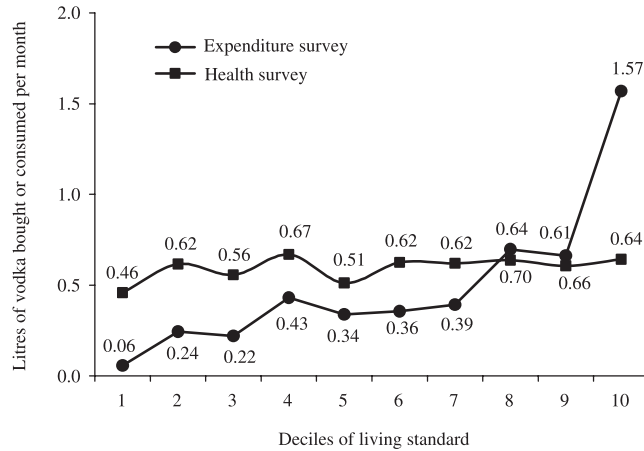
of budget surveys: the possibility of under-reported consumption of commodities which are considered as 'bads' by the respondents, and the influence of this possible under-reporting on the distributional pattern of indirect tax liabilities.[6]

Figure 1 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 of living standard.[7] 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, the distributional pattern of excise taxes (and hence of indirect taxes overall) might be quite sensitive to the data choice we make for the tobacco and alcohol quantities. We therefore first consider the obvious differences between the two data sources.

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[6] For a detailed analysis of alcohol consumption in the UK, see Atkinson, Gomulka and Stern (1990). Note, however, that, contrary to what is often assumed, the evidence for underreporting of tobacco and alcohol expenditures, is mixed. Kemsley, Redpath and Holmes (1980, p. 52) report that special surveys reveal no apparent missing expenditures on alcohol and tobacco, and that this form of under-reporting is not a major problem.

[7] In Appendix A we explain in detail how we constructed the concept of living standard. In brief, it is based on expenditures (instead of income), with an adjustment for durable expenditures through the imputation of a user cost (to approximate consumption instead of expenditures), and it is on a per capita basis (where we assume equality in the intra household distribution of the household living standard). The fact that a living standard concept is better based on expenditures (or consumption) instead of the more volatile income, seems to be commonly accepted now. But the sensitivity of tax incidence calculations to the choice of income or expenditures is less clear. Lyon and Schwab (1995) conclude that, contrary to earlier evidence, the regressivity of excise taxation does not turn into progressivity when switching from expenditure to income based calculations.

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 to the consumption of home produced vodka and to vodka received from households in the top deciles.[8] In these top deciles, the excessive purchases might then be explained by the buying of 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.

Second, there is the quantity of black market vodka purchases that might explain the difference between the two curves in Figure 1.[9] This again tells in favour of using the recorded expenditures from the budget survey. Indeed, calculating tax liabilities 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 first two explanations both support the use of the budget survey data for alcohol consumption to assess the distributional pattern of excise incidence. But in that case, the upward sloping line in Figure 1 might well translate into a less regressive pattern of the alcohol excise than usually found, or even a progressive one. Moreover, the gradual replacement of home production by marketed production in the course of the transition and development process, and policies that aim at curbing the black market, might have regressive distributional impacts and make the indirect taxes more regressive *ceteris paribus*.

Third, the recall period for the expenditure survey is one week, whereas it is one month for the health survey. If vodka is purchased by many households at a frequency less than once a week, the expenditure survey may suffer from serious zero expenditures due to infrequency of purchase. The recall period of one month for the health questionnaire is safer in this respect.

Fourth, 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 third and fourth explanation is supported by the evidence on the number of households with strictly positive quantities reported in the two

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[8] For the assumption of home production, we tried to find some evidence by regressing the difference between the two curves of Figure 1 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.

[9] See Lackó (2000) for recent estimates of the shadow economy in Russia and other transition countries.

Table 4. 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

surveys (see Table 4). 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.

Finally, 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 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. In contrast to the first explanation, these three under-reporting arguments would advocate using the health data, and pushes the results into the direction of a standard regressive excise tax on alcoholic drinks.

In any case, these alternative explanations for the different patterns found in the budget survey and the health questionnaire of the RLMS data, have quite different impacts on the reliability of our estimates of the distributional effect of Russian indirect taxes using either the quantities of alcohol and tobacco from the budget survey or those from the health questionnaire. 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, we have first followed the standard approach of basing the whole calculation on the budget survey information. We then look at the sensitivity of the results of switching to the alcohol and tobacco consumption recorded in the health questionnaire.

2.4 *Calculation of the tax liabilities*

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 $a_i = a_i/p_i$ allows the total tax per unit, or wedge between consumer and producer price, to be given as:

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

The first term in Equation (2) will be referred to as the VAT component; the second one as the excise component.[10] 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:

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

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:

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

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[10] 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.

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 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.

Finally, it is worth recalling an important assumption underlying the calculations: producer prices are assumed to be fixed, which implies a partial equilibrium framework.[11]

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

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

where the summation runs over the subset of commodities included in J. We then obtain T_J as the result of the summation of T_J^h's across households, giving the total indirect tax revenue collected on commodity aggregate J. This T_J is used to construct average tax rates on the commodity aggregates:

$$t_J = \frac{\sum_h T_J^h}{\sum_h e_J^h - \sum_h T_J^h} = \frac{T_J}{e_J - T_J}, \tag{8}$$

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).

Before examining the distributional pattern of tax liabilities, we first present these 'average' tax rates for the eleven commodities calculated from the expenditure pattern of the average consumer in the budget survey.[12] These are presented in Table 5, where we ranked them from highest to lowest tax rate.

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[11] 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 Davies (2004) for an overview of recent developments.

[12] The aggregate tax revenues obtained by means of our calculations of tax liabilites by household account for 89.4 percent of the revenues reported in official government statistics, a very satisfactory result when compared with other microsimulation exercises for indirect taxes. As expected, the result is better for VAT (92 percent of the reported figures), than for excises (70 percent).

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

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, shown in Table 5, now interacts with the variation in expenditure patterns across households to generate the distributional pattern of indirect taxation.

3. Distributional pattern of the indirect tax liabilities

3.1 *Indirect tax liabilities across the distribution of living standards*

The average indirect tax rate is 10.6 percent, but the variation across households is considerable. The rate varies between 0 and a maximum of 63 percent with a standard deviation of 4.2 percent. In the Appendix we present a table with the average by decile of living standard (Table B1 of Appendix B). But to reveal the large variation in the tax burden across the living standard distribution in as detailed a way as possible, we prefer to present graphs with non-parametric kernel

Figure 2. Share of indirect taxes in total expenditures

Percentile value of log living standard

regressions rather than simple averages by decile.[13] 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 simple averages of the tax shares by decile of living standard (to be found in Table B1 of Appendix B) and can be used to assess the value added of the non-parametric regression technique. To enhance readibility, the value itself of the logarithm of the living standard has been replaced on the horizontal axis by the percentile point in the distribution of it. Hence, the ordinate corresponding to a point of 9, say, on the horizontal axis indicates the tax rate at the 9th percentile of the distribution of living standards. Since a fixed grid was chosen, the horizontal axis of Figure 2 is not evenly distributed over the distribution of living standards. More points are estimated in the tails. Since, for the bottom and top tails of the distribution, the confidence bands are rather large, we have trimmed the display of the graph (not the regression itself) at both tails.

Figure 2 indicates a clear progressive pattern for indirect taxes. This finding stands in sharp contrast to similar results for most other countries (see Wagstaff *et al.*, 1999). 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

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[13] An adaptive Gaussian kernel was used on a fixed grid of 100 values between the minimum and the maximum of the logarithm of the living standard of the household (See Silverman 1986, or Blundell and Duncan, 1998). The bandwidth was first determined by means of a cross validation technique, as described in Härdle (1990, pp. 159–60). The sensitivity parameter of the adaptive kernel was set equal to 0.5 (see Silverman, 1986, pp. 103–05). The confidence bands were calculated by means of the approximation provided by Härdle (1990, pp. 100–101).
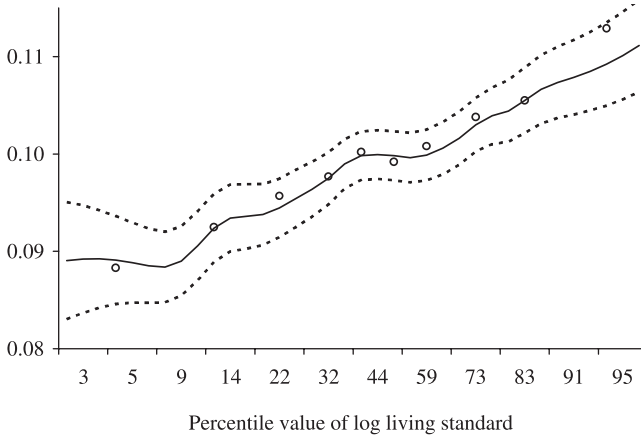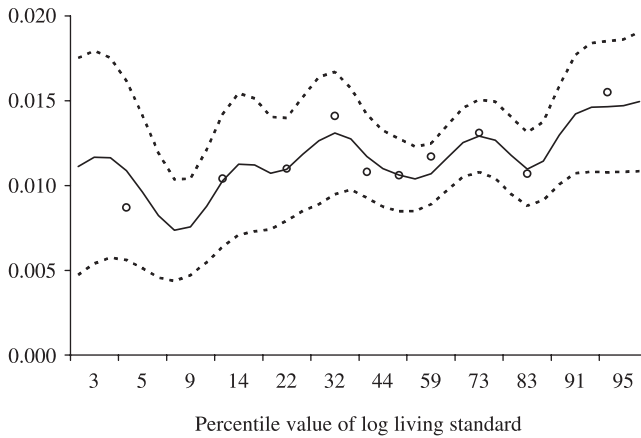
Figure 3. Share of VAT in total expenditures

Percentile value of log living standard

Figure 4. Share of excises in total expenditures

Percentile value of log living standard

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. In Russia this is not the case. In Figures 3 and 4 we present the distributional pattern for the separate components VAT and excises.

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 in the appendix might look quite fanciful, but the kernel regression reveals a roughly upward sloping pattern for almost all of the distributional range.

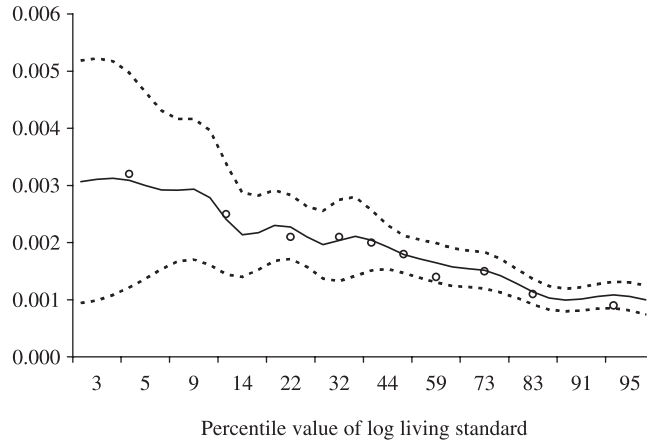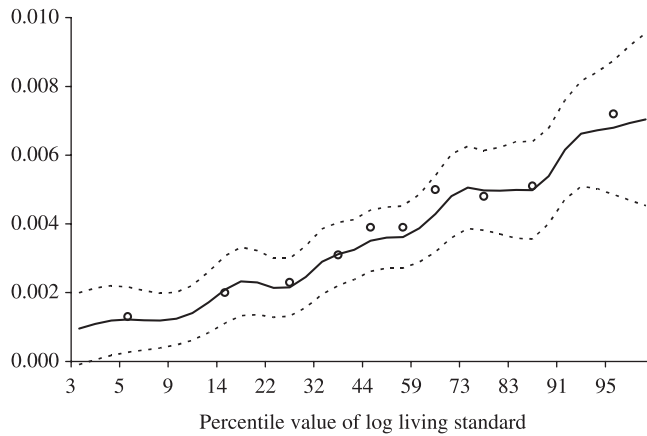**Figure 5. Share of tobacco excise in total expenditures**

Percentile value of log living standard

Figure 6. Share of car fuel excise in total expenditures

Percentile value of log living standard

To investigate this surprising and unexpected result for excises, the curve from Figure 4 has been decomposed into its three constituent parts: the excise tax on tobacco (Figure 5), on car fuel (Figure 6) and on alcoholic drinks (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 (Figure 5), whereas the one paid on car fuel (Figure 6) clearly increases with the living standard. The non-monotonicity in Figure 4 results from adding up these two opposite effects, and from the strange

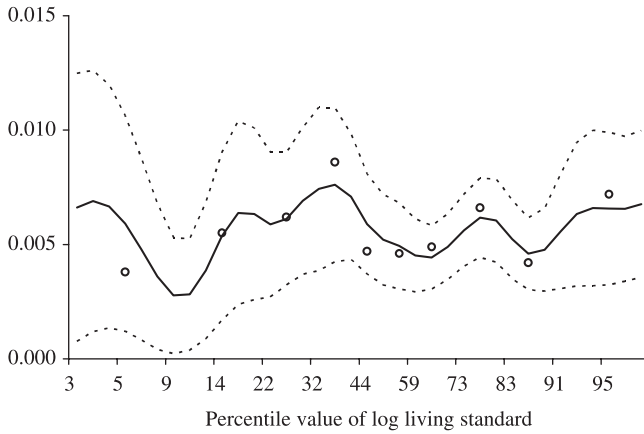**Figure 7. Share of alcohol excise in total expenditures**

Percentile value of log living standard

Table 6. Budget shares by deciles of living standards (in %)

Commodity	Decile of living standard										All hh
	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

pattern of the excise tax on alcohol in Figure 7 (which has very wide confidence bands). For the latter, 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.

Needless to say, the explanation for this result must be found in the variation of the expenditure pattern across the living standard distribution. In Table 6 we therefore present the budget shares across the deciles of living standards. Indeed,

Table 7. 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

the table reveals a clear rising trend for car fuel, and a non-monotonic pattern for alcoholic drinks.[14]

The overall conclusion is that the increasing consumption of car fuel through the deciles, and the strange consumption pattern for alcohol found in the budget survey, lead 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.

3.2 *How progressive are indirect taxes in Russia?*

Table 7 quantifies the pattern expressed in Figures 2 to 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, pp. 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 7 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.[15] 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).[16] The most progressive component is the excise on car fuel, with a progressivity index value of 0.155. Since it also provides

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[14] See Decoster and Verbina (2003) for a detailed analysis of the budget shares for the different items by means of kernel regressions.

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

[16] 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.

Table 8. Characteristics of quintiles of taxpayers

	Quintile					All house holds
	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 (roubles 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: Households are ordered by share of total indirect taxes in total expenditures.

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. The increasing budget share for alcoholic drinks in the budget survey data also shows up in a progressive excise liability of 0.052. In Section 3.4, we will investigate whether this result is robust for a switch to the other data source.

3.3 *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 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 8 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 9. Comparison of Kakwani indices for the components of indirect taxes with quantities of alcohol and tobacco from different data sources

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

3.4 *Using alcohol and tobacco consumption from the health survey*

As discussed in Section 2.3, there are arguments for using the health questionnaire as an alternative to the budget survey data as an indicator of alcohol consumption. In this section, therefore, we investigate the sensitivity of the results in Table 7 to this switch. We recalculated the Kakwani indices of progressivity of the indirect tax system, now using the quantity data for alcohol and tobacco consumption from the health survey.

Table 9 proves that the surprising findings of progressive excises are due entirely to the unexpected pattern of alcohol consumption observed in Section 2.3. 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 9: 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.

4. Conclusion

In this paper we investigated the distributional impact of the Russian indirect tax system by means of a recently developed microsimulation model for Russia. Our main result contrasts with the distributional pattern of indirect tax liabilities found in most western countries, where a progressive VAT is combined with regressive excises, leading to a roughly proportional indirect tax burden. Our calculations for Russia using the budget survey data in the RLMS survey, however, reveal a clear progressive incidence of taxes.

The reason for this surprising result was found in the progressive pattern of the excise on car fuel and on alcoholic drinks, which more than counterbalanced 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. But for alcoholic drinks, the result was not robust to the use of the other data source on alcohol consumption. Preliminary analysis shows that the regressive impact of excise taxes is sensitive to the acceptance of different explanations for the large discrepancies found between alcohol consumption in the budget survey and in the health survey of the same RLMS questionnaire. Further research is needed to clarify this important issue.

The important role of excises in the distribution of indirect taxes also shows up in the characterization of the distribution of low and high taxpayers by means of their sociodemographic characteristics. If we are prepared to accept the budget survey data, then 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. 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.

We did not incorporate behavioural effects in the analysis. 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.

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Appendix A

The calculation of living standards

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. Evidently, this individual living standard depends on household characteristics, such as income or consumption, household size, age, health status, region, etc. As far as the sociodemographic determinants are concerned, we only took into account household size (see below), and region (through a region-specific price index). Moreover, since there is no information on the intra-household 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:

$$m^h = (a^h + \eta c^h)^\theta, \tag{A1}$$

when 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 (see Blundell and Preston, 1998 or Deaton and Zaidi, 1999). 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.

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 A1. 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:

$$uc_i = value_i \cdot \frac{(r + \delta_i - \pi_i)}{12}, \tag{A2}$$

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.

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 those households which own a durable item, but which 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. We imputed a value by simply applying the rate of depreciation:

Table A1. Results of the imputation of user cost for durable items

Durable item	Owners		Buyers		All	
	Number of households	Average user cost in roubles	Number of households	Average user cost in roubles	Number of households	Average user cost in roubles
TV, VCR	3,508	27	145	56	3,653	28
Furniture, carpeting, etc.	–	–	146	40	146	40
Domestic appliances	3,584	14	145	28	3,729	15
Motor car	992	320	36	635	1,028	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 = 3,777.
Source: See text.

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

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.

The result of the imputation procedure is given in Table A1. Compared with an average total expenditure of 4,352 roubles, 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.

Summarizing, the living standard y^h for an individual living in household h is obtained as:

$$y^h = \frac{\sum_{i=1}^{11} q_i^h x_i^h}{n^h}, \tag{A3}$$

where the subscript i refers to the commodity index in the first column of Table 2 of the text, when n^h stands for the number of persons in the household, and $q_i^h x_i^h$ denotes the expenditures by household h on item i. For distributional analysis we always order individuals according to this calculated individual living standard.

Appendix B

Tax rates and budget shares by decile of living standards

Table B1. Tax liabilities in percentage of total expenditures

Tax item	Decile of living standard										All hh
	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.