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Statutory Tax Burden and Its Avoidance in Transitional Russia

By Vlad Ivanenko[1]

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Abstract: "Was taxation so heavy in the Russian transition that firms could not stay afloat?" is the question that this paper aims to answer. It details the fiscal structure and uses data from a number of sources to calculate statutory tax rates faced by businesses in 1995. The results show that statutory rates were manageable in the short run but unsustainable for several sectors in the long run. Important exceptions are the sectors of oil and gas extraction, which were overtaxed by statutory rates.

The problem of tax avoidance and arrears is explored by looking on the difference between statutory and effective tax rates and effective and actual tax payments. Regression analysis shows that tax avoidance rises with gross profit suggesting that profitable firms lobby successfully for tax exemptions. However, when the sectors of gas and oil extraction are excluded from the regression, its estimate becomes insignificant. The paper conjectures that the government deliberately imposed unsustainable statutory tax rates since their consequent renegotiation with oil and gas producers was expected. Tax arrears are found to be strongly and positively correlated with the sectoral average employment. Yet, the hypothesis of strategic labor hoarding is rejected on the grounds that large tax debtors are large trade creditors as well.

Finally, the paper asks the question of inflationary taxation. We recalculate input costs at their replacement values and find that almost all sectors are better off going out of business. Searching for possible explanations of why they continued to operate, the benefits and costs of receiving and extending trade and tax non-payments are considered. The results show that enterprises used non-payments to compensate incompletely for the costs of inflation.

JEL Code: H3, P2

Keywords: Russian Transition, Statutory Taxation, Inflation

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The statement that a government is a stationary (or even roving! See Olson [1993]) bandit has resonated soundly among scholars who studied taxation in the Russian transition. The fiscal system that evolved in that country has been generally viewed as repressive, inefficient, and corrupt. The absence of political consensus among the branches of government and active participation of the international financial organizations in the decision-making process politicized the area of Russian public finance. There was no lack of advice that sought and found its way in the tax legislation of the time. Unexpected appearance of amendments to tax and budgetary laws, tax exemptions secretly granted to individual companies, and non-transparency of state spending procedures reinforced general impression of a decaying state robbed by powerful interests.

Field studies showing that tax developments could not be explained by the politics of interest groups alone (see, for example, Alfandari and Schaffer [1996]) were not within the mainstream.[2] Left without empirical verification, policy makers at home and abroad were generally unable to interpret the situation and found guidance in the generalizations of that time such as the "Washington Consensus".[3]

This paper aims at extending the debate about tax system in the Russian transition to the field of quantitative estimation. There are two sets of issues that it addresses. First, the paper details the Russian tax system. Generally, a good exposition of the fiscal laws and regulations is hard to find.[4] Without guidance a researcher cannot infer what part of a contradictory statement such as "Russian taxation is a killer but we operate anyway" is correct. Actual numbers are scattered across a number of publications and are often incompatible. Time series are lacking and have to be constructed by a researcher. Thus, the organization of relevant information in a consistent manner is a contribution that can be used in further work.

Second, and more important, the paper uses the developed account of the tax system to explore several issues. One question relates to the statutory burden of taxation. As we have mentioned above there was a widespread belief that tax rates were excessive, possibly above 100 percent.[5] While this statement looks implausible, a researcher cannot reject it *a priori*. Then, a reader wonders how else taxpayers would get along if they pay more than receive and tends to exculpate tax evasion in Russia. Finding answer to the question of what is the statutory tax burden is the issue that Section 2 addresses.

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[2] It is a general problem that there are not many empirical works. EconLit cites 14 papers of mostly theoretical character that contain the roots of word "tax" or "fiscal" and "Russia"). The database of working papers IDEAS, that contains links to about 100,000 working papers, list two papers, which are similar to ours by title: Movshovich, Krupenina, and Bogdanova [1998] and Schaffer and Turley [2000]. Both papers do not address questions discussed here.

[3]The Washington Consensus presented international creditors' policy advice given to countries in sovereign default in early 1990s.

[4] The author used Chernik and Dadashev [1999] and Pavlova [1999] as the initial guides.

[5] A casual search in the Internet reveals statements like "In Russia, the voluntary sector is … subject to repressive tax regimes" (*Third Sector*, 5th April 2001); "Regulatory intrusion into enterprise activities is manifested in … repressive, unpredictable, and arbitrary taxation" (Department of Economics *Ohio State University Working Paper* AEDE-WP-0002-00); "Many heads of small- and medium-size enterprises have long complained their tax burdens are excessive" (*The Russia Journal*, May 24th 2002)

Section 3 deals with the estimation of tax avoidance. In general, researchers evaluate the size of tax avoidance utilizing other methods than what is used here.[6] Yet, the practice of including the estimate of informal sector in national accounts – that the State Committee for Statistics of the Russian Federation (GKS) adheres to – prompts to calculate tax losses resulting from the existence of informal economy. Certainly, the obtained result depends critically on the methodology used by the GKS.[7] Still, it provides a tentative answer to the question of how important was the problem of tax avoidance in Russia. Moreover, combining the estimates of sectoral tax avoidance with data on tax arrears and deferrals, we can check hypotheses on what sectors are likely to pay less than by statutory rates and using what approaches (avoidance or non-payment).

Section 4 presents estimates of real tax burden in inflationary environment. It is well-known that inflation biases the actual value of tax bases creating what is called "inflationary profit". "Could it be that real tax rates in Russia were unsustainable in inflation? Did the problem of inflationary profit require *ad hoc* corrections expressed in a variety of forms?" are two questions that we ask.

To answer the question of sustainability we find replacement costs for intermediate inputs and see if real net profit was still in the positive territory. If it was not, we conclude that tax rates were unsustainable because firms are better going out of business.

The problem of trade and tax non-payment looks differently when we ask the question of how enterprises adjust to the costs imposed by inflation. It has been generally considered that lax discipline and weak legal system were responsible for the growth in trade and tax arrears in the Russian transition. The paper offers alternative explanation. Accumulating debts may mitigate the problem of inflationary profit with arrears serving as a profit stabilizer. We calculate and interpret estimates of actual savings resulted from trade and tax non-payments in the end.

1. General Computational Approach and Data Used

There are a number of assumptions to make before we can proceed with numerical estimation of statutory tax rates (STRs) on enterprises' sales at consumer prices. They can be justified on either methodological grounds or by unavailability of data.

(a) General methodology of finding STRs. We choose the method of calculating STRs based on the Leontief input-output matrix. Its use introduces one implicit assumption: the substitution of factors of production is not allowed. This fixes the demand for factors in physical units.

The second assumption is determined by the question we ask. STRs are found by looking on what enterprises are expected to pay. Thus, no tax shifting (incidence) is present by definition. This corresponds to the situation of producers having inelastic supply.[8]

The last point refers to the estimation of the economic cost of capital. The existing procedures are relatively data demanding.[9] The paper employs a simplified procedure. It

[6] See Andreoni, Erard, and Feinstein [1998] for an overview of the methodologies employed.

[7] The methodology on the evaluation of informal sector is explained in GKS [1998e, part 1].

[8] In the literature, a similar approach is used by Fullerton [1996].

assumes that claimed capital cost allowance (CCA or amortization) is representative of the cost of capital for STRs purposes.

(b) Data used. The main data source for our analysis is the input-output table for 1995 (see GKS [2000a]). It is the first table based on primary data that the GKS has produced since the collapse of communism in 1991. Moreover, unlike the previous tables that were based on the Soviet definitions of costs and output, this table is consistent with the internationally recognized System of National Accounts 1993 (see System [1993]).

The table, as it appears in print, comprises 22 sectors.[10] The sectors are organized according to the Soviet industrial classification OKONKh (see GKS [1976]), which differs from both ISIC and NAICS classifications.[11]

We introduce several amendments into the original data following the logic of our investigation. Sectors "Oil and gas extraction and oil processing", "Transportation and communication", and "Banking and management and government" are disaggregated into the respective components. The disaggregation allows us to use the available fiscal information better. For example, the taxation of fuels is administered by different rules and this distinction would be lost if we assessed sectors by the composite tax rate. Similarly, transport and banking charges should be added to their respective sectors and not to the composites. The explanation of how adjustments to the input-output table are made is presented in Appendix A1.

(c) Modeling the Russian fiscal system. Another problem regards the modeling of the Russian fiscal system. After the collapse of the USSR, the system passed through a period of dramatic and spontaneous changes.[12] Various federal and provincial laws, government edicts, and presidential decrees were parts of the fiscal landscape. The reason for such a legal mosaic was twofold.

First, before the Russian government decided to break the Soviet Union in 1991, it operated the Soviet fiscal system. Its structure was pathetically incompatible with market economy and urgent measures to correct for revealed deficiencies were necessary.

While the Soviet business taxes had approximately the same bases as elsewhere (sales revenue, corporate property, payroll, corporate profit, and the use of natural resources), the process of how they were determined was different. Most prices, wages, and profit rates were set administratively. Taxes were a part of the system of state management and did not have independent meaning.

After price controls were abandoned in 1992, previously hidden economic imbalances went open. The government had foreseen the need for adjustments and introduced a

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[9] See King and Fullerton [1984] on capital taxation. McKenzie, Mansour, and Brûlé [1998] provide an updated reference to other works.

[10] Unfortunately, it is an aggregated version of the original table that contains 223 sectors. The latter is not publicly available and no reference to its use in public research has been found.

[11] The International Standard Industrial Classification (ISIC) that is accepted as the benchmark by the UN and Eurostat and the North American Industrial Classification Standards (NAICS), which the US Bureau of Census has switched recently to.

[12] It came to the end with the enactment of the second part of the Tax Code in 2000. For the first time in a decade, the fiscal legislation was based on a single document. That was not the case in 1995.

number of tax innovations. However, the scope of administrative and budgetary problems was larger than expected. Literally overnight, some taxes proved to be non-operational and had to be replaced or abandoned. To patch the holes, temporary amendments to fiscal laws were introduced in haste, creating a legal nightmare for a tax practitioner.

Second, after Russia left the USSR, its several provinces experimented with quasi-independence as well. One of the main bones of contention became the ownership of tax revenue. The federal government insisted that federal laws had preeminence over provincial legislation. The provinces disagreed. After lengthy negotiations, the center and provinces came to tax agreements that reflected the political balance of that time. They were by no means symmetrical across territories, which complicated the tax system further.

Finally, there were many individual tax exemptions granted *ad hoc*. As a result, the modeling of the Russian tax system of 1995 is not a trivial exercise by many counts.

Before we proceed it is important to determine what "tax" means. The paper follows the definition provided in the Russian legislation.[13] It defines a tax as a mandatory payment to state budgets and state-controlled funds that results from market activity (both incorporated and not) or ownership of certain assets. This definition includes contributions that are usually not counted as taxes by economists.[14]

According to the Law 2118-1 "On the Foundations of the Tax System in the Russian Federation", there were 16 federal, 4 regional, and 23 municipal taxes. The Budgetary Classification of the Ministry of Finance (the Order of the Ministry of Finance N 177 dated December 29, 1994) itemized 42 taxes in 1994. Several extra-budgetary funds were not included in this count.

Data on several taxes are incomplete, which is not usually a problem: many taxes produced miniscule revenue and can be safely ignored. In what follows, we consider only taxes that generated large revenue or have identical tax bases. We choose 19 taxes for modeling, including almost all taxes that collect more than 2,000 billion of rubles in revenue.[15] The list of taxes chosen is provided in Table 1.

Legal documents were found in the Internet, with the main source being the legal database supported by the Russian firm *IST*.[16] This information includes data on tax bases, rates, and exemptions. It has been possible to verify what documents were in force throughout 1995 and to trace legal changes that occurred during the year for most taxes. The references to laws and regulations that we use in this paper are presented in Appendix B.

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[13] The Federal Law N 2118-1 dated December 27, 1991 "On the Foundations of the Tax System in the Russian Federation", with amendments on July 1, 1994.

[14] We consider payments to the extra-budgetary funds, such as the mandatory pension plans, to be taxes. In literature they are treated as social transfers.

[15] Land taxes and rental payments for state-owned land are omitted because data on the distribution of land ownership and the use of state-owned land among sectors are unavailable.

[16] The web site address was *http://www.ist.ru/VP*. It has become a paid service since then.

Budgetary Code	Tax	Federal budget	Territorial budgets	Extra-budgetary funds	Total Revenue
10101	**Corporate income tax**	**40,995**	**76,619**		**117,614**
	Taxes on sales	**126,118**	**46,857**	**265**	**173,238**
10301	Value-added tax	70,705	24,543		95,247
10303	Excise tax	17,681	6,383		24,064
10304	Special tax to support the most important economic sectors	7,266	3,618		10,883
10305	Tax on the sale of fuels and lubricants	6,312			6,312
10309-03	Taxes on the sale of road vehicles			265	265
10601	Import duties	8,469	4		8,473
10603	Export duties	15,685	24		15,709
	Taxes on production	**2,857**	**26,322**	**4,754**	**33,932**
10201	Transportation tax		2,200		2,200
10202	Targeted fees to support police, urban maintenance, and other municipal needs		711		711
10203	Tax to support educational establishments		1434		1434
10309-01	Tax on automobile road users [a]			4,754	4,754
10402	Corporate property tax		15,790		15,790
10501	Tax on mining	1,174	5,583		6,756
10504	Tax to support prospecting	1,683	604		2,287
10704	Tax to support residential housing [a]		12,285		12,285
	Social security taxes			**103,449**	**103,449**
	Pension Funds			73,709	73,709
	Social Insurance Fund			15,979	15,979
	Mandatory Medical Insurance Fund			8,951	8,951
	Employment Fund			4,810	4,810
	Total sum	**169,970**	**149,798**	**108,468**	**428,236**
	Memo: total business taxes collected	*172,095*	*155,594*	*108,697*	*436,386*

Table 1: Business tax revenue collected in 1995 on the 19 taxes considered (in billions of rubles). Sources: GKS [1998d], SITE [2000], IET [1996, Table 1.12, pp. 36-8], FIPER [1998], Alexander Ustinov (Expert Economic Group). See Appendix A, Table A2 for details.

[a] This tax has the total revenue as its base. It is reported under the title of "indirect taxes on products" by the GKS and we do the same to avoid confusion.

2. The Comparison of Effective and Statutory Taxes for Economic Sectors

The input-output table (GKS [2000a]) presents data on effective tax liabilities. These numbers differ from what is shown in Table 1. The disparity is explained by the use of different definitions. The input-output table evaluates the amount of taxes to be paid and Table 1 shows data on the amount of taxes paid actually. Thus, both sets of numbers differ by the amount of tax non-payment accumulated during the reported year.

STRs are found using the model of the fiscal system and empirical data on tax bases.[17] The general idea is to apply the legal tax rates as they appear in the fiscal legislation to the estimates of tax bases. If tax rates differ for individual products, as in the case of import tariffs, we disaggregate the tax base in the components, apply the rates

[17] The procedure that we use is explained in Appendix C.

individually, and sum them up. The totals of tax liabilities are expressed as fractions of sectoral revenue at consumer prices (see Table 2). The estimates of the profit are net of taxes and gross of CCA.

	Effective rates					Statutory rates				
	Taxes on sales	Taxes on production	CIT	Social fees	Profit net-of-CIT	Taxes on sales	Taxes on production	CIT	Social fees	Profit net-of-CIT
Electricity	0.054	0.019	0.044	0.035	0.193	0.060	0.040	0.030	0.040	0.175
Oil extraction	0.195	0.147	0.048	0.017	0.309	0.500	0.238	0.000	0.021	**-0.042**
Oil processing	0.153	0.020	0.042	0.006	0.171	0.282	0.023	0.007	0.009	0.071
Gas extraction	0.297	0.144	0.038	0.008	0.216	0.510	0.087	0.005	0.012	0.089
Coal and other fuels mining	0.059	0.066	0.046	0.122	0.237	0.039	0.149	0.001	0.081	0.260
Iron and steel	0.060	0.016	0.037	0.023	0.127	0.018	0.045	0.042	0.027	0.131
Non-ferrous metallurgy	0.087	0.032	0.068	0.030	0.189	0.022	0.079	0.075	0.036	0.195
Chemical and petrochemical	0.062	0.016	0.044	0.026	0.124	0.026	0.054	0.043	0.032	0.117
Machine building and metal processing	0.073	0.018	0.033	0.050	0.094	0.083	0.061	0.011	0.060	0.053
Wood and paper	0.074	0.027	0.035	0.044	0.109	0.049	0.045	0.035	0.055	0.106
Construction materials	0.066	0.017	0.051	0.041	0.145	0.065	0.050	0.040	0.050	0.116
Textile, apparel, and footwear	0.089	0.017	0.000	0.054	0.047	0.087	0.051	0.000	0.069	**-0.000**
Food processing	0.113	0.011	0.022	0.019	0.115	0.048	0.024	0.051	0.026	0.132
Other manufacturing [a]	0.057	0.012	0.013	0.047	0.061	0.028	0.058	0.002	0.066	0.036
Construction	0.076	0.023	0.045	0.076	0.133	0.097	0.032	0.043	0.076	0.105
Agriculture and forestry	0.041	0.019	0.000	0.059	0.073	0.041	0.022	0.000	0.059	0.069
Transportation	0.059	0.042	0.065	0.063	0.282	0.109	0.050	0.032	0.069	0.251
Communications	0.065	0.037	0.079	0.074	0.266	0.130	0.030	0.060	0.078	0.223
Trade, intermediation, and food services	0.076	0.026	0.148	0.033	0.352	0.128	0.026	0.146	0.036	0.298
Other activities related to production and services [b]	0.079	0.024	0.003	0.168	0.012	0.144	0.047	0.000	0.184	**-0.088**
Residential, communal, and household services	0.049	0.020	0.020	0.079	0.425	0.003	0.025	0.000	0.088	0.478
Health, education, and culture	0.005	0.004	0.002	0.097	0.162	0.008	0.025	0.000	0.123	0.114
Science, geology, and meteorology	0.019	0.013	0.000	0.092	0.169	0.005	0.056	0.005	0.099	0.127
Finance, credit, and insurance	0.018	0.013	0.071	0.067	0.187	0.113	0.035	0.029	0.103	0.076
State and commercial management and NGO	0.000	0.014	0.001	0.084	0.102	0.006	0.016	0.000	0.112	0.066
Sum (billion of rubles)	**184,387**	**69,256**	**129,914**	**133,339**	**496,635**	**237,977**	**115,810**	**108,074**	**153,453**	**398,215**

Table 2: Effective and statutory tax rates as fraction of revenue at consumer prices in 1995. Profit is reported gross of the capital cost allowance. Sources: Effective rates – taxes are from the input-output table; effective rates for social fees, CIT, profit net-of-CIT, and statutory rates are author's calculations (detailed in Appendices A and C, Table A1 and Table C2).

[a] This sector includes microbiology, pharmaceuticals, medical equipment, printing and copying, art, jewelry, musical instruments, professional laundry and cleaning, and commercial water delivery systems.

[b] The sector comprises information technology, publishing houses, security, and recycling.

Data from the input-output table show that effective profit net of taxes was positive for all sectors in 1995.[18] Similar results are obtained with STRs: the profit is estimated to be

[18] Some sectors receive either negative or small positive profit if subsidies are abolished.

negative for only three sectors. Thus, the statement that STRs were so high that firms could not pay is not supported by our calculations in general. The only important sector (oil extraction) that receives a negative net profit is vertically integrated with the sector of oil processing and their joint profit is positive.[19]

Note that the profit in Table 2 is gross of depreciation. The situation changes significantly if CCA is included to account for the cost of capital. The profit becomes negative for six sectors (see Table 3). If these sectors pay according to the statutory rates, they would stop operating in free market.

Especially large difference between the statutory and effective rates is detected for the sectors of oil and gas extraction. Both are not viable in the long run under STRs. Note that they (plus agriculture) have large capital outlays. It is worth mentioning that two other sectors with large capital expenditure (coal mining and residential housing) do not show negative profit only because they are heavily subsidized.[20] This finding indicates that taxation was capital insensitive in 1995 and, hence, short-sighted.

The profitability of the sectors of textile, other manufacturing, and agriculture is reduced when STRs apply. Yet, we cannot say that taxation is to blame: both statutory and effective tax rates are less than on average for these sectors. Apparently, their main problems lie somewhere else, for example, in depressed markets for their products.

We conclude that statutory tax rates did not represent a problem in the short run. Virtually all sectors, with the notable exception of oil extraction, could continue operations under STRs. However, in the long run, the statutory claim of enlarged government is found to be unsustainable, especially the claim on the revenue received by the sectors of oil and gas extraction.

3. Taxes Avoided and Unpaid: Any Pattern?

The difference between the effective and statutory tax liabilities, which we have introduced in the previous section, warrants a closer examination of the reasons for its appearance. Two sources contribute to the difference: the existence of the non-taxable informal sector and the loopholes in the fiscal legislation not accounted for in our model.

As we have mentioned above, the input-output table for 1995 does not discriminate between the revenue of formal and informal sectors of the economy. Thus, we have applied STRs to tax bases that are larger than what tax authorities observe.

In addition, our tax model is a simplified account of the actual situation.[21] Many exemptions have not been introduced due to technical or informational problems. For example, tax rates on mining were specified in the individual licenses, which are not known in general, and we have replaced actual with generic rates that applied before licenses were issued. Similarly, internal expenditures of enterprises on activities covered by Social Insurance Fund (such as maternity leave payments) are deductible from the contributions that firms make to the Fund. Identical exemptions apply to prospecting

[19] This finding could be interpreted as a transfer pricing from oil extraction to processing. We talk more about the taxation of oil sector later.

[20] See Appendix A1, Table A1 for the values of subsidies as they are reported in GKS [2000a].

[21] Formulas for finding individual taxes are presented in Appendix C.

expenses of mining companies (deductible from tax to support prospecting) and maintenance of residential housing rented by companies for their workers (deductible from tax to support residential housing). Thus, there might be legitimate reasons for the difference to exist.

	Effective		Statutory		
	Total taxes and fees	Profit net of taxes and CCA	Total taxes and fees	Profit net of taxes and CCA	*Memo: CCA*
Electricity	0.152	0.144	0.170	0.127	*0.049*
Oil extraction	0.407	0.135	0.759	**-0.216**	*0.174*
Oil processing	0.222	0.155	0.322	0.055	*0.016*
Gas extraction	0.488	0.086	0.614	**-0.040**	*0.130*
Coal and other fuels mining	0.292	0.168	0.269	0.192	*0.069*
Iron and steel	0.136	0.098	0.132	0.102	*0.029*
Non-ferrous metallurgy	0.217	0.167	0.212	0.172	*0.023*
Chemical and petrochemical	0.148	0.070	0.155	0.064	*0.054*
Machine building and metal processing	0.174	0.049	0.215	0.007	*0.046*
Wood and paper	0.180	0.059	0.184	0.055	*0.051*
Construction materials	0.176	0.097	0.205	0.068	*0.048*
Textile, apparel, and footwear	0.160	**-0.003**	0.207	**-0.051**	*0.050*
Food processing	0.166	0.083	0.148	0.100	*0.032*
Other manufacturing	0.129	0.015	0.153	**-0.009**	*0.045*
Construction	0.220	0.103	0.248	0.075	*0.030*
Agriculture and forestry	0.119	**-0.089**	0.122	**-0.093**	*0.162*
Transportation	0.230	0.176	0.260	0.146	*0.105*
Communications	0.255	0.165	0.298	0.122	*0.101*
Trade, intermediation, and food services	0.283	0.309	0.337	0.256	*0.043*
Other activities related to production and services	0.275	**-0.021**	0.375	**-0.121**	*0.033*
Residential, communal, and household services	0.169	0.376	0.116	0.429	*0.049*
Health, education, and culture	0.108	0.055	0.156	0.007	*0.107*
Science, geology, and meteorology	0.124	0.075	0.165	0.033	*0.094*
Finance, credit, and insurance	0.169	0.137	0.280	0.026	*0.050*
State and commercial management and NGO	0.099	0.046	0.135	0.010	*0.056*
Sum (billion of rubles)	**516,896**	**356,855**	**615,315**	**260,041**	***139,780***

Table 3: Effective and statutory total taxes and fees and revenue net of taxes and the CCA as fraction of revenue at consumer prices in 1995. Sources: Taxes and profit – Table 2, CCA is recalculated from the CCA fraction of total cost reported in GKS [1998d, table 3.11 and 3.22] for manufacturing, mining, construction, and agriculture; in GKS [1996a, p. 213] for transport and communications; in GKS [1998b, table 2.33] for trade. The remainder of total CCA reported is distributed among the last six sectors according to the value of their capital assets reported in the input-output table.

Yet, we suggest using the difference as a proxy for tax avoidance due to several rationales. The situation with the informal sector (included in tax bases by GKS) is obvious: tax evasion is the prime motive for its existence. Tax exemptions are more ambiguous. Still, in general, they are suspicious for an economist, especially when the reasons for their existence are buried in legal intricacies or hidden from public eyes. The difficulty of finding answers to the questions why exemptions are granted and how they are administered make them look like favors obtained by particular taxpayers.

	Actually paid taxes and fees	Effective taxes and fees	Statutory taxes and fees	*Memo: Total revenue (in billion of rubles*
Electricity	0.098	0.152	0.170	*128,047*
Oil extraction	0.321	0.407	0.759	*73,834*
Oil processing	0.176	0.222	0.322	*78,904*
Gas extraction	0.454	0.488	0.614	*33,275*
Coal and other fuels mining	0.200	0.292	0.269	*24,861*
Iron and steel	0.108	0.136	0.132	*98,472*
Non-ferrous metallurgy	0.199	0.217	0.212	*77,922*
Chemical and petrochemical	0.112	0.148	0.155	*87,049*
Machine building and metal processing	0.107	0.174	0.215	*203,179*
Wood and paper	0.150	0.180	0.184	*57,571*
Construction materials	0.154	0.176	0.205	*57,437*
Textile, apparel, and footwear	0.121	0.160	0.207	*27,251*
Food processing	0.155	0.166	0.148	*190,075*
Other manufacturing	0.096	0.129	0.153	*28,835*
Construction	0.197	0.220	0.248	*241,530*
Agriculture and forestry	0.088	0.119	0.122	*111,762*
Transportation	0.204	0.230	0.260	*228,336*
Communications	0.246	0.255	0.298	*32,065*
Trade, intermediation, and food services	0.279	0.283	0.337	*357,715*
Other activities related to production and services	0.263	0.275	0.375	*16,497*
Residential, communal, and household services	0.154	0.169	0.116	*81,519*
Health, education, and culture	0.095	0.108	0.156	*161,134*
Science, geology, and meteorology	0.089	0.124	0.165	*28,353*
Finance, credit, and insurance	0.164	0.169	0.280	*37,114*
State and commercial management and NGO	0.084	0.099	0.135	*138,899*
Memo: Total taxes and revenue in billions of rubles	***445,299***	***516,896***	***615,315***	***2,601,635***

Table 4: Actually paid, effective, and statutory taxes and fees as fraction of total revenue at consumer prices. Sources: Author's calculations. The last column is from the input-output table

The difference between effective and actually paid tax rates provide another dataset to be analyzed.[22] Technically, tax deferrals, that are legitimately granted grace period, differ from tax arrears, that are illegitimate delays in payment of taxes. However, from the behavioral point of view they are similar. If a taxpayer manages to delay the payment of taxes for whatever reason, he obtains a credit in the sum of the payment. Certainly, the cost of this credit determines the motive for such behavior. Yet, we can exclude the possibility that the cost of tax non-payment exceeded the cost of credit available from

[22] Sectoral data on tax arrears and deferrals are scarce. The procedure that we use to estimate their amount is explained in Appendix A3. After the change in tax liabilities for 1995 is calculated, it is deducted from the amount of effective taxes arriving on the estimates of actually paid taxes by sectors.

alternative sources.[23] Therefore, both arrears and deferrals deliver some benefit to taxpayers and can be considered jointly.

Table 4 presents the estimates of actually paid, effective, and statutory tax liabilities as fraction of revenue at consumer prices.

The next step is to construct a model that can explain the choice between tax avoidance and non-payment. A variety of reasons come to mind.

Usual proxy that measures the extent of informal economy is the amount of cash in circulation. It is based on the assumption that cash does not leave "paper trail" and, hence, is ideal for tax evasion. The problem is that the use of cash by sectors is unobservable. We consider that the fraction of consumables in total revenue is closely correlated with cash because trade with individuals is usually conducted in cash.

The political economy of "labor hoarding" has been discussed elsewhere.[24] The argument is that firms grow large due to strategic reasons. The government is more likely to support a huge company, whose problems spill over to the rest of economy, than a small firm. Therefore, the average size of enterprises could influence the tolerance of tax arrears and explain tax favors that fiscal authority grants.

A similar argument with regard to the concentration ratio (*CR4* if four largest firms are considered) is found in the field of industrial organization. It is argued that the smaller is the number of competing firms the more likely they succeed in maintaining price collusion. If taxes are treated as costs that firms pay for the right to operate, more concentrated sectors would bargain better for tax deals.

Finally, inability to pay could be a factor that accounts for tax exemptions and arrears. Then, gross profit (*Profit* defined as the difference between gross revenue and the sum of intermediate costs and wages) should be included as an explanatory variable.

We test a simple econometric model that uses the explanatory variables discussed above of the form (the sign over variable indicates what relationship is expected)

$$TaxUnpaid = \beta_0 + \beta_1 \overset{(+)}{Consumables} + \beta_2 \overset{(+)}{AverageEmployment} + \beta_3 \overset{(+)}{CR4} + \beta_4 \overset{(-)}{Profit} \quad [1]$$

with the dependent variable *TaxUnpaid* being the difference either between statutory and effective or effective and actually paid tax rates. The results of the joint OLS regressions are presented in Table 5 and we discuss them in turns.

Gross profit is a significant factor explaining the difference between the statutory and effective tax liabilities. However, the sign of its coefficient is opposite to what is expected: sectors that are more able to pay get more exemptions.

[23] Otherwise, they would not exist in the first place. This argument ignores the possibility of credit rationing.

[24] See Shleifer and Vishny [1994].

It should be noted that the sectors of oil and gas extraction account for the significance of this result.[25] They have the highest gross profit margins and the largest difference between the statutory and effective tax rates (see Figure 1).

	Dependent variable: statutory minus effective rates		Dependent variable: effective minus actually paid rates	
Constant	-0.049	*-0.060*	**0.027**	**0.018**
Consumables (fraction of total use)	-0.038		-0.013	
Average employment (in 1,000)	0.010		**0.059**	**0.047**
Four-firms concentration ratio (fraction)	0.008		-0.032	
Gross profit (fraction of total output)	**0.283**	**0.310**	-0.012	
R^2	0.427	0.411	0.517	0.448
Number of observations	25	25	25	25

Table 5: Results of OLS regressions for equation [2], separately for the differences.
Sources: Data from Table 4 (taxes) and Table C3 (parameters), author's calculations. Estimates significant at 1% level are in bold, at 5% - in italics

We propose the following explanation. Recall from Section 2 (Table 3, data column 4) that the sectors of oil and gas extraction are unprofitable under the statutory tax rates. Apparently, the government raised statutory tax rates to unsustainable levels *ex ante* expecting renegotiations to happen with both sectors *ex post*.

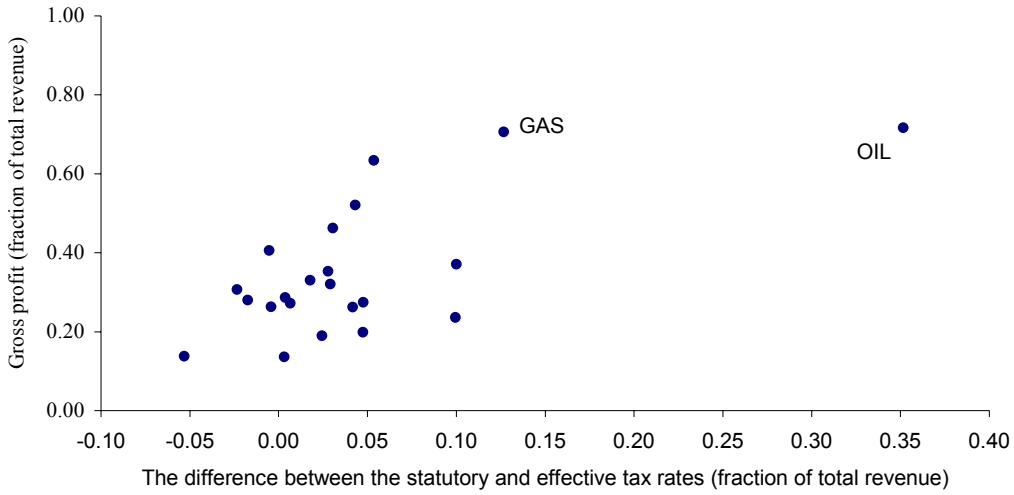

Figure 1: The scatter diagram of the difference between the statutory and effective tax rates and gross profit as fractions in total revenue. Sources: the statutory and effective tax rates are from Table 4, gross profit is calculated using input-output data on total revenue at consumer prices, intermediate costs, and wages (see Appendix A, Table A1)

[25] After we drop the sectors of oil and gas extraction from the regression, the estimated coefficient of gross profit becomes 0.098 with *t-statistics* being 1.398, which is insignificant at 10 % level.

The regression, where the amount of tax non-payment is the dependent variable, shows that the coefficient of the average employment has the expected sign and is significant. There are several potential interpretations of this finding.

Karpov [1997] finds that main tax debtors are large enterprises burdened by the stock of unpaid receivables.[26] He believes that this and other developments (such as the use of money surrogates) indicate that firms behave strategically to avoid paying taxes. The theory of "virtual economy" grows naturally out of this proposition.[27] It considers the tax arrears to be a proof of hidden subsidization that the state provides to politically connected firms.

However, it is also possible that the size and arrears are not connected directly but through something else. We postpone making the inference to the end of the next section, where we consider the dependency between trade credits received and extended by sectors and their link to the average employment.

The fraction of consumables in total use does not appear to be a factor that drives tax avoidance and non-payment up. Note that it has the unexpected sign of the coefficient. This result indicates that tax authorities were aware of tax evasion by cash using sectors and, apparently, put more effort into their monitoring.

4. Inflationary Taxes and How to Live with Inflation

The preceding discussion assumes implicitly that "a ruble is a ruble". However, Russia witnessed a high inflation in the transition and the ruble did not have the same purchasing power at the end of 1995 as it had at the beginning.[28] Could it be that enterprises' net real profit was negative due to inflation while their managers assumed mistakenly that heavy taxation was to blame?

The topic of inflationary taxation is not new. It became popular during the time of stagflation of 1970s.[29] Economists paid special attention to the problems of the inflationary "fiscal drag", when taxpayers move to a higher tax bracket without increasing their income in real terms, and the taxation of inflationary capital gains.

The redistributive effects of inflation were the source of another concern.[30] The idea is that if net borrowers/creditors and different asset owners belong to different wealth groups, some of them lose and others gain from inflation, thus changing the structure of wealth ownership.

Another concern was related to price games that sustain inflation. If agents change prices aiming at extracting gains from one another, the growth in prices follows naturally. "Government versus taxpayers" could be viewed as one of these games. When

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[26] This finding is somewhat predetermined because he focuses on the reasons for low tax collection and restricts attention to the largest 210 debtors.

[27] It is epitomized in Gaddy and Ickes [1998].

[28] In 1995, the consumer price index (CPI) rose by 131 percent while its producer counterpart (PPI) grew by 175 percent. Data are from SITE [2000].

[29] See a review of the literature related to this period in Nowotny [1980].

[30] Inflation itself could be a consequence of redistributive games. See Heymann and Leijonhufvud [1995, p. 55] for references.

government is unable to raise tax revenue but has the printing press, it is tempted to pay for purchases with freshly minted money. Since money holders lose a part of their real wealth as the result of governmental purchases, it represents a type of taxation on money holdings.[31]

In this paper we consider two effects that inflation makes on tax bases. First, to determine the base for CIT accounting costs of material inputs should be replaced with actual, or replacement, costs. Second, we account for changes in the real value of debts.

The concept of replacement cost is explained in Boadway and Kitchen [1999, p. 254]. In inflation, FIFO accounting cost of intermediate products used is less than its replacement cost, so the write-off allowed from the revenue is less than the amount required to replenish the stock of inventories. To account for inflationary profit (that appears due to the underestimation of the costs of inputs), Boadway and Kitchen propose to write off the material input at the time of its purchase. Due to a number of reasons, this proposition is impractical but it offers a framework for the recalculation of the CIT base.[32]

Boadway, Bruce, and Mintz [1982] present a methodology of finding the replacement cost that we adapt for our purposes. Total intermediate cost for sector j C_j^r is the product of the transposed vector of its nominal costs C_j^n and the vector of replacement cost index I_j

$$C_j^r = \mathbf{C}_j^{n\mathbf{T}} \bullet \mathbf{I}_j \qquad [2]$$

Data on the nominal costs C_j^n are available in the input-output table. We construct replacement cost index I_j using annual data on the variation in physical output for j during the production cycle T_j (determined in years) and in prices of input i (to be spent in the production of j).

Changes in sectoral prices are not reported continuously and should be interpolated from annual indices. Normalize price index for input i at the beginning of the year to unity and denote $p_i\ (1)$ to be the price index at its end. The price index at time $t \in [0,1]$ is

$$p_i(t) = e^{t \ln(p_i(1))} = p_i(1)^t \qquad [3]$$

If we assume that input i is used with the same rate in the production of good j q_j (or there is no seasonal fluctuations), the variation in its use changes identically with output. Using the same approach as in [3] we get

$$q_j(t) = e^{t \ln(q_j(1))} = q_j(1)^t \qquad [4]$$

FIFO accounting method takes the price of the oldest input as the cost of material inputs to be deducted from revenue for tax purposes. Without loss in generality, we assume that one unit of input is spent in the production of one unit of output. Then, the cost per unit

[31] This topic has been explored in the context of the Russian transition: Layard and Richter [1994] calculate the incidence of the inflation tax on different groups of money holders.

[32] There are several obstacle to the practical implementation:

- Firms can use material inputs for purposes unrelated to production after the write-off;

- CIT and VAT collection falls drastically in the initial period and a credit-constrained government (a usual case in inflation) cannot honor its obligations including fiscal promises.

of j produced at t at FIFO prices is $p_i\ (t\text{-}T_j)$ while the cost at LIFO prices is $p_i\ (t)$. The change in average cost over the year determines replacement cost index I_{ji} for input i used in the production of j

$$I_{ji} = \frac{\int_0^1 q_j(t)\,p_i(t)dt}{\int q_j(t)\,p_i(t-T_j)dt} = p_i^{\,T_j} \qquad [5]$$

The vector of individual replacement cost indices, found with equation [5], is applied to equation [2], which determines the replacement cost of intermediate inputs consumed by sectors. The replacement costs are deducted from the gross corporate income – instead of nominal costs – determining new tax base for CIT and profit net of taxes (see Table 6).

	Profit gross of CCA and net of statutory taxes	Profit net of CCA and net of statutory taxes	*Memo: Δ CIT at replacement values (in billion of nominal rubles)*	*Memo: Δ costs at replacement value (in billion of nominal rubles)*
Electricity	**-0.538**	**-0.587**	*-3,794*	*95,161*
Oil extraction	**-0.160**	**-0.334**	*0*	*8,687*
Oil processing	**-0.355**	**-0.370**	*-585*	*34,152*
Gas extraction	**-0.157**	**-0.287**	*-159*	*8,375*
Coal and other fuels mining	**-0.144**	**-0.213**	*-15*	*10,065*
Iron and steel	**-0.328**	**-0.358**	*-4,128*	*49,371*
Non-ferrous metallurgy	**-0.089**	**-0.111**	*-5,866*	*27,950*
Chemical and petrochemical	**-0.390**	**-0.444**	*-3,731*	*47,924*
Machine building and metal processing	**-0.805**	**-0.851**	*-2,277*	*176,526*
Wood and paper	**-0.118**	**-0.169**	*-2,020*	*14,892*
Construction materials	**-0.004**	**-0.052**	*-2,283*	*9,175*
Textile, apparel, and footwear	**-0.854**	**-0.905**	*0*	*23,276*
Food processing	0.044	0.012	*-8,870*	*25,637*
Other manufacturing	**-0.462**	**-0.507**	*-59*	*14,421*
Construction	**-0.040**	**-0.070**	*-10,454*	*45,591*
Agriculture and forestry	**-0.626**	**-0.788**	*0*	*77,701*
Transportation	**-0.012**	**-0.117**	*-7,301*	*67,252*
Communications	0.145	0.045	*-1,344*	*3,839*
Trade, intermediation, and food services	0.152	0.109	*-28,256*	*80,731*
Other activities related to production and services	**-0.370**	**-0.403**	*0*	*4,650*
Residential, communal, and household services	**-0.097**	**-0.146**	*0*	*46,865*
Health, education, and culture	**-0.348**	**-0.455**	*-70*	*74,600*
Science, geology, and meteorology	**-1.989**	**-2.083**	*-144*	*60,140*
Finance, credit, and insurance	**-0.230**	**-0.280**	*-1,076*	*12,439*
State and commercial management and NGO	**-0.125**	**-0.180**	*-42*	*26,524*
Memo: Sum (billion of rubles)	-565,253	-705,033	*-82,474*	*1,045,943*

Table 6: The estimates of profit net of taxes as fraction of revenue at consumer prices. Intermediate costs are recalculated at their replacement value and statutory tax rates adjusted to the new corporate income tax base. Sources: Author's calculations.

Accounting for the replacement costs of intermediate consumption changes estimates of net profit dramatically. Recall from our previous discussion that STRs were manageable for the vast majority of sectors in the short run (see Table 2, last column). If the burden of input inflation is accounted for, almost all sectors would not be viable both in the short and long run. The estimated reduction in CIT liabilities due to the proposed inflationary CIT credit (see Table 6, numerical column 3) does not solve the problem implying that the argument for activist fiscal policy is weak.

Given our finding, one would wonder why Russian enterprises did not stop operating in numbers. What can explain this fact? Real federal tax arrears

Several venues are open to companies in financial distress. If problems are temporary, creditors might be willing to renegotiate the schedule of debt payment. If problems persist, firms can be pressed to pay by disposing their assets. Finally, if no payment is coming, creditors can request the restructuring of indebted enterprises (bankruptcy).

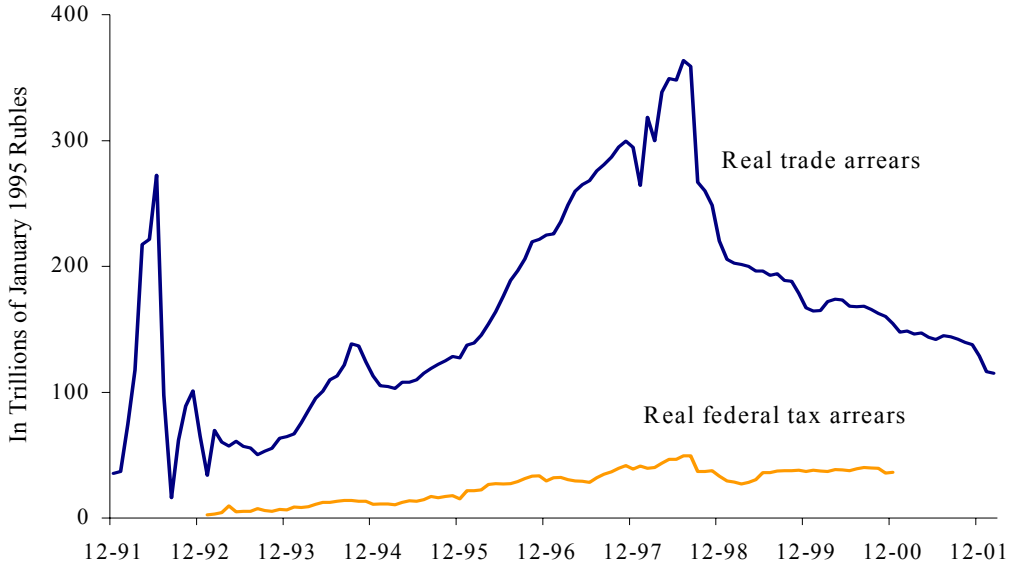

Figure 3: Monthly data on real trade arrears for the sectors of manufacturing, mining, construction, transportation, and agriculture and total federal tax arrears. Sources: real trade arrears – for December '91-July '92 – Table 2, p. 151 in Rostowski [1993]. For August 1992-August 1993 – IET [1992, p. 37 in text; 1993, p. 36, Fig. 4]. For September 1993 – 1997: SITE [2000]. For 1998-October 1999 – RET monthly report 1-2001 (Table 7). Later observations are calculated by the author using the Information about Social and Economic Situation in Russia, the monthly publication by Goskomstat (available at http://www.gks.ru/scripts/free/1c.exe). Real arrears to federal budget – RET, quarterly issue 4-1997 (Table A6, p. 236) for 1993-4, IET [1996, Tables 1.3 and 1.7, p. 10 and p. 23; 1997, Table 6, p. 63, Section 2; 1998, Table 7, p. 80, Section 1] for 1995-8 and IET monthly reports for 1999-2000 (various numbers in text)

Russian creditors used all three mechanisms. However, the most popular appeared to be renegotiation of debts, often implicit. The tolerance of trade and tax arrears, that grew spectacularly in the real terms (see Figure 3), was puzzling to external observers.[33] We

[33] Alfandari and Schaffer [1996] claim that the amount of arrears in Russia was comparable with other industrial economies. Other researchers considered the situation to be unusual. See, for example, Karpov

believe that since creditors were willing to wait, the choice of arrears as the dominant method of debt management indicates that non-payments were considered to be manageable.

The estimates of real net profit at replacement cost in Table 6 have not accounted for the changes resulting from the use of trade credit. However, the actual input costs that firms incur in inflation are determined both by the time of use and payment.

To see this, note that the replacement cost is the sum of input purchase price and holding profit resulting from the price increase during the production cycle.[34] If producer of output j receives input i at time 0, pays for the delivery at time S_j, and produces the output at time T_j, he effectively turns the part $(S_j/T_j) < 1$ of the holding into actual profit.[35] This part should not be included as inflationary cost credit that the immediate write-off rule grants.

Since the duration of trade credit C_j affects the effective price that producer of j pays, the replacement cost index I_{ji} of equation [6] should be adjusted by the factor $p_i(t)^{C_j}$

$$I_{ji}^{TC} = \frac{p_i^{T_j}}{p_i^{C_j}} = p_i^{T_j - C_j} \qquad [6]$$

The difference between the intermediate costs found using replacement cost index without trade credit I_{ji} (equation [5]) and the index with trade credit I_{ji}^{TC} (equation [6]) is a subsidy in real terms that producers receive from their suppliers.

A similar argument applies to tax arrears when they do not involve fines for non-payment.[36] Legally, government has the right to claim the assets of enterprises that have failed to pay taxes. Due to a number of reasons, tax arrears were partly restructured in longer-term liabilities and partly tolerated by the Russian tax authorities. They could be viewed as another line of credit received by firms.

Unlike trade credit received, which is illiquid in general, tax arrears represent a claim on the revenue that firms can spend on anything.[37] The actual cost of nominal tax arrears to sector j is the loss in the sector's consumption. Postponing payment of taxes by A_j, the sector gets inputs and consumables (for workers and owners) cheaper by factor p_i^A

[1997]. The difference in perception may be explained by different objectives (comparative analysis vs. finding ways to improve tax collection) that researchers set.

[34] Certainly, if the extension of trade credit involves paying an interest on it, there is no holding profit. It was not a usual practice in the Russian transition to charge the interest on trade credit and arrears.

[35] Consider an example. If the purchase price is 100 rubles at the beginning of the cycle and 150 at its end and the producer could store the input without incurring costs, he receives 50 rubles of the holding profit if the input is sold in the end. If he manages to get a trade credit, say for half of the production cycle, and price increases steadily over time, about 25 rubles becomes actual profit.

[36] Gaddy and Ickes [1998] consider tax arrears to be implicit subsidies. Their argument is based on the assumption that tax arrears were not penalized. In general, they were with fines being added to tax arrears. We assume for our calculations that no tax penalties were levied for the sake of argument.

[37] We ignore the issue of non-monetary trade making this argument. Certainly, if revenue is received in the form of illiquid products, it cannot be spent on everything. This point is not essential for our analysis.

$$p_j^A = \frac{1}{\sum_{i=1}^{25} \alpha_i p_i^{A_j} + \sum_{k=1}^{2} (Wages + GrossProfit) \times CPI^{A_j}} \quad [7]$$

where coefficients α stand for fractions of revenue spent on intermediate inputs, *Wages* and *GrossProfit* are wages and capital gross of CCA and taxes as fractions of revenue, and *CPI* is the consumer price index. Then, total saving on taxes S_j is the difference between nominal tax liabilities L_j and liabilities adjusted by factor p_j^A

$$S_j = L_j(1 - p_j^A) \quad [8]$$

	Profit		Change in the costs of intermediate consumption	Change in the costs of tax liabilities S_j	Change in the value of revenue R_j	Net change in profit
	gross of CCA and net of statutory tax rates	net of CCA and statutory tax rates				
Electricity	**-0.202**	**-0.250**	0.172	-0.031	0.236	*-0.377*
Oil extraction	**-0.086**	**-0.260**	-0.098	-0.073	0.214	*-0.044*
Oil processing	**-0.397**	**-0.413**	0.328	-0.039	0.179	*-0.468*
Gas extraction	**-0.054**	**-0.184**	-0.065	-0.056	0.265	*-0.144*
Coal and other fuels mining	0.109	0.040	0.028	-0.068	0.192	*-0.152*
Iron and steel	**-0.222**	**-0.251**	0.207	-0.026	0.171	*-0.353*
Non-ferrous metallurgy	**-0.060**	**-0.082**	0.169	-0.022	0.108	*-0.254*
Chemical and petrochemical industry	**-0.248**	**-0.301**	0.219	-0.030	0.176	*-0.365*
Machine building and metal processing	**-0.555**	**-0.600**	0.490	-0.044	0.161	*-0.607*
Wood and paper	**-0.099**	**-0.150**	0.110	-0.029	0.124	*-0.205*
Construction materials	**-0.031**	**-0.079**	0.037	-0.025	0.134	*-0.147*
Textile, apparel, and footwear	**-0.663**	**-0.713**	0.567	-0.031	0.126	*-0.662*
Food processing	0.009	**-0.023**	0.074	-0.021	0.070	*-0.123*
Other manufacturing	**-0.330**	**-0.376**	0.309	-0.025	0.083	*-0.367*
Construction	**-0.062**	**-0.092**	0.058	-0.027	0.138	*-0.168*
Agriculture and forestry	**-0.444**	**-0.606**	0.448	-0.025	0.090	*-0.514*
Transportation	0.158	0.053	-0.057	-0.030	0.180	*-0.093*
Communications	0.063	**-0.038**	0.067	-0.017	0.110	*-0.160*
Trade, intermediation, and food services	0.200	0.157	0.029	-0.015	0.085	*-0.099*
Other activities related to production and services	**-0.273**	**-0.306**	0.160	-0.021	0.046	*-0.185*
Residential, communal, and household services	**-0.003**	**-0.052**	0.365	-0.027	0.143	*-0.481*
Health, education, and culture	**-0.363**	**-0.470**	0.423	-0.013	0.068	*-0.477*
Science, geology, and meteorology	**-1.408**	**-1.502**	1.497	-0.026	0.064	*-1.535*
Finance, credit, and insurance	**-0.039**	**-0.090**	0.033	-0.014	0.096	*-0.115*
State and commercial management and NGO	**-0.057**	**-0.113**	0.030	-0.014	0.107	*-0.123*
Memo: Total (billions of nominal rubles)	*-324,381*	*-464,161*	*450,100*	*-70,732*	*343,228*	*-722,596*

Table 7: The changes in the value of intermediate products assessed at its replacement cost, tax liabilities, and revenue given the benefits and losses resulting from receiving and extending trade and tax credits (in fraction of the reported revenue at consumer prices).
Sources: author's calculations. Data columns 1 and 2 are found as the sum of statutory profit reported in Tables 2 (data columns 5 and 10) and the sum of inflationary costs from numerical column 6

An old saying goes that "one man's gain is another man's loss". From the methodological point of view, if we add the benefit of credits received to real net profit, we need to subtract the cost of credit extended to customers. Let the payment for output *j* delivered at time *0* be postponed by V_j days. Then, its value is reduced by the change in the composite consumption price index for the same period. The cost of trade credit R_j extended by sector *j* is

$$R_j = M_j(1 - p_j^V) \qquad [9]$$

where M_j is total revenue at producer prices and p_j^V is found by [7] when A_j is replaced with V_j.

Table 7 contains the estimates of the value of credits received and extended as fractions of revenue. Comparing its results with the results of Table 6, we see that some sectors were in a better financial shape after the benefits and costs of credits were accounted for. Yet, only the sectors of coal and transportation move to the positive territory.

It is interesting to note that sectors redistributed value in inflation (see Figure 4).[38] The main benefactors were sectors considered to be in poor financial shape (science, electricity, coal mining, machine building, textiles, and agriculture).

An apparent explanation is that trade and tax arrears served as a profit stabilizer in inflation. Companies with low profit margin resorted to arrears to stay afloat. Yet, this proposition does not explain why creditors tolerated arrears. Given the assumption of individual rationality, suppliers extend credit if they are somehow compensated.

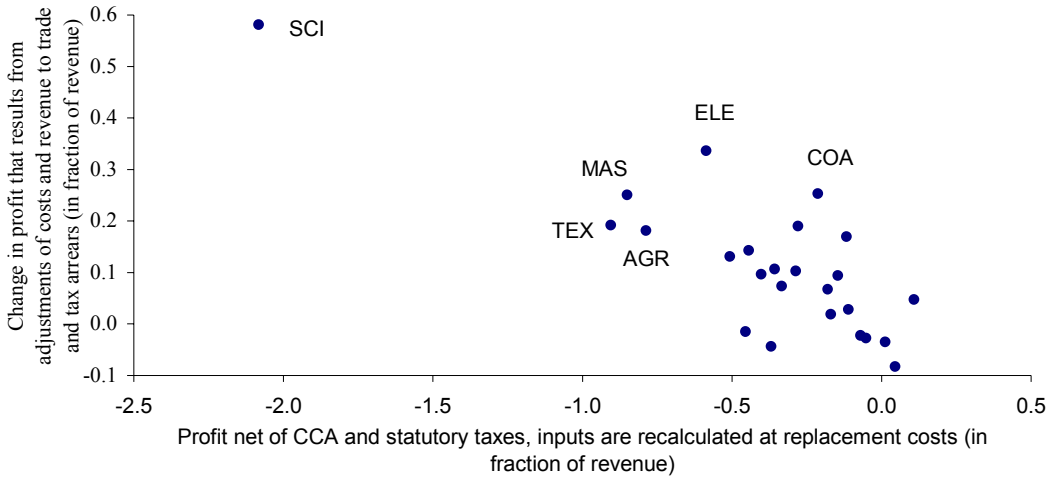

Figure 4: Scatter diagram of net profit at replacement costs and its change when trade and tax arrears are accounted for. Sources: Profit net of CCA and statutory taxes is from Table 6, data column 2. The change in net profit is found as the difference between data columns 2 of Table 7 and 6

The compensation can come in a variety of forms. For example, firms could extend credit at prices that already include interest on expected late payments. Or, through repurchase agreements, debtors bind themselves to supply products at discounted prices. Then,

[38] OLS regression supports this proposition: the regression of the type $Change = \alpha + \beta\, NetProfit$ delivers the estimate of $\beta = -0.219$, which is significant at 1% (*t-statistics* is -5.509).

debtors report low profit because their revenue was already discounted and costs – inflated.[39]

Let us now come back to the result reported in Section 3 that the average employment is a factor explaining the size of tax arrears. This result has been considered as supporting the proposition that "labor hoarding" was used strategically to extract benefits from the state and other creditors. However, if it is correct, we should observe that large sectors extend lesser fraction of their revenue in trade credit than on average. This is not what data show (see Figure 5). Thus, the hypothesis of strategic hoarding, discussed in Section 3, is not confirmed.

Top borrowers and lenders belong to sectors that comprise large enterprises in terms of employment (electricity, gas and oil extraction, coal mining, and railroad transportation) and they are major receivers of trade credit are large creditors as well. This fact indicates that large companies serve as credit intermediaries for enterprises clustered around them.[40] It is likely that facing financial credit rationing producers organized voluntary trade credit unions with tax arrears being the consequence and not the cause of labor hoarding.

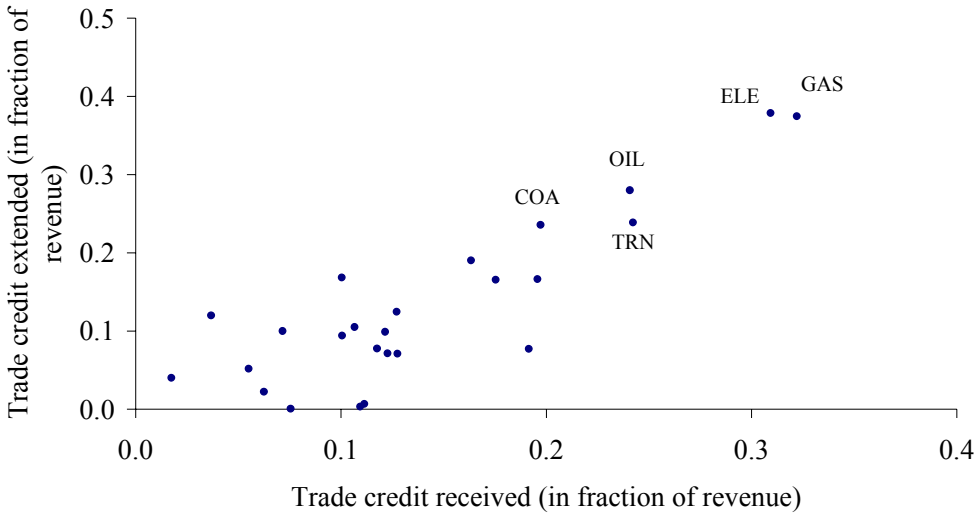

Figure 5: Scatter diagram of trade credit received and extended, in fraction of revenue at consumer prices. Sources: GKS [1998d, table 3.62 for industries, agriculture, construction, and transportation; sample data for other sectors from accounting documents reported as a part of corporate disclosure for 1995, author's sampling and calculations (10-20 companies per sector).

[39] Studying the behavior of relative prices in transition may confirm or reject this hypothesis, which lies outside the scope of this paper.

[40] This argument has been advanced by several authors who studied the behavior of financial-industrial groups and large companies in transition. See, for example, Humphrey [2000] that proposes the "star-shaped" configuration of non-monetary exchanges. She believes that Russian firms went around the problem of credit crunch by clustering around large companies that served as quasi-financial intermediaries.

Conclusion

The paper has addressed several questions about transitional tax system in Russia. The initial emphasis has been on the numerical estimation of the statutory tax rates for business, which have been often cited as excessive and driving businesses underground.

The results, reported in Tables 2 and 3, are ambivalent regarding the importance of statutory tax rates in determining profit net of taxes. On one hand, there are sectors of oil and gas extraction and other activities, which had STRs significantly higher than effective rates. These sectors could not operate with given STRs in the long run.

On the other hand, STRs were not significantly higher than effective rates for the sectors of textile, other manufacturing, and agriculture, which have been found to be unprofitable as well. It is likely that generally low profitability was a factor driving them into red.

The estimates of STRs have been calculated for tax bases that included informal sector and ignored individual tax exemptions. This methodological feature has provided an opportunity to evaluate the importance of informal sector and loopholes for tax collection (see Table 4). Along with the estimates of tax deferrals and arrears (defined as the difference between effective and actually paid tax rates), data on tax avoidance have allowed testing several hypotheses on the causes for tax avoidance and non-payment.

The results of OLS regressions have shown that the average employment and gross profit matter (see Table 5). More profitable sectors are more likely to avoid taxes. This finding could be interpreted as the evidence of successful lobbying. However, the finding that the sectors of oil and gas extraction are both the most profitable and overtaxed (see the point above) implies that unreasonable tax claims and lobbying for tax exemptions go hand in hand. We have suggested that the government foresaw a bargaining game with oil and gas producers and raised STRs to unsustainable levels expecting renegotiations to happen afterwards.

Finally, we have broadened the question of tax burden and looked on the implications that inflation makes on net profit in real terms. Several issues have been considered. First, we have re-evaluated the value of intermediate inputs spent in production at their replacement costs and found the amount of holding profit. When the holding component has been deducted from net profit, it has turned negative for almost all sectors. Thus, inflation represented a serious problem by biasing the real value of net profit. Yet, introducing the inflationary cost tax credit has been found to be an insufficient incentive for the sectors to continue operating. The estimate of tax credit has been small compared with the costs of inflation (see Table 6).

We have considered other options that firms employ to stay afloat in inflationary environment. If debts are not completely indexed, enterprises effectively reduce the costs of operation if they accumulate trade and tax liabilities. We have estimated the benefits and costs of accumulated debts and extending credits under the assumption of no penalty for the late payment. The financial situation has improved somewhat (see Table 7). Yet, many sectors have been found still non-viable both in the short and long run.

The comparison of real profit with and without the benefits and costs of trade and tax credits reveals an apparent redistribution of value. Relatively “poorer” sectors of science, electricity, coal mining, machine building, agriculture, and textiles get effective subsidies

from other sectors (see Figure 4). The question of why "richer" sectors lend support is natural to ask next.

We have found that the sectors of electricity, oil and gas extraction, coal mining, and transportation tend to accumulate and extend relatively large trade debts and credit at the same time (see Figure 5). These sectors are the largest in the terms of average employment as well. This fact has provided an explanation to our finding that larger firms tend to accumulate larger tax liabilities (see Table 5). We have conjectured that firms organized trade credit unions around large companies, which served as credit intermediators, to cope with the problem of restricted access to financial credit. Under such interpretation tax liabilities become a subsequence and not the prime reason for companies to keep large labor force.

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Appendix A: 1) the Input-Output Table 1995 and Its Adjustment

The main data source for the present analysis is the input-output table for 1995 (see GKS [2000a]). It is the first table based on primary data that the Russian State Committee for Statistics (GKS) has produced since the collapse of communism in 1991. Moreover, unlike previous tables that were constructed according to the Soviet definitions of costs and output, this table is based on the principles of the internationally recognized System of National Accounts 1993 (see System [1993]).

Since we adjust the table to include features that are important for our analysis, it would be helpful to consider in short how it is organized.[41] An enterprise serves as the primary unit that provides a number of statistical forms upon which the table is constructed. Raw data are aggregated as follows. First, firm's "main output", by which the enterprise's professional affiliation is determined, is separated from its "subsidiary outputs" that are added to appropriate bundles of goods and services. The results are provided in the matrix of supply. It contains columns showing professional affiliation and rows presenting values of specific output. Some sectors are well diversified with less than 70 percent of total output belonging to the main activity, even at the level of aggregation that is reported in the table. Second, cost structure is determined for outputs at purchase prices. The structure is reported in the matrix of use at consumer prices. Finally, transport and trade margins and net taxes on products are deducted from costs, generating the matrix of use at producer prices.

The table as it appeared in print comprises 22 sectors.[42] The sectors are organized according to the Soviet industrial classification *OKONKh* (see GKS [1976]), which differs from both *ISIC* and *NAICS*[43] classifications.

OKONKh divides economic activities into "material production"[44] and "unproductive sectors". The most peculiar feature for a Western practitioner is blending of mining activities with manufacturing. Mining of oil, natural gas, and coal is reported sometimes separately but, in general, they are aggregated with refineries. Mining of ores is reported together with steel mills and other metal smelters. Mining of raw materials for fertilizers and chemicals goes under the title of chemical and petrochemical industry. Mining of sand and gravel is included in the construction material industry. It makes sense for vertically integrated companies to aggregate mining and their processing but, for tax purposes, it is better to treat them separately.

In this paper, we disaggregate three sectors into seven and two are merged. The main adjustment regards sector of "Oil and gas production". It is divided into the sectors of oil extraction, gas extraction, and oil processing. These three groups are important sources of fiscal revenue and some taxes are specific to them. We use a variety of data sources. Data

[41] The general methodology of constructing an input-output table is described in UN [1999].

[42] It is an aggregated version of the original table that contains 223 sectors. The latter is not publicly available.

[43] The International Standard Industrial Classification (*ISIC*) that is accepted as the benchmark by the UN and Eurostat and the North American Industrial Classification Standards (*NAICS*), which the US Bureau of Census has switched recently to.

[44] That includes any activity generating tangible products, energy, and services that are necessary for both production and distribution of products and energy.

on resources and use of oil and gas are taken from the balance of fuel resources (GKS [1997a, table 10.32]. Natural gas monopoly Gazprom [1998] reports numbers on the consumption of gas by main sectors providing additional information. The domestic producer prices and average export and import prices for oil, gas, petrol, diesel fuel, and heating oil are from GKS [1996c, table 389-90, 396-7]. Consumer prices for the same products are from RET [1996-1]. GKS [1997b, table 6.4] has data on household expenditure on natural gas, prices of which are regulated. The consumption of fuels by transport is from GKS [1996a, p.208] and by agriculture from GKS [1997a, table 11.14]. Price of fuels for agriculture is from GKS [1998a, table 6.9]. After matrix of use is set determining sectoral output at consumer prices, the output is converted into producer prices by applying transport and trade margins and taxes on products. Data on margins are taken from GKS [2000a] with several sectors that use only oil or gas serving as the benchmark.

On the cost side, imputed output at producer prices is divided into cost components. GKS [1998c, table 4.4] provides information on consumption of electricity per unit of output for the sectors of oil extraction and processing. GKS [1999a, tables 2.6, 2.9, 10.17, 10.22] gives the number of employees and their average wage rates for 1995. Unfortunately, cost structure from GKS [1998d, table 3.11] provides highly aggregated components of costs and distinguishes only between "the cost of material inputs", "other expenses on production", and "social contributions". Thus, in general the cost of a particular input is found as the product of the input cost reported in input-output table times its sectoral weight in production.

The sectors "Transport and communications" and "Banking, credit, pension funds, government, business management, and NGO" are split in two. We justify the disaggregation on the ground that the input-output matrix is not square. It includes transportation and banking margins (the transportation markup over producer price and the cost of external finance) as separate entries. These margins should be added to costs of transport and banking services. GKS [2000b, tables 2.11 and 2.25] contains information on output, total intermediate cost, labor expenses, and net direct taxes for sectors "Transport", "Communications", "Banking, credit, and pension funds", and "General government, management organizations, and NGO". This information suffices to set border values on revenue structure. However, the itemization of costs that the split sectors incur is problematic. On the use side, GKS [1996a, p. 189] has a table of expenditures on communication services by main economic sectors. The itemization of electricity and fuel costs for the sector of transportation is from GKS [1996a, p. 208]. The rest of cost parameters are found by splitting costs for larger sectors as reported in the input-output table according to their weights. The latter are the sectoral fractions in the total costs on the cost side and the fractions in the output on the use side.

The table does not account for the use of financial intermediation[45] because the structure of borrowers is statistically unobservable. To get around this situation, the table introduces a fictitious sector that consumes the services of financial intermediation but produces nothing. Since this entry does not appear in our final analysis, we have to add

[45] That is determined as the difference between the interest earned on financial credit and the interest paid to depositors.

its cost to other sectors. GKS [2000b] proposes to add the cost to the sector of "Banking, credit, and pension funds". However, this suggestion amounts to the assumption that banking sector is the ultimate consumer of its own services, which is not obvious. We distribute the value of banking margin among all sectors taking their shares in total banking credit as a proxy for the use of financial intermediation. GKS [1998d, tables 3.23 and 3.27] presents numbers on banking credit for 1996.[46]

Trade margin is added directly to the sector of "Trade, commercial intermediation, and general market activity", which completes the conversion of the table into a square matrix of costs.

Finally, the sectors of "Coal mining" and "Peat and bituminous shale mining" are merged. The reason is that this sector is unimportant for the economy as the whole and its appearance in the publication is somewhat odd.

We make a number of other adjustments in the table that are justified by the issues that we explore. One regards the itemization of the wage bill that is reported in the input-output table jointly with the social contributions. Since we treat the contributions as taxes, they should be separated from wages. The wages paid to employees are found by the multiplication of the total wage expenses reported in the table by the ratio of the wage net of the contributions to the wage gross of them. The latter two numbers are reported in GKS [1998d, tables 3.14 and 16] as components in the cost structure. Missing ratios are taken from GKS [1999a, table 10.2]. To account for possible methodological differences between the input-output table and the cost structure provided in other publications, we adjust the ratios by constructing a coefficient. We take the data on labor expenses for 1992 from the input-output table GKS [1996b, p. 146-55]. The table distinguishes between wages and fees. The equation used to find the wage expenses net of the social contributions is

$$Wage_{IO95} = Labor_{IO95}\left(\frac{Wage_{Cost95}}{Labor_{Cost95}}\right)\left(\frac{Wage_{IO92}}{Labor_{IO95}}\right)\left(\frac{Labor_{Cost92}}{Wage_{Cost92}}\right) \qquad [A1]$$

where subscripts stand for the source of data and the year of observation. The residual between total labor expenses and wages determines social fees.

The sums of intermediate costs exclude the intermediate expenses on household production. Household production is generally intended to be consumed within households and it is not taxable. Therefore, we need to distinguish between business and household activities in our calculations. The total intermediate expenses on the household production are found as the difference between the total output and the "mixed profit" (from GKS 2000a, Tables "Resources" and "Basic"]. As it is explained in GKS [1998e, Part 5], the line "mixed profits" combines household's equivalent of profit and wages of household producers. Since no data on the technological structure of intermediate consumption for households are available, we assume that they use the same structure (technology) as businesses. Thus, the itemization of the cost structure for the latter stays the same.

[46] Unfortunately, data for 1995 are absent.

The input-output table presents numbers on several taxes. We should note that they stand for assessed taxes and not actual payments, which are smaller by the amount of deferred and late payments. The estimates of taxes on production and corporate income tax (CIT) are unavailable in the input-output table. We approximate their values using our calculations of statutory rates adjusted to meet the sum of the collected taxes (see Table A2) and the annual change in tax arrears (reported in GKS [1996d, table 22]). The profit net of CIT and gross of subsidies is the residual that brings the total sum of the rows to unity. Table A1 contains columns of cost items, subsidies, and the net profit that are expressed as a fraction of the total revenue at consumer prices.

	Intermediate consumption	Labor cost net of social fees	Taxes on sales	Taxes on production	CIT	Social fees	Subsidies	Profit net-of-CIT	**Revenue (bn. of rubles)**
Electricity	0.568	0.102	0.054	0.019	0.044	0.035	-0.014	0.193	**128,047**
Oil extraction	0.228	0.055	0.195	0.147	0.048	0.016	0.000	0.309	**73,834**
Oil processing	0.608	0.022	0.153	0.020	0.042	0.008	-0.023	0.171	**78,904**
Gas extraction	0.265	0.032	0.297	0.144	0.038	0.017	0.000	0.216	**33,275**
Coal and other fuels mining	0.486	0.206	0.059	0.066	0.046	0.121	-0.221	0.237	**24,861**
Iron and steel	0.666	0.070	0.060	0.016	0.037	0.023	0.000	0.127	**98,472**
Non-ferrous metallurgy	0.502	0.091	0.087	0.032	0.068	0.029	0.000	0.189	**77,922**
Chemical and petrochemical	0.646	0.082	0.062	0.016	0.044	0.026	0.000	0.124	**87,049**
Machine building and metal processing	0.582	0.155	0.073	0.018	0.033	0.050	-0.005	0.094	**203,179**
Wood and paper	0.572	0.141	0.074	0.027	0.035	0.043	-0.003	0.109	**57,571**
Construction materials	0.551	0.128	0.066	0.017	0.051	0.041	0.000	0.145	**57,437**
Textile, apparel, and footwear	0.623	0.177	0.089	0.017	0.000	0.053	-0.007	0.047	**27,251**
Food processing	0.654	0.066	0.113	0.011	0.022	0.019	0.000	0.115	**190,075**
Other manufacturing	0.642	0.168	0.057	0.012	0.013	0.047	0.000	0.061	**28,835**
Construction	0.451	0.195	0.076	0.023	0.045	0.075	0.000	0.133	**241,530**
Agriculture and forestry	0.676	0.187	0.041	0.019	0.000	0.058	-0.054	0.073	**111,762**
Transportation	0.359	0.178	0.059	0.042	0.065	0.063	-0.048	0.282	**228,336**
Communications	0.278	0.200	0.065	0.037	0.079	0.073	0.000	0.266	**32,065**
Trade, intermediation, and food services	0.273	0.093	0.076	0.026	0.148	0.032	-0.001	0.352	**357,715**
Other activities related to production and services	0.288	0.471	0.079	0.024	0.003	0.161	-0.046	0.012	**16,497**
Residential, communal, and household services	0.637	0.225	0.049	0.020	0.020	0.079	-0.455	0.425	**81,519**
Health, education, and culture	0.416	0.315	0.005	0.004	0.002	0.105	-0.001	0.162	**161,134**
Science, geology, and meteorology	0.453	0.255	0.019	0.013	0.000	0.089	0.000	0.169	**28,353**
Finance, credit, and insurance	0.380	0.264	0.018	0.013	0.071	0.066	0.000	0.187	**37,114**
State and commercial management and NGO	0.474	0.325	0.000	0.014	0.001	0.083	0.000	0.102	**138,899**
Memo: Total (billion of rubles)	**1,251,653**	**402,465**	**184,387**	**69,256**	**129,914**	**133,339**	**-66,013**	**496,635**	**2,601,635**

Table A1: Estimated cost structure of economic sectors at consumer prices in 1995. The sum of fractions is unity for economic sectors. Sources: Intermediate costs, direct and indirect taxes, subsidies are from the input-output table; labor cost net of social fees, social fees, CIT, and profit net-of-CIT are author's calculations.

Appendix A: 2) Reported Tax Collection for 1995

Data on tax collection in Russia in 1995, that is the base year for the input-output table, are not presented in a single source and are to be compiled. GKS [1998d, Tables 2.3, 2.20-30] contains highly aggregated numbers on public finance. SITE [2000] has

monthly series on some additional taxes. Estimates of federal tax revenue are available in the Law N 212-FZ[47] but they are projections for 1995 made in December of that year. FIPER [1998, Chapter 4-1] provides a table but its sum of taxes differs from that in GKS [1998d, Table 2.3]. Another detailed account of tax collection is in IET [1996, Table 1.12, pp. 36-8] but it apparently double-counts targeted budgetary funds in the general tax revenue. The author expresses its gratitude to Alexander Ustinov of the Expert Economic Group who has provided numbers on several taxes unavailable elsewhere. Unfortunately, the possibility of data cross-checking is severely limited. The compiled numbers are presented in Table A2.

Appendix A: 3) Evaluation of Unpaid Taxes

The change in the amount of tax and social fees arrears for 1995 is found using sectoral data from GKS [1998d, Table 3.58]. Then, arrears are recalculated in tax liabilities using the ratio of liabilities to arrears presented in Alfandari and Schaffer [1996, Table 3b]). Not all sectors from the input-output table have data reported. For missing sectors, we collect accounting information for 1995, reported through the corporate disclosure program (available at *disclosure.fcsm.ru*), with about 10-20 observations per sector. The ratios of tax and social fees liabilities to revenue are taken as proxies for missing sectors

Appendix B: The Rules of Tax Administration in 1995

The initial structure of the Russian tax system, after it left the USSR, was established by the Federal Law N 2118-1 dated December 27, 1991 "On the Foundations of the Fiscal System in the Russian Federation".[48] The law provided a list of federal, provincial, and municipal taxes (15, 3, 21 items respectively) and general procedures by which they were administered. Later, the list was changed and new taxes introduced. Russian taxes are generally administered by a vertically integrated tax inspectorate. The inspectorate administers tax documents but does not collect tax revenue itself. Tax revenue is deposited directly on tax recipients' bank accounts.

Below we explain under what rules taxes were administered in 1995. Only taxes that we model are included. To clarify the exposition, we organize the presentation under the names of relevant tax bases: gross revenue, assets, wage fund, use of mineral resources, foreign trade, specific goods, corporate profit, and value-added.

Taxes on gross revenue

1. Tax to support residential housing

This municipal tax is introduced by the Federal Law N 4178-1 dated December 22, 1992 "On the Introduction of Changes in Several Laws of the Russian Federation on Taxation". The law specifies that the rate does not exceed 1.5 percent of the total revenue of a business that resides within the municipality excluding its expenses on the maintenance of residential and public buildings. It is the responsibility of local governments to choose the rate.

[47] The Federal Law N 212-FZ dated December 27, 1995 "On Amendments in the Law on the Federal Budget for 1995".

[48] In what follows, we mention only laws that introduce new taxes. Otherwise, the discussed tax is stipulated by that law.

	Tax	Federal budget	Territorial budgets	Social funds	Total Revenue	Source
10101	Corporate income tax	40,995	76,619		117,614	SITE
10102	Personal income tax	3,250	33,178		36,428	IET
10200	Payroll taxes, including		4,345		4,345	IET
10201	Transportation tax		2,200		2,200	FIPER
10202	Targeted fees to support police, urban maintenance, education and other municipal needs		711		711	Residual
10203	Tax to support educational establishments		1434		1434	Residual
10301	Value-added tax on domestic products	60,160	24,543		84,702	IET
10302	Value-added tax on import	10,545			10,545	Ustinov
10303	Excise taxes, including	17,681	6,383		24,064	SITE
x01-2	Alcoholic beverages	1,200	5,694		6,894	Ustinov
x12	Natural gas	7,486			7,486	Ustinov
x13	Raw oil	8,963			8,963	Ustinov
10304	Special tax to support the most important sectors	7,266	3,618		10,883	IET
10305	Tax on the sale of fuels and lubricants	6,312			6,312	GKS
10306	License fee for the right to produce, store, bottle, and wholesale liquors	662			662	Law on Budget 95
10307	License fee for the right to sell liquors		438		438	FIPER, residual
10308	Other license and registration fees	420	680		1,100	FIPER, share 1997
10309	Taxes on vehicles, including			5,248	5,248	GKS
x01	Tax on automobile road users			4,754	4,754	GKS
x02	Tax on vehicle's ownership			229	229	GKS
x03	Taxes on the sales road vehicles			265	265	GKS
10401	Personal property tax		233		233	Residual
10402	Corporate property tax		15,790		15,790	IET
10403	Estate and gift tax		30		30	Residual
10404	Tax on operations with securities	831	71		902	IET
10501	Tax on mining	1,174	5,583		6,756	IET
10503	Fee on use of seabed and sea resources		50		50	Residual
10504	Tax to support prospecting	1,683	604		2,287	IET
10505	Fee on pollution and disposal of industrial garbage	37	100		137	Residual
10506	Lumber profit tax		150		150	Residual
10508	Fee on the industrial use of water		100		100	Residual
10509-13	Land taxes and rental payments for land	187	3,079		3,266	IET
10601	Import duties	8,469	4		8,473	IET
10603	Export duties	15,685	24		15,709	IET
10704	Tax to support residential housing		12,285		12,285	Ustinov
10705	Advertising tax		150		150	Guesstimate
	Pension Funds			73,709	73,709	GKS
	Social Insurance Fund			15,979	15,979	GKS
	Mandatory Medical Insurance Fund			8,951	8,951	GKS
	Employment Fund			4,810	4,810	GKS
	Sum	175,356	188,057	108,697	472,110	SITE
	Total tax revenue	**175,345**	**189,035**	**108,697**	**473,077**	SITE, GKS (social funds)

Table A2: Revenue collected by the enlarged government in 1995 (billions of rubles).
Sources: GKS [1998d], SITE [2000], IET [1996, Table 1.12, pp. 36-8], FIPER [1998], Alexander Ustinov (Expert Economic Group), private communication. Residual share means that aggregated data are itemized taking shares as reported in tax collection data for 1997

We consider 1.5 percent to be the general rate. No exemption is specified by the Letter of the Ministry of Finance N 5-1/756 dated May 31, 1993 "On the Recommended Instructions on Some Municipal Taxes and Fees", Appendix 4.

2. Tax on automobile road users

This extra-budgetary tax is stipulated by the Federal Law N 1759-1 dated October 18, 1991 "On the Road Funds in Russian Federation" with tax revenue going to the Territorial Road Funds.[49] The rate for 1995 is determined by the Instruction of the State Tax Services N 30 dated May 15, 1995. It differs for producers and traders. The former pays at the rate of 0.4 percent of total revenue net of VAT, special and excise taxes, and tax on the sales of fuels and lubricants. Traders pay at the rate of 0.03 percent of trade turnover (revenue) minus the same taxes.[50]

The instruction explains that budgetary and not-for-profit organizations pay on the value of total revenue from commercial re-sales only. Since commercial re-sales are not the main activity for non-commercial sectors (and data on which are not provided), we consider that they are exempt in our estimation. The share of budgetary organizations is found from GKS [2000b, table 2.11] as the ratio of the total output generated by non-commercial service providers to all operators included in the sector. Agriculture and highway maintenance organizations are exempt as well.

Taxes on Assets

3. Corporate property tax

This provincial tax is introduced by the Federal Law N 2030-1 dated December 13, 1991 "On Taxation of Corporate Property". The law sets the rate of not more than 1 percent of the value of corporate assets. The specific rate is set by regional authorities. Corporate assets comprise tangible and intangible capital, inventories, and work-in-progress, which belong to the enterprise, at their residual value.[51] Budgetary organizations and NGO, agriculture, education and culture, science, residential and communal services are exempt. Food processing facilities and equipment, highways and railroads, pipelines, electric and communication lines or satellites are exempt from taxation.

The maximum rate is raised to 2 percent by the Federal Law N 62-FZ dated April 25, 1995 "On the Introduction of Amendments and Supplements in the Law on Taxation of Corporate Property". The law specifies that it applies to legal obligations that originate from January 1, 1995 and, hence, the rate of 2 percent holds for the whole year.

The Instruction of the State Tax Services N 33 dated June 8, 1995 "On the Rules of Calculation and Payment to Budget of the Tax on Corporate Property" explains that currency, bank deposits, and other liquid assets are exempt from taxation.

Taxes on Wage Fund

[49] Revenue collected in Moscow and St. Petersburg goes to the Federal Road Fund.

[50] Gross revenue and trade turnover differs in assessment of costs. Gross revenue for traders does not include the cost of goods intended for re-sale only, while trade turnover includes the value of all items sold.

[51] Residual value for capital assets is determined as its purchase price plus the cost of its upgrading minus CCA that are granted because of this asset. The value of inventories and work-in-progress is found as its cost.

4. Pension Funds

The Federal Law N 340-1 dated November 20, 1990 "On the State Pensions in RSFSR" states that the state pensions are paid from the extra-budgetary Pension Fund of the Russian Federation. The law stipulates that employers contribute to the Fund proportionally to their wage bill including all compensations for labor services that are used as the basis for determining this person' pension value. Tax rate is set annually by a federal law. For 1995, the rate is determined by the Federal Law N 3-FZ dated January 10, 1995 "On the Insurance Contributions to the Pension Fund, Social Insurance Fund, State Employment Fund, and Mandatory Medical Insurance Funds". It is the same as in 1994. The Government Edict N 61 dated February 3, 1994 with the same name preserves the rate of the second half of 1993. The latter is set at 28 percent by the Decree of the Supreme Soviet N 5357-1 dated July 9, 1993 with the same name. Thus, the rate is 28 percent.

The Appendix to the Letter N V3-6-15/46 dated February 16, 1994 "Methodology on Answering the Questions on the Practical Use of Laws and Documents that Regulate the Rules of Contributions to the State Extra-Budgetary Funds" explains that agricultural producers pay 20.6 percent.

5. Social Insurance Fund

The Presidential Decree N 822 dated August 7, 1992 "On the Fund of Social Security of the Russian Federation" establishes the aforementioned fund and specifies that it accumulates employers' contributions. Tax base and rates are set by the same laws as above.

Tax rate for 1995 is 5.4 percent of the wage bill. The Federal Law N 9-FZ dated July 1, 1994 "On the Federal Budget for 1994" stipulates that the wages of servicemen are not subject to mandatory contributions to the Social and Medical Insurance, and Employment Fund for that year. This paragraph is preserved by the Federal Law N 39-FZ dated March 31, 1995 "On the Federal Budget for 1995".

6. Mandatory Medical Insurance Funds

This extra-budgetary tax is introduced by the Decree of the Supreme Soviet N 4543-1 dated February 24, 1993 "On the Rules of Payment of Insurance Contributions to the Federal and Territorial Mandatory Medical Insurance Funds". According to the decree employers contribute 3.6 percent of wage bill to these extra-budgetary funds. The Federal Fund gets 0.2 percent while the Territorial Funds receive 3.4 percent. This rate is updated by the same regulations as above. The same exemption as above applies.

7. Employment Fund

This extra-budgetary tax is established by the Federal Law N 3307-1 dated July 15, 1992 "On Introduction of Amendments and Supplements to the Federal Law On Employment in RSFSR". The law stipulates that employers pay mandatory employment insurance. The rate is set every year by the same law that applies to the funds above. The rate of 2 percent is preserved for 1995. The same exemption as above applies.

8. Other payroll taxes

a) Transportation tax is a federal tax. It is introduced by the Presidential Decree N 2270 dated December 22, 1993 "On Changes in Taxation and Distribution of Fiscal Authority among Budgets". The rate is determined as 1 percent of the wage bill. Budgetary organizations are exempt.

The Letter N VZ-4-15/39n of the State Tax Services dated March 17, 1994 "On Transportation Tax" explains that the tax is collected from the same base and is administered according the same rules as the mandatory medical insurance contribution until a specific instruction is approved.[52]

b) The provincial fee to support educational establishments is introduced by the Federal Law N4178-1 dated December 22, 1992 "On the Introduction of Changes in Several Laws of the Russian Federation on Taxation". Its rate is set by provincial legislatures. However, the Letter of the Ministry of Finance N 5-1/756 dated May 31, 1993 "On the Recommended Instructions on Some Municipal Taxes and Fees"; Appendix 5 stipulates that the rate cannot exceed 1 percent of the wage bill. The letter recommends exempting the budgetary organizations and this paper assumes that they are.

c) Targeted fees that citizens and enterprises-residents pay to support police, urban maintenance, educational and other municipal needs is introduced by the Federal Law N 2118-1 dated December 27, 1991 "On the Foundations of the Fiscal System in the Russian Federation". It is determined proportionally to the minimal wage fund that is found as the average number of employees times annual minimal wage rate. The maximum tax rate is determined by the Federal Law N 3317-1 dated July 16, 1992 "On Amendments and Supplements in the Fiscal System of Russia". It is 3 percent. The Letter of the Ministry of Finance N 5-1/756 dated May 31, 1993 "On the Recommended Instructions on Some Municipal Taxes and Fees"; Appendix 3 recommends to exempt budgetary organizations and NGO, which recommendation this paper follows.

Taxes on Use of Mineral Resources

9. Tax on mining

This tax is established by the Federal Law N 2395-1 dated February 21, 1992 "On Mineral Resources" with a complex structure of distribution of payments among federal, provincial, and municipal budgets.[53] The structure and tax base is amended by the Federal Law N 27-FZ dated March 3, 1995 "On the Introduction of Amendments and Supplements to the Law on Mineral Resources". The latter law replaced the former from March 15, 1995

The Letter of the State Tax Services N NP-6-02/591 dated November 13, 1995 explains that the tax base is the value of extracted minerals at producer prices excluding VAT, excise, and special tax. Natural gas is evaluated at the wholesale price including excise tax. The value of allowed mineral losses is excluded from the base after March 15, 1995 but is included before that date. We ignore this fact as insignificant.

[52] No instruction appeared and the tax was annulled in 1997.

[53] Since problems of fiscal federalism are outside the scope of this paper, we do not go into details on tax revenue distribution.

The tax rate is specified in individual licenses granted to mining establishments. The Governmental Edict N 828 dated October 28, 1992 "On Approval of the Statute of the Rules and Conditions of Payment for the Right to Mine, to Use Shelf and Seabed" sets mandatory rate ranges for licenses. Until the license is issued, minimal rates are determined by the Governmental Edict N 478 dated July 9, 1992 "On Temporary Minimal Rates of Payment for the Right to Mine". Since individual licenses are not available, we use the minimal rates that are

Oil, natural gas, and coal – 8 percent
Nickel – 4 percent
Peat and bituminous shale, iron ore, copper, bauxite, glass raw material, sand, gravel, and clay – 3 percent
Lead, zinc, tin, molybdenum – 2.5 percent
Apatite and potassium salts – 1 percent

10. Tax to support prospecting

This tax is introduced by the same law as above. It applies to those companies that mine deposits discovered by state prospectors at state-owned lands.

The Letter of the State Tax Services N NP-6-02/591 dated November 13, 1995 explains that tax base is the value of sold minerals before March 15, 1995 and the value of extracted minerals since then. We ignore this fact as insignificant. The tax base for oil extraction excludes VAT, special and excise taxes, and export tariff and transportation expenses for exported products. The tax base for natural gas extraction is the wholesale-regulated price (that includes excise tax). For the rest of minerals, the tax base is the value of minerals at producer prices.

Appendix 2 to the Decree of the Supreme Soviet N 4546-1 dated February 25, 1993 "On Approval of the Statute on the State Extra-Budgetary Fund of Mineral Resources' Prospecting of the Russian Federation" determines rates of payment for 1995. We use the following numbers

Oil and natural gas – 10 percent
Hard fuels – 5 percent
Iron and chrome ores – 3.7 percent
Non-ferrous and rare earth metals – 8.2 percent
Apatite and phosphates – 3.1 percent
Potassium salts – 1.7 percent
Other extracted materials (apart from underground water) – 5 percent

Taxes on foreign trade

11. Import duties

This federal tax is established by the Federal Law N 5003-1 dated May 21, 1993 "On Custom Tariff". The law introduces import and export tariffs at rates that are approved by the Government of the Russian Federation. The specified import rates apply to the goods

that originate in the countries with which Russia maintains the most favored nation regime.[54] The rates are set either in monetary units per item or *ad valorem*.

The rates were amended relatively often and it is hard to trace individual changes. This paper takes the rates determined by the Governmental Edict N 454 dated May 6, 1995 "On Approval of Rates for Import Tariffs". The edict refers to the edict N 169 dated March 10, 1994 with the same name but the latter is not available. Thus, rates set on May 6, 1995 are used for the whole year. Several individual amendments that were introduced in between are considered in the paper.[55]

12. Export duties

Taxes on export are introduced in the same law as above. The main documents that we use are the Governmental Edicts N 1103 dated October 30, 1993 "On Approval of the Rates of Export Tariffs" and N 858 dated August 31, 1995 "On Partial Amendments of the Rates of Export Tariffs". Individual rates that this paper considers are provided by the Governmental Edicts

- N 862 dated July 19, 1994;
- N 147 dated February 20, 1995;
- N 304 dated March 29, 1995 "On Export Tariff and Excise on Raw Oil Extracted on the Territory of the Russian Federation";
- N 1064 dated November 2, 1995 "On Partial Amendment of Rates of Export Tariffs";
- N 1270 dated December 26, 1995

and the Presidential Decree N 2213 dated December 26, 1994 "On Streamlining of the Export of Natural Gas".

Taxes on Specific Goods

13. Excise Tax

This tax is introduced by the Federal Law N 1993-1 dated December 6, 1991 "On Excise Tax". The law determines the list of goods that are subject to the tax. Tax revenue collected on some goods goes towards federal budget that from other goods contributes to provincial budgets and the rest of revenue is divided between them. The law explains that, in general, the tax base is the value of goods at producer prices including excise.

The Instruction of the State Tax Services N 36 dated July 17, 1995 "On the Rules of Calculation and Payment of Excise Tax" explains that excise is collected *ad valorem* from consumer price. For example, if strong liquors are taxed at the rate of 85 percent and are sold at 10,000 rubles, the tax due is 8,500.

However, the excise tax on oil is a unit tax. The Instruction of the State Tax Services N 40 dated November 1, 1995 "On the Rules of Payment of Excise Tax on Oil including Gas Condensate and Natural Gas" specifies that the amount of excise tax is per ton of product.

[54] Otherwise, rates are doubled.

[55] Particularly, we use the Governmental Edict N 1101 dated September 27, 1994 that annuls import duties on vegetable oils.

The list of the goods that are subject to excise tax was changed several times. We do not attempt to introduce the whole range of excisable products. The rates on goods included in our calculations are (from the Instruction N 36)

Vodka and strong liquors – 85 percent
Grape wines – 46.5 percent
Sparkling wines – 47.5 percent
Fruit wines – 30 percent
Beer – 40 percent
Tobacco products – 20 percent
Cars and light trucks – 10 percent
Leather and fur apparel – 35 percent
Tires – 15 percent
Petrol – 20 percent

The rates on oil and natural gas were changed often in 1995. The Governmental Edict N 678 dated July 13, 1993 "On the Rate of Excise Tax on Natural Gas" sets the rate of excise tax at natural gas at 15 percent of the value at producer prices. The Edict N 208 dated February 28, 1995 changes the rate to 25 percent starting from March 27, 1995. Finally, the Edict N 859 dated September 1, 1995 raises the rate to 30 percent starting from September 1, 1995. We use a weighed average rate in our calculations.

The same story applies to raw oil. The Governmental Edict N 320 dated April 14, 1994 sets the rate of the excise tax on oil at 14,750 rubles per ton starting from May 1, 1994. At the beginning of each month, the rate is indexed by the coefficient of US dollar exchange rate as set by the Central Bank of Russia. The Edict N 304 dated March 29, 1995 "On Export Tariff and Excise Tax on Raw Oil Extracted on the Territory of the Russian Federation" updates the rate to 39,200 rubles per ton with further indexing starting April 1, 1995. Finally, the Edict N 590 dated June 26, 1995 raises the rate to 50,000 rubles for most producers starting from July 1, 1995 (listing several firms that are subject to lower rates).[56]

The Order of the State Customs Committee N 49 dated January 30, 1993 "On the Collection of Value-Added and Excise Taxes on Goods Exported to and Imported from the Russian Federation" explains that excise tax rates on foreign trade are the same as on domestic products. They apply to the custom value of goods excluding tariff. The Federal Law N 5604-1 dated August 6, 1993 "On the Introduction of Amendments in the Law on Excise Taxes" stipulates that excisable goods that are exported to non-CIS countries are exempt.

14. Taxes on the sales of fuels, lubricants, and road vehicles

This tax is introduced by the Federal Law N 1759-1 dated October 18, 1991 "On the Road Funds in the Russian Federation". The Federal Road Fund is a part of the budget but the Territorial Road Funds are extra-budgetary.

The Instruction of the State Tax Services N 30 dated May 15, 1995 "On the Rules of Calculation and Payment of Taxes to the Road Funds" specifies the rate of 25 percent

[56] The paper ignores individual exemptions.

from the total value at producer prices including excise tax. Tax proceeds go towards the Federal Road Fund. No exemption is mentioned.

The tax rate for road vehicles (cars, trucks, and buses) is 20 percent of the value of a vehicle at producer prices excluding excise.[57] The Territorial Road Funds are recipients of tax revenue apart from the revenue collected in Moscow and St. Petersburg, which the Federal Road Fund collects. Agriculture and passenger road transportation are exempt.

Taxes on Corporate Profit

15. Corporate income tax

This tax is introduced by the Federal Law N 2116-1 dated December 27, 1991 "On Tax on Profit of Enterprises and Organizations". The tax revenue is divided between the federal and provincial budgets in the proportion that is set annually by the law "On the Federal Budget".

The tax base is the difference between corporate revenue excluding taxes on products and qualified costs of production. The latter encompasses the cost of intermediate products (including excise tax and the difference in VAT paid and received), capital cost allowances, labor expenses including mandatory contributions to social funds, and other expenses. The list of qualified costs is reported by the Governmental Edict N 552 dated August 5, 1992 "Regulations on the Structure of Expenses that are Included in the Cost of Production and Sale of Goods".

The Federal Law N 64 dated April 25, 1995 "On the Introduction of Amendments and Supplements in the Law on Corporate Profit" clarifies ambiguous tax rates that were introduced by the Presidential Edict N 2270 dated December 22, 1993. It stipulates that enterprises pay at the rate of 13 percent to the federal budget and sets the maximum rate of 22 percent for the provincial budgets. The rates apply to all sectors apart from banks, insurance companies, intermediaries, and exchanges that are taxed at 30 percent. The rates apply since January 1, 1995. We assume that the provinces use maximum rates.

The Instruction of the State Tax Services N 37 dated August 10, 1995 "On the Rules of Calculation and Payment of the Tax on Corporate Profit" provides a list of exemptions. Agriculture, budgetary and not-for-profit organizations do not pay the tax. Some expenses made out of profit and activities are untaxed as well. They are:

- investments by industrial companies as they are listed in the General Classification (see GKS [1976]) provided that capital cost allowances are fully used and gross taxable profit is not reduced by more than half;
- expenses on science (R&D) subject to the same constraint inclusive of new investment credit;
- education related revenue of education establishments including labor costs;
- profit obtained from production of children food;
- cultural activities including cinema.

This paper considers that education and culture are effectively exempt. We ignore the exemption of children food as a minor point.

[57] The sales of trailers are taxed at 10 percent. We do not consider this point.

Value-Added Taxes

16. Value-added tax (VAT)

The value-added tax is introduced by the Federal Law N 1992-1 dated December 6, 1991 "On the Value-Added Tax". Its revenue is divided between the federal and provincial budgets in the proportion that is set by the law on the federal budget of a particular year.

The tax is found as the difference between the tax assessed on the total revenue of delivered products and the tax paid on intermediate goods and services written off in their production. All taxes are included in the tax base apart from VAT and the special tax paid on intermediate products[58]. A credit on the VAT paid on capital inputs can be deducted in equal installments within six months.

The rates for 1995 are 10 percent for a number of food staples and children apparel and footwear goods and 20 percent for the rest. The lists of goods taxed at 10 percent are listed in the Government Edicts N 888 dated November 20, 1992 "The List of Goods for Children That Are Taxed at the Rate of 10 Percent Starting in January 1, 1993" and N 659 dated July 1, 1995 "The List of Food Products That Are Taxed at the Rate of 10 Percent". We detail the following items taxed at 10 percent in our calculations

- Coats, overalls, jackets, suits, dresses, skirts, shirts, hoses and socks, sweaters, and footwear;
- Meat and fish products, butter, whole milk products, vegetable oil, sugar, bread, flour and groats, spaghetti, salt;
- Potato, vegetables, and eggs.

The Instruction of the State Tax Service N 39 dated October 11, 1995 "On the Rules of Calculation and Payment of the Value-Added Tax" lists other goods and services that are exempt from taxation. We consider the following exemptions

- goods and services exported to non-CIS countries;
- coal for household consumption;
- inner-city and suburban passenger transportation;
- rental payments;
- educational services including school and college eateries;
- scientific research including industrial design;
- cultural services including cinema;
- pharmaceuticals and medical services (excluding veterinary).

The Order of the State Customs Committee N 49 dated January 30, 1993 "On the Collection of the Value-Added and Excise Taxes on the Goods Exported to and Imported from the Russian Federation" explains that the VAT on imported goods applies at the same rates as those that apply to domestic producers. Tax base is the custom value of goods including excise tax and tariffs where applicable. For example, if the custom value is 1,000 rubles and tariff and excise rates are 30 percent, VAT at 20 percent rate is 260 rubles. The order explains that the VAT on the goods and services imported from the CIS is not collected on the border. This means that the cost of intermediate goods imported from those countries do not count towards tax credit.

[58] Unless the sum of tax paid exceeds the sum of tax collected from customers.

17. Special tax to support the most important economic sectors

This federal tax is introduced by the Presidential Decree N 2270 dated December 22, 1993 "On Changes in Taxation and Distribution of the Fiscal Authority among the Budgets". Its revenue is divided between the federal and provincial funds that support industries deemed to be important. The decree specifies that the tax base is the same of that of the VAT and sets the rate at 3 percent.

The Federal Law N 25-FZ dated February 23, 1995 "On the Special Tax to Support the Most Important Economic Sectors of the Russian Federation" lowers the tax rate to 1.5 percent and annuls the tax starting January 1, 1996.

The Instruction of the State Tax Service N 39 dated October 11, 1995 "On the Rules of Calculation and Payment of Value-Added Tax" explains that the new rate applies to tax obligations that have resulted after April 1, 1995. Before that date, the rate of 3 percent applies. The list of exemptions is identical to that of the VAT. We use weighted rate of 1.875 percent for the tax and combine it with the VAT in our calculations.

Appendix C: The Methodology of Calculating Individual Statutory Tax Rates.

Appendix B identified general tax parameters such as rates, bases, and main exemptions. Now we turn to constructing equations for individual statutory tax rates. We have to determine how to organize the available data. Since our main interest lies with the taxation of economic sectors, we normalize different tax rates to the sectoral revenue at consumer prices.[59]

The normalization is done in two steps. At first, we define tax bases and apply relevant *legal* rates (as they appear in the fiscal legislation) arriving at statutory tax liabilities in absolute values. Then, the liabilities are divided by the sectoral revenue. The ratio is the individual *statutory* tax rate. The rates are presented in Table C2.

In what follows, we explain data used and provide formulas for finding rates. The definition of parameters that we use below is provided in Table C1. The formulas to calculate individual statutory tax rates are as follows:

1) **Tax to support residential housing** applies to revenue at consumer prices minus VAT and export tariffs with no exemptions

$$Tax = Rate\left(\frac{RevG - VAT - Xtar}{RevG}\right) \qquad [C1]$$

2) **Tax on automobile road users** applies to revenue at consumer prices minus direct taxes (VAT, taxes on the sales of fuels, lubricating oils, and road vehicles, excise tax, and export tariffs). Agriculture, highway maintenance, and budgetary organizations are

[59] The value of a product at consumer prices is the sum of its value at producer prices and the direct taxes paid on the sale net of taxes paid on intermediate products. In the input-output framework, the value of the product at producer prices includes the following components: the cost of intermediate products (including the direct taxes net of subsidies on products and trade and transport margins), labor expenses gross of social contributions, gross profit, and the indirect taxes net of subsidies on production. Since our emphasis is on taxation, we subtract household production from the sectoral revenue as irrelevant to our research and add the net direct taxes paid by final consumers.

exempt. Sector of trade pays on trade turnover. Turnover for retail and wholesale trade comes from GKS [1997a, tables 15.1 and 25]

$$Tax = Rate(1 - Budg_2)\left(\frac{RevG - VAT - Xtar - Excise - Fuels}{RevG}\right) \qquad [C2]$$

	Parameter	Definition
1	*AllTax*	The value of all taxes apart from the VAT and CIT calculated according to the formulas provided below. It qualifies as business expenses for CIT purposes
2	*Asset*	The value of business property subject to corporate property tax
3	*Budg*	The share of budgetary organizations in a sector. We use data from GKS [2000b, table 2.11] and take the ratio of output of non-commercial service providers to total output of the sector to which they belong. If commercial sub-sectors are exempt as well, we combine them with non-commercial entries under the same name. Then, *Budg* has a numerical subscript attached
4	*CCA*	The capital cost allowance
5	$\mathbf{Cost^T}$	The transposed matrix of intermediate costs gross of taxes, domestic products only
6	*Empl*	The number of employees from the input-output table. Data for the sectors of fuels transport, communications, and finance are from GKS [1999a, table 2.6 and 9]
7	*Excise*	The value of excise taxes paid by a sector
8	*ExciseRev*	The value of products at producer prices subject to the excise tax and the tax on the sale of road vehicles or the value of products at producer prices plus the excise tax subject to the tax on the sales of fuels
9	*Fuels*	The value of taxes on the sales of fuels, lubricating oils, and road vehicles paid by a sector
10	$\mathbf{M^T}$	The transposed matrix of imported intermediate products from the input-output table
11	*Inv*	value of new capital investment from GKS [1999b, tables 2.7, 7.5 and 7.6];
12	*Loss*	The corporate loss as reported in GKS [1998d, table 3.7]
13	*Mineral*	The value of extracted minerals at producer prices
14	*MinWage*	The annual minimum wage for 1995 from SITE [2000]
15	*Rate*	The generic name for a legal rate of the tax considered in the paragraph (by default taken from Appendix B); **Rate** in bold means a vector of rates
16	***RevC***	The corporate revenue at consumer prices from the input-output table recalculated
17	*RD*	The sectoral expenditure on R&D (the sector "Science" from the input-output table)
18	*Tax*	The generic name for a statutory tax rate of the tax considered within the paragraph
19	*XnonCIS*	The value of sectoral export to non-CIS countries
20	*Xtar*	The export tariffs paid by a sector
21	*VAT*	The VAT paid by a sector
22	*VATnonCIS*	The VAT legal rates on products imported from non-CIS countries
23	*Wage*	The wage bill found according to the procedure explained in Appendix A1

Table C1: The list of parameters used in the equations of this appendix

3) **Tax on corporate property** is imposed on the residual value of fixed and current assets. We take data from GKS [1998d, table 3.36 and 1998c, table 7.7] for the residual value of fixed assets, the values of inventories and work-in-progress, and unfinished capital construction. Some sectors and components are missing while fuel sectors are aggregated. Proxies for missing parameters are obtained from a number of sources. The input-output table provides data on the fixed assets at purchase price and GKS [1997a, table 10.17] contains the same information for fuel sectors. These numbers set weights to distribute the residual among missing sectors.

The exempt assets are electric lines, roads, and communication lines, which are taken as the share of "constructions" in total fixed assets reported in GKS [1999b, table 3.2]. Exempt capital assets for food processing sector are found by weighting. The weight is one minus the ratio of the value of alcohol and tobacco products from GKS [1997a, table 10.76 and 1998a, table 4.11] to total sectoral output from GKS [1997a, table 10.73]. Agriculture, residential and communal services, science, education, and budgetary organizations are exempt. The equation to find the statutory tax rate is

$$Tax = Rate(1 - Budg_3)\left(\frac{Asset}{RevG}\right) \qquad [C3]$$

4) **Social contributions to the Pension, Social and Medical Insurance, and Employment Funds** are determined proportionally to the wage bill. Wages paid to military personnel are exempt from the last three funds. We find military wages as the share of defense labor cost to the total "management, defense, and NGO" labor expenses reported in GKS [2000b, table 2.25]. Rates for all funds are found according to the same formula

$$Tax = \left(\frac{Wage}{RevG}\right)\sum_{j=1}^{4} Rate_j \qquad [C4]$$

5) **Other payroll taxes** use two tax bases that we combine in a single equation with subscripts distinguishing between rates applied to wage bill and minimum wage bill. Budgetary organizations are exempt

$$Tax = \left(\frac{Rate_1 \cdot Wage + Rate_2 \cdot Empl \cdot MinWage}{RevG}\right)(1 - Budg) \qquad [C5]$$

6) **Tax on mining** and **tax to support prospecting** have the tax base that is not presented in a single source. We take data on production of fuels from GKS [1997a, table 10.32], iron ore – GKS [1998c, table 11.9], non-ferrous metals (bauxite, nickel, copper, zinc, tin, and lead) – Mineral Group [1998]. The value of silver and gold is from the input-output table (cell "the accumulation of pure wealth"), chemicals (sulfur, apatite, pyrite, nepheline) - GKS [1998c, table 11.16], and construction materials (sand and gravel) - GKS [1998c, table 11.69]. Prices are from GKS [1998a, table 4.11] adjusted to 1995 by the PPI indices from GKS [1998a, table 4.1]. the mining of table salt is miniscule and the sector of food processing, to which the salt mining belongs, is omitted from taxation. We use the same equation finding statutory rates for both tax on mining and tax to support prospecting that is

$$Tax = \frac{\sum_{j \in J} Rate_j \cdot Mineral_j}{RevG} \qquad [C6]$$

where j stands for a mineral belonging to sector J.

7) **Export and import tariffs** are levied on the total volume of trade given in the input-output table. For the purpose of taxation, we need to itemize data for particular product groups. GKS [1996c, table 357] contains numbers for the custom values in US dollars of 130 items that cover around 80 percent of total exports and 60 percent of imports for

1995. It distinguishes between the trade with CIS and non-CIS countries, which is used in the calculation of the excise tax rate. We convert the values from dollars into rubles using the annual average rate for 1995 as set by the Central Bank of Russia (data on exchange rate changes are from the legal database supported by *IST*). Several sectors are not represented in the data. Pharmaceuticals stand as the only item in sector "Other manufacturing" and its rate applies to the whole sector. The only service sector that is taxed is the sector "Other activities related to production and services" since it is treated in the input-output table in this way.[60] Its taxable items are not on the list of traded products and its rate is found as the ratio of export tariff to the value of export reported in the input-output table. For both import and export tariffs, we calculate the weighed average rate based on items reported. The tax bases are constructed differently for import and export. For import tariffs we take the sectoral value of import as reported in the table as the base. Export tariffs apply to the items reported in GKS [1996c, table 357] only. The rationale for different treatment lies in the assumption that export tariffs apply to a limited list of specific items and not to unmentioned products. On the contrary, import tariffs cover the whole range of unmentioned products. This assumption is justified by a more inclusive structure of import rates (that cover two-digit specifications of goods as mentioned in the Russian trade classification VED) whereas export rates apply to 4- or even 6-digit specifications.

The rates for excise tax and tax on the sale of fuels and road vehicles on imported items are included in import tariff rates since they are collected at the border.[61] To find the normalized sectoral rates of import tariffs, we multiply the transposed matrix of the intermediately consumed import by the weighed averages of import tariff rates. The rates for export are normalized by the ratio of the value of exported items to that of total output. The formula for finding the statutory export rate is

$$Tax = \frac{\sum_{j \in J} Rate_j \cdot Export_j}{RevG} \qquad [C7a]$$

where j stands for a product group from GKS [1996c, table 357] belonging sector J. The formula for the calculation of statutory import rate is

$$Tax = \frac{\mathbf{M}^{\mathbf{T}} \bullet \mathbf{Rate}}{RevG} \qquad [C7b]$$

8) **Excise tax** applies to the products of seven sectors. In addition, two of them pay **taxes on the sales of fuels, lubricating oils, and road vehicles**. Since the taxes are determined similarly, we consider them jointly. Generally, tax rate applies to the value of excisable products at producer prices. Since we do not have the total value of excisable products sold, we find it as the product of physical output and average producer prices. The data on physical output are from GKS [1997a, table 10.32 (oil), 10.38 (petrol and diesel fuel), 10.76 (alcohol and tobacco products); 1998c, table 11.25 (car tires), 11.42 (cars), and 11.72 (leather apparel)]. The wholesale price for gas is calculated using indices from

[60] Among possible items for export, the item "recycled paper" is apparently accountable for export tariff.

[61] The VAT on import is also collected on the border but since it is broad-based tax it is calculated jointly with the domestic VAT.

GKS [1996c, table 389].[62] The producer prices for other goods are from GKS [1998a, table 4.1 and 4.11] indexed to arrive at prices for 1995. The export to non-CIS countries is excluded from taxation apart from oil.[63] Data on export come from GKS [1996c, table 357] in the US dollars converted into rubles at the annualized exchange rate set by the Central Bank of Russia. The excise tax on the imported excisable goods is calculated as a part of import tariff (see above). Buses, both produced domestically and imported, are assumed to be purchased by passenger transportation companies that are exempt from the tax on the sale of road vehicles. Purchases of vehicles by agriculture are excluded as well. We take data on agricultural purchases of trucks from GKS [1997a, table 11.13]. The equation to find the statutory excise rate is

$$Tax = \frac{\sum_{j \in J} (Rate_j \cdot ExciseRev_j - XnonCIS_j)}{RevG} \qquad [C8]$$

9) **Corporate income tax** has the tax base that is the residual of the total revenue at consumer prices minus qualified expenses. We include the size of losses from GKS [1998d, table 3.7] to account for the non-transferability of losses within sectors. Deductible expenses are the value of intermediate inputs, the wage bill gross of the social contributions, the capital cost allowances (CCA), the indirect taxes, and the allowances on new capital investment and R&D. The first two items are from the input-output table. The value of CCA is given in absolute values in GKS [1999b, tables 3.4 and 4.4] but in a highly aggregated form. We use the product of total sectoral revenue at producer prices and the CCA weights in the sectoral revenue structure as a proxy for granted CCA. The weights are found as the shares of CCA in the cost structure reported in GKS [1998d, table 3.14 and 3.16; 1996a, p. 213, and 1998b, table 2.33] divided by the sum of one plus the rate of return on costs from GKS [1998d, table 3.11]. The last six sectors in the table have the undetermined cost structure. Then, the residual of the CCA from GKS [1999b] is divided among sectors according to their share in the fixed assets as reported in the input-output table. The sum of imputed taxes is assessed according to equations [C1-C8, C10]. Data on the R&D come from the input-output table as intermediate expenditure on sector "Science and prospecting". New investment is from GKS [1999b, tables 7.5 and 7.6]. Some service sectors are missing and we use data on capital assets that are put into operation as the proxy (see GKS [1999b, table 2.7]. This item is deductible in the amount that exceeds CCA granted in that period if the sum of two last exemptions does not exceed half of gross profit

$$Tax = Rate\left(1 + \frac{Loss - AllTax - Wage - CostG - CCA - InvRD}{RevG}\right)(1 - Budg_9) \qquad [C9]$$

$$InvRD = Min\left(Max(Inv - CCA, 0) + RD, \frac{RevG + Loss - AllTax - Wage - CostG - CCA}{2 \cdot RevG}(1 - Budg_9)\right)$$

10) **Value-added** (VAT) and **special taxes** apply to the output at consumer prices net of

[62] The base excise value for gas is from the Letter of State Tax Service N NP-6-02-02/62 dated February 8, 1995 "On indexing of wholesale price of natural gas for industries". It sets the price for February –81,232 Rubles per thousand m^3.

[63] It is unclear whether exported gas is taxed but, judging by indirect evidence, it is not (see Presidential decree N 2213 dated December 26, 1994).

VAT. The calculation of VAT proceeds in two steps. First, the gross tax liabilities are assessed at a given tax base. Second, the tax paid on intermediate products is deducted with the residual representing the net tax liability. Since we use the revenue gross-of-VAT normalizing rates to the same numeraire, we re-arrange terms getting VAT into the denominator. Budgetary organizations, pharmaceuticals, health, education, culture, and science establishments are exempt. The value of pharmaceutical output is from GKS [1997a, table 10.78].

Several food products are taxed at a lower rate. Their output in physical units is from GKS [1998c, table 11.80; 1997a, table 11.6 and 11.24] and their producer prices are from GKS [1998a, tables 4.1, 4.11]. We take 15 product groups (out of 38 groups for which data are available) for sector "Food processing" and 3 product groups (out of 12 groups) for sector "Agriculture". Adjusting for products taxed at lower rates changes tax credits that other sectors, that use them as intermediate inputs, receive. The rest of products taxed at lower rates do not generate the credit. They are for final consumption only, such as coal for households, children apparel, passenger inner- and by-city transportation, and residential rent. We exclude the value of these products from the VAT base directly. The amount of coal consumed by households in physical units and its producer price are from GKS [1997a, table 10.32 and 1996c, table 389]. The volume of children products in physical units is found on the basis of 10 items the production of which is reported in GKS [1998c, table 11.78]. Their average purchase price is approximated from the consumer prices reported in GKS [1998a, table 2.20]. The household expenditure on passenger transportation is from GKS [1996a, p. 5] and it is weighed by the share of passenger-km that inner-city and suburban transportation claims. The value of residential rent is from the survey of household expenditure on rent and utility reported in GKS [1997a, table 4.36] times the number of household reported in GKS [1997a, table 2.1].

Export values are from the input-output table and the shares of export to non-CIS countries are determined from GKS [1996c, table 357]. The VAT credit is the product of transposed matrix of intermediate costs from the input-output table and the vector of VAT rates as defined above

$$Tax = \frac{(RevG - XnonCIS) \times Rate - \mathbf{Cost}^{\mathrm{T}} \cdot \mathbf{Rate}}{(1 + Rate) \cdot RevG} \qquad [C10]$$

The total actual payment of taxes and fees is not reported for individual sectors. We construct an account of tax paid using information from a number of sources.

The principal source is the input-output table that provides number on the nominal value of assessed taxes. By definition, the sum of tax arrears and deferrals represents the difference between assessed and actually paid taxes. The problem is to determine what they were for the sectors appearing in the input-output table in 1995.

GKS [1998d, table 3.58] contains data on the total size of tax (and social fees) arrears at the beginning and the end of the year. They are insufficient for our purposes. Only four main sectors are presented with further disaggregation of the sector of mining and manufacturing into ten industries.

		Tax to support residential housing	Tax on automobile road users	Corporate property tax	Pension Funds	Social Insurance Fund	Mandatory Medical Insurance Fund	Employment Fund	Other payroll taxes	Tax on mining
1	Electricity	0.014	0.004	0.020	0.028	0.005	0.004	0.002	0.002	0.000
2	Oil extraction	0.010	0.002	0.060	0.015	0.003	0.002	0.001	0.001	0.073
3	Oil processing	0.014	0.003	0.006	0.006	0.001	0.001	0.000	0.000	0.000
4	Gas extraction	0.014	0.002	0.030	0.009	0.002	0.001	0.001	0.001	0.018
5	Coal and other fuels mining	0.015	0.004	0.032	0.058	0.011	0.007	0.004	0.004	0.058
6	Iron and steel	0.015	0.004	0.021	0.020	0.004	0.003	0.001	0.002	0.001
7	Non-ferrous metallurgy	0.015	0.004	0.024	0.026	0.005	0.003	0.002	0.002	0.005
8	Chemical and petrochemical industry	0.015	0.004	0.033	0.023	0.004	0.003	0.002	0.002	0.000
9	Machine building and metal processing	0.014	0.004	0.039	0.043	0.008	0.006	0.003	0.004	0.000
10	Wood and paper	0.014	0.004	0.024	0.039	0.008	0.005	0.003	0.003	0.000
11	Construction materials	0.014	0.004	0.024	0.036	0.007	0.005	0.003	0.003	0.002
12	Textile, apparel, and footwear	0.015	0.004	0.028	0.050	0.010	0.006	0.004	0.005	0.000
13	Food processing	0.015	0.004	0.003	0.018	0.004	0.002	0.001	0.001	0.000
14	Other manufacturing	0.015	0.004	0.035	0.047	0.009	0.006	0.003	0.004	0.000
15	Construction	0.014	0.004	0.011	0.055	0.011	0.007	0.004	0.004	0.000
16	Agriculture and forestry	0.015	0.000	0.002	0.038	0.010	0.007	0.004	0.005	0.000
17	Transportation	0.013	0.004	0.029	0.050	0.010	0.006	0.004	0.004	0.000
18	Communications	0.013	0.004	0.009	0.056	0.011	0.007	0.004	0.004	0.000
19	Trade, intermediation, and food services	0.013	0.001	0.010	0.026	0.005	0.003	0.002	0.002	0.000
20	Other activities related to production and services	0.013	0.004	0.020	0.132	0.025	0.017	0.009	0.010	0.000
21	Residential, communal, and household services	0.015	0.003	0.003	0.063	0.012	0.008	0.004	0.004	0.000
22	Health, education, and culture	0.015	0.001	0.008	0.088	0.017	0.011	0.006	0.001	0.000
23	Science, geology, and meteorology	0.015	0.002	0.036	0.071	0.014	0.009	0.005	0.003	0.000
24	Finance, credit, and insurance	0.013	0.004	0.012	0.074	0.014	0.010	0.005	0.006	0.000
25	State and commercial management and NGO	0.015	0.000	0.001	0.091	0.011	0.007	0.004	0.000	0.000
Billions of rubles	**Sum**	**36,556**	**7,036**	**46,046**	**111,146**	**20,769**	**13,846**	**7,692**	**6,999**	**8,044**
	Memo: Assessed taxes	*20,522*	*7,032*	*25,348*	*95,006*	*20,596*	*11,537*	*6,200*	*6,775*	*7,156*
	Memo: Actual collection	*12,285*	*4,754*	*15,790*	*73,709*	*15,979*	*8,951*	*4,810*	*4,345*	*6,756*

Table C2: Sectoral statutory tax rates 1995 as fraction of the revenue at consumer prices

		Tax to support prospecting	Import duties	Export duties	Excise taxes	Taxes on the sales of fuels, lubricating oils, and road vehicles	Corporate income tax	Value-added and special taxes	**Total**
1	Electricity	0.000	0.003	0.000	0.000	0.000	0.030	0.058	**0.170**
2	Oil extraction	0.091	0.003	0.227	0.182	0.000	0.000	0.088	**0.759**
3	Oil processing	0.000	0.004	0.037	0.057	0.151	0.007	0.034	**0.322**
4	Gas extraction	0.023	0.005	0.051	0.429	0.000	0.005	0.025	**0.614**
5	Coal and other fuels mining	0.036	0.007	0.000	0.000	0.000	0.001	0.032	**0.269**
6	Iron and steel	0.002	0.011	0.007	0.000	0.000	0.042	0.000	**0.132**
7	Non-ferrous metallurgy	0.030	0.005	0.017	0.000	0.000	0.075	0.000	**0.212**
8	Chemical and petrochemical	0.000	0.009	0.015	0.002	0.000	0.043	0.000	**0.155**
9	Machine building and metal processing	0.000	0.013	0.007	0.006	0.016	0.011	0.041	**0.215**
10	Wood and paper	0.000	0.008	0.030	0.000	0.000	0.035	0.011	**0.184**
11	Construction materials	0.003	0.005	0.000	0.000	0.000	0.040	0.060	**0.205**
12	Textile, apparel, and footwear	0.000	0.048	0.004	0.006	0.000	0.000	0.029	**0.207**
13	Food processing	0.000	0.021	0.003	0.017	0.000	0.051	0.007	**0.148**
14	Other manufacturing	0.000	0.011	0.001	0.000	0.000	0.002	0.016	**0.153**
15	Construction	0.000	0.011	0.000	0.000	0.000	0.043	0.085	**0.248**
16	Agriculture and forestry	0.000	0.009	0.000	0.000	0.000	0.000	0.032	**0.122**
17	Transportation	0.000	0.004	0.000	0.000	0.000	0.032	0.105	**0.260**
18	Communications	0.000	0.006	0.000	0.000	0.000	0.060	0.124	**0.298**
19	Trade, intermediation, and food services	0.000	0.003	0.000	0.000	0.000	0.146	0.125	**0.337**
20	Other activities related to production and services	0.000	0.020	0.000	0.000	0.000	0.000	0.124	**0.375**
21	Residential, communal, and household services	0.000	0.003	0.000	0.000	0.000	0.000	0.000	**0.116**
22	Health, education, and culture	0.000	0.008	0.000	0.000	0.000	0.000	0.000	**0.156**
23	Science, geology, and meteorology	0.000	0.005	0.000	0.000	0.000	0.005	0.000	**0.165**
24	Finance, credit, and insurance	0.000	0.005	0.000	0.000	0.000	0.029	0.108	**0.280**
25	State and commercial management and NGO	0.000	0.006	0.000	0.000	0.000	0.000	0.000	**0.135**
Billions of rubles	**Sum**	**11,129**	**21,148**	**28,687**	**37,039**	**15,231**	**108,074**	**135,873**	**615,315**
	Memo: Assessed taxes	*2,422*	*9,074*	*19,163*	*28,378*	*7,837*	*129,914*	*119,936*	*516,896*
	Memo: Actual collection	*2,287*	*8,473*	*15,709*	*24,064*	*6,577*	*117,614*	*106,130*	*428,233*

Table C2: (continued …). Sources: Author's calculations apart from the actual tax revenue (from Table A1) and the assessed taxes on sales (from the input-output table)

No data on tax deferrals (the change in total minus overdue tax debts) are presented. Alfandari and Schaffer [1996, Table B3] refer to an unavailable to us GKS publication that has data on the stock of tax debt on the beginning of 1995. Assuming that the ratio of

total to overdue debt stayed the same during the year, we can approximate the size of tax liabilities accumulated over the year as the growth in tax arrears times the ratio of total accumulated taxes to tax arrears.

The value of arrears to the extra-budgetary funds is unavailable on the flow basis. The only information available to us is the total stock on the end of the year. No data on deferrals to social funds are present. We find the change in the total social fees liabilities by assuming that sectors treated fees identically to taxes. Technically, the equation of finding the change is

$$\Delta TotalFees_{95} = StockArrearsFees_{end95}\left(\frac{\Delta ArrearsTaxes}{StockArrearsTaxes_{end95}}\right)\left(\frac{StockTotalTaxes_{start95}}{StockArrearsTaxes_{start95}}\right) \quad [C11]$$

Yet, the estimates found cover only 13 out of 25 sectors. Apparently, GKS did not calculate both total debt and arrears for the rest of sectors prior to 1998. We should find a reasonable proxy for them.

The following approach is used. There is a sample of accounting information for 4,244 companies for 1997.[64] We take the values of the stock of tax and social fees debt on the beginning of 1997 and find the ratio of the debt to total revenue for each missing sector[65] and for the sector of mining and manufacturing, which serves as a benchmark. Then, we approximate the value of tax arrears and deferrals accumulated during 1995 as

$$\Delta SectorTax_{95} = \left(\frac{SectorRatioTaxDebtRevenue_{Start97}}{IndustryRatioTaxDebtRevenue_{Start95}}\right)\left(\frac{SectorRevenue_{95}}{IndustryRevenue_{95}}\right)\Delta IndustryTax_{95} \quad [C12]$$

Apart from finding the change in the stock of tax and fees liabilities, we calculate parameters that are used in testing the hypotheses on tax avoidance and non-payment. There are three parameters of interest: average size of the firms within sectors, concentration ratio, and the fraction of consumables in the total use. The rationale for mentioning these parameters is provided in Section 3.Total number of employed within sectors is presented in the input-output table. We find the number of enterprises in GKS [1997a, table 9.1 and individual tables related to sectors of manufacturing and mining], which is the average for the year.

The concentration ratio for four largest firms (CR4) is from GKS [1997a, table 10.9] for the sectors of manufacturing and mining. Other sectors are found using the sum of the revenue of four largest companies received in 1997 (from the sample of 4,244 companies introduced above) to total revenue reported in that year.

[64] It is introduced in Ivanenko [2001, Appendix A].

[65] The sector of residential housing is represented by gas utilities and hotels and the sector of health – by sanatoriums and tourist agencies. The sector of banking is approximated using reports of investment companies. No data is reported on general government that is assumed to be similar to the sector of residential housing.

	Ratio of consumables to total use (fraction)	Average number of employees (in thousands)	Concentration ratio CR4	Gross profit
Electricity	0.037	0.896	0.189	0.330
Oil extraction	0.001	0.931	0.378	0.716
Oil processing	0.034	0.687	0.451	0.371
Gas extraction	0.014	0.752	0.900	0.706
Coal and other fuels mining	0.015	0.872	0.266	0.307
Iron and steel	0.001	0.817	0.395	0.263
Non-ferrous metallurgy	0.000	0.377	0.371	0.406
Chemical and petrochemical	0.074	0.186	0.141	0.272
Machine building and metal processing	0.107	0.128	0.166	0.262
Wood and paper	0.111	0.091	0.167	0.287
Construction materials	0.042	0.137	0.042	0.320
Textile, apparel, and footwear	0.667	0.084	0.050	0.199
Food processing	0.545	0.134	0.029	0.280
Other manufacturing	0.086	0.048	0.138	0.190
Construction	0.017	0.036	0.013	0.353
Agriculture and forestry	0.434	0.058	0.002	0.137
Transportation	0.343	0.165	0.049	0.463
Communications	0.300	0.106	0.208	0.521
Trade, intermediation, and food services	0.305	0.015	0.011	0.634
Other activities related to production and services	0.181	0.051	0.049	0.236
Residential, communal, and household services	0.584	0.067	0.007	0.138
Health, education, and culture	0.113	0.090	0.010	0.275
Science, geology, and meteorology	0.000	0.023	0.055	0.290
Finance, credit, and insurance	0.080	0.020	0.482	0.355
State and commercial management and NGO	0.080	0.022	0.010	0.200

Table C3: Parameters used in the regressions in Section 3, in fraction to total apart from the average number of employees per establishment, data for 1995. Sources: Consumables (household consumption) and gross profit (the difference between output at consumer prices and the sum of intermediate input costs and wages) are from the input-output table. See references in the text for other columns. Author's calculations