ВОПРОСЫ ТЕОРИИ

Tax Collection, Transfers, and Corruption: the Russian Federation at the Crossroads[1)]

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Abstract

After theoretically considering the problems of tax collection and corruption, we empirically analyzed our theoretical findings using a unique data set on Russian regional governments. Our theoretical models predict that the Russian system of transfers does not ensure an adequate level of incentives for tax collection by its subnationals and that, under certain condition, the numbers of tax inspection employees are inversely related to the tax collection. Empirical evidence strongly buttresses our theoretical findings and sheds significant light on one of the most contentious issue (intergovernmental fiscal relationship) in the Russian Federation.

Introduction

Sharing resources between the federal government and the subnational governments is one of the most contentious problem in the Russian transition towards decentralization, complacency about the existing level of corruption among government employees has helped to put Russian corruption index close to those of Cote d'Ivoire, Honduras, India, Tanzania, and Zimbabwe. Unorthodox incentives and a web of inefficient institutions are keeping Russia from the realization of its true economic potential. Inappropriate fiscal incentives, negotiable fiscal federalism, and corruption have led to perverse results for the Russian Federation (RF). Inefficient

[1)] This paper was prepared under the research program "Transforming Government in Economies in Transition" (GET) sponsored by the Ford Foundation. This paper would not have been possible without the support of numerous GSU/USAID Russian Federation Fiscal Reform Project staff. We also thank Selcuk Caner, Paul Gregory, Oleh Havrylyshyn, Marshall Goldman, Barry Ickes, Vladislav Kontorovich, Leonid Polishchuk, Janet Wagner, Olga Vorontsova, and Ekaterina Zhuravskaya for useful comments and suggestions. We also wish to express our gratitude for useful comments received during seminars at the IMF, Washing ton, DC, and the New Economic School, Moscow Russia. Remaining errors are our own.

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Статья поступила в Редакцию в июле 2002 г.

revenue sharing arrangements, lack of well-define tax rights, and corruption are significant causes of Russia's poor economic performance – see, Andrei Shleifer (1997), Daniel Berkowitz and Wei Li (1997), Ekaterina V. Zhuravskaya (1998), and Daniel Treisman (1999a)[2]. Jorge Martinez and Jameson Boex (998) point out that, Shleifer and Treisman (2000) conclude that, in the reform of state finance, Russia's reformer have never found a way forward (p. 184). This paper fills a significant void by providing theoretical and empirical analyses of the intergovernmental revenue assignment system and the corruption problem in the Russian Federation. Our analyses identify the system of transfers and widespread corruption among tax inspection employees as significant causes for inadequate tax collection in the RF. We use a unique data set that allows us to quantify the inadequacy of the transfer system and to capture the illusive effect of corruption on the RF tax collection process.

In the RF, subnational governments play a more important role in tax collection than those of the Czech Republic and Poland. For 1997, tax collection by the subnational governments in the Czech Republic and Poland were only 5% and 3% of GDP, respectively, while that of Russian subnational governments was 12% of GDP (see Table 1). Table 1 also shows that as a share of GDP, Russia does not collect as much in taxes as is collected in the Czech Republic and Poland. The Russian central government collects a low share of GDP, while subnational governments collect a relatively large share compared to transition successes such as Poland and the Czech Republic. The fact that subnational governments have incentives to under-collect national taxes is evident in Treisman (1999c).

Several striking features of the Russian transitional economy come together in the move towards collecting taxes. First, the transition towards a market-based economy has created large pockets of profitable opportunities, where in private sector pay significantly exceeds that of public employees. This may imply that the government implicitly has accepted the widespread bribery of its own employees (Timothy Besley and John McLaren, 1993). Second, a substantial increase in wealth inequality has made it very profitable for the rich to evade paying taxes by paying a small fee. Third, low public sector pay, coupled with chronic government wage arrears, has left public employees in a dire situation, disposed to use their offices and positions for personal gain (John D. Donahue, 1989, Shleifer and Robert W. Vishny, 1993, and Shleifer and Vishny, 1994). Fourth, tax inspection employees are allowed to *negotiate* the actual tax payments by taxpayers that owe a substantial amount of taxes. Fifth, the transitional nature of the economy and the instability of the political process and governmental jobs have made tax inspection employees behave as 'nonstationary' (Mancur Olson, 1995). Accordingly, in the countries in transition a fertile ground for corruption and predatory behavior is created. This leads to a series of challenging problems for government interventions (Daron Acemoglu and Thierry Verdier, 2000). In this paper, our theoretical models and empirical analysis shed lights on some of these problems.

[2] Shleifer discusses the fact that the laggerd reform in Rassia is due to inappropriate fiscal incentives, lack of well define rules, negotiable fiscal federalism, and corruption. Zhuravskaya shows that revenue sharing schemes between regional and local governments are an impediment to both increasing the tax base and the growth of new businesses. Berkowitz and Li show that lack of well-defined tax rights in Russia is the significant cause of Russia's poor economic performance. Treisman provides evidence that shows perception of corruption is endemic to federal states.

For understanding the tax collection process in the RF intergovernmental fiscal relationship system we must explicitly incorporate the transfers' rule in the subnational governments' optimization problem and allow for bribes in the tax inspectors' profit function. This framework lets us demonstrate that federal transfers could, positively or negatively, influence the subnational governments' *tax collection efforts*. But, in either case, this invariably leads to a negative impact on the actual tax collected by the subnational governments. Additionally, our theoretical analysis shows that increasing the number of tax inspection employees may in fact lead to a decrease in the tax revenue collected by the government. For quantifying the tax efforts and the corruption problem a data set which is capable of representing regional tax collection efforts and capturing the corruption effect is required. Hence, we use a unique regional data set, including previously unpublished regional data on tax arrears and tax deferrals, which let us to approximate important theoretical and empirical variables. Our theoretical model and our regional data set provide a unique opportunity to shed light on many thorny issues in the RF tax system.

In Section I, we develop a theory of the tax collection incentive mechanism that sheds light on the tax collection problem in the Russian intergovernmental fiscal relationship system. Our model show that the transfers rule is the root cause of under-provision of tax collection incentives among the subnational governments to collect (federal and local) taxes. In Section II, we present a model that captures the motivation for accepting bribes by corrupt tax inspectors. This model yields a negative relationship between the number of per capita tax inspectors and the per capita tax collection. In Section III, we use our regional data set of the RF to present an empirical analysis of the underlying issues. Empirical evidence strongly supports our theoretical findings and sheds lights on the present tax collection problems in the RF. Conclusions are presented in Section IV.

I. A Model of Tax Collection Incentive Mechanism

We consider a country (Russian Federation) which consists of a large number of independent subnational governments (i=1,2,… N). Subnational government i collects federal and local taxes and can increase local tax collection by applying a higher level of effort e_i, from which it derives disutility[3)].

Federal taxes (FR_i) are used to provide pure public good G and to make transfers TR_i to subnational governments. Local taxes form own revenue (OR_i) of the region i. Hence, the total revenue of subnational government RS_i consists of own revenues OR_i plus transfers TR_i. We assume that a subnational government can

[3)] Since 1994, the reform of revenue assignment has led to some new features in the system (also, see the appendix to this paper). On the one hand, official revenue (federal/subnational) sharing rates for major taxes are standardized across regions. On the other hand, actual sharing rates between the federal and subnational governments, in practice, have always differed from the ones stated in the federal budget. This is particularly true for VAT, which continues to be shared on a derivation basis. Special treaties with some regions also break the standard sharing rates. Hence, soft-budget constraints of the past system are being extended to the present transitional environments amongst the central government and the subnational governments.

spend no more than the amount of local tax revenue plus transfers[4]. Thus, we postulate that the utility of a subnational government depends positively on its per capita revenue RS_i/N_i and public goods G, which are provided by the central government, and negatively on the level of effort e that it exerts for tax collection, i.e., $u = u(RS_i / N_i, G, e_i)$.

Accordingly, we summarize this general framework as follows:

$$RS_i = OR_i + TR_i, \tag{1}$$

$$\frac{RS_i}{N_i} = \frac{OR_i + TR_i}{N_i}, \tag{2}$$

$$\sum_1^N TR_i + G = \sum_1^N FR_i, \tag{3}$$

$$u = u(RS_i / N_i, G, e_i), \tag{4}$$

and

$$\begin{aligned} OR_i &= OR_i(e_i), \\ FR_i &= FR_i(e_i) \end{aligned} \tag{5}$$

where, (5) shows that tax collection depends on effort.

Expenditure responsibilities, which are divided between the central government and subnational governments, have different priorities. Some of these responsibilities, such as salaries of teachers, are of the first priority and form the minimum expenditure budget M_i. Such a measure M_i is usually negotiated with the central government and may reflect the size of the population in the region as well. Transfers TR_i either cover a portion of the gap between the minimum expenditure budget and local tax revenue ($M_i - OR_i$) or take a portion of the budget surplus to the central government budget[5],

$$TR_i = \alpha[M_i - OR_i]. \tag{6}$$

Because individual regions cannot significantly influence the size of the federal government budget (3) and the amount of public good G, the utility function of a subnational government will only depend on its per capita revenue and tax collection effort. This allows for depicting the subnational government problems as follows:

$$\begin{aligned} &\max \quad u\left(\frac{RS_i(e_i)}{N_i}, e_i\right) \\ &s.t. \\ &\quad RS_i = (1-\alpha)OR_i + \alpha M_i \\ &\quad OR_i = OR_i(e_i); \\ &\quad e_i \in [0,1] \end{aligned} \tag{7}$$

[4] By early 1998, Lev Freinkman (1998) estimates the total accumulated amount of subnational debt to be about six percent of GDP.

[5] To improve the efficiency of transfers, a formula-driven system has been introduced and is in use. However, not all kinds of transfers are driven by formula and the system of negotiations (soft-budget constraints) over the size of certain transfers has survived. This process continues to have a significant role in the reallocation of resources from the top to the bottom.

Equation (7) shows that utility is an increasing function of per capita revenue of a subnational government and a decreasing function of tax collection effort. However, the relationship between tax revenue and effort is not linear. Tax revenue increases as effort increases, but after effort exceeds some critical value, tax revenue decreases as effort increases, i.e., too much effort reduces tax collection. Hence, own tax revenue of subnational government OR_i is concave and has a maximum on the interval (0,1).

We now consider a separable utility function for the subnational governments, i.e.,

$$u(RS_i / N_i, e_i) = h(\frac{RS_i}{N_i}) - g(e_i), \tag{8}$$

where $h' > 0$ and $h'' \le 0$; thus, the utility of a subnational government is a concave and monotonically increasing function of its per capita revenue. We assume $g' > 0$ and $g'' \ge 0$, which show that exerting tax collection effort leads to disutility for the subnational government. Other descriptions (constraints) of this example are as follows,

$$\begin{aligned} & RS_i = (1-\alpha)OR_i + \alpha M_i; \\ & OR'_e > 0, e \in [0, e_i^*); \\ & OR'_e < 0, e \in (e_i^*, 1]; \\ & OR''_{ee} < 0; \end{aligned} \tag{9}$$

which show, among other things, that own revenue is a concave function of tax collection efforts with the maximum being between zero and one. Maximizing (8) with respect to the constraints in (9) leads to:

$$\dot{u} = \frac{du}{de} = h'(\frac{RS_i}{N_i})\frac{RS_i'(e_i)}{N_i} - g'(e_i); \tag{10}$$

where $\dot{u} < 0$ on $e \in [e^*, 1]$ and $\dot{u} \ge 0$ on $e \in [0, e^*)$. Thus, optimal effort is $e^{opt} \in [0, e^*)$. To arrive at an internal solution, optimal effort should not equal zero. Thus, the optimal effort decreases as α increases. Therefore, the lack of incentive to collect taxes can be easily seen from:

$$d\dot{u} = (h' RS'_e / N_i - g'(e_i))'_e \, de + (h' RS'_e / N_i - g'(e_i))'_\alpha \, d\alpha = 0 \tag{11}$$

that,

$$\frac{de}{d\alpha} = \frac{-(\frac{h''(1-\alpha)}{N^2{}_i}(M_i - OR_i) - \frac{h'}{N_i})OR'_e}{h''((1-\alpha)OR'_e)^2 / N_i^2 + (1-\alpha)h'OR_{ee}'' / N_i - g''(e_i)}. \tag{12}$$

This can be used to establish a negative relationship between the share of central government transfers and the amount of subnational tax collection. For the majority of regions, which are recipients, minimum responsibilities (expenditures) exceed their own income $(M_i - OR_i) > 0$.

Then, $\frac{de}{d\alpha} < 0,\ e \in [0, e^*)$ and $\frac{de}{d\alpha} > 0, e \in (e^*, 1]$. If optimal tax effort is on *the increasing interval of the own revenue curve*, then each increase in the share of central government transfers will lead to a decrease in tax collection effort by the subnational government. A decrease in tax effort, in turn, will lead to *a decrease in tax collection*. If optimal tax effort *is on the decreasing interval of the own revenue curve,* than each increase in the share of central government transfers will lead to an increase in the tax collection effort of the subnational government. An increase in the tax collection effort, in turn, will again lead to a *decrease in tax collection*. In our empirical analysis, therefore, we should observe that a higher level of subnational tax collection leads to a lower level of central government transfers.

II. A Model of Corruption

Consider an economy where the taxpayers face tax rate t while receiving taxable income Y. In this economy, the tax payers tend to hid their true income Y, report S ($< Y$) as their true income, and pay $t(S)$ [$< t(Y)$] to the government. Tax inspectors are supposed to discover Y and collect $t(Y)$ for the government.

In this economy, the tax inspectors maximize their own expected profit, which consist of wages W from the government and bribes $b(Y)$ from the taxpayers

$$[W + b(Y) < t(Y)],$$

i.e., if they discover Y. The probability of discovering Y by the tax inspectors is q, which positively depends on the number of per capita tax inspectors, $q = q(m)$. Similarly, per capita tax revenue r positively depends on the probability of discovering the true income, $r = r(q)$. Moreover, the probability that a tax inspector exhibits *non-corrupt* (honest) behavior is h. Conversely, $(1-h)$ is the probability that this tax inspector behaves in a *corrupt* (dishonest) manner. The tax inspectors can change h at will. Higher values of h leads to more per capita tax revenue r for the government, $r = r(h)$. In the absence of corruption increasing the number of per capita tax inspectors (m) may increase per capita tax revenue (r); however, in the presence of corruption this relationship could be negative, i.e., $(dr/dm) < 0$.

Given the above, the government expected tax revenue is

$$q[ht(Y) + (1-h)t(S)] + (1-q)t(S),$$

if Y is not known with certainty and is $[ht(Y) + (1-h)t(S)]$, if Y is known with certainty. In the presence of corruption, if the tax inspector discovers Y, he lets the taxpayer pay $t(S)$ to the government and bribe $b(Y)$ to the tax inspector (himself), such that, $t(S) + b(Y) < t(Y)$.

The government handles this type of corruption by changing the number of per capita tax inspectors m and/or by changing the probability of tax inspectors being fired p. This implies that, for a proactive government such as this, the expected per capita tax revenue r is given by

$$r = (1-p)\{q[ht(Y) + (1-h)t(S)] + (1-q)t(S)\} + pt(Y). \quad (13)$$

We assume that p negatively depends on r and that the tax inspectors know this ($\partial p/\partial r < 0$). Given this knowledge, to maximize profit, tax inspectors change their behavior by changing h.

Now, we will show that the equilibrium level of h negatively depends on m, *i.e.*, $dh/dm < 0$. This allows us to show that

$$dr/dm = (\partial r/\partial q)(dq/dm) + (\partial r/\partial h)(dh/dm)$$

or

$$dr/dm = r'_q(dq/dm) + r'_h(dh/dm)$$

takes a negative value under certain circumstances. That is, we may observe that the higher the number of per capita tax inspectors the lower the per capita tax revenue.

First, we note that h and q directly influence capita tax revenue. Letting

$$x'_z = \partial x/\partial z \text{ and } x''_{zz} = \partial^2 x/\partial z \partial z,$$

this is represented by:

(14) $r'_h = (1-p)[t(Y) - t(S)]q > 0,$

(15) $r'_q = (1-p)h[t(Y) - t(S)] > 0,$

and that,

(16) $r''_{hh} = 0,$

(17) $r''_{hq} = (1-p)[t(Y) - t(S)] > 0.$

Second, we note that, apart from the risk of being fired, the tax inspector's expected bribe is $q(1-h)b(Y)$. Taking his wage W and the probability of being fired p into account, the tax inspector's expected income is $[W + q(1-h)b(Y)](1-p)$. Hence, the tax inspector's problem is:

(18) $\max [W + q(1-h)b(Y)](1-p)$

s.t

(19) $p = p(h),$

and

(20) $r = r(h, q).$

This maximization problem yields

(21) $-p'_r r'_h [W + q(1-h)b(Y)] - (1-p)q\, b(Y) = 0,$

as the first order condition. Given $p = p[r(h, q)]$ and $r = r(h, q)$, the sign for dh/dq may be obtained by taking the full differential of the first order condition (21), that is,

(22) $[-p''_{rr}(r'_h)^2 A + p'_r r'_h q\, b(Y) + q\, b(Y)\, p'_r r'_h]dh +$
$+ [(-p''_{rr} r'_h r'_q A - p'_r r''_{hq} A - p'_r r'_h(1-h)b(Y) - (1-p)b(Y) + p'_r r'_q q b(Y)]dq = 0,$

where $A = W + q(1-h)b(Y)$. Solving for dh/dq leads to:

(23) $dh/dq = \{[p''_{rr} r'_h r'_q + p'_r r''_{hq}]A + [p'_r r'_h(1-h) - (1-p) + p'_r r'_q q]b(Y)\}/$
$/[2p'_r r'_h q\, b(Y) - p''_{rr}(r'_h)^2 A],$

which is negative ($dh/dq < 0$) if we note that the probability of being fired p is inversely related to the per capita tax revenue, such that, $p'_r < 0$ and $p''_{rr} > 0$.
We can rewrite $dr/dm = r'_q(dq/dm) + r'_h(dh/dm)$ to obtain

(24) $dr/dm = r'_q(dq/dm) + r'_h(dh/dq)(dq/dm),$

where $r'_h(dh/dq)(dq/dm)$ reflects the *corruption effect* and as we just have shown it is negative. On the other hand, $r'_q(dq/dm)$ reflects the *non-corruption effect*

which is positive. Therefore, when $|r'_h(dh/dq)(dq/dm)| > r'_q(dq/dm)$, an increase in the number of per capita tax inspectors will lead to a decrease in per capita tax revenue $dr/dm < 0$.

III. Empirical Evidence

A. Data description

The main sources of data are Goskomstat (1998), the Central Bank of Russia (1997), and the Ministry of Taxation and Fees. The Ministry of Finance also provided data not available from the above sources. While there are 89 regions in the *RF*, lack of observations on some of the variables left us 72 regions with complete data. Table 2 presents definitions, notations, and descriptive statistics for our data.

For 1997, Table 2 shows that average subnational revenue (*RS*) for the 72 regions included in our data set was 3,655 million (old) rubles, i.e., average subnational government revenue was about 630 thousand dollars at an average exchange rate of 5.8 rubles per dollar. Ninety percent [(3,149+157)/3,655] of this revenue was obtained by retaining taxes collected at the subnational level. However, the relative value of Federal transfers (*TR*) to the subnational government revenue (354/3,655) is 9.7 percent, which is more than twice the same ratio for the *VAT* collection retained in the region (157/3,655). This suggests that federal transfers have substantive impact on the subnational revenues.

Subnational tax effort (*E*) is measured by the inverse of tax arrears and tax deferrals to the subnational governments, i.e. $E = 1/(\text{tax arrears}+\text{tax deferrals}+1)$. This reflects the fact that reduction in tax arrears and tax deferrals may reflect increased vigilance in collecting taxes. The subnational tax arrears are not, however, uniformly distributed. The top thirty subnational governments with tax arrears in excess of one percent are owed seventy seven percent of all tax arrears in the Russian Federation.[6)] While a host of institutional, geographical, and demographic reasons may have created arrears and their uneven distribution, government tax inspection employees may have had a substantive role in this as well.

B. Federal Transfer to Regions

The federal government, among other things, decides on the size of transfers by using the *tax capacity* of regions, which also reflects the importance of any region and the level of influence that the region may exert on the federal government. Thus, the federal government decreases transfers to the regions as the regions' tax capacity increases. Conversely, an increase in tax capacity allows regional authorities to bargain for further transfers. For the period of 1994–1998, the federation government used the actual tax collection (*OR*) as the measure of tax capacity; thus, we use this measure to model the federal government transfer (*TR*) policy. Additionally, we include quadratic values of *OR* to capture the ability of large regions with large tax capacity to bargain for more transfer.

[6)] Data shows that, apart from seven regions, all of the other subnational governments are owed money by their taxpayers. A data appendix is available upon request from the authors.

Because seventy-five percent of all *VAT* collected by subnational governments is passed to the federal government and the regional governments retain the rest, we expect the federal government to reward the regional government for its efforts in *VAT* collection. We expect to observe a favorable transfer policy when more *VAT* is collected and, thus, more *VAT* is retained.

While, the secession tendencies in Russia will eventually abate (Peter Murrell, 1995), the ongoing conflict between center and regions allows for strategic behavior by the regional governments. Treisman (1996a, b, c) shows that regional governments causing the most trouble for the central government, e.g., separatist movements, are the ones to receive the most transfers (Berkowitz, 1996). Hence, we expect regional distance to Moscow (*L*) to positively influence *TR*. Moreover, we use the number of credit agency branches per capita in each region (*NF*) to represent the level of financial sophistication and development in each region. We summarize all this in the following functional form:

$$TR_i = f\,(OR_i,\ OR_i^2,\ VAT_i,\ L_i,\ NF_i), \tag{25}$$

where i (=1,2,3...N) shows the ith region and, *a priori,* we expect: $\partial TR/\partial OR<0$, $\partial TR/\partial L>0$, and $\partial TR/\partial NF>0$.

C. Subnational Tax Collection

Tax Collection Effort and Tax Capacity

Decreases in tax arrears and tax deferrals indicate higher tax collection efforts. At any given time, in the majority of regions, there are stocks of tax arrears and a flow of tax deferrals, which may lead to arrears in the future. We approximate tax collection effort (*E*) by the inverse of per capita subnational tax arrears and tax deferrals [E = 1/(tax arrears+tax deferrals+1)]. Given that tax inspection employees exercise considerable power in allowing for tax deferrals by taxpayers and collecting tax arrears, we expect a direct relationship between E and subnational tax collection (*OR*).

The RF government uses tax capacity to determine the size of transfers to the subnational governments. Despite the fact that the RF used 'actual tax collection' for its transfer to the regions during 1994–1998, there is no perfect method for estimating the 'true' tax capacity.[7)] To approximate subnational true tax capacity, we use a host of relevant variables: per capita subnational tax debt to the consolidated

[7)] Tax capacity is usually estimated by the actual tax collection (which was used in Russia during the 1994–1998 period), average per capita income in the region, or gross regional product (GRP). Actual tax collection does not capture tax capacity because it implicitly contains information on tax collection effort and other factors. Actual tax collection may be higher in one region than in another region because of different levels of tax collection efforts or because of different tax evasion tendencies. Average per capita income, which could be easily measured, has its own drawbacks as well. As a measure of tax capacity, average per capita income not only does not take into account the shadow economy but also ignores the fact that the regional authorities may tax economic resources which do not belong to the people living in their region. Gross regional product (GRP), which is a broader measure of economic activities, may suffer from the same shortcomings. Nonetheless, a set of economic indicators may provide a better proxy for measuring tax capacity of each region.

budget (*TD*), percentage of pensioners in the region (*PEN*), the number of small enterprises per capita (*SP*), and the ratio of engineering (including military) enterprises to the total number of industrial enterprises in the region (*MASH*). These variables capture the characteristics that may positively or negatively influence tax capacity of regions:

- Per capita total tax debt (*TD*) reflects, among other things, the tax capacity of a region – higher tax liabilities imply potential for higher tax collection.
- Transition to a market system has been favorable to the flourishing of small enterprises; hence, the number of small enterprises per capita (*SP*) has sharply increased in recent years. Thus, higher values of *SP* show better economic conditions and better potential for collecting taxes at the subnational level.
- In Russia, pensioners do not receive large incomes and do not pay high taxes. Similarly, the share of people under the poverty line (*prozhitochnyi minimum*) per region (*PM*) indicates lower capacity for taxation. A high percentage of pensioners (*PEN*) in any region implies that the number of people paying taxes is relatively small. Overall, high values for *PEN* and/or *PM* in any region show the existence of a large number of poor, thus, indicating a lower tax capacity for the region.
- Share of engineering (*mashinostroenie*) industry enterprises relative to the total number of enterprises (*MASH*), in effect, reflects how many military industrial enterprises are in the region. Given that the military industrial complex has been hit hard from the downward shift in the demand for their products, we expect to see an inverse relationship between *MASH* and the subnational tax collection.

Corruption

To capture the impact of corruption, we include the number of tax inspection employees per capita (*NR*) as an explanatory variable in our regression for subnational tax collection. Therefore, *a priori*, we expect $\partial TR/\partial NR<0$.

Based on our theoretical model and the above arguments, our model for subnational tax collection (*OR*) is:

$$OR_i = g\,(E_i,\ NR_i,\ TD_i,\ PM_i,\ PEN_i,\ MASH_i), \tag{26}$$

where $i(=1, 2, 3,...N)$ shows the i^{th} region and, *a priori,* we expect: $\partial OR/\partial E>0$, $\partial TR/\partial NR<0$, $\partial TR/\partial TD>0$, $\partial TR/\partial SP<0$, $\partial TR/\partial PM<0$, $\partial TR/\partial PEN<0$, and $\partial TR/\partial MASH<0$.

E. Regression Analysis

We approximate the above functional forms by their logarithmic equivalents. This allows us to mitigate the potential heteroskedasticity in our subnational (cross section) analysis, enforce the fact that our variables take positive values, and read the coefficient estimates as elasticities. In our empirical specifications, however, we do not use log values of *L* and *E*. Linear values of *E* allows us to gauge different levels of effort (different elasticities), which are exerted by subnational authorities.

To obtain consistent estimates for our coefficients, we first, estimate our equation for *OR* and, then include its predicted value and its squared values in the equation for *TR*. Similarly, in our *OR* and *TR* equations, we replaced *VAT* and *TD* with their respective instrumental variables.[8)] Finally, for improving the efficiency of our

[8)] In addition to all of the explanatory variables, instruments included total number of firms in the region, number of foreign firms in the region, and yearly variation in temperature.

estimates, we applied the Seemingly Unrelated Regression (*SUR*) technique to our regression models to get:

$$\ln OR = \underset{(1.11)}{1.44} + \underset{(2.49)}{54.96}\, E - \underset{(3.71)}{0.84}\, \ln NR + \underset{(1.33)}{0.11}\, \ln SP + \underset{(2.29)}{0.46}\, \ln TD - \underset{(2.66)}{0.019}\, \ln PM - \underset{(1.68)}{0.11}\, \ln MASH - \underset{(2.81)}{0.69}\, \ln PEN + \hat{U} \quad (27)$$

and

$$\ln TR = \underset{(0.30)}{0.68} - \underset{(3.41)}{1.23}\, \ln OR + \underset{(3.51)}{0.77}\, \ln OR_i^2 + \underset{(4.63)}{0.96}\, \ln VAT + \underset{(0.02)}{0.004}\, \ln NF + \underset{(4.62)}{0.00017}\, L + \varpi \quad (28)$$

$$R^2_{\text{system}} = 0.691,$$

where, $\hat{U}$ and ϖ are estimated residuals and t-ratios are reported in the parentheses (.). It is worth noting that replacing ln*NR* with its values for 1996, 1995, or 1994 did not change results, i.e., we consistently obtained similar significant negative values for the coefficient of this variable. Apart from the intercepts, *SP*, *MASH*, and *NF*, coefficient estimates of other variables are statistically significant. Reported R^2_{system} shows that, despite the fact that we are using cross section data, a large proportion (i.e., 69%) of the variation in the dependent variables is explained by the explanatory variables.

The reported coefficient estimate (and t-ratio) support the hypothesis that, an increase in tax collection effort *E* has a positive impact on per capita tax collection (*OR*). Effort-elasticity of OR (= 54.96E) attains a minimum of 0.005 for Kemerovo Oblast and a maximum of 1.68 for the Ingush Republic. Effort-elasticity of *OR* attains its average value of 0.1 for Pskov Oblast and the Republic of Dagestan. On average, for every one-percent decrease in arrears and/or deferrals, i.e., one percent increase in efforts (*E*), per capita tax collection increases by one-tenth of one percent. Thus, solving the problem of tax arrears and tax deferrals at the subnational level will have a significant and substantive impact on intergovernmental problems.

Estimates also corroborate our observation that corruption is a significant problem in tax collection. Estimates show that an increase in the number of tax inspectors per capita (*NR*) has a negative effect on per capita tax collections. In particular, a one percent increase in the number of tax inspection employees per capita leads to a whopping 0.84 percent decline in subnational tax collections. Tax inspection employees' power to engage in negotiation with taxpayers for granting tax deferrals and ignoring tax arrears are detrimental to the tax collection process. This also resembles the principal-agent problem, where the agent is not fully serving the principal's objective.

The elasticity estimate for total tax debt, (0.46), indicates that for every one-percent increase in the per capita tax liability, only 0.46 percent is collected. This is, in fact, consistent with the reported low tax compliance rate in Russia and is indicative of a major ongoing deficiency in the process of tax collection.

Signs and sizes of the estimated elasticity coefficients for the variables approximating poverty (*PM*, −0.019, and *PEN*, −0.69), post-communism economic vigor (*SP*, 0.11), and declining demand for large engineering/military complexes (*MASH*, −0.11)

capture the historical dynamics of moving from a command system to a market system. Increases in the number of poor (*PM*) pensioners (*PEN*) and the erosion of demand for the large engineering/military complexes have had substantial negative impacts on tax collections. On the other hand, the transition to a market system leading to larger number of small enterprises than before has provided a larger tax base and OR for subnational governments.

Estimates for the *TR* equation show that the coefficient estimates of *OR*, *VAT*, *NF*, and *L* have substantive impact on *TR*. The estimated coefficient for *OR* (−1.23) shows that at the low level of tax collection, any increase in *OR* leads to a larger contraction of federal transfers (*TR*). For example, for subnational governments with low tax collection, every one- percent increase in the subnational tax revenue leads to 1.23 percent decrease in federal transfers. Thus, higher tax collection effort is not a worthwhile activity for a subnational government with low tax collection. But, when *OR* increases beyond 2.22 [= 1.23 / (2)(0.77)] new rubles per person, *TR* increases as well. This suggests that after *OR* exceeds 2.22 rubles per person, subnational authorities bargain for further transfers.

The estimated VAT-elasticity of *TR* attains a value close to unity (0.96). In practice, *VAT* proceeds are divided between the federal and the subnational governments on a 75/25 rule. Hence, the federal government has a vested interest not to reduce transfers to the regions that collect more *VAT*.

The regression results also show that distance from Moscow *L* and number of credit agencies *NF* influence federal transfers to regions. A positive coefficient estimate for *NF* implies that the number of financial institutions has a positive impact on intergovernmental transfers. Similarly, distance from Moscow positively influences *TR*. Distance could indicate higher needs of regions for transfers or higher cost of transfers, such as in-kind transfers.

IV. Conclusion

This study provides theoretical and empirical analyses of the incentives provided by the Russian intergovernmental fiscal relationship system, as well as the widespread corruption among Russian tax inspectors. One of the main results of our theoretical analysis is that the Russian system of transfers does not ensure an adequate level of incentives for tax collection by its own subnational (regional and local) governments. Our theoretical analysis also shows that, when potential for bribe-taking exists, increasing the number of tax inspectors may lead to lower tax revenues for the government. Empirical evidence buttresses our theoretical findings and significantly illuminates recent events in the intergovernmental relationship in the Russian Federation. There are four major empirical findings. First, increasing local tax collection leads to the contraction of transfers from the federal government. Second, corruption plays a significant role in reducing tax collection in Russia; we find that a higher number of tax inspection employees leads to reduction in per capita tax collection. Third, a decline in the demand for large military complexes and increased poverty, which reduce the tax base for a region, have decreased the ability of regions to collect taxes. Finally, the transition to a market system, where the sovereignty of consumers is respected, has led to flourishing small enterprises that may provide a larger tax base for subnational taxes.

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APPENDIX 1

Table 1.

Tax Collections by Subnational (regional and local) Governments and Central Government, %

Type of Tax Revenue	Subnational Government Revenues as share of GDP			Central Government Revenues as share of GDP		
	Czech Republic 1996	Poland 1995	Russia 1997	Czech Republic 1996	Poland 1995	Russia 1997
Total Tax Revenue	5.1	3.2	12.3	35.9	36.8	16.1

Table 2.

Descriptive Statistics

Variable		Mean	(standard deviation)
	Financial variables		
RS	Subnational government revenue (millions of ruble)	3,655.70	(2,866.34)
TR	Transfers from Federal Budget to subnational governments (millions of ruble)	354.34	(269.51)
VAT	VAT collection retained in the region (millions of ruble)	157.46	(145.43)
LTC	Tax collection (excluding VAT) retained in the region (millions of ruble)	3,149.85	(5,284.20)
	Demographic variables		
POP	Size of population in each region	1,635,347	(1,231,597)
DP	Number of people per square kilometer	31.95	(41.38)
PEN	Percentage of pensioners in the region	19.49	(4.97)
	Structure of the region		
TP	Number of enterprises per capita in the region	0.018	(0.0)
SP	Number of small enterprises per capita in the region	0.004	(0.002)
NC	Number of credit agencies in the region	12.34	(11.53)
NR	Number of tax inspection employees per capita	0.0013	(0.0003)
NF	Number of credit agencies per capita in the region	0.00003	(0.00001)
	Geographic variables		
L	Distance of subnational capital city from Moscow (in kilometers)	2,465.91	(2,837.11)
S	Area of the region (in thousand square kilometers)	199.11	(419.76)
Type	Geographical categorization (e.g. Northern, Central, Volga region, etc.)	6.27	(3.24)
TZ	Minus lowest average monthly temperature	13.66	(8.74)
DT	Difference between the highest and lowest monthly average temperature	30.30	(8.10)

APPENDIX 2

Revenue Sources

The difficult transition towards a decentralized government in Russia will determine the economic integrity of the Russian Federation (RF) and the future course of its economic development. The 1993 Constitution, while creating a federation consisting of 89 heterogeneous subjects, removed the Soviet command system that had harnessed the centrifugal forces in Russia for the last half century. Similar to the conception of its central command system, Russia's move towards a federal system has been based on trial and error rather than an accepted blueprint (see Valery Lazarev and Paul R. Gregory, 1999, on central command system and Shleifer and Treisman, 2000, on the economic reform in Russia). Nonetheless, after almost a decade of tumultuous transition, the flux in the RF has sufficiently settled to allow for a formal economic analysis of its intergovernmental fiscal relationship.

The sources of revenues for the subnational government[9)] in the RF, mainly, are *shared revenues and transfers* and *own revenue sources*. The shared revenues and transfers consist of a portion of federal taxes and other transfers that the federal government channels to the regions[10)]. This is the major source of revenues for the subnational governments in the RF. The lump sum nature of revenue sharing (tax sharing), however, reduces the subnational authorities' incentives to facilitate tax collection. The own revenue sources are federal taxes, which are *one hundred* percent assigned to the subnational, and revenues from other sources (including introducing new taxes)[11)]. The importance of own revenue sources and particularly regional and local taxes have been increasing in the recent years. In general, regional governments finance their spending through tax revenues divided between the region and the Federation or between the locality and region or Federation. Higher level grants to the lower tiers are other methods of financing further spending.

Subnational governments' ability to introduce new taxes, to change tax rates, and to choose the tax base are limited. Among these, regional governments have less limitation on choosing the rate to be levied on a particular tax. For example, while the Federation introduces new taxes, new tax rates, and the shares to be distributed to the regional governments, in some cases (e.g., enterprise profit tax rate) the oblast

9) Within the context of a three-tiered government, however, the relationship between the lower tiers (regional and local governments) are based on a less formal structure than that of the federal government and the regions. Local government for the most part have to negotiate their revenue assignment with that of regional government. However, a move towards using the federal-regional relationship as a model for the regional-local relationship is underway (A.M. Lavrov, O.V. Kuznetsova, J.W. David, and E.E. Skatershchikova, 1996)

10) Among a large number of taxes in Russia five are considered to be the most important: value-added tax (VAT), corporate profits, personal income, excise taxes and custom duties. Since the early years of transition (1992–1993), VAT, enterprises profit tax (EPT) and some excises are shared between federal and subnational. Additionally, minor taxes are 100 percent assigned to the regions. Presently, the federal/regional sharing rates are 75/25 for VAT, 37/63 for EPT, 50/50 for excises on alcohol, and 100/0 for excises on energy products.

11) There has been an off and on approach to allowing regional to introduce their own taxes. For example, a 1993 Presidential decree "On Forming Republican Budget and its Relationship to the Subject of the Federation," allowed regional to introduce taxes while a 1996 decree removed such a permission.

governments choose tax rate to levy (or surcharge) on a base defined by the Federation[12]. Similarly, subnational governments, now may choose to levy a regional sales tax[13]. In other cases (e.g., personal income tax), regional governments are recipients of a rather large share of taxes but cannot change the tax rate, tax base or the collection procedure. However, more than eighty five percent of subnational own revenues are from property taxes, natural resource taxes, and housing maintenance taxes. The importance of own revenue sources and relative shared resources has over time increased and, presently, is as high as two-third of the shared revenues.

Perfectly matching the revenues and spending of regional governments is virtually impossible. Thus, transfers are needed to fill the gap. Fiscal deficits of local tiers are closed by transferring tax power to regional governments and transferring responsibilities of spending to central government or by reducing regional spending and service standards (Wallich, 1996). Even though spending may meet revenues in aggregate, the budgets of subnational governments may not balance. Accordingly, the determinations of factors that influence own revenue sources and transfers are of paramount importance.

[12] For the enterprise profit tax, the rate may vary from zero to 22 percent. The advantage of surcharge over revenue sharing is that it allows lower tiers to choose rates and allows avoiding administrative confusion and duplication of fully independent taxes.

[13] Oblasts choose the transactions that they would like to tax by the sales tax and may levy a sales tax at any rate up to five percent.