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The Marginal Excess Burden of Taxes in the Russian Transition

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CONTENTS

1. INTRODUCTION

A society bears the cost of taxation in the lost value to consumers and producers of the reduction in employment and sales. The valuation of this loss, or excess tax burden, provides important information to society and its policymakers. It gives them a tool with which to compare the private and public costs and benefits of various tax measures.

Building on the work of Hicks (1941), Mohring (1971) and Diamond and McFadden (1971) used the equivalent and compensating variations, respectively, to provide rigorous definitions of excess tax burden. More recently, economists have given greater attention to the marginal excess burden (MEB) of taxes, i.e., to the social cost of raising an additional dollar of tax revenue. Stuart (1984) and Ballard *et al.* (1985) used the equivalent variation to define the MEB as the lump sum amount that households would be willing to pay to avoid a tax change. The MEB can be measured in a general equilibrium model by first calculating the equilibrium economic parameters for a given set of taxes, then calculating those parameters after the rate of some tax changes a little. The excess tax burden is the sum of the lump sum payments required by households to bring them back to their initial minus the additional revenues generated by the tax. The MEB is equal to the ratio of the excess tax burden to additional tax revenues.

This definition of the MEB is not completely based on an equilibrium approach because the reactions of economic agents to the lump sum payments are not considered. Here, we include additional payments in equilibrium model as a component of household income. Furthermore we will use compensating variation.

Let us consider equilibrium in a general equilibrium model with taxes. Suppose that one of the tax rates changes and each household receives additional outside income that allows it, in equilibrium, to preserve its initial utility level. The difference between the sum of these additional compensating incomes (ACI) and the increment of tax revenues is called the excess tax burden. Its ratio to the increment is called the MEB when the tax change is small.

We intend also to change here the procedure of MEB calculation. Instead of computing two equilibrium states before and after tax change we are going to consider the second equilibrium as a perturbed initial one and to use comparative statics to determine the MEB.

Our purpose here is to evaluate the MEB for the present Russian tax system. The available data about Russia's economy do not allow us to consider detailed equilibrium models such as Ballard's. Nevertheless, there are data published by Goskomstat about monthly collections of Russian federal taxes (profit tax, value added tax, personal income tax and excises) and monthly payroll data that allow us to make estimates. We develop explicit expressions for the MEB of every one of four Russian federal taxes (section 2). As might be expected, the profit tax does not create excess burden (*MEB=0*). Excess burdens of taxation of paid and received wages are equal. The excess burden of the value added tax is equal or less than the latter two. The difference depends on the concavity of production function. It is zero under constant returns to scale.

In section 2, we further show that the relationship between MEB estimates from our approach and that of Diamond, McFadden (1974) is ambiguous for the general case. In the case of a separable utility function, the approach of Diamond and McFadden (1974) underestimates efficiency losses.

In section 3, we calculate the marginal excess tax burden for the Russian economy in 1996. We calculate MEB for the income tax and the payroll tax for the general case and the value-added tax in the case of constant returns to scale. We show that the excess tax burden changes together with tax levies over the course of the year. On average, the MEB in 1996 was equal to 0,67, suggesting that the MEB is much greater in Russia than in other countries (Ballard *et al*., 1985). In other words, when government collects an additional tax ruble, it distorts the distribution of labor and goods to such an extent that Russia loses an additional 0.67 rubles. It follows from this that to increase allocative efficiency in the Russian economy, the government s role must be reduced. In section 4, we calculate the losses causes by Russia s pension system. And in section 5, we consider two examples of the tradeoff of moving specific activities from the public to the private sector, considering that 1 ruble from the tax-payer costs more to the society than the private one.

2. MARGINAL EXCESS BURDEN OF TAXES IN EQUILIBRIUM MODEL

In this section, we are derive explicit expressions of marginal excess burden (MEB) for Russia s primary taxes: profit tax (PT), value added tax (VAT), personal income tax (IT) and payroll tax (PRT). We will consider here an equilibrium model of the economy and define MEB in connection with this model. Then we will obtain the equilibrium conditions and, lastly, use comparative statics to derive the MEB for different taxes.

Let us consider a model of competitive economy of Arrow-Debreu type (Debreu, 1982). The model includes three agents: a representative household, a producer and a government. There are two markets, one for a single product and one for homogenous labor. Without loss of generality, let us assume that the product s price is equal to one.

The household chooses its consumption c and working time l as a solution to the following problem:

$$u(c, l) \to \max \text{ s.t. } c=(1-\tau)(wl+D)+n+e^0. \qquad (1)$$

Here u is a utility function that does not depend on public goods, increases with c and decreases with l. The household real income is the sum of total wages wl, dividends D, and net transfers n, where w is wage for an hour of working. Household income is taxed proportionally at the rate t. We suppose here that endowment e^0 is not taxable. We also assume that for any wage and tax rate, working time is positive.

The producer maximizes disposable profit (*i.e.*, the profit after all tax payments). According to All taxes of Russia (1996), the definition of taxable profit is the difference between revenues (after paying the VAT) and the costs of production. Costs include PRT. In this section we restrain ourselves to a one-period model with fixed capital. The producer solves the following problem:

$$P(l)=(1-\alpha)[(1-\beta)F(l)-(1+\gamma)wl] \to \max, \qquad (2)$$

where F is a production function. F determines the volume of the net product or value added when l is working time used. $F(0)=0$, <u>and</u> F increases with l. In (2) α is the rate of PT, β is the rate of VAT, γ is the rate of PRT, $(1-b)F(l)$ are revenues after VAT payments. We consider a case where the disposable profit is paid to household as dividends

$$D=P(l^{d}), \tag{3}$$

where l^{d} is a solution of (2).

The process of changing tax rates, we presume, takes a lot of time. We, therefore consider them as fixed in the short run. If its budget is balanced, government consumption can be found from the next expression:

$$g+n=\tau wl^{s}+\gamma wl^{d}+bF(l^{d})+aP(l^{d}). \tag{4}$$

Here l^s is the solution to (1), with the right hand terms representing the budget revenues from IT, PRT, VAT and PT, respectively. In this section, we assume that transfers n are fixed.

An equilibrium under given tax system $t=(a,\ b,\ \gamma,\ \tau)$ is a vector $E(t)=(w^0,\ c^0,\ l^{s},\ l^{d},\ g^0)$ such that $(c^0,\ l^{s})$ is a solution of (1), l^{d} is a solution of (2), g^0 satisfies (4) and both markets are cleared

$$l^{s} = l^{d} = l^0, \tag{5}$$

$$c^0 + g^0 = F(l^0) + e^0. \tag{6}$$

The model (1)-(4) is a special case of social system Debreu (1982, p.702) and equilibrium exists under standard requirements of continuousness and concavity. Actually, the existence problem is trivial in our case because we will employ real economic data and suppose that economy is in equilibrium.

It is easy to see that if equations (1), (3), (5) hold, then the budget constraint (4) follows from (6) and *vice versa*.

If some of the tax rates change, the real wage w and dividends D also change in equilibrium. Hence the utility level changes. Let us call additional compensating income (ACI) the change in the endowment e^0 that ensures the utility level does not vary in equilibrium after taxes change and ACI is added.

Formally, let initial tax rates be t^0. Later they change to t. Denote $u(c^0,\ l^0) = u^0$ and add the requirement

$$u(c,l) = u^0 \tag{7}$$

to the definition of equilibrium, simultaneously looking at the endowment e as variable. Then $ACI=e-e^0$. The government expenditures g also change in the new equilibrium, $(g\text{-}g^0)$. The value of $(e\text{-}e^0)\text{-}(g\text{-}g^0)$ is called the excess burden of the tax change $t\text{-}t^0$ for a given tax system, t^0. Marginal excess burden (MEB) is the ratio of the excess burden to the increment of tax revenue when the tax change is small or, more precisely, $MEB= lim\ [(e\text{-}e^0)\text{-}(g\text{-}g^0)]/(g\text{-}g^0)$ when t®t^0. Obviously, MEB is a derivative in some direction. It is useful to stress that MEB is related to a given system of taxes. In the theory of optimal taxation, on the contrary, government expenditures are given, and taxes are chosen to maximize utility.

An equilibrium vector satisfying the additional requirement (7) is a solution of (7) and the next system of equations

$$wu_1(c, l) + u_2(c, l) = 0, \tag{8}$$

$$c = w\, l + D' + n + e, \tag{9}$$

$$D' = h(F(l) - (1 + q)wl), \tag{10}$$

$$F'(l) - (1 + q)w = 0, \tag{11}$$

$$g + c = F(l) + e. \tag{12}$$

It follows from the Kuhn-Tucker theorem that any solution of (7) (12) is an equilibrium. Here u_i, $i=1,2$ are partial derivatives with respect to first and second arguments. Accordingly, $D'=(1\text{-}t)D$ represents net dividends, and $w=(1\text{-}t)w$ is net real wage,

$$h= (1 - a)(1 - b),\ 1 + q = (1+ g)((1 - b)(1 - t))^{-1}. \tag{13}$$

It follows from (7) (12) that only two tax parameters q and h can be considered instead of four original rates.

Let us assume that functions u and F are twice continuously differentiable and that there are not other equilibria in the neighborhood of the one defined by (1)-(6) when tax rates are fixed. Then we can consider g and e as implicit functions of q and h, and apply the theory of implicit functions to define derivatives of g and e with respect to q and h. Writing out the total differentials of the equations (7)-(12), there are three equations for household:

$$u_1dc + u_2dl = 0, \tag{14}$$

$$(wu_{11} + u_{21})dc + (wu_{12} + u_{22})dl + u_1dw = 0, \tag{15}$$

$$dc = ldw + wdl + dD' + de. \tag{16}$$

Here u_{ij} is second derivative of u with respect to arguments i and j, $i,j = 1,2$,

$$dD' = - h((1 + q)ldw + wldq) + (F(l) - (1 + q)wl)dh. \qquad (17)$$

The next equation is related to the producer

$$F''dl - (1 + q)dw - wdq = 0. \qquad (18)$$

To get (18), equation (11) was used. The last equation is the market clearing condition

$$dg + dc = F'dl + de. \qquad (19)$$

If dq and dh are independent variables and the determinant of system (14)-(19) is not zero, then (7)(12) determines a unique equilibrium for every q and h in the neighborhood of t^0. Let us exclude dc, dl and dw from the last system of linear equations and express dg *and* de by dq and dh. The process of transforming the system (14)-(19) is described in Appendix I. As a result, we obtain two equations:

$$(1+hrF'')dg=(1+hrF''+qwr/l)de+qwr/l(F(l)-(1+q)wl)dh, \qquad (20)$$

$$dg=de+qw^2r(F''r+1+q)^1dq\ , \qquad (21)$$

where

$$r= u_1[w^2u_{11} + w(u_{12} + u_{21}) + u_{22}\ )^{-1} \qquad (22)$$

It follows from these equations that the determinant of (14)(1 9) is distinct from zero if r is nonzero. If u is strictly concave, $r < 0$.

Let us consider first the case of a linear production function $F(l)=fl$. Taxable profit is equal to zero, and dividends are zero too. Besides $F''=0$. Let us suppose that $(1 + qwr/l)$ is positive. Hence, from (20)

$$MEB=de/dg-1=1/(1+qwr/l)-1 \qquad (23)$$

We denote MEB in this case by *M.* Here additional compensating income (ACI) per ruble of tax revenue increment does not depend on which tax rate changes. For an additional ruble collected from the VAT, IT or PRT, losses will be the same.

Remark 1. The tax system t^0 is called optimal if for a given g^0 it is impossible to enlarge u^0 by changing of tax rates. Under the additional requirement that q is fixed, any tax system is optimal in the case of constant returns to scale. The next equation is correct

$g = q(1+q)^{-1} f\, l(f/(1+q))$,

where $l(w)$ is a solution of (8), (9). If this equation has a unique solution, then any tax system providing g is optimal.

Now let F be a nonlinear concave function. We begin with PT. If only the rate of PT changes, $dq = 0$, it follows from (21) that $MEB(PT) = 0$. The profit tax does not impose distortions. It does not affect the producer's solution and affects households as a lump sum tax.

If only the rates of either PRT or IT change, then $dh = 0$ and $MEB(PRT) = MEB(IT) = M$ *i.e.*, excess losses per additional ruble of revenue are equal for PRT and IT in linear and nonlinear cases. At last, as it is shown in Appendix I for VAT

$$MEB(VAT)=M_n-(l+hrlF''+qwr)^{-1}[F(l)-$$

$$(1+q)wl](F''r+1+q)h/(1+q)w\,, \qquad (24)$$

where $M_n = [1 + qwr/l(1 + hrF'')]^{-1} \quad 1.$

It is easy to see that $M_n < M$, since the subtrahend on the right in (24) is positive *i.e.*, concavity decreases the magnitude of MEB(VAT).

Thus, MEB(PT) < MEB(VAT) < MEB(IT) = MEB(PRT). Hence, the tax system can be improved (*i.e.,* the utility level can be increased for given tax revenues) if either $a < 1$ and some other rate is positive or $b < 1$ and $g+t>0$ and so on. This means that in an optimal tax system, $a=1$ (Stiglitz, Dasgupta, 1971).

We have noticed that our definition of excess tax burden and MEB differs from the one given by Diamond, McFadden (1974). Let us now derive MEB according to their approach and compare it to the above in the case of constant returns to scale. According to their definition, the incremental tax burden equals the additional income that a household would have to be paid such that their utility level before and after the tax change remained equal. It is not supposed that economy is in equilibrium after compensating income is added. Now instead of (14) (19), ACI is defined as a solution of the next system of linear equations:

$u_1ACl + u_1dc + u_2dl = 0,$

$(wu_{11} + u_{21})dc + (wu_{12} + u_{22})dl + u_1dw = 0,$

$dc=ldw +wdl,$ (25)

$fdl - (1 + q)dw - wdq =0,$

$dg+dc=F'dl.$

Without the first equation, this system determines the economy s equilibrium after taxes change. As u_1 is marginal utility of income, the first equation in (25) determines ACl. It follows from (25) that

$MEB=1/(1+qwr/l+qwrq)-1,$ (26)

where $q = (wu_{11} + u_{22})/u_1$. The comparison of the two definitions of marginal excess tax burden shows that, in the general case, their relationship is ambiguous. However, in the case of separable utility, Diamond and McFadden s (1974) definition yields a smaller value for thelosses.

Remark 2. The expression MEB, in the linear case, can be written in another way. Using the invariance of utility property (14), let us notice that $dl/dw = - r,$ and elasticity $E = (w /l) dl/dw$. Therefore E is the elasticity of compensated supply of labor.

It follows from these expressions that

$MEB=1/(1-Eq)-1.$ (27)

As it is well known, efficiency losses increase if the elasticity of compensated labor supply rises.

Remark 3. Till now, we considered only the case when $1+qwr/l>0.$ Theoretically, the opposite cases $1+qwr/l<0$ and even $1+hrF''+qwr/l<0$ are possible too. If $MEB(t)$ is negative, the government expenditures and utility level can be enlarged simultaneously. That is, the economy would be on the downward slope of the Laffer curve. In this case, tax rates should be decreased.

Remark 4. We will show now that all expressions for MEB received above are valid for the case of many households when there is only one type of labor. Let each household $i,i = 1,m,$ solve the next problem:

$u^i(c, l)$ ® max, s.t. $c = (1-t)(wl +D^i) + e^{i0}.$ (28)

Here D^i is dividends that i gets. Denote c_i ,l_i as the solution of (27). Then, as in Appendix, using equations (14)-(16) for household i we get

$$dc_i = wdl_i,\ dl = -\ r_i\ dw,\ l_i dw = dD^i - de^i, \qquad (29)$$

where

$$r_i = u_1{}^i (w^2 u_{11}{}^i + w(u_{12}{}^i + u_{21}{}^i) + u_{22}{}^i)^{-1}$$

Summarizing these expressions with respect to i, we get formulas (23)-(24) with $r = S\ r_i$.

3. CALCULATION OF MEB

In this section we evaluate MEB of Russian tax system on the basis of the equilibrium model, using expression (23). Thus we obtain MEB of PRT and IT in the general case and of VAT in the case of constant returns to scale. To compute MEB we need first to calibrate the model. Let us suppose that at every period of time the economy is in equilibrium *i.e.*, the observable data that enter system (8)-(12) must satisfy it. The system also contains some unobservable parameters. We need to calculate them with the help of (8)-(12) and some additional economic data. First of all, we have to know parameter r *i.e.,* some properties of the utility function. Assume that the utility function does not change with time. Let us consider the separable logarithmic function

$$u(c, l) = \lg c + h \lg (L - l). \qquad (30)$$

It depends on two unknown parameters h and L. Rewrite system (8)-(12) for linear production and utility functions (30). Building on equations (8) and (13), we add in some new items important for numerical results and obtain

$$c+s=w+n+b,\ h/(L-l)=w/c,\ f=(1+q)w,\ qw\ l=g+n+b. \qquad (31)$$

The representative household s income includes wages, net social transfers n (with pension payments), and salary paid from the federal budget b. It uses its income for consumption c and savings s. As above, we assume that the government budget is balanced and that tax levies are the only source of government income. This means that

$$g+n+b=T, \qquad (32)$$

where T is tax collection without PT. We suppose that the pension fund is consolidated into the federal budget.

The Central Bank of Russia s *Bulletin of Banking Statistics* (*BBS*) (1996; 1997a, b) contains information about $c, s, n,$ and data on the components of T. It also contains information about the numbers of the economically active population and unemployed, which can serve as the basis for calculating l. There is no information about b, f, g, w and q. Let us set $b=0$. Then the first equation in (31) gives us an enlarged magnitude for w, which together with the last equation in (31) gives us the effective value of q. Value of q found by this way differ in a time and are not connected with rates of taxes by (13). This can be explained by high rates of tax evasion. We tried to compute L and h using the ordinary least square method for the sample period of 27 months (01.95 - 03.97) but the linear system for L and h was not well-posed. If l is working time and L is time for work and leisure (without sleeping time), we assume that l is approximately equal to 2/3 of L. Then we can find h as an average of values, satisfying second equation (31). Hence h is enlarged too. It follows from (22) and the second equation of (31) that

$$r=-c(L-l)^2[w^2(L-l)^2+hc^2]^{-1}=-(L-l)/(1+h)w,qwr/l$$
$$=-T(L/l-1)[(h+1)(c+s-n)]^{-1} \tag{33}$$

i.e., by neglecting b, MEB becomes closer to zero.

The initial data are represented in Tables 1 and 2. Columns in Table 1 contain the following data:

1) Number of economically active population in M. (Table 2; *BBS*, 1997a);
2) Number of unemployed calculated by method of ILO in M. (Table 2; *BBS*, 1997a);
3) Monthly consumption expenses of households, c, in T. (trillion) rubles (Table 3; *BBS*, 1997a);
4) Monthly savings of households, s, in T. rubles (Table 3; *BBS*, 1997a);
5) Monthly transfers n in T. rubles (Table 3; *BBS*, 1997a).

Rows A, B, C of Table 1 contain data for 1 5 above for January 1996, July 1996 and November 1996, respectively.

Table 1

	1	2	3	4	5
A	73.0	6.0	73.4	14.8	12.5
B	73.2	6.5	81.5	27.3	15.5
C	72.6	6.7	84.6	29.8	16.2

The columns of Table 2 contain data for the

1) Profit tax collection in T. rubles (Table 5; *BBS*, 1997b)
2) Personal income tax collection in T. rubles (Table 5; *BBS*, 1997b)
3) Value added tax collection in T. rubles (Table 5; *BBS*, 1997b)
4) Excises in T. rubles (Table 5; *BBS*, 1997b)

These data are given for the same period as in Table 1.

Table 2.

	1	2	3	4
A	5.0	3.4	9.2	0.8
B	53.5	30.1	68.0	17.3
C	82.0	49.1	116.3	41.2

The columns of Table 3 contain calculations for the following:

1) Working time, l, is equal to the difference between the first and second columns of table 1;
2) Taxes collection without profit tax, T, is equal to sum of 2nd, 3rd and 4th columns of Table 2 (in our model excises do not differ from the value added tax);
3) Net real wage of household, $c + s \quad n$;
4) Net real wage per employee, w, is equal to $(c + s - n)/l$;
5) Tax parameter, q, is equal to T/wl.

Table 3.

	1	2	3	4	5
A	67.0	13.4	75.7	1.13	0.18
B	66.7	115.4	93.3	1.40	1.24
C	65.9	206.6	98.2	1.49	2.10

If we set $L = 100$ and estimate the average of h, we get $h = 0.56$.

Now we are able to estimate MEB using (33). We get *MEB = 0.06* in January 1996, *0.66* in July 1996, *2.30* in November 1996. The value of MEB rises during the year because tax payments are too small at the beginning and rise at the end of the year .

We now estimate MEB on the bais of legal tax rates and (13).

Nominal tax rates are calculated according to the laws of the RF (*All taxes of Russia*, (1996)). They are equal to:

Tax on profit, 35%;

Value added tax 10-20% (we consider here 20%);

Excises by factual collection are approximately equal to 0.25 of the VAT (we added them to VAT);

Income tax rate equals 12-35% (we consider here 12% + 1% in the pension fund).

The payroll tax is the sum of the following charges:

to pension fund, 28%;

to fund of employment, 1.5%;

to medical insurance, 3.6%;

to social insurance, 5.4%;

to road fund, 1%;

to fund of education, 1%;

to police fund, 4%.

The total charges are equal to 44.5% of the payroll fund.

It follows from (13) that *q=1.21* and *MEB » 0.67*. This magnitude corresponds closely to the value of MEB found from factual tax collections in the middle of the year.

We thus conclude that when government collects an additional ruble of tax revenue, it distorts the distribution of labor and goods such that society additionally loses about 0.7 ruble. It follows that to increase the efficiency of economy, it is necessary to reduce the size of the government.

4. EXCESS BURDEN OF INCOME REDISTRIBUTION

Until now, we have considered excess tax burden when additional tax revenues are spent without affecting household utility. In this section, we will describe the case when the additional tax revenue is transferred to households. Our purpose is to evaluate the costs of income redistribution needed for pension payments. Personal income and payroll taxes are the major sources of these payments. As it was demonstrated in section 2, MEB of these taxes is similar in the models with constant and decreasing returns to scale. So, for simplicity, let us consider the model (1)-(6) with constant returns to scale. As in section 2, the initial equilibrium is determined by the system (8), (9) with $D' = 0$, (11) and (12). To evaluate the excess tax burden of redistribution, suppose that either of two tax rates (g or t) change and the compensating income necessary to maintain a constant level of utility is added. Additional tax revenues are transferred to households. Then $dg=0$, and dn and other parameters of the perturbed equilibrium are defined by the system:

$$u_1 dc+u_2 dl=0,$$

$$(wu_{11} +u_{21})dc+(wu_{12} +u_{22})dl+u_1 dw =0,$$

$$dc=ldw +wdl+dn+de, \qquad (34)$$

$$-(1+q)dw -wdq =0,$$

$$dc =(1 + q)w\, dl + de.$$

In section 2, the losses of society were equal to the difference $de - dg$. Here they are equal to de, because $dg = 0$. This means that $MEB = de/dn$, *i.e.,* MEB is equal to ACI per ruble of additional tax revenues. It follows from (34) that

$dc=wdl$, $dl=rdw$, $dw =-(dn+de)/l$, and $qw\, dl=d$,

i.e.,

$$MEB=-qwr/l(1+qwr/l)^{-1} \qquad (35)$$

and we have got that MEB is equal for both the cases of wasted and transferred (to households) tax revenues. Let us now use (35) to estimate the costs of Russia s pension system. The pension fund now gets 29% of wages and q was equal to *1.24* in July 1996*.* The net wages were *(1-*t*)*35.2 T. rubles. Without pensions, q would be equal to 0.95. Obviously, the excess tax burden or costs of the pension system is integral to MEB. So we have to find MEB and pensions for q = 1.05 and 1.15. They are known for q = *1.24.* As far as a change of taxes does not affect productivity, it does affect net real wage and employment. The expressions for all equilibrium parameters as a function of different taxes are given in the Appendix. Results from these calculations are shown in a Table 4. The columns of the Table contains the following parameters:

1) Value of q;
2) Net real wage per employee, w (M. rubles. a month);
3) Number of employed (M);
4) Pension (T. rubles.);
5) MEB.

Table 4

1.24	1.40	66.7	9.2	0.67
1.15	1.46	68.3	8.08	0.52
1.05	1.53	69.0	4.25	0.43
0.95	1.61	69.7	0.31	0.36

Thus excess tax burden of taxation for distributive pension payments is approximately equal to 4.4 trillion rubles. That is, for every ruble of pension payments, society loses 48 kopecks.

5. MEB IN ECONOMIC EVALUATION OF POLITICAL DECISIONS

We now turn our attention to analyzing the costs and benefits of political decisions, which in terms of our framework refer to actions that result in the transformation of property rights. Privatization, the transfer of public property to private hands, and its opposite, nationalization, would be two such examples. Costs to the government are ultimately financed by taxpayers. And any profits that the government generates can substitute for tax collections from the private sector. Here, as earlier, we consider the consolidated state budget without singling out special public funds beyond the state budget. And in the cost-benefit analysis of a given project, we take into account all opportunity costs and benefits.

That is, the excess tax burden must be considered since it measures the distortion of resource allocation. The costs faced by the private sector are not the source of thedistortions. Additional costs of 1 ruble to the private sector reduce public utility by 1 ruble (we ignore constant coefficient of proportionality). However, 1 ruble of tax collections lowers public utility by (1+MEB) rubles.

We shall explain the essence and the role of this distinction through two examples.

Example 1. We consider an enterprise that may be either private or publicly owned. In either case, its owner is responsible for covering all costs and possesses full residual claimancy rights. We will say that if it is a public enterprise, its expenses are equal to 100 conventional units, and if it is private, they are 95. In the both cases gross income is 110 units. Which of these property forms is better for society if MEB equals 0.6? Under private possession, the difference between benefits and costs (that is, the increment of public utility) is 15 units. Under public possession, profit equals 10 units. But if these profits of the public corporation reduce by an equal amount, the tax bill on the private sector, the increment of public utility will be 16 units. Thus, from the point of view of society, public ownership is better than private because it reduces the excess burden of taxation.

Example 2. Should schools be run by the private sector if private sector costs exceed those in the public sector and the quality of education is not worse than in the public sector? Let us assume that the costs to the government of maintaining a public high school is 100 units. Whereas if this school is handed over to private owner, its expenses would increase to 150 units. Public school education is tax-payer funded with a marginal cost of zero to students, whereas private school students must cover all expenses. In equilibrium, the payment for education will equal its marginal utility. That is, both public and private schools bring in 150 units of utility increment when the educational

quality is the same. If utility grows proportionally to the difference between benefits and costs (and is not affected by concerns of equity), then private schooling is better than public schooling for society because its costs of 150 is less than the total cost for public school, 160, if MEB=0.6.

6. CONCLUSION

Usually Computational General Equilibrium Models are used for valuing of the marginal excess burden of taxes in developed countries. These calculations require extensive amounts of data, the level and quality of which are not present in economies in transition. The CGEM method, therefore, would probably not produce any more reliable results than those produced by the formulas for MEB outlined in this paper. The concept of marginal excess burden of taxes (MEB) has been modified here. Our MEB is defined more rigorously in comparison with earlier definitions, in context of equilibrium consideration. In addition, the formulas expressing MEB as functions of an economy s parameters are simpler.

Our calculations show that the distortion caused by the tax system in Russia is too big. The excess burden greatly exceeds that of the US economy. This means that the Russian government is too big and has to shrunk. The magnitude of MEB has to be taken into account in when discussing the costs and benefits of tax changes.

APPENDIX I. SOLUTION OF THE SYSTEM OF LINEAR EQUATIONS (14)-(19).

Let us exclude dc, dl and dw from this system. It follows from (6) and (14) that

$$dc=wdl. \tag{A1}$$

Substituting (A1) in (15) and denoting

$$r=u_1[w^2u_{11}+w(u_{12}+u_{21}+u_{22})],^{-1} \tag{A2}$$

we get

$$dl=-rdw \tag{A3}$$

and then it follows from (16)

$$dw=-(dD'+de)/l. \tag{A4}$$

It follows from (19), (A1), (11) and (A3) that

$dg=de-qwrdw$ (A5)

and from (A4)

$dg = de(1 + qwr/l) + (qwr/l)dD'$.

From (17), (18)

$dD' = hlF''dl + [F(l) - (1+ q)wl]dh.$

From (19), (11), (A1) we get

$3dl = (dg -de)/wq$

and finally,

$(1+hrF'')dg=(1+hrF''+qwr/l)de+qwr/l[F(l)-(1+q)wl]dh$ (A6)

follows from the three last equations. The formula (A6) is the formula (20) of the text. The second remaining equation connects *de* and *dg* with *dq.* It follows from (18), (A3) and (A5) that

$dg = de + qw^2r(F''r +1 + q)^{-1}dq$. (A7)

The formula (A7) is the formula (21) of the text.
If *dt* is an increment of some original tax, then we can rewrite these two equations:

$MEB=de/dg-1=M_n+A[F(l)-(1+q)wl](dh/dt)(dt/dg)$, (A8)

where

$A=-qwr/(l+hrlF''+qwr)$ and $M_n=[1+qwr/l(1+hrF'')]^{-1}-1,$

$MEB=-qw^2r(F''r+1+q)^{-1}(dq/dt)(dt/dg).$ (A9)

Apply (A8) and (A9) to get MEB for VAT. Obviously, $(dh/dt)/ (dq/dt)=-h/(1+q).$ Notice, that for other taxes either the numerator or the denominator is zero. Apply (A8) and (A9) to get MEB. Finding *dt/dg* from (A9) and substitute it in (A8):

$MEB=M_n+A(F(l)-(1+q)wl)(F''r+1+q)h((1+q)qw^2r)^{-1}$. (A10)

(A10) is the formula (24) of the text.

APPENDIX II. SOLUTION OF THE SYSTEM (31) FOR DIFFERENT q.

Suppose that the solution for basic q^* is known and changes in tax rates do not affect productivity f, savings s and government expenditures without pensions. From $f=(1+q)w$, we get

$$w(q)=(1+q)^{-1}(1+q^*)w^*, \tag{A11}$$

where * corresponds to basic magnitudes. Let $n=m+p$, where p is pension, and m is other transfers. As $g+m$ does not change with taxes, $g+m=q^*w^*l^*-p^*$. So $p=p^*+qwl-q^*w^*l^*$. It follows from the second equation (31) that $c=(wL-l)/h$ and from the fourth that $(wL-l)/h+s^*-n^*-qwl+q^*w^*l^*=wl$. Then

$$l(q)=(wL/h+s^*-n^*+q^*w^*l^*)(w/h+w^*+q^*w^*)^{-1}. \tag{A12}$$

It follows from (33) that $-qwr/l=q(L/l-1)(1+h)^{-1}$, so we can now calculate MEB and pension as a function of q.

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