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Research paper

The Reverse Subsidy`s Impact of United Territorial Community`s Budget Generations

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Abstract

Critical analysis of the fiscal equalization system proved that its main disadvantages are a real threat to UTCs.
The comparison of UTCs income growth trends with the reverse subsidies` growth rate revealed that over the period from 2015 to 2017 the income growth rate slowed down accompanied by the simultaneous growth of reverse subsidy to 25% of its amount.
It was proposed to determine the permissible limits of the reverse subsidy correlated to the UTC per capita income growth rate.
It was proved that to describe the dynamics of UTC income it is expedient to use not the exponential law (hard model), but the logistic model (soft model).
It was offered to determine the safe limits of UTC financial position`s adjustment with the help of the logistic model ensuring sustainable development.
Conditions for the external impact on the UTC system in the form of reverse subsidy were shaped. Safe limits for its amounts` adjustments were defined as well. It was proved that 50% of UTC income is critical amount of the reverse subsidy. The estimated permissible amount of the reverse subsidy is no more than 25% of UTC income.
It was shown that ensuring of financially substantial UTC`s sustainable development is possible, if flexible, financially proved approach when setting the reverse subsidy amount, is used.

Keywords: *united territorial community, efficiency, financial sustainability, reverse subsidy, basic subsidy.*

1. Introduction

Local self-government reform started in Ukraine in 2014. Its implementation was based on the provisions of the European Charter of Local Self-Government and the Concept of the Reform of Local Self-Government and Territorial Organization of Government. The process started with the financial decentralization initiated with the introduction of amendments to the Budget and Tax Codes of Ukraine. That is why the problems of the development of territorial communities` financial management effective system are of particular importance.
Such scholars as Pavlyuk A.P., Oleinik D.I., Batalov O.A., Datsko O.I., Murkovich L. L., Molodozhen Yu. B. and others [1-15] study contemporary aspects of solving Ukrainian territorial communities` development and local self-government`s problems.

2. New tools of fiscal equalization amid decentralization

As noted above, conditions for decentralization of power have already been created at the legislative level, as well as formation of territorial communities` financial autonomy environment took place. Indeed, according to the changes introduced into the Budget Code in 2014, the balancing system was replaced by the system of fiscal equalization. Balancing of local budgets used to be based on the vertical principle: the amount of necessary expenditures for the maintenance of the public sector branches was determined, then the income was calculated and, in case of expenditure excess over income, the equalization subsidy was provided. The purpose of such a system was to ensure the balance between every level`s budget obligations in terms of expenditure and the possibilities of their income part generation, that is, equalization was performed by expenditure.
In the new version of the Budget Code (Article 96), the basic subsidy is defined as transfer from the state budget to local budgets for horizontal equalization of the territories` fiscal capacity. Reverse subsidy is funds transferred to the state budget from local budgets for horizontal equalization of the territories` fiscal capacity.
Horizontal equalization of the territories` fiscal capacity is implemented depending on the rate of per capita income, which is income equalization. The fiscal capacity index of the relevant budget, calculated on per capita basis, is determined by individual income taxes (excluding regional budgets). The normative is the average level of the per capita incomes of ±10%. If this level exceeds by 10%, then 50% of excess incomes are withdrawn to the state budget in the form of the reverse subsidy. In case if income is 10% below the average level, the basic subsidy is provided from the budget, which means compensation of 80% of the amount necessary to reach this level.

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In our opinion, the current system of intergovernmental fiscal relations has significant disadvantages.

First, reverse subsidy amount depends on UTC budget`s fiscal capacity indicator, which, in turn, is determined on the basis of the amount of individual income tax (IIT). IIT is known to be the main budget source in the structure of local budgets. Its share in total local budgets of Ukraine is 56% of the total income, excluding transfers, and, in particular, 55% of UTCs. Since the share of the IIT remained in UTC is significant enough – by 60%, a partial withdrawal of funds from this source of income can negatively affect the financial position of a UTC.

Secondly, the new equalization method still does not solve the main issue, namely intensification of measures that will ensure the environment of national UTCs` financial capacity. Thus, financially capable communities will increase their potential and transfer part of their income to the State Budget (reverse subsidy). At the same time, insolvent communities will receive funds from the State Budget in the form of a basic subsidy. This instrument, in our opinion, does not solve the issue of ensuring financial stability of the overwhelming majority of UTCs, but also poses a threat to the financial position of UTCs that are able to increase their income.

Thus, we consider that only equalization method – from vertical to horizontal one was changed. The essence of the process did not transform. Today, pumping up of UTCs deficit budgets is still performed at the expense of financially capable communities.

According to the official information (based on the analysis of local communities financial performance) [16], basic subsidy adversely affects the financial capability and stability of local budgets. It is true, if the amount relative to their income is more than 50% (the calculation is done by dividing the amount of the basic subsidy for the total amount of own income and basic subsidy). The level of basic subsidy within 20-30% is considered uncritical for the budget.

From our point of view, it is advisable to identify similar indicators for the reverse subsidy amounts, since it directly affects the stability of local budgets and the UTCs financial capability.

3. Model building of reverse subsidy`s impact and united territorial communities` financial positions

We simulate the dynamics of UTC budgets` income, taking into account the current system of intergovernmental transfers. Malthus proposed one of the growth models (for the world population). If this model is used to describe the dynamics of the increase in the amount of united territorial communities` (UTC) own income, we will obtain: the growth of UTC income dN in certain time period t will be proportional to the income – N . This increase is proportional to the length of the lesser interval. Attributing this property to a function considered as continuous, we obtain:

$$dN = \varepsilon N\, dt, \tag{1}$$

where ε – constant coefficient of proportionality, expressing the ratio of income growth rate $\frac{dN}{dt}$ to income N. It will be called the coefficient of UTC own income increase.

From the equation

$$\frac{dN}{dt} = \varepsilon N \tag{2}$$

we obtain by integration

$$N = N_0\, e^{\varepsilon(t - t_0)}, \tag{3}$$

where $T = t - t_0$.

This is the formula of the Law of exponents`, which states that if time rises in arithmetic progression, the income changes in geometric progression.

It is possible to determine the number ε, which characterizes the rate of UTC income increase. Indeed, during the period $T = t - t_0$, income increases in $e^{\varepsilon T}$ times, which is more or equals to or less than one, depending on whether the income rises, decreases or remains unchanged. Besides, ε does not depend on the initial moment of time.

Thus, in order to describe the dynamics of UTC income changes, it is possible to propose the model described by the function (2). The model is hard and, in our opinion, does not reflect with sufficient accuracy the dynamics of feasible economic processes. It is expedient to replace it with the so-called soft one, where the coefficient of UTC own income increase (ε) depending on the income:

$$\frac{dN}{dt} = \varepsilon(N)\, N. \tag{4}$$

Then, $\varepsilon(N) = c - d\, N$.

The equation (2) will be the following:

$$\frac{dN}{dt} = c\, N - d\, N^2. \tag{5}$$

Formula (5) describes the logistic model. We consider that it can be used to describe the process of UTCs income growth. The following expressions for coefficients c and d could be proposed in this model: $c = \varepsilon$, $d = \varepsilon / K$. In this case, the dynamics of own resources, forming the sufficient level of UTC financial and economic security, can be described by the logistical equation:

$$\frac{dN}{dt} = \varepsilon N - \frac{\varepsilon}{K} N^2, \tag{6}$$

where ε – constant coefficient of proportionality which is the ratio of the resources growth rate $\frac{dN}{dt}$ to the volume of financial resources N;

$K = N_{max}$ – maximum possible and safe rate of UTC own financial resources.

In this model, steady state C is sustainable: higher income – decreases, lower – increases.

The equation (6) can be written in another way:

$$\frac{dN}{dt} = \varepsilon N \frac{K - N}{K}. \tag{7}$$

Dividing the variables into equation (7), we obtain:

$$\frac{K dN}{N(K - N)} = \varepsilon dt. \tag{8}$$

Taking into account that

$$\frac{1}{N(K-N)} = \frac{1}{KN} + \frac{1}{K(K-N)}, \quad (9)$$

The equation (8) will be:

$$\left(\frac{1}{N} + \frac{1}{K-N}\right)dN = \varepsilon dt. \quad (10)$$

After integration (10), we obtain:

$$\int \left(\frac{1}{N} + \frac{1}{K-N}\right)dN = \int \varepsilon dt + A,$$

$$ln\ T - ln(K - T) = \varepsilon t + ln\ a,\ ln\ a = A,$$

$$\ln\frac{N}{K-N} = \varepsilon t + \ln a. \quad (11)$$

From the equation (11) we find:

$$\frac{N}{K-N} = a\, e^{\varepsilon t}. \quad (12)$$

When t = 0, the amount of UTC own financial resources is $R = R_0$, then from the equation (12) we obtain:

$$a = \frac{N_0}{K - N_0}.$$

Having solved the equation (11) as to N, we find the function $N = f(t)$ in this form:

$$N(t) = \frac{aK\, e^{\varepsilon t}}{1 + a\, e^{\varepsilon t}}. \quad (13)$$

If to divide the numerator and denominator of the right part by e^{rt}, we obtain:

$$N(t) = \frac{aK}{a + e^{\varepsilon t}}, a = \frac{N_0}{K - N_0}, 0 < a < \infty. \quad (14)$$

Function (14) can be presented as:

$$N(t) = \frac{K}{1 + \exp(b - \varepsilon t)}, \quad (15)$$

where constant of integration *b*:

$$b = \ln\frac{1}{a} = \ln\frac{K - N_0}{N_0}. \quad (16)$$

The traditional model of the studied dynamics of process` development is: $\frac{dN}{dt} = \varepsilon N$, parametric variable ε – specific speed of UTC income growth is considered to be constant. To take into account the inverse relationship in the economic system, we assume that *r(R)* is variable, which depends on income:

$$r(R) = b - aR = r_0 - \frac{r_0 R}{K}.$$

It is under these conditions we have a logistic model of the rate of return changes` dynamics:

$$\frac{dN}{dt} = \varepsilon(N)N = (b - aN)N = \varepsilon_0\left(1 - \frac{N}{K}\right)N,\ K = N_{\max}, b = \varepsilon_0, a = \frac{\varepsilon_0}{K}$$

The equation (8) could be presented as:

$$N(t) = \frac{a}{1 + b\, e^{\varepsilon t}}$$

or (17)

$$N(t) = \frac{1}{a\, b^t + \eta}$$

The upper point of the logistical curve is defined as $\frac{1}{\varepsilon}$;the lower point as – $\frac{1}{a + \varepsilon}$; point of trajectory inflexion – $\frac{1}{2\varepsilon}$.

In our opinion, the logistic equation can be considered an equation that is closest to the conditions of UTCs sustainable development. Thus, it allows to determine safe limits of UTC`s financial position changes, which is capable to ensure sustainable development. The lower and upper points of the curve`s trajectory are these limits.

Equation (6) illustrates the dynamics of UTCs own income changes without external influences on the system. In national economic system, this corresponds to a situation when UTCs start to receive financial resources without their additional extraction. Nevertheless, according to the current legislation of Ukraine, both basic and reverse subsidies are used. In order to take into account the factor of a reverse subsidy, the model described by formula (6) must be adjusted. Then formula (6) is:

$$\frac{dN}{dt} = \varepsilon N - \frac{\varepsilon}{K}N^2 - q, \quad (18)$$

where q – component that takes into account the intensity of a reverse subsidy`s impact on UTC own income dynamics.

We provide (18) differently taking into account:

$$N = K\,B,\ t = \frac{\tau}{\varepsilon_0},\ q = \varepsilon_0 KQ, \quad (19)$$

obtain:

$$\frac{dB}{d\tau} = B - B^2 - Q. \quad (20)$$

If we equate the right side of equation (20) to zero, we obtain stationary (optimum) equation:

$$B = B^2 - Q = 0. \quad (21)$$

The roots of this equation are determined by equality: $B_{1,2} = \frac{1}{2} \pm \sqrt{\frac{1}{4} - Q}$.

If there is a reverse subsidy ($Q > 1/4$), UTC income rate falls down to the extremely low. With a slight level of effects ($Q < 1/4$), there are two stationary conditions B_1 and B_2. The stationary condition of B_2 income is sustainable: income is somewhat lower than in the absence of a reverse subsidy, but it can be quickly

restored. The stationary condition of UTCs B_1 income is unsustainable, if there is tendency of further income contraction. UTC may face crisis situations.

Thus, planning of a reverse subsidy depending on the achieved level of profitability enables the sustainable UTC performance. This condition should be described by equation: $Q = \alpha B$, where it is possible to vary the parameter α.

In this case, equation (20) is the following:

$$\frac{dB}{d\tau} = B - B^2 - \alpha B, \text{ where } \alpha > 0. \quad (22)$$

Stationary condition $B = 1 - \alpha$ is sustainable if $\alpha < 1$ and UTC financial resources are determined by equation: $B(1 - \alpha - B) = 0$, so $B_0 = 1 - \alpha$, $0 < \alpha < 1$.

Thus, the reverse subsidy`s intensity impact on UTC income amid stationary conditions is determined as follows:

$$A = \alpha B_0 = \alpha(1 - \alpha). \quad (23)$$

We find the value of the parameter α with the maximum decrease of UTC profitability. To do this, we equate to zero the derivative of dominant function on UTC income (23), which is considered as a function of the parameter α:

$$\frac{dQ}{d\alpha} = 1 - 2\alpha = 0. \quad (24)$$

So $\alpha = ½$. Hence, maximum power of dominance $Q = ¼$ is reached when $\alpha = ½$.

This approach allows to take into account the inverse relationship to control the UTCs income rate. It does not affect system`s sustainability. Optimal value of the coefficient $\alpha$ is accompanied by minor income reductions amid stationary conditions $B = B_0 = 1 - \alpha$, which cause the automatic restoration of UTCs profitability due to the system`s internal characteristics. A slight deviation of α from the optimal $\alpha = ½$ does not lead to the destruction of UTCs financial position, but only causes the decrease in the intensity of the reverse subsidy`s effect.

4. Approbation model

Let us examine the proposed model using official statistics of reverse subsidies in Ukraine. The analysis showed that amounts of reverse subsidies increase annually. 738 local budgets received basic subsidy in 2017, including 17 regional budgets (UAH 909.2m); 375 district budgets (UAH 3746.5m); 53 budgets of cities of regional significance (UAH 391,7m); 293 UTC budgets (UAH 768.1m).

Reverse subsidies were provided to 155 local budgets in 2017, among them 5 regional budgets (UAH 624,5m); 38 district budgets (UAH 366,9m); 64 budgets of cities of regional significance (UAH 2745,9m); 48 UTC budgets (UAH 157,9m).

According to the Law of Ukraine "On the State Budget of Ukraine for 2018", the basic subsidy was planned for 930 local budgets, namely for 17 regional budgets (UAH 1039.6m); 363 district budgets (UAH 4598.2m); 52 budgets of cities of regional significance (UAH 647.3m); 498 UTC budgets (UAH 1897.6m).

Reverse subsidy for 2018 is provisioned for 223 local budgets, including 5 regional budgets (UAH 732.0m); 45 district budgets (UAH 503.4m); 66 budgets of cities of regional significance (UAH 3668.0m); 107 UTC budgets (UAH 503.1m).

Thus, in 2017, the reverse subsidy made 20.56% of the basic subsidy, in 2018 this amount was increased by 5.95% and amount to 26.51%. Even so, calculations according to the proposed model indicate that the basic subsidy`s growth rate in 2018 in comparison with 2017 is 1.47%, and the reverse subsidy`s is 2.186%.

Conducted analysis of the reverse subsidy ratio in UTC income indicators showed that the leading territorial communities as for the received reverse subsidy amount were Goncharivska UTC (Chernihiv region); Verbkivska UTC (Dnipropetrovsk region) and Bogdanivska UTC (Dnipropetrovsk region). In addition, it is worth noting that in these communities subsidy amounts increased during 2016-2017: for Verbkivska UTC (Dnipropetrovsk region) from 15.9 to 19.9%; for Bogdanivska UTC (Dnipropetrovsk region) from 13.9% to 19.1%. For Goncharivska UTC (Chernihiv region) it totaled 25.8% in 2017. Goncharivska UTC was established in 2016, therefore its budget in 2017 was unsubsidized.

Let us analyze growth rates of the average per capita own income of the mentioned communities during 2015 – 2017. We have the following data: Verbkivska UTC – 946,22% (2016/2015), 25,98% (2017/2016); Bogdanivska UTC – 632,95% (2016/2015), 24,50% (2017/2016).

Thus, comparing the analysis results of the mentioned communities per capita own income dynamics during 2015 – 2017 we found out that the communities` income growth rates were distributed as follows: Verbkivska UTC (Dnipropetrovsk region) – 946.22% (2016/2015), 25,98% (2017/2016); Bogdanivska UTC (Dnipropetrovsk region) – 632,95% (2016/2015), 24,50% (2017/2016). That is, the exponential income growth was observed during the first year of performance, namely in 2015. In 2016, income growth rate significantly decreased and approached the logistic regularity. However, the reverse subsidy soared from 2016 to 2017 as follows: in Verbkivska UTC (Dnipropetrovsk region) – from 15.9% to 19.9%; in Bogdanivska UTC (Dnipropetrovsk region) – from 13.9% to 19.1%, in Goncharivska UTC (Chernihiv region) it was 25.8% in 2017. The reverse subsidy amounts almost reached the calculated 25% safe level for the united territorial communities. Their subsequent growth causes crisis for UTCs and, unfortunately, there are appropriate preconditions for this. For instance, the proposal to increase the rate of withdrawals from local budgets, called reverse subsidies, from 50% to 80%, was introduced, but not adopted in 2017.

5. Conclusions

The analysis of the fiscal equalization system introduced in 2014 instead of the system of income and expenditure balancing, allowed us to conclude that the current system is also not without disadvantages. The main one is the reverse subsidy, which amount is determined based on individual income tax. It negatively affects the financial position of a UTC, since the individual income tax itself is the main source of community`s income. The new equalization tool negatively affects financially capable communities, constrains their development as a result of funds withdrawal to the State Budget with the simultaneous support having no factual basis of insolvent communities at the expense of the basic subsidy.

Comparing income growth trends with the reverse subsidy`s growth rates clarified that over recent years during 2015-2016 the income growth of financially capable united territorial communities exponentially slowed down with a simultaneous increase in reverse subsidies to 25% of their amount.

We put forward a hypothesis regarding the definition of reverse subsidy`s permissible limits correlated to the growth rates of UTC per capita income.

It was demonstrated that the exponential law could be considered as a hard model, since it does not reflect with sufficient accuracy the dynamics of UTC income growth. It was suggested to use the so-called soft model to describe UTC own income dynamics by the logistic curve. This model allows determining the safe limits of UTC financial position adjustments and ensure its sustainable development. The lower and upper points of the logistic curve`s trajectory could be considered as these limits.

Conditions for the external impact on the UTC system in the form of reverse subsidy and safe limits for its amount`s adjustments

were shaped. It was proved that the reverse subsidy in the amount of 50% of UTC income could cause the critical financial position which would be difficult to meet aidless. The permissible value of the reverse subsidy according to our calculations should be no more than 25%. It was demonstrated that it is possible to enable conditions for sustainable development of financially capable communities, if flexible, financially based approach is used to determine the reverse subsidy`s amount.
The proposed model is based on factual data concerning methods of UTC income generation and reverse subsidy`s amount during 2015 – 2017. It was estimated that the growth trend of reverse subsidy in 2017 and its planned rate in 2018 threaten the financial position of successfully operating financially capable united territorial communities.

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