

Optimal structure of International Union budgetary revenues

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Abstract: This article proposes a new approach to the issue of political and financial sustainability (equilibrium) in an international union. The proposition is made to set members' budgetary payments proportionate to their willingness to pay. It is argued that this willingness-to-pay principle ensures an optimal setup in the institutional system of an international union. Application of this methodology to the EU allowed deriving the members' optimal budgetary contributions and brought up some other important insights.

Keywords: international union, budget, contribution, optimal, member state, EU

JEL Classification: F36, F55, G28

Introduction

Economic integration became a distinct feature of international economic relations in the second half of the last century. The constantly growing number of bilateral and multilateral trade agreements and other economic agreements makes it clear that the integration process will hardly be reversed. Moreover because financial stability is one of the main factors of the successful operation of any international organization, the question of how to create a financially and politically balanced budgetary system of an international union is of great importance. This balance can be achieved by following two simple rules: 1) Budgetary expenditures should be rational and decided upon before the revenues are determined. (In short, only policies that will be more efficient if they

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are realized at the supranational level should be financed.) Furthermore, 2) budgetary revenues should be structured to reflect the interests of all of the member states in an equal manner.

The means to keep the first rule are completely grounded by the followers of the theory of fiscal federalism and its satellites (see Musgrave, 1969; Oats, 1972; Bird, 1993; Figueira, 2008; Persson et al. 1997; Alesina, Angeloni and Etro, 2005; Pelkmans, 2006; However, the second issue has not received adequate attention in the scientific literature.

Many attempts have been made to explain the interstate distribution of expenditures or the net budgetary balances in the EU (Hix, 1999; Carruba, 1997; Baldwin et al., 2001; Mattila, 2004) and to improve the revenue side of the EU budget (European Commission, 2014; Cipriani, 2007; Ferrer, 2007; Cacheux, 2007; Begg, 2009; Alves and Afonso, 2009; Leen, 2012). However, I have not discovered any works that give sound theoretical guidelines for structuring international unions' budgetary revenues. The closest research on this issue (which has not yet been published) is being carried out by Simon and Valasek, 2012; who are evaluating the efficiency of the whole fiscal redistribution system in supranational unions under various endogenous and exogenous conditions, such as unstructured bargaining and different voting methods, levels of income, heterogeneity, and budget size. I use some of the assumptions made by these authors. For example, in rational members' behaviour and voluntary participation, the utility is an individual member's valuation of the integration process. However, my task in this article is to deduce the optimization options of the revenue part of a supranational budget when the expenditures are considered as given.

The concept of the benefit principle from the theories of taxation developed by Wicksell (1896) and Lindahl (1919) played an important role in this research. This principle bases the taxes imposed to pay for public-goods expenditures on the benefits received by the taxpayers from these goods. However, in this article I transform this principle into the willingness-to-pay principle.

In my opinion, the revenue side of an international union's budget should serve as the main mechanism to make the whole union politically and financially balanced and, hence, sustainable. From this point of view, the role of the revenue anticipated in a supranational budget is underestimated by both theoreticians and practitioners. I intend to improve this situation.

The bulk of the empirical data on supranational budgeting can be obtained from the regulatory acts of international unions that are currently in force. In conjunction with the research papers I have cited, these acts are an important

methodological basis for developing the revenue optimization model presented in this article.

I begin by arguing that there is only one way to improve the institutional arrangements in an international union when the decisions on the basic parameters (the authorities, their powers and location, the decision-making procedures, the budget size and the structure of the expenditures) have already been made, namely, to render all of the member states equally satisfied with the institutional setup. This goal can be achieved by establishing the payments made available to the common budget by each member, which should be proportional to the individual members' willingness to pay.

The empirical evidence that the revenue systems of existing international unions are not optimal based on my model is provided in the third section. In section IV, I focus on the factors that determine the willingness-to-pay.

The main difficulty that arises when applying this model is the determination of the willingness to pay values. Some appropriate techniques that can be used for this purpose are suggested and briefly discussed in section V. Furthermore, I apply one of the techniques to estimate the 'willingness to pay' of the EU Member States, and I derive the optimal amounts of payments that they should have contributed to the common budget in 2011. These calculations also led to some important conclusions (section VI). Final remarks are given in section VII.

I. Conceptualization

I begin with the notion that the international union in this study is regarded as a voluntary association of sovereign states that decide to centralize or coordinate certain policies and confer corresponding powers to central supranational bodies. First, I single out the main parameters of a typical international union's budgetary system and clarify my approach.

The parameters include the budget size, the structure of the budgetary expenditures and the structure of the budgetary revenues. The latter point covers two principal issues: the sources of revenue (the contributions from national budgets, supranational taxes, etc.) and the amount of revenue generated within each member state's jurisdiction. Each member's payment is a keystone not only of the whole union budgetary system but also of the entire union's institutional setup. The payment calculation is the culmination of the budgetary process and the 'last frontier' where 'fairness' of the system can be secured.

Generally, the steps of the budgetary process can be ordered as follows: 1) deciding what projects will be funded (the structure of the expenditures); 2) summing up their costs to determine the size of the budget; *3) deciding how much each member pays*; 4) agreeing on the sources of revenue; and 5) resolving the procedural issues. The first two issues are normally decided prior to the pure revenue issues. Thus, when focusing on each member's contribution, we can assume the first two issues have already been addressed. Note that the issues of revenue sources and procedures normally have a minor impact on the parameters in my optimization model.

In this context, it is reasonable both to consider the mechanism of assigning budgetary contributions to member states as an optimization instrument and to consider the optimal state itself as a set of institutional parameters that equally satisfy all of the members of an international union. Thus, this mechanism ensures the union's political and financial sustainability. In other words, the ability of the parameters of a system to meet members' interests to the same degree should be considered the main optimality criterion.

Holding all of the other institutional and budgetary arrangements (except for the per-state split of budgetary revenues) constant is the main precondition for the concept to work properly.

Following all of the above definitions and assumptions, it becomes clear that as a result of the 'satisfaction' with the institutional setup of a union, each member is willing to pay a particular amount of money into the union budget. Hence, *it is impossible to assign optimal contributions to the members of an international union without employing a new category: the willingness to pay into the common budget.*

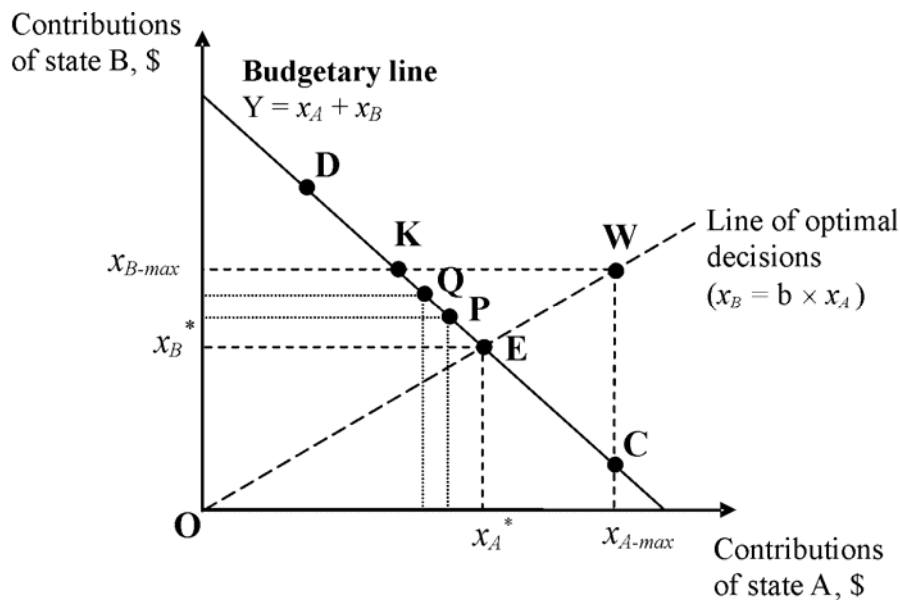
Using the introduced category of willingness-to-pay, I suggest a model that will help to answer the question of what distribution of members' budgetary contributions is optimal for a union.

II. Basic Model

Consider an international union of two states, A and B. Having established a budget size Y , both states agree to finance it through contributions, which will be the only revenue source. Then, the *budgetary curve* will be a line connecting both axes of the coordinate system with the contributions of member state A plotted on the horizontal axis and the contributions of state B plotted on the vertical axis. In Figure 1, $Y = x_A + x_B$ is an equation describing the budgetary line,

where x_A and x_B are the amounts of the budgetary contributions of the corresponding states.

Figure 1 – Model of Optimal Contributions of Members to the Budget of an International Union



Each combination of contributions located on the budgetary line should exactly meet the needs of an international union in financial resources. But obviously not each combination of contributions that is located on the budgetary line should exactly meet the financial needs of an international union. Although not all of the combinations will satisfy both states, it can be expected that there will be more than one combination that satisfies them. The optimal combination is a point that in percentage terms is equidistant from the critical points of the segment that combines all of the acceptable combinations of contributions for both members (which is termed an 'acceptability segment').

The coordinates of these critical points are the points where the budgetary line intersects the lines that reflect the amounts of the maximum contributions (x_{A-max} and x_{B-max}) that both members are willing to pay into the common budget (the *willingness-to-pay lines*). In the figure, these lines are line CW for state A and line KW for state B, and C and K are the critical points of the 'acceptability segment'.

Furthermore, W is the intersection point of both willingness-to-pay lines that demonstrates the upper limit of the budget size that members will accept.

Hence, when there are three linear constraints (a budgetary line and two willingness-to-pay lines) and the above assumption holds (see section I), *the optimal budgetary contributions will be calculated proportionally to the maximum amounts that members are willing to pay into the common budget*. Graphically, this optimum is an intersection point of the line OW with the budgetary line (point E). In percentage terms, this point will be equidistant from the critical points of the 'acceptability segment' CK. *This decision allows assignments of member states' contributions that not only satisfy them all, but do so to the same extent.*

The coordinates of the optimum point (E) in this model can easily be found by simultaneously solving the equations of the budgetary line and the line of optimal decisions:

$$\begin{cases} Y = x_A + x_B \\ x_B = b \times x_A \end{cases} \quad (1)$$

where: Y is the size of the revenue part of the budget (which is assumed to be balanced); x_A is the budgetary contribution of state A; x_B is the budgetary contribution of state B; lastly, b is the slope of the 'line of optimal decisions', which must be greater than zero, and is calculated as the ratio between the values of the willingness to pay (x_{B-max} / x_{A-max}). Thus, the optimal (equilibrium) contributions of states A and B are as follows:

$$x_A^* = \frac{Y}{1 + b} \quad (2)$$

$$x_B^* = \frac{b \times Y}{1 + b} \quad (3)$$

Point P in Figure 1 is a schematic demonstration of the combination of members' contributions, which are calculated proportionally to their GDPs. Point Q shows equal contributions (50/50). Although both points fall into the 'acceptability sector', they do not provide for the optimal combination of payments.

Point D represents a combination of contributions when the combination falls beyond the limit of acceptability for member state B, though it still provides the

union with the necessary financial resources. This phenomenon can be observed when the rules according to which the contributions were established disregard the members' willingness-to-pay. State B can only accept payments that are larger than its willingness-to-pay if it receives compensation from state A. The size of this compensation must be not less than the length of the projection of segment DK onto the vertical axis.

When point W falls into the area between the axes and the budgetary line, none of the combinations of contributions can meet the financial needs of an international union. This situation can occur when the decision-making rules of a union allow for the approval of budgets the sizes of which are larger than the sum of all of the members' willingness to pay values, OR when under specific circumstances, the values of the willingness to pay decrease without corresponding reductions in the budget size.

It should be mentioned that it is possible to apply the simple proportion rule in the optimal contributions' calculation only when the values of the willingness to pay all of the members can be determined. In addition, formulas 2 and 3 will reveal the optimal combination of payments based on either the willingness to pay values or their ratio (coefficient b). Thus, the second method is more adaptable.

Depending on researchers' needs and the tools employed, the willingness to pay values can be estimated either in monetary terms or in terms of the percentage share in GDP (the GNI). These values are easily convertible. For comparative purposes, it seems to be more useful to use relative indicators.

To summarize, it should be noted that a variety of rules can be used to determine member states' shares in financing the common union budget. However, as certain rules do not lead to equal satisfaction with the institutional arrangements among all of the members, they cannot be considered optimal. Deviations from the suggested 'proportionality of the willingness to pay' principle make international unions less sustainable and more vulnerable to endogenous and exogenous factors. Furthermore, over time, such deviations can cause budgetary crises and jeopardize integration projects.

III. Are the Revenue Systems of the Existing International Unions Optimal?

Based on my definition of 'optimality' as a system's ability to satisfy all parties equally, I would expect a negative answer to the posed question, as the current systems were not designed optimally. The underlying principle for projecting

international unions' budgetary parameters is to make them acceptable (satisfactory) to all members but not to approximate the levels of acceptability (satisfaction). Moreover, cases when members make their contributions late or do not make them at all show that even the simplest acceptability principle is not always followed. However, we must search for more empirical evidence of international integration.

Surprisingly, none of the 23 international unions that I analyzed establishes direct links between their integration effects or the benefits and contributions that members pay into the union budget. Instead, the constitutive treaties of most of these unions appeal to principles of equality, economic capacity, balanced budgets and their own resources. The first two of these principles are meant to create a sense of 'fairness' regarding the contributions that members pay into the common budget. Thus, these principles seem to be closely related to the approach I suggested above (to link the contributions to members' willingness to pay). However, in reality there is no relationship between the two approaches; that is, some distortion of the determinants of 'fairness' takes place. To demonstrate this distortion, let us consider the principles in detail.

The equality principle is understood in two ways: 1) everyone pays equal (in size) contributions to the common budget; 2) members pay differentiated contributions calculated according to a universal formula (rule). The first concept can be considered 'fair' from the perspective of integration benefits only when all members receive identically valued benefits from integration, which is practically impossible. Moreover, the second concept would coincide with my approach only if the willingness to pay or the integration benefits were used as a basic variable for the above-mentioned formula, which is not the case in any international union. Instead, the variables used in such formulas include member states' GDPs and the number of their votes in union authorities.

The principle of economic capacity (understood as 'everyone pays according to their economic capacity or potential') reflects integration benefits only partially. It is known that a state's participation in a particular integration project is not the only determinant of its economic development. In most cases, the participation is not even a primary factor. Integration itself is not only an economic issue. However, in all unions where this principle is applied, the budgetary payments are calculated proportionally to members' GDPs (or GNIs).

In some international unions, there are unwritten rules regarding 'fairness'. Particularly in the EU, the member states often judge this concept based on the net balance between the contributions that they make available to the common budget and the payment appropriations that they directly receive from the budget.

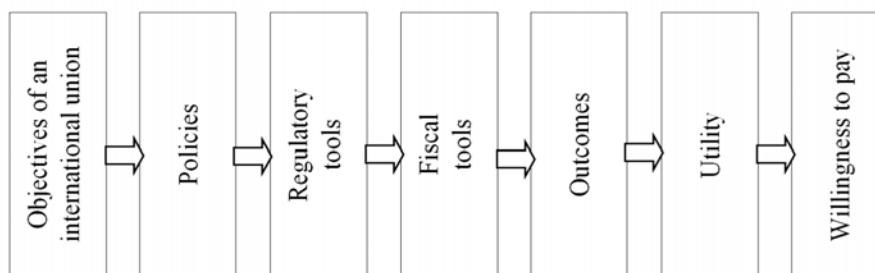
Thus, the principles of equality, economic capacity and others on which the revenues of international unions are based provide the members with the feeling of relative 'fairness' in the interstate distribution of budgetary contributions. These contributions can be considered acceptable by the members. However, they do not assert that all of the members' interests are equally satisfied. *Exactly these differences in the levels of the 'satisfaction' of the members with the financing system of a particular international union demonstrate that the system can be improved. In my view, improvements can be made only by assigning to each member a contribution that respects its willingness to pay into the common budget.*

IV. The Willingness to Pay Determinants

A number of factors can impact members' willingness to pay into the budget of an international union. However, if they behave rationally, the utility created by a particular integration project seems to be the main determinant. It has been argued (see Boiar, 2013) that the integration utility is a direct consequence of the outcomes of union policies, which are realized through regulatory tools (the legislative and institutional framework) and fiscal tools (budgetary revenues and expenditures). The legislative and institutional framework of a union includes its legislation in force, a set of institutions, the location of their headquarters, the decision-making procedures, etc. All of these links are demonstrated in Figure 2.

Union institutions can be empowered for policies whenever the members' preferences are sufficiently heterogeneous. In that case, some of the states may have few expected benefits from the integration project; as a result, their willingness to pay into the common budget will decrease. Similar results may occur if there are weaknesses in any link of the chain in Figure 2.

Figure 2 – Union's Objectives and Its Members' Willingness to Pay Chain



It should also be noted that upon considering the integration utility as the only determinant of members' willingness to pay and allowing for a proportionate linear relationship between the two factors, the former factor (if it is estimated in a monetary form or any other absolute form) can be used as an alternative for the latter factor, as suggested in Section 11 optimization model. However, in this case it will be impossible to reveal the upper limit of the financial resources that a union can count on (the coordinates of point W in Figure 1). Even if only the relative values of the integration utility can be established, it will still be possible to calculate the willingness to pay values.

Importantly, integration utility is not the only determinant of members' willingness to provide a union budget with financial contributions. There is empirical evidence (in the EU) that a member's net balance in a supranational budget can also become an important factor of its willingness to pay, which is clearer when weighty financial resources are redistributed through the budget. If there is a significantly negative balance (i.e., if the payments to the budget exceed the appropriations received from it), a member can treat the whole budgetary system as 'unfair'. As a result, the willingness to pay of this member will decrease, and furthermore, it will insist on institutional rearrangements in the union. When this phenomenon occurs, the value of this negative net balance can help a researcher to estimate the willingness to pay value of the corresponding state.

The cost of membership is another willingness to pay determinant. It is reasonable to assume that member states bear different costs or losses associated with their membership in a union (in both pre-accession and post-accession stages). Those members that have larger costs can be expected to be willing to pay less than the states whose membership in a union did not cost as much.

States' willingness to pay will also depend on their macroeconomic parameters (their annual GDPs, growth rates, sovereign indebtedness, tax regime, etc.), the welfare of their citizens (which is primarily expressed by the income per capita indicator), the historical and socio-cultural identity of the regional population, and other factors. Whereas the former two factors are associated with countries' capacity to pay, the others are associated with psychological and political issues.

It makes sense to assume that the willingness to pay values can affect each other (i.e., that these values are colinear). Thus, if one member state is not

willing to pay their existing contribution anymore, other states may also reconsider their contributions.

V. Methods for Estimating the Willingness to Pay

Establishing the true values of member states' willingness to pay is the most complicated step in the suggested method of optimization. The willingness to pay values can be estimated using three techniques:

- A public survey conducted in all of the union's member states. Because people are adequately informed in their perception of the benefits that their country would obtain from participation in a particular international union, this method can give the most 'true-to-life' values of the willingness to pay. The only problems that can distort the results are the shortcomings of the survey technique (e.g., poor questioning or manipulations of the sample).
- Mathematical calculations based on a situational analysis of the existing parameters of the revenue of a union, such as the methods of abstraction, extrapolation, and analogy. However, this methodology can only be used in active (for at least several years) international unions. The lack of universality, the possibility of a biased approach and the dominance of *ad hoc* rules can be singled out as the main shortcomings of this technique, whereas high resilience to the specific conditions of a particular international union can be considered its main advantage.
- Assuming that officials represent public opinion, a survey of the representatives of the major financial and political departments of the member states that are directly involved in the negotiating process for the union's budget can be undertaken. The disadvantages of this method are its opacity, subjectivism and the possibility of conscious manipulations on the part of the member states to minimize their contributions to the common budget (the common pool problem). This technique's closeness to 'real life' conditions is its main advantage.

One cannot exclude the possibility of employing other research techniques, e.g., econometric modelling or other types of surveying. In any case, these techniques must allow the determination of the absolute values of member states' willingness to pay into the common supranational budget for the optimization model presented above to work properly.

VI. Optimal Budgetary Payments for the EU Member States

To calculate the willingness to pay values of the EU Member States, I use the second technique presented above. The assumption is that the integration utility is the only determinant of the members' willingness to pay. The relative integration utility levels of the EU Member States in 2011 were estimated by Boiar (2013) and presented in the form of composite indexes of integration utility (**R**) that can theoretically range from 0 to 100. If the index is close to 100, then the country receives the maximum possible utility from all five components of integration utility.

Given the per-state relative integration utility values, it would be possible to estimate the per-state willingness to pay values if we knew the willingness to pay value for at least one of the members and assumed the same proportional relationship between the two parameters for all of the EU Member States. The excessively negative net budgetary balances of some Member States in the EU budget can help in this calculation, as they allow to assume that states with the largest negative balances pay quantities into the common budget that are close to the maximums they are willing to pay. The fact that some states receive compensation through the EU budgetary mechanisms confirms this idea. However, deciding which member state can be chosen for these calculations is not trivial; I argue that the best choice is Italy. The reason is that in 2011, Italy was the country with the largest (as percentage of its GNI) negative balance in the EU budget (see column 8 of the table) and did not receive any compensation.

Table 1 – Optimal Budgetary Payments of the EU Member States: Initial and Derived Data

	1	2	3	4	5	6	7	8	9	10
	GNI 2011, € billion ^a	Composite index of integration utility (R) ^b	Willingness to pay (WFP), per cent GNI ^d	Willingness to pay, € million ^d	Optimal payments (OP), € million ^a	Actual payments (AP), 2011, € million ^a	Actual Payments 2011, per cent to GNI ^d	Net balance in the EU budget, per cent to GNI ^c	Difference between AP and OP, per cent to GNI ^d	Difference between AP and WFP, per cent to GNI ^c
Belgium	375.458	70.4	1.388	5,211.4	4,501.8	4,926.5	1.312	0.498	0.113	-0.001
Bulgaria	37.475	60.7	1.197	448.5	387.4	395.2	1.055	1.900	0.021	-0.001
Czech Republic	144.408	56.9	1.122	1,620.9	1,400.2	1,682.5	1.165	0.932	0.196	0.000
Denmark	247.479	56.3	1.110	2,746.9	2,372.9	2,448.3	0.989	-0.394	0.030	-0.001
Germany	2612.420	60.8	1.199	31,321.1	27,056.2	23,127.1	0.885	-0.421	-0.150	-0.003
Estonia	15.162	63.8	1.258	190.7	164.7	158.6	1.046	2.283	-0.041	-0.002
Ireland	125.333	58.1	1.146	1,436.7	1,241.0	1,338.7	1.068	0.240	0.078	-0.001
Greece	208.242	54.2	1.068	2,223.7	1,920.9	1,903.0	0.914	2.225	-0.009	-0.002
Spain	1048.131	63.0	1.242	13,019.8	11,246.9	11,046.3	1.054	0.244	-0.019	-0.002
France	2034.027	55.8	1.101	22,386.0	19,346.4	19,617.2	0.964	-0.317	0.013	-0.001
Italy	1589.735	51.9	1.024	16,078.0	13,888.7	16,078.0	1.024	-0.414	0.139	0.000
Cyprus	17.156	57.2	1.129	193.6	167.3	184.8	1.077	-0.007	0.102	-0.001
Latvia	20.194	48.7	0.960	193.9	167.5	182.3	0.903	3.608	0.073	-0.001
Lithuania	29.555	59.9	1.181	349.0	301.5	302.0	1.022	4.570	0.002	-0.002
Luxembourg	30.646	73.9	1.458	446.8	386.0	293.1	0.956	4.096	-0.303	-0.005
Hungary	94.576	55.0	1.084	1,025.5	885.8	937.4	0.991	4.645	0.055	-0.001
Malta	5.833	51.6	1.018	59.4	51.3	66.5	1.139	1.179	0.260	0.001
Netherlands	608.147	67.3	1.326	8,065.3	6,967.1	5,868.9	0.965	-0.626	-0.181	-0.004
Austria	300.247	53.7	1.058	3,177.5	2,744.8	2,688.7	0.895	-0.271	-0.019	-0.002
Poland	353.853	65.7	1.295	4,582.1	3,958.2	3,580.4	1.012	3.069	-0.107	-0.003
Portugal	164.901	54.9	1.083	1,786.2	1,543.0	1,734.4	1.052	1.808	0.116	0.000
Romania	134.704	65.0	1.283	1,727.8	1,492.5	1,225.9	0.910	1.064	-0.198	-0.004
Slovenia	35.050	58.9	1.161	406.8	351.4	401.1	1.144	1.272	0.142	0.000
Slovakia	67.753	69.0	1.361	921.8	796.3	693.7	1.024	1.611	-0.151	-0.003
Finland	193.671	49.3	0.973	1,884.0	1,627.5	1,955.2	1.010	-0.342	0.169	0.000
Sweden	396.095	53.7	1.059	4,196.4	3,625.0	3,333.6	0.842	-0.398	-0.074	-0.002
United Kingdom	1758.852	38.1	0.750	13,200.0	11,402.5	13,825.2	0.786	-0.412	0.138	0.000
Total	12629.105	-	-	138,909.8	119,994.7	119,994.7	-	-	-	-

^a Source: European Commission: "EU expenditure and revenue". Accessed December 24, 2014, http://ec.europa.eu/budget/revexp/revenue_and_expenditure_files/data/revenue_and_expenditure_en.xls.

^b Source: Boiar, 2003.

^c Source: Own calculations based on: European Commission: "EU expenditure and revenue". Accessed December 24, 2014, http://ec.europa.eu/budget/revexp/revenue_and_expenditure_files/data/revenue_and_expenditure_en.xls.

^d Source: Own calculations.

Thus, in 2011 Italy generated payments to the EU budget amounting to 1.024 per cent of its GNI (€16.078 billion), which I consider to be the willingness to pay of this country. The ratio of the values of Italy's willingness to pay to the integration utility (0.0197) gives a coefficient that I need to calculate other members' willingness to pay values, which are provided in the table (columns 3 and 4). The optimal budgetary payments in 2011 (column 5) are calculated proportionally to the willingness to pay values remembering that the actual nationally generated payments in that year amounted to €119.995 billion in payment appropriations (column 6).

The integration utility indexes and willingness to pay values (in percent of GNI) vary significantly among the member states (the variation coefficient exceeds 13 percent). The United Kingdom, Latvia and Finland receive a level of integration utility that is less than 50 percent of the greatest theoretically possible value; naturally, their willingness to pay values are the lowest ones. The opposite statement can be made about Luxembourg, Belgium and Slovakia, whose integration utilities are ranked top three in the EU (at approximately 70 percent).

Interesting conclusions can be reached by examining the values expressed in monetary form. *The sum of the willingness to pay values (€138.91 billion or 1.10 percent of the EU GNI) gives us the maximum size of the EU budget that the Union can securely rely on.* The actual upper limit for the EU's 'own resources' in 2011 was established at 1.23 percent of its members' GNI.

The optimal budgetary payments for 2011 should have been established at somewhat higher or lower levels. On a large scale, they are very close to the actual payments (the correlation coefficient is 0.989). However, *even this small difference makes some member states pay significantly more into the common budget than they would otherwise have paid.*

The difference between the actual and optimal payments (column 9) also shows that if the integration utility were the only determinant of the willingness to pay, *Germany, Austria, Sweden and the Netherlands most likely would not receive the compensation through the EU budgetary mechanisms that they are currently receiving.* The fact that these countries get compensated confirms that their willingness to pay is determined by other factors, possibly by the fact that other states (initially, the UK) receive compensation. In that case, the EU mechanisms of budgetary rebates are politically biased.

There are also four states whose actual payments exceed their willingness to pay values (the UK, Finland, Malta and the Czech Republic). However, among them only the UK receives compensation through the EU budget. Some other

interesting relationships can be noticed by examining the figures presented in the table.

It should also be mentioned that selecting a different country (not Italy) whose budgetary payments are considered as its willingness to pay value would only change an interpolation coefficient and, correspondingly, change the willingness to pay values of other member states but not the sizes of their optimal budgetary payments. This statement will be true as long as R index and the total budget size remain unchanged because the proportions among the willingness to pay values remain the same. Therefore, manipulations with a sample country will not alter most of the above conclusions.

Thus, *the current budgetary revenue generation system of the EU is far from optimal*. To optimize the system, it must be redesigned so that member states are obligated to contribute to the budget amounts that are proportional to their willingness to pay. It would be fair if in the new formula, this calculation were made a function of the utility created by the Union for its members.

The application of this optimization technique in the EU will not only ensure political and financial stability in the organization, but will also help to solve the problem of the net budgetary balance approach that has spread in the EU since late 1970. Due to the recent recession, both issues have become more urgent.

VII. Final remarks and conclusions

The described model can be used to establish the optimal distribution of the budgetary contributions among the members of an international union regardless of how many members it includes or what the sources of revenue are. Establishing quota for each member's contribution is the main focus of this optimization technique. When supranational taxes are introduced, they can flow into the union budget until the quota is drained; if tax payments do not deplete the quota, they can be supplemented by direct national contributions.

The introduction of the willingness-to-pay principle in the budgetary system of the EU is expected to improve the efficiency of the whole system. There are two reasons for this improvement (as Simon and Valasek argue, 2012): 1) exogenous rule will lessen the effect of contributions upon bargaining outcomes; and 2) states with higher social returns from supranational projects will start receiving more resources from the common budget. Thus, increased contributions will increase the states' bargaining power with respect to the allocation of expenditures, which *will continue happening until the decreasing*

marginal utility (which is revealed through the willingness-to-pay of the citizens) is equal to the marginal costs (which are revealed in the contributions).

The main difficulty in applying this optimization methodology is determining the true values of the willingness to pay and/or the integration utility. The techniques that can be employed for this purpose (which are from Social Choice Theory, Welfare Economics, Microeconomics or from the arsenals of other scientific fields) are the most debatable issue and should be improved. I consider nationwide surveys the most impartial way to reveal a country's willingness to pay, especially in advanced international unions of democratic societies.

Other difficulties could occur when introducing the new approach, such as the political resistance of members whose budgetary contributions will increase after the reform. Because such reforms usually require unanimity for their approval, they can easily be rejected. Thus, these reforms' introduction seems to be more realistic when projecting a new international union. In existing unions, the willingness-to-pay approach can be introduced under conditions of endogenous political and financial disturbances, that is, as a stabilization tool.

The possibilities for applying this approach while projecting new international unions will also be limited. Because this method can be based only on the willingness to pay derived from the expected utility but not the real integration utility (which is not yet known), the willingness to pay in such situations can be revealed only through public or expert polls. Empirical data will only become accessible after the integration project achieves practical results. In any case, the revision of the amounts that member states contribute to the union budget should be modified periodically, which will help to maintain the budgetary system in a state which is close to the optimal one.

It is quite natural to expect the rejection of the idea of linking contributions to a common supranational budget with members' willingness to pay or the integration utility among supporters of the principle of complete solidarity in international unions. In particular, among the followers of the structuralistic concept of integration which was started in the papers of Marshal (1965) and Wiles (1968). The issue can become especially contentious in organizations that are very diverse in terms of the levels of economic development among the member states, as poorer members can be expected to oppose this approach.

A possible difference between the estimated and actual values of the willingness to pay that is associated with the usage of data lagging in time can also be considered a shortcoming of this optimization methodology. However, as long as all of the members are treated equally on this issue and the postponed effects of

most common policies are taken into account, this shortcoming of the methodology can be ignored.

Finally, I would like to express my assurance that the optimization methodology proposed in this article is plausible and applicable. Although some of its details may be debatable, it clearly indicates a method by which the budgetary system of any international union can be improved. Improvements will appear and increase the fairness of the system, and subsequently, the whole union will become more sustainable in political and financial terms. There is also evidence that the introduction of the 'proportionality of the willingness-to-pay principle' will increase the efficiency of the fiscal redistributions in a union.

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