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Effects of financial transfers on redistribution and risk sharing within the EU and the Euro Area

Tsvetan Pavlov[1*], Dimitar Kostov[2]

[1,2]*Department of Finance and Credit, Tsenov Academy of Economics, Svishtov, Bulgaria.*

Corresponding author: Tsvetan Pavlov (*Email: ts.pavlov@uni-svishtov.bg*)

Abstract

The effectiveness of European fiscal policies is of particular importance for the future economic performance of the community especially during times of crisis due to polarized public opinion and expert criticism. This study attempts to identify the redistributive and risk-sharing effects resulting from centralized financial transfers within the EU. We investigate a broader sample of EU (28) countries during 2000-2021 in addition to the Euro area countries used in most studies on the issue. Traditional regression methods and the Pooled Mean Group (PMG) model were used in order to maximize the objectivity of the analysis. The study's results show that long-term redistribution is virtually absent with levels below 1%. In some cases, the values are even negative which is an interesting (but not unattested) finding in the context of such a sensitive issue as the permanent shift of wealth within the EA and EU. Budget transfers achieved a risk-sharing effect of 11% for the EU and 29% for the EA. Risk sharing levels are comparable and even better than those of some fully-fledged fiscal federations. This is an attestation to the capacity of the EU to successfully implement its intended policies despite some criticism.

Keywords: EU, Euro area, Financial integration, Fiscal transfers, Macroeconomic shocks, PMG model, Redistribution, Risk sharing.

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1. Introduction

The European Union and the Euro Area (EA) have been the subject of research interest since their inception to assess the viability of the European economic project, its conformity with theoretical propositions, its performance under various economic conditions, its comparison with analogous economic unions and the extent to which it has achieved its objectives. Central to these research pursuits is the concept of the Optimal Currency Area [1] according to the theory of R. Mundell, formulated in two successive foundational papers Mundell [2] and Mundell [3]. The main focus of Mundell's [2] study is on the integration of regions, understood as the synchronization of the response to productivity shocks. Hence, if some regions in one country are not very well integrated with the others but are synchronized with regions in another country, it may be fruitful for them to form a separate currency area despite the fact that they are in different countries (referring to the US and Canada). According to the second study by Mundell [3], an optimal currency area is better formed by countries with a greater degree of divergence [4]. Mundell is often considered to be the "father of the euro" due to this second paper [5]. However, a key element in both concepts is the response of regions to asymmetric (idiosyncratic) shocks and their ability to cope with them. It is impossible to deal with a sudden change through separate monetary policy and exchange rate adjustments in an area with a shared currency [6]. National fiscal policies are limited in effect due to deficit financing constraints as in the Euro area [7]. This leads to a vicious circle where idiosyncratic shocks affect the common economic and monetary space and it does not help to overcome them [8]. According to the parameters outlined in the optimum currency area theory, the adjustment has to take place through multiple channels [9-11]: (1) mobility of factors of production especially labor. (2) Openness of economies. (3) Product diversification. (4) Unrestricted movement of capital. (5) Synchronization of business cycles of different regions. (6) A system of fiscal transfers to smooth shocks if any of the above conditions are unachievable, etc.

Many of the requirements are not satisfied inside the EU and the EA. For example, labour mobility cannot be at such a high level because of language barriers, etc. The problem described above should therefore be implemented mainly through the channels of capital movements, financial markets and the fiscal function. However, it is important to keep in mind the essential distinctions between the various forms of redistribution in this context.

According to Poghosyan, et al. [12] and Alcidi and Thirion [13], the processes are complicated and this makes the current classification of functions rather conditional (see Figure 1). Some policies and shock absorption mechanisms address two or more of the axes simultaneously (e.g., redistribution and risk-sharing simultaneously) or alternatively. Some of the effects attributed to risk-sharing are actually due to inter-temporal consumption smoothing through the redistribution of retained corporate taxes [14].

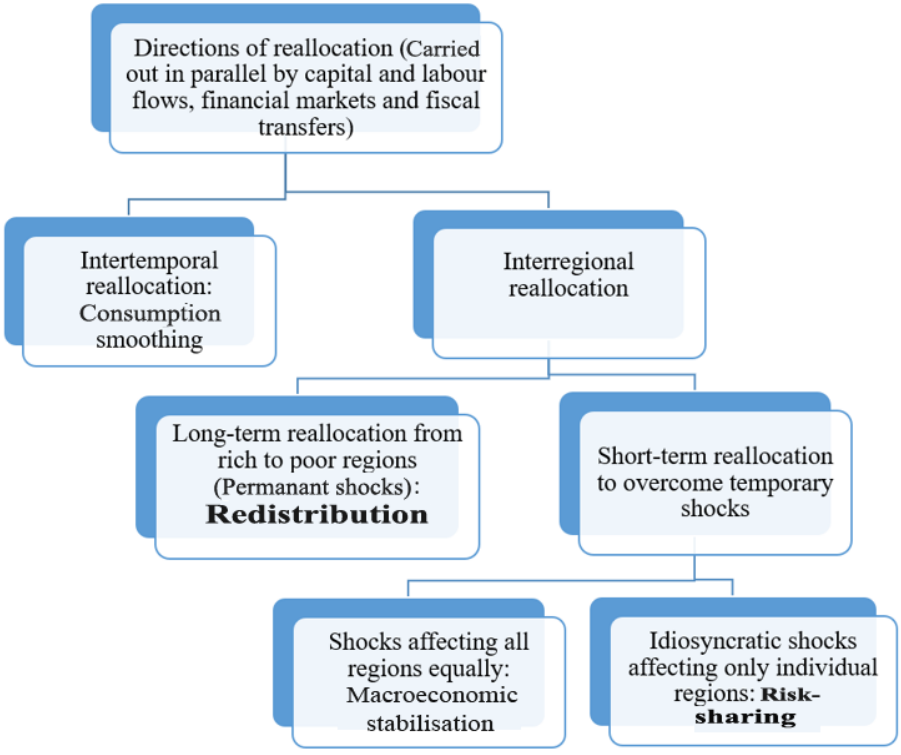

Figure 1.
Classification of reallocation functions.
Source: Poghosyan, et al. [12] and Alcidi and Thirion [13].

A conceptual distinction between the different objectives and effects of rebalancing policies and channels is essential both for the study's outcomes and the success of their implementation.

In this study, we focus on two aspects of general reallocation: long-term redistribution from "rich" to "poor" regions and short-term interregional transfers (risk sharing). These issues (especially the second one) are very important within a common market and a common currency area for various reasons. Firstly, it is the unaddressed idiosyncratic shocks that

destabilise the common currency, creating internal divergent tensions between countries and regions. On the other hand, the long-term redistribution from rich to poor regions is a sensitive issue that can potentially generate domestic political tensions. This logically directs research interest towards measuring and distinguishing the effects of these two fiscal reallocation functions. This research interest is reinforced by the special relationship between fiscal risk-sharing schemes and market-based ones. Supranational fiscal policy to absorb shocks is a catalyst for the development of the other channels [13]. The problem is strengthened by the fact that the EU and the EA do not have centralized fiscal policy or fiscal federalization. One of the main instruments are the structural and investment funds which are a small percentage of countries' Gross domestic product (GDP) and are "set up" to act primarily in the long term. They form a redistribution of EU funds through member states' contributions on the one hand and grants under the operational programme on the other. These transfers are classified into multiple studies which provide a basis for comparison with other currency unions and an opportunity to apply a methodology to test their effects on redistribution and shock smoothing.

2. Literature Review

Numerous fundamental publications serve as the foundation for the study of the dampening of macroeconomic shocks and in particular, the effects of budgetary transfers. Sala-i-Martin and Sachs [15] study U.S. fiscal federalism during 1970-1988 and its role in the sustainability of the U.S. as a currency area in comparison to some unsuccessful supranational currency systems (gold standard and Bretton Woods system). They draw the conclusion that the main reason for the observed resilience is fiscal centralization. More precisely about 40% of regional shocks have been smoothed through the centralized taxation system. The authors emphasize the conceptual significance of these findings for the European Economic Community (at the time), highlighting the fact that there is still more work to be done in this area. In contrast to Sala-i-Martin and Sachs [15] and Von Hagen [16], these researchers use a research strategy that allows them to make distinctions between risk-sharing and redistribution by using two distinct regressions. Analyzing data for the United States during 1981-1986, Von Hagen [16] concludes that redistribution is significantly greater than risk sharing. A methodological framework has been developed by Asdrubali, et al. [17] for assessing the extent of risk sharing across states in the US from 1963 to 1990 and the processes through which it took place. Their results show that 39 percent of shocks to the gross productivity of states are dampened by capital markets, 13 percent by the central government and 23 percent by credit markets. The last 25 percent remain unsmoothed. Additionally, the smoothing impact of the federal budget is decomposed by estimating the separate effects of taxes, transfers and grants to individual states. According to the analysis, transfer payments which have a smoothing impact of 6.3%, are the most significant factor followed by federal taxes (4.3%), grants (2.5%) and unemployment benefits (1.9%). Bayoumi and Masson [18] examine central budget cash flows in the United States (1969-1986) and Canada (1965-1988) to formulate some recommendations for the in-project currency area in Europe. They distinguish redistributive and stabilization effects from federal taxes and transfers. Redistributive effects were found to be smaller in the United States (22 cents on the dollar shock) than macro-stabilization effects (31 cents). In Canada, the redistributive effects are more substantial (39 cents for every dollar change in gross income) than the stabilization effects (17 cents). The redistribution is on a considerably larger scale than the amounts distributed through the European structural funds both in the US and Canada. The federal fiscal policies of the United States and Canada were not as effective in stabilizing the economy as the decentralized national fiscal policies of the community member states.

Poghosyan, et al. [12] in a study of three fiscal federations (the United States, Australia and Canada) conclude that between 4% and 11% of asymmetric shocks (risk-sharing) and between 13% and 24% of permanent shocks (redistributive function) are addressed through the budget. Federal taxes and transfers to individuals are more effective than transfers from the central government to state budgets. These findings have important implications for possible future fiscal centralization in the EU where cohesion policy faces long-run differences between regions on which current shocks are further layered. The research conducted by Dreyer and Schmid presents specific results for this approach [7]. They establish the parameters of redistribution and risk sharing in U.S. fiscal policy to simulate what the transfers would be in an eventual Euro Area fiscal federation. According to the findings, larger magnitudes would be required to provide the same long- and short-run consumption smoothing effects as in the US. This is somewhat in contradiction with some other more recent research in terms of the possibilities of dealing with asymmetric shocks.

The EA and the EU itself are now subjects of later publications with actual facts. Furceri and Zdzienicka [19] use the Asdrubali, et al. [17] approach for a panel of 15 member states during 1979-2010 in the context of Euro Area crisis periods. They reach several significant conclusions. First, risk-sharing in the EA is significantly less efficient compared to existing federations such as the US and Germany. Second, its effectiveness declines sharply in downturns just when it is needed the most. Last, the results of the study suggest that a supranational fiscal risk sharing mechanism, financed at relatively little cost would be quite sufficient to cushion member states in the event of extreme, persistent and unexpected downturns. Nikolov and Pasimeni [20] analyze the effectiveness of macroeconomic stabilization channels and unemployment compensation in the context of the great recession (2008-2010). They show that corporate income taxes are the most important instrument against aggregate shocks (stabilization) and social payments and personal taxes against asymmetric shocks (risksharing). The federal unemployment insurance system can play an important stabilization role supported by a discretionary extended benefits program. On the other hand, according to Bargain, et al. [21], not all forms of fiscal integration are beneficial. Some may introduce redistribution without stabilization (a sensitive topic in the EU). This finding again proves that measuring and distinguishing between redistributive and risk-sharing effects is essential.

Cimadomo, et al. [22] reach slightly different conclusions. They analyse private and public consumption smoothing and risk-sharing channels in Europe during 1999-2015. According to the results, recently, risk-sharing has increased from 40% in the beginning to 65% due to financial integration channels, the European Stability Mechanism and the European

System of Financial Supervision (ESFS). These results contradict the results of Ferrari and Picco [8] who through simulation analysis and the methodology of Asdrubali, et al. [17] conclude that risk sharing and consumption smoothing have declined since the introduction of the euro. This can be explained not only by the lack of exchange rate adjustability in individual countries, but also by potential over-optimistic expectations after the introduction of the euro. They have reduced risk premia and thus removed certain buffers, thereby reducing the private-market channel for stabilization and risk sharing.

The results of Capella-Ramos, et al. are intriguing from the standpoint of the actual effects of transfer mechanisms [23]. They show that the redistribution implemented by the EU through member state contributions and structural funds primarily addresses long-run convergence in disposable income rather than real convergence and short-run asymmetric shocks. The net beneficiaries were mostly countries with a "positive output gap," low unemployment rates and a strong fiscal situation during the study period. On this basis, it is acknowledged that the impact of EU transfers may have been pro-cyclical and to some extent have reinforced divergence.

An obvious conclusion from the literature review is that the results of the studies are quite contradictory to further investigate the problem. One reason for these contradictions can be found in the differences in the methodology used. Also whether redistribution, stabilization and risk smoothing are measured together or separately, the different channels for doing so (credit markets, capital markets and fiscal) and to what extent the model used allows for measuring the effects reliably despite the objective limitations of the data used.

3. Methodology and Data

3.1. Methodology

The key idea for evaluating redistributive and stabilizing effects is measuring the degree to which changes in disposable income depend on changes in gross income. The greater this dependence, the larger the portion of the shock in gross income that is transmitted to disposable income. If the dependence is small, then it is assumed that a larger part of the shock to gross income is absorbed. Thus, the smoothing of shocks is indirectly estimated. For example, if for every €1 variation in a region's gross income, there is a €0.90 variation in analogous disposable income, it can be inferred that the short-term risk-sharing effect is 10%. Different types of redistribution are estimated with different ways of accounting for the shock in gross income.

The methodology for measuring the smoothing of shocks can be divided into two broad branches. The first includes studies that do not distinguish between long-term redistribution and short-term risk sharing and stabilization such as Sala-i-Martin and Sachs [15] and Masson and Taylor's studies [24]. However, they distinguish the effects of different channels of shock absorption, taxes and transfers.

The second branch includes studies that distinguish between the smoothing of long- and short-term shocks. This includes studies that analyze redistribution and risk-sharing with separate equations (a two-stage approach) [17, 18] and those that account for individual effects in a single equation. In the latter group is the large-scale study by Poghosyan, et al. [12].

We consider the distinction between short-run risk-sharing and long-run redistributive effects to be essential. We adhere to the second branch of study. Specifically, we apply the methods of Bayoumi and Masson [18] and Poghosyan, et al. [12].

Bayoumi and Masson [18] apply a two-stage approach with two separate regressions (see Equations 1, 2). The first is a cross-section regression to identify long-run redistributive effects:

$$\left(\frac{\overline{YD_i}}{\overline{\overline{YD}}}\right) = \alpha + \beta_{redist}\left(\frac{\overline{Y_i}}{\overline{\overline{Y}}}\right) + \varepsilon_i \qquad (1)$$

$\overline{YD_i}$ is the absolute average per capita disposable income for the i_{th} country over the sample period. The corresponding indicator averaged across all countries is $\overline{\overline{YD}}$. Thus, the ratio $\overline{YD_i}/\overline{\overline{YD}}$ indicates each country's *relative* disposable income. Similarly, $\overline{Y_i}$ is the absolute per capita gross income for the country *i* averaged over the sample period and $\overline{\overline{Y}}$ is the average gross income across all countries. Accordingly, the ratio $\overline{Y_i}/\overline{\overline{Y}}$ indicates the *relative* gross income of each country. Hence, formulated in this way, the equation will show to what extent a shock in the gross income of a country is conveyed into a shock in disposable income. The effect is measured by the coefficient β_{redist}. The smaller the fraction of changes in gross productivity that are transmitted into disposable income, the greater the redistribution measured by 1- β_{redist}. For example, in the original results for the U.S., the β coefficient equals 0.781 which means that of every dollar of change in gross income, just 78.1% is conveyed as a risk sharing change in disposable income. The other 22 % are redistributed.

The second equation in the Bayoumi and Masson [18] study is a fixed effects panel regression formulated as follows:

$$\Delta\left(\frac{YD_{it}}{\overline{YD_t}}\right) = \alpha_i + \beta_{risk-sharing}\Delta\left(\frac{Y_{it}}{\overline{Y_t}}\right) + u_{it} \qquad (2)$$

In this equation, YD_{it} is the disposable income of country *i* at time *t*, and $\overline{YD_t}$ is the average disposable income for all countries at the same time *t*. The indicator $\Delta(YD_{it}/\overline{YD_t})$ measures the change in the relative disposable income of country *i* at a given time *t*. Similarly, Y_{it} is the per capita gross income for country *i* at time *t* and $\overline{Y_t}$ is the average national gross income at the same time *t*. The independent variable thus becomes the ratio $\Delta(Y_{it}/\overline{Y_t})$ which indicates the change in the relative gross income of each country. The whole Equation 2 thus measures the extent to which changes in relative gross income affect changes in relative disposable income through the coefficient $\beta_{risk-sharing}$. The smaller the impact, the greater the risk sharing which is mathematically equal to $1-\beta_{risk-sharing}$. Dependent and independent variables are in

relative form where each country's income is divided by the average income of all countries and in the form of a change from a previous period which removes the impact of common shocks and allows one to measure only the smoothing of asymmetric shocks. According to Bayoumi and Masson [18], for the United States, the coefficient $\beta_{risk-sharing}$ has a value of 0.927 indicating a stabilization effect of $1 - \beta_{risk-sharing}$ = 7% on the dollar.

However, Poghosyan, et al. [12] highlight a potential major issue with the adoption of this method. The use of cross-sectional regressions with values relative to the mean reduces the degrees of freedom, especially for regional unions (federations) with a small number of regions (states). That is why the cited authors propose an innovative solution for this type of research (the PMG model of Pesaran, et al. [25]). Combining the two separate regressions of levels and first differences into a single equation increases the number of observations included in the model, yielding more efficient estimates. The PMG model uses an optimization procedure that allows some of the regression coefficients to account for the "panel dimension. Thus, the PMG model appears as a "golden mean" between the two extreme groups: pooled regression (incl. fixed and random effects Anderson and Hsiao [26]) models and mean-group models. The dynamics of some economic processes are reflected more realistically by detecting that some changes in the observed variables may be due to general, long-run equilibrium factors while other changes come from short-run individual characteristics. By including lagged values of the dependent and independent variables, it is also possible to reflect the frequently occurring process involving a change in equilibrium (moving away from the level set by the long-run common factors) and the resulting error correction. Poghosyan, et al. [12] propose the use of the PMG model adapting it for the purpose of studying the smoothing of macroeconomic shocks. Thus, it becomes possible to estimate both the long-run redistributive effects and the short-run risk-sharing effects by using a single Equation 3 approach:

$$\Delta\left(\frac{YD_{it}}{\overline{YD}_t}\right) = \varphi_i\left[\frac{YD_{it-1}}{\overline{YD}_{t-1}} - \alpha - \beta\frac{Y_{it-1}}{\bar{Y}_{t-1}}\right] + \delta_i\Delta\left(\frac{Y_{it}}{\bar{Y}_t}\right) + \mu_i + \varepsilon_{it} \quad (3)$$

The dependent variable $\Delta(YD_{it}/\overline{YD}_t)$ measures the change in the relative disposable income of country *i* at a given time *t*; $YD_{it-1}/\overline{YD}_{t-1}$ is the relative disposable income per capita for the previous period; $\Delta(Y_{it}/\overline{Y}_t)$ is the change in relative gross income per capita, and $Y_{it-1}/\bar{Y}_{t-1}$ is the relative gross income per capita for the previous period. The expression in parentheses measures the deviation from the long-run equilibrium level, so the impact of long-run redistribution is estimated with 1-β in the same way as in the Bayoumi and Masson [18] two-stage approach. The cointegration coefficient φ_i should have negative values in the presence of significant long-run dependence. The more extreme its value, the greater the speed of return to equilibrium (speed of adjustment). The coefficient δ_i measures the significance of deviations from relative gross income and corresponds to $\beta_{risk-sharing}$ of the Bayoumi and Masson [18] two-stage approach. The value 1-δ_i indicates the risk-sharing effect. The coefficient μ_i accounts for time fixed effects not captured by the main part of the model due to heterogeneity in the relative disposable income of countries.

3.2. Data

The research examines all 28 countries that were a part of the EU from 2000 to 2021.[1] We compare the results with a smaller sample of countries: EA(11)[2] (the so-called "core" of the Euro Area). For per capita income (Y_{it}), we rely on gross national income (*GNI*) instead of *GDP* which is often used in similar studies. Although the difference between the indicators for most countries is minimal, we chose *GNI* because: 1) it has been used as a reference point in EU budgetary procedures since 2002 [27]. 2) Taking into account net transfers between residents and non-residents allows us to control for this factor as well, thereby more accurately accounting for the actual impact of public transfers on the EU economy. The source of the *GNI* data and the fiscal indicators for the funds received and contributions made to the EU budget is the European Commission [28]. Within the EU, there are no federal taxes on the source of income but the intermediation of the state budgets of the individual member states is used. Revenues are mainly based on national *GNI* levels, value added tax (VAT) revenues and customs duties on imports from non-EU countries. We use country aggregates for revenue and expenditure in the European budget. In particular, the net transfer for each country is derived as the difference between its corresponding "total expenditure" and "total own resources" items in the EU budget. Hence, for disposable income we use: $YD_{it} = GNI_{it} + Net\ transfers_{it}$. The time series of Y_{it} and YD_{it} are annual (22 observations for all countries) and inflation adjusted (Harmonised Indices of Consumer Prices (HICP), monthly average index, 2015 = 100). Population and inflation index data are sourced from Eurostat and the Office for National Statistics (for the UK over the period 2019-2021).

4. Results and Discussion

There were almost no changes in the status of countries. They were either net beneficiaries or donors to the EU budget (see Figure 2). Only four of the 28 countries experienced a change in status such as Spain, Ireland, Cyprus and Finland which were net beneficiaries (96%, 64%, 64% and 14%) of the years respectively. Citizens of the Netherlands, Germany and Sweden have contributed the largest net share of their income to the community while those of Luxembourg, Lithuania and Hungary have benefited the most from the redistributive processes.

[1] The countries used in the article are as follows: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.
[2] Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain.

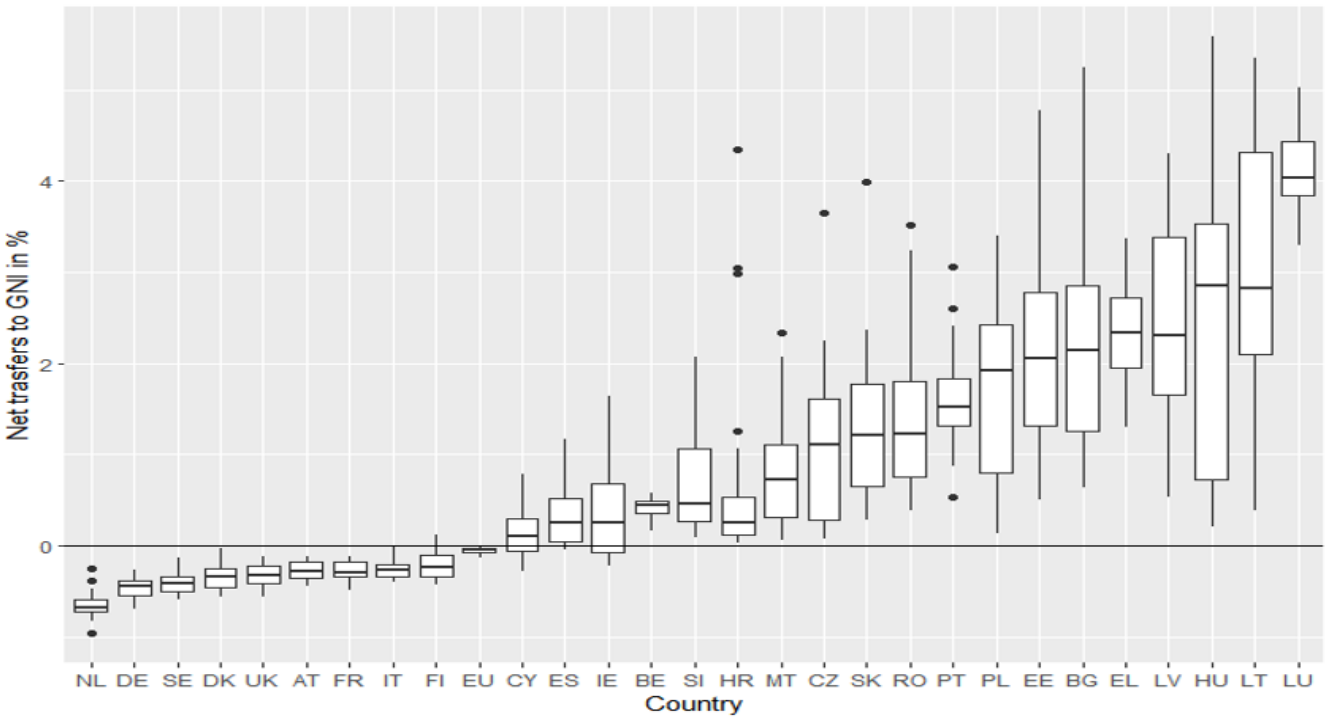

Figure 2.
Division of countries into donors and beneficiaries of the EU budget in the period 2000-2021.
Note: Donor: negative net transfer, Beneficiary: positive net transfer; calculations are at current prices in Euro. Country abbreviations: AT (Austria), BE (Belgium), BG (Bulgaria), HR (Croatia), CY (Cyprus), CZ (Czech Republic), DK (Denmark), EE (Estonia), FI (Finland), FR (France), DE (Germany), EL (Greece), HU (Hungary), IE (Ireland), IT (Italy), LV (Latvia), LT (Lithuania), LU (Luxembourg), MT (Malta), NL (Netherlands), PL (Poland), PT (Portugal), RO (Romania), SK (Slovakia), SI (Slovenia), ES (Spain), SE (Sweden), UK (United Kingdom).

Although the EU budget is mostly balanced, net transfers to the GNI are smaller and stable for sponsor and donor countries (mean = -0.315%, stdev = 0.19%) compared to beneficiary countries (mean = 1.61%, stdev = 1.36%) due to the difference in the size of the economies.

It is noteworthy that net transfers as a share of income vary (min = -0.96%, max = 5.59%) within a considerably narrower range than between administrative units in the US, Canada and Australia (based on Poghosyan, et al. [12]). Hence, we might expect a relatively weaker impact of the European budget on the economies of member states.

It is necessary to take into account the differences in living standards between countries in order to identify the extent to which the available distinction between donor and beneficiary countries is an indication of the redistributive role of the European budget, (Figure 3). For this purpose, we sorted countries into three groups: those with real *GNI* per capita that is under, around or above the EU average (dynamic composition) for each of the years.[3]

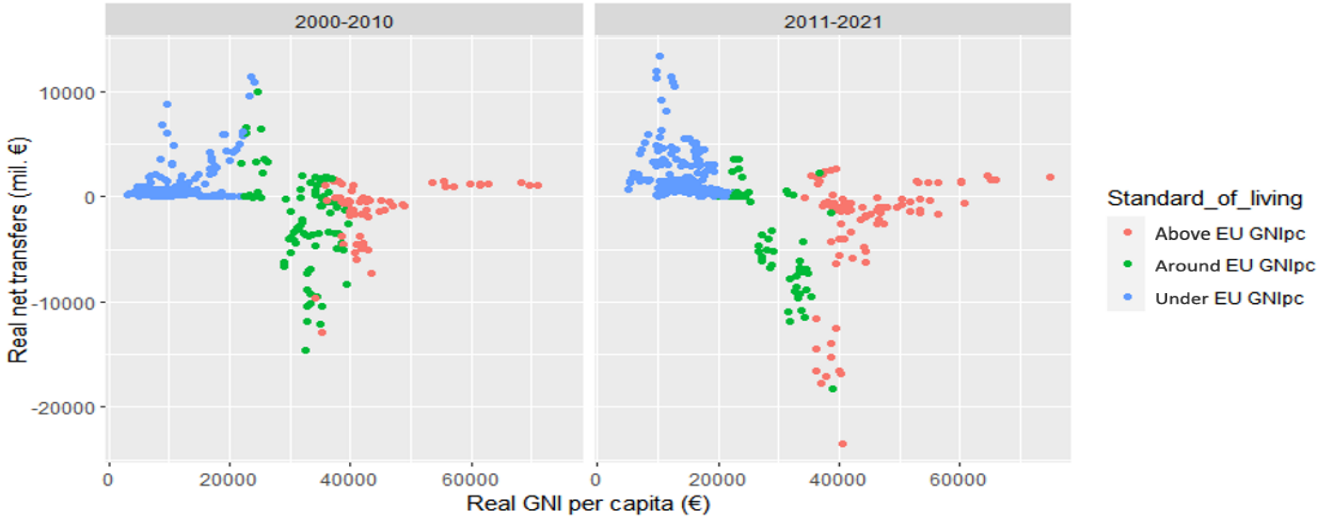

Figure 3. Consistently over time, some countries with average and above-average living standards (Real GNI per capita in Euro) are also net recipients of EU transfers (€ million).

[3] The group with average living standards includes countries whose real *GNIpc* for year *t* is in the range: real $GNIpc_t$ of EU ± 0.5 × σ_t. The standard deviation is calculated from the *real GNIpc* for all countries in the sample for year *t*. If the value of *real* $GNIpc_t$ is lower or higher than this range, the country falls this year in the group with a standard under or above the Community average, respectively.

Countries with lower living standards are net beneficiaries of the EU budget with a clearer inverse relationship between transfers and real income levels emerging in the second half of the sample. For the other two groups, the picture is less homogeneous. Despite having average or even above average living standards, a significant group of countries has also been a net beneficiary of budgetary funds. This finding is valid for both sub-periods suggesting a deeper analysis of the redistributive effects of the EU budget.

The redistribution coefficient (*β_redist*) for EU(28) from the application of Equation 1 of the Bayoumi and Masson [18] model is 1.000135 (see Table 1). This indicates an almost zero level of redistribution (*1- β_redist*) of income within the EU. If we exclude the countries with lower living standards from the sample and accordingly focus on the first 11 members of the Euro area, the redistribution (*β_redist* = 1.039032) is almost 4% for each euro of income deviation but in the opposite direction, from the countries with lower standards in the group to those with higher ones. Both coefficients have a high degree of statistical significance (see Figure 3).

In the second regression equation, there were no significant differences between the two groups. The coefficients (β_{EU} = 0.977 and β_{EA} = 0.976) indicate weak levels of risk-sharing of just over 2 % per Euro of shock reduction.

Table 1.
Redistribution and risk-sharing coefficients for the EU(28) and EA(11) groups of countries.

Factor \ Group	EU(28)	EA(11)
*β*_redist	1.000***	1.039***
Std. error	6.392e-3	1.745e-2
Adj. R^2	0.999	0.997
# of obs.	28	11
β_risk-sharing	0.977***	0.976***
Std. error	3.022e-3	3.758e-3
Adj. R^2	0.994	0.997
# of panel obs.	587	231

Note: *** Indicates significance at 1%.

The *β_redist* values in the PMG model are similar and again close to unity (see Table 2). This confirms the thesis of weak levels of long-term income redistribution through the EU budget. The coefficient divergence is relatively more substantial in EA(11) compared to the two-stage model.

Regarding risk sharing, this model reports more sizeable levels of smoothing of individual short-term shocks (β_{EU} = 0.888 and β_{EA} = 0.711). The PMG model distinguishes the groups more clearly. The EA risk-sharing is 29 % per euro and the EU is at 11% respectively. Hence, within the Euro area, shocks to disposable income are more successfully dampened. This result is to be expected given the need for countries in a single currency area to have a good level of integration.

Table 2.
Long-run and short-run coefficients for the EU (28) and EA(11) groups of countries.

Factor \ Group	EU(28)	EA(11)
β_redist (Long-Run Eq.)	0.997***	0.991***
Std. Error	4.03e-4	1.86e-4
β_risk-sharing (Short-Run Eq.)	0.888***	0.711***
Std. Error	0.029	0.082
φ_i (Speed of adjustment)	-0.091***	-0.269***
Std. Error	0.030	0.085
PMG Hausman specification test (p-Value)	0.281	0.107
# of panel obs.	587	231

Note: *** indicates significance at 1%.

The coefficients of the speed of adjustment (φ_i) are negative and statistically significant, i.e. cointegration between countries is present and the validity of the model is confirmed. In addition, risk-sharing is larger in EA and the speed of adjustment is nearly three times larger than in the EU (28).

The level of income redistribution is much weaker in the EU and EA while risk-sharing is more pronounced compared with the results of Poghosyan, et al. [12] for the US, Canada and Australia.

The results shown are based on an application of the model in a (1, 1, ..., 1) configuration[4] and without a trend component as it is insignificant which indicates that the level of income redistribution does not change over time. We conducted the PMG Hausman Specification Test to check the statistical validity of the model. The results give us reason to reject the null hypothesis that the mean group estimator is statistically similar to the PMG estimator.

[4] Under automatic lag selection (from 1 to 6), using Akaike criteria, (1, 1, ..., 1) configuration is the best in both groups of countries.

5. Conclusion

The analysis allows us to draw the following summaries and conclusions:

First, the academic literature lacks consensus on the assessment of levels of income redistribution and risk-sharing within the EU and often reaches completely contradictory results. This condition can be explained by various factors such as variations in the models used, the sample of countries and the length of the data. In this respect, it is appropriate to investigate the interactions between all EU countries in addition to the Euro area and to use more complex models such as PMG.

Second, we find very weak levels (below 1%) of long-run income redistribution through the community budget, both between EU (28) and EA (11) members. However, several countries with middle- to above-average income per capita are also consistent net recipients of funding. Reducing disparities in living standards is therefore either not the main objective of EU budgetary procedures or these policies have not been implemented successfully enough. According to our results from the application of the Bayoumi and Masson [18] model, β_redist is above 1 which supports the findings of Capella-Ramos, et al. [23].

Third, fiscal transfers lead to a noticeable reduction in shocks to per capita disposable income. This effect is more pronounced within the EA(11) with a level of risk-sharing of 29 cents per euro while in the EU, it is at a level of 11 cents.

Fourth, the EU budget achieves higher levels of risk-sharing relative to federations such as the US, Australia and Canada despite a lack of political integration, federal taxes and generally lower levels of distribution as a share of income. On this basis, it can be argued that the EU is allocating the accumulated resources in its budget appropriately. This success could be put forward as an argument for an increase in reallocation of income by the commission or even for deeper fiscal integration within the EU. At present, the impossibility of deviating from budgetary constraints limits the scope for fiscal intervention under unfavourable macroeconomic conditions [29] which are calculated by markets when assessing the indebtedness of member states [30].

References

[1] H. Handler, "The Eurozone: Piecemeal approach to an optimum currency area," Austrian Institute of Economic Research, Working Paper, No. 446, 2013.

[2] R. A. Mundell, "A theory of optimum currency areas," *The American Economic Review*, vol. 51, no. 4, pp. 657-665, 1961.

[3] R. A. Mundell, "Uncommon arguments for common currencies, in The Economics of Common Currencies, ed. H.G. Johnson, A.K. Swoboda." Cambridge (MA): Harvard Univiersity Press, 1973, pp. 114-132.

[4] R. McKinnon, "Optimum currency areas and key currencies: Mundell I versus Mundell II," *Journal of Common Market Studies*, vol. 42, no. 4, pp. 689-715, 2004. https://doi.org/10.1111/j.0021-9886.2004.00525.x

[5] H. R. Vane and C. Mulhearn, "Interview with Robert A. Mundell," *Journal of Economic Perspectives*, vol. 20, no. 4, pp. 89-110, 2006. https://doi.org/10.1257/jep.20.4.89

[6] J. Mélitz and F. Zumer, "Interregional and international risk-sharing and lessons for EMU," in *Carnegie-Rochester Conference Series on Public Policy*, 1999, vol. 51: Elsevier, pp. 149-188.

[7] J. K. Dreyer and P. A. Schmid, "Fiscal federalism in monetary unions: Hypothetical fiscal transfers within the Euro-zone," *International Review of Applied Economics*, vol. 29, no. 4, pp. 506-532, 2015. https://doi.org/10.1080/02692171.2015.1016407

[8] A. Ferrari and A. R. Picco, "Risk sharing and the adoption of the Euro," *Journal of International Economics*, vol. 141, p. 103727, 2023. https://doi.org/10.1016/j.jinteco.2023.103727

[9] L. A. Ricci, "A model of an optimum currency area," *Economics*, vol. 2, no. 1, pp. 1-33, 2008.

[10] J. A. Frankel and A. K. Rose, "The endogenity of the optimum currency area criteria," *The Economic Journal*, vol. 108, no. 449, pp. 1009-1025, 1998. https://doi.org/10.1111/1468-0297.00327

[11] T. Broz, "The theory of optimum currency areas: A literature review," *Privredna Kretanja i Ekonomska Politika*, vol. 15, no. 104, pp. 52-78, 2005.

[12] T. Poghosyan, C. Cottarelli, and A. Senhadji, "The role of fiscal transfers in smoothing regional shocks: Evidence from existing federations," International Monetary Fund. No. 2016/141, 2016.

[13] C. Alcidi and G. Thirion, "Assessing the euro area's shock-absorption capacity: Risk sharing, consumption smoothing and fiscal policy," CEPS Special Report, No. 146, 2016.

[14] C. Alcidi, P. D'Imperio, and G. Thirion, "Risk-sharing and consumption-smoothing patterns in the US and the Euro Area: A comprehensive comparison," CEPS Working Document No 2017/04, May 2017, 2017.

[15] X. Sala-i-Martin and J. D. Sachs, "Fiscal federalism and optimum currency areas: Evidence for Europe from the United States," Center Discussion Paper, No. 638, Yale University, Economic Growth Center, New Haven, CT, 1992.

[16] J. Von Hagen, *Fiscal arrangements in a monetary union: Evidence from the US*. Netherlands: Springer, 1992.

[17] P. Asdrubali, B. E. Sørensen, and O. Yosha, "Channels of interstate risk sharing: United States 1963–1990," *The Quarterly Journal of Economics*, vol. 111, no. 4, pp. 1081-1110, 1996. https://doi.org/10.2307/2946708

[18] T. Bayoumi and P. R. Masson, "Fiscal flows in the United States and Canada: Lessons for monetary union in Europe," *European Economic Review*, vol. 39, no. 2, pp. 253-274, 1995. https://doi.org/10.1016/0014-2921(94)e0130-q

[19] D. Furceri and A. Zdzienicka, "The euro area crisis: Need for a supranational fiscal risk sharing mechanism?," *Open Economies Review*, vol. 26, no. 4, pp. 683-710, 2015. https://doi.org/10.1007/s11079-015-9347-y

[20] P. Nikolov and P. Pasimeni, "Fiscal stabilization in the United States: Lessons for monetary unions," *Open Economies Review*, vol. 34, no. 1, pp. 113-153, 2023. https://doi.org/10.1007/s11079-022-09664-8

[21] O. Bargain *et al.*, "Fiscal union in Europe? Redistributive and stabilizing effects of a European tax-benefit system and fiscal equalization mechanism," *Economic Policy*, vol. 28, no. 75, pp. 375-422, 2013. https://doi.org/10.1111/1468-0327.12011

[22] J. Cimadomo, G. Ciminelli, O. Furtuna, and M. Giuliodori, "Private and public risk sharing in the euro area," *European Economic Review*, vol. 121, p. 103347, 2020. https://doi.org/10.1016/j.euroecorev.2019.103347

[23] J. Capella-Ramos, C. D. Checherita-Westphal, and N. Leiner-Killinger, "Fiscal transfers and economic convergence," ECB Occasional Paper, No. 2020252, 2020.
[24] P. R. Masson and M. P. Taylor, "Fiscal policy within common currency areas," *Journal of Common Market Studies*, vol. 31, no. 1, pp. 29-44, 1993. https://doi.org/10.1111/j.1468-5965.1993.tb00446.x
[25] M. H. Pesaran, Y. Shin, and J. Smith, "Bond testing approach to the analysis of long run relationship," *Journal of the American Statistical Association*, vol. 94, pp. 621-634, 1999.
[26] T. W. Anderson and C. Hsiao, "Estimation of dynamic models with error components," *Journal of the American Statistical Association*, vol. 375, no. 76, pp. 598-606, 1981. https://doi.org/10.1080/01621459.1981.10477691
[27] D.-G. f. B. European Commission, "EU budget 2008: Financial report, Publications Office," Retrieved: https://data.europa.eu/doi/10.2761/10839. [Accessed 2009.
[28] European Commission, "Budget spending and revenue," Retrieved: https://commission.europa.eu/document/download/db7394f7-b867-4d1e-a961-f2c874eed22d_en?filename=eu_budget_spending_and_revenue_2000-2021.xlsx. [Accessed 02.02.2023], 2022.
[29] A. Zahariev, A. Radulova, A. Aleksandrova, and M. Petrova, "Fiscal sustainability and fiscal risk in the EU: Forecasts and challenges in terms of COVID-19," *Entrepreneurship and Sustainability Issues*, vol. 8, no. 3, pp. 618-632, 2021. https://doi.org/10.9770/jesi.2021.8.3(39)
[30] S. Zarkova, D. Kostov, P. Angelov, T. Pavlov, and A. Zahariev, "Machine learning algorithm for mid-term projection of the EU member states' indebtedness," *Risks*, vol. 11, no. 4, p. 71, 2023. https://doi.org/10.3390/risks11040071