

# The Fiscal Transfer Dilemma in a Monetary Union

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We illustrate the trade-off in designing a system of fiscal transfers (“fiscal capacity”) in a monetary union between members of different size. A system cannot guarantee symmetric treatment of members and simultaneously ensure a balanced budget. We compute hypothetical transfers for the Eurozone members from 2001 to 2012 to illustrate this trade-off.

*Keywords:* fiscal union, asymmetric shock insurance, federal transfers, optimum currency area

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# 1. Introduction

Existing federations around the world typically entail a common personal tax base, a social security system, and in some cases a system of federal fiscal transfers across regions. Such a fiscal scheme may act as an automatic insurance against asymmetric macroeconomic shocks in a currency union. In contrast, the euro area has no explicit mechanism for absorbing asymmetric shocks. This issue was heavily discussed when the Maastricht Treaty was drafted and the debate has been revived by the European debt crisis.

Increasingly, there are calls for such a transfer system in the Eurozone as a built-in insurance mechanism against asymmetric business cycle shocks. The current president of the European Council, Van Rompuy, considers “an integrated budgetary framework” that includes a “fiscal capacity” for absorbing asymmetric shocks to be an essential building block for a “stable and prosperous EMU” (Van Rompuy, 2012). The idea is to provide temporary relief for members hit by a negative shock by conditioning the received transfers on the *change* in a performance measure relative to the rest of the union. A performance measure can be the unemployment rate or GDP per capita. Conditioning on the change in the performance measure instead of the level aims to avoid a continuous redistribution from rich to poor regions and the political resistance that would come with this. However, many questions still arise.<sup>1</sup>

This note adds to this discussion by considering the design of an insurance mechanism and computing the amount of transfers that would have taken place in the Eurozone in the last decade. In particular, we highlight a trade-off in designing any system of fiscal transfers in a federation consisting of members of different sizes. We show that there exists no transfer system that can satisfy two conditions simultaneously: 1) A balanced budget of the transfer scheme, and 2) an equal treatment among member countries, where equal treatment is defined as identical transfers per capita triggered by an identical shock. The intuition is that in case of an asymmetric shock, a large region requires a higher amount of transfers than a small region implying higher payments per capita from inhabitants in the smaller regions.

How large is this trade-off in the Eurozone and what would be the amounts of these transfers in practice? To answer these questions, we update the transfer system originally

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<sup>1</sup>Examples of papers on fiscal stabilisation schemes include Dolls et al. (2013), Fuest and Peichl (2013), De Grauwe (2013), and von Hagen (2012).

proposed by Italianer and Vanheukelen (1992) that defines transfers — recipients and payers — based on the deviation of the *change* in unemployment rate of a member country from the average of that of the rest of the union. This system imposes a cap on received transfers of 2 percent of a member’ GDP. In this system, the sum of required transfers does not match “surpluses” generated in the above-average countries. Therefore, we modify the system to ensure a balanced budget and compute the amount of contribution for every above-average country. The results illustrate that a system cannot simultaneously respect the caps, the balanced transfer constraint, and symmetric insurance between donors and recipients.

## 2. The Transfer Dilemma in a Federation: A Simple Proof

Assume there are  $n$  regions in a federation (a monetary union). The fraction of total population living in region  $i$  is  $x_i$ ,  $i = 1, \dots, n$ . Regions are subject to idiosyncratic shocks to income,  $\epsilon_i$ , affecting per capita performance measured for instance by the unemployment rate or per capita income. Let  $y_i$  denote a performance measure and  $\bar{y}_i$  the trend (or average) of the federation. A shock can be measured as the deviation between the actual realized value and this trend value:  $\epsilon_i = y_i - \bar{y}_i$ , where  $\epsilon_i > 0$  is a positive income or employment shock.

**Definition 1** A transfer system is a set of differentiable transfer functions that relates the transfer made (or received) by region  $i$  to the per capita size of the shock and satisfies the budget constraint:

$$T_i = f_i(x_1, \dots, x_n; \epsilon_1, \dots, \epsilon_n) \tag{1}$$

$$\sum_i^n T_i = 0. \tag{2}$$

As a convention, we define  $T_i > 0$  as a net receipt of region  $i$ . We can distinguish between two cases.

### Case 1 *Symmetric Regions:*

Let  $\bar{\epsilon}$  be the average shock among all regions. Then, a linear system of transfers is defined as:

$$T_i = \beta(\epsilon_i - \bar{\epsilon}); \beta > 0 \tag{3}$$

Since  $\bar{\epsilon} \equiv \frac{1}{n} \sum_i T_i = 0$ , it implies that  $\sum_i T_i = \beta(\sum_i \epsilon_i - n\bar{\epsilon}) = 0$ .

**Case 2** *Asymmetric Regions:*

Let regions be of different sizes. Without loss of generality, consider two identical shocks to the per capita performance variable  $y_i$ . An equivalent treatment is a situation in which an inhabitant in the large region receives (pays) the same amount as an inhabitant in the small region. Explicitly,

**Axiom 1** If  $\epsilon_i = \epsilon_j$  then  $x_i T_i = x_j T_j \iff T_i = (x_i/x_j) T_j$ .

**Axiom 2** For any arbitrary  $\hat{\epsilon}$ ,

$$\frac{1}{x_i} \frac{\partial T_i(\hat{\epsilon})}{\partial \epsilon_i} = \frac{1}{x_j} \frac{\partial T_j(\hat{\epsilon})}{\partial \epsilon_j} \quad (4)$$

Given two shocks with an identical size, Axiom 1 asserts that transfers per capita should be equal in both regions. Axiom 1 and the assumption about differentiability imply Axiom 2. Starting from an arbitrary level of shock, a small identical innovation in the shock in any two or more regions should trigger the same change in transfers per capita in these regions.

**Proposition 1** Given arbitrary shock structures and asymmetrically sized regions, there exists no transfer system that complies with Definition 1, Axiom 1, and Axiom 2.

*Proof.* Consider two regions  $i$  and  $j$ . Assume that there exists a transfer system that respects the budget constraint and Axiom 1. Starting from the same initial condition  $\hat{\epsilon}$ , suppose that  $d\epsilon_i = d\epsilon_j$ . Totally differentiating the budget constraint  $\sum_i T_i = 0$ , we obtain  $\frac{\partial T_i(\hat{\epsilon})}{\partial \epsilon_i} = \frac{\partial T_j(\hat{\epsilon})}{\partial \epsilon_j}$ . This result contradicts Axiom 2 for  $x_i \neq x_j$ . ■

This simple proof by contradiction reveals that in general it is not possible to design a transfer system that satisfies the budget constraint and implies equal per capita transfers.

### 3. Stabilisation Mechanism in the Eurozone: An Illustration

Intuitively, one can illustrate the trade off by considering a polar case of a currency union between, e.g., Germany and Luxembourg. The insurance of one percent of German GDP

would cost Luxembourg 63 percent of its GDP, whereas Germany can compensate one percent of Luxembourg GDP by paying only 0.016 percent of its GDP. However, the important question is: how would transfers and the trade-off in the euro area look like in practice? We provide answers by simulating a built-in stabilisation scheme (IV) originally proposed by Italianer and Vanheukelen (1992). Let transfers received be denoted by  $R_i$  and contributions by  $C_i$ .

$$R_{it} = \left\{ \begin{array}{ll} 0 & \text{if } \Delta u_{it} - \Delta u_{EUt} \leq 0 \\ \alpha[\Delta u_{it} - \Delta u_{EUt}]y_i & \text{if } 0 < \Delta u_{it} - \Delta u_{EUt} \leq 2 \\ 2\alpha y_i & \text{if } \Delta u_{it} - \Delta u_{EUt} > 2. \end{array} \right\} \quad (\text{IV})$$

A member country  $i$  receives transfers  $R_{it}$  in year  $t$  if the percentage point change (“shock”) in its unemployment rate  $\Delta u_{it}$  is positive and larger than the area average  $\Delta u_{EUt}$ , which is calculated excluding country  $i$ . Similarly to a typical proposed transfer system in the current policy discussion, IV is designed in terms of the changes and not the levels of the performance variable. The amount of transfers received is given by  $\alpha[\Delta u_{it} - \Delta u_{EUt}]y_i$ , where  $y_i$  denotes GDP. The parameter  $\alpha$  is set by IV to 0.01. In addition, the system imposes a limit on the received transfers of 2 percent of GDP.<sup>2</sup> Note that since IV computes the average  $\Delta u_{EUt}$  excluding the own country  $i$ , it complies with Axiom 1:<sup>3</sup>

$$\frac{\partial R_i}{\partial \Delta u_{it}} = \alpha \left[ 1 - \frac{\partial \Delta u_{EU}}{\partial \Delta u_{it}} \right] y_i = \alpha y_i. \quad (5)$$

Table (1) presents the results of implementing System IV. The list of recipient countries in 2009 include Estonia, Ireland, and Spain; each receiving 2 percent of GDP. Spain would have received 2 percent of its GDP for 5 consecutive years from 2008 to 2012 and Greece for three consecutive years from 2010 to 2012. Germany would have been a receiver from 2001 to 2005 with received transfers reaching 1.1 percent of GDP in 2005. Finland would have

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<sup>2</sup>Italianer and Vanheukelen (1992) discuss the benefits of using unemployment as the reference performance. For our purposes, considering GDP growth instead of unemployment growth would not matter. As clarified by our proof, the trade-off is present independent of the choice of the per capital performance variable.

<sup>3</sup>Note that if averages are computed including the own country then the term  $\frac{\partial \Delta u_{EU}}{\partial \Delta u_{it}}$  is not zero. In this case, by definition, the sum of transfers received equals the sum of surpluses of above-average members. However, this means a country performance itself affects the reference measure.

almost never been a receiver of transfers (apart from very small amounts in 2005 and 2006) whereas Portugal was always a receiver with the exception of one year.

Next, consider contributions by above-average countries. The IV is silent about this issue. Obviously, there are a number of ways to assign an allocation rule. An intuitive suggestion is to relate the payments of each contributor to its above-average performance analogously to recipients; i.e., every above-average country denoted by  $j$  pays based on  $\alpha[\Delta u_{EUt} - \Delta u_{jt}]y_j$ . However, as we argue in the previous section, there is no guarantee that this system will be balanced. Figure (1) presents the implied imbalances of the IV system. In years 2002 to 2005 the insurance scheme would have been in deficit whereas, perhaps quite surprisingly, in the crisis years 2009 to 2012 there would have been a surplus of up to 0.65% of eurozone GDP.

How can we ensure balanced transfers? Given the total amount of received money ( $R_t = \sum_i R_{ti}$ ) as implied by IV, we complete the transfer scheme as follows:

- Step 1: Analogously to the equation determining transfers received, the amount of money that has to be contributed by country  $j$  is given by:

$$C_{jt} = \min\{\beta[\Delta u_{EUt} - \Delta u_{jt}]y_j, 0.02y_j\} \text{ for any contributor } j. \quad (6)$$

Unlike in the unbalanced system, we cannot impose  $\alpha = \beta$ , but  $\beta$  is determined endogenously by the system and  $\alpha \neq \beta$  reflects asymmetric treatment of shocks.

- Step 2: We impose the zero-sum transfers' constraint:  $\sum_i R_{it} = \sum_j C_{jt}$ . This constraint and equation (6) together give a unique value of  $\beta$ :

$$\beta = \frac{R_t}{\sum_j [\Delta u_{EUt} - \Delta u_{jt}]y_j}. \quad (7)$$

The result of this step may yield  $C_{jt} \leq 2$  percent of GDP  $\forall j$ . In this case, the algorithm ends here and the system is balanced without violating the thresholds. That would have been the case in most years. For example, in 2012, the highest contribution was by Finland with 1.8% of GDP. The second possibility gives  $C_{lt} > 2$  percent of GDP for at least one country  $l$ . In this case, the upper cap is violated and the system would be imbalanced. That was the case in 2005 for Estonia, Slovakia and Spain and in 2003 for

Slovakia. In such a case, we have to proceed with the algorithm in order to respect the upper cap and the balanced budget constraint.

- Step 3: If  $C_{lt} > 0.02y_{lt}$  for some donors  $l = 1 \dots L$ , then let  $C_{lt} = 2$  percent of GDP; i.e, make the 2 percent of GDP binding. This leaves  $R_{t,rest} = R_t - \sum_{l=1}^L C_{lt}$  for the other donor countries. Accordingly, the value of  $\beta$  for the remaining countries derives as

$$\beta = \frac{R_{t,rest}}{\sum_j [\Delta u_{EUt} - \Delta u_{jt}]y_j}. \quad (8)$$

- Step 4: For sake of completeness, in the special case that all donor countries are hitting the cap of 2 percent of GDP,  $\alpha$  for the receiving countries has to be reduced to secure a balanced budget. According to our simulations this would not have occurred during 2001-2012.

In 2005, contributions by Estonia, Slovakia, and Spain were capped at 2 percent of GDP and the contributions of other members, e.g., Finland, Greece, and Luxembourg, were increased such that the system is balanced without violating the caps. Additionally, table (1) indicates to a heterogeneous experience of countries. For instance, in the case of France, Germany, Luxembourg, and the Netherlands, we notice that the width of fluctuations in transfers over the years is relatively narrow compared to smaller members such as Estonia, Slovakia, and Spain.

## 4. Summary

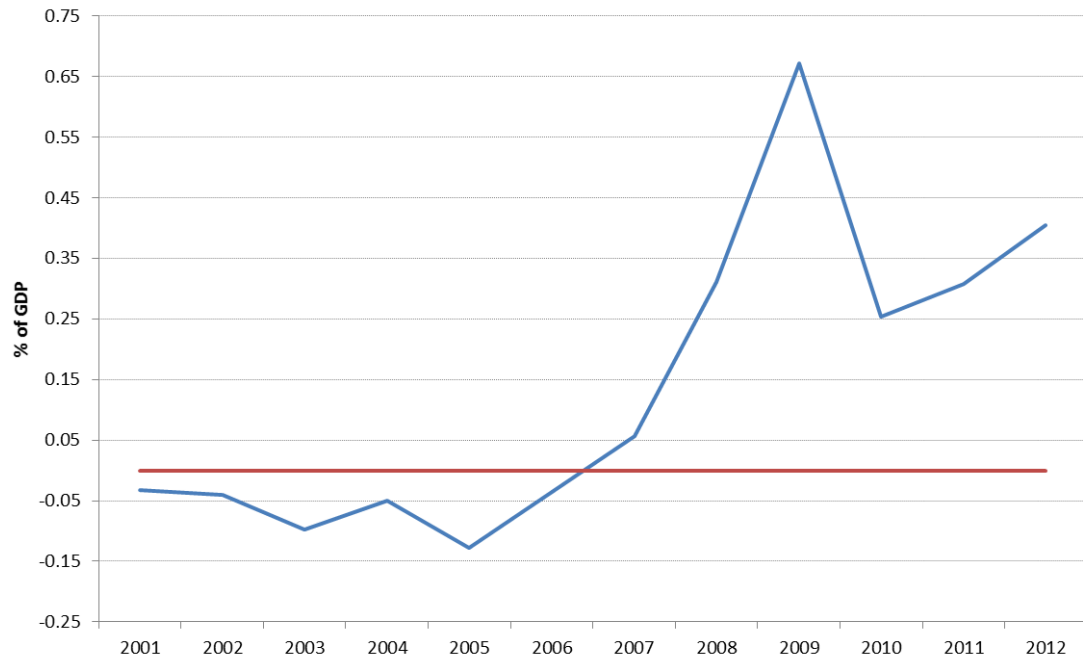
We have contributed to the positive analysis of fiscal transfers as an insurance scheme against asymmetric macroeconomic shocks in a monetary union comprised of members of heterogeneous sizes. We show that generally there exists a trade-off between ensuring an identical treatment between contributors and receivers and having a balanced transfer system without deficits. We have computed the amount of transfers that in the past would have been received or contributed in the Eurozone with historical unemployment rates and GDP figures. We should add that our illustrations per se have no normative implication. The welfare implications of insurance systems in a monetary union is an important topic for future research.

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Figure 1: Implied Imbalances of the transfer system IV



Note: The figure plots the difference between the amount of received transfers and contributions as implied by the system IV for  $\alpha = \beta$  and based on realized annual data for GDP and unemployment.

Table 1: Fiscal Transfers in the Eurozone

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
$\beta$		0.011	0.012	0.014	0.013	0.027	0.012	0.008	0.006	0.003	0.005	0.005	0.005
Austria	<i>R</i>	0.006	0.003		0.004	0.004	0.003	0.005					
	<i>C</i>			0.006					0.004	0.003	0.006	0.001	0.006
Belgium	<i>R</i>	0.003	0.006	0.002		0.002	0.005	0.001					
	<i>C</i>				0.0004				0.003	0.003	0.001	0.006	0.005
Cyprus	<i>R</i>			0.001	0.003	0.008	0.000	0.002			0.004	0.016	<b>0.020</b>
	<i>C</i>	0.004	0.009						0.001	0.001			
Estonia	<i>R</i>								0.009	<b>0.020</b>	<b>0.020</b>		
	<i>C</i>	0.005	<b>0.020</b>	0.010	0.008	<b>0.020</b>	0.016	0.003				<b>0.020</b>	0.018
Finland	<i>R</i>						0.000	0.001					
	<i>C</i>	0.001	0.004	0.008	0.005	0.008			0.003	0.0004	0.002	0.003	0.007
France	<i>R</i>			0.002	0.002	0.001	0.007	0.001					
	<i>C</i>	0.003	0.003						0.004	0.001	0.003	0.001	0.004
Germany	<i>R</i>	0.007	0.006	0.009	0.006	0.012							
	<i>C</i>						0.005	0.008	0.009	0.006	0.010	0.008	0.011
Greece	<i>R</i>	0.001			0.006			0.003			<b>0.020</b>	<b>0.020</b>	<b>0.020</b>
	<i>C</i>		0.009	0.016		0.014	0.004		0.004	0.0004			
Ireland	<i>R</i>	0.003	0.003				0.008	0.011	0.017	<b>0.020</b>	0.014	0.008	
	<i>C</i>			0.005	0.004	0.0003							0.007
Italy	<i>R</i>							0.002	0.007		0.001		0.012
	<i>C</i>	0.006	0.012	0.010	0.009	0.007	0.003			0.003		0.0002	
Luxemburg	<i>R</i>	0.003	0.004	0.007	0.010		0.007	0.005	0.007			0.002	
	<i>C</i>					0.008				0.005	0.006		0.005
Malta	<i>R</i>	0.015				0.002	0.003	0.005					
	<i>C</i>		0.006	0.003	0.009				0.003	0.003	0.003	0.002	0.007
Netherlands	<i>R</i>		0.003	0.007	0.007	0.003		0.001			0.003		
	<i>C</i>						0.003		0.003	0.004		0.001	0.002
Portugal	<i>R</i>	0.007	0.008	0.010	0.002	0.013	0.007	0.012		0.002	0.009	0.009	0.017
	<i>C</i>								0.002				
Slovakia	<i>R</i>	0.012			0.005					0.006	0.019		
	<i>C</i>		0.012	<b>0.020</b>		<b>0.020</b>	<b>0.020</b>	0.012	0.009			0.004	0.005
Slovenia	<i>R</i>	0.001				0.003	0.002				0.009	0.009	
	<i>C</i>		0.003	0.001	0.008			0.002	0.003	0.001			0.003
Spain	<i>R</i>		0.007				0.000	0.007	<b>0.020</b>	<b>0.020</b>	0.019	0.019	<b>0.020</b>
	<i>C</i>	0.008		0.008	0.010	<b>0.020</b>							

Note: *R* denotes received transfers according to system IV. *C* denotes implied contributions by the algorithm described in the text. All figures are expressed as ratios to GDP.  $\beta$  is computed as described in the text, and it measures a country's contribution, as a fraction of GDP, for each percentage point the unemployment rate is lower than the rest of the area average. In 2005, the value of  $\beta$  corresponds to contributors for which the cap of 2 percent of GDP is not binding.