Solidarity: regions or persons? Some calculations to illustrate the "by-product" status of interregional transfers

André Decoster and Dirk Verwerft, KULeuven

Jacques Drèze's paper on the interaction between subsidiarity and interpersonal solidarity raises, among others, the interesting empirical question how much of the transfers in the Belgian taxation and social security system can be interpreted as resulting from an efficient risk sharing insurance contract, and how much as the expression of ex ante solidarity. Jacques shows that it is conceptually possible to implement this "redistribution" following from the insurance perspective in two steps: first by designing - after initial conditions have been suitably taken into account -an insurance for deviation of regional GDP's per capita from their expected trend, leading to interregional compensating transfers; second by designing interpersonal redistribution within each region.

Jacques Drèze emphasizes that his text has to be read in a forward looking way, where the past is taken up in the "initial conditions" when the contract is set up. Yet, we could try to interpret the current Belgian interregional transfers in these terms. In that case, the choice of the exact time when the implicit contract was agreed upon plays a decisive role. It determines both the initial relative position of the regional GDP's (and all other aspects deemed relevant for the initial conditions) and the region's expectations about future growth paths. Which moment should one choose? The last reform in the tax or the social security system, or the last reform that significantly changed transfers across regions? The question could even be turned around: has there ever been a moment in history with a reasonable set of beliefs that could be considered as the point where an implicit contract was closed which can explain the later transfer directions and magnitudes (assuming that later reforms had only a minor influence on the transfers)? The goal of the illustrative calculations we present below is therefore *not* to provide an empirically quantified implementation of the framework proposed in Jacques' text, nor in a backward – and even less in a forward looking way. As a mere static and descriptive analysis, they only serve to illustrate two things.

First, in current practice, a balanced and nuanced approach to the interregional transfer debate, embedded in a sound and explicit conceptual framework is altogether missing and more than ever necessary. It does not seem likely that the current, often hotly debated interregional transfers correspond to interregional transfers that would follow from the two tiered set-up described in Jacques Drèze's text. And as we will show below, the detailed data can be interpreted (and manipulated) in very different ways according to the theoretical and – necessary - ideological perspective that one wants to take. We want to further qualify this contentious topic, by showing how the current transfers are a relatively **small by-product of an interpersonal redistributive tax and transfer system** which did not intend to take up "region" as a crucial characteristic (see the comment of Erik Schokkaert above). Looked at it from this perspective, the repeated call for more figures, refined methodology and updated figures in the debate on (current) interregional transfers seems to be beside the point, because they do not make the tax and transfer system more transparent. Quite the contrary.

Second, we will show that microsimulation models can help in reframing the debate. These models simulate tax and social security systems for all individuals on a representative sample of the population, often an income survey as the EU-SILC.[23] Since the sample is meant to be representative for the Belgian population, ànd we also know in which region the individual or household lives, these micro-calculations offer the possibility of having a much more detailed look at the direction and explanation of transfers. To the extent that one judges the regional perspective to be sensible and justified, these micro-calculations can be considered as valuable complements for the mainly macro-based calculations of interregional transfers. But because the surveys also contain variables as individual or household income, professional status, age and educational status, microsimulation also allows to leave the "univariate" presentation which dominates the public debate (where the univariate analysis is along the regional axis), and to switch to a multivariate analysis which might quantify the role of "region" as an explanatory variable in interpersonal transfers[24]. In this sense one could even consider our calculations as illustrative for the thought of Christian Gollier in his comment when stating "The uncertainty faced by a community is nothing else than the sum of individual risks faced by its members". Adding in these individual factors, we will show, changes the picture considerably and actually relativizes the importance of current interregional transfers.

Data, model and benchmark results

The data used here come from the EU-SILC 2004 income survey. The simulation of personal income taxes and social security benefits and contributions was carried out with the MISIM program of the University of Antwerp[25]. The model calculates personal income taxes, employee social security contributions and social benefits received at the household level for the year 2003. We have added the employer social security contributions as calculated by the EUROMOD microsimulation program running on the same database.[26]

We follow the methodology used in the report of the National Bank (see Dury et al. 2008) by calculating the transfers as the difference between the net tax per capita in the region and the national average, multiplied by the number of inhabitants in the region. A positive number indicates that the region contributes more to government revenue than could be expected on the basis of its population share. A negative figure reveals that the region is a net recipient. Table 1 shows the results for the different components of taxes, social contributions and benefits.

Table 1: Transfers across regions in 2003, per capita in euros per year

	Flanders	Wallonia	Brussels
Population	6034015	3384034	1009806
Population share	57,9	32,4	9,7
Personal income tax	202	-384	79
Social security Benefits	104	-89	-327
Employee Social Contributions	102	-146	-119
Employer Social Contributions	284	-418	-298
Total	693	-1036	-666

[23] EU-SILC is the Eurostat Survey on Income and Living Conditions
[24] See Cantillon en De Maesschalck (2008) for an earlier contribution.
[25] We are grateful to Gerre Verbist for performing the simulations.
[26] See http://www.iser.essex.ac.uk/research/euromod for the European-wide publicly available microsimulation model EUROMOD.

Table 1 shows the familiar univariate story, often produced by means of macro-figures.[27] Flanders is overall a net donor for all types of government revenue and transfers, while Wallonia and Brussels are net receivers, with the exception of personal income taxes for Brussels. On average a Flemish resident pays €693 per year to the other two regions. Not unexpectedly, personal income tax and social security contributions of the employers exhibit the most important transfers. Of course, this is on a per capita basis and does not take into account differences in the labour population.

Indeed a by-product

Is the transfer of €693 per year paid by a Fleming high? The top row of table 2 repeats the three figures of the bottom row of table 1, and compares them with other, still univariate, groupings of the Belgian population. Indeed, why not look at the variation in the net tax rate between home owners and non home owners, or according to age groups or educational level?

Table 2: Transfers between different socio-economic groups (€ per capita per year)

Region	Flanders	Wallonia	Brussels		
	693	-1 036	-666		
Education	Low	Secondary	High		
	-5 085	468	4 849		
Employment	Self-employed	Employed	Unemployed	Retired	Other
	2 504	5 592	-7 196	-12 108	-8 557
Home owner	No	Yes			
	-1 740	616			
Income [28]	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
	-7 897	-6 908	-2 562	2 414	10 936
Age	< 30	>=30 & <50	>=50 & <65	>=65	
	2 410	3 132	-232	-13 448	

Note: blue indicates positive net tax (paying); red: negative net tax (receiving)

The results in Table 2 which are expressed in yearly euro amounts per capita (where the number of people is counted in the respective cells), are revealing.[29] The Flemish transfer is approximately the same size as the one home owners pay to non home owners. The transfer which highly educated people pay to low educated ones is about seven times as large as the

[27] One could easily multiply the per capita figure in the bottom row of table 1 to obtain the figure comparable with the macro figures as e.g. produced by the National Bank or the "Transfer Commissie". We obtain a transfer of 4,180 billion € of Flanders to the other two regions (3,507 to Wallonia and 0,673 to Brussels). It is tempting to consider this as a validation of either our own model and data, or of the macro methodology, but we abstain from this for at least two reasons. First, we do not cover all government revenues that are taken up in the reference studies (e.g. indirect taxes), and the similarity of the total transfer conceals important divergent figures in some categories. E.g. for personal income taxes the National Bank reports Brussels as receiving 455 million €, whereas we obtain a positive net tax for the Brussels region of 79 million €. Second, our aim is explicitly *not* to produce a reliable interregional transfer but to produce a benchmark figure for the next sections.

[28] Income is measured here as 'equivalised disposable income', where 'equivalised' refers to the fact that we divide nominal household income by a so-called equivalence scale to take into account economies of scale w.r.t. household size. The quintiles are constructed as to contain 20% of the individuals in the population.

[29] The classification of individuals is done by looking at the characteristic of the household head. Hence all individuals belonging to a household where the head is unemployed, are counted in the cell "unemployed". This has to be taken into account when interpreting the per capita figures.

interregional transfer.[30] And, not surprisingly, the most important transfer is the one from rich people to the bottom three quintiles of the distribution (€10936 per year).

Table 2 clearly illustrates that interregional transfers in the current Belgian set-up of a tax and transfer system are a *by-product* of demographic and economic differences. Differences between households along dimensions that every welfare state wants to compensate for, e.g. employment status, (although there are of course debates about the levels) result in substantial transfers along dimensions which one does not want to compensate for explicitly (e.g. region) because of correlation between the dimensions. It also implies that a relatively small transfer in one dimension can be unjustified while a large one in another dimension might be justified.

Interregional transfers: certainly not 'WYSIWYG'…

The home owner transfer in table 2 may have led some readers to the conclusion that this is an inappropriate way of presenting the results, since the transfer probably has to do with the fact that home owners are richer than renters. We agree. And we therefore step from the univariate to a bivariate one, where we cross two variables and take region as one of them. In tables 3a-3c we cross region with equivalised disposable income quintiles, and show the transfers for three different reference points. We have defined the quintiles at the national Belgian level, in order to compare people living in more or less the same objective conditions.

Table 3a shows the transfers per capita relative to *the national average* (and hence the population weighted sum over all cells equals zero). The simple questions "does the Flemish resident pay?" and "does the Walloon resident receive?" get a nuanced answer once we no longer accept that there are only "average" Flemish and Walloon people, but take into account the heterogeneity within the different regions. The rich Flemings do pay indeed, but not that much more than the rich Walloon, and certainly less than the rich Brussels people. And the poor Fleming do receive transfers which are as outspoken as the ones for the poor living in Brussels and Wallonia. What the table reveals is that analyzing a tax transfer system along an axis or perspective for which it has not been designed does not enhance transparency. Quite the contrary. The transfers become clear when we insert a dimension for which the system has been explicitly designed.

Table 3a: Yearly per capita transfer in € with respect to national average

		Flanders	Wallonia	Brussels
Income Quintile	1	-7 920	-8 217	-7 104
	2	-7 129	-6 589	-6 791
	3	-2 693	-2 268	-2 864
	4	2 559	2 139	2 348
	5	10 629	10 000	16 598

Note: blue indicates positive net tax (paying); red: negative net tax (receiving)

Table 3b depicts the transfers *within* each region. This means that average per capita taxes are calculated per region and that the figures in each cell represent the deviation of the cell with respect to this column average. Since per capita taxes in Flanders are higher than in Belgium, Flemish people in all quintiles now pay less taxes or receive more transfers than in table 1. The opposite is true for Wallonia and Brussels. This table can be used to compare the level

[30] This does of course not take into account the implicit transfer to highly educated people by means of the publicly financed educational system. We only track the explicit cash transfers of the tax benefit system.

of redistribution within the regions (accepting that the Belgian quintiles reflect objective, different welfare levels), and is in fact an indication of step two in Jacques Drèze's analysis. But it is not difficult to imagine how slippery the use of the results in table 3b might be in public debates.

Table 3b: Yearly per capita transfer in € with respect to regional (column) average

Income Quintile	Flanders	Wallonia	Brussels
1	-8 613	-7 181	-6 437
2	-7 822	-5 552	-6 124
3	-3 386	-1 232	-2 198
4	1 866	3 175	3 015
5	9 937	11 036	17 265

Note: blue indicates positive net tax (paying); red: negative net tax (receiving)

A still more striking phenomenon becomes visible when one looks at transfers the other way around. In that case we take as reference group the own income quintile to which a household belongs. Table 3c presents these interregional transfers calculated as regional deviations from the average tax rate *within* each income quintile. We now answer the question: if we take a poor household, is there a different treatment between a poor Fleming, a poor Walloon, or a poor Brussels inhabitant? The same for the other quintiles.

Perhaps contrary to intuition based on the information in Table 1 (where Flanders is the net payer and Wallonia and Brussels are the net receivers), four out of the five income groups exhibit a pattern which favours Flanders. Only in the fourth quintile group the structure of Table 1 is repeated. How is this possible?

Table 3c: Yearly per capita transfer in € with respect to quintile (row) average (number of people in brackets)

Income Quintile	Flanders	Wallonia	Brussels
1	-23 (735420)	-320 (679308)	793 (296084)
2	-222 (984008)	318 (604999)	116 (220397)
3	-131 (1261779)	295 (732559)	-302 (168585)
4	145 (1490870)	-275 (756858)	-66 (139048)
5	-307 (1561908)	-936 (610301)	5662 (185721)

Note: blue indicates positive net tax (paying); red: negative net tax (receiving)

Table 3c is an almost perfect example of Simpson's paradox mentioned in nearly every introductory textbook on statistics. Conditional on equivalent disposable income quintile, Flemish people on average receive transfers from the other regions combined in any but the fourth quintile. The situation is symbolically depicted in Figure 1, where the black lines connect the quintile average net taxes per capita paid by Flanders and the other regions respectively (the lowest line being the first quintile, the highest the fifth quintile). The slopes

of four out of five quintiles are up, indicating higher net taxes in Wallonia and Brussels combined than in Flanders, while only the slope of the fourth decile is down. Yet when one considers overall regional averages as in table 1, so neglecting quintiles in one's analysis, the slope is down, indicated by the red line. Note that even if the slope of the fourth quintile were also positive, the overall slope could still be negative (in which case this would be a perfect illustration of Simpson's paradox).

The explanation lies in the fact that there are relatively more Flemish people in the higher quintiles, shifting the left hand point of the red line (the average net tax paid in Flanders) up, while there are relatively more people in Wallonia and Brussels in the lower quintiles, dragging the overall net average tax (the right hand side of the red line) in Brussels and Wallonia down. Put differently: the red point on each side is a population-weighted sum of the black points on the same side, and for Flanders the weight of the higher quintiles is higher while for the combination of other regions the weight of the lower quintiles is higher.

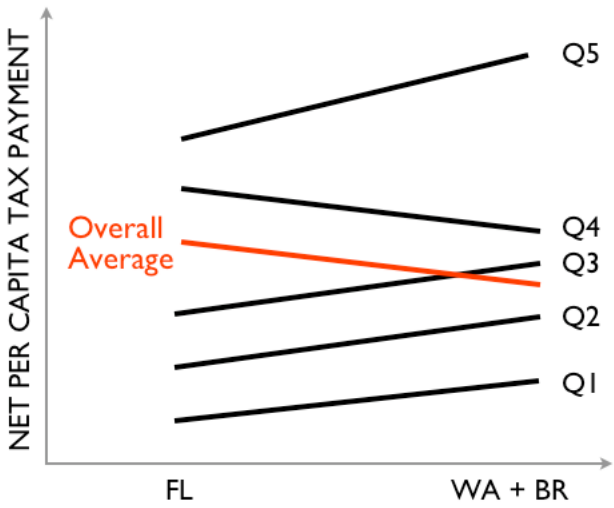

Figure 1: Simpson's paradox

The conclusion of these three tables 3a-3c as compared to the standard tale of Table 1 is that in order to choose for one perspective or the other, one needs a theory consisting of both a sound conceptual framework (e.g. the one offered by Jacques Drèze) and ideological inputs. All other calculations of interregional transfers are "ad hoc" and hence meaningless or prone to manipulative interpretation. If one believes that social justice should mean that net taxes paid are equal across regions independent of the differences in welfare levels between the regions, the marginal regional perspective can do and this shows 'injustice' towards people living in Flanders. But in the other extreme case, where one considers equivalent disposable income quintiles to reflect the welfare level of the population perfectly and one believes that people of the same welfare level should pay the same net tax, then the Belgian tax system is socially unjust by advantaging the people living in Flanders (except for the fourth quintile).

Regional aspects of Belgian inequality

Table 2 showed that the regional transfer effect is small compared to differences along other dimensions. For an overall view, it is useful to see what the effect of region is on the total inequality in Belgium. To achieve this, we used the fact that inequality measures like the Gini or the Theil's entropy coefficient can be decomposed into inequality between subgroups in a population and the inequality within these subgroups. Tables 4a and 4b summarize the results. In the first two columns we give the decomposition for the baseline incomes in 2003.

Table 4a: Gini decomposition

Gini components	Primary income	Disposable income	Disposable income Simulation 1	Disposable income Simulation 2
Total	.511	.263	.270	.272
Within regions	.226	.115	.118	.115
Between regions	.042	.024	.060	.060
Overlap (residual)	.243	.125	.092	.097

Table 4b: Theil decomposition

Theil components	Primary income	Disposable income	Disposable income Simulation 1	Disposable income Simulation 2
Total	.480	.122	.127	.129
Within regions	.477	.121	.119	.122
Between regions	.003	.001	.007	.007

The commonly used Gini coefficient (table 4a) is not simply decomposable into a 'between' and 'within regions' component but has an extra term capturing the overlapping between the regional distributions. As this is not related to between groups inequality (considered to be the difference between the group averages weighted by the groups' population) it is generally counted as part of the within groups variation. However, to account for this conceptual peculiarity, we also included a perfectly additively decomposable inequality measure, Theil's entropy index, in table 4b. As is clear from the first and second column, the influence of the between groups, regional component on inequality is only a minor fraction of the overall inequality, before (column 1) as well as after (column 2) taxation.

The third and fourth column show (purely arithmetic) simulation results on inequality if the transfers between the regions are removed and all regions adopt the average Belgian per capita tax rate. In practice: Flanders can lower its net tax rate (either by lowering taxes or increasing transfers), Wallonia and Brussels have to increase the net tax rate. There is of course ample choice in how to implement these tax changes. We show the effect of two stylized scenario's: a proportional one, where net disposable per capita incomes are changed in proportion to their net tax in the baseline (simulation 1) and one in which each individual receives or has to pay a fixed amount (simulation 2). In both cases the overall inequality in Belgium rises because of a substantial rise in between group inequality. The quite stable 'within' component (which itself is the weighted average of inequality within the regions) is the result of different trends in the three regions, which are heavily dependent on the chosen scenario. Flanders can lower taxes. If this is done by giving all Flemings the same absolute amount (Scenario 1), inequality as measured by a scale invariant inequality measure goes down. Whereas the opposite occurs in Wallonia and Brussels: taxing all inhabitants with the same additional amount increases inequality.

Finally we summarize the change in inequality and regional average disposable incomes by combining them into an 'abbreviated welfare function' which is the product of average income and one minus inequality. We used the Gini as the inequality measure. The results are displayed in table 4c. We fist show the change in average disposable incomes per capita

(in euros per year). In the baseline, Flanders is 3.9% richer than the Belgian average, while Wallonia and Brussels are respectively 6.3 and 2.2 % poorer. Removing the interregional transfers of course widens this discrepancy substantially. Flanders is now nearly 10% above the Belgian average, while Wallonia falls more than 15% below the Belgian average. As explained above the changes in inequality within the regions depend on the scenario. In the bottom two rows we then combine the sharp change in average disposable income in the regions (and in Belgium) with the changes in inequality. Looking at the Belgian column, one observes that in neither of the two scenarios, the substantial loss in welfare in Wallonia and Brussels is compensated fully by the increase in welfare in Flanders. In both scenario's there is a loss of welfare for Belgium as a whole ranging from 0.9% to 1.2%, depending on the chosen scenario within the regions to compensate the removal of the interregional transfers.

Table 4c: Welfare effects of removing the interregional transfers

	Belgium	Flanders	Wallonia	Brussels
Baseline disposable income (€ per year)	11 479	11 925	10 758	11 321
Baseline disposable income (BE=100)	100.0	103.9	93.7	97.8
Baseline Gini	0.263	0.248	0.259	0.355
Disposable income S1 and S2 (€ per year)	11 479	12 617	9 721	10 564
Disposable income S1 and S2 (BE=100)	100.0	109.9	84.7	92.0
Gini S1	0.270	0.253	0.244	0.357
Gini S2	0.272	0.234	0.286	0.378
Welfare S1 (Baseline=100)	99.1	105.1	92.2	93.8
Welfare S2 (Baseline=100)	98.8	107.8	87.1	90.7

Note: S1 denote simulation 1 (procents), S2 denote simulation 2 (cents)

Conclusion

This Appendix had the twofold objective of (a) showing that a (nuanced) theoretical position is necessary for a meaningful interpretation of the data, and (b) to highlight the advantages and possibilities of working with micro data to address this question.

The Belgian data are an almost perfect example of Simpson's paradox: taking only region into account, there is a transfer from Flanders to the other regions. Taking equivalent disposable income into account, there is a transfer towards Flanders in every quintile but the fourth. These two extremes are merely to illustrate the need of social and economic theory in carefully interpreting and structuring the data.

Micro data and microsimulation models, when carefully implemented and checked with available macro-economic figures, can contribute to hypothesizing about explanations for the observed transfers.

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