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Workpackage 3.6:
Comparative analysis of the distributional impact of combined changes in direct and indirect taxes and benefits for five European countries

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Abstract: **This workpackage performs a simulation on the expenditure-enriched EUROMOD datasets for four selected countries. The simulation encompasses a decrease of social security contributions of the employees by 25%. The decrease in government revenue is compensated by a rise in the standard VAT rate. A distributional analysis of the welfare change is performed.**

I. INTRODUCTION

The previous workpackages were concerned with preparing (WP 3.1-3.3), finding (WP 3.4) and executing (WP 3.5) the optimal method to impute expenditure information into the EUROMOD datasets of Belgium, Hungary, Ireland and the UK. In this workpackage, a decrease in social security contributions of the employees of 25% is simulated in EUROMOD for all countries. The government budget is then kept constant by raising the standard VAT-rate. This simulation is exemplary for contemporaneous policy proposals to shift taxes from labour to consumption.

The next section elaborates the way the simulation is carried out and which assumptions are being made about the behaviour of tax payers and consumers. Section three proposes a

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measure for welfare change that can be used to perform a distributional analysis of gainers and losers. In the fourth section, the simulation results are discussed separately for each country. Section 5 concludes.

II. BACKGROUND AND ASSUMPTIONS

As stated in the introduction, the simulation encompasses for all countries a decrease in social security contributions of the employees by 25%. In EUROMOD, a new tax system is defined, where the rates in the social security for employees policy sheet are all multiplied by a factor 0.75. E.g. for Belgium this contains a rate for employees in the private sector, one for local civil servants and one for federal civil servants. For Hungary the rates for pension insurance, health insurance and general insurance schemes are changed. For the other countries an analogous procedure is followed. The measure has the effect that disposable income is increased in Hungary, Ireland and the UK. In Belgium, taxable income is increased, so that the decrease in contributions is already partially compensated by a raise in personal income tax revenue.

A first assumption is that the increase in disposable income is entirely translated into a corresponding increase in total expenditures. This is equivalent to stating that the absolute level of savings is kept constant. Furthermore, in the same spirit, quantities of durable goods purchased are kept constant. However, since durables are often taxed with the standard VAT- rate, the level of durable *expenditures* has to rise. Hence, the new level of total nondurable expenditures e^1 can be expressed in terms of the pre reform level e^0, the change in disposable income Δy and the change in durable expenditures Δe_{16} as follows:

$$e^1 = e^0 + \Delta y - \Delta e_{16}$$

where Δe_{16} can be written as:

$$\begin{aligned}\Delta e_{16} &= q_{16}^1 x_{16}^0 - q_{16}^0 x_{16}^0 \\ &= \frac{q_{16}^1 - q_{16}^0}{q_{16}^0} e_{16}^0\end{aligned}$$

In this formula, e_j^i, x_j^i and q_j^i represent respectively the expenditures, quantities and consumer prices in period i for aggregate j. There are 15 nondurable aggregates, so 16 stands for durables. Home production is not included in the analysis, since it is not taxed. The old and new consumer prices can be calculated from the expenditure data and the

detailed indirect tax system with a slimmed down version of the `aggrtax.do` program of workpackage 3.3.

At this point, the 15 nondurable budget shares are the only unknowns left. In what follows, two simulations will be carried out. The first will assume constant budget shares. This means that all the nondurable goods are supposed to rise proportionally with total nondurable expenditures. Of course, from the discussion of the estimation of the Engel curves in workpackage 3.5, this assumption is not very likely to hold. Therefore, in a second imputation behavioural responses are introduced by calculating the new budget shares according to the already estimated Engel curves.

The simulation programs hence take the following form. First, the loss in government revenue is calculated, which is equal to the total gain in disposable income of all the households. So also the new disposable income is known. This determines the total expenditures since savings are kept constant. The first step ends with calculating the indirect tax revenue for the baseline using the slim `aggrtax.do` program. Then the standard VAT-rate is augmented by an a priori determined step size (1 percent point for Belgium and Hungary, 0.5 percent point for the UK and Ireland). This determines the new durable expenditures. The nondurable expenditure categories can then be calculated by recalculating the new budget shares (constant or with Engel curves). This enables the calculation of the new indirect taxes. If the difference in indirect taxes exceeds the government revenue loss, the program ends. If not, the standard VAT-rate is increased by the same step size, until government revenue neutrality is obtained.

III. A MEASURE FOR WELFARE CHANGE

Only looking at the change in standard VAT-rate tells something about the importance of indirect taxation in the entire tax system. Yet, for distribution analysis purposes, it is interesting to see which groups in the population are better off by the change in policy and which are worse off. Here a measure of consumption based welfare gain was adopted. In what follows, the derivation of this measure (from Capéau, Decoster, De Swerdt & Orsini, 2008) is briefly summarized.

Write the Marshallian demand functions as:

$$\mathbf{x} = f\left(\mathbf{q}, e\right),$$

where $\mathbf{x}$ and $\mathbf{q}$ denote quantities and consumer prices respectively. In this case the expenditure function for the non durable commodities becomes:

$$e = c\left(\mathbf{q}, U\right),$$

U denoting the welfare level obtained from the preference representation function $u\left(f\left(\mathbf{q}, y\right)\right)$. This expenditure function is homogeneous of degree 0 in the level of non durable expenditures and consumer prices, allowing to transform each proportionate price change into a corresponding change of e. The function $c(.)$ is the building block of the money metric welfare function (see King, 1983). E.g. for a household with non durable expenditures e^0 and facing prices $\mathbf{q}^0$ welfare is measured as:

$$m(\mathbf{q}^r, \mathbf{q}^0, e^0) = c\left(\mathbf{q}^r, u\left(f\left(\mathbf{q}^0, e^0\right)\right)\right),$$

where $\mathbf{q}^r$ is a set of reference prices to convert welfare U^0 in the situation $(\mathbf{q}^0, e^0)$ into monetary units. Now use as reference prices the baseline prices $\mathbf{q}^0$. The welfare change due to the change in nominal non durable expenditures (from e^0 to e^1) and in consumer prices (from $\mathbf{q}^0$ to $\mathbf{q}^1$) is then calculated as follows:

$$\begin{aligned} WG(\mathbf{q}^0, \mathbf{q}^1, e^0, e^1) &\equiv c\left(\mathbf{q}^0, U^1\right) - c\left(\mathbf{q}^0, U^0\right) \\ &= c\left(\mathbf{q}^0, u\left(f\left(\mathbf{q}^1, e^1\right)\right)\right) - c\left(\mathbf{q}^0, u\left(f\left(\mathbf{q}^0, e^0\right)\right)\right), \end{aligned}$$

where $U^1 \equiv u\left(f\left(\mathbf{q}^1, e^1\right)\right)$ denotes the utility level in the post-reform situation.

The second term in the last equation equals e^0. The first term in the right hand side of equation embodies the counterfactual situation of reaching the post-reform utility level at the pre-reform prices. This can be calculated by means of the Hicksian, or compensated demand functions, denoted here as:

$$\mathbf{x} = h\left(\mathbf{q}, U\right),$$

leading to:

$$c\left(\mathbf{q}^0, U^1\right) \equiv e^* = \sum_{i=1}^{15} q_i^0 h\left(\mathbf{q}^0, U^1\right).$$

These compensated demands only take-up the real income effect, leaving relative prices unchanged. Hence they correspond to the quantities calculated as follows:

$$x_i^* = \frac{e_i^*}{q_i^0} \quad i = 1,...,15.$$

e^* is therefore calculated as:

$$e^* = \sum_{i=1}^{15} q_i^0 x_i^*.$$

The welfare gain is then calculated as:

$$WG(\mathbf{q}^0, \mathbf{q}^1, e^0, e^1) = e^* - e^0.$$

Note that this welfare gain can be decomposed into three different effects: one effect coming from the change in nominal non durable expenditures, an effect coming from the change in the aggregate price level of the nondurable consumer items, discarding the relative price change, and an effect coming from the change in the relative prices of the non durable consumer items. The decomposition is as follows:

$$\begin{aligned}
WG(\mathbf{q}^0, \mathbf{q}^1, e^0, e^1) &= e^* - e^0 \\
&= e^1 - e^0 - \left(e^1 - e^*\right) \\
&= \Delta e - \left[\sum q_i^1 x_i^1 - \sum q_i^0 x_i^*\right] \\
&= \Delta e - \left[\sum q_i^1 x_i^1 - \sum q_i^0 x_i^* + \sum q_i^1 x_i^* - \sum q_i^1 x_i^*\right] \\
&= \Delta e - \left[\sum \left(q_i^1 - q_i^0\right) x_i^* + \sum q_i^1 \left(x_i^1 - x_i^*\right)\right] \\
&= \Delta e - \left[\Delta^1 \mathbf{q} + \Delta^2 \mathbf{q}\right].
\end{aligned}$$

The first term in the above expression is the change in nominal non durable expenditures. But this difference would be an overestimation of the welfare gain. The other two terms in squared brackets give the effect of the changing consumer prices. The first is the change in the general price level, discarding the relative price change. Concretely, it is an aggregate measure of price changes, namely the weighted average of the individual price changes, weighted by the quantities x_i^* (to be interpreted as the Hicksian quantities, after adjusting the price level in a proportionate way). The inclusion of this term is intuitive: a rise in the general price level decreases the gain in welfare as measured by nominal expenditures alone, since one can purchase fewer quantities with the same money. The second term between square brackets, $\Delta^2\mathbf{q}$, accounts then for the relative price effect, i.e. for the changing of the slope of the budget constraint.

With our specific assumptions, $x_i^* = x_i^1$, and hence the third price-change-term $\Delta^2\mathbf{q}$ vanishes. The term between square brackets then simplifies to:

$$\sum_{i=1}^{15}\left(q_i^1 - q_i^0\right)x_i^1,$$

and the welfare gain to

$$\begin{aligned} WG &= \Delta e - \sum_{i=1}^{15}\left(q_i^1 - q_i^0\right)x_i^1 \\ &= e^1 - e^0 - \left(e^1 - \sum_{i=1}^{15} q_i^0 x_i^1\right) \\ &= \sum_{i=1}^{15} q_i^0 x_i^1 - \sum_{i=1}^{15} q_i^0 x_i^0 \\ &= \sum_{i=1}^{15} q_i^0\left(x_i^1 - x_i^0\right). \end{aligned}$$

The last expression is very intuitive: to measure the welfare impact one looks at changes in quantities. These changes are evaluated at pre reform prices. The first expression allows for a decomposition of the welfare gain in an expenditure and a price effect. This decomposition will be used in the tables.

IV. SIMULATIONS BY COUNTRY

This section contains the description of the simulation results per country. The tables are numbered x.1, x.2 etc., where "x" refers to the country. First, a revenue table is given to show the effects of the simulations on the composition of the government revenues (table x.1). This is followed by a description of the welfare measure for different population subgroups, to identify winners and losers of the change in policy. Relevant groups are equivalized nondurable expenditures and disposable income deciles (table x.2, x.3 and x.4), household size (table x.5), age (table x.6), socio-economic status (table x.7) and education level of the household head (table x.8).

1. Belgium

For Belgium, the standard VAT-rate is raised from 21 to 26% in both simulations. Table 1.1 shows a decrease in the social security contributions of the employees with respect to the baseline and an increase in the personal income tax revenue. This is a consequence of the fact that taxable income consists of the original income out of labour minus the social security contributions. Hence lowering the latter leads to a higher taxable income and to higher taxes paid. The compensation of the loss in contribution is divided almost equally between the rise in PIT and the rise in indirect tax. Notice that only the difference in indirect tax revenue differs between the simulation methods. The increase in VAT-rate is the same, so there is no large difference, but the resulting tax revenue is higher with the constant budget shares. This indicates that luxury goods are slightly taxed less than necessities.

Table 1.1: revenue table for baseline and both simulations, in million Euros - Belgium

million Euros	baseline	simulation, constant budget shares	difference	simulation, Engel curves	difference
SIC employer	40,768	40,768	0,000	40,768	0,000
SIC employee	17,490	13,590	-3,900	13,590	-3,900
PIT	35,500	37,263	1,763	37,263	1,763
Indirect tax	14,400	16,733	2,332	16,710	2,309

Tables 1.2 to 1.3 summarize the welfare measure WG and its components for the equivalized nondurable expenditure deciles. Clearly, the reform has a regressive character, irrespective of the method used. Table 1.4 contains the values for change in disposable income and WG per equivalized disposable income decile. Again, the welfare measure

points to a regressive reform. Notice that every decile gains in disposable income, but due to price effects, the lower deciles lose utility.

Tables 1.5 to 1.8 check the differences in welfare changes for other population characteristics. Households containing few or many members lose, while medium sized households gain. Households with older or low educated heads also lose through the change in policy. Only households with employed heads gain on average from the measure, while the reverse is true for all other socio-economic categories.

Table 1.2: welfare effects for simulation with constant budget shares - Belgium

Equivalent nondurable expenditure deciles	Baseline disposable income, EUR /year	Baseline total expenditure, EUR /year	Change in non durable expenditure, EUR /year	Price effect, EUR /year	WG, EUR /year	Nondurable expenditure change, % of total expenditure	Price effect, % of total expenditure	WG, % of total expenditure
1	10860	11587	43	-193	-150	0.370	-1.664	-1.294
2	15021	15393	79	-262	-183	0.512	-1.703	-1.191
3	18374	17930	159	-308	-149	0.888	-1.716	-0.828
4	22033	21048	237	-365	-129	1.124	-1.736	-0.612
5	25603	23876	389	-416	-27	1.628	-1.743	-0.115
6	28458	25594	482	-455	27	1.882	-1.776	0.106
7	32144	28137	614	-508	106	2.181	-1.804	0.377
8	35306	29984	735	-556	179	2.450	-1.853	0.597
9	39341	32986	837	-606	232	2.539	-1.837	0.702
10	48824	47857	1162	-855	307	2.429	-1.787	0.642
Mean	27592	25435	473	-452	21	1.862	-1.778	0.083

Table 1.3: welfare effects for simulation with Engel curves - Belgium

Equivalent nondurable expenditure deciles	Baseline disposable income, EUR /year	Baseline total expenditure, EUR /year	Change in non durable expenditure, EUR /year	Price effect, EUR /year	WG, EUR /year	Nondurable expenditure change, % of total expenditure	Price effect, % of total expenditure	WG, % of total expenditure
1	10860	11587	43	-193	-150	0.370	-1.666	-1.296
2	15021	15393	79	-262	-183	0.512	-1.704	-1.192
3	18374	17930	159	-308	-149	0.888	-1.718	-0.830
4	22033	21048	237	-366	-129	1.124	-1.737	-0.614
5	25603	23876	389	-417	-28	1.628	-1.746	-0.118
6	28458	25594	482	-455	26	1.882	-1.779	0.103
7	32144	28137	614	-509	105	2.181	-1.808	0.373
8	35306	29984	735	-557	178	2.450	-1.857	0.593
9	39341	32986	837	-607	230	2.539	-1.841	0.698
10	48824	47857	1162	-858	305	2.429	-1.793	0.636
Mean	27592	25435	473	-453	20	1.862	-1.781	0.080

Table 1.4: Difference in disposable income and WG pre- and post-reform per equivalised disposable income decile, Belgium

Equivalized disposable income deciles	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
1	21	-268	21	-269
2	40	-233	40	-233
3	81	-234	81	-234
4	166	-187	166	-187
5	286	-119	286	-119
6	435	-10	435	-11
7	598	95	598	94
8	751	202	751	200
9	941	316	941	314
10	1416	651	1416	649
Mean	473	21	473	20

Table 1.5: Difference in disposable income and WG pre- and post-reform per household size, Belgium

Household size	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
1	206	-62	206	-63
2	364	-71	364	-71
3	712	134	712	133
4	924	265	924	263
5	836	156	836	154
> 5	695	-39	695	-41
Mean	473	21	473	20

Table 1.6: Difference in disposable income and WG pre- and post-reform per socio-economic category of household head, Belgium

Socio-economic category	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
Self-employed	397	-71	397	-71
Employed	848	279	848	277
Unemployed	112	-177	112	-177
Retired	54	-269	54	-269
Other	67	-266	67	-267
Mean	473	21	473	20

Table 1.7: Difference in disposable income and WG pre- and post-reform per age group of household head, Belgium

Age group	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
< 30	512	104	512	103
>= 30 and < 50	696	171	696	170
>= 50	276	-124	276	-124
Mean	473	21	473	20

Table 1.8: Difference in disposable income and WG pre- and post-reform per education level achieved of household head, Belgium

Achieved education level	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
Primary	233	-124	233	-124
Secondary	506	55	506	54
Higher	741	167	741	166
Mean	473	21	473	20

2. Hungary

Both simulations cause the standard VAT-rate to rise from 25 to 34%. The fact that this change is considerably higher than in Belgium can be explained by the fact that there is no partial compensation by the income tax, as is clear from the revenue table 2.1.

Table 2.1: revenue table for baseline and both simulations, in million Euros - Hungary

million Euros	baseline	simulation, constant budget shares	difference	simulation, Engel curves	difference
SIC employer	7,479	7,479	0,000	7,479	0,000
SIC employee	2,777	2,084	-693	2,084	-693
PIT	4,608	4,608	0,000	4,608	0,000
Indirect tax	4,300	5,039	740	5,030	731

Tables 2.2 to 2.4 again show the regressive nature of the reform. The average change in welfare is negative up to the fifth decile. The welfare effect analysed for different subgroups of the population gives the same results as for Belgium, with the exception of the large size households, who gain here from the measure.

Table 2.2 welfare effects for simulation with constant budget shares Hungary

Equivalent nondurable expenditure deciles	Baseline disposable income, EUR /year	Baseline total expenditure, EUR /year	Change in non durable expenditure, EUR /year	Price effect, EUR /year	WG, EUR /year	Nondurable expenditure change, % of total expenditure	Price effect, % of total expenditure	WG, % of total expenditure
1	2652	3149	22	-69	-46	0.709	-2.183	-1.475
2	3825	3927	34	-89	-55	0.873	-2.275	-1.402
3	4598	4471	57	-105	-48	1.277	-2.347	-1.070
4	5199	5041	82	-123	-41	1.634	-2.439	-0.805
5	5815	5534	112	-139	-26	2.031	-2.508	-0.477
6	6323	6014	141	-156	-15	2.343	-2.601	-0.258
7	7513	6852	192	-182	10	2.808	-2.656	0.152
8	8196	7359	231	-204	27	3.138	-2.767	0.371
9	9523	8311	310	-235	75	3.730	-2.832	0.898
10	13958	10907	527	-337	190	4.828	-3.089	1.740
Mean	6759	6156	171	-164	7	2.776	-2.662	0.114

Table 2.3: welfare effects for simulation with Engel curves - Hungary

Equivalent nondurable expenditure deciles	Baseline disposable income, EUR /year	Baseline total expenditure, EUR /year	Change in non durable expenditure, EUR /year	Price effect, EUR /year	WG, EUR /year	Nondurable expenditure change, % of total expenditure	Price effect, % of total expenditure	WG, % of total expenditure
1	2652	3149	22	-70	-47	0.709	-2.215	-1.506
2	3825	3927	34	-90	-56	0.873	-2.286	-1.413
3	4598	4471	57	-105	-48	1.277	-2.357	-1.081
4	5199	5041	82	-124	-41	1.634	-2.451	-0.816
5	5815	5534	112	-139	-27	2.031	-2.519	-0.488
6	6323	6014	141	-157	-16	2.343	-2.614	-0.270
7	7513	6852	192	-183	9	2.808	-2.671	0.137
8	8196	7359	231	-205	26	3.138	-2.783	0.355
9	9523	8311	310	-237	73	3.730	-2.850	0.880
10	13958	10907	527	-339	188	4.828	-3.104	1.724
Mean	6759	6156	171	-165	6	2.776	-2.677	0.099

Table 2.4: Difference in disposable income and WG pre- and post-reform per equivalised disposable income decile, Hungary

Equivalized disposable income deciles	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
1	21	-62	21	-63
2	53	-50	53	-51
3	60	-50	60	-51
4	82	-39	82	-39
5	97	-33	97	-34
6	125	-21	125	-22
7	165	-2	165	-3
8	221	26	221	25
9	301	68	301	66
10	583	234	583	232
Mean	171	7	171	6

Table 2.5: Difference in disposable income and WG pre- and post-reform per household size, Hungary

Household size	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
1	65	-41	65	-41
2	130	-25	130	-25
3	254	55	254	53
4	290	73	290	71
5	330	94	330	92
> 5	235	10	235	7
Mean	171	7	171	6

Table 2.6: Difference in disposable income and WG pre- and post-reform per socio-economic category of household head, Hungary

Socio-economic category	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
Self-employed	126	-70	126	-71
Employed	333	108	333	106
Unemployed	117	-2	117	-3
Retired	35	-72	35	-72
Other	85	-34	85	-35
Mean	171	7	171	6

Table 2.7: Difference in disposable income and WG pre- and post-reform per age group of household head, Hungary

Age group	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
< 30	244	59	244	59
>= 30 and < 50	241	46	241	45
>= 50	119	-23	119	-24
Mean	171	7	171	6

Table 2.8: Difference in disposable income and WG pre- and post-reform per education level achieved of household head, HU

Achieved education level	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
Primary	63	-36	63	-36
Secondary	191	15	191	14
Higher	362	82	362	81
Mean	171	7	171	6

3. Ireland

The simulation with constant budget shares causes the standard VAT-rate to rise from 20 to 23.5%. The simulation with Engel curves requires a lower increase from 20 to 23%. This means that the proposed reform would be less radical in the case of Ireland than for the other countries. There is no partial compensation by the income tax, as is clear from the revenue table 3.1. The Irish system relies more upon employer than employee contributions.

Table 3.1: revenue table for baseline and both simulations, millions of Euros - Ireland

million euros	baseline	simulation, constant budget shares	difference	simulation, Engel curves	difference
SIC employer	14,856	14,856	0	14,856	0
SIC employee	5,768	4,615	-1,154	4,615	-1,154
PIT	38,600	38,600	0	38,600	0
Indirect tax	15,491	16,634	1,206	16,507	1,077

Tables 3.2 to 3.4 show the regressive impact of the proposed reform. The average change in welfare is negative up to the fifth decile. Tables 3.2 and 3.3 show the welfare changes as a proportion of total expenditure. The impact of the reform does not exceed one per cent of total expenditure in any of the deciles.

Table 3.5 shows that one person households and households with more than five members lose from the reform when one does not account for the Engle curve response. All other household size groups appear to benefit from the reform. The average result for each household size group appears to be an improvement when one accounts for the Engle curve response. However the improvement is very small as should be expected.

Table 3.6 shows that the self-employed and employed would be likely to benefit from the reform. Households headed by those in other socio-economic categories would lose from the reform. This is what one would expect given that those employed are those that benefit from the reduction in social insurance contributions whereas the other categories would not benefit from the reduction of social contributions.

Table 3.7 shows that households headed by older people would lose because of the reform unless one takes account of the engle curve response. Lower educated household heads would also be likely to lose because of the reform. It seems likely that such individuals do not contribute much in terms of social insurance contributions because they fall below the income threshold for which social insurance contributions are mandatory.

Table 3.2: welfare effects for simulation with constant budget shares - Ireland

Equivalent nondurable expenditure deciles	Baseline disposable income, EUR /year	Baseline total expenditure, EUR /year	Change in non durable expenditure, EUR /year	Price effect, EUR /year	WG, EUR /year	Change in non durable expenditure, %	Change in price effect, %	Change in WG, %
1	10143	7124	0	-59	-58	0.007	-0.827	-0.820
2	13157	16763	38	-152	-114	0.227	-0.904	-0.678
3	18822	22979	108	-202	-94	0.470	-0.878	-0.408
4	24763	31777	213	-277	-64	0.670	-0.873	-0.203
5	31507	36132	321	-313	8	0.889	-0.867	0.022
6	34271	36710	364	-328	36	0.992	-0.894	0.098
7	37029	38698	390	-338	52	1.009	-0.875	0.134
8	44922	42703	483	-403	80	1.131	-0.943	0.187
9	46291	44439	523	-399	124	1.178	-0.899	0.279
10	63495	55354	722	-531	191	1.304	-0.959	0.345
Mean	32412	33245	316	-300	16	0.950	-0.903	0.048

Table 3.3: welfare effects for simulation with Engel curves -Ireland

Equivalent nondurable expenditure deciles	Baseline disposable income, EUR /year	Baseline total expenditure, EUR /year	Change in non durable expenditure, EUR /year	Price effect, EUR /year	WG, EUR /year	Change in non durable expenditure, %	Change in price effect, %	Change in WG, %
1	10140	7123	0	-55	-54	0.007	-0.768	-0.761
2	13163	16766	38	-127	-88	0.228	-0.755	-0.528
3	18827	22979	108	-170	-62	0.470	-0.739	-0.269
4	24768	31778	213	-196	16	0.670	-0.616	0.050
5	31498	36131	321	-238	83	0.888	-0.659	0.229
6	34257	36708	364	-235	130	0.991	-0.641	0.353
7	37010	38687	390	-265	126	1.008	-0.684	0.325
8	44898	42700	483	-301	182	1.130	-0.705	0.426
9	46291	44447	523	-327	197	1.178	-0.735	0.443
10	63498	55358	722	-466	255	1.304	-0.841	0.461
Mean	32407	33245	316	-237	78	0.950	-0.713	0.234

Table 3.4: Difference in disposable income and WG pre- and post-reform per equivalised disposable income decile, Ireland

Equivalized disposable income deciles	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
1	2	-141	2	-117
2	34	-162	34	-133
3	106	-138	106	-92
4	99	-87	99	-56
5	221	-55	221	13
6	310	-28	310	53
7	402	13	402	104
8	526	111	526	197
9	634	230	634	323
10	830	421	830	495
Mean	316	16	316	78

Table 3.5: Difference in disposable income and WG pre- and post-reform per household size, Ireland

Household size	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
1	101	-18	101	8
2	259	23	259	69
3	382	49	382	127
4	434	42	434	126
5	499	45	499	117
> 5	458	-80	458	34
Mean	316	16	316	78

Table 3.6: Difference in disposable income and WG pre- and post-reform per socio-economic category of household head, Ireland

Socio-economic category	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
Self-employed	403	59	403	130
Employed	467	111	467	190
Unemployed	82	-145	82	-104
Retired	102	-119	102	-82
Other	105	-108	105	-66
Mean	316	16	316	78

Table 3.7: Difference in disposable income and WG pre- and post-reform per age group of household head, Ireland

Age group	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
< 30	329	53	329	113
>= 30 and < 50	425	85	425	166
>= 50	234	-42	234	6
Mean	316	16	316	78

Table 3.8: Difference in disposable income and WG pre- and post-reform per education level achieved of household head, Ireland

Achieved education level	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
Primary	264	-22	264	32
Secondary	270	-18	270	50
Higher	525	169	525	242
Mean	316	16	316	78

4. UK

In the UK simulations, the standard VAT-rate is increased from 17.5 to 21.5%. Although there is no compensation effect by an increase in income tax either, the change in rate is rather modest. This can be explained by the fact that indirect taxes are relatively more important than social security contributions, contrary to e.g. the Belgian and the Hungarian case. Table 4.1 shows the details.

Table 4.1: revenue table for baseline and both simulations, in million GBP - UK

million GBP	baseline	simulation, constant budget shares	difference	simulation, Engel curves	difference
SIC employer	50,847	50,847	0,000	50,847	0,000
SIC employee	42,283	32,570	-9,713	32,570	-9,713
PIT	164,813	164,813	0,000	164,813	0,000
Indirect tax	71,717	82,446	10,729	82,372	10,655

Tables 4.2 to 4.4 again show the same regressive image as with Belgium and Hungary, with the five poorest deciles losing. The effect is limited to less than 1% of total expenditure. Gaining and losing categories for other demographic variables show the same picture as in Belgium, except for the fact that here the two-person households are also gaining welfare.

Table 4.2: welfare effects for simulation with constant budget shares UK

Equivalent nondurable expenditure deciles	Baseline dispos. income, GBP /year	Baseline total expend., GBP /year	Change in non durable expend., GBP /year	Price effect, GBP /year	WG, GBP /year	Nondurable expenditure change, % of total expenditure	Price effect, % of total expend.	WG, % of total expend.
1	10354	4315	9	-50	-41	0.201	-1.162	-0.961
2	11298	7086	39	-99	-60	0.545	-1.391	-0.847
3	13136	9242	90	-134	-44	0.972	-1.449	-0.477
4	15031	11308	134	-168	-34	1.186	-1.483	-0.297
5	17194	13209	196	-200	-3	1.486	-1.511	-0.025
6	20313	15136	278	-233	45	1.840	-1.540	0.300
7	23034	17057	360	-269	92	2.111	-1.575	0.537
8	27687	19707	473	-315	159	2.402	-1.597	0.805
9	34368	23206	620	-375	246	2.673	-1.615	1.059
10	53698	35300	764	-569	195	2.164	-1.612	0.552
Mean	22610	15556	296	-241	55	1.905	-1.549	0.356

Table 4.3: welfare effects for simulation with Engel curves - UK

Equivalent nondurable expenditure deciles	Baseline disposable income, GBP /year	Baseline total expend., GBP /year	Change in non durable expendit., GBP /year	Price effect, GBP /year	WG, GBP /year	Nondurable expenditure change, % of total expenditure	Price effect, % of total expend.	WG, % of total expend.
1	10354	4315	9	-50	-42	0.201	-1.165	-0.964
2	11298	7086	39	-99	-60	0.545	-1.391	-0.846
3	13136	9242	90	-134	-44	0.972	-1.450	-0.478
4	15031	11308	134	-168	-34	1.186	-1.485	-0.299
5	17194	13209	196	-200	-4	1.486	-1.513	-0.027
6	20313	15136	278	-233	45	1.840	-1.543	0.297
7	23034	17057	360	-269	91	2.111	-1.578	0.533
8	27687	19707	473	-316	158	2.402	-1.602	0.801
9	34369	23206	620	-376	245	2.673	-1.619	1.054
10	53698	35300	764	-570	194	2.165	-1.615	0.549
Mean	22610	15556	296	-241	55	1.905	-1.552	0.353

Table 4.4: Difference in disposable income and WG pre- and post-reform per equivalised disposable income decile, UK

Equivalized disposable income deciles	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
1	3	-127	3	-127
2	20	-131	20	-131
3	50	-116	50	-116
4	97	-76	97	-77
5	164	-30	164	-31
6	258	37	258	36
7	370	115	370	115
8	505	212	505	211
9	682	333	682	331
10	813	339	813	338
Mean	296	55	296	55

Table 4.5: Difference in disposable income and WG pre- and post-reform per household size, UK

Household size	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
1	112	-23	112	-23
2	376	101	376	100
3	467	79	467	78
4	571	100	571	99
5	576	21	576	21
> 5	424	-186	424	-187
Mean	296	55	296	55

Table 4.6: Difference in disposable income and WG pre- and post-reform per socio-economic category of household head, UK

Socio-economic category	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
Self-employed	104	-238	104	-238
Employed	518	233	518	232
Unemployed	35	-130	35	-130
Retired	16	-133	16	-133
Other	59	-114	59	-114
Mean	296	55	296	55

Table 4.7: Difference in disposable income and WG pre- and post-reform per age group of household head, UK

Age group	Constant budget shares		Engel curves	
	Difference in disposable income	Welfare Gain WG	Difference in disposable income	Welfare Gain WG
< 30	285	75	285	74
>= 30 and < 50	405	139	405	138
>= 50	168	-51	168	-51
Mean	296	55	296	55

V. CONCLUSION

This workpackage illustrated the value added of Project 3 in the AIM-AP project, consisting of adding indirect tax calculations into the EUROMOD framework. We used the combination of income and direct tax data on the one hand and expenditures and indirect tax data on the other hand in a hotly debated policy relevant topic. A 25% decrease of social security contributions is simulated in EUROMOD. The loss in government revenue is compensated by raising the standard VAT-rate. Two different simulations are run: one without behavioural responses (constant budget shares) and one with behavioural responses (Engel curves).

The increase in VAT-rate ranges from 2.5 to 9%. The precise percentage is a function of the possibility of other sources for compensation of government revenue loss (as in Belgium) and the relative size of indirect taxes and social security contributions.

The consumption based welfare measure shows that the policy change has a regressive effect with the lower (equivalized disposable income and total expenditure) deciles losing. The effects in terms of total expenditure are in the order of magnitude of some percentages expect in the case of Ireland where the effects never exceed one per cent of total expenditure.

For all countries the households with low educated heads lose on average while the others gain, the households headed by an individual older than 50 lose on average while the others gain, and the households with employed heads gain on average while all other socio-economic categories lose. This differs in the case of Ireland where the Engel curve effect is substantial enough to reverse the welfare losses for such household groups. Inter country differences do exist with respect to the impact upon households of different size. In Belgium, households with strictly less than three or more than five members lose and all the others gain on average, while in Hungary the large households also gain on average and in the UK the two-person households also gain on average. One person households and households with more than five members lose from the reform in the case of Ireland. However the Engelcurve effect is again substantial enough to reverse those losses in terms of welfare.

VI. REFERENCES

Capéau, Bart, Decoster, André, De Swerdt, Kris, and Orsini, Kristian (2008), *Welfare effects of alternative financing of social security. Some calculations for Belgium*. Leuven, Centre for Economic Studies, Discussion Paper DPS 08.12.

King M. A. (1983), Welfare analysis of tax reforms using household data, *Journal of Public Economics*, 21, 183-214.