

Using EUROMOD (MICROsimulation) for MACRO topics

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- Microsimulation models: micro level heterogeneity, complex tax benefit system
- Macro models: whole economy, much less detail heterogeneity
- MACRO questions often important for policymakers
- MICRO models can be used for MACRO questions
- Aim of this talk: show some examples

- ① Automatic Stabilizers
- ② Application: “United States of Europe?”
- ③ Austerity & Destabilization?
- ④ Automatic Stabilization & Labor Supply
- ⑤ Linking Micro & Macro models

Automatic Stabilizers and Economic Crisis: US vs. Europe

(M. Dolls, C. Fuest, A. Peichl, JPubE 2012)

- Assess the effectiveness of automatic stabilizers in smoothing demand after a macro shock in US and Europe
 - ① Tax and transfer system: determines how a given shock to gross income translates into a change in disposable income
 - ② Link between disposable income and demand for goods and services
 - Different identification strategies for the estimation of liquidity constraints
- Decomposition of overall stabilizing effects into contributions of taxes, social insurance contributions and benefits
 - Extensions: employer's SIC, consumption taxes and in-kind benefits

- Note: **This is NOT a forecasting exercise** nor an ex-post evaluation but a scenario analysis!
 - why? ... comparable micro data for 2009 NOT YET available!
- Tools to compute how a gross income shock translates into changes of disposable income
 - EUROMOD: static tax-benefit microsimulation model for 19 EU countries (EU-15 + Estonia, Hungary, Poland, Slovenia)
 - TAXSIM: NBER's microsimulation model for the US
 - calculate (cash) benefit entitlements and (direct) tax liabilities for a representative micro-data sample of households for each country
 - assume full benefit take-up, no tax evasion, no behavioral responses
- Models allow for *exogenous variation in key parameters* (avoid identification problems) \implies **disentangle automatic stabilizers from discretionary fiscal policy and behavioral responses**

Measurement of stabilization (1/2)

- Market income Y_i^M of individual i :
 - $Y_i^M = E_i + Q_i + I_i + P_i + O_i$
 - where E_i are earnings, Q_i business income, I_i capital income, P_i property income, and O_i other income
- Disposable income Y_i^D :
 - $Y_i^D = Y_i^M - G_i = Y_i^M - (T_i + S_i - B_i)$
 - with T_i : direct taxes, S_i : employee social insurance contributions, B_i : benefits (i.e. negative taxes)

Measurement of stabilization (2/2)

- *Income stabilization coefficient*: How much of a given shock is absorbed by the tax and transfer system?

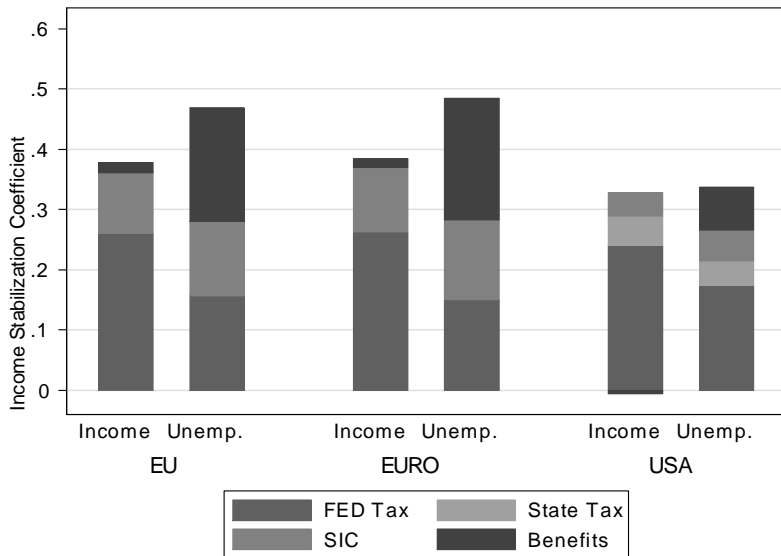
$$\bullet \tau^I = 1 - \frac{\sum_i \Delta Y_i^D}{\sum_i \Delta Y_i^M} = \frac{\sum_i (\Delta Y_i^M - \Delta Y_i^D)}{\sum_i \Delta Y_i^M} = \frac{\sum_i \Delta G_i}{\sum_i \Delta Y_i^M}$$

- τ^I resembles average effective marginal tax rate (EMTR)
- Example: $\tau^I = 0.4$: 40% of an income shock is absorbed by the tax benefit system
- Determinants: Overall government size, structure of tax benefit system
- Contribution of individual components of the tax transfer system:

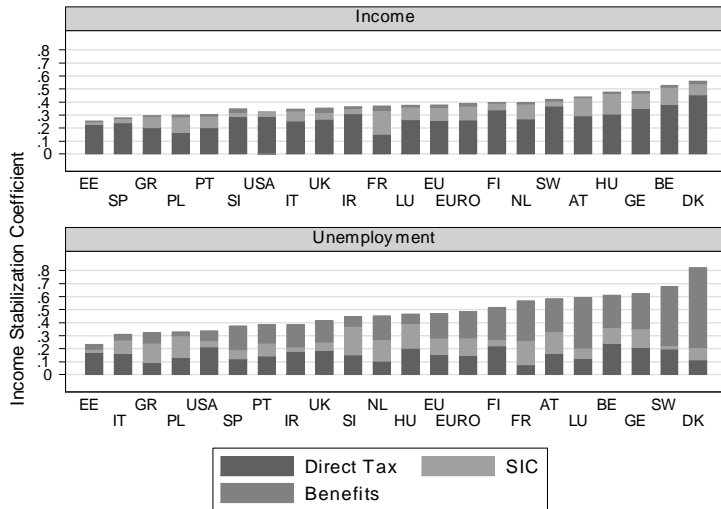
$$\bullet \tau^I = \sum_f \tau_f^I = \tau_{Tax} + \tau_{SIC} + \tau_{Ben} = \frac{\sum_i \Delta T_i}{\sum_i \Delta Y_i^M} + \frac{\sum_i \Delta S_i}{\sum_i \Delta Y_i^M} - \frac{\sum_i \Delta B_i}{\sum_i \Delta Y_i^M}$$

- Previous studies focused on proportional income increases
 - However: Downturn can be *asymmetric* (plus non-linearities in tax benefit system)
- We focus on **two types of shocks**:
 - *Proportional reduction* in household gross income by 5% for each household (*income shock*)
 - *Increase of the unemployment rate* such that aggregate total household gross income decreases by 5% (*unemployment shock*)

Results



Heterogeneity



- New evidence on the EU–US stabilization gap
- Amount of automatic stabilization depends strongly on the type of macro shock
- **Social transfers play a key role** for stabilization of disposable income (confirmed by the decomposition of stabilization effects, as benefits absorb 19% of unemployment shock in EU-group vs. 7% in the US)
- Demand stabilization depends on liquidity constrained households
 - **Policy measures aiming at low income households** (credit constrained) should yield higher stabilizing effects
- **Large heterogeneity** within the EU
 - No patent remedy for stimulus programs in a crisis

Fiscal Union in Europe? Redistributive and Stabilizing Effects of a European Tax-Benefit System and Fiscal Equalization Mechanism

(O. Bargain, M. Dolls, C. Fuest, D. Neumann, A. Peichl, N. Pestel, S. Siegloch, Economic Policy 2013)

Follow-up: Dolls, Fuest, Neumann, Peichl (2016): EU-UI (poster)

Quantitative analysis of two key elements of fiscal integration:

- **Simulation experiment 1:** Introduce an EU-wide integrated tax-transfer system
 - Analyze redistributive and welfare effects
 - Redistribution (of *income*) across *households*
 - Impact on automatic stabilization
- **Simulation experiment 2:** Introduce a system of fiscal equalization based on taxing capacity of countries
 - Redistribution (of *revenues*) across *countries*
 - Impact on automatic stabilization

- European tax-benefit calculator EUROMOD: simulates income taxes, social insurance contributions and cash benefits for households
- Harmonized data and common variable definitions across countries
- $N = 63.500$ households (pooled sample)
- 2001 household data and tax and transfer systems for the Euro12 (excluding LU)
- Account for labor supply effects when introducing the “EU average” system
- Interpretation of the analysis: what would have happened if a fiscal union had been created in 2001?

4 steps

- 1 EUROMOD: extract household net taxes $T_{ic} = f_c(X_i, \mathbf{z}_i)$
with gross income X , vector of non-income factors \mathbf{z}
- 2 Estimation of the average system: $T_{ic} = \omega_i f_{EU}(X_i, \mathbf{z}_i) + \varepsilon_i$
population weight ω , highly flexible f , estimated on pooled sample
- 3 Predict $T_{i,EUavg}$
- 4 Calculate: $T_i = w T_{i,EUavg} + (1 - w) T_{ic}$; $w \in \{\frac{1}{3}, 1\}$

- Introduction of a common tax and transfer system would improve automatic fiscal stabilizers in the union in the presence of asymmetric shocks
- Replacing one third of the national tax and transfer systems would provide 'federal' automatic stabilizers of 10-15 per cent (USA: appr. 25 per cent)
- Redistributive effects across countries are significant but perhaps smaller than one would expect
- Introduction of a fiscal equalization scheme leads to large redistributive effects and has ambiguous implications for automatic fiscal stabilizers in the currency union
- Currently a move towards fiscal union as analyzed here seems unrealistic, but other surprising things happen in this crisis!

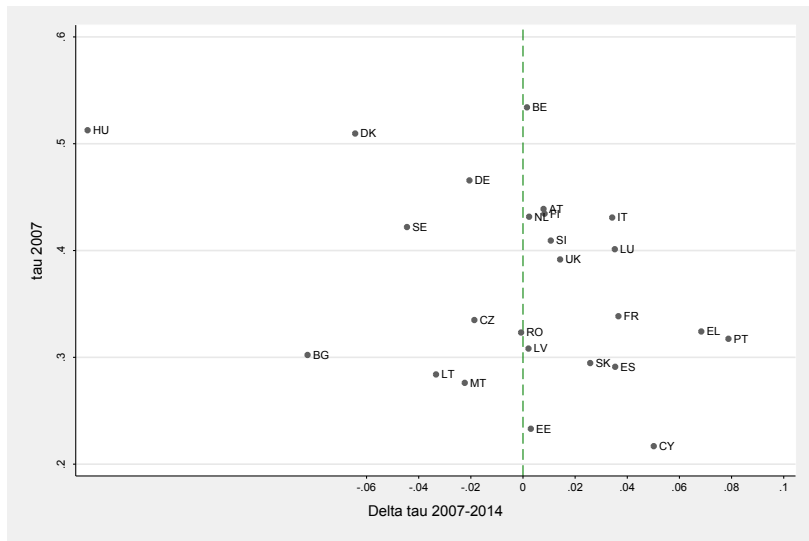
Crisis, Austerity and Automatic Stabilization – Long vs. Short Term Effects (M. Dolls, C. Fuest, A. Peichl, C. Wittneben, 2016)

- Tax benefit systems provide (temporary) income insurance through built-in **automatic stabilizers** in times of crises
 - elements of the tax and transfer system that mitigate fluctuations in output without discretionary government action:
 - progressive taxation
 - (unemployment) benefits
- Great Recession + sovereign debt crisis
⇒ followed by **policy reforms** (austerity measures) potentially affecting AS in many countries
- But: Magnitude of stabilization effect depends on changes to the tax and transfer system the government may make

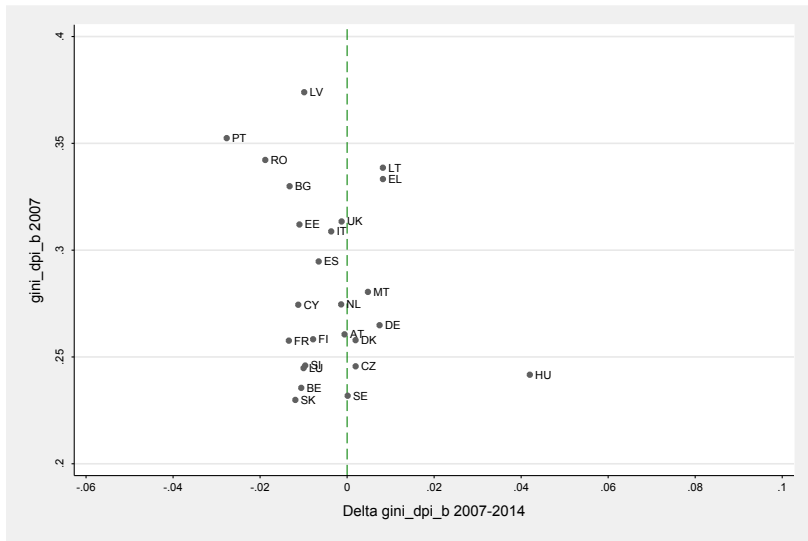
We ask:

- How did automatic stabilizers change from 2007 to 2014?
- Did governments let automatic stabilizers work?

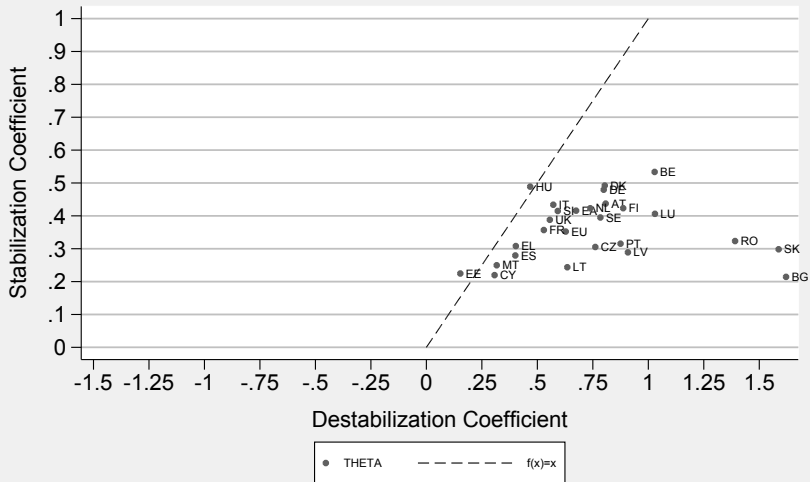
AS Changes: Difference 2007-2014: τ



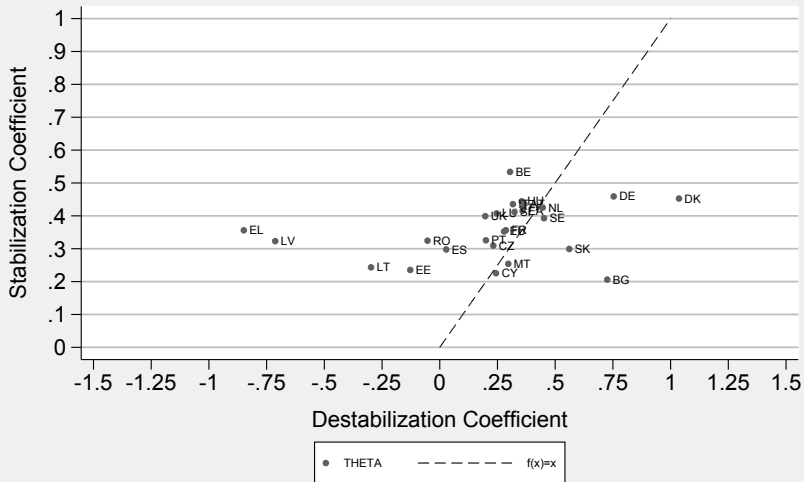
Changes in Redistributive Effect: DPI Gini 2007-2014



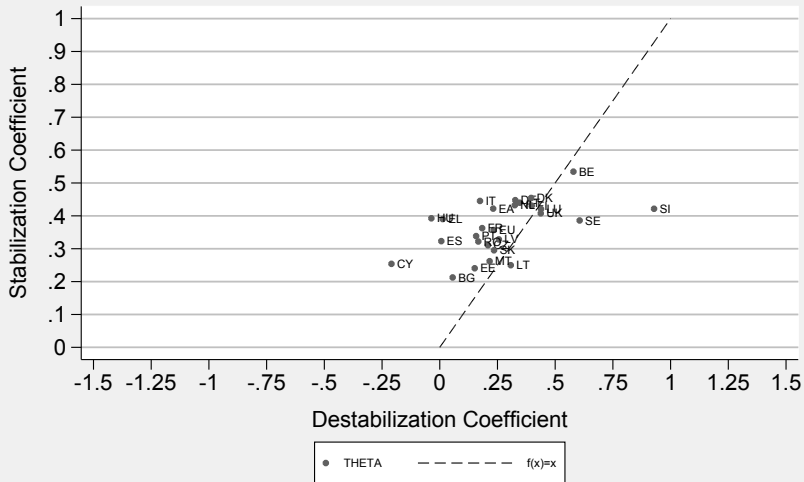
2009



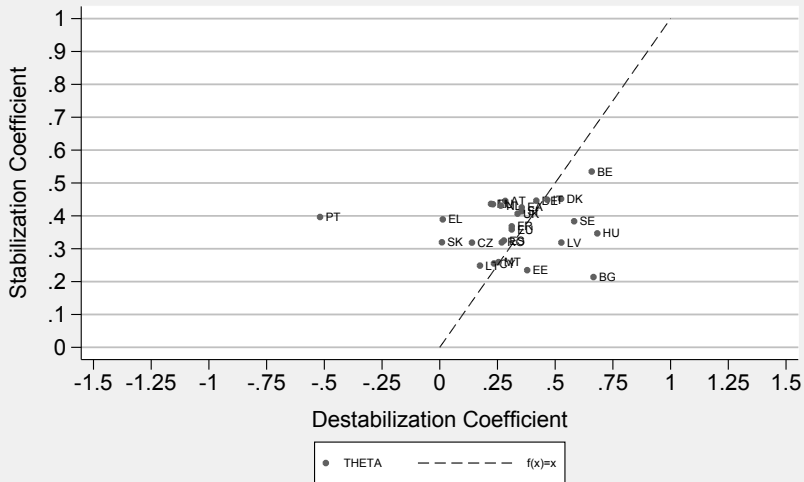
2010



2012



2013



Labor Supply and Automatic Stabilizers

(M. Dolls, C. Fuest, A. Peichl, C. Wittneben, 2016)

- Tax and transfer systems redistribute incomes across households and serve as Automatic Stabilizers
- We estimate the intertemporal substitution of labor that follows the *change in the marginal tax rate* after a temporary income decline

⇒ This gives a Supply Side Stabilization effect

- We estimate labor supply elasticities for households (Bargain, Orsini, Peichl 2014, JHR)
- We provide estimates of effective marginal tax rates and the progressivity of the tax and transfer system (Dolls et al. 2012, JPubE)
- We present an estimate of the Automatic Stabilization effect that operates through the marginal incentives channel (Auerbach / Feenberg 2000)

Stabilization Framework

Supply Side Stabilization Coefficient:

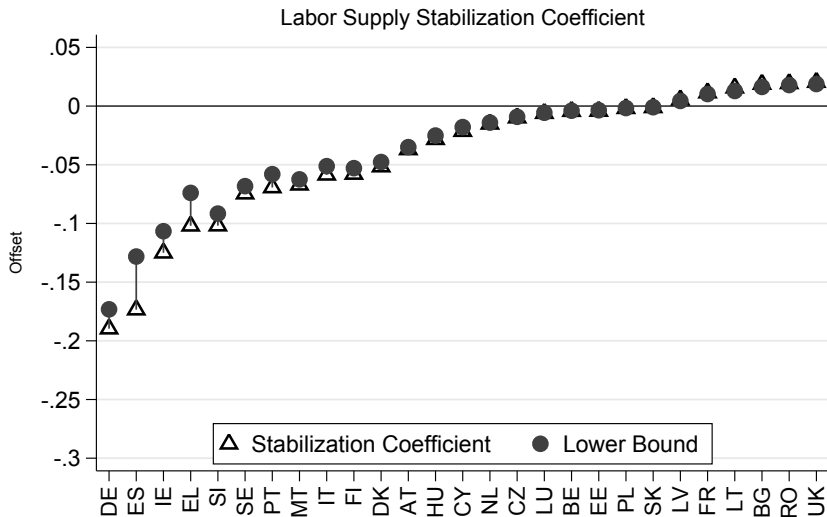
$$\tau^s = \underbrace{\frac{d\tau}{d \ln Y}}_{\text{Change in MTR w.r.t. 1\% change in } Y} \cdot \underbrace{\frac{\alpha}{1 - \tau}}_{\text{Labor income share over net of tax rate}} \cdot \underbrace{\eta_{L, \tilde{w}}}_{\text{Labor Supply Elasticity}}$$

- Assumption: Everyone can choose hours without constraints
- This is an upper bound estimate

Lower bound:

$$\tau_{LB}^s = 0 \cdot UR + \tau_s \cdot (1 - UR)$$

Figure: Supply Side Stabilization Coefficient



- **Large heterogeneity** within the EU...
- ... both in LS elasticities and responsiveness of the Tax-and-Transfer System
- AS play an important role in stabilizing incomes through labor supply in some countries, but the LS effect is zero for flat-tax countries

Caveats:

- Don't (yet) include demand constraints or aggregate labor market conditions
- Don't talk about optimality

Further possibilities

Linking MSM with partial (macro) model

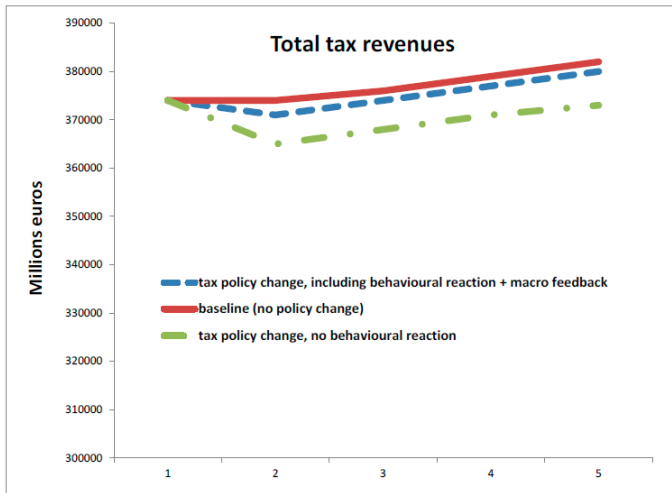
- Bargain/Immervoll/Peichl/Siegloch, 2012, ITAX: “Distributional Consequences of Labor Demand Shocks: The 2008-09 Recession in Germany”
 - ① Estimate labor-demand functions by industry, differentiating between 5 industries, 3 age groups, 2 skill levels, 2 employment types
 - ② Predict employment shock after change in output for each group
 - ③ Replicate employment shocks cell by cell on household level
 - ④ Analyze distributional consequences by comparing to pre-crisis data
- EUROMOD: nowcasting
- Dolls / Doorley / Paulus / Siegloch / Sommer / Schneider (2016): Analyze demographic change by reweighting data according to population projections

- Combining Microsimulation models (MSM) and Computable General Equilibrium models (CGE) / macro models allows the utilization of the advantages of both types.
- Peichl (2009) discusses benefits and problems
- project on “Dynamic scoring”: linking EUROMOD and QUEST
 - joint work by European Commission staff (Salvador Barrios and Sara Riscado from JRC and Janos Varga from DG ECFIN) and ZEW (Mathias Dolls, Andreas Peichl and Christian Wittneben)
The views expressed in this paper are those of the authors and should not be attributed to the European Commission.

- Linking EUROMOD, labor supply model and DSGE model
 - ① Use EUROMOD to calibrate the implicit tax rates on labor income, gross wages & labor supply elasticities by skill level used in QUEST.
 - ② We simulate the behavioral reaction to tax reforms using the L-supply model integrated into EUROMOD.
 - ③ We simulate the changes in gross wages and ITRs by skill level with the extended EUROMOD and use these in QUEST in order to obtain economy-wide effects (consumption & employment) and adjustment in monetary variables (prices and labor income).
 - ④ Results from QUEST (prices, wages & employment effects) are used to extrapolate the results obtained with the extended EUROMOD model.
- This work is motivated by the closer monitoring of EU Member States' tax policy in the aftermath of the financial and euro crises.

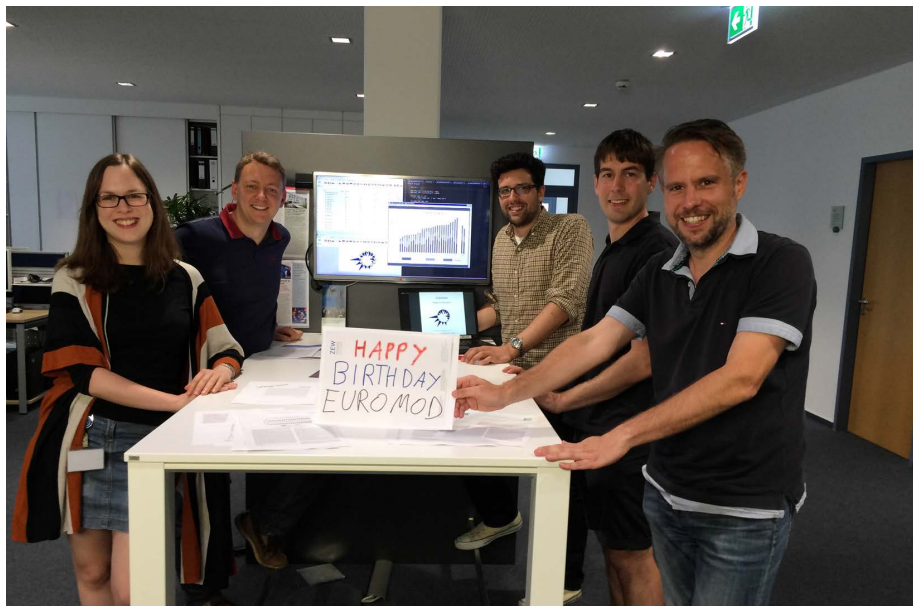
5. Illustration: working tax credit in Italy

Tax revenues impact in EUROMOD incorporating macro feedback on prices, wages and employment



- EUROMOD is a great tool for policy advice and / or research!
- Microsimulation models such as EUROMOD can be used to answer macro economic questions

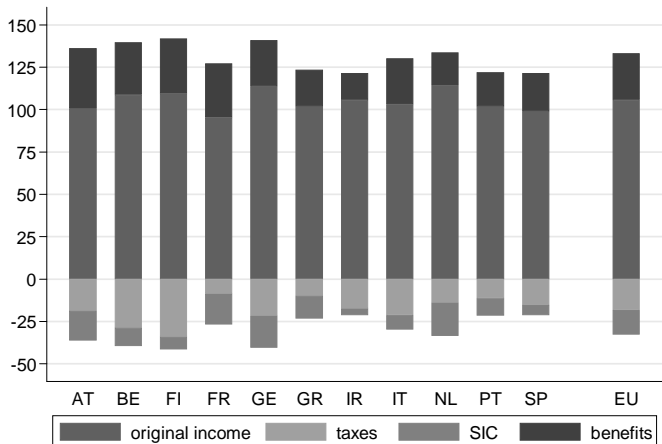
Happy birthday!



Thank you for your attention!

Comments? Questions?

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Source: Own calculations based on EUROMOD.

Redistributive effects

	<i>EUavg - Sc.1</i>				<i>EUavg - Sc.2</i>			
	%+	%dY	Gain	Loss	%+	%dY	Gain	Loss
EU	55	0.0	19.9	-23.6	56	0.5	60.0	-70.5
AT	35	-2.2	17.2	-28.3	36	-6.5	51.1	-85.0
BE	50	-0.3	19.2	-22.3	51	-0.5	58.0	-66.6
FI	51	0.0	19.1	-19.6	53	0.7	57.1	-58.6
FR	31	-2.8	14.5	-26.5	32	-7.9	42.5	-78.6
GE	66	1.0	20.0	-24.5	68	3.6	60.7	-74.0
GR	80	8.5	30.8	-12.7	80	26.1	93.6	-38.2
IR	28	-2.7	21.2	-33.8	29	-7.6	63.3	-98.4
IT	63	0.9	19.6	-21.8	64	2.8	59.7	-65.8
NL	40	-0.6	16.8	-16.5	41	-1.3	50.1	-47.4
PT	68	4.5	29.4	-17.9	69	13.6	87.8	-54.0
SP	60	0.9	20.1	-20.2	61	3.1	61.0	-60.8

- ⇒ slight majority of winners at the EU level
- ⇒ but only 5 out of 11 countries significantly gain
- ⇒ similar results for increased progressivity

Tab. C.2: Hours worked and (changes in) fulltime equivalents

	<i>Baseline</i>		<i>EUavg</i>		<i>EUavg_p</i>	
	(1)	(2)	(3)	(4)	(3)	(4)
EU	29.9	71.1	-0.1	-1.0	-0.6	-2.6
AT	32.0	2.1	-0.1	-0.9	-0.6	-2.2
BE	32.7	2.6	2.5	5.6	1.8	3.7
FI	33.2	1.7	2.0	4.6	1.6	3.6
FR	30.8	17.3	0.5	1.3	0.3	0.6
GE	30.0	23.5	0.4	0.0	-0.3	-2.3
GR	25.3	1.3	-3.1	-10.2	-3.7	-12.1
IR	28.1	0.7	-1.3	-4.7	-1.8	-6.6
IT	26.7	8.4	-1.4	-4.9	-1.9	-6.6
NL	31.3	5.2	0.2	-0.2	-0.3	-1.7
PT	34.5	2.0	-0.3	-1.2	-0.5	-2.0
SP	27.7	6.4	-2.4	-8.0	-2.9	-9.9
	<i>Net taxes base</i>		<i>Relative %-change in net taxes</i>			
EU		26.3	1.8	-2.4	0.5	-2.6

Note: (1) Mean hours worked per week; (2) fulltime equivalents (FTE) in millions; (3) change FTE scenario 1 in %; (4) change FTE scenario 2 in %. Number of observations: 30382.

Source: Own calculations based on EUROMOD.

	Base	EUavg			EUavg-p		
		Sc.1	Sc.1cc	Sc.2	Sc.1	Sc.1cc	Sc.2
EU	0.40	0.40	0.13	0.40	0.41	0.15	0.45
AT	0.43	0.43	0.14	0.42	0.44	0.15	0.45
BE	0.51	0.45	0.11	0.34	0.46	0.12	0.37
FI	0.42	0.42	0.14	0.42	0.44	0.16	0.47
FR	0.36	0.38	0.14	0.41	0.39	0.15	0.45
GE	0.49	0.47	0.15	0.44	0.48	0.16	0.48
GR	0.29	0.30	0.11	0.34	0.31	0.12	0.36
IR	0.38	0.36	0.10	0.31	0.38	0.13	0.38
IT	0.34	0.35	0.12	0.37	0.38	0.15	0.46
NL	0.40	0.41	0.14	0.43	0.42	0.15	0.46
PT	0.30	0.31	0.11	0.32	0.31	0.11	0.34
SP	0.30	0.32	0.12	0.36	0.33	0.13	0.39

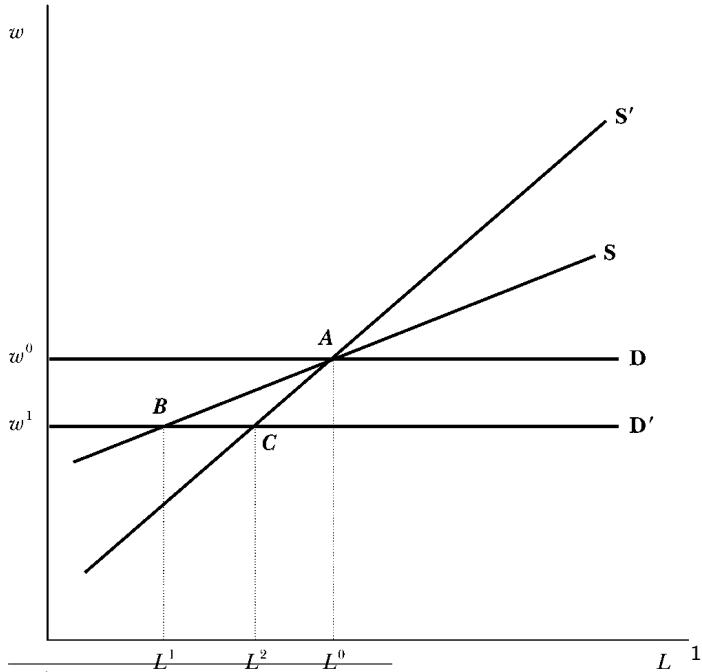
⇒ most countries (especially southern European) gain in terms of AS
 ⇒ if individual countries are *credit constrained*: 'federal' automatic stabilisers of 10-15%

- previous AS measures assume economy in (long-run) equilibrium
- However, “austerity” measures might not work in the short run, when governments adjust the tax and transfer system (discretionary changes)
- short-run measure: construct difference in disposable incomes for household i when subject to tax policy in period t and when subject to tax policy in period $t + 1$:

$$\theta_{t+1}^{I,T} = \frac{\sum_i (T(0.95Y_i^M, X_i, \chi_{t+1}) - T(Y_i^M, X_i, \chi_t))}{\sum_i \Delta Y_i^M}$$

$$\theta_{t+1}^{l,T} = \frac{\sum_i (T(0.95Y_i^M, X_i, \chi_{t+1}) - T(Y_i^M, X_i, \chi_t))}{\sum_i \Delta Y_i^M}$$

- coefficient measures the change in the tax and transfer system relative to hypothetical 5% change in the gross income
- compare the tax burden of the household under the new system at the reduced income to the hypothetical shock
- Example: $\theta = 1$. Then the increase in taxes even after a decline in income is as large as a 5% loss in gross income



¹Source: Auerbach / Feenberg 2000