EUROPEAN CENTRAL BANK

EUROSYSTEM

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A minimal moral hazard central stabilisation capacity for the EMU based on world trade

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Outline

1. Motivation

- ***Insufficient stabilisation*** in the euro area in second phase of **crisis** (loss of exchange rate and interest rate instruments).

➢ Some countries reached their **fiscal limits** more quickly than anticipated, also due to private sector problems. As a result, **automatic stabilizers did not operate freely** in countries with the sharpest fiscal adjustment

➢ **Risk-sharing** via private sector channels operated only partially in the euro area (Cimadomo et al., 2017; ECB's FIR 2017)

- Recent debate in the Eurozone has focused on the introduction of a ***central stabilisation capacity*** as completing element of the EMU (5PR, EC's reflection paper)

1. Motivation

Recent proposals mainly build on two types of scheme, addressing:

1. Idiosyncratic (country-specific) shocks hitting, e.g., country-specific GDP, output gap, employment [loss of ER and IR flexibility]

- **Enderlein et al. (2013):** 'European fund' calibrated on country-specific output gaps
- **Furceri and Zdzienicka (2015):** scheme calibrated on country-specific GDP shocks
- **EUI schemes:** levels or changes in cyclical employment (CEPS, 2017; Moyen, Stähler and Winkler, 2016; Dolls, Moyen, Stähler and Winkler, 2018)

2. Aggregate (area-wide) shocks hitting all countries [Monetary policy might be constrained by the ZLB]

- **Investment capacity** to finance national investment projects in downturns (Zettelmeyer, 2016; Bara *et al*., 2017)

1. Motivation

Three main criticisms:

1. ***Moral hazard:*** countries would have less incentives to run sound fiscal policies and structural reforms (e.g., EUI)

2. ***Permanent transfers*** across countries, e.g. from ‘Core’ countries to ‘Periphery’ ones (e.g., investment capacity)

3. ***Data reliability:*** schemes often based on unobservable variables, potential of large mistake in ‘real time’ (e.g., Enderlein et al., 2013)

Outline

2. An export-based stabilisation capacity (ESC) for the EMU

This paper:

- We propose an ***'export-based stabilisation capacity' (ESC)*** that allows for cross-border transfers in response to exogenous changes in the world market conditions in the various export sectors (Beetsma and Bovenberg, 2001).

- The ***ESC*** works as follows:

➢ if **Eurozone exports in a specific sector fall** → Eurozone members that are relatively more intensive in this sector **receive a transfer** from the members that are relatively less intensive in this sector.

2. An export-based stabilisation capacity (ESC) for the EMU

Several advantages:

1. ***Limited moral hazard:*** transfers respond to exogenous developments in world trade → outside the control of individual governments
2. ***No permanent transfers:*** based on *changes* in *world trade* in individual sectors → the danger of permanent transfers is mitigated
3. ***Robust to revisions*** in the underlying data
4. ***Easy implementation:*** scheme does not need a long-run process of convergence of economic structures before it can be implemented
5. ***No debt issuance.*** in each year all cross-border transfers add up to zero

However: currently, sectoral export data are available with a lag (e.g. OECD)

2. An export-based stabilisation capacity (ESC) for the EMU

Main findings: Empirical analysis on the **1996-2014** period

1. Net transfer received by a country in a given period tends to be **"counter-cyclical"**: it is more positive (or less negative) when the output gap is lower

→ However, when aggregate shocks hit (e.g., in 2009) transfers may be *pro-cyclical* in some countries [refinements could be added]

2. Transfers are **generally small** (<0.5% of GDP) and their absolute magnitude tends to be larger if **sectoral diversification** is smaller.

3. Over the full sample, cumulative transfers generally stabilize and they tend to return towards zero towards the end of the sample, thus suggesting that the danger of **permanent transfers** is mitigated.

4. Transfers are quite **robust to revisions** in the underlying export data.

Outline

Derivation of the transfer scheme (1)

- The ESC is based on export shocks that hit specific sectors
- Different countries are specialised in different sectors → countries are affected asymmetrically by sectoral shocks → the ESC's purpose is to compensate countries hit negatively.

x_{ijt}: export of country *i*, in sector *j* and year *t*.

$$x_{ijt} = w_{ijt}x_{jt},$$

where x_{jt} is the total EA export in sector *j* and w_{ijt} is country *i*'s share of it.

$$x_{ijt} - x_{ij,t-1} = w_{ijt}x_{jt} - w_{ij,t-1}x_{j,t-1}$$
$$= (\Delta w_{ijt})x_{jt} + (\Delta w_{ijt})(\Delta x_{jt}) + \boldsymbol{w_{ij,t-1}(\Delta x_{jt})}$$

Derivation of the transfer scheme (2)

- $\boldsymbol{w_{ij,t-1}(\Delta x_{jt})}$ is largely **out of the control of government policies** and driven by external trade shocks.
- The **aim of the scheme** is to equalize across countries the following objective function:

$$\frac{w_{ij,t-1}(\Delta x_{jt}) + \boldsymbol{T_{ijt}}}{x_{i,t-1}} = \frac{w_{kj,t-1}(\Delta x_{jt}) + \boldsymbol{T_{kjt}}}{x_{k,t-1}}$$

where T_{ijt} is the transfer for country *i* related to sector *j*, hence transfer compensates for asymmetric movements of first term in numerator

- Also, we want the sum of transfers for sector *j* across countries to be equal to zero:

$$\sum_j T_{ijt} = 0$$

Derivation of the baseline transfer scheme (3)

By imposing these two conditions, we have that transfers (by sector) are equal to:

$$T_{ijt} = \left[\frac{x_{i,t-1}}{x_{t-1}} - w_{ij,t-1}\right]\Delta x_{jt}$$

Summing across all sectors we have then the transfer received or paid by a country are:

$$T_{it} = \sum_j \left[\frac{x_{i,t-1}}{x_{t-1}} - w_{ij,t-1}\right]\Delta x_{jt}$$

By construction, they sum to zero every year, keeping the system balanced and avoiding the need for a central budget.

A simple example

- There are only two countries (e.g., Germany and Greece), with shares of total EA exports of 90% and 10%
- There is only a shock to one sector (e.g. hotels and restaurants)
- Greece is relatively more specialised in that sector (e.g., w_{ij} = 20%).
- An aggregate negative shock hits the total euro area export for that sector (e.g., $\Delta x_{jt} = -\$1000$ million)
- Using $T_{ijt} = \left[\frac{x_{i,t-1}}{x_{t-1}} - w_{ij,t-1}\right] \Delta x_{jt}$, we have:

$$T_{GR,j,t} = (0.10 - 0.20)(-1000) = +\$100 \text{ million}$$

In this specific case, the transfer, which compensates Greece for the shock hitting its economy relatively more, would be fully financed by Germany.

3. Design of the ESC: Alternative versions of the scheme

1. Scheme compensating labour income

- Limit the transfers so as to only cover shocks to labour income.

2. Scheme calibrated on government revenues

- Compensate the additional revenue received (or lost) from taxes due to the shock.

3. Compensation based on shocks from trend growth

- Euro area exports of most sectors grow because of the expansion of world trade. Analysis based on deviations from trends in each sector.

4. Scheme with GDP weighting

- The transfer can also be calibrated as a *share of the GDP of a country*:

A cap on annual transfers

- We introduce a cap, in % of GDP, to annual transfers.
- The transfer paid or received is capped at a fraction $\bar{c}$ of GDP:

$$T_{it}^{c} = \begin{cases} \sum_j \left[\frac{x_{i,t-1}}{x_{t-1}} - w_{ij,t-1}\right]\Delta x_{jt} & if \left|\sum_j \left[\frac{x_{i,t-1}}{x_{t-1}} - w_{ij,t-1}\right]\Delta x_{jt}\right| \leq \bar{c}y_{it} \\ -\bar{c}y_{it} & if \sum_j \left[\frac{x_{i,t-1}}{x_{t-1}} - w_{ij,t-1}\right]\Delta x_{jt} < -\bar{c}y_{it} \\ \bar{c}y_{it} & if \sum_j \left[\frac{x_{i,t-1}}{x_{t-1}} - w_{ij,t-1}\right]\Delta x_{jt} > \bar{c}y_{it} \end{cases}$$

→ As the sum of the capped transfers across countries would not be zero any more, the difference needs to be reallocated amongst all of them, with each country being redistributed the same amount as a fraction of its GDP (possibly leading to a slight but negligible violation of the cap).

Outline

4. Simulations

Data

- The sample covers all the **EA19 countries**, from 1995 to 2014.
- Data on the value added of exports by country and by sector (x_{ijt}), from the **OECD TiVA database (2017)**, with years 2012-2014 published as "nowcasts".
- 33 industrial sectors correspond to the ISIC Rev. 3 classification.
- Using these data, we calculate $x_{jt} = \sum_i x_{ijt}$, $x_t = \sum_j x_{jt}$ and $w_{ijt} = \frac{x_{ijt}}{x_{jt}}$.
- Nominal and real GDP, and the output gap: the OECD and the World Bank.
- The labour share of total income by sector (lsh_{jt}) is based on data from Eurostat on Gross Value Added and Compensation of Employees, by industry and country
- The tax rate τ_t is the EA19 value for "Total receipts from taxes and social contributions (including imputed social contributions)" retrieved from Eurostat
- All data are annual, and expressed either in million US$ or percentages

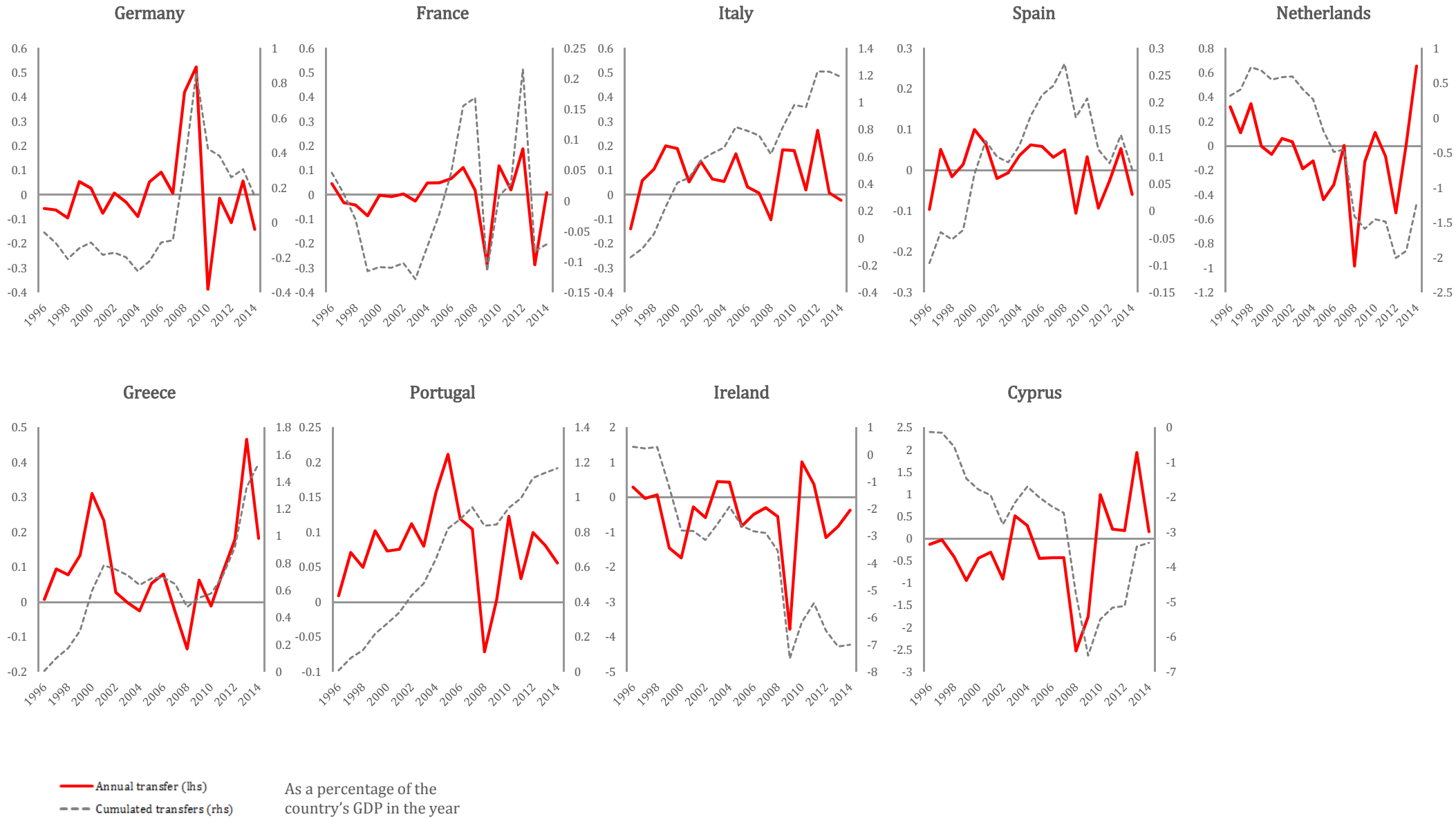
Country share in total EA exports in the sector. Avg. 1996-2014 (%)

SECTOR	AT	BE	EE	FI	FR	DE	GR	IE	IT	LV	LU	NL	PT	SK	SI	ES	CY	LT	MT
Agriculture, hunting, forestry and fishing	1.7	3.3	0.3	1.3	26.3	12.0	4.0	1.4	8.4	0.5	0.3	19.5	1.3	1.0	0.4	17.4	0.1	0.8	0.1
Mining and quarrying	2.6	2.5	0.2	0.8	7.3	13.2	1.4	1.3	5.5	0.1	0.1	56.9	1.7	0.8	0.1	5.0	0.0	0.3	0.0
Food products, beverages and tobacco	2.7	5.9	0.2	0.8	20.1	19.9	2.1	6.7	11.7	0.3	0.3	15.9	1.7	0.5	0.3	10.3	0.2	0.4	0.1
Textiles, textile products, leather and footwear	2.5	3.7	0.3	0.6	14.6	15.6	2.1	0.5	40.0	0.3	0.3	2.3	5.6	0.9	0.7	9.2	0.1	0.6	0.1
Wood and products of wood and cork	13.0	4.1	1.9	14.3	9.2	22.1	0.5	1.1	10.1	3.5	0.3	3.0	6.6	1.9	1.8	5.4	0.0	1.1	0.0
Pulp, paper, paper products, printing and publishing	5.9	3.7	0.2	13.8	12.3	33.5	0.4	3.2	8.3	0.1	0.3	7.1	2.3	1.0	0.7	6.7	0.0	0.2	0.1
Coke, refined petroleum products and nuclear fuel	1.6	10.4	0.2	2.5	16.5	18.7	2.7	1.2	10.5	0.0	0.0	22.0	0.8	1.2	0.1	9.3	0.0	2.4	0.0
Chemicals and chemical products	2.1	6.4	0.1	1.2	19.9	33.8	0.7	8.0	10.0	0.0	0.1	9.6	0.6	0.3	0.6	6.5	0.0	0.1	0.0
Rubber and plastics products	4.0	4.2	0.1	1.6	16.0	36.9	0.7	0.9	16.8	0.1	0.9	5.9	1.6	1.2	0.9	7.8	0.0	0.3	0.1
Other non-metallic mineral products	4.7	5.1	0.2	1.5	12.3	25.3	1.4	1.0	24.8	0.2	0.8	4.1	3.3	1.1	0.7	13.3	0.0	0.2	0.0
Basic metals	5.3	6.8	0.0	3.1	16.3	34.8	1.6	0.3	13.8	0.2	0.8	4.8	1.0	1.4	0.5	9.2	0.0	0.0	0.0
Fabricated metal products except machinery and equipment	5.1	4.4	0.2	1.8	11.4	33.6	0.6	0.6	24.1	0.1	0.3	6.5	1.5	1.3	1.2	7.0	0.0	0.2	0.0
Machinery and equipment n.e.c	3.9	1.8	0.0	2.7	12.1	43.2	0.3	0.5	25.6	0.0	0.2	3.9	0.6	0.5	0.5	4.0	0.0	0.1	0.0
Computer, electronic and optical products	3.3	1.6	0.2	5.7	19.7	39.3	0.4	7.0	10.4	0.1	0.1	5.7	1.0	1.0	0.4	3.8	0.0	0.1	0.2
Electrical machinery and apparatus n.e.c	4.2	2.3	0.2	2.4	16.5	46.6	0.5	1.2	14.0	0.1	0.1	2.3	1.5	1.2	0.7	6.1	0.0	0.1	0.1
Motor vehicles, trailers and semi-trailers	2.7	3.3	0.0	0.4	15.5	53.8	0.1	0.1	9.0	0.0	0.0	1.8	1.0	1.3	0.4	10.6	0.0	0.0	0.0
Other transport equipment	1.8	1.1	0.1	1.8	37.3	34.1	0.5	0.5	11.4	0.1	0.0	3.8	0.6	0.3	0.1	6.4	0.0	0.1	0.0
Manufacturing n.e.c; recycling	4.4	4.7	0.4	1.2	17.2	22.6	1.1	1.1	27.4	0.2	0.1	6.9	1.7	1.0	1.1	7.8	0.2	0.6	0.2
Electricity, gas and water supply	4.6	6.7	0.2	1.3	18.6	55.3	0.3	0.2	3.0	0.1	0.3	4.9	0.4	0.5	0.7	2.6	0.0	0.2	0.0
Construction	8.0	11.3	0.5	4.5	33.9	13.2	2.1	0.6	6.8	0.2	0.8	7.9	2.6	1.2	1.1	2.6	2.1	0.4	0.1
Wholesale and retail trade; repairs	4.2	5.5	0.2	1.6	20.0	27.0	1.1	2.8	17.8	0.2	0.7	7.4	1.8	0.9	0.4	8.0	0.2	0.2	0.1
Hotels and restaurants	8.7	2.6	0.3	0.8	13.4	8.8	5.9	1.4	23.3	0.1	0.8	2.4	3.2	0.5	0.5	25.7	1.0	0.2	0.4
Transport and storage	3.1	6.4	0.5	1.5	18.6	21.1	5.5	1.6	13.2	0.6	1.0	10.3	2.2	0.7	0.6	11.9	0.4	0.6	0.2
Post and telecommunications	5.9	11.7	0.3	1.4	11.9	20.5	1.9	3.6	13.7	0.3	5.3	10.1	1.8	0.8	0.6	8.5	1.0	0.4	0.3
Finance and insurance	6.1	7.7	0.1	0.4	9.9	17.6	0.4	13.1	8.6	0.4	16.9	8.9	1.1	0.2	0.1	6.6	1.6	0.0	0.2
Real estate activities	6.9	2.3	0.2	0.7	13.6	14.5	2.7	0.8	30.3	0.1	1.1	5.4	4.5	0.6	0.6	12.5	2.4	0.5	0.2
Renting of machinery and equipment	3.2	2.8	0.2	1.3	36.4	23.5	1.5	13.2	4.0	0.1	1.5	4.7	1.1	0.2	0.0	5.6	0.4	0.1	0.2
Computer and related activities	2.6	6.5	0.2	4.4	4.9	29.5	0.6	19.0	7.3	0.1	1.3	8.3	0.5	0.4	0.3	13.2	0.4	0.1	0.1
Research and development and other business activities	4.5	11.1	0.1	2.4	18.6	27.8	0.6	2.8	10.6	0.2	0.7	7.9	0.7	0.5	0.3	10.3	0.5	0.1	0.2
Public admin. and defence; compulsory social security	6.0	7.3	0.2	2.8	28.5	1.0	1.0	0.0	1.3	0.0	1.0	18.7	3.6	0.3	0.2	27.8	0.0	0.0	0.1
Education	2.9	12.5	0.3	0.7	17.6	13.4	2.0	2.5	6.4	0.1	1.2	25.4	1.8	0.8	1.3	8.8	1.9	0.2	0.2
Health and social work	8.5	2.0	0.1	2.8	28.7	25.1	2.4	2.9	2.6	0.1	0.9	10.0	2.2	1.3	1.1	8.9	0.2	0.2	0.1
Other community, social and personal services	7.2	4.9	0.3	1.3	20.2	19.9	4.8	1.8	11.0	0.1	2.8	8.6	1.6	1.5	1.3	9.9	1.5	0.5	0.8
SHARE OF THE COUNTRY IN TOTAL EURO AREA EXPORT	3.9	5.0	0.2	2.2	17.5	30.4	1.5	3.2	15.0	0.2	1.0	7.6	1.6	0.8	0.5	8.8	0.3	0.3	0.1

Three highest shares Three lowest shares

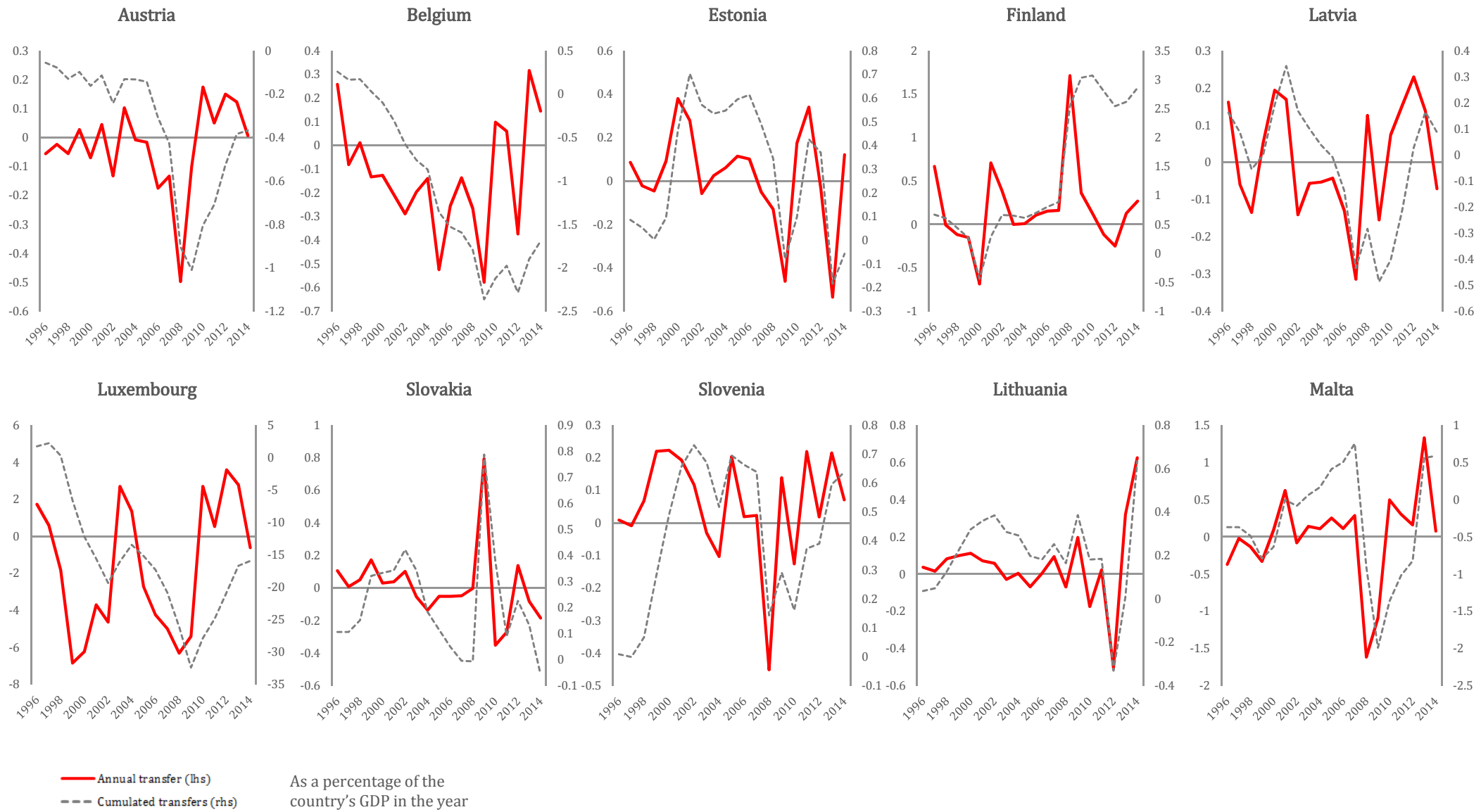
4. Simulations

Transfers implied by the baseline scheme, 1996-2014, by country (1)



4. Simulations

Transfers implied by the baseline scheme, 1996-2014, by country (2)



4. Simulations

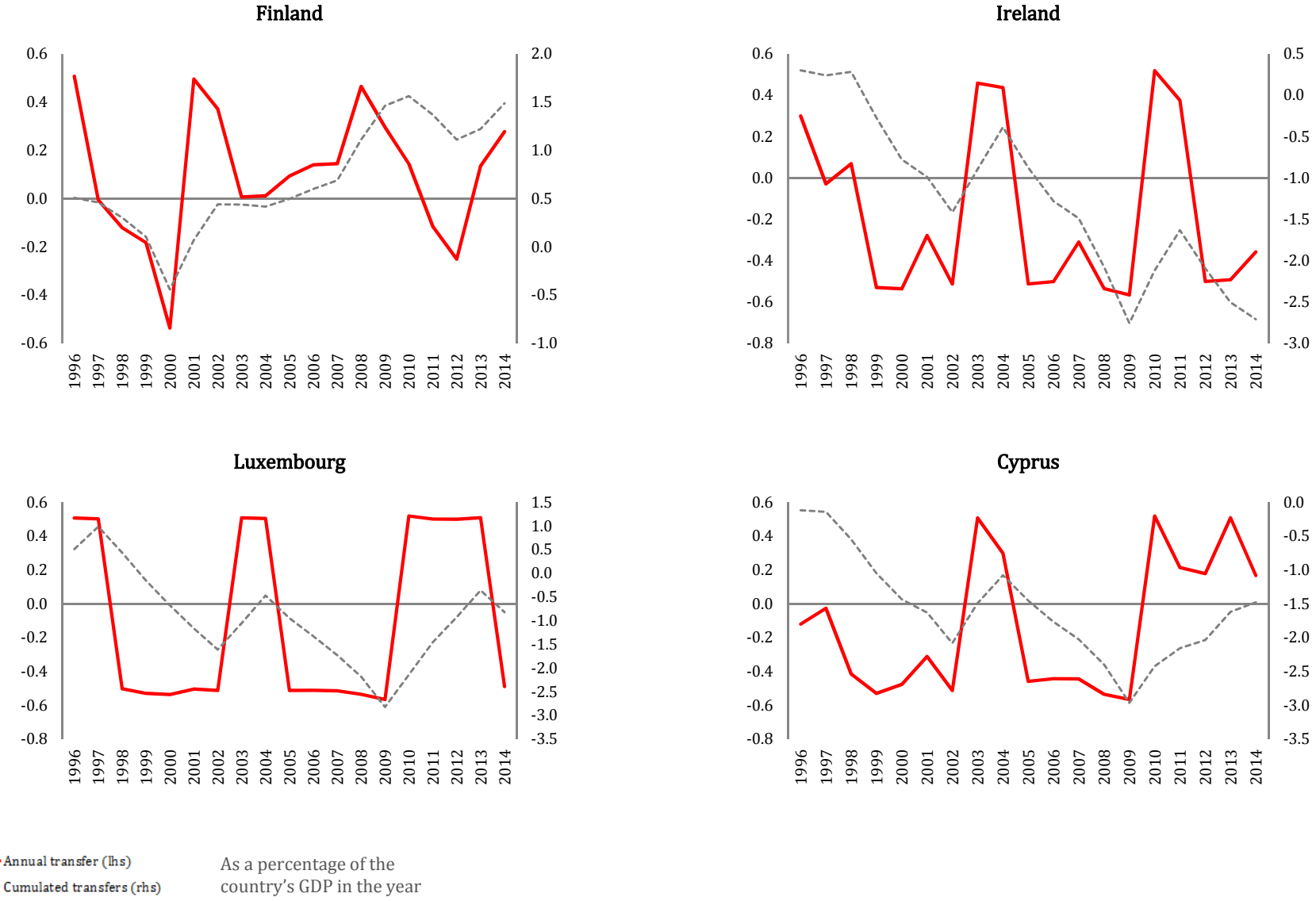
Explanatory variable	Output gap	Lag of output gap	Output gap minus weighted average of Eurozone output gap
Baseline: compensation for full income loss			
Estimate	-0.038**	-0.036**	-0.033
p-value	0.011	0.021	0.113
Baseline with cap on transfers			
Estimate	-0.015***	-0.015***	-0.018***
p-value	0.000	0.000	0.000
Compensation for labour income loss			
Estimate	-0.020**	-0.023**	-0.019
p-value	0.049	0.023	0.172
Compensation for labour income loss, with cap			
Estimate	-0.008**	-0.011***	-0.011***
p-value	0.014	0.001	0.008
Compensation based on taxes for full income loss			
Estimate	-0.015**	-0.014**	-0.013
p-value	0.010	0.022	0.108
Compensation based on taxes for full income loss, with cap			
Estimate	-0.008***	-0.007***	-0.009***
p-value	0.001	0.005	0.008
Shock as deviation from 4-year moving-average growth rate			
Estimate	-0.053*	-0.065**	-0.043
p-value	0.056	0.024	0.279
Shock as deviation from 4-year moving-average growth rate, with cap			
Estimate	-0.016***	-0.019***	-0.019***
p-value	0.001	0.000	0.006
Compensation based on stabilisation as a fraction of GDP			
Estimate	-0.076***	-0.043	-0.039
p-value	0.004	0.130	0.300
Compensation based on stabilisation as a fraction of GDP, with cap			
Estimate	-0.008	-0.002	-0.002
p-value	0.138	0.715	0.796

- The ESC would have generally had counter-cyclical effects in the euro area, in all of its versions.
- Introducing a cap reduces the counter-cyclicality of the scheme.

Note: estimates are based on panel regressions including random effects. Dependent variable: annual transfers as a % of GDP

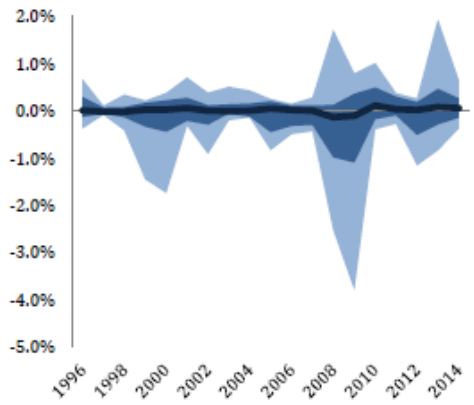
4. Simulations

Transfers with a cap of 0.5% of GDP annually. Selected countries

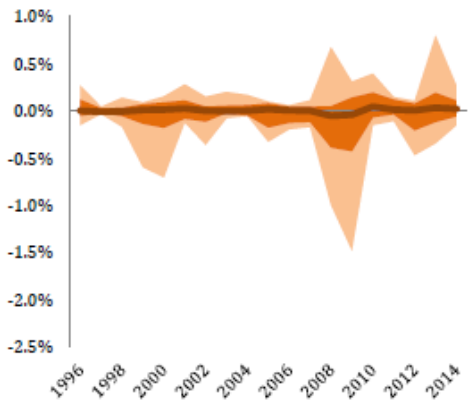


Dispersion of transfers generated by different schemes

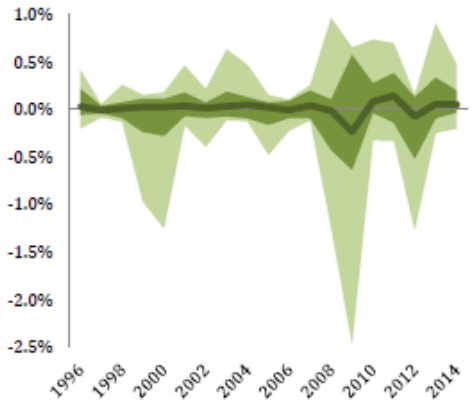
(a) Baseline



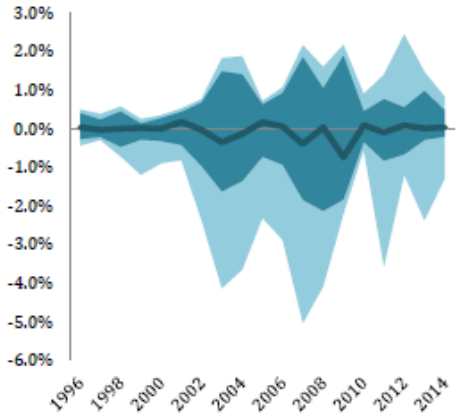
(a) Based on tax revenues



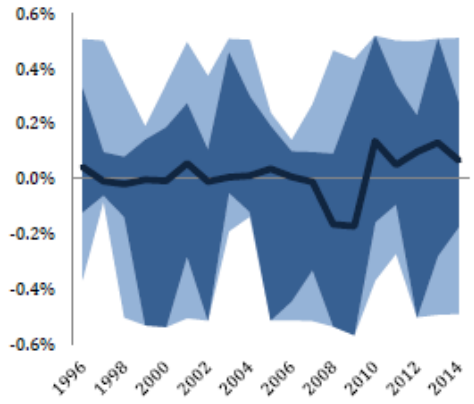
(a) Based on the labour share of income



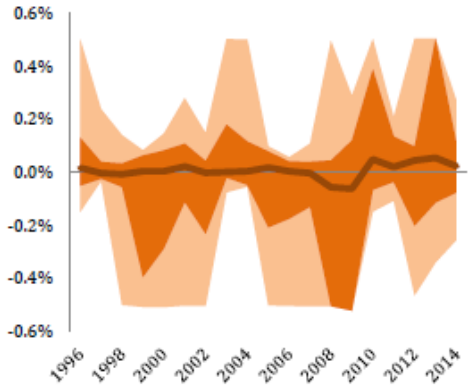
(a) Based on GDP



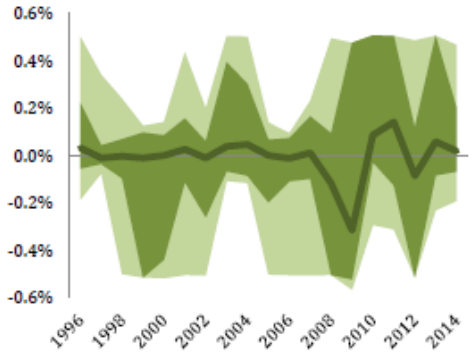
(b) Baseline, with caps on annual transfers at 0.5% of GDP



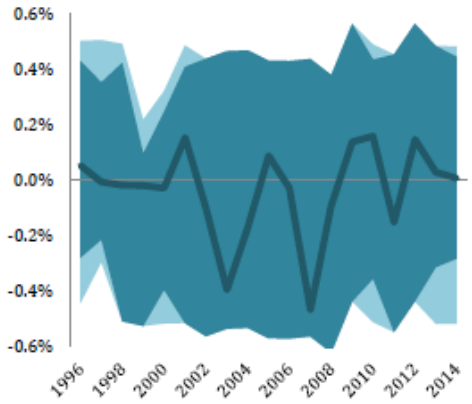
(b) Based on tax revenues, with caps on annual transfers at 0.5% of GDP



(b) Based on the labour share of income, with caps on annual transfers at 0.5% of GDP



(b) Based on GDP, with caps on annual transfers at 0.5% of GDP

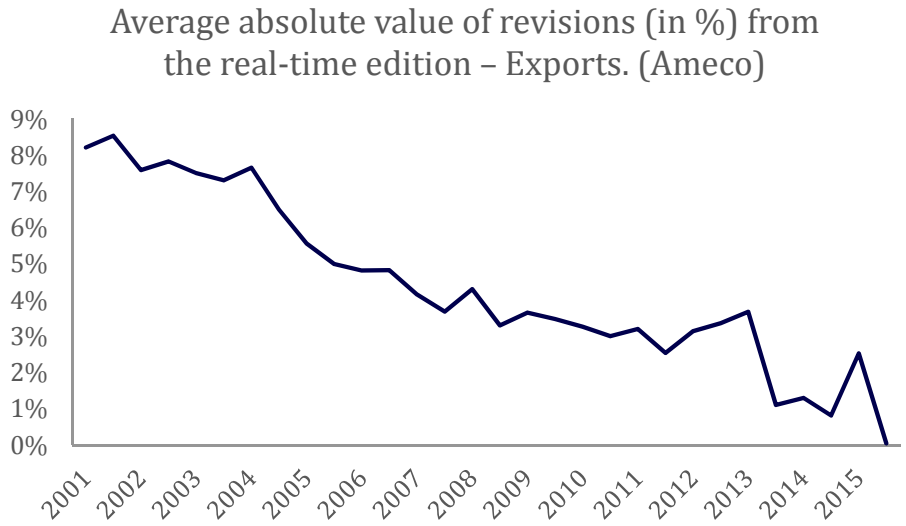


Highest-Lowest (excl LU) 15th-85th percentile Median

Outline

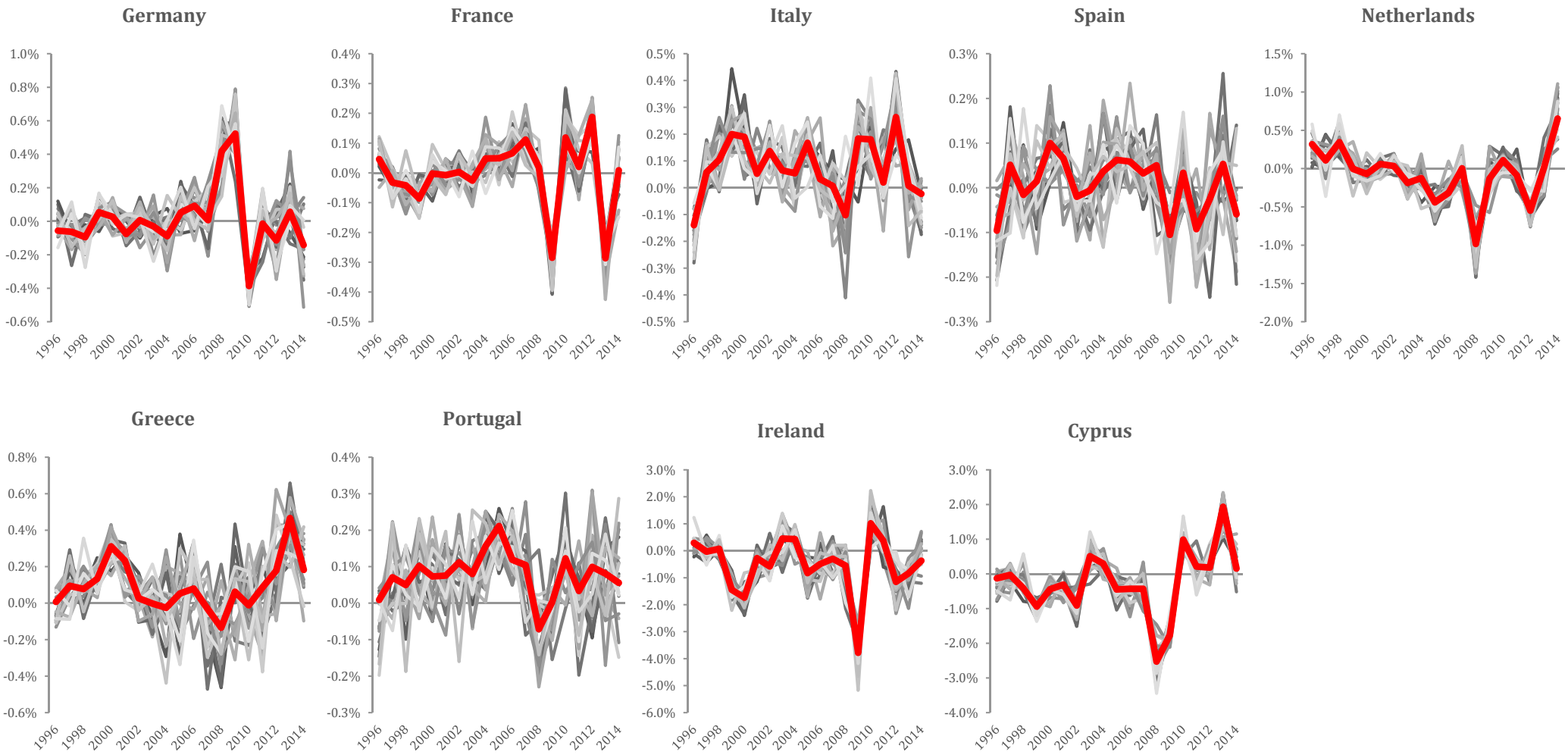
Addressing data revision

- Data on *total* exports are subject to revisions over time: these tend to be below 10% and are relatively correlated across countries.
- However, export data revisions are smaller than for GDP and the output gap



- Past vintages of sectoral export are *not available*
- We perform a simulation in which we assume all underlying exports data (x_{ijt}) to be revised randomly between -10% and +10%.
- We then calculate the transfers based on these simulated revised data and compared them to the actual transfers

Addressing data revision (2): simulated annual transfers



Outline

6. Conclusions

- We propose a scheme that minimises **moral hazard** by conditioning transfers on (exogenous) world market developments → this should facilitate ***political feasibility***
- Transfers are imposed to **add up to zero on an annual basis** and they are based on *changes* in aggregate exports in each sector
- Transfers are highly **countercyclical**. Moreover, cumulative transfers tend to stabilize of **towards zero over time**.
- Limitation: data on sectoral exports available with a lag. This can be addressed by encouraging statistical agencies to work on fulfilling these data needs

Future discussion: how transfers should be put to best use

→ it could be politically advisable to earmark them for ameliorating the consequences of structural reforms or help in transforming the economy towards activities with a more prosperous future

Thank you

3. Design of the ESC

Desirable properties for a CSC (Hagen and Hammond, 1995)

1. Insurance should only be provided against temporary (uncorrelated) and asymmetric shocks
2. The scheme should be simple and automatic
3. Net transfers should be zero in the long run
4. The scheme should be financially balanced at the supranational level

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5. Should not undermine incentives for sound fiscal policies and structural reforms (moral hazard)
6. It should not be an instrument for crisis management (ESM)

Alternative versions of the scheme (1)

1. Scheme compensating labour income

- Assume that risk-sharing for capital income already takes place in EA
- We may want to limit the transfers so as to only cover shocks to labour income. This is done by simply introducing the labour share of total income in each sector for the whole EA (lsh_{jt}):

$$T_{ijt} = lsh_{jt}\left[\frac{x_{i,t-1}}{x_{t-1}} - w_{ij,t-1}\right]\Delta x_{jt}$$

2. Scheme calibrated on government revenues

- We may also want governments to contribute only for the additional revenue received from taxes (or vice-versa to only receive the lost tax revenue) due to the shock. In this case transfers would be:

$$T_{it} = \tau_t \sum_j \left[\frac{x_{i,t-1}}{x_{t-1}} - w_{ij,t-1}\right]\Delta x_{jt}$$

Alternative versions of the scheme (2)

3. Compensation based on shocks from trend growth

- Over time, euro area exports of most sectors tend to grow because of the expansion of world trade.

➢ Analysis based on deviations from trends in the various sectors

$$T_{ij}=\sum_j \left[\frac{x_{i,t-1}}{x_{t-1}}-w_{ij,t-1}\right]\left[x_{jt}-x_{jt-1}\left(1+\frac{g_{j,t-1}+g_{j,t-2}+g_{j,t-3}+g_{j,t-4}}{4}\right)\right]$$

Alternative versions of the scheme (3)

4. Scheme with GDP weighting

The transfer can also be calibrated as a *share of the GDP of a country*:

$$\frac{w_{ij,t-1}(\Delta x_{jt}) + T_{ijt}}{y_{i,t-1}}$$

where y_{it} is country *i*'s GDP.

In this case the transfer scheme would be such that:

$$T_{it} = \sum_j \left[\frac{y_{i,t-1}}{y_{t-1}} - w_{ij,t-1}\right] \Delta x_{jt}$$

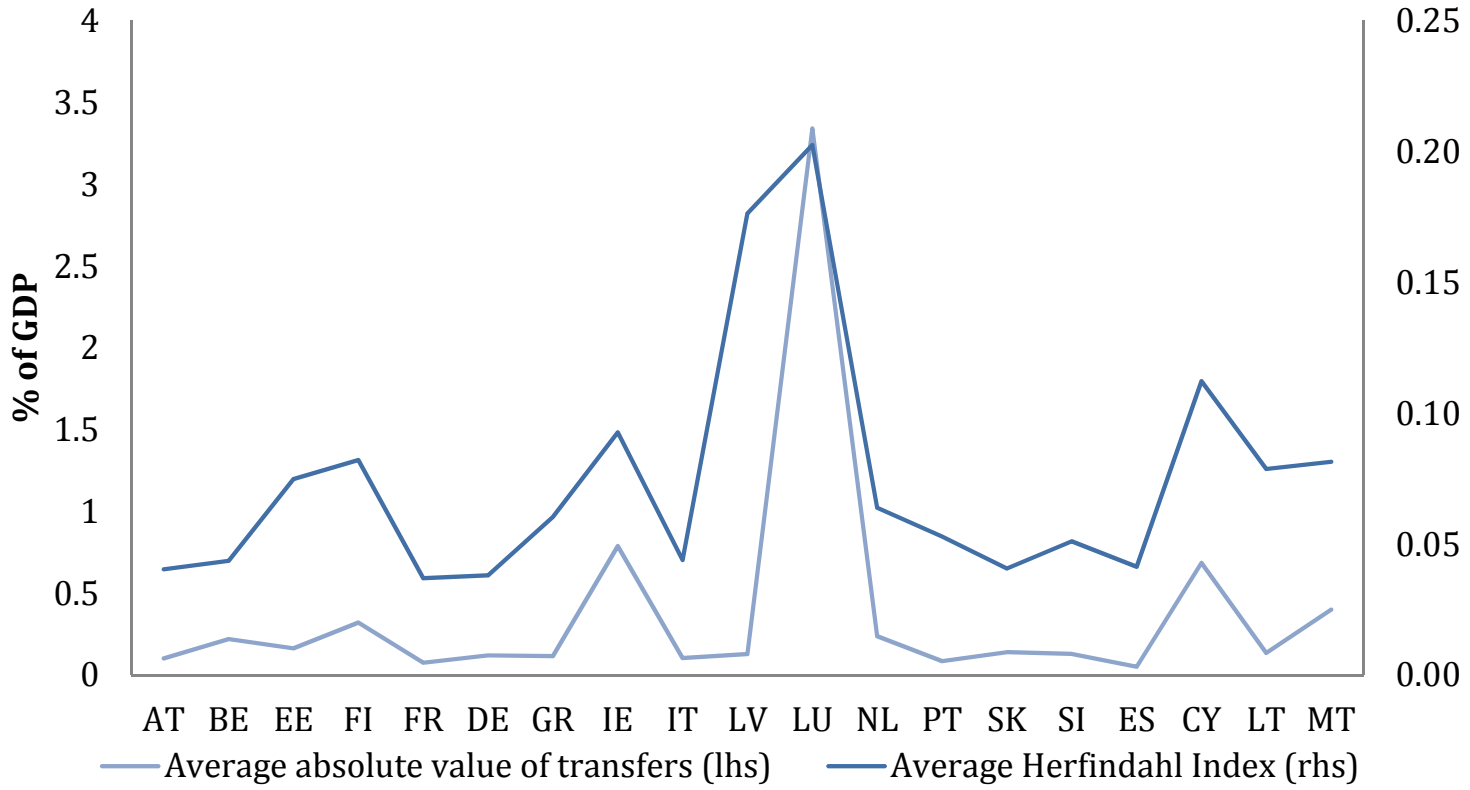
- As the importance of exports as a percentage of GDP differs widely, this scheme is likely to have rather asymmetric effects.

Background slides: correlation among various transfer schemes

	Baseline	Baseline, cap	Labour share	L. share, cap	Taxation	Taxation, cap	MA4	MA4, cap	Based on GDP	Based on GDP, cap
Baseline	1									
Baseline, cap	0.68	1								
Labour share	0.97	0.66	1							
Labour share, cap	0.71	0.89	0.76	1						
Tax	1.00	0.68	0.97	0.71	1					
Tax, cap	0.83	0.93	0.81	0.90	0.83	1				
Shock from MA4	0.80	0.54	0.80	0.59	0.81	0.67	1			
Shock from MA4, cap	0.49	0.65	0.49	0.59	0.49	0.60	0.62	1		
Based on GDP	0.55	0.32	0.41	0.32	0.55	0.40	0.32	0.16	1	
Based on GDP, cap	0.27	0.39	0.21	0.31	0.28	0.36	0.11	0.17	0.63	1

Note: the table reports the correlations between transfers of each pair of schemes, where the correlation is computed over all (year, country) combinations.

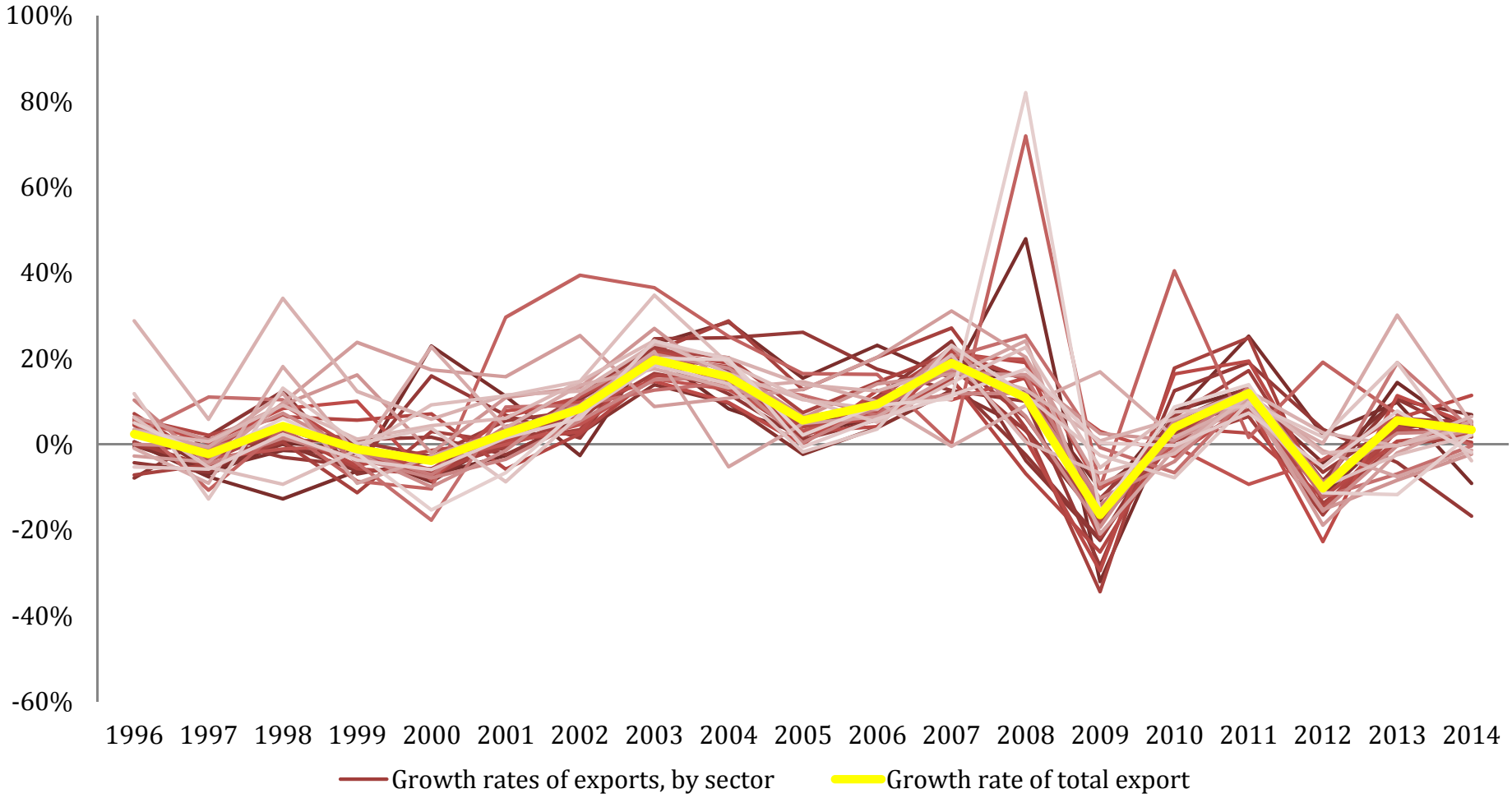
Background slides: diversification of exports and transfers



The "Herfindahl" index was calculated as: $H_{it} = \sum_j \left[\frac{w_{ijt}}{\sum_j w_{ijt}}\right]^2$

Countries with a lower diversification of their economy tend to receive/contribute higher transfers as a share of their GDP.

Background slides: growth rates exports in the 33 sectors



Growth rates across the various sectors differed significantly in all years, leading to asymmetric shocks and providing a rationale for the transfer scheme we propose. A wider dispersion of growth rates leads to bigger transfers under the scheme.