



EUROPEAN CENTRAL BANK

EUROSYSTEM

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Leverage interactions across economic sectors in the euro area

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1

Introduction

2

Sector analysis: imbalances and leverage interactions in the euro area

3

Interconnectivity across economic sectors

Motivation and scope

- *The government sector interacts with other economic sectors, as debtor and creditor*
- *Conventional analysis:*
 - *Government and private sector (non-financial corporations and households), but no cross-sectoral implications*
 - *Thresholds are defined in gross terms (no net of assets)*
 - *Leverage is defined as debt to income or GDP ratios*
- *Possible analytical avenues from balance sheets:*
 - *Calculations on a comprehensive “public sector”*
 - *“Leverage” interactions by combining assets and liabilities, obtain information of exposures, linkages, propagation across sectors*
- *Relevant information for macro-economic and financial stability analyses*

1. Introduction

Stylized government sector balance sheet

<i>Balance sheet items (ESA)</i>	Financial assets	Liabilities
	Currency and deposits	Currency and deposits (<i>EDP debt</i>)
	Securities other than shares, excluding derivatives	Securities other than shares, excluding derivatives (<i>EDP debt</i>)
	Financial derivatives	Loans received (<i>EDP debt</i>)
	Loans granted	
	Shares and other equity	Financial derivatives
	Insurance technical reserves	Insurance technical reserves
	Other accounts receivable	Other accounts payable
	Non-financial assets Produced fixed assets Non-produced assets	Net worth
<i>Off-balance sheet items</i>	Implicit assets (e.g. additional revenue stemming from future taxes, broadening tax bases, increasing social contributions)	Implicit liabilities (e.g. unfunded PAYG pension pillar)
	Contingent assets	Contingent liabilities (e.g. guarantees)

“Net debt” concept

Use of financial assets

EDP debt versus ESA debt

Calculation of net worth

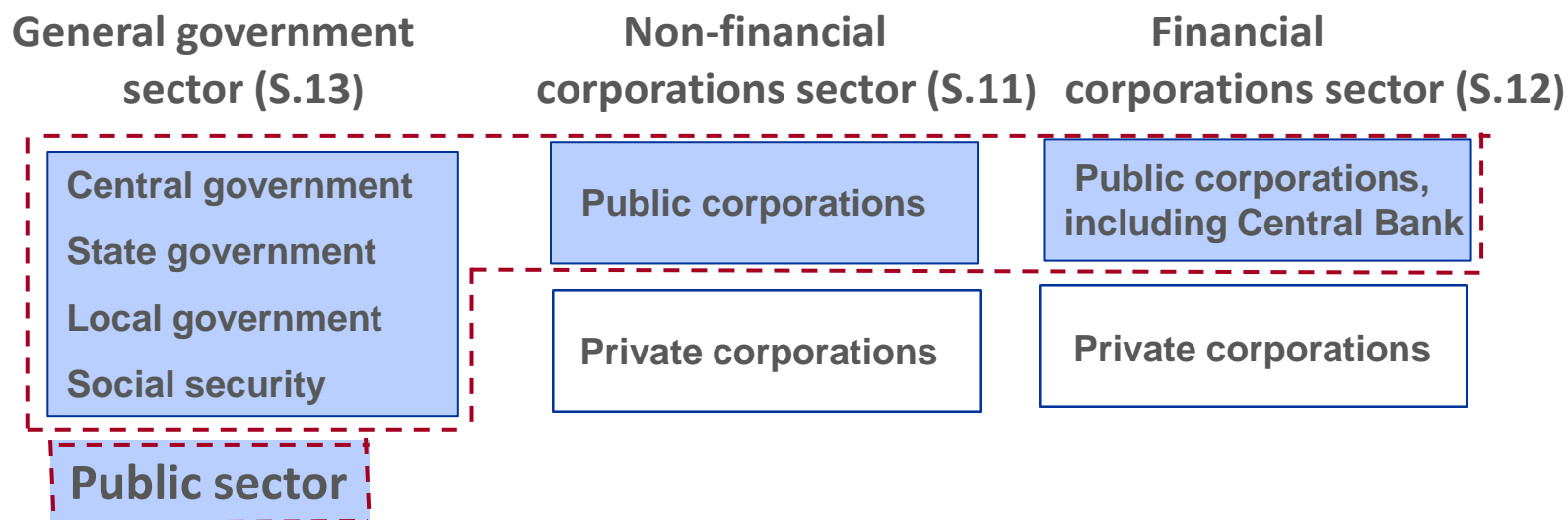
Calculation of contingent liabilities from State-Owned Companies

Pensions: calculation of implicit liabilities
Accrued-to-date method

Central Bank-Government sector balance sheets

1. Introduction

Public corporations (i.e. State-owned companies) are an important part of any economy...

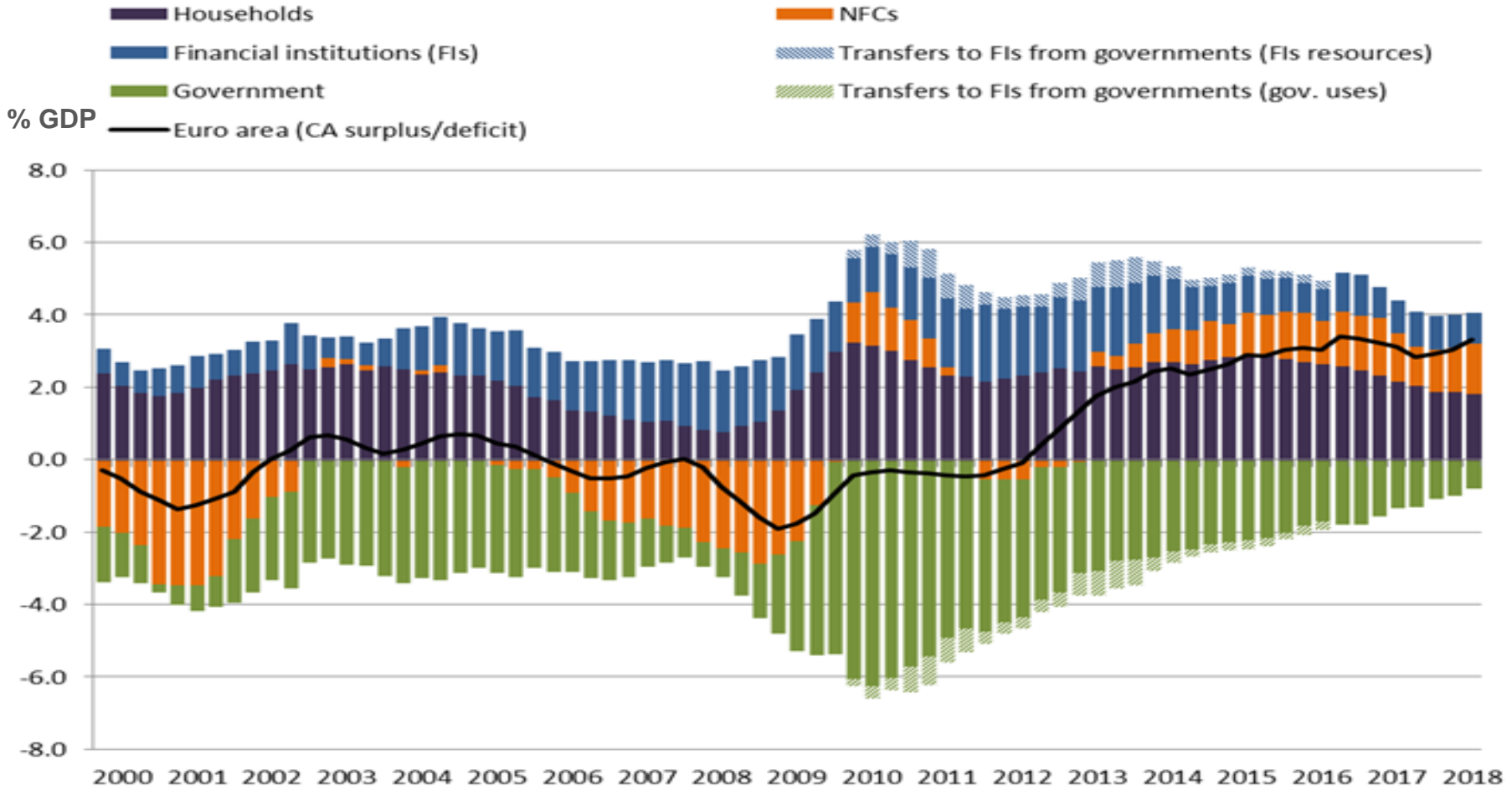


Source: Girón and Rodríguez Vives (2019) based on the IMF's Government Finance Statistics Manual 2014 and the ESA2010 Manual

Note: Moreover, the general government sector has off-balance sheet positions to the non-financial and financial corporations sector through the so-called "guarantees". For the quantification of these contingent liabilities, see the paper by Dagmar Hartwig Lojsch, Marta Rodríguez Vives, and Michal Slavík (2011), "The size and composition of government debt in the euro area", ECB Occasional Paper Series, 132.

2. Sector analysis: imbalances and leverage interactions in the euro area

Analysis of sector imbalances (net lending/net borrowing)...



Source: EAA, last observation is 2018Q3.

Units: four-quarter sums, as percentage of GDP.

NFCs stands for non-financial corporations and FIs stands for financial institutions.

Leverage ratio: $l_i = D_i/A_i$

Leverage multiplier: $m_i = 1/l_i - 1$

$$m_i = \frac{NA_i}{D_i} = \frac{\bar{A}_i - D_i}{D_i}$$

Source: Girón and Rodríguez Vives (2017)

The **key advantage of the “leverage multiplier”** is that the accounting restrictions binding net assets across sectors can be exploited:

$$\Delta^i m_j = \frac{1}{D_j} \Delta D_i^j$$

✓ Changes in the leverage multiplier of agent j when debt of agent i increases (and net assets of other sectors change)

✓ ΔD_i^j share of agent j in total change in net assets

2. Sector analysis: imbalances and leverage interactions in the euro area

Private leverage and government indebtedness

(debt-to-asset, percentages)

(% GDP)



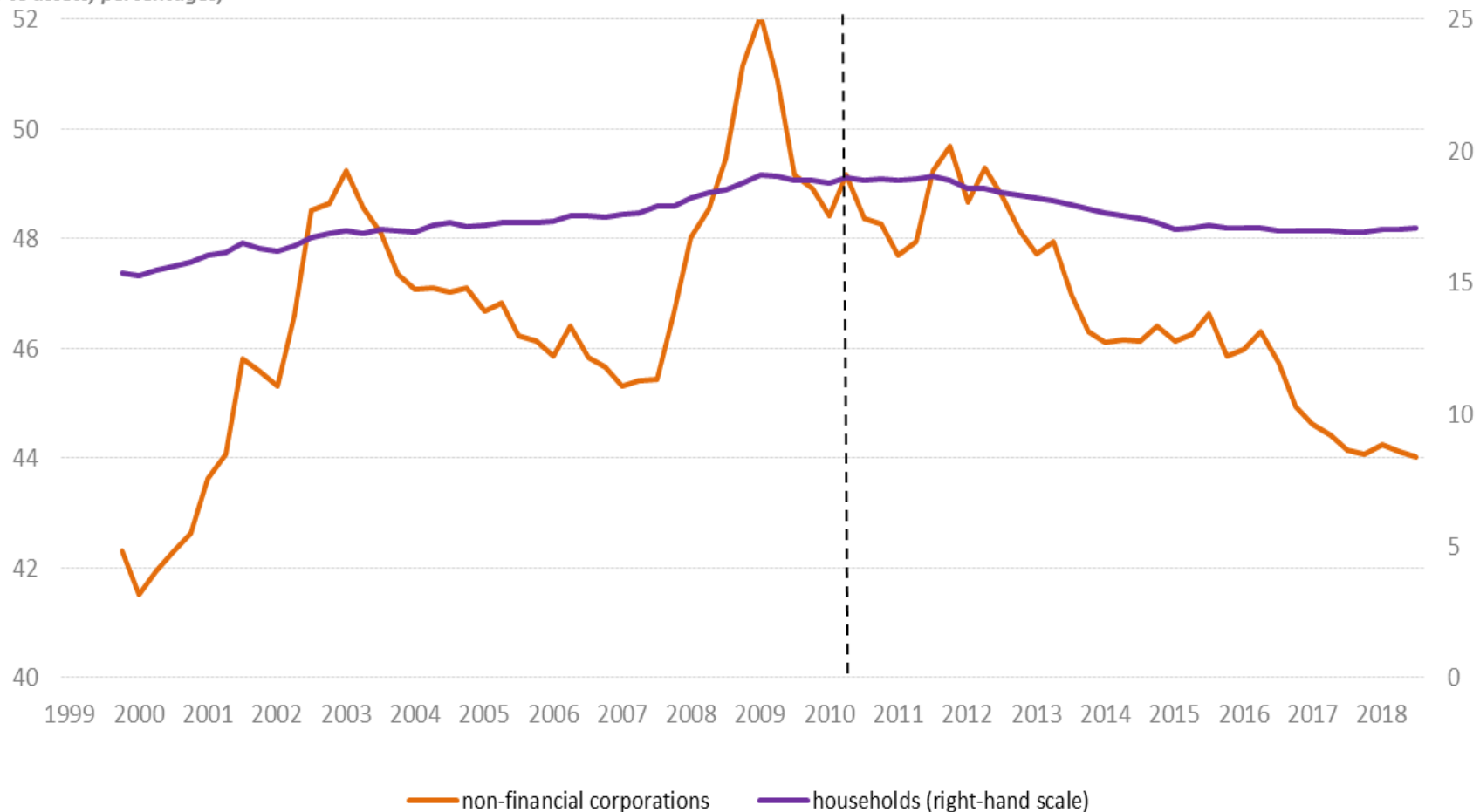
Source: Girón and Rodríguez Vives (2017)

Government deficit ($B9_{S13}$) increases net assets of the private sector, increases its “leverage multiplier” and its debt capacity

2. Sector analysis: imbalances and leverage interactions in the euro area

Private leverage

(debt-to assets; percentages)

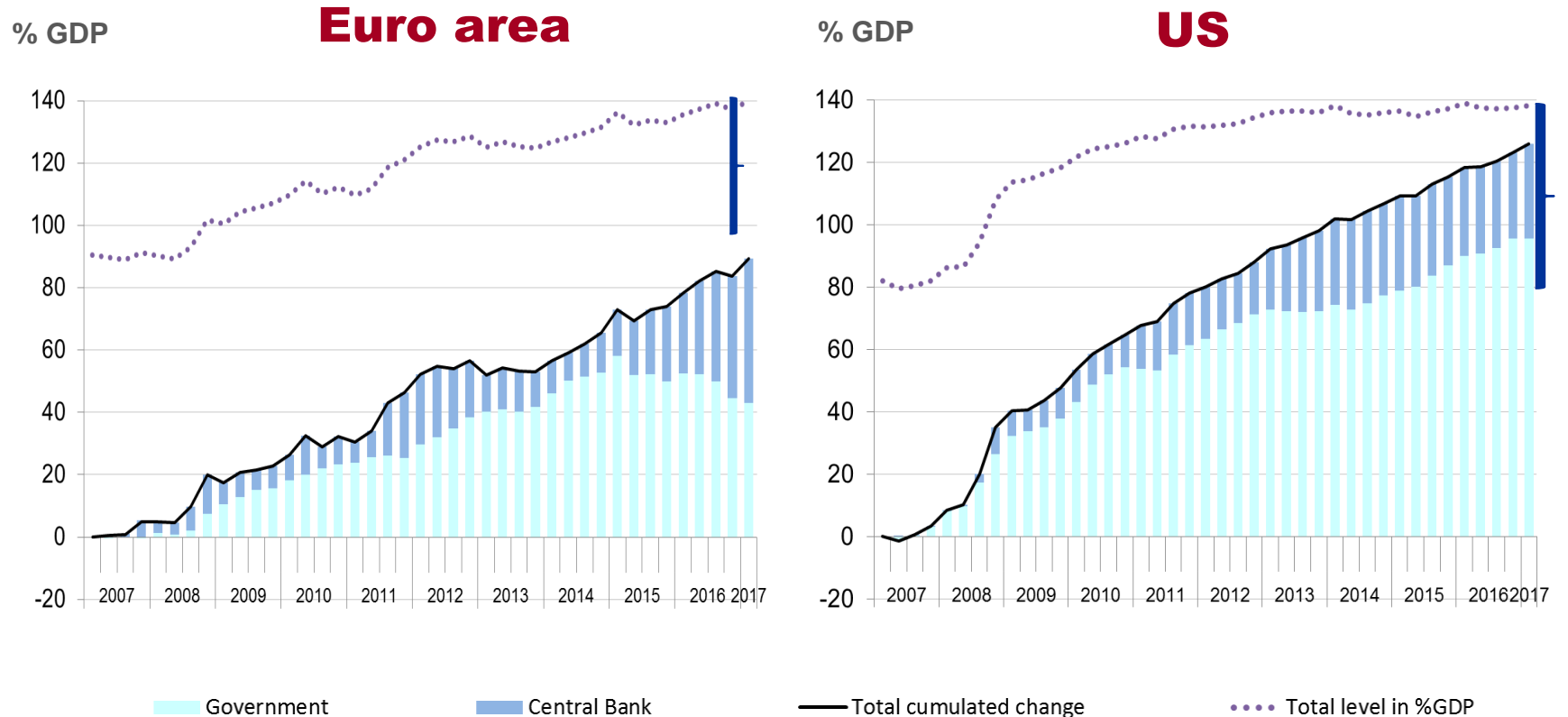


Source: Girón and Rodríguez Vives (2017)

2. Sector analysis: imbalances and leverage interactions in the euro area

Comparison of policy responses

Accumulated change in “public” liabilities (consolidated)



Source: Girón and Rodríguez Vives (2019)

EAA & US FoF; last observation 2017Q1

Units: Accumulated change in liabilities since 2007, contributions

Note: holdings of government liabilities by the central bank and of the central bank by government are consolidated

3. Interconnectivity across economic sectors

Sectors interconnected via “Who-to-whom” accounts

(Flow-of-Funds data)

Columns break down a sector’s liabilities by counterparty

Rows break down its assets

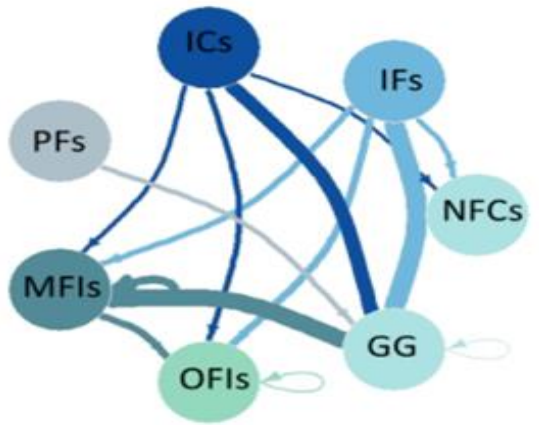
Government

Assets:	Liabilities :
Item 1 ...	Item 1 ...
Item 2 ...	Item 2 ...
	Debt issued : B+E+H

Banks

Assets:	Liabilities :
Item 1 ...	Item 1 ...
Item 2 ...	Item 2 ...
	Debt held : A+B+C

		Debtor (issuer)			
		Banks	Gov't	Corp.	Total held
Creditor (holder)	Banks	A	B	C	Banks: A+B+C
	Gov't	D	E	F	Gov't: D+E+F
	Corp.	G	H	I	Corp.: G+H+I
	Total issued	Banks: A+D+G	Gov't: B+E+H	Corp.: C+F+I	

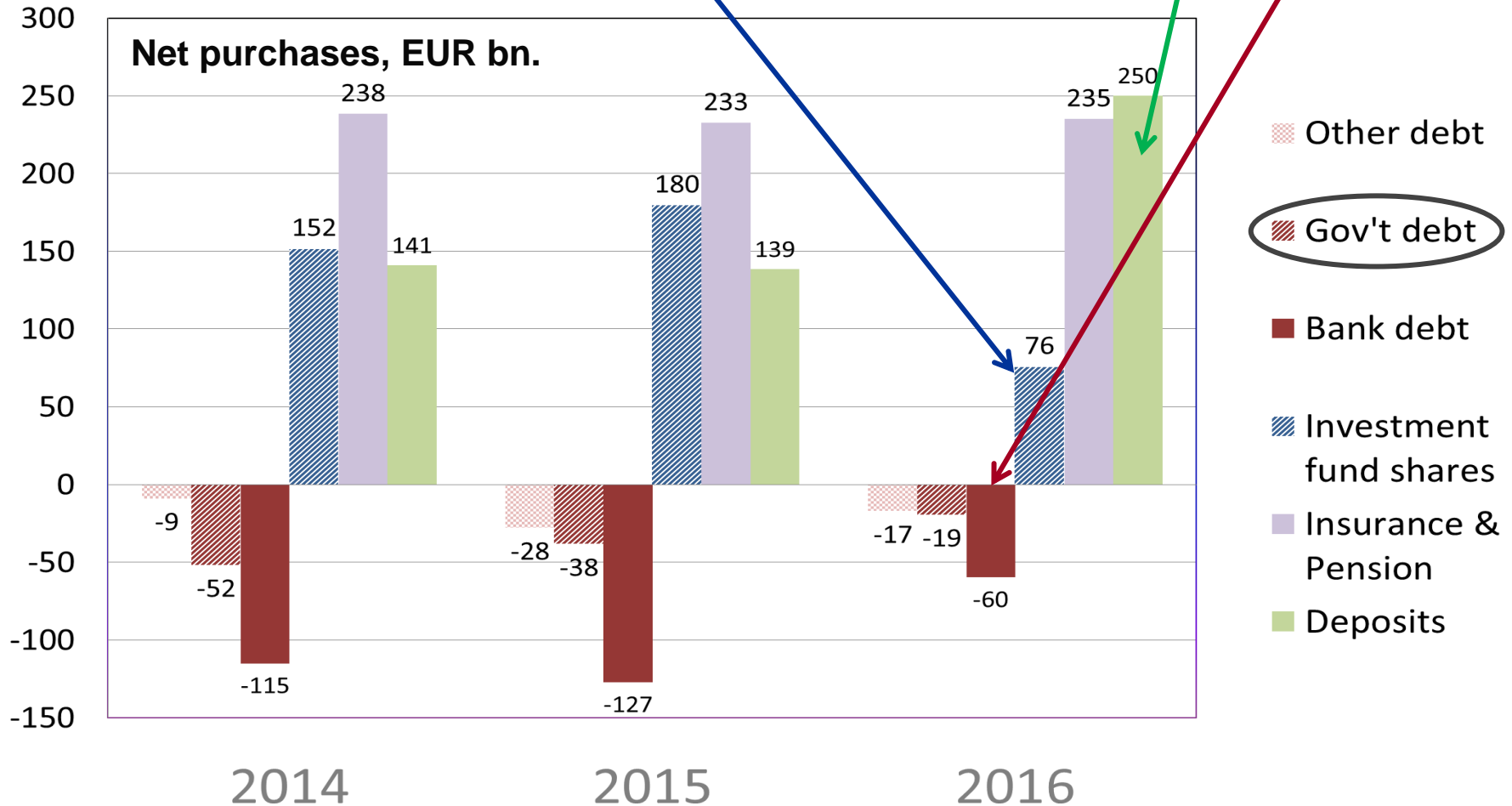


3. Interconnectivity across economic sectors

Portfolio analysis: Euro area households

Households allocate less to investment funds in 2016, increasing deposits instead.

Significant divestment from debt securities, especially those issued by banks.



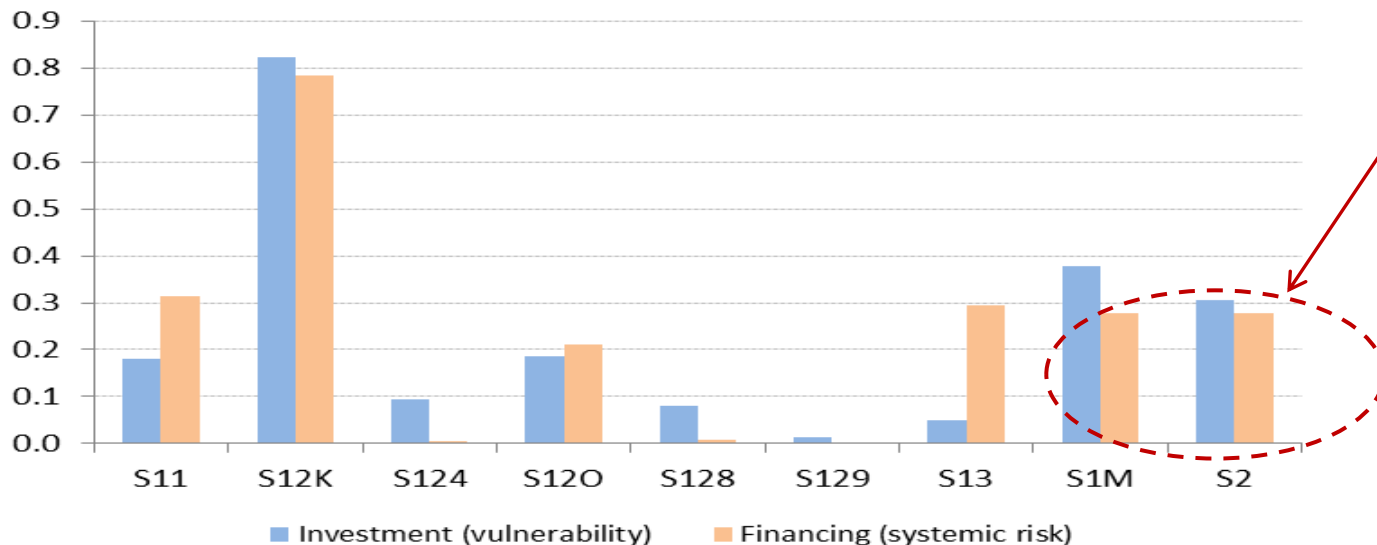
Notes: annual financial investment of households, four quarters ending in September, EUR bn

3. Interconnectivity across economic sectors

Future research: network theory tools

Scores take into account indirect investment-financing links

Eigenvector centrality. EA



Households are as systemic as **government** and the rest of the world in spite of having half their liabilities!!!

Notes:

- Units: components of normalized Perron eigenvectors; network of debt (debt securities, loans and deposits); 2016Q4.
- Vulnerability indicator:** creditor-debtor links, provides rankings of interconnectedness via **investment**.
- Systemic risk indicator:** debtor-creditor links provides rankings of interconnectedness **via financing**.
- S11: non-financial corporations; S12K: MFIs (S121+S122+S123); S124: investment funds; S120: OFIs (S125+S126+S127); S128: insurance corporations; S129: pension funds; **S13: general government**; S1M: households and NPISHs (S14+S15); S12: rest of the world

Thank you for your attention!

Questions and comments are welcome

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References

“Leverage Interactions: A National Accounts Approach” (2017), *ECB Statistical Paper Series*, No. 19, January (C. Girón and M. Rodríguez Vives)

“The Provision of Leverage by Central Banks: A Balance Sheet Perspective” (2019), Mimeo (C. Girón and M. Rodríguez Vives)

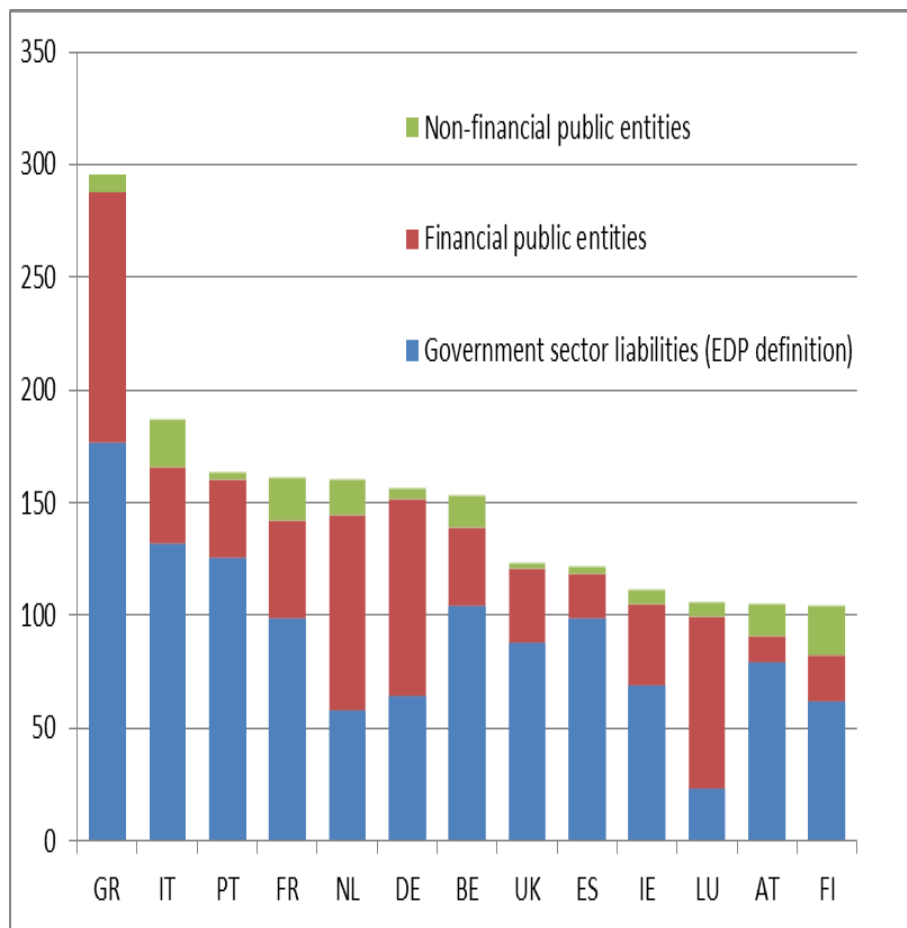
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“Eurostat/ECB Workshop on Pensions, ECB, 29-30 April 2009 – Proceedings” (2010), Editors (R. Mink and M. Rodríguez Vives)

Background slides

Balance sheet of a wider government sector

A proxy for the liabilities of “public sector” (% of GDP), 2017



Source: based on Eurostat press release 19/2019 of 30 January 2019

Implicit liabilities from pensions (net present value of liabilities as % of GDP)

Source	OECD 1)	IMF 1)	Eurostat / ECB Task Force on Pensions	
Method	Implicit pension debt (ABO)	Implicit pension debt (PBO)	Accrued-to-date liabilities (PBO)	
Coverage	Pension liabilities in the government sector		Social security	Defined-benefit schemes
Germany	157.4)	221.4)	275	47
France	216	265	292	60
Italy	242	357	322.5)	1.5)
Euro area	-	-	278	52

Source: Mink and Rodríguez-Villaverde

High implicit liabilities vis-à-vis Households!

Better understanding of the interconnectivity across economic sectors



Financing and investment dynamics

Deposits

Short-term debt securities

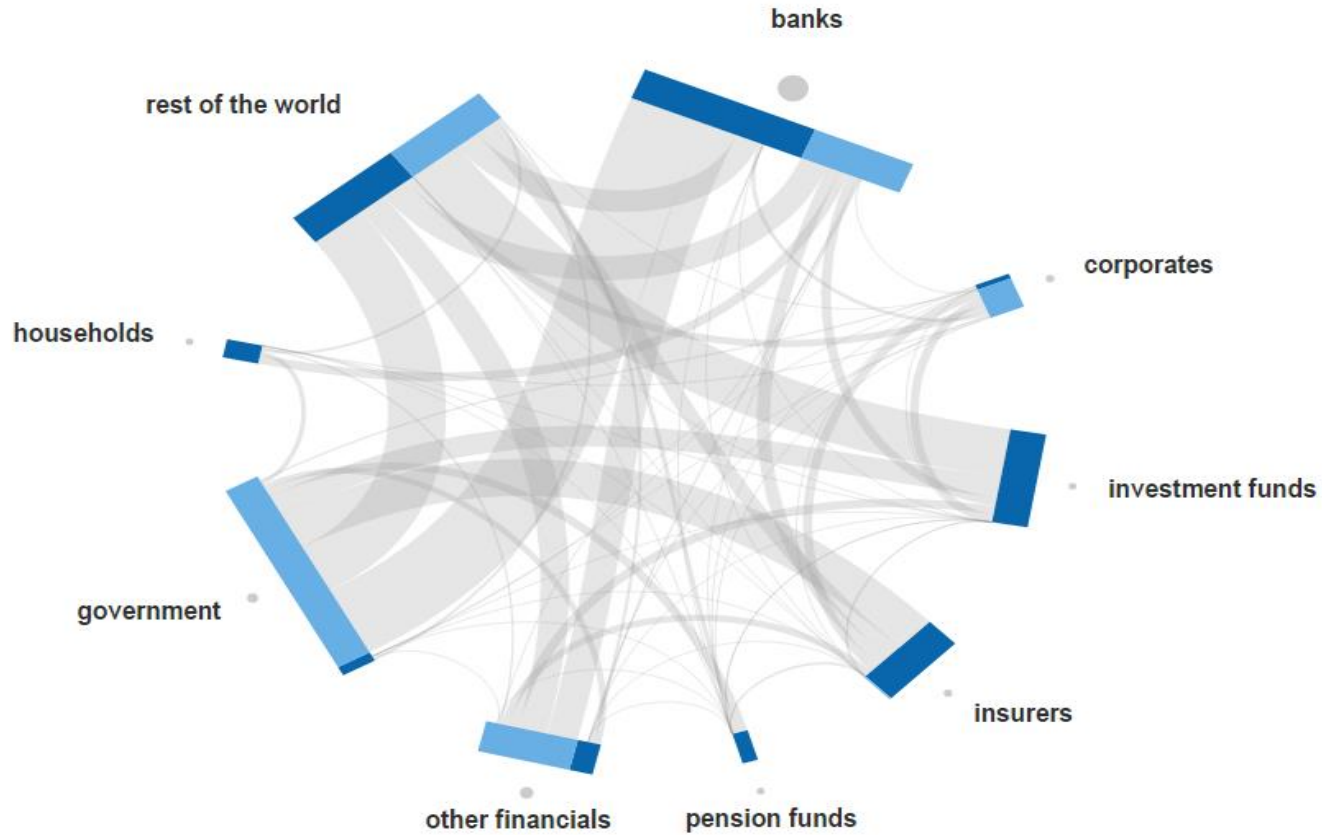
Long-term debt securities

Short-term loans

Long-term loans

Listed shares

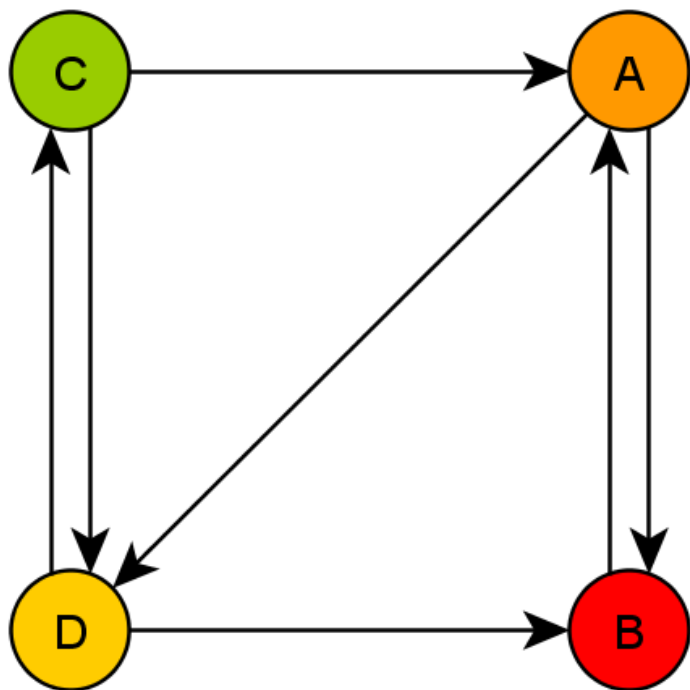
Investment fund shares/units



Source: ECB website for journalists: www.euro-area-statistics.org

2016-Q3

Network centrality



Eigenvector centrality provides “interconnectedness” scores/ rankings on the basis of the matrix representation of the network:
Perron eigenvector (principal vector of Perron eigenvalue)

✓ Perron’s vector, when calculated on networks ...

- ...showing **creditor-debtor** links, provides rankings of interconnectedness via investment: **vulnerability indicator**
- ...showing **debtor-creditor** links (represented by the transposed matrix of a creditor-debtor network), provides rankings of interconnectedness via financing: **systemic risk indicator**