



IFC workshop on *"Combining micro and macro statistical data for financial stability analysis. Experiences, opportunities and challenges"*

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## Investor heterogeneity and international portfolio holdings: estimating a gravity model with security-by-security data<sup>1</sup>

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<sup>1</sup> This presentation was prepared for the meeting. The views expressed are those of the authors and do not necessarily reflect the views of the BIS or the central banks and other institutions represented at the meeting.

# Investor heterogeneity and international portfolio holdings: Estimating a gravity model with security-by-security data

**Martijn Boermans** and Robert Vermeulen  
IFC-NBP workshop, 14-15 December 2015

DeNederlandscheBank

EUROSYSTEEM

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# International portfolio choice

- Large literature on international investment patterns using **cross-country level data** (e.g. CPIS) to study determinants of portfolio choice
- These papers use a country  $i$  country  $j$  perspective which implies a **representative investor** from country  $i$

# Investor heterogeneity

- Across literature there is evidence of **heterogeneity between investors**

*Heterogeneity in asset holdings between **sectors** stems from different functions (ALM), e.g.*

- **Banks:** Deposits can easily be redeemed, need for liquid assets
- **Pension funds:** Guarantees not directly redeemable/long term liabilities may drive long term asset preference
- **Insurers:**
  - Technical reserves need to be matched with assets of similar risks
  - Liabilities are in euro, so hold fewer assets outside currency area
- **Households:** In general not directly linked liabilities

# Contribution of this study

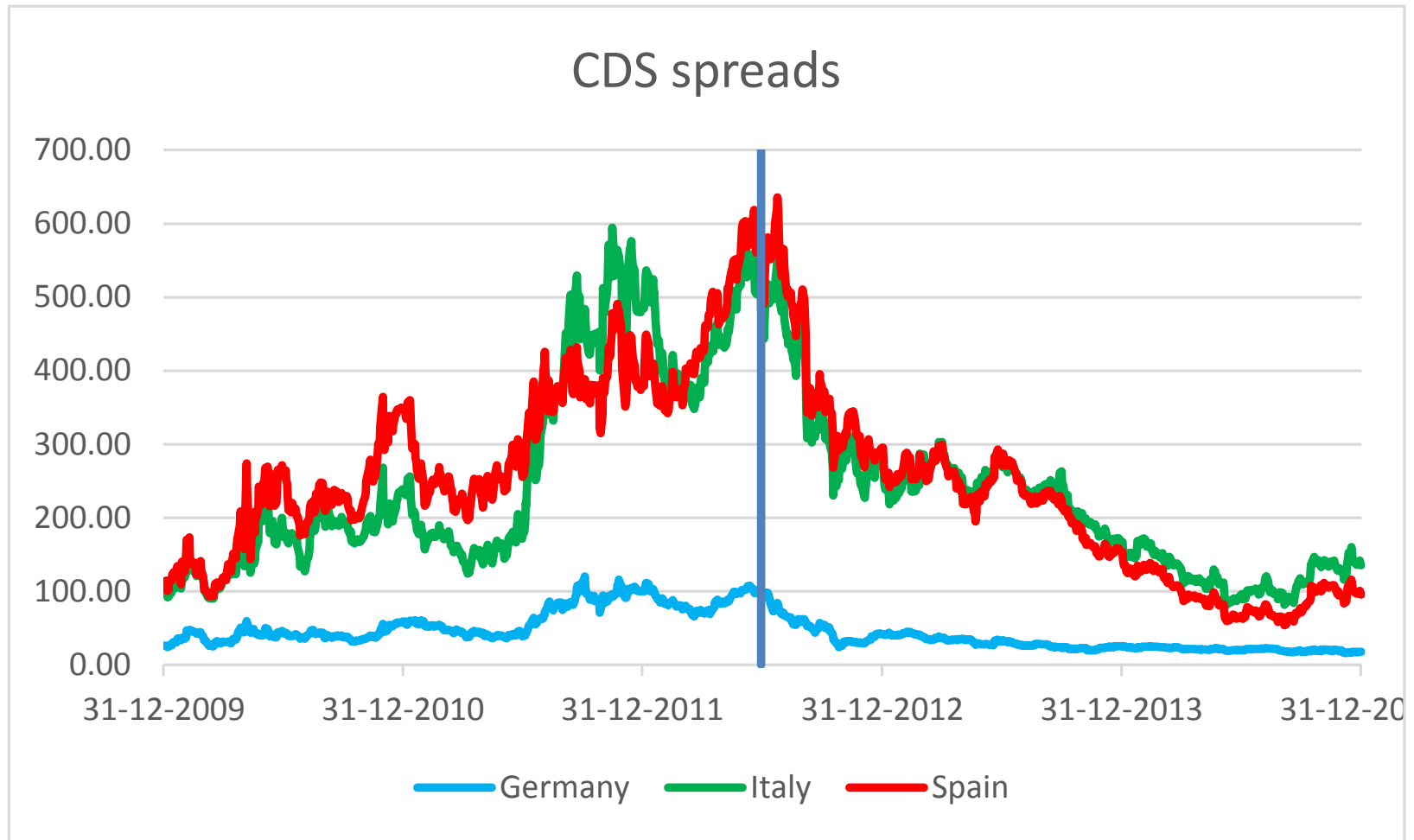
- Document heterogeneity between investor types using **security-by-security data**

*Investor heterogeneity important as cross-country differences in sector composition may lead to different macroeconomic transmission effects in financial markets*

- Explain portfolio investment patterns and *changes* among euro area investors using a **gravity model** with multilateral resistance terms
  - Compare investor types in a *single* regression

*Portfolio analysis gives us insights to the degree and changes in home bias in asset allocations that have important ramifications for financial stability and risk assessments*

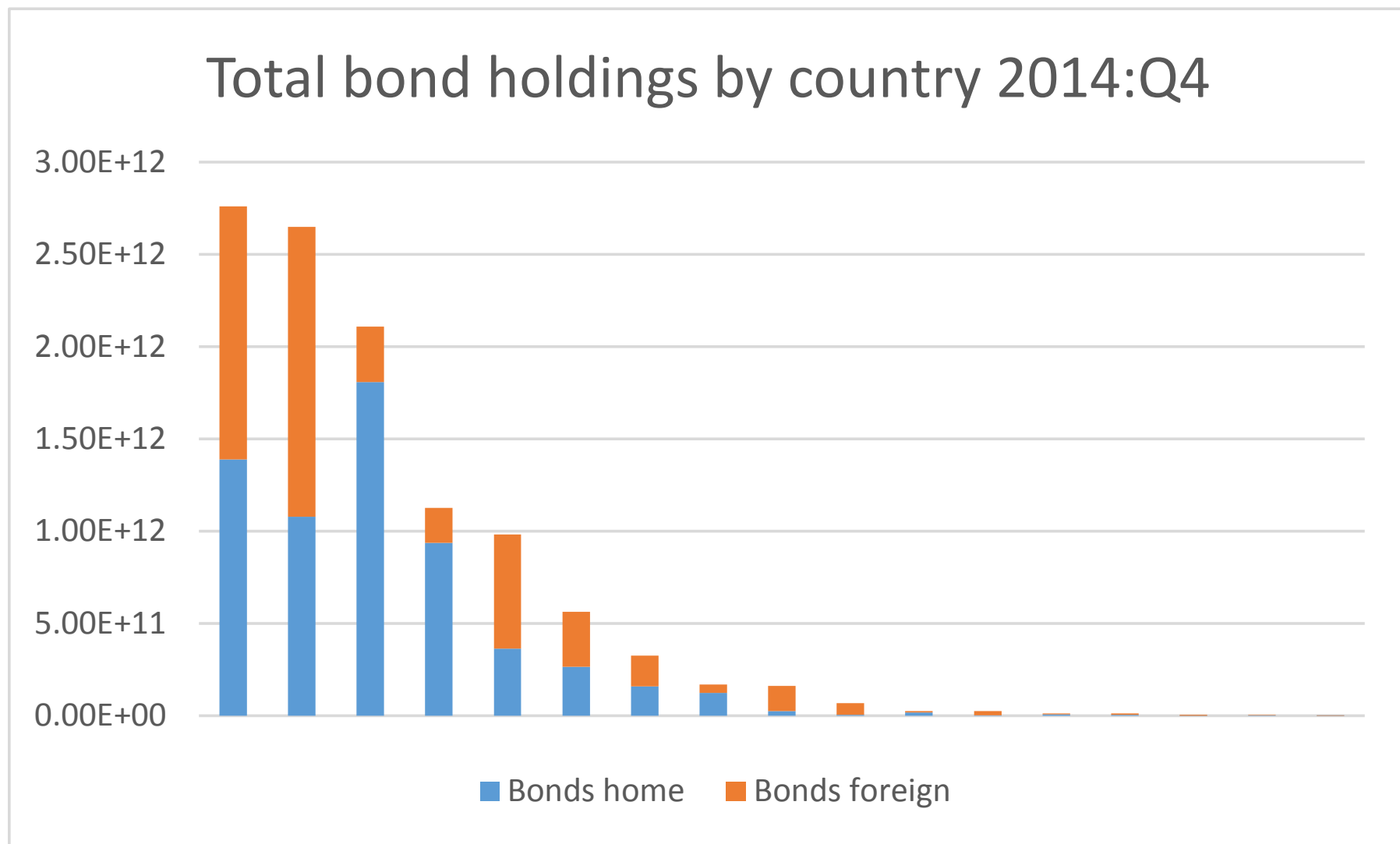
# Two phases of the crisis



# Data

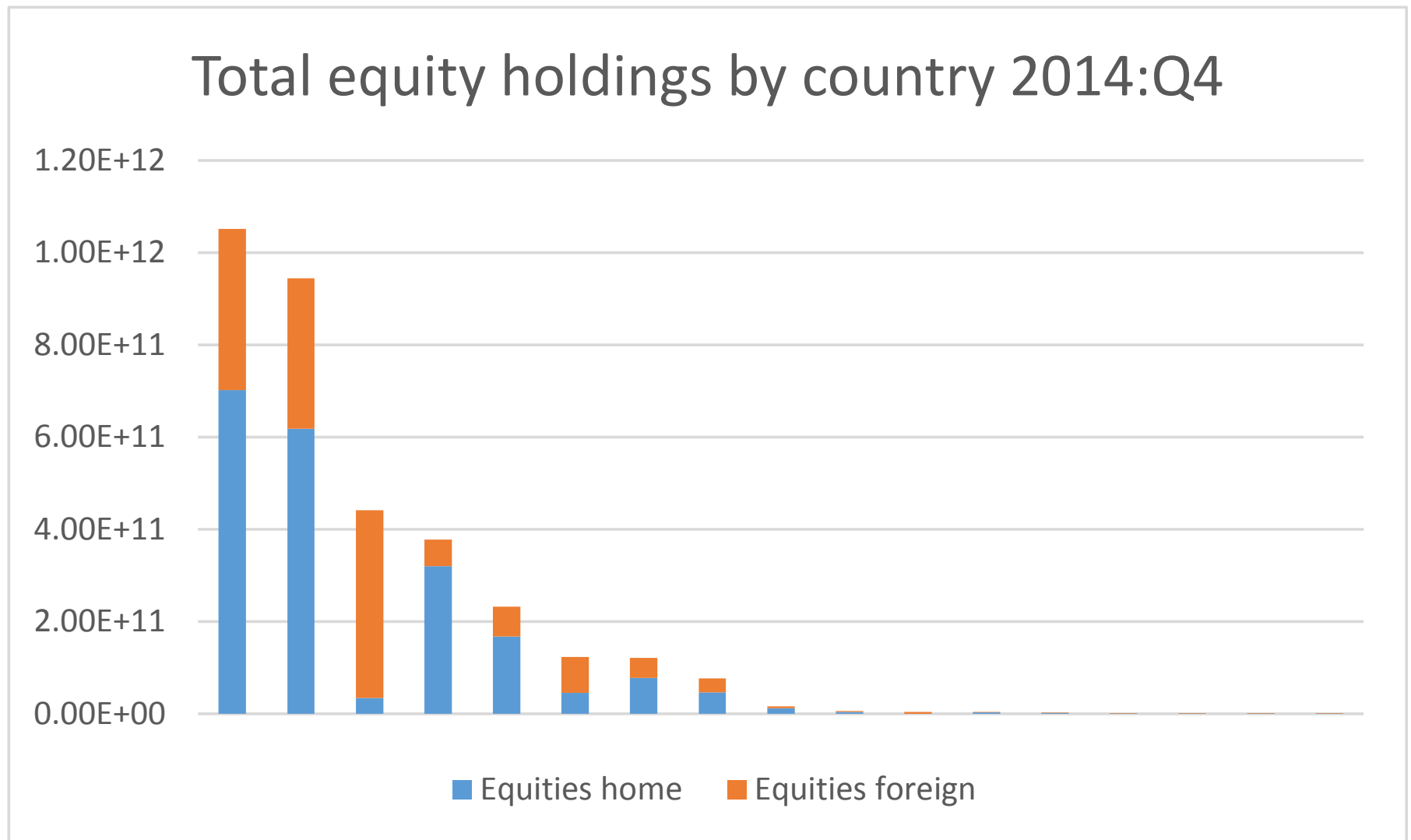
- ESCB **Securities Holdings Statistics (SHS)**
  - Highly granular database with quarterly security-by-security data
  - Disaggregate holdings of country  $i$  sector  $s$  in asset  $a$
- At aggregate level very comparable to total holdings in the IMF's **CPIS** database
- Data is classified as highly **confidential**, thus at this stage we cannot disclose all details of our analysis

# Home bias in the bond markets



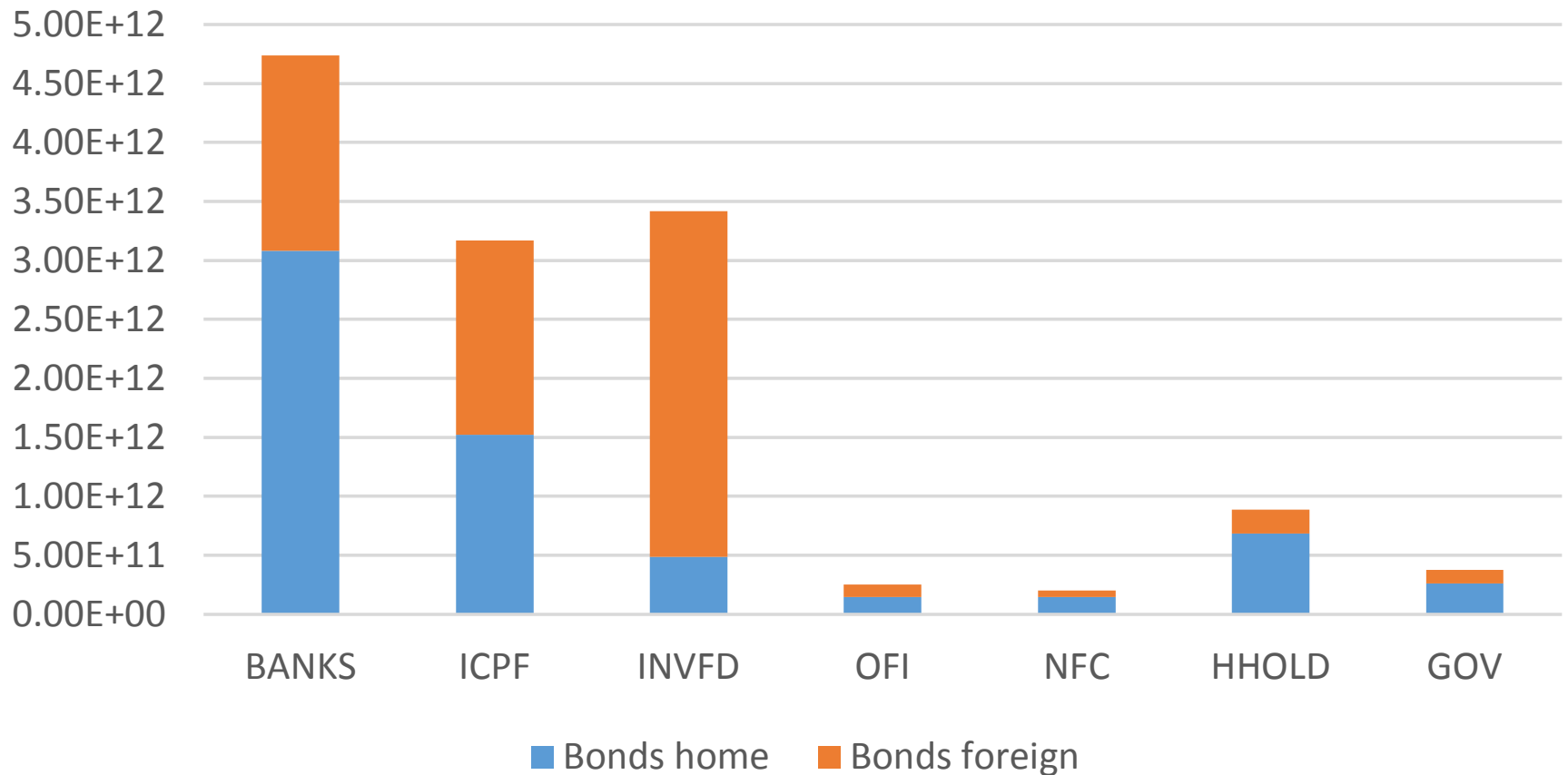


# Home bias in the equity holdings

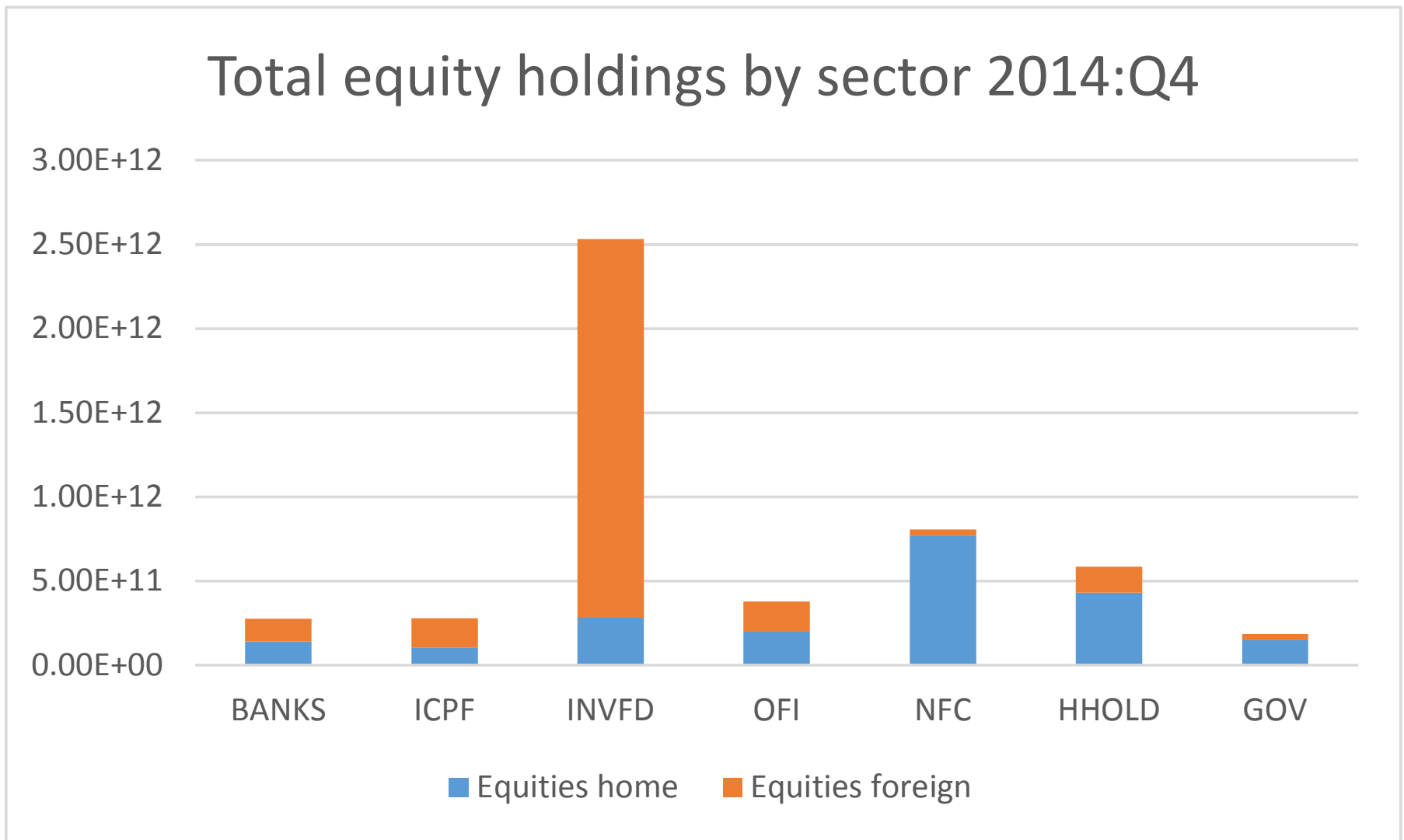


# Sector heterogeneity in bond holdings

## Total bond holdings by sector 2014:Q4



# Sector heterogeneity in equity holdings



# Empirical specification

- Starting point is standard gravity model in international finance ([Okawa and Van Wincoop, 2010](#)), extended with multiple investor types at the asset level

$$\log(Holdings_{i,s,a,t}) = \beta_{1,s} * \log(MktVal_{a,t}) + \beta_{2,s} * Home_{i,s,j,a} + \beta_{3,s} * \log(Distance_{i,a}) + \beta_{4,s} * Euro_{i,a} + \beta_{5,s} * Common\ language_{i,a} + \mu_{i,s} + v_{j,u} + \varepsilon_{i,s,a,t}$$

- Analysis at the holding country, holding sector, asset level
  - Include holding country-holding sector pair dummies
  - Include destination country-issuer sector dummies

# Results: Bond holdings 2014:Q4

2014:Q4	banks	icpf	invfd	ofi	nfc	hhold	gov
log(isin_value)	++	+	+	+	++	+	++
home	++	-	+	-	++	++	+
log(distance)	-	-	-	--	--	--	-
euro	++	++	++	=	+	+	=
common language	=	+	=	--	=	++	=
# observations	567,865						
R2	0.632						
* p<0.05, ** p<0.01 and *** p<0.001							

Colors indicate significance (green/red significant at 5% level); ++/+ and --/- size of coefficients; figures are hidden for confidentiality reasons

- Regressions were also ran for **2009Q4** and **2012Q2**, yielding comparable results thus indicating high robustness.

# Results: Equity holdings 2014:Q4

2014:Q4	banks	icpf	invfd	ofi	nfc	hhold	gov
log(isin_value)	++	+	++	+	+	+	++
home	+	+	+	++	++	++	+
log(distance)	--	--	--	-	--	--	-
euro	+	++	+	=	++	++	=
common language	--	=	=	=	++	++	--
# observations	250,844						
R2	0.652						
* p<0.05, ** p<0.01 and *** p<0.001							

Colors indicate significance (green/red significant at 5% level); ++/+ and --/- size of coefficients; figures are hidden for confidentiality reasons

- Regressions were also ran for **2009Q4** and **2012Q2**, yielding comparable results thus indicating high robustness.

# Results: Changes bond holdings (balanced)

2009Q4- 2012Q2	<b>banks</b>	<b>icpf</b>	<b>invfd</b>	<b>ofi</b>	<b>nfc</b>	<b>hhold</b>	<b>gov</b>
home	++	=	+	++	--	+	=
log(distance)	-	-	--	=	--	-	-
euro	++	++	++	=	++	--	++
# observations	250,844						
R2	0.652						
* p<0.05, ** p<0.01 and *** p<0.001							

Includes lag holding amount as additional control; colors indicate significance (green/red significant at 5% level); ++/+ and --/- size of coefficients; figures are hidden for confidentiality reasons

# Conclusion

- Investigate domestic and international investment positions for different investor types using security-by-security data
- **Investor heterogeneity** relevant to explain portfolio choices and trading behavior
- **Gravity model** explains the cross-section of both bond and equity holdings very well
  - Especially equity investors follow strongly the **CAPM** predictions



# Back up slide: ISIN data

- **Example of bond data**

- NL Government bond with 4% fixed coupon (ISIN NL0000102283)
- Outstanding amount is EUR 15 billion
- Issue date: 17/7/2006
- Maturity date: 15/7/2016
  
- Data at 31/12/2014
- Price of bond
- Holdings of different investors (only euro area residents)
  - NL banks
  - BG households
  - IT pension funds
  - ...

# Back up slide: Wrap-up main findings

- **Large heterogeneity across sectors**
- **Home bias** generally strongest in non-financial sectors
  - Bias stronger for equity than debt
  - During crisis period 2009-2012 especially banks and other financial intermediaries shifted positions strongly to the home market
- Investors shy away from **distant** investments, rather persistent effect across sectors
  - During crisis period 2009-2012 especially investment funds and non-financial corporations became less sensitive to distance effects
  - **Euro currency** preference strongest in financial sector for bonds (especially banks), yet in non-financial sector for equity
    - Bank preference for euro denominated bonds increased in crisis period