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# **Cross-border banking and credit (mis)allocation**

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Preliminary version, disclaimer: opinions and views presented are those of the author



# Motivation (1)

- Textbook cross-border banking
  - International risk sharing
  - Higher expected returns: new markets, economies of scale and scope
  - Diversification at the bank capital group level
  - Technology transfer

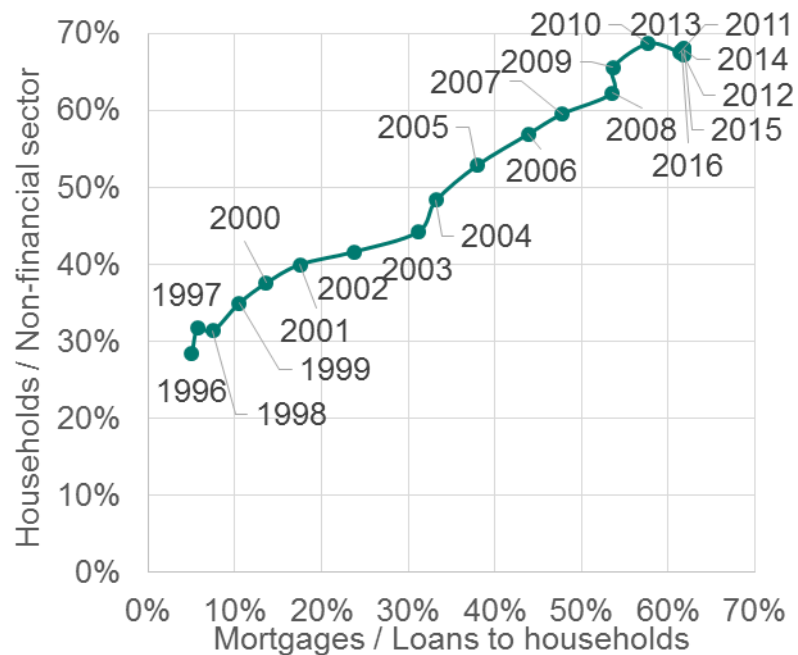
# Motivation (1)

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  - Higher expected returns: new markets, economies of scale and scope
  - Diversification at the bank capital group level
  - Technology transfer
- Not-so-pleasant policy challenges
  - Excessive cross-border capital flows and credit boom-bust cycles
  - Shock spillovers
  - Banks "global in life, national in death"
  - Missing deposit insurance pillar of the Banking Union
  - National ring-fencing debate

## Motivation (2)

- Banking sector in an emerging economy
  - Often significant foreign ownership
  - Local decision process influenced (formally or informally) by parent company guidance
- Convergence and demand structure
  - Households attempt to smooth consumption over time (expected income growth)
  - Property market – gaps in quality and quantity of available housing
- Destabilizing lending booms
  - Accumulation of net foreign liabilities
  - Challenges for macroeconomic and financial stability

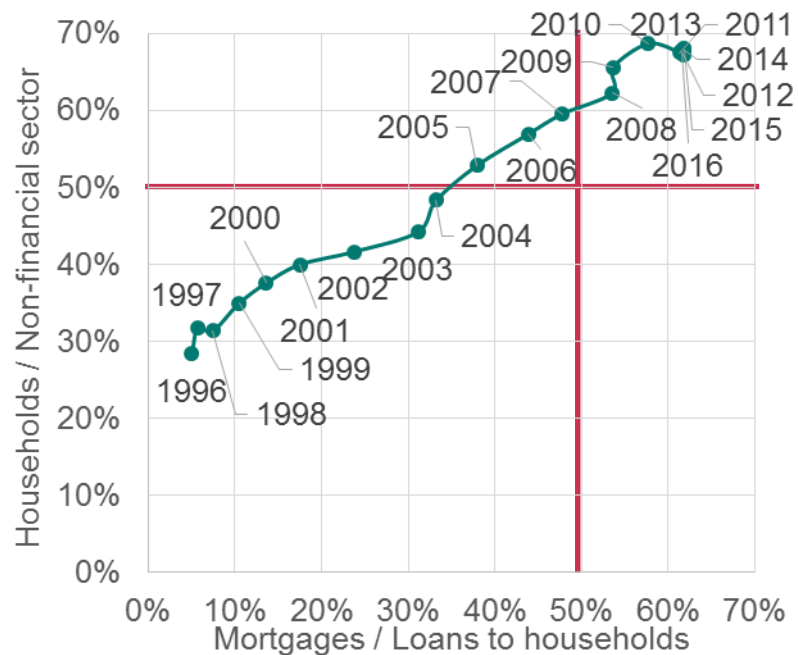
# Motivation (3)



## Poland – bank loan portfolio (NFS)

Source: NBP

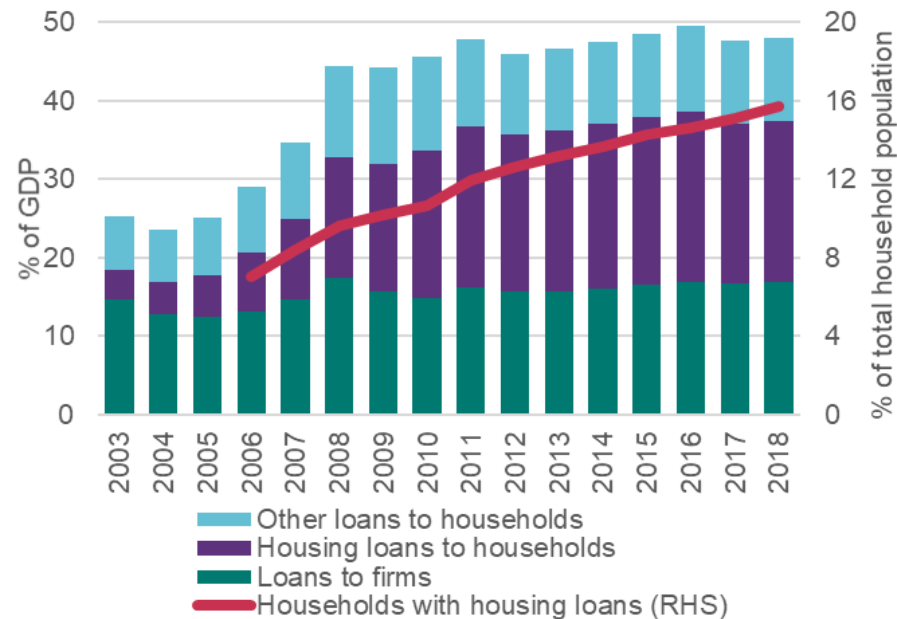
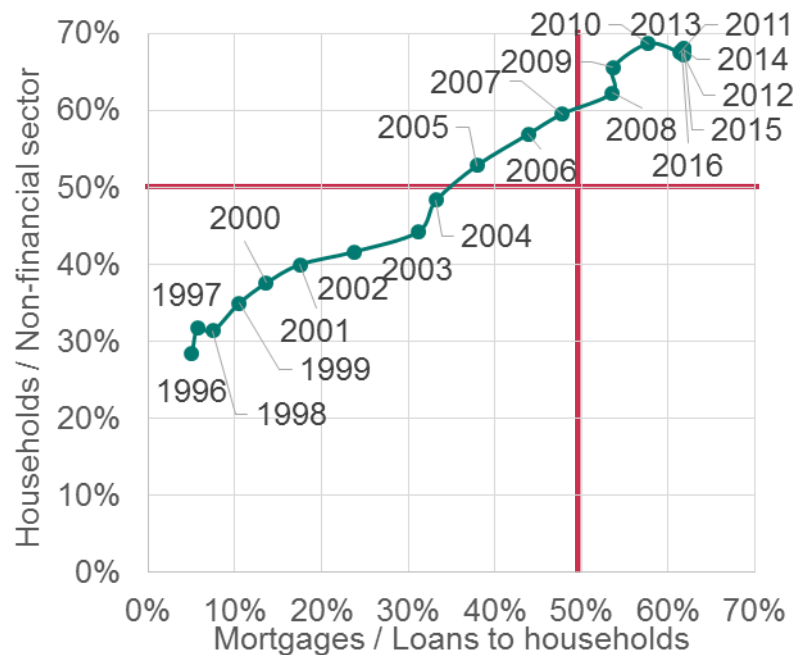
## Motivation (3)



## Poland – bank loan portfolio (NFS)

Source: NBP

# Motivation (3)



## Poland – bank loan portfolio (NFS)

Source: NBP

## Poland – financial deepening

Source: NBP and AMRON-SARFIN

# General setup (1)

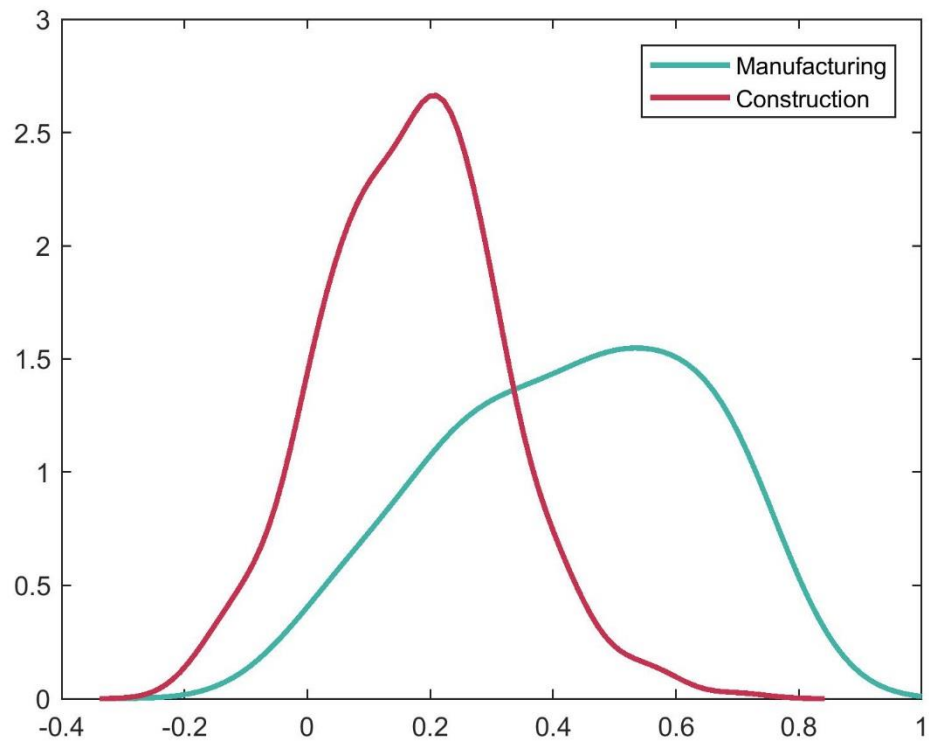
- A simple framework for portfolio choice in cross-border banking
- Two countries (**home** and **host**)
  - In this presentation: host as an emerging economy
- Two sectors (**tradable** and **non-tradable**)
- Tradable sectors correlated, non-tradable sectors not correlated
- Possible interpretation: non-tradable sector related to construction / real estate activities (including mortgage lending)



## General setup (2)

- Incentives of bank shareholders and management aligned
- Bank from the home country considering expansion into host country
  - Possibly higher profits
  - Diversification
  - Branch/cross border operations or subsidiary
  - FX risk fully hedged
- Bank decisions based on return on equity (leverage and limited liability)
- Other stakeholders might be concerned with return on assets
- Public authorities burdened with negative externalities of bank failure (if losses exceed equity)

# Intra-industry correlations, EU countries



# General correlation structure

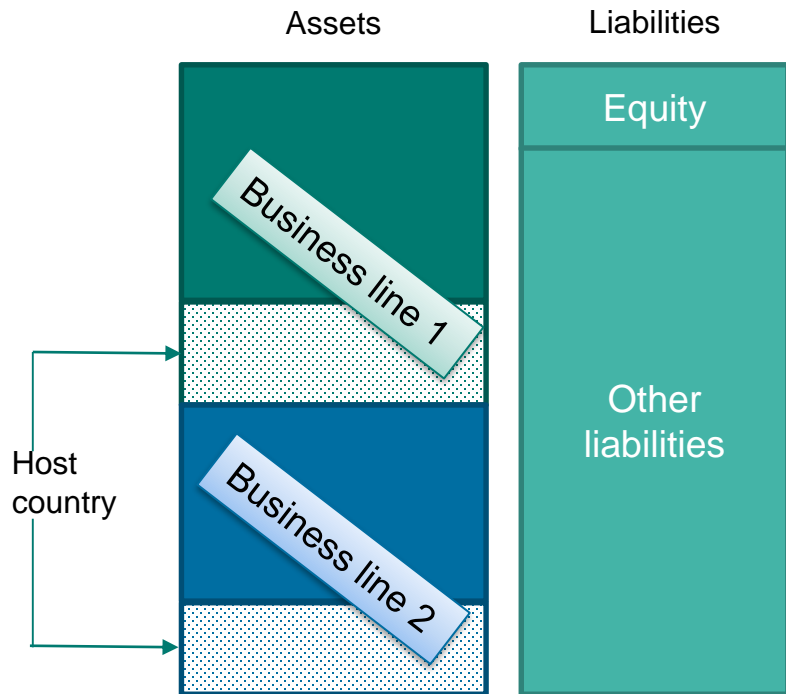
	Tradable – home	Non-tradable - home	Tradable - host	Non-tradable – host
Tradable – home	1	>0	>>0	~0
Non-tradable – home	>0	1	~0	~0
Tradable – host	>>0	~0	1	>0
Non-tradable – host	~0	~0	>0	1

Note: “~0” – no correlation, “>0” – low positive correlation, “>>0” – high correlation

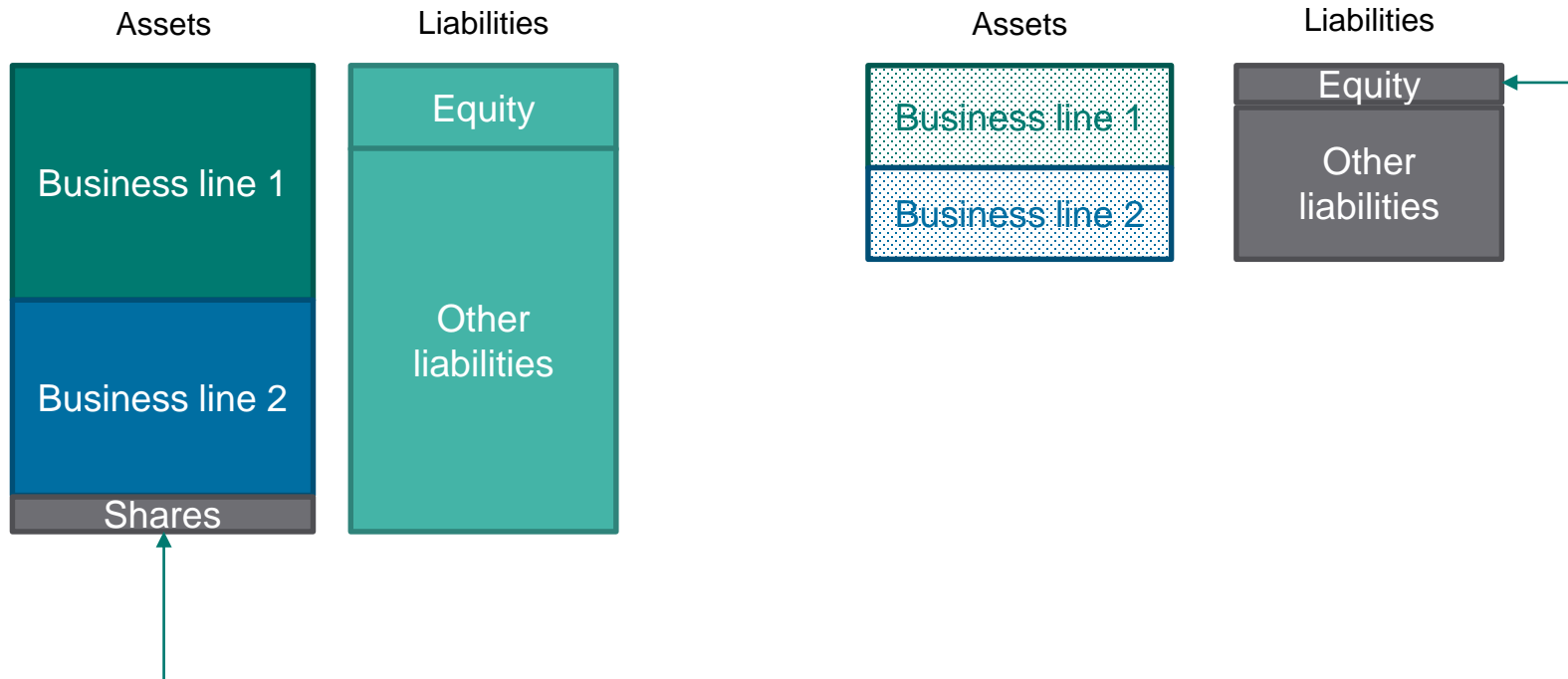
# Bank's decision problem

- Bank allocates resources into business lines
- Returns for business lines defined in return on assets (RoA) terms
- Funding, operational costs, liquidity buffers etc. implicitly assigned to business lines
  - No need to separately model assets and liabilities
  - No risk free asset as a separate business line
- Skewed RoA distribution
- Foreign operations funded locally (except for equity)
- No FX risk for foreign operations
- Bank optimizes Sharpe ratio for return on equity (RoE)
  - Limited liability of shareholders
  - Subject to default probability and leverage constraints
  - Main qualitative results robust to other specifications

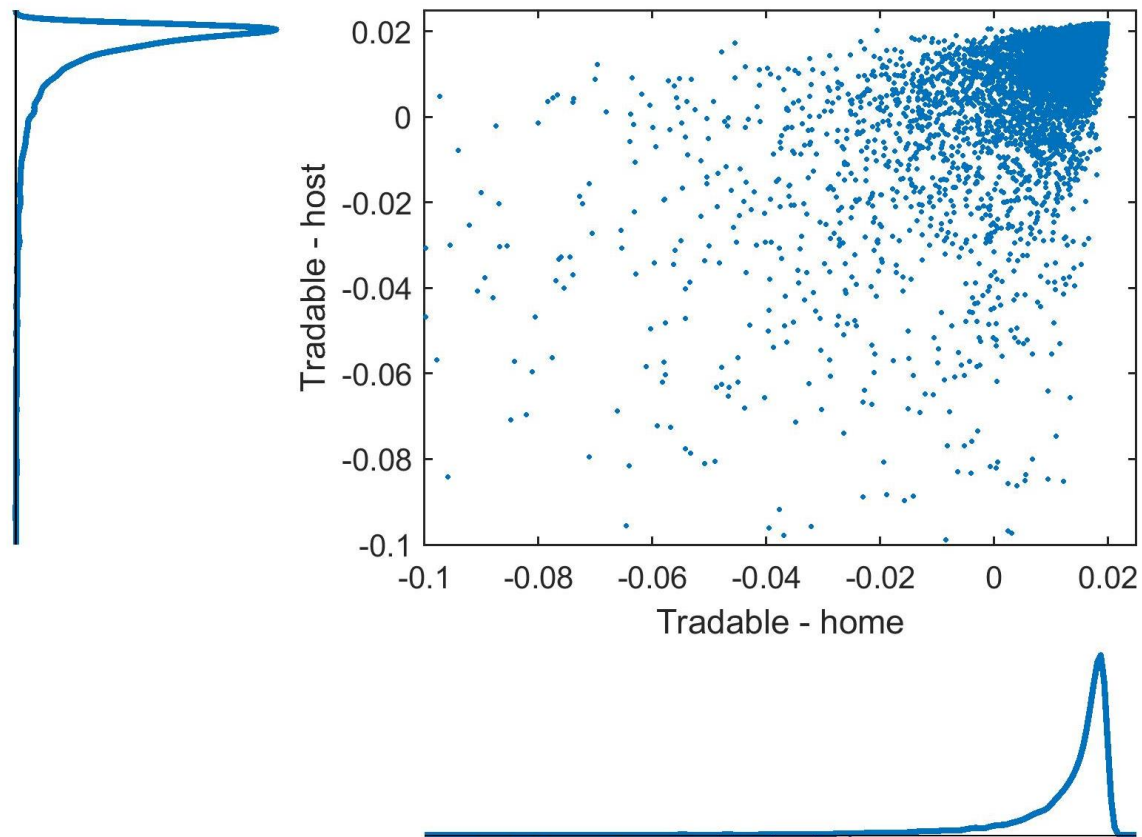
# Branch / cross border banking



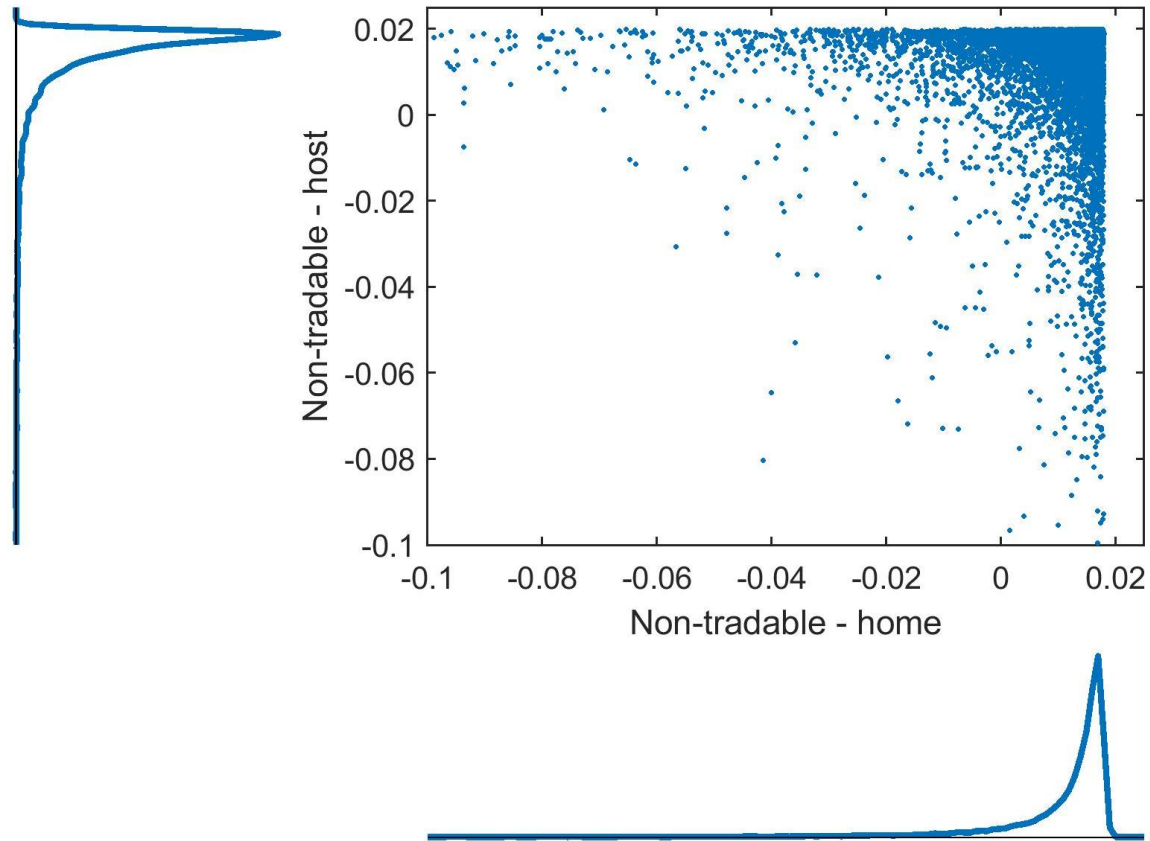
# Subsidiary (with limited liability)



# Simulation – tradable sectors



# Simulation – non-tradable sectors





# Bank's optimisation problem (with a branch)

- $RoE = \frac{\max(-equity_{total}, r_T p_T + r_{NT} p_{NT} + r_T^* p_T^* + r_{NT}^* p_{NT}^*)}{equity_{total}}$
- $\max \frac{E(RoE)}{\sigma_{RoE}}$ , subject to:
  - $P[(r_T p_T + r_{NT} p_{NT} + r_T^* p_T^* + r_{NT}^* p_{NT}^*) < -equity_{total}] \leq PD_{limit}$
  - $\frac{equity_{total}}{p_T + p_{NT} + p_T^* + p_{NT}^*} \geq leverage_{limit}$
  - $\frac{p_T^* + p_{NT}^*}{p_T + p_{NT}} \leq relative\_size\_limit$

$equity_{total}$  – parent bank equity

$r_T$  – return (RoA) for the tradable good business line

$r_{NT}$  – return (RoA) for the non-tradable good business line

$p_t$  – amount of resources (exposures, assets) allocated to tradable sector business line

$p_{NT}$  – amount of resources (exposures, assets) allocated to non-tradable sector business line

\* denotes host country variables

# Bank's optimisation problem (with a subsidiary)

- $RoE = \frac{\max(-equity_{total}, r_T p_T + r_{NT} p_{NT} + \max(-equity_{host}, r_T^* p_T^* + r_{NT}^* p_{NT}^*))}{equity_{total}}$
- $\max \frac{E(RoE)}{\sigma_{RoE}}$ , subject to:
  - $P \left[ \left( r_T p_T + r_{NT} p_{NT} + \max(-equity_{host}, r_T^* p_T^* + r_{NT}^* p_{NT}^*) \right) < -equity_{total} \right] \leq PD_{limit}$
  - $P \left[ \left( r_T^* p_T^* + r_{NT}^* p_{NT}^* \right) < -equity_{host} \right] \leq PD_{limit}$
  - $\frac{equity_{home}}{p_T + p_{NT}} \geq leverage_{limit}$
  - $\frac{equity_{host}}{p_T^* + p_{NT}^*} \geq leverage_{limit}$
  - $\frac{p_T^* + p_{NT}^*}{p_T + p_{NT}} \leq relative\_size\_limit$

# Regulators' loss functions (expected externality given default)

- Home, branch scenario:

$$E \left[ \begin{array}{l} r_T p_T + r_{NT} p_{NT} + r_T^* p_T^* + r_{NT}^* p_{NT}^* + equity_{total} | \\ (r_T p_T + r_{NT} p_{NT} + r_T^* p_T^* + r_{NT}^* p_{NT}^*) < -equity_{total} \end{array} \right]$$

- Home, subsidiary scenario:

$$E \left[ \begin{array}{l} r_T p_T + r_{NT} p_{NT} + \max(-equity_{host}, r_T^* p_T^* + r_{NT}^* p_{NT}^*) + equity_{total} | \\ (r_T p_T + r_{NT} p_{NT} + \max(-equity_{host}, r_T^* p_T^* + r_{NT}^* p_{NT}^*)) < -equity_{total} \end{array} \right]$$

- Host, subsidiary scenario:

$$E[r_T^* p_T^* + r_{NT}^* p_{NT}^* + equity_{host} | (r_T^* p_T^* + r_{NT}^* p_{NT}^*) < -equity_{host}]$$

## Parameterization – RoA for business lines

	Mean (%)	Standard deviation (p.p.)	1 <sup>st</sup> percentile (%)	5 <sup>th</sup> percentile (%)	Loss probability (%)
Tradable – home	1.0	2.2	-7.15	-1.68	11.7
Non-tradable – home	0.9	2.1	-6.71	-1.55	11.7
Tradable – host	1.1	2.3	-7.60	-1.83	11.7
Non-tradable – host	1.0	2.2	-7.15	-1.69	11.7

## Parameterization – correlation

	Tradable – home	Non-tradable - home	Tradable - host	Non-tradable – host
Tradable – home	1	0.15	0.65	0
Non-tradable – home	0.15	1	0	0
Tradable – host	0.65	0	1	0.15
Non-tradable – host	0	0	0.15	1

# Independently constructed portfolios

	Home only	Host only
Tradable – home	52.52	0.00
Non-tradable – home	47.48	0.00
Tradable – host	0.00	45.45
Non-tradable – host	0.00	54.55
Leverage	5.40	5.68
Default probability	0.98	0.99
Mean ROA	0.95	1.05
Std. dev. ROA	1.61	1.71
Sharpe ratio for ROA	59.16	61.03
1 <sup>st</sup> percentile ROA	-5.32	-5.64
Exp. externality given default	-10.08	-10.37
Mean ROE	18.53	19.21
Std. dev. ROE	22.17	22.66
Sharpe ratio for ROE	83.61	84.78
1 <sup>st</sup> percentile ROE	-98.55	-99.34

## Portfolio optimized from home country shareholders perspective

	Home only	Host only	Branch	Subsidiary
Tradable – home	52.52	0.00	40.11	44.25
Non-tradable – home	47.48	0.00	39.57	35.40
Tradable – host	0.00	45.45	3.21	1.77
Non-tradable – host	0.00	54.55	17.11	18.58
Leverage	5.40	5.68	5.35	5.90
Default probability	0.98	0.99	0.66	0.55
Mean ROA	0.95	1.05	0.98	0.98
Std. dev. ROA	1.61	1.71	1.34	1.35
Sharpe ratio for ROA	59.16	61.03	72.87	72.80
1 <sup>st</sup> percentile ROA	-5.32	-5.64	-4.17	-4.14
Exp. externality given default	-10.08	-10.37	-9.57	-10.40
Mean ROE	18.53	19.21	18.78	17.02
Std. dev. ROE	22.17	22.66	19.92	18.40
Sharpe ratio for ROE	83.61	84.78	94.28	92.50
1 <sup>st</sup> percentile ROE	-98.55	-99.34	-77.89	-70.24

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## Impact on host country stakeholders

	Host only	Subsidiary
Tradable – home	0.00	0.00
Non-tradable – home	0.00	0.00
Tradable – host	45.45	8.70
Non-tradable – host	54.55	91.30
Leverage	5.68	7.25
Default probability	0.99	0.89
Mean ROA	1.05	1.01
Std. dev. ROA	1.71	2.04
Sharpe ratio for ROA	61.03	49.29
1 <sup>st</sup> percentile ROA	-5.64	-6.74
Exp. externality given default	-10.37	-13.75
Mean ROE	19.21	14.71
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# Policy implications

- Foreign ownership in the banking sector, although clearly beneficial in many aspects, might result in a too concentrated bank loan portfolio
  - Attention needed from host country bank supervisors, regulators, DGS, macroprudential authorities
  - Structure of bank loan supply might be inconsistent with an optimal long-run convergence path
  - Later on, possible challenges for reducing net foreign liabilities
- Not fully aligned incentives for home and host country supervisors and DGSs
  - Justification for supervisors in host countries not comfortable with attempts to supervise cross-border banking group mostly on consolidated basis
  - Local ring-fencing of equity and liquidity is not irrational
- Incomplete banking unions might generate some (unexpected) systemic risks

## Further research

- Banking union – home and host countries with similar characteristics
- Transmission of shocks within group
  - Subsidiaries in two countries
- Additional cost for having too little capital after the shock (near-failures)
  - Dynamic setting
- Portfolios constructed under too optimistic expectations
- Supervisory risk weights vs bank internal models (Basel IV)
- Robustness to parameter changes
- Herd behaviour of bank executives for host country controlled banks



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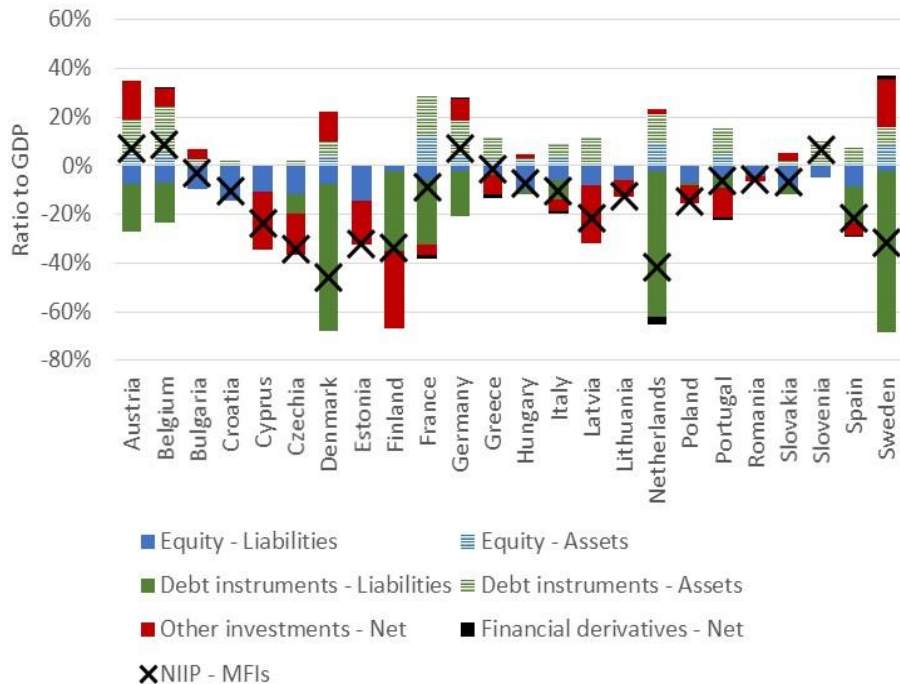
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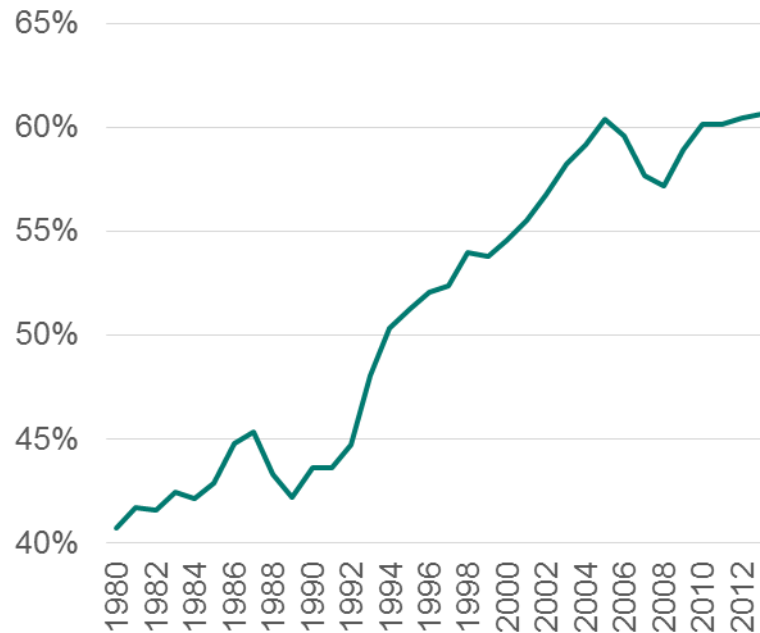
## **Additional slides**

# Motivation (2)



Net international investment position of MFIs

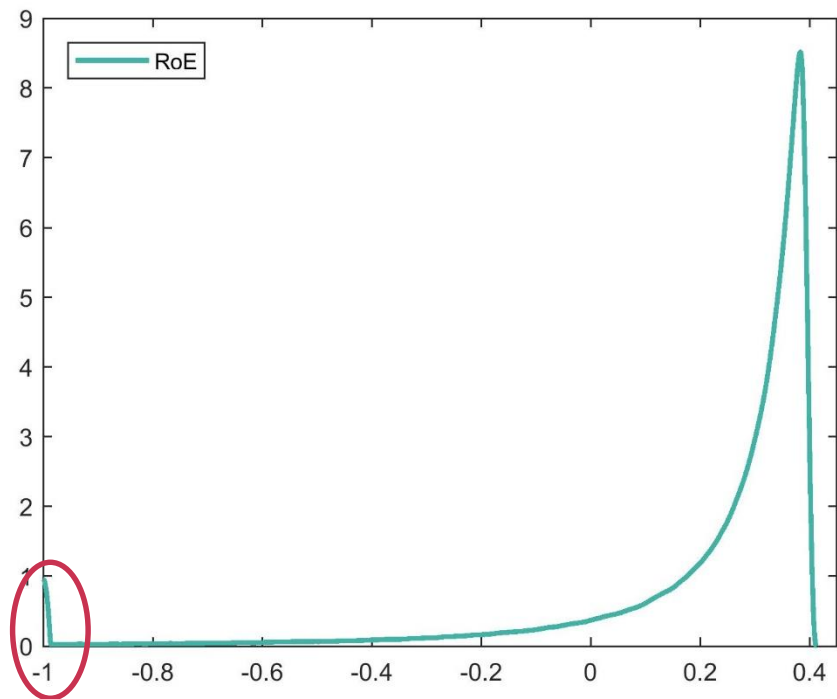
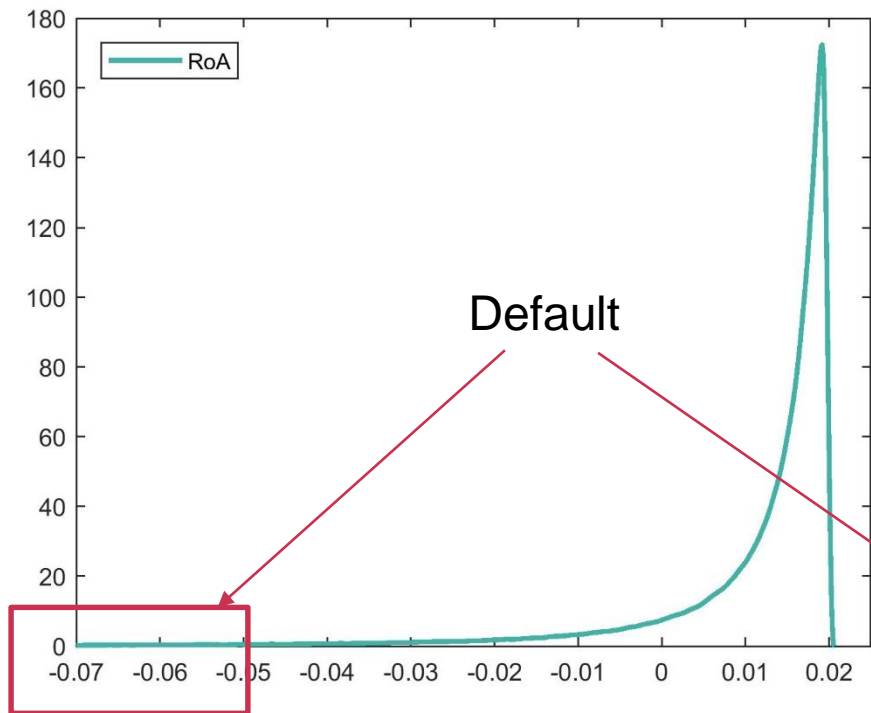
Source: Eurostat



World – mortgages / total loans to NFS

Source: Jordà-Schularick-Taylor Macrohistory Database

# RoA and RoE



## Two banks – possible outcomes

Bank 1  
Bank 2

