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Assessing Household Credit Risk: Evidence from a Household Survey

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Foreign Currency Related Risk Taking
by Financial Institutions, Firms and Households
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Outline

- Motivation
- Stylized facts
- Overview of the employed methodology
- Stress test
- Summary of key results
- Future plans

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Motivation

- Building up a framework suitable for measuring household credit risk and applicable for stress testing
  - Shifting from the „macro" to the „micro" perspective (MNB surveys 2007, 2008)
    - Indicators generated from sectoral-level data may be misleading in terms of the magnitude in risks (disregarding the structure of indebtedness)
    - **From financial stability point of view the financial position of indebted households matter! (debt concentration)**
- Identifying (empirically) the main idiosyncratic driving forces of household credit risk
- Analyzing the shock absorbing capacity of the banking system

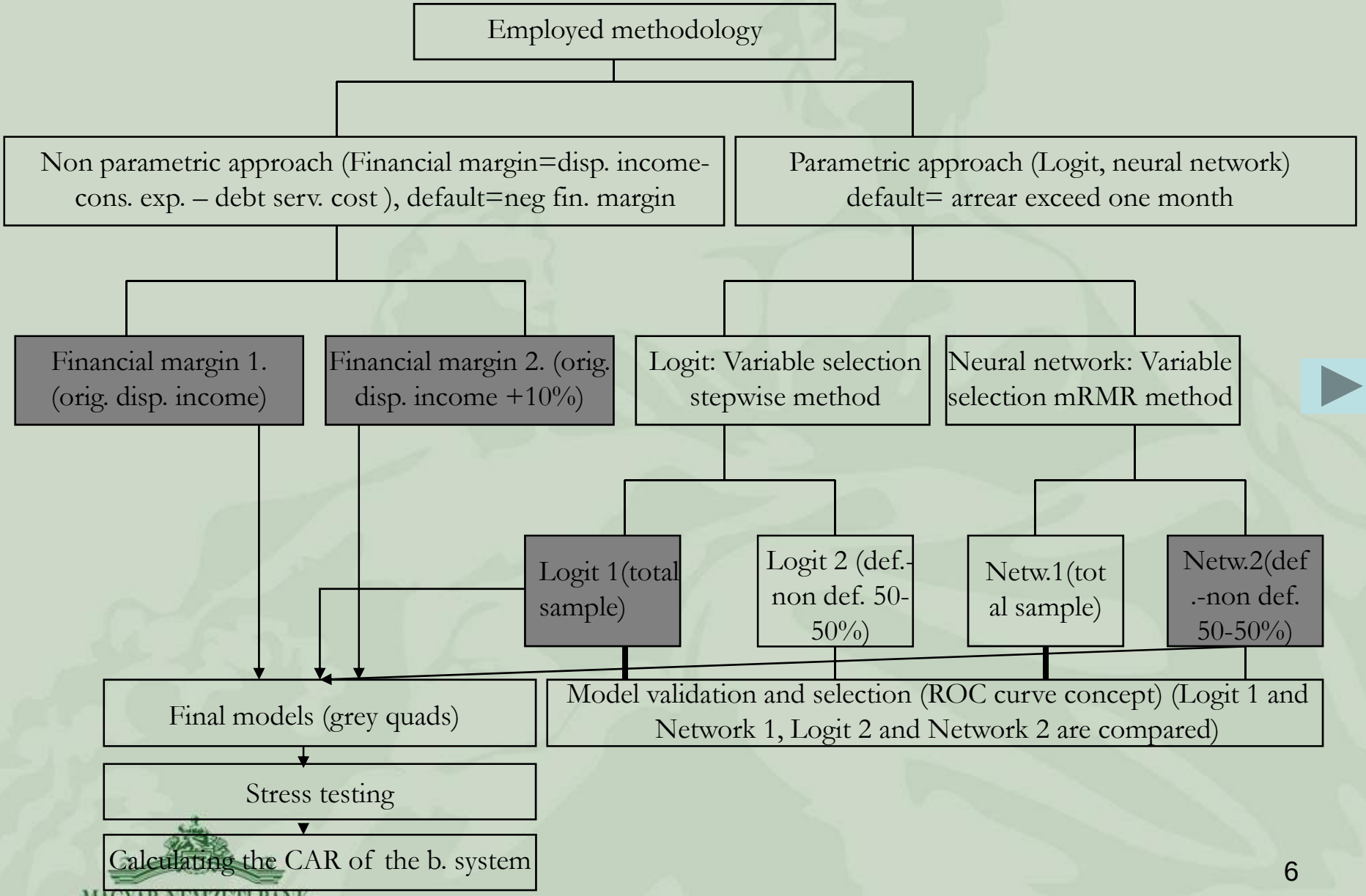
Stylized facts 1.

- Macro (household sectoral level data)
  - Household debt to annual household disposable income ratio is not high compared to developed countries (approx. 40%)
  - Debt servicing burden is approaching the level of developed economies (approx. 10%)
  - Degree of leverage (ratio of debt to financial assets) has increased substantially (1998: 6%, 2006: 26%)
- Micro (data on indebted households (2007))
  - Debt to annual household disposable income ratio is on average 94%
  - Debt servicing burden is on average 18%
  - Amount of loan outstanding is 7.5 times higher than that of financial savings

Stylized facts 2.

- Additional risk factors
  - Growing share of FX debt (households do not have natural hedge, main currency of FX is CHF)
  - Substitution towards FX loans (Does monetary policy matter?)
    - Restrictive domestic M.P. may strengthen substitution → share of FX debt grow further → Unfavorable financial stability consequences (risk transformation)
    - Substitution effects are asymmetric, average substitution effect from domestic to foreign currency loans (1% price increase of HUF denominated loans): 0.28%; average substitution effect from foreign to domestic currency loans (1% price increase of CHF denominated loans): 0.2% (Sample period: March 2004 – August 2007)
    - Asymmetric own-price effects (1% price increase): (-3.78% decline on average in the demand for HUF and -3.55% decline on average in the demand for CHF loans) (Sample period: March 2004 – August 2007)

Overview of the employed methodology



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Stress test 1.

- Key aspects of stress testing
  - Identification of the main vulnerabilities that worsen obligors' payment ability
    - Two main sources of risks were considered that have a greater significance
      - Declining employment, financial shocks (i.e. exchange rate depreciation, domestic and foreign interest rate rise)
  - Identification of the main risk transmission channels through which the banking activity is principally affected
    - income generation risk, funding risk, **credit risk**
  - Measuring the impacts of the selected vulnerabilities on banks' balance sheet

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Stress test 2.

- Assumptions
  - As a result of the shocks neither the volume nor the composition of household consumption changes
  - Households' labor supply remain unchanged
  - No banking adjustment (i.e. banks do not react for increasing losses by curtailing credit supply, or portfolio restructuring)
  - Unemployment risk do not depend on individual factors such as age, qualification etc.
  - One household member looses its job and the worker in question will not find new employment in a one year period
  - Each employee is equally contributed to the household income
- Shocks
  - 3 and 5 percent employment decline→PD, Debt at risk=$\left(\sum_i PD_i * loan_i\right) / \left(\sum_i loan_i\right)$
  - 10, 20, 30 percent exchange rate depreciation a 100, 250, 500 bp increase in the HUF and a 100, 200 bp increase in the CHF interest rates→PD, Debt at risk

Stress test 3.

- Assumptions of capital adequacy calculation
  - Banks' client structure from quality point of view is similar
  - PDs are uniform for all loan types
  - Recovery ratio differs among products (10 percent baseline + varying LGD for mortgages, 50 for car purchase loans and 90 for unsecured loans)
  - The potential losses, based on the most severe stress scenarios (i.e. highest average PD and debt at risk) were calculated by using the final models
  - $Loss_i = PD * EAD_i * LGD$, Profitability is influenced by only in those cases when $Loss_i > LLP_i$ (i denote bank)
  - New capital adequacy ratios of the sector are built as a weighted average of the individual bank's ratios (the weights are the individual banks market share)

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Summary of key results 1.

- Most important idiosyncratic factors of credit risk are the disposable income, the number of dependants, the income share of monthly loan installment and the employment status of the head of the household
- Effects of unemployment and income on the probability of default are monotonically increasing with the number of dependants and the income share debt servicing costs
- Portfolio quality is more sensitive to exchange rate and CHF interest rate movements than to forint yield rise that is due to the denomination and repricing structure of the household loan portfolio

Summary of key results 2.

- The shock-absorbing capacity of the banking sector, as well as individual banks, is sufficient under the given loss rate (LGD) assumptions (i.e. the capital adequacy ratio would not fall below the current regulatory minimum of 8 per cent) even if the most extreme stress scenarios were to occur

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Future plans

- Shifting form the survey to „real" banking retail data (loan application and high frequency behavioral data)
  - The goal is to develop a „global" credit risk model applicable for FS purposes
    - Data allow us to apply a more sophisticated framework (survival analysis), which provide the possibility to directly analyze the evolution of relevant macro factors on portfolio quality
  - Bilateral agreements with banks (joining to the project is voluntary (3 large banks joined so far))
    - Participants get the „total" portfolio and regular analysis of retail market trends
    - Database will be updated once a year
    - Retail panel will contain approx. 600.000 clients and 15.000.000 transactions (Sample period: January 2005 – June 2008)

Thank you for your attention!

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References:

Holló, D., 2007, 'Household Indebtedness and Financial Stability: Reasons to be Afraid?', MNB Bulletin 2007, http://english.mnb.hu/Engine.aspx?page=mnben_mnbszemle&ContentID=10367.

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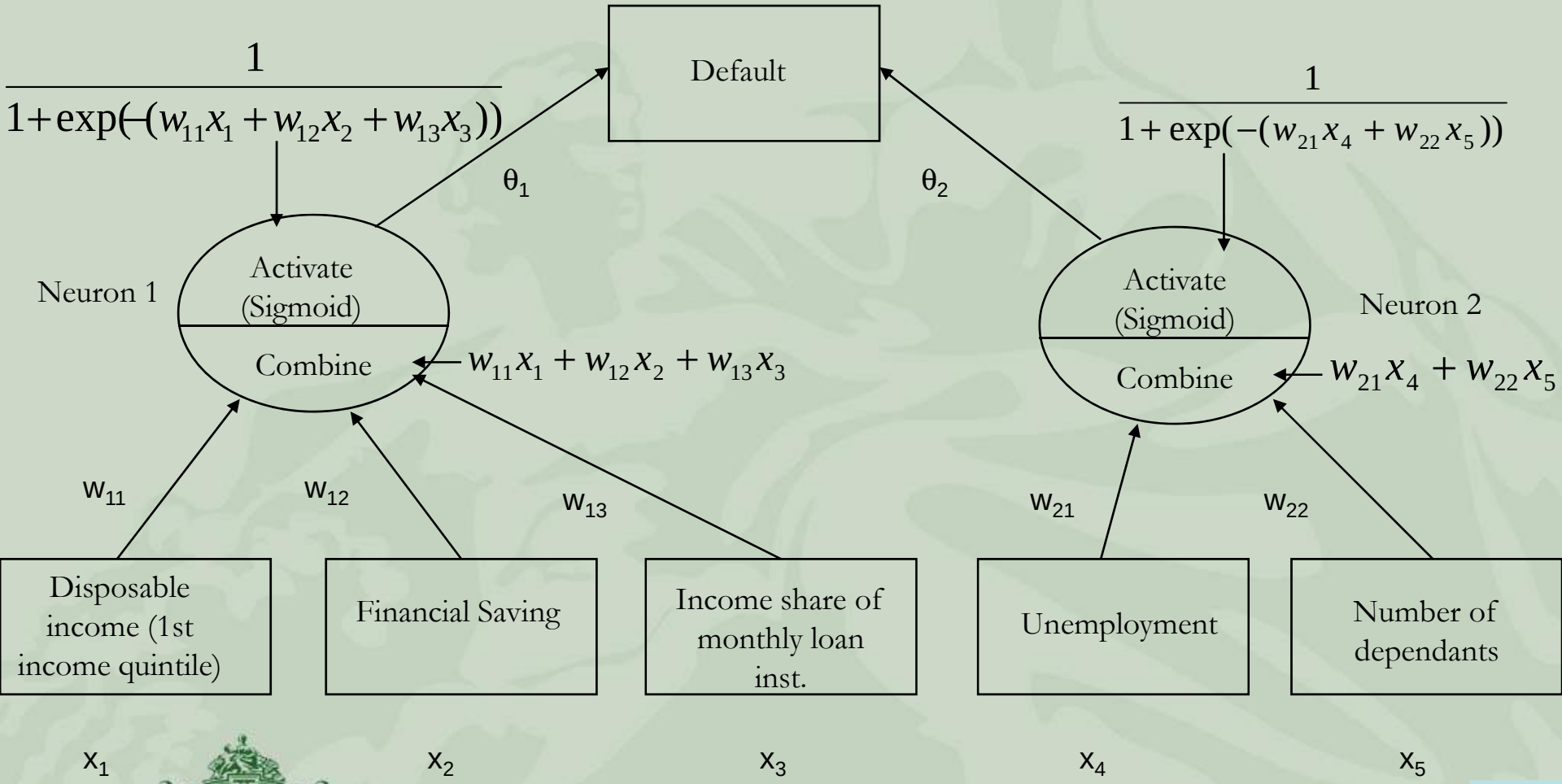
The network architecture

$$y = \theta_0 + \theta_1 \frac{1}{1+\exp(-(w_{11}x_1 + w_{12}x_2 + w_{13}x_3))} + \theta_2 \frac{1}{1+\exp(-(w_{21}x_4 + w_{22}x_5))}$$



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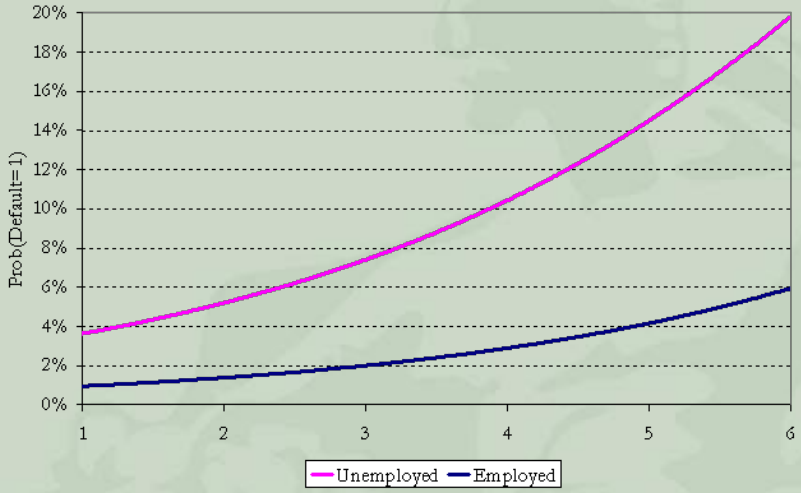
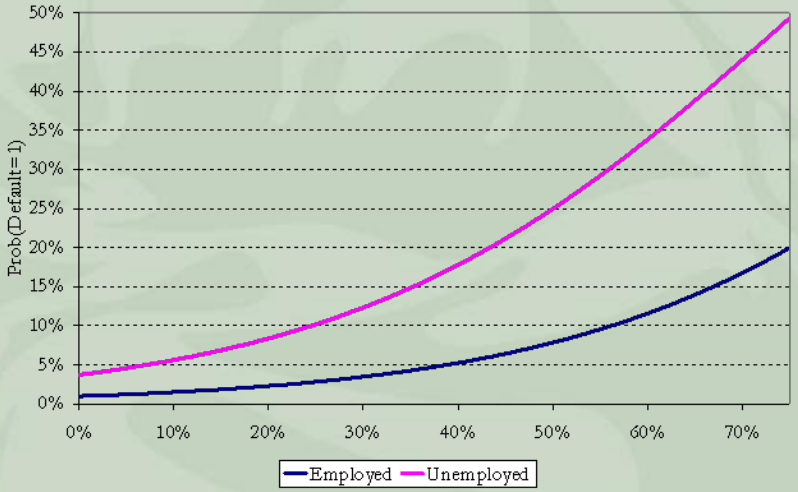
Probability response curves

Probability response curve of unemployment as a function of the number of dependants



Probability response curve of unemployment as a function of the income share of monthly debt servicing cost



Source: own calculations

Reaction of debt at risk to various financial shocks

Debt at risk (non-model based approach)								
	Original income				Original income plus 10 per cent			
CHF interest rate shock: 0								
HUF Interest rate shock/HUF depreciation	0	10%	20%	30%	0	10%	20%	30%
0	12.9%	15.5%	18.1%	21.5%	5.7%	7.8%	9.0%	10.6%
100 bp	13.2%	15.5%	18.1%	21.5%	5.7%	7.8%	9.0%	10.6%
250 bp	14.1%	16.4%	19.0%	22.4%	5.7%	7.8%	9.0%	10.6%
500 bp	14.9%	17.2%	19.8%	23.2%	6.6%	8.8%	10.0%	11.6%
CHF interest rate shock: 200 bp								
HUF Interest rate shock/HUF depreciation	0	10%	20%	30%	0	10%	20%	30%
0	14.3%	17.9%	21.6%	22.8%	7.2%	8.8%	11.3%	12.8%
100 bp	14.6%	17.9%	21.6%	22.8%	7.2%	8.8%	11.3%	12.8%
250 bp	15.5%	18.8%	22.5%	23.7%	7.2%	8.8%	11.3%	12.8%
500 bp	16.3%	19.6%	23.3%	24.5%	8.2%	9.8%	12.3%	13.8%
Debt at risk (model based approach)								
	Logit 1				Network 2			
CHF interest rate shock: 0								
HUF Interest rate shock/HUF depreciation	0	10%	20%	30%	0	10%	20%	30%
0	4.8%	5.1%	5.4%	5.8%	5.5%	5.8%	6.0%	6.3%
100 bp	4.8%	5.1%	5.5%	5.9%	5.5%	5.8%	6.0%	6.3%
250 bp	4.8%	5.2%	5.5%	5.9%	5.6%	5.8%	6.1%	6.3%
500 bp	4.9%	5.3%	5.6%	6.0%	5.6%	5.9%	6.1%	6.4%
CHF interest rate shock: 200 bp								
HUF Interest rate shock/HUF depreciation	0	10%	20%	30%	0	10%	20%	30%
0	5.3%	5.7%	6.2%	6.8%	6.5%	6.8%	7.1%	7.5%
100 bp	5.3%	5.7%	6.2%	6.8%	6.5%	6.8%	7.2%	7.5%
250 bp	5.4%	5.8%	6.3%	6.8%	6.5%	6.9%	7.2%	7.6%
500 bp	5.5%	5.9%	6.4%	6.9%	6.6%	6.9%	7.3%	7.6%

Source: own calculations

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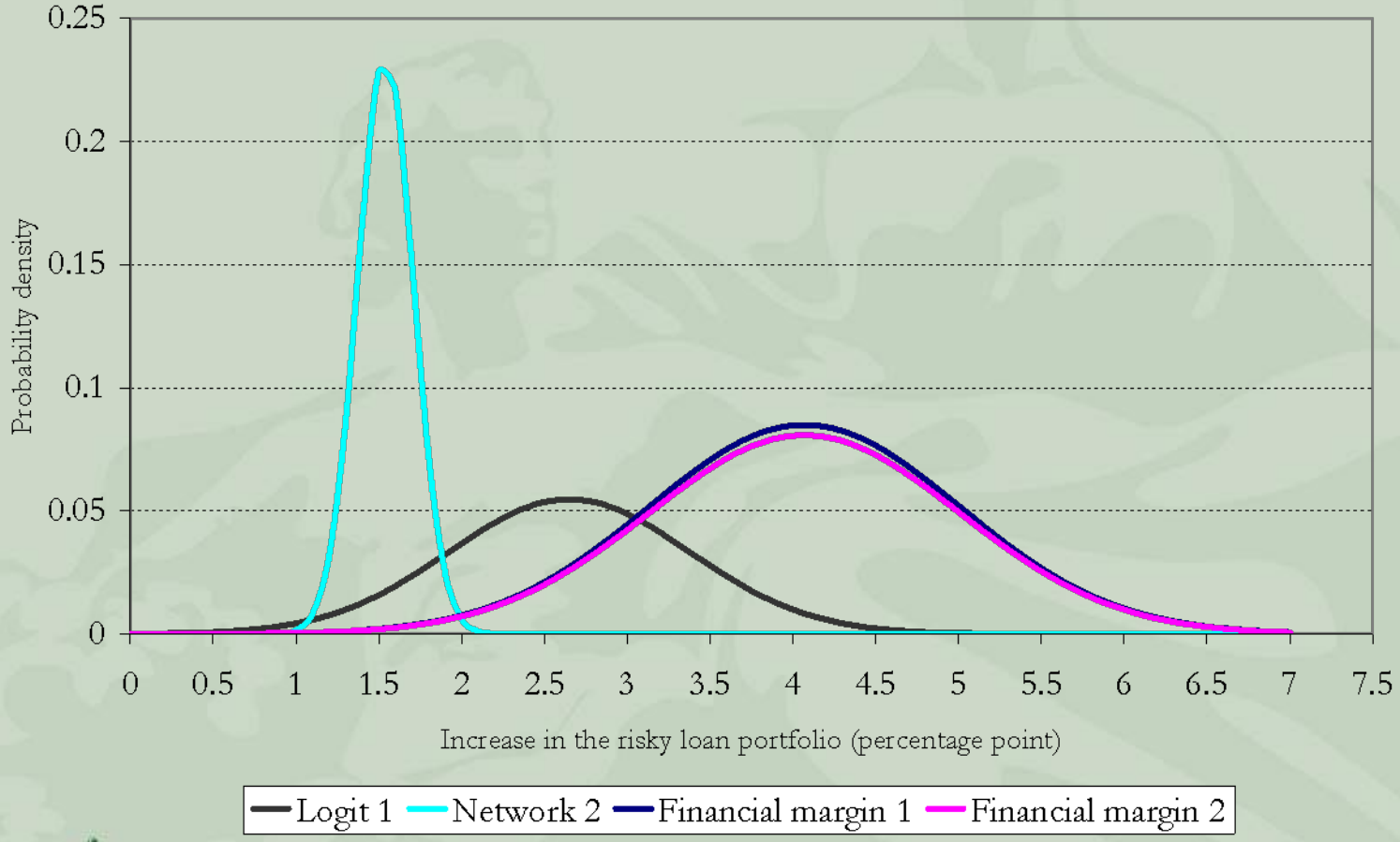
The effect of a 5 percent decline in employment on portfolio quality



Source: own calculations

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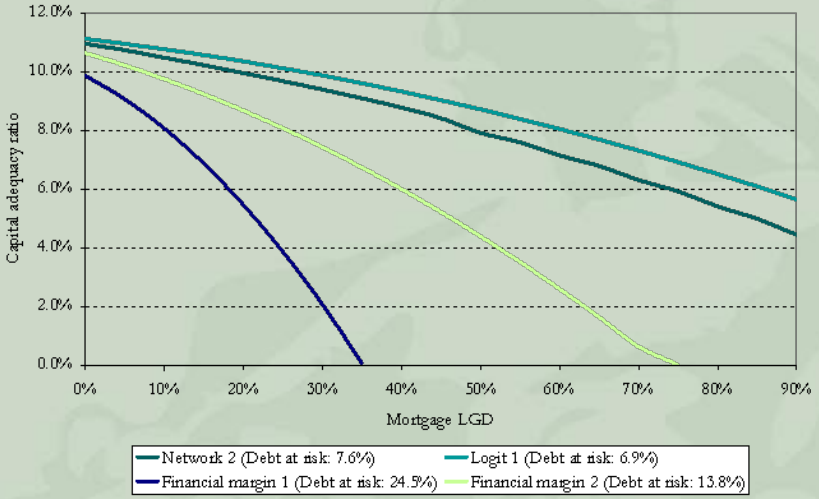
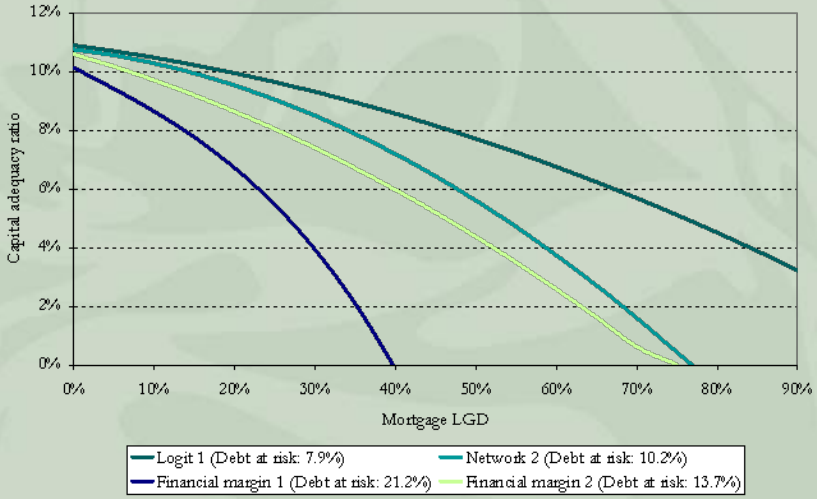
The impact of the most severe shocks on the capital adequacy ratio of the banking system

The impact of the most severe financial shocks (30 percent depreciation 500 bp HUF and 200 bp CHF interest rate rise) on the CAR of the banking system



The impact of the most severe employment shock (5 percent decline) on the CAR of the banking system



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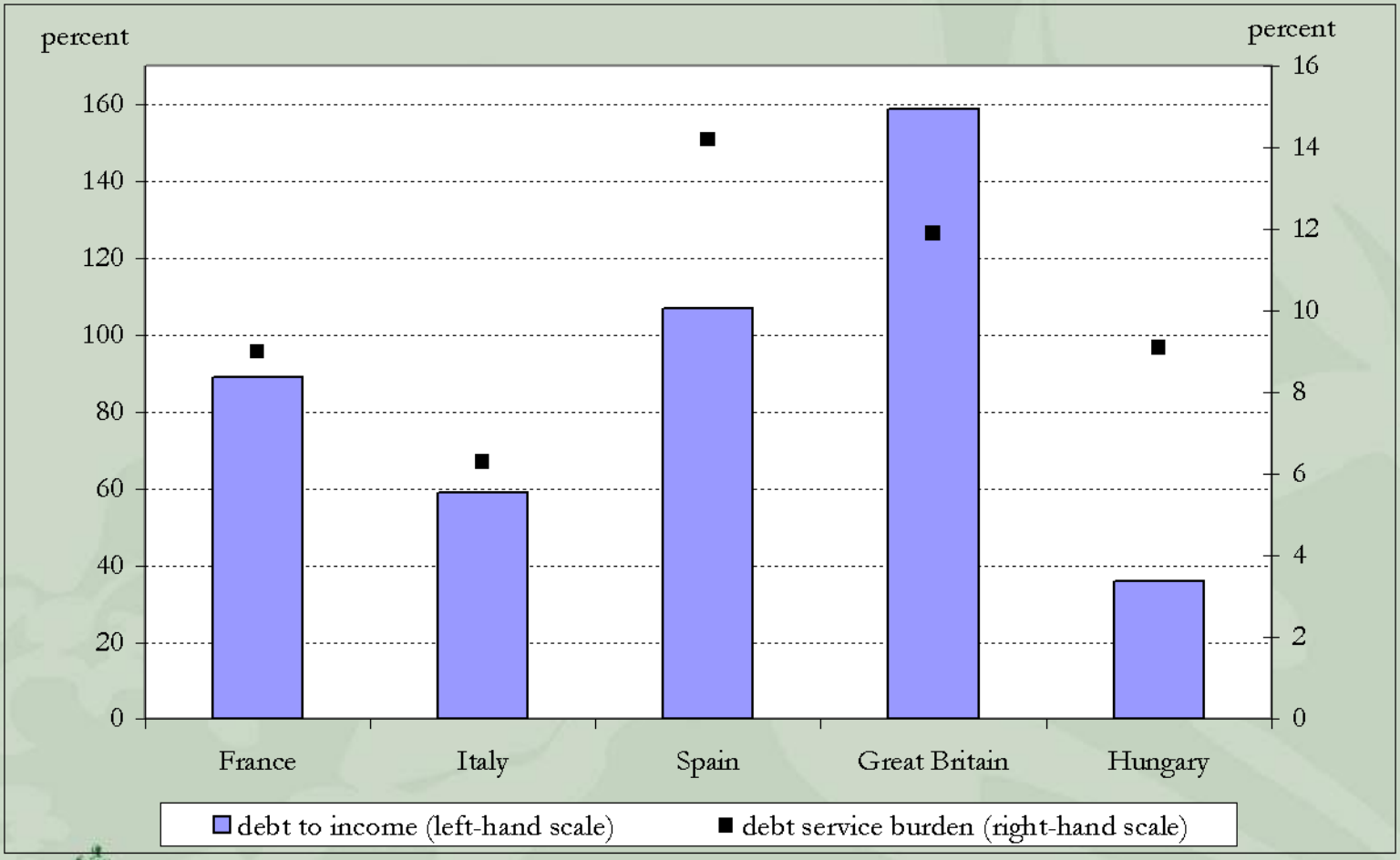
Source: own calculations

Hungarian household indebtedness based on various indicators, in international comparison at end-2006 (sectoral level)



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Source: OECD, MNB

Share of FX and HUF loans as a percentage of total loans to households

Source: MNB, Financial Accounts

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Own- and cross-price elasticities on the Hungarian consumer lending market (median values)

Own- and cross-price elasticities in August 2007		
	Hire purchase loan (HUF short maturity)	Hire purchase loan (HUF max. 5 year maturity)
Hire purchase loan (HUF short maturity)	*-2.30*	**0.46**
Hire purchase loan (HUF max. 5 year maturity)	0.20	*-2.12*
Personal loan (HUF max. 5 year maturity)	0.29	0.27
Overdraft (HUF)	0.32	0.30
Home equity (HUF maturity over 5 years)	0.22	0.20
Home equity (CHF short maturity)	0.40	0.10
Home equity (CHF maturity over 5 years)	0.24	0.21
	Overdraft (HUF)	Home equity (HUF maturity over 5 years)
Hire purchase loan (HUF short maturity)	0.41	0.35
Hire purchase loan (HUF max. 5 year maturity)	0.20	0.17
Personal loan (HUF max. 5 year maturity)	0.30	0.31
Overdraft (HUF)	*-2.23*	0.29
Home equity (HUF maturity over 5 years)	0.21	*-2.37*
Home equity (CHF short maturity)	0.10	0.10
Home equity (CHF maturity over 5 years)	0.22	0.24
	Home equity (CHF maturity over 5 years)	Home equity (CHF max. 5 year maturity)
Hire purchase loan (HUF short maturity)	0.20	0.25
Hire purchase loan (HUF max. 5 year maturity)	0.25	0.30
Personal loan (HUF max. 5 year maturity)	0.21	0.20
Overdraft (HUF)	0.30	0.29
Home equity (HUF maturity over 5 years)	**0.40**	**0.40**
Home equity (CHF short maturity)	**0.51**	0.49
Home equity (CHF maturity over 5 years)	*-1.12*	**0.44**

Source: Holló D. (2008), 'Estimating Price Elasticities on the Hungarian Consumer Lending and Deposit Markets: Demand Effects and its Possible Consequences' (mimeo)

Note: Cell entries i, j, where i indexes row and j column, give the percent change in market share of brand j with a one percent change in price of brand i. The entries represent the median of the individual price elasticities of banks with the selected products in august 2007. The bold numbers in row i and column j denote the strongest demand reaction of the price increase of brand i on brand j. Numbers in italics show the own-price elasticities of the products in the first column.