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The effectiveness of combinations of borrower-based measures: a quantitative analysis for Slovakia

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based on joint work with
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Outline

- **Overview of macroprudential measures in Slovakia**
- **Micro module – data and assumptions**
- **Macro module – the adverse scenario**
- **Counterfactuals and default detection**
- **Key results and implications for actual policy-making process in SK**



Macroprudential measures in Slovakia

Character

Objective

		2014 – 2016 Non-binding recommendation	2017 – 2018 Binding decree	Since mid 2019 Binding decree
Borrower-based measures	Lending practices	<ul style="list-style-type: none"> Max. share of LTV 90+: 10% DSTI limit: 100 % Sensitivity test on IR jump Maturity limits Mandatory annuity repayments 	<ul style="list-style-type: none"> Max. share of LTV 90+: 10% Max. share of LTV 80+: 40% DSTI limit: 80 % Sensitivity test on IR jump Maturity limits Mandatory annuity repayments 	<ul style="list-style-type: none"> Max. share of LTV 90+: 0% Max. share of LTV 80+: 20% DSTI limit: 80 % Sensitivity test on IR jump Maturity limits Mandatory annuity repayments
	Indebtedness			<ul style="list-style-type: none"> DTI limit: 8 (net income) Max. share of DTI 8+: 10%

		2015 – 2016	2017	2018	2019
Capital measures	Resilience	<ul style="list-style-type: none"> SRB + O-SII: 1 – 2% CCyB: 0 % 	<ul style="list-style-type: none"> SRB + O-SII: 1 – 2% CCyB: 0.5 % (since August 1, 2017) 	<ul style="list-style-type: none"> SRB + O-SII: 1 – 2% CCyB: 1.25 % (since August 1, 2018) 	<ul style="list-style-type: none"> SRB + O-SII: 1 – 2% CCyB: 1.5 % (since August 1, 2019)

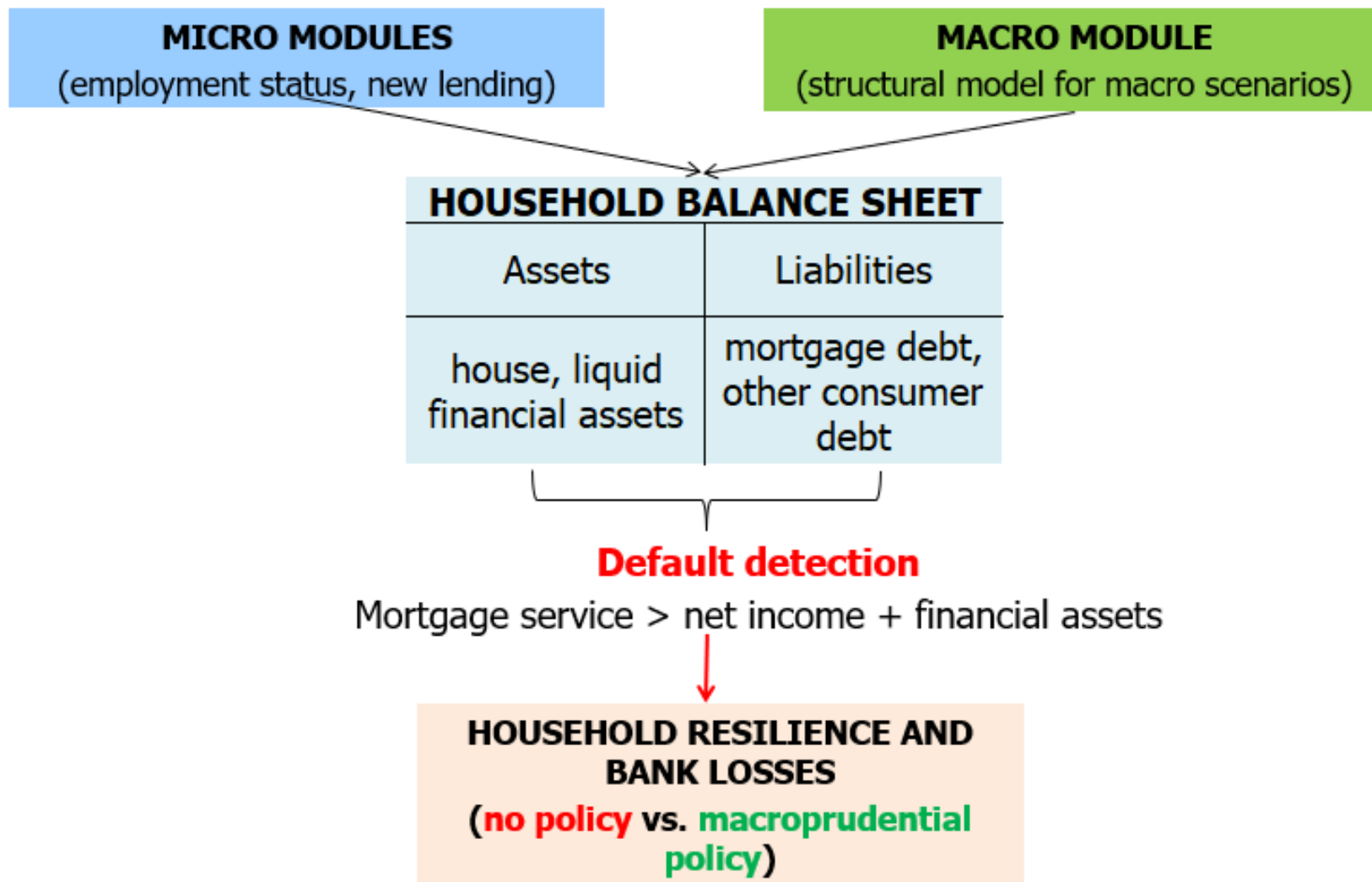


Main objective and broad overview

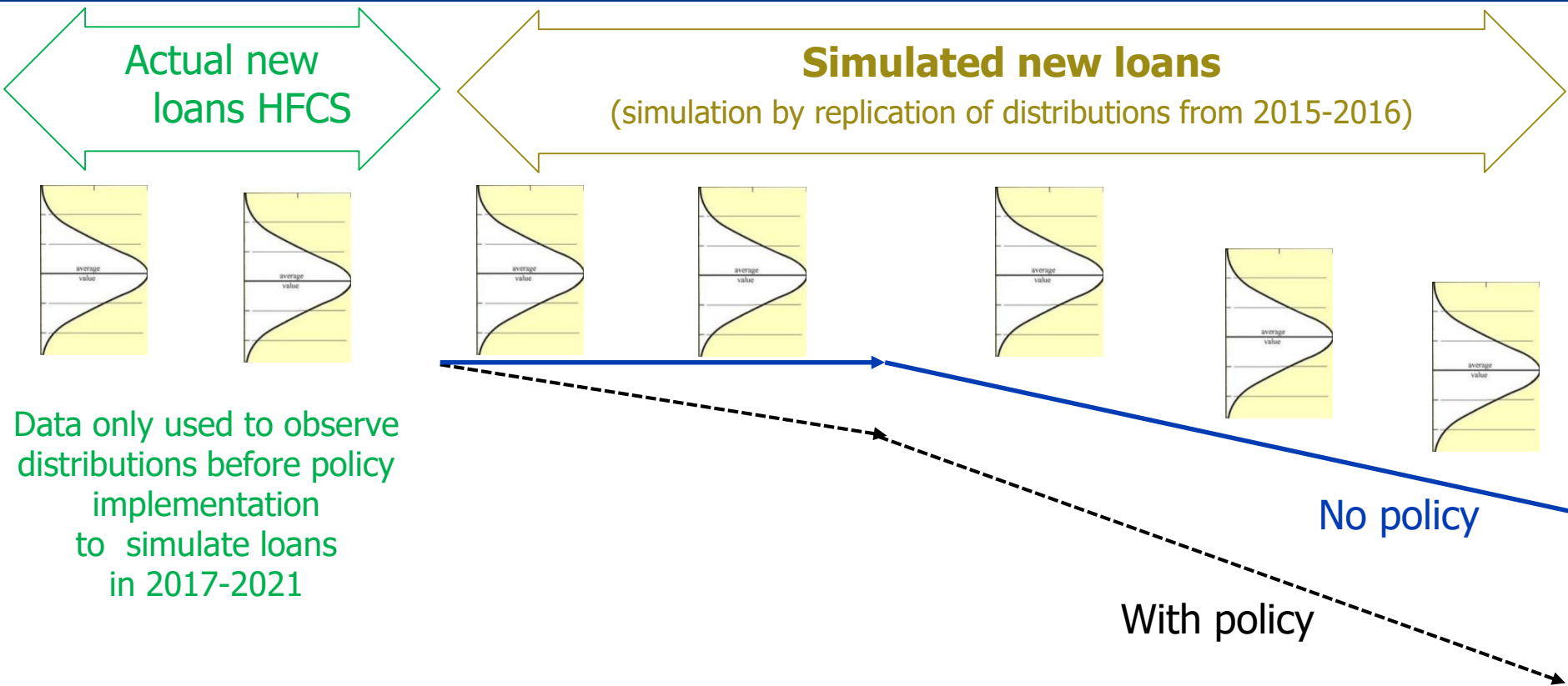
- Estimate the effect of BBMs on increase in the resilience in an adverse scenario
 - Effect on banks (losses and capital adequacy ratios)
 - Effect on households (share of defaulted loans)
- **Reference framework:** empirical micro-macro with dynamic household balance sheets (Gross and Poblacion 2017)
- Combination of Household Finance and Consumption Survey (HFCS) with macroeconomic time series
- Modular structure
- Combined effect of the policy mix, while assessing the size of transmission channels of individual measures
- Role of timing of the measure (before crisis)



Adaptation of original framework



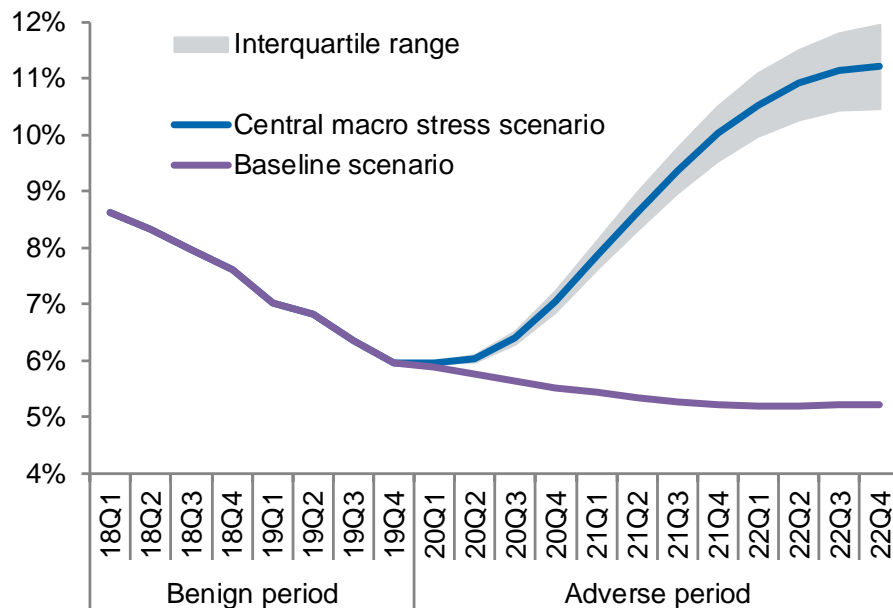
Counterfactual new loan simulation



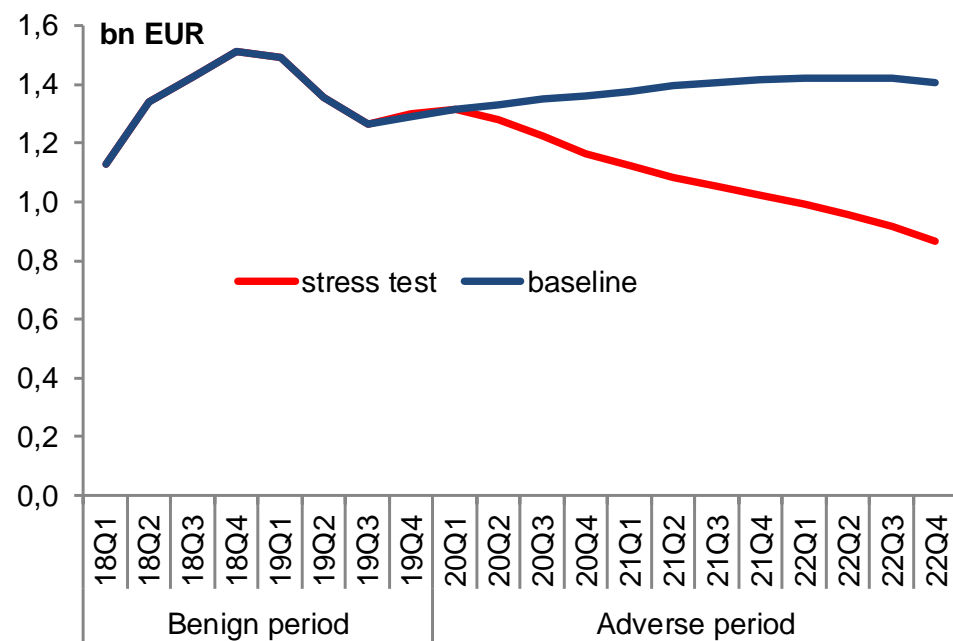
Macroeconomic module

- VECM generating **adverse macroeconomic scenario**
- Multiple **unemployment** paths
- Common parameters: house price decline and income decline

Unemployment rate



Mortgage lending growth (new lending)



Default detection

	P ₂ stays employed	P ₂ becomes unemployed
P ₁ stays employed	Situation: s ₁ Probability: (1-PU _{h,1,t}) × (1-PU _{h,2,t}) Income: income ₁ + income ₂	Situation: s ₃ Probability: (1-PU _{h,1,t}) × PU _{h,2,t} Income: inc ₁ + b _t × inc ₂
P ₁ becomes unemployed	Situation: s ₂ Probability: PU _{h,1,t} × (1-PU _{h,2,t}) Income: b _t × inc ₁ + inc ₂	Situation: s ₄ Probability: PU _{h,1,t} × PU _{h,2,t} Income: b _t × (inc ₁ + inc ₂)

Unemployment benefit $b_t = \begin{cases} 0.75 \text{ during the first six months,} \\ 0 \text{ later.} \end{cases}$

Liquidity gap $Gap_{h,t}(s_j) = (\text{Income}_{h,t}(s_j) - \text{Total payments}_h - 0.5 \times \text{Living min.}_h)^+$.

Default indicator: $D_h(s_j) = \begin{cases} 1 \text{ if } \sum_{t=1}^{18} Gap_{h,t}(s_j) > FA_h, \\ 0 \text{ if } \sum_{t=1}^{18} Gap_{h,t}(s_j) \leq FA_h. \end{cases}$

$$PD = \sum_j \text{Prob}(s_j) \times D(s_j)$$

LGD = Mortgage outstanding at default – value of the house + admin. costs



Steady state impact of combined measures

Median scenario	Without measures	With measures	Difference
Exp. loss (€ mil)	62	38	-39%
Loss rate	0.30 %	0.20 %	-0.1 pp
LGD	19%	13%	-6 pp
PD	1,68	1,61	-0.07 pp
NPL ratio	1.56 %	1.52 %	-0.04 pp
New loans (€ bln.)	20,70	18,70	-10%

Source: Authors' calculations.

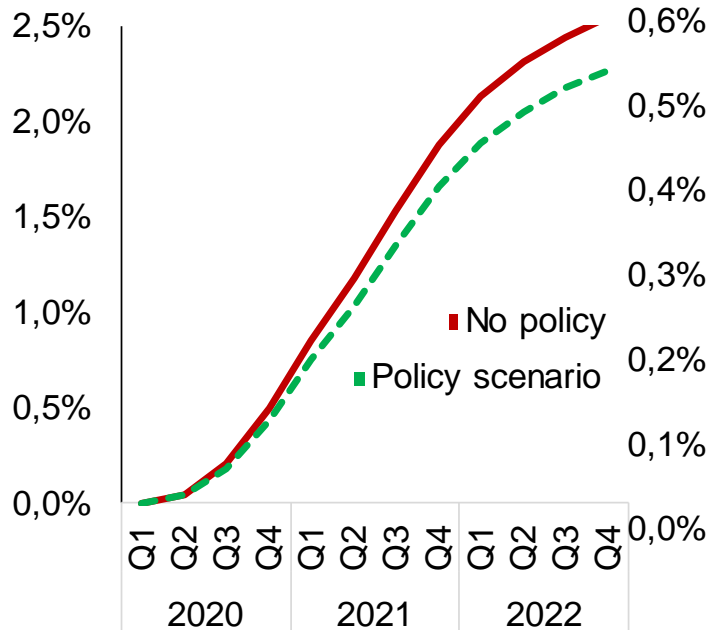
Note: The values show the median scenario results cumulatively over the whole stress period (2020–2022) for new loans provided in the years 2018 to 2022.



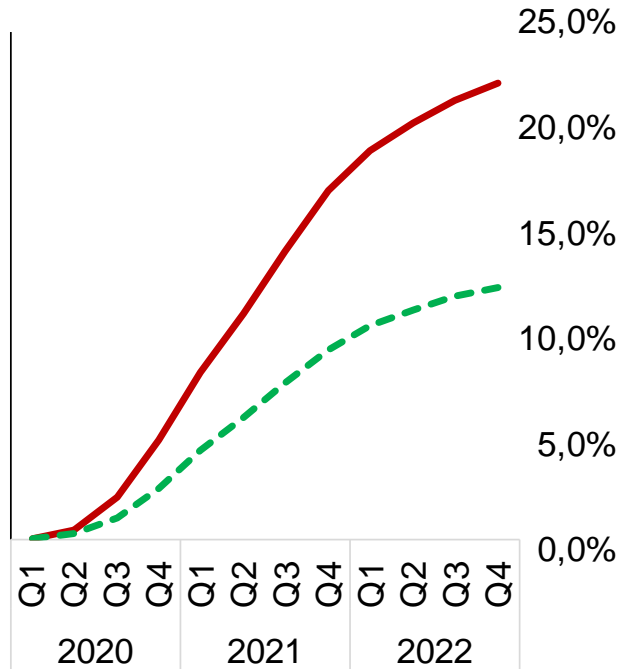
Results: impact on resilience over time

Evolution of simulated PDs, loss rates and LGDs over time

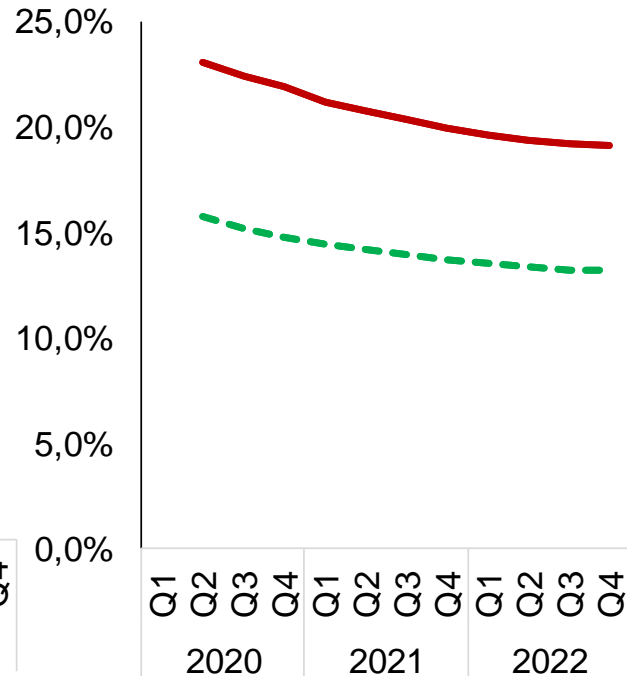
Probability of default



Loss rate



Loss given default

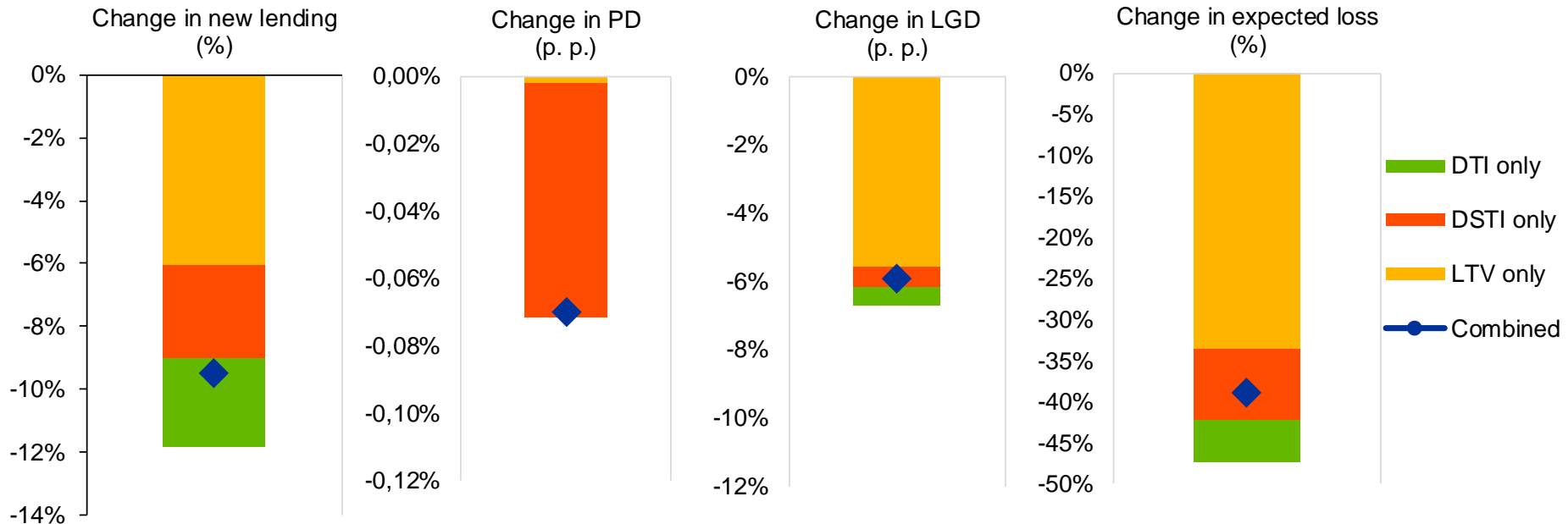


Source: Authors' calculations



Results: relative impact on resilience

Contribution of borrower-based measures to decrease in new lending and to increased resilience over the adverse period



Note: The decomposed impact does not always equal the joint impact because some loans are affected by multiple limits, but the combined impact only represents the limit with the most significant impact.



Sensitivity analysis to key assumptions

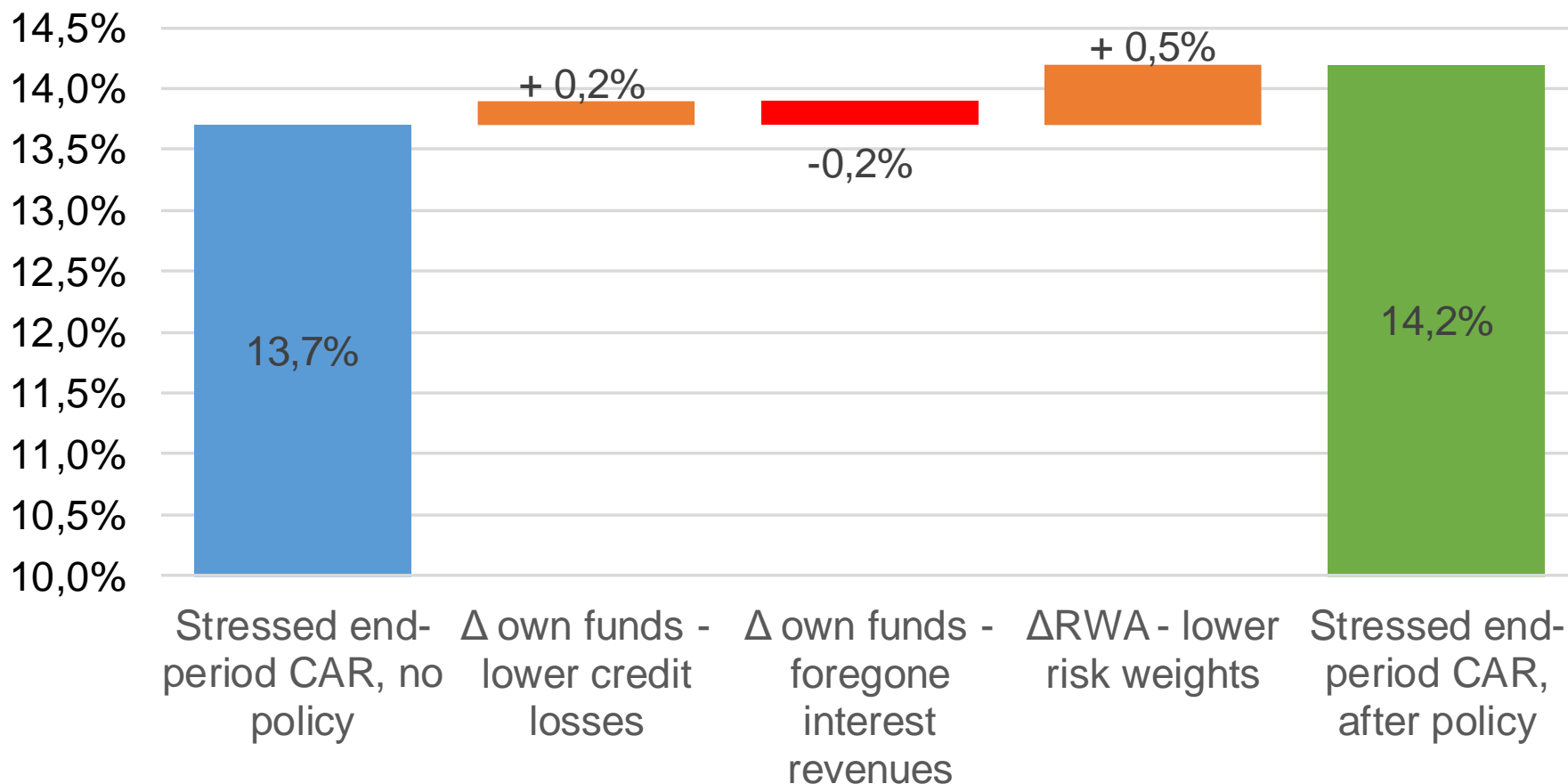
Assumption	Included in the original model?	Change in loss rate
Help from other HHMs (adding income of HHMs who are not mortgage borrowers)	No	-0.10 pp
Ability to shrink living costs to ½ of subsistence minimum	No	-0.09 pp
Inability to use of HH's financial assets to cover drop in income	Yes	0.06 pp
Inability to reduce debt service by maturity extension	Yes	0.04 pp

Source: Authors' calculations



The interaction with capital measures

Impact of borrower-based measures on bank capital adequacy



Source: Authors' calculations



Using the framework for policy

Currently, this method is being implemented within in NBS as the main framework for policy reference

- Assessment of policy effectiveness on both banks (via losses and CAR) and households (via PDs)
- Calibration of potential policy changes

Main extentions:

- Implemented on a full dataset of loan level data
- Added module for consumer loans and default cascade rules



Using the framework for policy

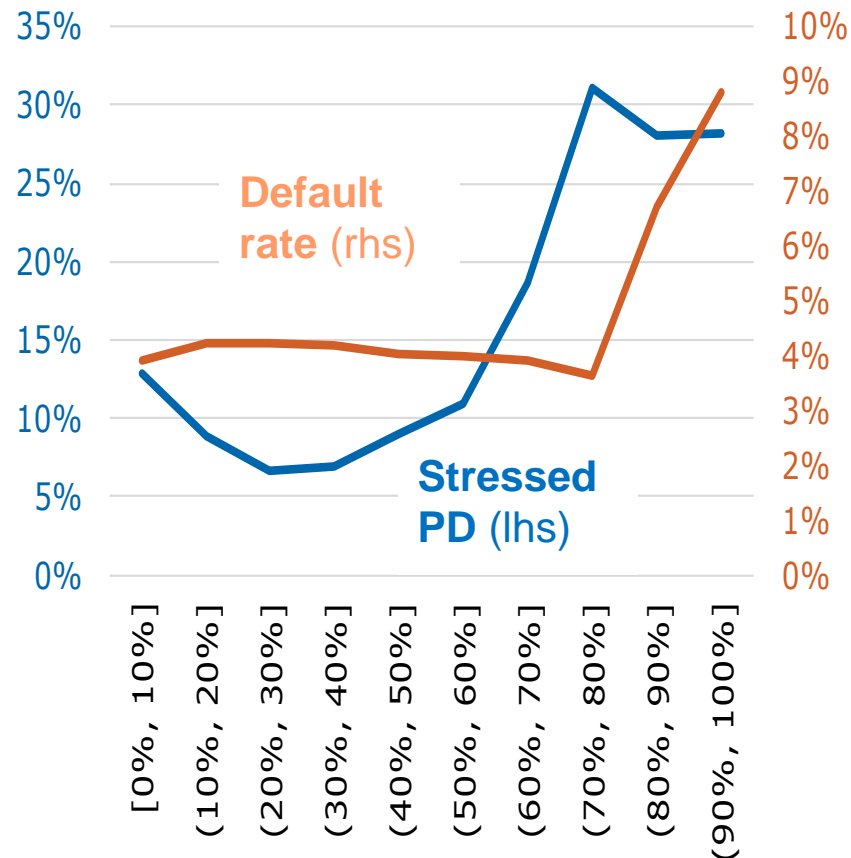
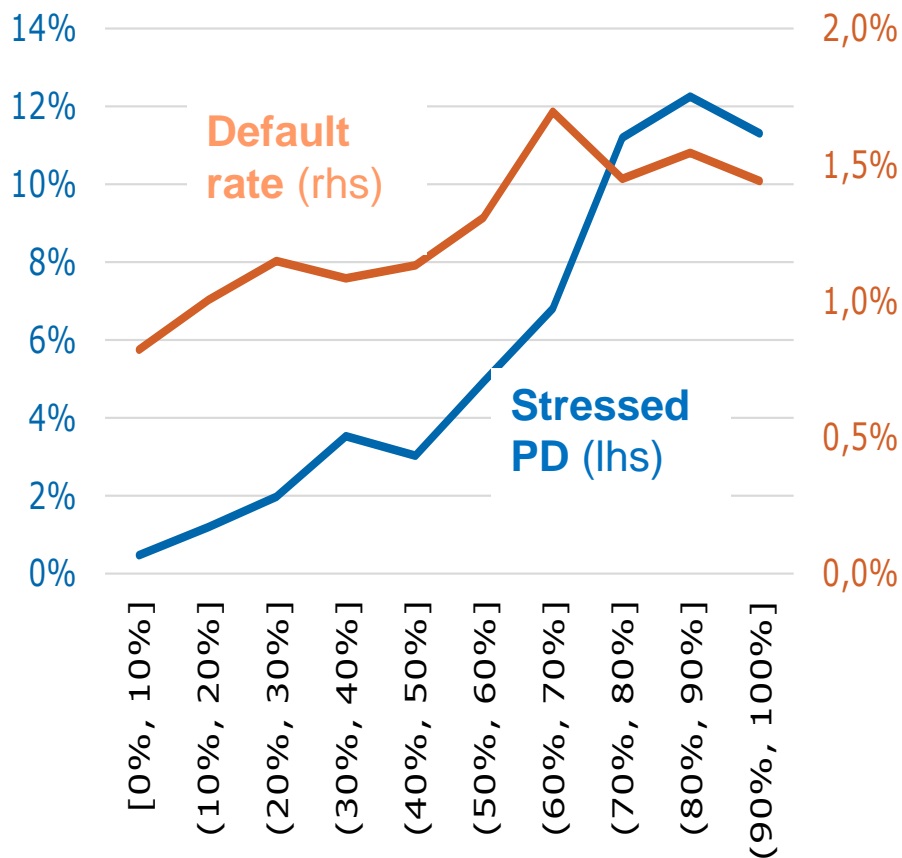
Main benefits:

- ✓ Allows for impact assessment of very specific measures (conditional limits, formula adjustments)
- ✓ Provides the policymakers with a unified forward looking risk indicators for new loans
 - Reveals future credit risk hidden by a historically good economic environment
 - Combines many layers of risks – clients characteristics, economic situation, RRE market, room for maturity extension, help from family...
- ✓ Allows us to focus on loan segments with the highest risk
 - Scewer vs hammer
- ✓ Assessment of transmission channels of various types of instruments, individually or marginally (in combination)



Using the framework for policy

Impact of DSTI on default rates and estimated stressed PDs



Source: NBS



Conclusions

- **Integrated micro and macro approach essential for BBM assessment**
- **Combination of BBMs materially increases resilience to macro shocks**
- **Individual BBMs tend to complement each other via different channels**
- **BBM resilience benefits more significant if measures implemented early on and may create “capital savings”**



Thank you

