Research at the CNB: Evolution, Current Challenges, and Future Directions

Simona Malovaná
Director of Financial Research Division

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Agenda

- Objectives and the Role of Research
- Evolution of Research at the CNB
- The Impact on Decision Making
- Current Challenges and Ongoing Projects
- Future Directions

Czech National Bank: Objectives and Tasks

Act No. 6/1993 Coll.: *"The primary objective of the Czech National Bank shall be to maintain price stability. In addition, the Czech National Bank shall work to ensure financial stability and the safe and sound operation of the financial system in the Czech Republic."*

- Three main policy groups:
  - Monetary policy
  - Macroprudential policy (implementing regulations to address systemic risks)
  - Microprudential policy (supervision of individual financial institutions)

The Role of Research at Central Banks

Research at central banks serves to support their primary tasks.

- Policy support: Evidence-based analysis and recommendations for monetary, macroprudential, and microprudential policies.
- Economic forecasting: Models for short- and long-term economic forecasting to inform policy decisions.
- Financial stability: Assess financial markets, institutions, and regulations to identify risks and propose strategies.
- Economic behavior: Investigate the behavior of economic agents to better inform policy actions.
- Knowledge dissemination: Share research findings with policymakers, academics, and the public.
- Collaboration: Work with other central banks, international organizations, and academia to exchange ideas and best practices.

II. Evolution of Research at the CNB

History of Research Organization at the CNB

Year	Organization form	Management and supervision
2000	Economic Research Unit	Managed and overseen by Governor
2001	Economic Research Department	Managed by Executive Director and overseen by Governor
2004	Newly established Financial Stability Unit becomes part of Economic Research Department	Managed by Executive Director and overseen by Governor
2007	Economic Research and Financial Stability Department	Individual management of the two activities, which share joint administrative infrastructure; overseen by board member
2010	Financial Stability Department split off and Economic Research Department becomes autonomous again	Managed by Executive Director and overseen by board member
2017	Economic Research Department divided into Economic Research Division within Monetary Department and Financial Research Unit within Financial Stability Department	Economic Research Division managed by division director and Financial Research Unit by department director; overseen by two different board members
2019	Financial Research Unit "upgraded" to Financial Research Division	Both research divisions managed by division directors; overseen by two different board members

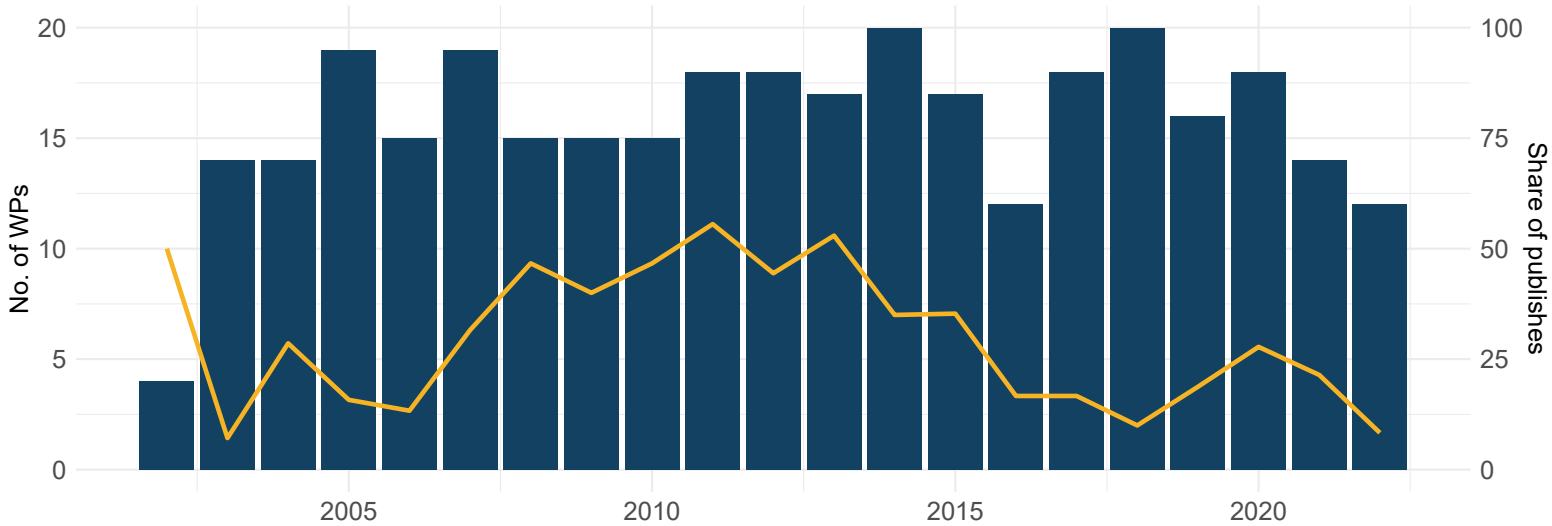
Current Organisation: Strengthening Policy Connections

- Since 2017, research at the CNB has been restructured to strengthen the link between research and policy and increase the flexibility of the research process.
- Research coordinated by two divisions:
  - Economic Research Division (Monetary Department)
  - Financial Research Division (Financial Stability Department)
- Both divisions contribute to policy discussions, fostering interaction between central bank policies.
- Each division consists of five researchers.
- Research internship program for junior researchers (graduate level and Ph.D. students).
- Annual Research Open Day and awards for best paper and referee report.

CNB Research Publications

- Over 330 research papers (WPs and RPNs) were published by CNB from 2002 to 2022.
- Around 30% of the papers were published in peer-reviewed journals.

Fig. Number of WPs (left axis) and Share of Published Papers (right axis)



Evolution of CNB Research Topics

- Long-term emphasis on policy and model-based analysis.
- CNB research has shifted focus after the Global Financial Crisis towards financial risks and macroprudential policy.

Fig. Word Clouds of Keywords

2002–2007

2008–2022

III. The Impact on Decision Making

Monetary and Macroprudential Policy Cooperation

- Cooperation on multiple levels – policy, analytical, and research.
- Monetary and financial stability departments exchange information before policy meetings.
  - Collaboration on analyses (satellite models, stress testing, scenario analysis, etc.).
- Both departments prepare briefing materials for each other's policy meetings and attend the meetings.
  - Includes complementary monetary policy or macroprudential policy recommendations.
- Monetary policy and financial stability issues discussed during both meetings.
- Significant role of research and research divisions.

Selected Recent Papers Expanding the Analytical Toolkit: Stress Testing

- Plašil (2021) introduces the Czech National Bank's satellite model framework for consistent macroprudential stress-testing, better communication, and robustness to structural changes.
- Siuda (2020) presents a simulation framework for stress testing non-financial corporations, capturing macroeconomic developments and providing reliable industry-level outputs for analysis and policy evaluation.
- Panoš and Polák (2019a) introduces a computing-driven stress-testing approach using constrained Bayesian model averaging, addressing model uncertainty and ensuring robust and prudential modeling.
- Panoš and Polák (2019b) discusses integrating IFRS 9 accounting standard into a macroprudential stress-testing framework, highlighting data challenges, key assumptions, and the pro-cyclicality of the IFRS 9 approach.

Selected Recent Papers Expanding the Analytical Toolkit: Macro-financial Linkages

- Časta (2021) introduces a model for calculating implied equity risk premium and decomposing stock price movements into individual components.
- Franta (2023) highlights the advantages of multiple-output quantile regression for macroeconomic analysis and systemic risk forecasting, guiding policy responses.
- Časta (2022) presents a reduced-form error correction model for forecasting nominal exchange rates using corporate loans, demonstrating predictability and emphasizing their role in exchange rate movements.

Selected Recent Papers Expanding the Analytical Toolkit: Forecasting and Counterfactual Analysis

- Adam et al. (2021) introduces the Rushin, a weekly Czech economic activity index for real-time monitoring, nowcasting, and identifying economic turning points.
- Ambriško (2022) explores using timely fiscal data in nowcasting macroeconomic variables for the Czech Republic, improving forecasting accuracy and incorporating daily data via STL decomposition.
- Brázdik et al. (2020) presents CNB's new core forecasting model, g3+, maintaining forecasting performance and introducing a new approach for conditional forecasts.
- Audzei and Brůha (2022) presents a model for the euro area, US, and China, showing no long-run benefits from tariffs, with impact dependent on import/export link strength.

IV. Current Challenges

Current Challenges and Ongoing Projects

- Monetary Policy and Financial Stability
- Central Banks and Inequality
- Green Transition and Climate Risks

On Today's Program:

- Macroprudential Transmission (capital requirements, borrower-based limits)
- Meta-Analysis in Economics and Finance
- CNB Core Macroeconomic Models for Forecasting and Policy Analysis
- Labor Market and Inflation

Monetary Policy and Financial Stability

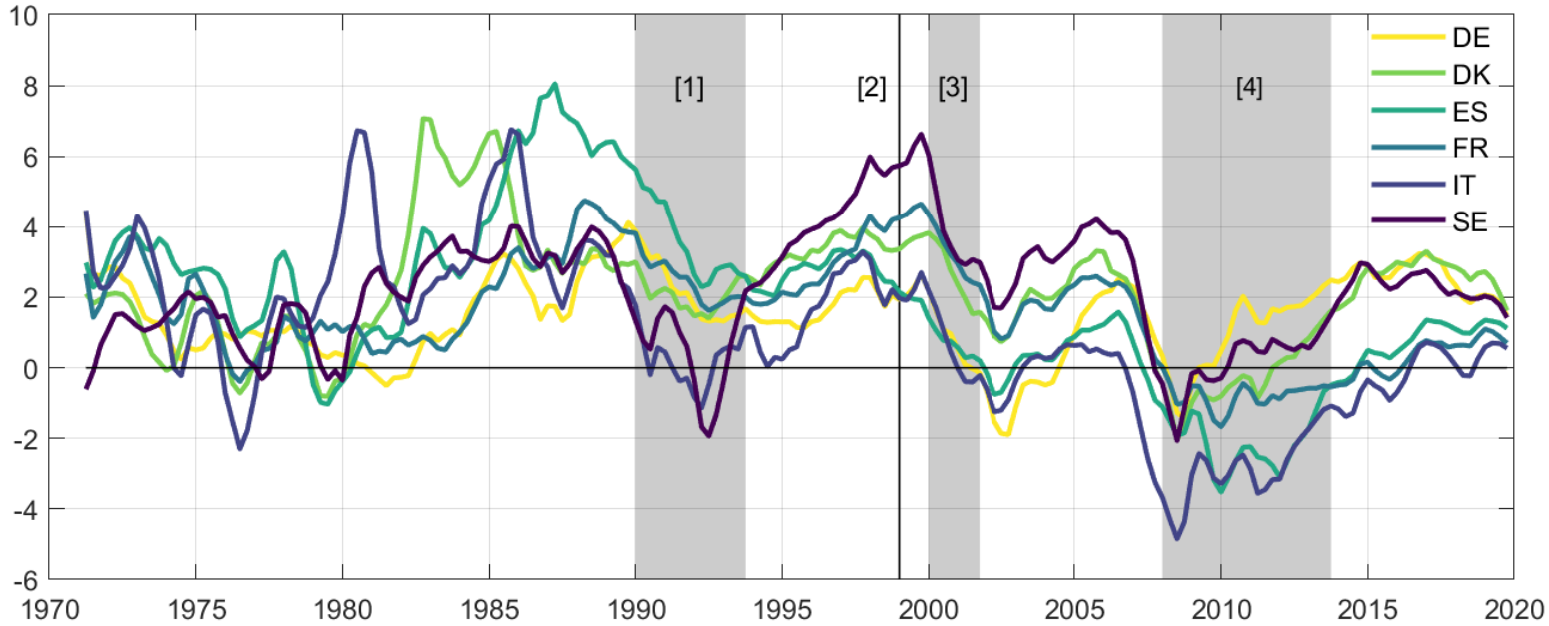
Financial Vulnerabilities Fuelled by LIRE

Broad category	Subcategory
Excessive credit growth and leverage	1. Overindebtedness and excessive debt service burdens of non-financial private sector (corporations and households) 2. Excessive leverage of banks / low capitalization in relation to assets 3. Excessive securitisation and use of special purpose vehicles / rapid increase in banks' off-balance sheet 4. Regulatory (capital) arbitrage and leakages 5. Excessive leverage of non-banking financial institutions 6. Use of derivatives to mimic leverage
Misvalued price of risk	7. Deteriorating underwriting standards 8. Changes in portfolio quality 9. Compressed risk premiums on credit 10. Compressed risk premiums in various asset classes (equities, bonds, real estate) 11. Compressed term premiums 12. Undervalued risk parameters used to calculate regulatory capital requirements (PD, LGD)
Excessive maturity mismatch and market illiquidity	13. Excessive use of short-term or floating rate debt by non-financial sector 14. Excessive lengthening of the asset maturities 15. Lower liquidity and solvency of insurance companies and pension funds
Misaligned incentives and moral hazard	16. Moral hazard of high deposit banks with lower equity 17. Moral hazard of friendly corporate governance 18. Moral hazard in repo contracts with negative rates 19. Excessive size of financial institutions bearing critical functions (TBTF)
High interconnections and exposure concentration	20. Rapid increase in common asset holdings / highly correlated risks in balance sheets 21. Higher interconnections between financial sectors of advanced and emerging market economies 22. Excessive size of CCPs coupled with riskier activities conducted by members and inadequate risk management 23. Shift from a banking-based financial system towards capital markets

Source: Malovaná et al. (2023a)

Finance-Neutral Natural Rate and Macro-Financial Linkages

- Laubach and Williams (2003) model extended by the leverage gap and the debt service gap.
- Downward trend from mid-1980s due to financial liberalization and financialization.
- Private credit in advanced economies doubled relative to GDP (1980-2009).
- European economies faced recessions and crises, adding volatility to finance-neutral rate.



Source: Malovaná et al. (2023a)

Financial Factors and Natural Rates in European Economies

- Difference between finance-neutral and Laubach and Williams (2003) natural rates captures the role of financial factors.
- Finance-neutral natural rate falls below Laubach and Williams (2003) rate after GFC.
- Divergence between Northern and Southern countries reflects different financial factors and monetary policy needs.

Tab. Gap Between Finance-Neutral and Laubach and Williams (2003) Natural Rate

	1970s	1980s	1990–2002	2003–2007	2008–2012	2013–2019
DE	-0.246	0.729	0.754	0.373	0.379	1.976
DK	-0.881	2.458	1.858	1.482	-0.717	1.844
ES	-0.508	2.441	1.204	-0.541	-2.189	-0.122
FR	-0.408	0.791	2.027	1.223	-1.122	-0.201
IT	-1.150	1.676	0.076	-0.643	-3.039	-0.482
SE	-0.348	1.430	2.112	2.163	-0.424	1.459
Total	-0.590	1.587	1.338	0.676	-1.186	0.746

Source: Malovaná et al. (2023a)

How Stimulatory Interest Rates Have Been?

- Divergence between North and South: different monetary policy needs due to financial conditions and cycle synchronization.
- Both the business and financial cycles of individual economies may not be well synchronized, with the financial cycle being more desynchronized.
- Financial factors play a prominent role in monetary policy needs for some European countries outside the euro area.
  - Important to acknowledge given significant monetary policy spillovers from major world central banks.

Tab. Gap Between Real Interest Rate and Finance-Neutral Natural Rate

	1970s	1980s	1990–2002	2003–2007	2008–2012	2013–2019
DE	0.158	2.294	1.488	0.004	-0.713	-3.548
DK	-2.045	-2.205	0.986	-1.144	-0.367	-3.607
ES	-8.632	0.570	1.439	-1.177	1.684	-1.097
FR	-2.280	1.358	1.267	-1.160	0.761	-0.916
IT	-3.996	-0.538	2.873	0.561	2.486	-0.233
SE	-3.433	-1.013	1.193	-1.812	0.068	-3.085
Total	-3.371	0.078	1.541	-0.788	0.653	-2.080

Source: Malovaná et al. (2023a)

Monetary Policy Spillover to Small Open Economies

- Cao et al. (2023) explore the effect of low or negative interest rates in core economies (US, EU, UK) on bank lending in small open economies (CA, CL, CZ, NO) through international banking.
- Confidential supervisory bank-level data between 2002 and 2019.
- Countries share similar characteristics:
  - Small, financially open, bank-oriented economies, with a significant presence of global banks, exposed to international shocks.
  - Flexible exchange rates, and an inflation-targeting monetary policy regime.

	Canada	**Chile**	**Czech Republic**	**Norway**
Credit to non-financial sector from all sectors to GDP	305%	188%	120%	284%
Credit to non-financial sector from banks to GDP	112%	88%	51%	80%
5-bank asset concentration	92%	77%	66%	64%
Share of foreign-owned banks in total assets	2%	44%	86%	29%
Share of cross-border liabilities in total assets	9%	12%	24%	35%
Share of cross-border assets in total assets	35%	6%	10%	21%
Share of loans to private sector in foreign currency	0%	11%	20%	8%
Year of inflation-targeting adoption	1991	1999	1998	2001
Currency regime	Freely floating	Managed floating	Managed floating	Freely floating
Capital mobility	"Open"	"Gate"	"Open"	"Open"

Source: Cao et al. (2023)

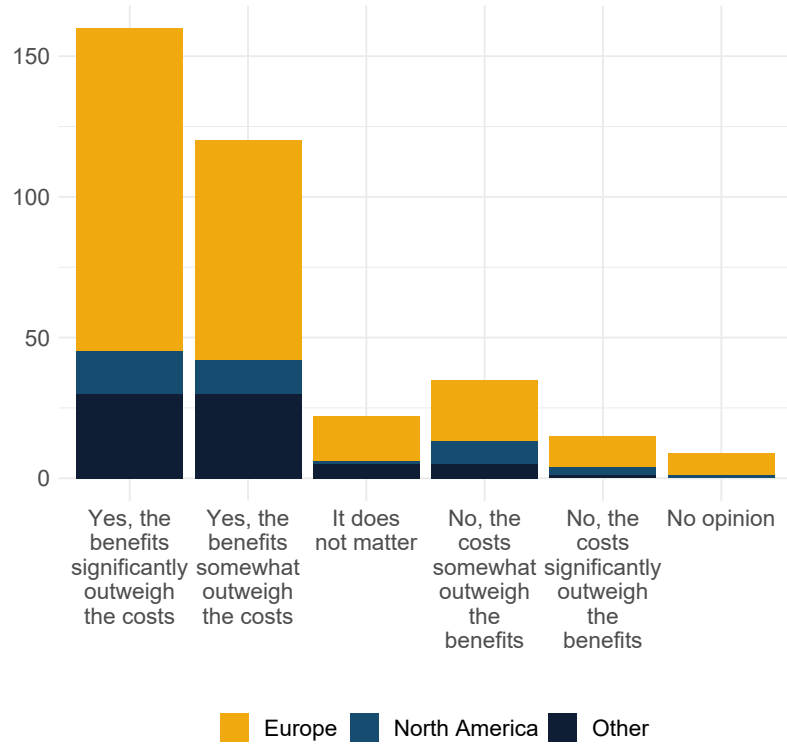
Evidence and Policy Implications for Small Open Economies

- Monetary policy spillovers from core countries to small open economies (SOEs):
  - Low interest rates: Further expansionary monetary policy shocks from core lead to increased lending in periphery - international bank lending channel.
  - High interest rates: Expansionary monetary policy in core may result in shrinking lending volumes in periphery - portfolio channel.
- Policy implications: Central banks in SOEs should monitor potential regime switches between high and low interest rate periods in core countries.
  - Monetary policy expansions in core may initially tighten credit supply in periphery.
  - With sufficiently low interest rates in core, credit supply in periphery can start increasing.
  - Reverse likely to occur when core begins tightening monetary policy.

Integration of Monetary and Macroprudential Policy: Survey Among Economists

- Malovaná et al. (2023b) surveyed 361 economic and finance professionals, researchers, and public sector regulators.
- Strong support for integrating macroprudential policy within central bank.
  - Respondents believe in the interdependence of monetary and macroprudential policy conduct.
  - Information gains from integration.
  - Increased capacity for swift responses in conflicting situations.

Fig. Should a central bank conduct both monetary and macroprudential policy?

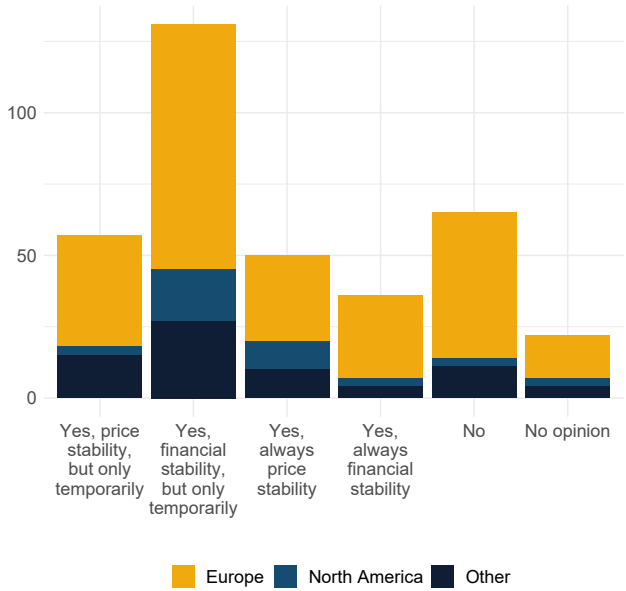


Source: Malovaná et al. (2023b)

Policy Objectives and Monetary Policy Effectiveness

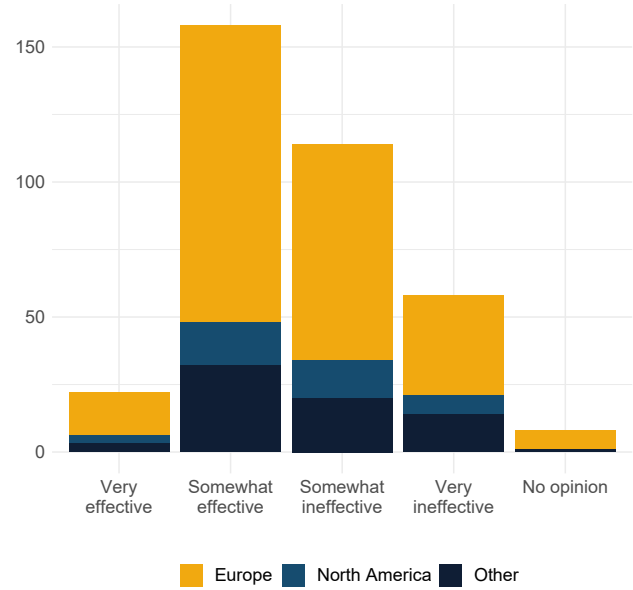
- Mixed opinions on whether
  - central bank should prioritize price stability or financial stability when the two conflict.
  - monetary policy is effective in mitigating systemic risks.

Fig. Should a central bank favor one of the two objectives?



Source: Malovaná et al. (2023b)

Fig. Can monetary policy mitigate systemic risks?



Source: Malovaná et al. (2023b)

Central Banks and Inequality

Central Bank Policies and Inequality: Gaps in Literature

- Central bank policies influence financial markets, asset valuations, and balance sheets of institutions and borrowers.
- Existing studies focus on macro-financial stability, inflation, and financial sector resilience, but less on unintended inequality consequences.
- Recent research just started to explore monetary and macroprudential policies' effects on income and wealth distribution, yet gaps persist.
  - Frost and van Stralen (2018); Carpantier et al. (2018); Auclert (2019); Richter et al. (2019); Peydro et al. (2020); Acharya et al. (2022); Albert and Gómez-Fernández (2021); Tarne et al. (2022); Malovaná et al. (2023)
- Our research addresses gaps by focusing on:
  - Macroprudential policy's impact on wealth and income inequality, international spillover effects, regional inequality, and non-bank sector role.
  - Examining household-level and country-level data, and considering short-term and long-term effects.

Macroprudential Policy and Inequality: Research Design

- Question: How does macroprudential policy impact income inequality, and what are the transmission channels?
- Data and method: a panel of 105 countries from 1990–2019, considering borrower-, capital-, and liquidity-based macroprudential measures; a local projection method; various inequality measures.

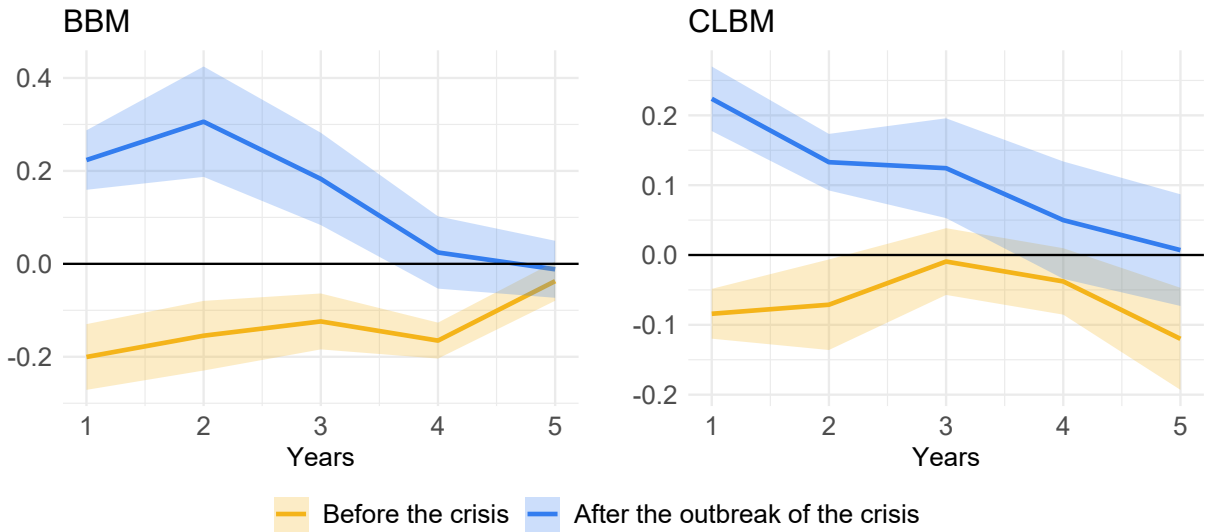
	BBM		CLBM	
	No. of events	No. of countries	No. of events	No. of countries
All countries	285	61	1,296	105
Advanced economies	151	29	539	35
Emerging markets and developing economies	134	32	757	70
Africa	2	1	62	12
Asia and Pacific	103	14	267	21
Europe	136	31	664	41
Middle and South America	9	5	152	15
Middle East and Central Asia	20	8	120	14
North America	15	2	31	2
1990–1999	7	6	67	39
2000–2009	87	30	233	72
2010–2019	191	49	996	96

Source: Malovaná et al. (2023)

Macroprudential Policy and Inequality: Key Channels

- Macroprudential policy tightening affects income inequality via two channels:
  - Crisis mitigation and prevention: reduces inequality by limiting credit booms, mitigating redistributive effects of crises, and enhancing financial sector resilience.
  - Credit redistribution: higher inequality due to negative effect on credit growth and property prices.
- Policy implications: timely macroprudential regulation helps prevent crises and contributes to more equal income distribution.

Fig. Crises, Macroprudential Policy, and Income Inequality: Crisis Mitigation Channel



Source: Malovaná et al. (2023)

Green Transition and Climate Risks

What Do Economists Think About the Green Transition?

- Malovaná et al. (2023) surveyed 286 economic and finance professionals, researchers, and public sector regulators.
- Respondents consider the low-carbon transition as an opportunity more than a risk, particularly for the financial sector.
- They do not expect a significant increase in banking risks due to the transition, incl. credit, market, liquidity, or operational risk.

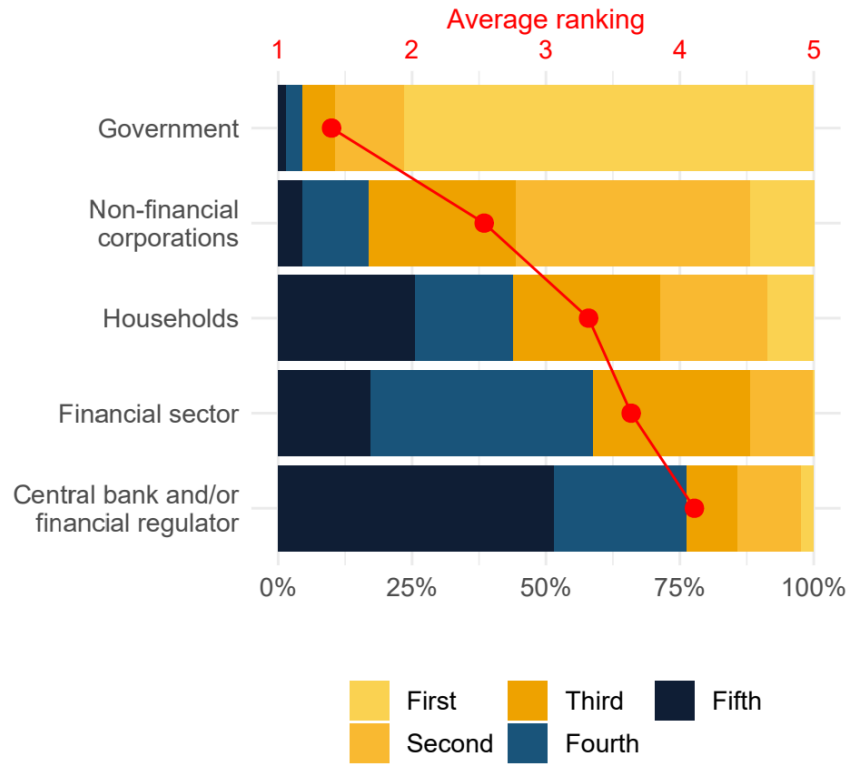
Tab. Respondents' Composition

Job position (%)	
Professor	24
Associate Professor	7
Assistant Professor	10
Lecturer	5
Director, Deputy Director, or Head	14
(Senior) Economists	20
(Senior) Advisors	5
(Senior) Researchers	9
(Senior) Analysts	7
Publication activity (%)	
Top 25% journals (Q1)	76
Top 15 journals	19
Publication in the last 3Y (2020–22)	76
Years between first and last publication	
Average	16.5
Median	15.0

Source: Malovaná et al. (2023)

Who Should Be Responsible for the Transition to a Low-Carbon Economy?

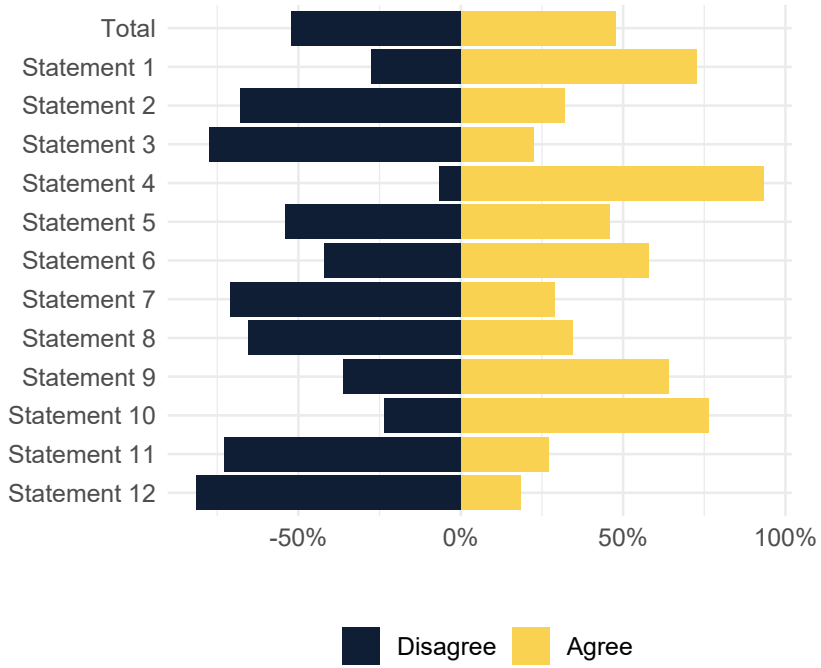
- Governments should be the most responsible for climate mitigation policies, while central banks and financial regulators are the least responsible.
- Preferred policy tool: carbon tax.
- Central bankers assign a lower level of responsibility to central banks and the financial sector compared to others.



Source: Malovaná et al. (2023)

The Role of Environmental Awareness

- Environmental awareness and professional roles significantly influence opinions.
- We measure respondents' environmental awareness based on their self-reported contribution to reducing their carbon footprint.
- More environmentally aware respondents exhibit greater optimism regarding climate issues.
- Central bankers often have a more pessimistic outlook than academics and other institution members.



Source: Malovaná et al. (2023)

- Policy implications: Promote environmental awareness and engage diverse stakeholders to address financial stability risks during the low-carbon transition, as expert opinions impact policy decisions.

Impact of Climate Policies on Securities Holdings

- Question: How do climate policies affect the securities holdings of low-carbon and high-carbon firms?
- Data and method: SHS, all financial institutions in EA, 2013–2021; DiD method.

Tab. Events, Estimation Window, and Expected Sign

Event	Date	Post=1 from	Firms	Exp. sign
Paris Climate Agreement (COP21)	Dec 2015	1Q 2016	green	+
			brown	−
UN Climate Action Summit (Greta Thunberg's speech)	Sep 2019	3Q 2019	green	+
			brown	−
COVID-19	Mar 2020	2Q 2020	green	+
			brown	−
Trump's announcement of withdrawal from COP21	Jun 2017	3Q 2017	US green	+/−
			US brown	+/−
Biden's announcement of rejoining COP21	Jan 2021	1Q 2021	US green	+
			US brown	−

Source: Ehrenbergerová et al. (2023)

Policy Implications and Sectoral Response to Climate Policies

- Following the COP21 and UN Climate Action Summit, the financial sector increases securities holdings of low-carbon (green) firms and reduces securities holdings of high-carbon (brown firms).
  - Financial sectors responded differently: banks reduced financing for brown firms post-COP21, while non-banking institutions increased green investments post-UN summit.
- Risk-allocation shift from financial to the private non-financial sector.
- Home bias and environmental performance influence climate policy effects.
- Policy implications: Results highlight the role of effective policy design in low-carbon transition and the importance of understanding financial sector responses.

V. Future Directions

Fintech, Digital Currencies, AI, and Other TechIn

- Impact of technological changes on financial market risks and vulnerabilities.
- Effects of design choices in private and central bank digital currencies on monetary transmission, financial stability, and international spillovers.
- Implications of AI, blockchain, and cloud services on the resilience of the financial system.
  - Veselý (2022, 2023) examines quantum computing's potential for portfolio optimization and FX reserve management at the CNB, comparing quantum and classical algorithms.
  - Hodula (2022) shows that fintech credit platforms can act as both complements or substitutes to traditional bank credit, with banking sector characteristics shaping the relationship.
  - Hodula (2023) shows that fintech and big tech are linked to decreasing profit margins in the banking sector, as traditional banks adjust rates defensively.

Long-Run Trends and Fundamental Changes

- The pandemic highlights the need to re-evaluate risk distribution in extreme events, sovereign indebtedness, and explore insurance policies and financial securities like catastrophe bonds.
- Climate change and the low-carbon transition introduce new risks and opportunities for the economy and financial system.
- Structurally high uncertainty from various sources (medical, natural, technological, geopolitical) requires an assessment of its effects on saving and spending decisions, and appropriate policy responses.
- Factors like the gig economy, demographics, and automation may impact long-run growth and inflation.
- The financial sector's role in managing and mitigating risks from structural changes needs exploration.

Thank You for Your Attention

Simona Malovaná

Director of Financial Research Division
Financial Stability Department
Czech National Bank

Mobile: +420 731 369 328
Work email: simona.malovana@cnb.cz
Personal email: simona.malovana@gmail.com
LinkedIn · IDEAS/RePEc · Personal webpage

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