Monetary Policy, Inflation, and Crises: Evidence from History and Administrative Data

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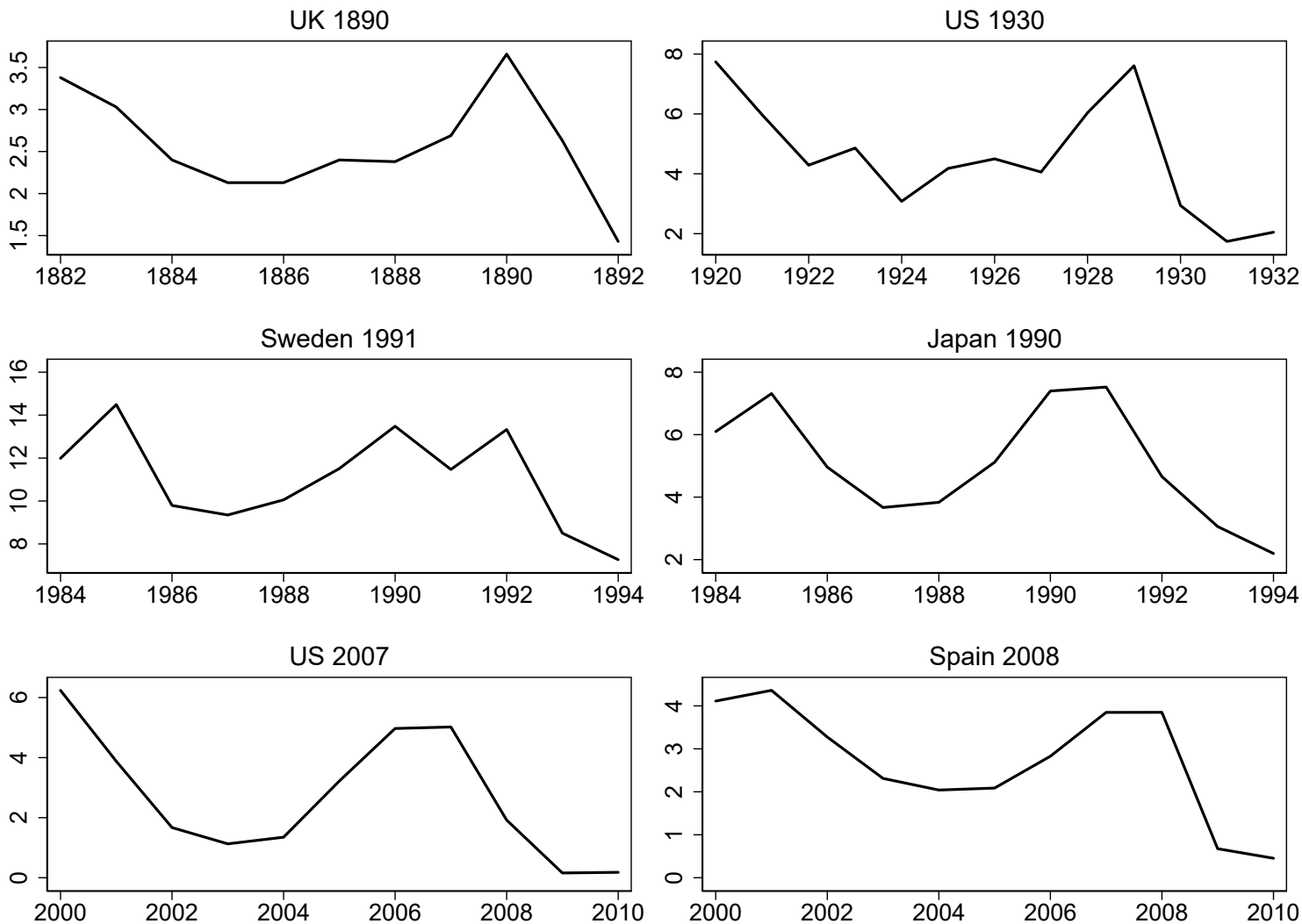
Motivation

- Current environment: high inflation, rising policy rates
- Policymakers are balancing risks of inflation vs recession
  - We know a lot about these inflation–GDP trade-offs (Blinder, 2023)
- But raising rates can also trigger a financial crisis (2022-23 financial distress: SVB & other banks, sovereign EA, UK pension funds / Gilts, crypto, CRE, private credit...)
  - Especially after a period of low rates (Acharya et al., 2022; Kashyap and Stein, 2023; IMF, 2023; ECB, 2023; Rajan, 2023)
- We **know little about the links between the path of monetary policy and banking crises**

Case studies of important banking crises



y axis: nominal monetary policy rate

This paper

- **Impact of monetary policy (MP) dynamics on banking crises**
  - What is the full path of the MP rate before a crisis?
  - Does raising rates in an environment like today (U-shaped path) increase crisis risk?
  - What are the underlying mechanisms?
- **Data: two-pronged approach**
  - A panel of historical crises to establish the results & mechanisms (17 countries, 1870–2016, 80 crises)
  - Credit registry data for detailed crisis case study (Spain, 1995–2020)
- MP rate: short-term nominal rate (raw or relative to GDP and inflation dynamics); international finance trilemma IV

Findings

1. **U-shaped monetary policy (MP) rate path increases crisis risk**
   - Most banking crises preceded by a U in MP rates
   - Raising MP rates materially increases crisis risk, but only if rates were previously cut over a long period
   - **Different for non-crisis recessions**

Findings

1. **U-shaped monetary policy (MP) rate path increases crisis risk**
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   - **Different for non-crisis recessions**

2. **Mechanism**: higher credit & asset prices as MP rates are cut (first half of the U), stronger reversal if raises follow such cut
   - Red-zone (R-zone) booms (Greenwood et al., 2022) after (strong) MP rate cuts
   - Higher crisis risk within R-zone only if MP rate hikes
   - Combination of **U-MP & R-zone crucial for crises**
   - Boom-bust in **bank performance** around U-MP & R-zones
   - **Microdata**: loan defaults higher after U-MP, especially for ex-ante riskier firms & banks

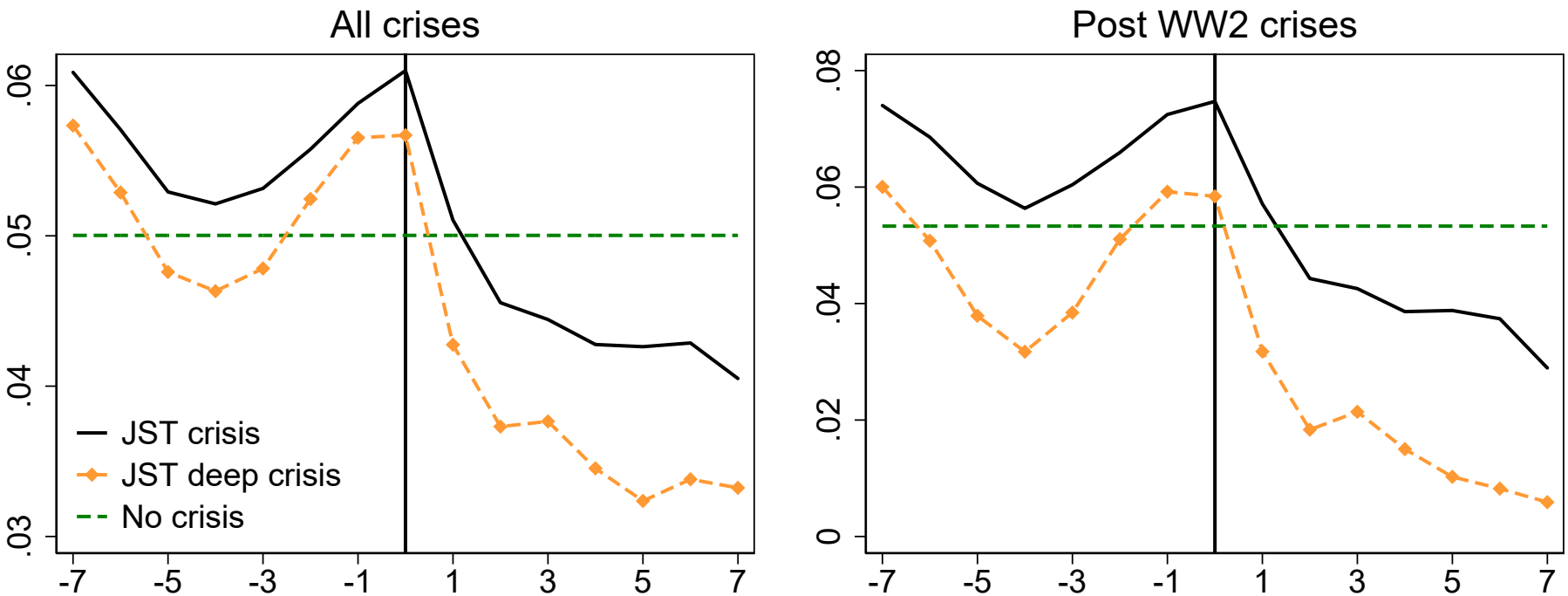
▸ Literature

The path of monetary policy rates and crisis risk

Data

- 17 advanced economies (13 European countries, USA, Canada, Australia, Japan), 1870–2016 (Jordà et al., 2016)
- Narrative crisis definition (Schularick and Taylor, 2012) (bank runs / defaults / forced mergers)
  - Robust to Baron et al. (2021) chronology: narrative + sharp declines in bank stock returns
- Monetary policy rate: short-term interest rate (central bank / interbank / t-bill rate)

Monetary policy rates around crises

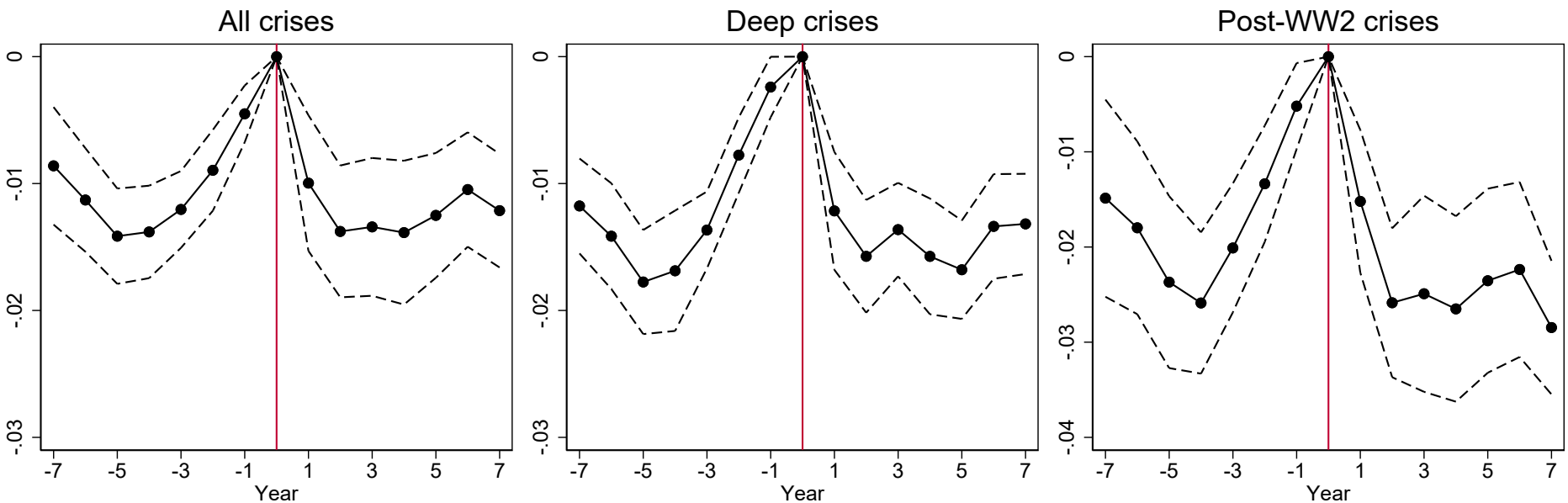


Crisis definitions. JST: Jordà et al. (2016); JST deep: JST & low GDP growth

▸ Inflation & real rates

Monetary policy rates: Crisis window regressions

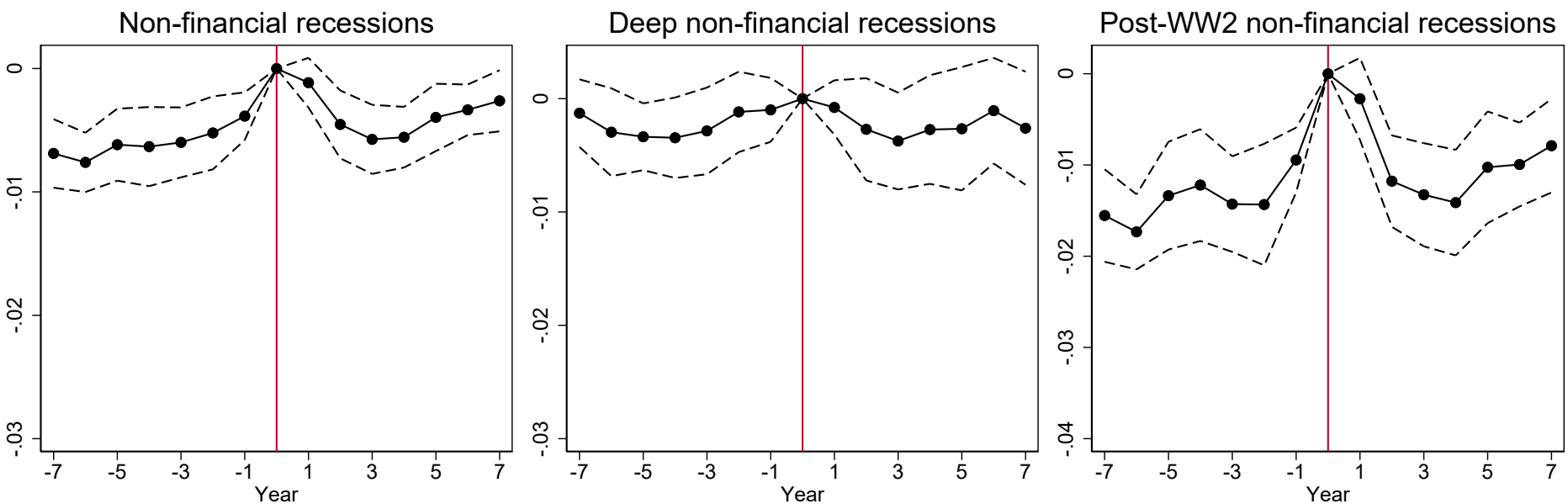
$$r_{i,t+h} - r_{i,t} = \alpha_{i,h} + \alpha_{d,h} + \beta_h \mathbb{1}_{Crisis_{i,t}=1} + \epsilon_{i,t+h} \quad h \in \{-7, ..., 7\}.$$



▸ Residual rates ▸ Long-term rates

Monetary policy rates & non-financial recessions

$$r_{i,t+h} - r_{i,t} = \alpha_{i,h} + \alpha_{d,h} + \beta_h \mathbb{1}_{\text{Recession}_{i,t}=1} + \epsilon_{i,t+h} \quad h \in \{-7, ..., 7\}.$$



Frequency of MP-rate paths before crises

- Sort data in 2×2 groups by time window (t − 8 to t − 3 & t − 3 to t) and monetary rate change (cut vs raise)
- 55% of crises are preceded by a U shape in the full sample; 71% post WW2
- By contrast, only $\approx 30\%$ of non-financial recessions preceded by a U ▸ Recessions ▸ Graphs

	(1)	(2)	(3)	(4)	(5)
	Crisis	Deep crisis	Post-WW2 crisis	Post-WW2 deep crisis	All observations
U shape (cut, raise)	0.55***	0.63***	0.71***	1.00***	0.27
Raise, raise	0.19	0.16	0.12	0.00	0.24
Raise, cut	0.16	0.11	0.08	0.00	0.26
Cut, cut	0.10	0.11	0.08	0.00	0.23

*: higher frequency than non-crisis obs

Frequency of crises after different MP rate paths

- Compute crisis frequency 3 years after each shape (t to t + 2)
- Crises are more than twice as frequent after the U shape than after other shapes

	(1)	(2)	(3)	(4)
	Crisis	Deep crisis	Post-WW2 crisis	Post-WW2 deep crisis
U shape (cut, raise)	0.18***	0.11***	0.16***	0.13***
Raise, raise	0.09	0.04	0.04	0.01
Raise, cut	0.06	0.02	0.02	0.00
Cut, cut	0.06	0.03	0.03	0.00
Unconditional	0.10	0.05	0.06	0.03

*: higher frequency than other bins

▸ With numbers of crises ▸ 1-year crisis window ▸ Symmetric U ▸ Non-financial recessions

Trilemma instrument

- Countries with fixed exchange rate and open capital accounts are forced to track base country interest rates (Mundell, 1963)
- Use base country interest rate changes to look at exogenous policy responses (Jordà et al., 2020, see also Maddaloni and Peydro, 2011; Jiménez et al., 2012, 2014)

$$\text{Trilemma IV} = \Delta \text{Rate}^{\text{Residual}}_{b(i),t} * \text{PEG}_{i,t} * \text{PEG}_{i,t-1} * \text{KOPEN}_{i,t}.$$

- $\text{Rate}^{\text{Residual}}_{b(i),t}$: change in the base country residual rate
  - Controls: inflation, GDP, consumption, investment, current account, short-term rates, long-term rates

U-shaped monetary policy rates and crises

$$\text{Crisis}_{i,t \text{ to } t+2} = \alpha_i + \beta_1 \Delta_3 \text{Rate}_{i,t} + \beta_2 \text{Cut}_{i,t-8,t-3} + \beta_3 \Delta_3 \text{Rate}_{i,t} \times \text{Cut}_{i,t-8,t-3} + \gamma X_{i,t} + u_{i,t}.$$

	Dependent variable: $\text{Crisis}_{t \text{ to } t+2}$					
	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta_3 \text{Rate}_t$	0.02**	0.02**	0.01	0.03	0.03	0.01
	(0.01)	(0.01)	(0.00)	(0.02)	(0.02)	(0.01)
$\text{Cut Rate}_{t-8,t-3}$		0.05	0.05		0.04	0.04
		(0.03)	(0.03)		(0.03)	(0.03)
$\Delta_3 \text{Rate}_t \times \text{Cut Rate}_{t-8,t-3}$			0.03**			0.07**
			(0.01)			(0.03)
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID				45.41	41.42	26.57
Observations	1626	1626	1626	1626	1626	1626

$X_{i,t}$ contains 8 lags of yearly real GDP growth and inflation (country and sample average), and a crisis dummy. Driscoll-Kraay s.e. with 5 lags.

▸ Economic effects

No U-shape effects for (deep) non-crisis recessions

	Normal recession$_{t \text{ to } t+2}$				Deep recession$_{t \text{ to } t+2}$	
	OLS		IV		OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta_3 \text{Rate}_t$	0.02**	0.02**	0.05*	0.06*	0.01**	0.03
	(0.01)	(0.01)	(0.03)	(0.03)	(0.00)	(0.02)
Cut $\text{Rate}_{t-8,t-3}$		-0.05		-0.08**	-0.03	-0.05
		(0.03)		(0.04)	(0.02)	(0.03)
$\Delta_3 \text{Rate}_t \times$ Cut $\text{Rate}_{t-8,t-3}$		0.01		-0.00	-0.00	-0.01
		(0.01)		(0.04)	(0.01)	(0.02)
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID			48.80	29.22		29.22
Observations	1626	1626	1626	1626	1626	1626

$X_{i,t}$ contains 8 lags of yearly real GDP growth and inflation (country and sample average), and recession dummy. Driscoll-Kraay s.e. with 5 lags.

Does the depth of the U matter?

1. Larger cuts and raises are associated with higher crisis risk

   ▸ 3 × 3, raw ▸ 3 × 3, residuals

2. Does cutting & raising "too much" increase crisis risk?

   - Analyse MP relative to macroeconomic developments
   - Systematic MP proxied by GDP and inflation, by country & period (pre-1914, interwar, Bretton-Woods, post-1973)

Strong vs moderate U-MP & crises

- Cutting and raising more than systematic component is linked to higher crisis risk ▸ Detailed ▸ Regressions

	(1)	(2)	(3)	(4)
	Crisis	Deep crisis	Post-WW2 crisis	Post-WW2 deep crisis
Strong U (residual cut & raise)	0.30***	0.21***	0.27***	0.23***
Moderate U (systematic cut or raise)	0.07	0.05	0.04	0.04
Raise, raise	0.08	0.03	0.04	0.00
Raise, cut	0.01	0.01	0.01	0.00
Cut, cut	0.05	0.02	0.02	0.00
Unconditional	0.09	0.05	0.06	0.04

*: higher frequency than other bins

▸ Robustness / summary

Understanding the mechanisms

Why does U-shaped policy increase crisis risk?

- Low rates create financial vulnerabilities (Jiménez et al., 2014; Acharya and Rajan, 2022; Kashyap and Stein, 2000)
- Rate increases may crystallize these vulnerabilities
- Define financial "red zone" (R-zone) as in Greenwood, Hanson, Shleifer, and Sørensen (2022)

$$\text{R-zone}_{i,j,t} = \text{High-Credit-Growth}_{i,j,t} * \text{High-Price-Growth}_{i,j,t}$$

$$\text{High-Cred.-Growth}_{i,j,t} = 1\left\{\Delta_3(\text{Credit/GDP})_{i,j,t} > 80^{\text{th}} \text{ percentile}\right\}$$

$$\text{High-Price-Growth}_{i,j,t} = 1\left\{\Delta_3 \ln(\text{Asset Price})_{i,j,t} > 66.7^{\text{th}} \text{ percentile}\right\}$$

Rate cuts increase the likelihood of future R-zones

- Monetary rate cuts increase the likelihood of ending up in the R-zone over the next 3 years ▸ Res. rates

	R-Zone Either$_{t+1 \text{ to } t+3}$			
	ΔRate$_{t-5,t}$		Cut Rate Dummy$_{t-5,t}$	
	OLS (1)	IV (2)	OLS (3)	IV (4)
See header	-0.02***	-0.05***	0.07**	0.34**
	(0.01)	(0.02)	(0.04)	(0.15)
Country fixed effects	✓	✓	✓	✓
Controls	✓	✓	✓	✓
Kleibergen-Paap		43.48		54.67
Observations	1335	1335	1335	1335

- Also, in the boom: low credit spreads; high bank equity valuations; predictably worse future outcomes ▸ Details
  - Consistent with ↑ credit supply & overoptimism

Raising rates in the R-zone triggers crises

- (Strong) raises in the R-zone increase crisis risk

	Dependent variable: $\text{Crisis}_{t \text{ to } t+2}$					
	All raises			Residual raises		Systematic raises
	OLS (1)	OLS (2)	IV (3)	OLS (4)	IV (5)	OLS (6)
$\text{R-Zone}_{t-3 \text{ to } t-1}$	0.13***	0.04	-0.05	0.06**	-0.02	0.10***
	(0.03)	(0.02)	(0.07)	(0.02)	(0.06)	(0.03)
$I(\Delta_3 \text{Rate}_t \geq 0)$		0.05*	-0.01	0.05	-0.04	0.03
		(0.03)	(0.10)	(0.03)	(0.11)	(0.02)
R-Zone $\times$ $I(\Delta_3 \text{Rate} \geq 0)$		0.18***	0.36**	0.19***	0.42***	0.10**
		(0.05)	(0.15)	(0.06)	(0.16)	(0.05)
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID			14.52		11.24	
Observations	1351	1351	1351	1351	1351	1351

- But only if rates were cut before entering R-zone ▸ Pre-cut RZ

Combination of U-MP & R-zone is crucial for banking crises

- Sort data by U-MP (over $t-8$ to t) and R-zone ($t-3$ to t)
- Compute crisis frequency for 3 years after each shape (t to $t+2$)

	(1)	(2)	(3)	(4)
	Crisis	Deep crisis	Post-WW2 crisis	Post-WW2 deep crisis
U-shaped MP & R-zone	0.36*** (18/49)	0.25*** (12/49)	0.37*** (12/33)	0.30*** (10/33)
U-shaped MP & no R-zone	0.10 (11/118)	0.07 (8/118)	0.06 (3/58)	0.04 (2/58)
No U-shaped MP & R-zone	0.11 (10/98)	0.05 (5/98)	0.06 (4/71)	0.01 (1/71)
No U-shaped MP & no R-zone	0.05 (19/364)	0.03 (10/364)	0.02 (4/220)	0.00 (0/220)
Unconditional	0.09 (58/628)	0.06 (36/628)	0.06 (24/382)	0.03 (13/382)

*: higher frequency than other bins

▸ Residual U & R-zones ▸ Broader R-zone window

Why is the combination of U & R-zone conducive to crises?

- Raising rates in the R-zone reverses the vulnerabilities that built up during the low-rate period
  - We show: raising rates triggers a larger decline in credit, house prices etc, the larger the previous growth in credit, house prices... ▸ Vulnerability LPs
- Raising rates after long periods of cuts puts stress on the banking system

U-shaped MP & banking sector outcomes

- U-shape in MP rates leads to declines in bank profitability, increasing loan losses, lower bank stock returns

▸ Bank equity crises

	$\Delta \text{RoE}_{t \text{ to } t+2}$		$\Delta \text{LoL}_{t \text{ to } t+2}$		$\text{Return}^{\text{Bank}}_{t \text{ to } t+2}$	
	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta_3 \text{Rate}_t$	-0.12	-0.01	0.05**	0.13***	-0.02	0.02
	(0.15)	(0.33)	(0.02)	(0.04)	(0.01)	(0.02)
$\text{Cut Rate}_{t-8,t-3}$	0.17	0.43	0.03	-0.04	-0.04	-0.06
	(0.70)	(0.65)	(0.09)	(0.07)	(0.05)	(0.05)
$\Delta_3 \text{Rate}_t \times \text{Cut Rate}_{t-8,t-3}$	-0.83***	-3.16***	0.09***	0.27***	-0.03*	-0.07*
	(0.26)	(1.04)	(0.03)	(0.09)	(0.02)	(0.04)
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID		30.49		16.51		17.91
Observations	1563	1350	868	756	1420	1298

Loan-level evidence from the Spanish credit register

Data and specifications

- Sample: all new loans extended by banks to businesses 1995-2008 (robustness: 1995–2016)
- Exogenous monetary policy set in Frankfurt; bank-dominated financial system
- Predict loan default over 3 years:

$$\begin{aligned}\text{Loan Default}_{i,j,t,t+3} = {} & \beta_1 \Delta_3 \text{Rate}_{t,t+3} + \beta_2 \text{Cut}_{t-5,t} \\ & + \beta_3 \Delta_3 \text{Rate}_{t,t+3} \times \text{Cut}_{t-5,t} \\ & + \beta_4 \Delta_3 \text{Rate}_{t,t+3} \times \text{Cut}_{t-5,t} \times \text{F}_{j,t-1} \\ & + \beta_5 \Delta_3 \text{Rate}_{t,t+3} \times \text{Cut}_{t-5,t} \times \text{B}_{j,t-1} \\ & + \gamma_1 \text{F}_{i,t-1} + \gamma_2 \text{B}_{j,t-1} + \gamma_3 \text{M}_t + \ldots + u_{i,j,t,t+1}\end{aligned}$$

F, B, M: firm & bank characteristics, macro controls.

Heterogeneous effects of U-MP on loan defaults

- Effects larger for loans by ex ante riskier banks & to riskier firms

	Dependent variable: Loan default$_{t+1 \text{ to } t+3}$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ_3Rate$_{t,t+3}$	0.003***	0.003***	0.001*	0.002**			
	(0.001)	(0.001)	(0.001)	(0.001)			
Cut Rate$_{t-5,t}$	0.008***	0.007***	0.007***	0.007***			
	(0.003)	(0.003)	(0.003)	(0.003)			
Δ_3Rate$_{t,t+3}$ × Cut Rate$_{t-5,t}$	0.004***	0.004***	0.005***	0.005***			
	(0.001)	(0.001)	(0.001)	(0.001)			
Δ_3Rate × Cut × Real estate firm	0.012***			0.012***	0.012***	0.010***	0.011***
	(0.002)			(0.002)	(0.002)	(0.001)	(0.001)
Δ_3Rate × Cut × Firm not audited		0.002*		0.002*	0.002**		
		(0.001)		(0.001)	(0.001)		
Δ_3Rate × Cut × Firm cost of credit						0.002***	0.001***
						(0.000)	(0.000)
Δ_3Rate × Cut × Bank NPL ratio			0.003***	0.003***	0.002***	0.002***	0.002***
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Δ_3Rate × Cut × Bank NPL × Real estate							0.003*
							(0.002)
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm × Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	Yes	Yes	Yes
Firm Controls	No	No	No	No	No	Yes	Yes
Observations	1.1m	1.1m	1.1m	1.1m	1.1m	0.7m	0.7m
R^2	0.552	0.551	0.551	0.552	0.552	0.586	0.586

▸ Summary statistics ▸ Regression w/o heterogeneity

Conclusion

- **U-shaped MP rate path materially increases crisis risk**
  - Raising MP rates increases crisis risk, but only if rates were previously cut over a long period
  - This link appears **unique to banking crises. Different for non-crisis recessions.** Stronger for deeper U.
- Mechanism: build-up of vulnerabilities as MP rates are cut, reversal as rates are raised
  - **Combination of U-MP & financial red zone crucial**
  - Banking sector is key to transmission, with stronger effects for worse firms & banks in microdata
- Bigger-picture implications
  - Effects of policy on crises are path-dependent
  - Policy options if need to raise rates: raise before the red zone; avoid strong raises; use macropru