Economics 210C/236A
Spring 2018

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LECTURE 10

The Effects of Financial Crises

October 31, 2018

I. Overview

Central Issue

- What are the macroeconomic effects of financial crises?
- The possible endogeneity of crises is a key concern.
- Papers for today look at aggregate, time-series evidence.
- Next week look at more micro, cross-section evidence.

What Is a "Financial Crisis?"

- Many candidates: Could involve sovereign debt, the exchange rate, intermediation, asset prices, ….
- Today's papers all focus on developments involving financial intermediation—something causes a rise in the cost of credit intermediation.
- And if the goal is to focus on "crises," need some way of distinguishing crises from more run-of-the-mill disruptions to intermediation.

Previous Literature

Papers for Today

- Jalil: Detailed study of the United States, 1825–1929.
- Romer and Romer: Aftermath of crises in advanced economies post-World War II; special emphasis on the role of the policy response in explaining variation in outcomes.
- Jordà, Schularick, and Taylor: Comparing recessions with and without crises; special emphasis on the role of credit growth before the peak.

II. Jalil, "A New History of Banking Panics in the United States, 1825-1929: Construction and Implications"

Overview

- Interested in the macroeconomic effects of financial crises.
- Focuses on one country over a defined period: United States, 1825–1929.
- Two key steps:
  - Identifying crises.
  - Estimating their effects.

Previous Panic Series for the U.S.

- Bordo-Wheelock
- Thorp
- Reinhart-Rogoff (2 versions)
- Friedman-Schwartz
- Gorton
- Sprague
- Wicker
- Kemmerer
- DeLong-Summers

TABLE 1—NINE PANIC SERIES, 1825–1929

Bordo-Wheelock banking panic 1865–1929	Thorp panic 1865–1925	Reinhart-Rogoff V1 banking crisis 1865–1929	Reinhart-Rogoff V2 banking crisis 1865–1929	Friedman-Schwartz banking panic 1867–1929
Panel A. 1825–1864				
1825	1825	1825	Jan. 1825	
1833	1833			
		1836		
1837	1837		1836–1838	
1839	1839			
			March 1841	
	1847			
1857	1857	1857	Aug. 1857	
			Dec. 1861	
			April 1864	
Panel B. 1865–1929				
1873	1873	1873	Sept. 1873	1873
1878 (financial distress)				
1884 (financial distress)		1884	May 1884	1884
1890 (financial distress)		1890	1890	1890
1893	1893			1893
			March 1907	
1907	1907	1907		1907
		1914	Jul. 1914	
1920s (financial distress)				
1929–1933		1929	1929–1933	

From: Jalil, "A New History of Banking Panics in the United States, 1825–1929."

Jalil's Definition of a Panic

- A financial panic occurs when fear prompts a widespread run by private agents … to convert deposits into currency (a banking panic)." (p. 300)
- "A banking panic occurs when there is an increase in the demand for currency relative to deposits that sparks bank runs and bank suspensions." (p. 300)
- "A banking panic occurs when there is a loss of depositor confidence that sparks runs on financial institutions and bank suspensions." (p. 302)

Implementing the Definition

- Use articles in *Niles Weekly* Register, *the Merchants' Magazine and Commercial* Review, and *The Commercial and Financial Chronicle*.
- A banking panic requires accounts of a cluster of bank suspensions and runs.
- A cluster means 3 or more, and excludes ones mentioned in articles that do not reference other suspensions or runs or general panic.
- A panic ends if there are no references to panics or suspensions for a full calendar month.
- A panic is major if it is mentioned on the front page of the newspaper and if its geographic scope is greater than a single state and its immediately bordering states.

Documentation from the Online Appendix

Banking Panic	Newspaper	Index Listing	Newspaper Articles	Front Page	Geographic Reach
Nov 1833 - May 1834	*Niles Weekly Register*	Bank Run, Bank Failures	Vol 45: [Dec 28, 1833 "Bank Items and Scraps" p. 295; Jan 25, 1834 "Banks and Banking Matters" p. 373; Feb 1, 1834 "Miscellaneous" p. 389; Feb 15, 1834 "The Pressure" p. 415] Vol 46: Mar 1, 1834 "The Pressure" p. 5; Mar 8, 1834 "The Currency"	Yes [Mar 1, 1834; Mar 8, 1834; Mar 29; 1834; Apr 12; 1834;	Nationwide monetary unrest, with reports of runs and/or suspensions in New York, Pennsylvania, Maryland, District

From: Jalil, "A New History of Banking Panics in the United States, 1825-1929," Online Appendix.

TABLE 2—NEW SERIES ON BANKING PANICS, 1825–1929

Major banking panic	Nonmajor banking panic
Nov. 1833–Apr. 1834	
Mar.–May 1837	
Oct. 1839	
	Jan.–April 1841 (Pennsylvania, Delaware, Maryland, North Carolina, Virginia, Illinois)
	March 1842 (Pennsylvania)
	May–June 1842 (New Orleans)
	Oct. 1851 (New York, New Jersey, Maryland)
	Sept. 1854–Feb. 1855 (Ohio, Indiana, Michigan, Wisconsin, Iowa, Missouri, New York, California)
Aug.–Oct. 1857	
	Nov. 1860 (suspension of specie payments by banks in the South)
	Dec. 1861 (generalized suspension of specie payments)
Sep. 1873	
	May 1884 (New York City, Pennsylvania, New Jersey)
	Nov. 1890 (New York City)
May–Aug. 1893	
	Dec. 1896 (Illinois, Minnesota, Wisconsin)
	Dec. 1899 (Boston and New York City)
	June–July 1901 (New York: Buffalo and New York City)
	Oct. 1903 (Pennsylvania, Maryland)
	Dec. 1905 (Chicago)
Oct.–Nov. 1907	
	Jan. 1908 (New York City)
	Aug.–Sept. 1920 (Boston)
	Nov. 1920–Feb. 1921 (North Dakota)
	July 1926 (Florida, Georgia)
	March 1927 (Florida)
	Jul.–Aug. 1929 (Florida)

From: Jalil, "A New History of Banking Panics in the United States, 1825–1929."

Seasonality of Panics

TABLE 5—SEASONALITY OF BANKING PANICS

	Major	Nonmajor
Distribution of panics by starting months		
Spring		
March	1	1
April	1	0
May	0	2
Summer		
June	0	1
July	0	0
August	1	0
Fall		
September	1	1
October	2	2
November	1	2
Winter		
December	0	4
January	0	2
February	0	0
Percentage spring and fall	85.7	53.3
Percentage summer and winter	14.3	46.7

Note: The table records panics, according to the month of outbreak.

From: Jalil, "A New History of Banking Panics in the United States, 1825–1929."

Issues in Jalil's Identification of Crises

- Very different from other series—is this a problem?
- Should NYC panics be counted as local?
- 3 of his 7 major panics are in the 1830s—does that raise questions about his procedures?
- Is there corroborating evidence?
- Is his narrative work of high quality?

Interest Rates during Major Panics

Table A3. Change in the Commercial Paper Rate During Major Banking Panics.

Major Bank Panic	Change in Commercial Paper Rate (in Percentage Points)
1857	15.50
1873	9.44
1893	4.85
1907	1.02
Average	7.70

From: Jalil, "A New History of Banking Panics in the United States, 1825–1929," Online Appendix

Peak-to-Trough Change in IP around Crises

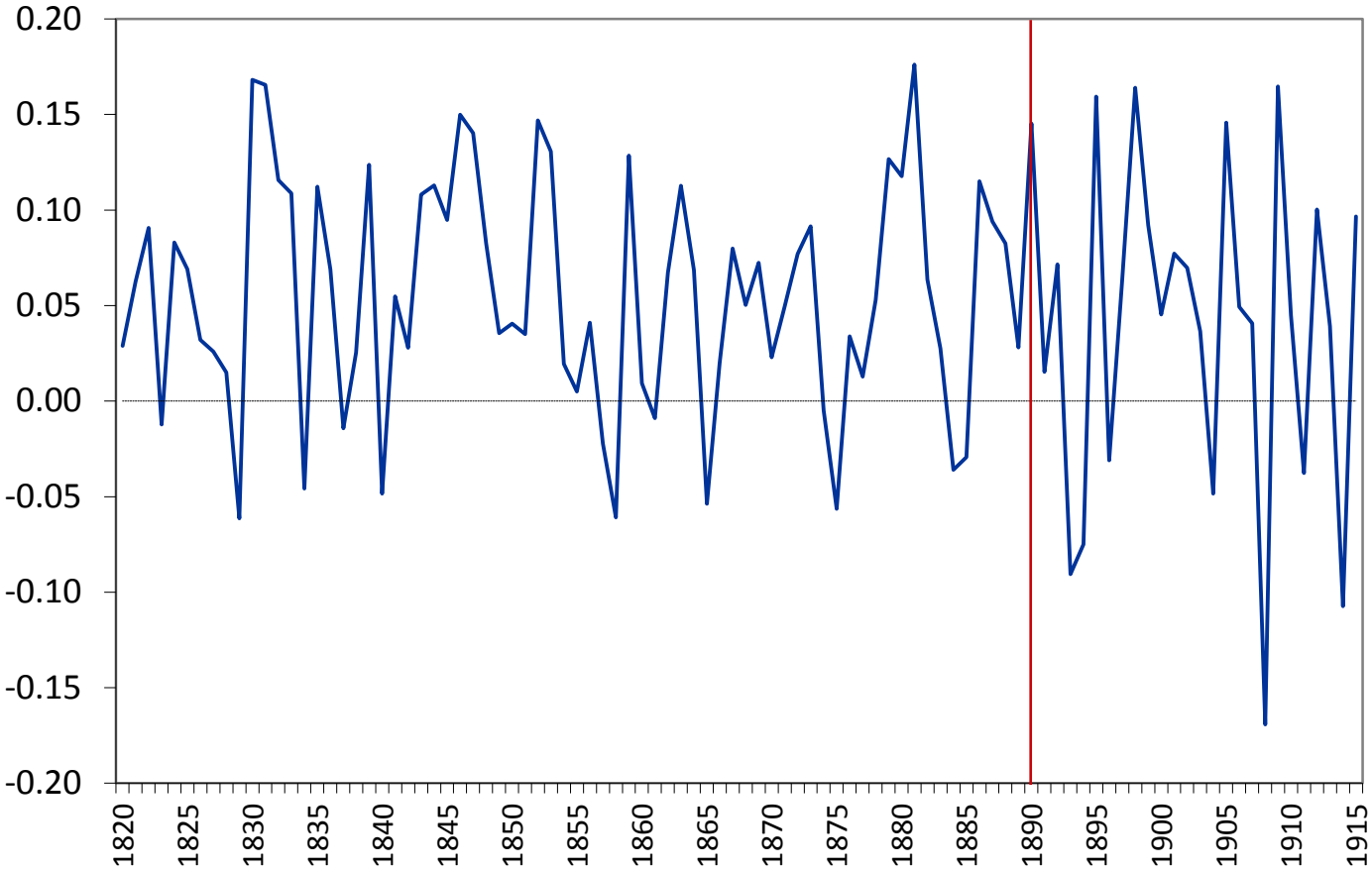
TABLE 6—MAJOR PANICS AND DOWNTURNS

Panic	Percent change in Davis Index from peak to trough
1833	−4.5 percent from 1833 to 1834
1837	−1.4 percent from 1837 to 1838
1839	−4.7 percent from 1839 to 1840
1857	−8.0 percent from 1856 to 1858
1873	−6.0 percent from 1873 to 1875
1893	−15.3 percent from 1892 to 1894
1907	−15.6 percent from 1907 to 1909

Source: The Davis Index of Industrial Production comes from Davis (2004).

From: Jalil, "A New History of Banking Panics in the United States, 1825–1929."

Percentage Change in Industrial Production



Standard Deviation	
1820-1889	0.060
1890-1915	0.089

Jalil's VAR Specification

$$F_t = a + \sum_{i=1}^{3} \alpha_i F_{t-i} + \sum_{i=1}^{3} \beta_i \Delta Y_{t-i} + u_t$$

$$\Delta Y_t = c + \sum_{i=1}^{3} \gamma_i F_{t-i} + \sum_{i=1}^{3} \delta_i \Delta Y_{t-i} + v_t$$

- Where *F* is the crisis dummy and Δ*Y* is the change in log output, and *u* and *v* are uncorrelated with one another and over time.
- Notice timing assumption: Neither variable is allowed to affect the other contemporaneously.

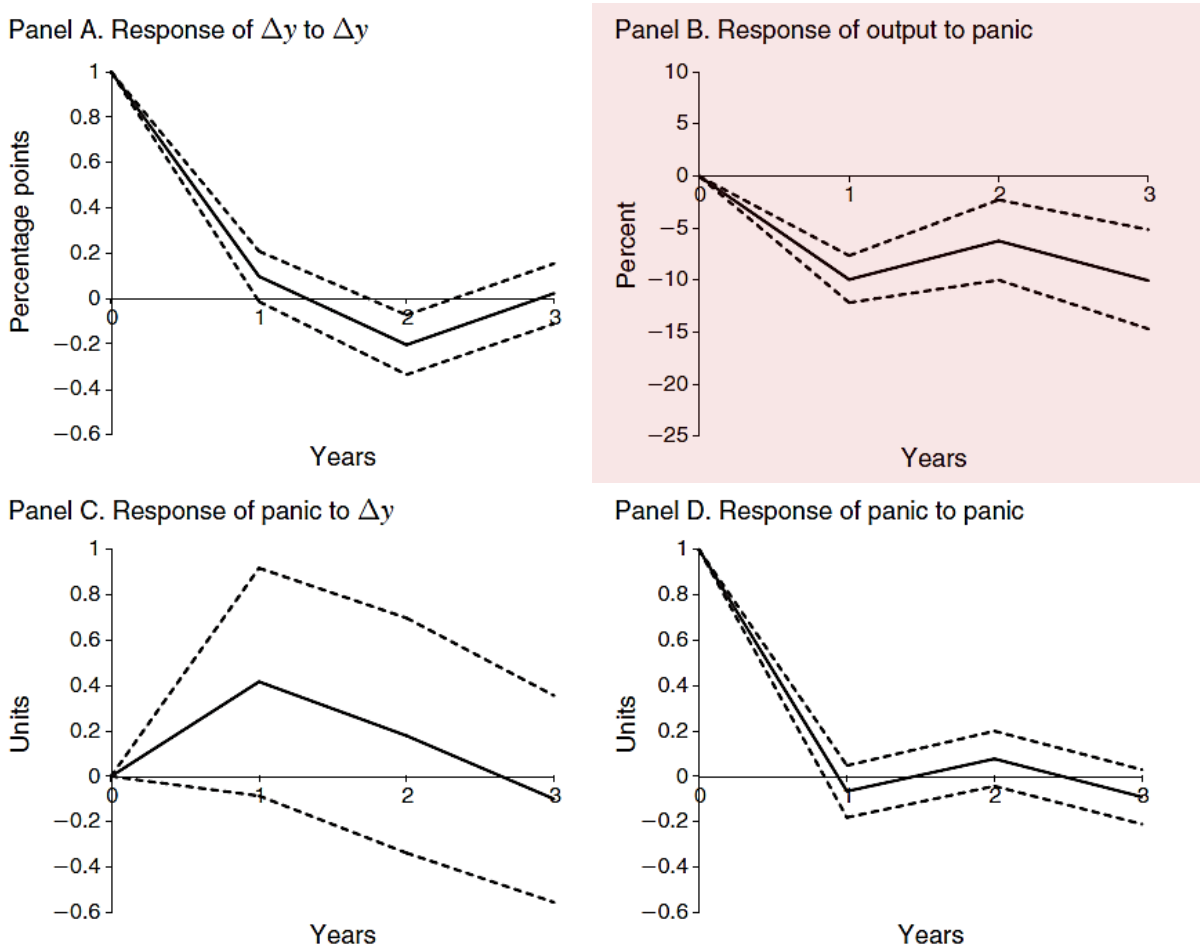


FIGURE 1. RESULTS OF THE BASIC VAR

Notes: The figure displays the impulse response functions of output and the panic dummy to shocks of 1 percentage point in output growth and one unit in the panic dummy. The dashed lines are one standard error Monte Carlo bands.

From: Jalil, "A New History of Banking Panics in the United States, 1825–1929."

How Does Jalil Attempt to Deal with Endogeneity?

- Narrative evidence on the cause of the crises.
- Restrict sample to major crises that were not caused by a decline in output.

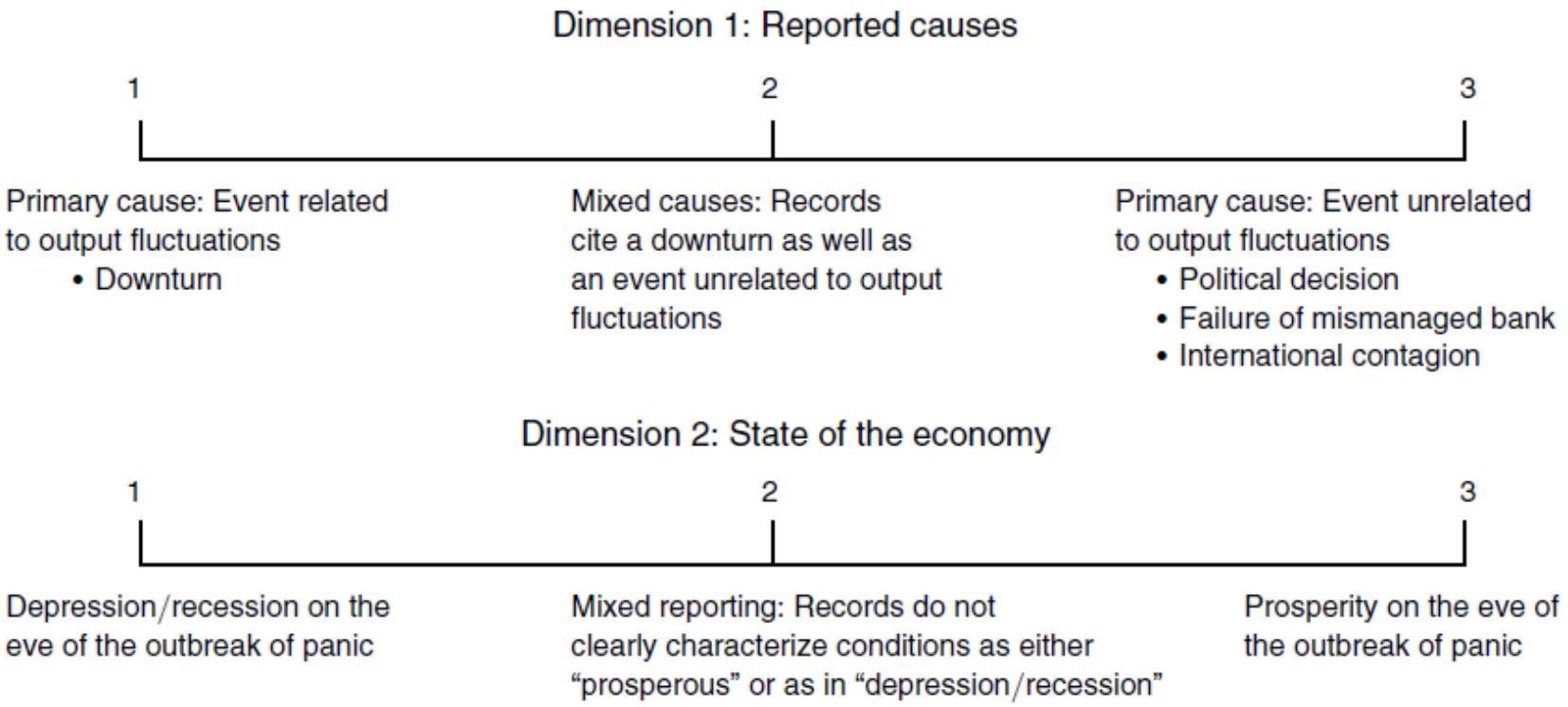


FIGURE 2. CLASSIFICATION ALGORITHM

Does he need Dimension 2, given he uses a VAR?

From: Jalil, "A New History of Banking Panics in the United States, 1825–1929."

TABLE 7—CLASSIFICATION OF PANICS

Panic	Dimension 1	Dimension 2
1833	3	3
1837	No rank	No rank
1839	No rank	No rank
1857	3	3
1873	3	3
1893	3	1
1907	2	1

Hint on Tables: They should be self-explanatory. Many readers just flip through the tables.

From: Jalil, "A New History of Banking Panics in the United States, 1825–1929."

Banking Panic of 1857

The first bank failure—the Ohio Life Insurance Company—occurred on August 24th. Its failure was attributed to mismanagement and fraudulent activities. Edward Ludlow, the director of its New York office, loaned $2 million, an amount that equaled the firm's capital, to several railroad companies, with a significant proportion being loaned to the struggling Cleveland & Pittsburgh road. Following the bank's suspension, Charles Stetson, the president of the company, seemed to be unaware of Ludlow's activities and immediately launched an investigation. The extent of Ludlow's mismanagement is still unclear—charges that his activities involved fraud and that he stole money for his own devices were leveled against him.

The collapse of this banking firm triggered the panic. The Ohio Life was considered one of the most reputable firms in the nation and initially, the cause of its failure was unknown. Its demise shocked the financial community and sparked runs on banks throughout the country. Over the next several weeks, fear spread and the panic gained in intensity. On September 25th, the Bank of Pennsylvania suspended, along with a generalized suspension of specie payments by the banks in Philadelphia, Baltimore, Washington, and many of the interior cities. The panic reached its climax when a dramatic run on the New York City banks forced the city to suspend specie payments on October 13.

From: Jalil, "A New History of Banking Panics in the United States, 1825-1929," Online Appendix.

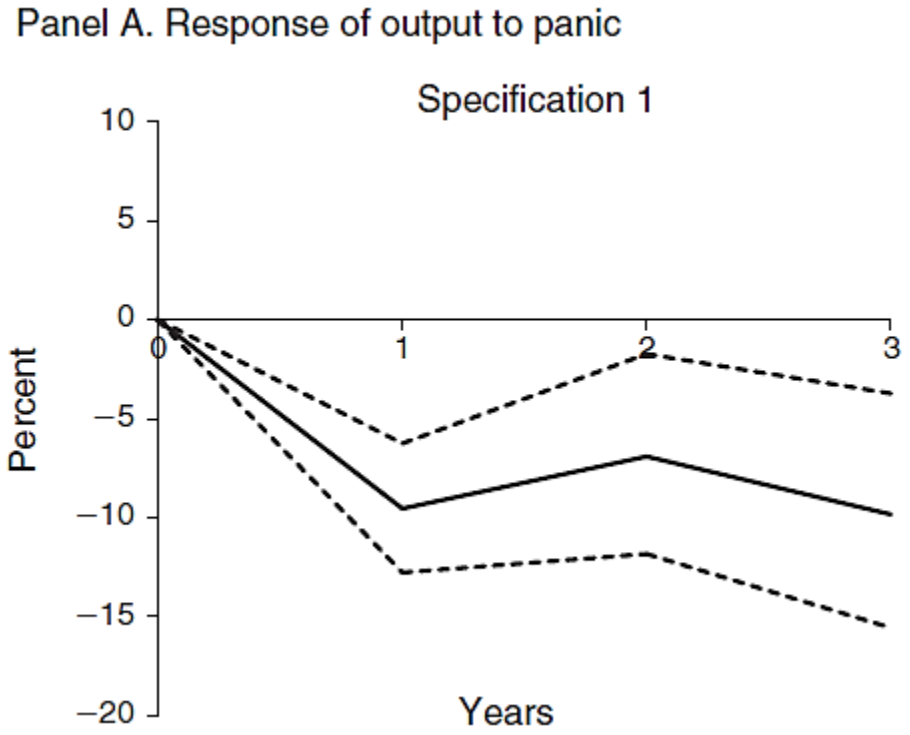


FIGURE 3. RESULTS OF THE RESTRICTED VARS

Notes: The figure displays the impulse response functions of output and the restricted panic dummy to shocks of 1 percentage point in output growth and one unit in the panic dummy. The restricted panic dummy includes those panics that receive a 3 on the first dimension of the scale (specification 1), a 2 or 3 on the first dimension (specification 2), and a 3 on both dimensions (specification 3). The dashed lines are one standard error Monte Carlo bands.

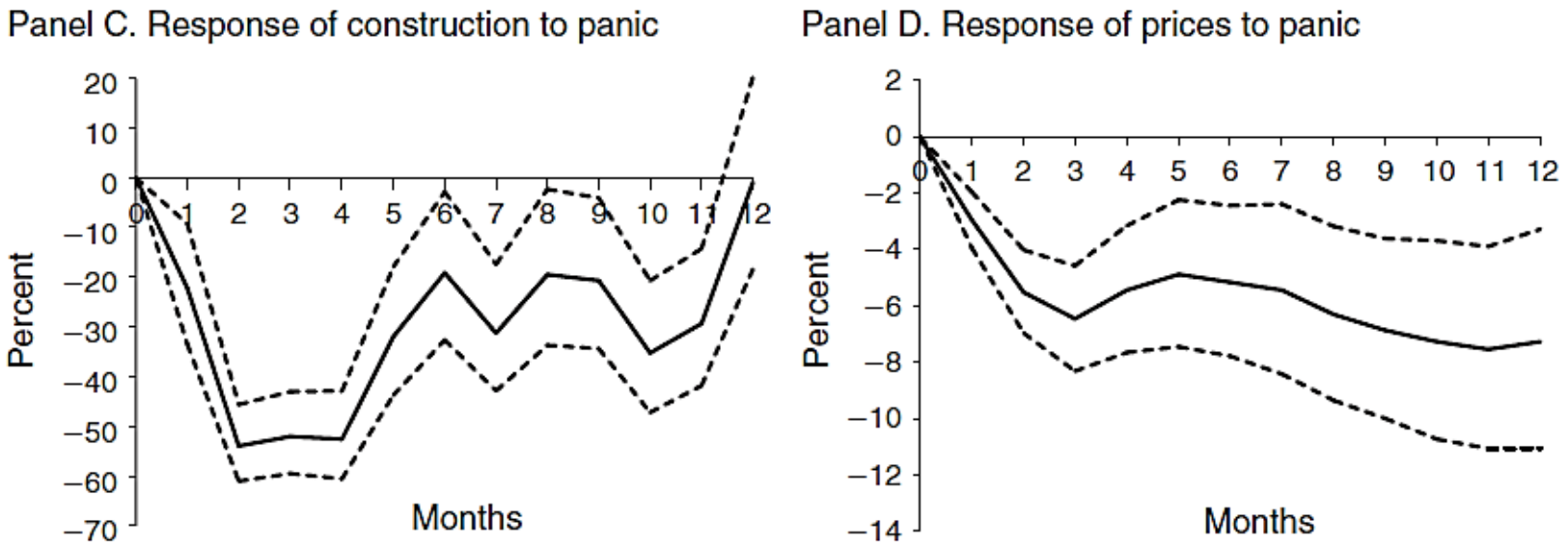


FIGURE 4. RESULTS OF THE VAR ESTIMATED WITH MONTHLY DATA

Notes: The figure displays the impulse response functions implied by the monthly VAR. The dashed lines are one standard error Monte Carlo bands.

From: Jalil, "A New History of Banking Panics in the United States, 1825–1929."

Looking for Trend and Level Effects

[53] The specific regression that I estimate takes the following form: $\ln y_t = \alpha_0 + \alpha_1 D_t + \beta_0 t + \beta_1 D_t t + \varepsilon_t$, where y_t is the Davis Index of Industrial Production in year t and D_t is a dummy variable that equals 1 if year t is in the postpanic period and 0 if year t is in the prepanic period. I include the dummy variable to identify changes in trend following the panic. Since the Davis Index is available at an annual frequency and since I want to come as close as possible to separating periods by banking panics, I implement a specific criterion for panic years. If the panic broke out in the first half of the year, then I include that year in the postpanic period. If the panic broke out in the second half of the year, then I include that year in the prepanic period. For uniformity across panics, I restrict each prepanic period to the 15 years prior to the panic and each postpanic period to the 10 years following the panic, with the exception of the Panic of 1907 where the postpanic period ends in 1915 (since the Davis Index ends in 1915). Because there were three major banking panics during the 1830s—1833, 1837, and 1839, I begin my analysis in 1840, rather than try to estimate shifts in trend between the panics of 1833 and 1837, which only spans four years, and between the panics of 1837 and 1839, which only spans two years.

From: Jalil, "A New History of Banking Panics in the United States, 1825–1929"

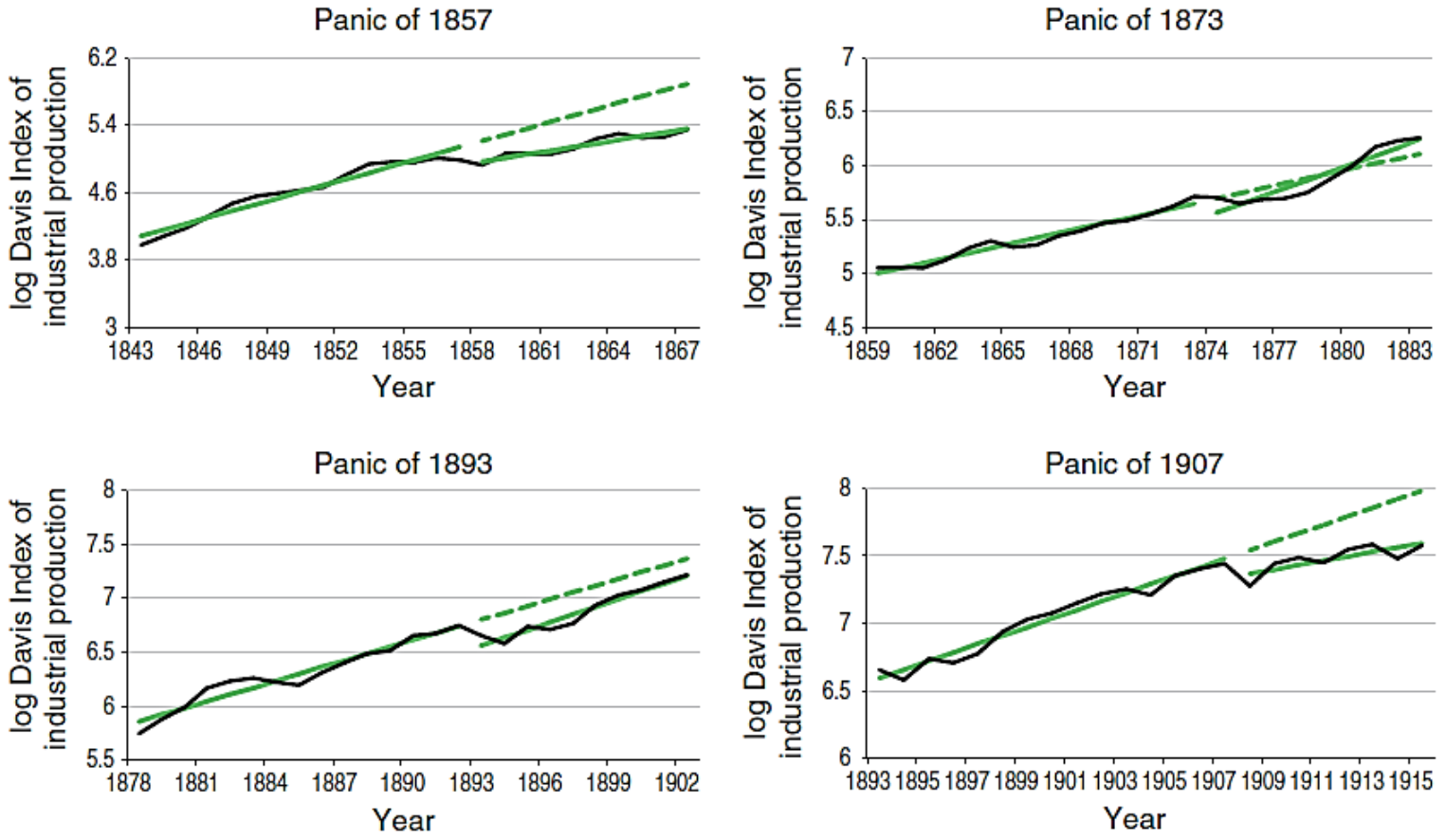


FIGURE 5. ACTUAL AND PROJECTED TREND LINES (*Panics of 1857, 1873, 1893, and 1907*)

Notes: The graphs display the prepanic and postpanic trend paths (solid lines) and the prepanic trend path projected into the postpanic period (dashed lines). The output data come from Davis (2004).

From: Jalil, "A New History of Banking Panics in the United States, 1825–1929."

Evaluation

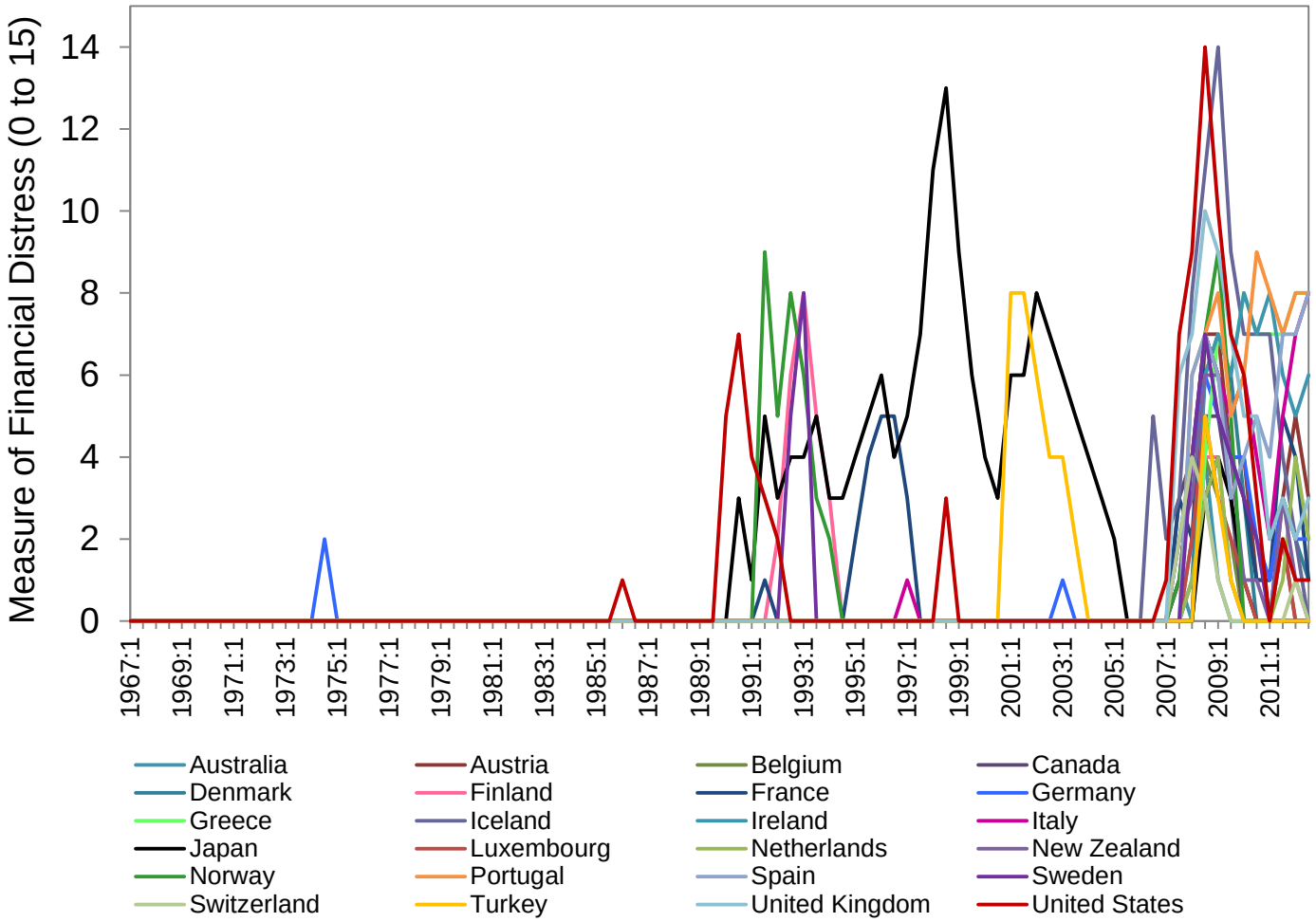
- Very careful and an impressive attempt to get more information.
- Takes identification seriously.
- Does the study have implications for modern financial disruptions?

III. Romer and Romer: "Why Some Times Are Different: Macroeconomic Policy and the Aftermath of Financial Crises"

New Measure of Financial Distress

- Use a single real-time narrative source (the *OECD Economic Outlook*).
- Define financial distress as a rise in the cost of credit intermediation.
- Scale distress from 0 to 15 (with 7 corresponding roughly to the start of the systemic crisis range).
- Specify detailed criteria for translating words into a measure of financial distress.
- Evaluation/concerns.

New Measure of Financial Distress



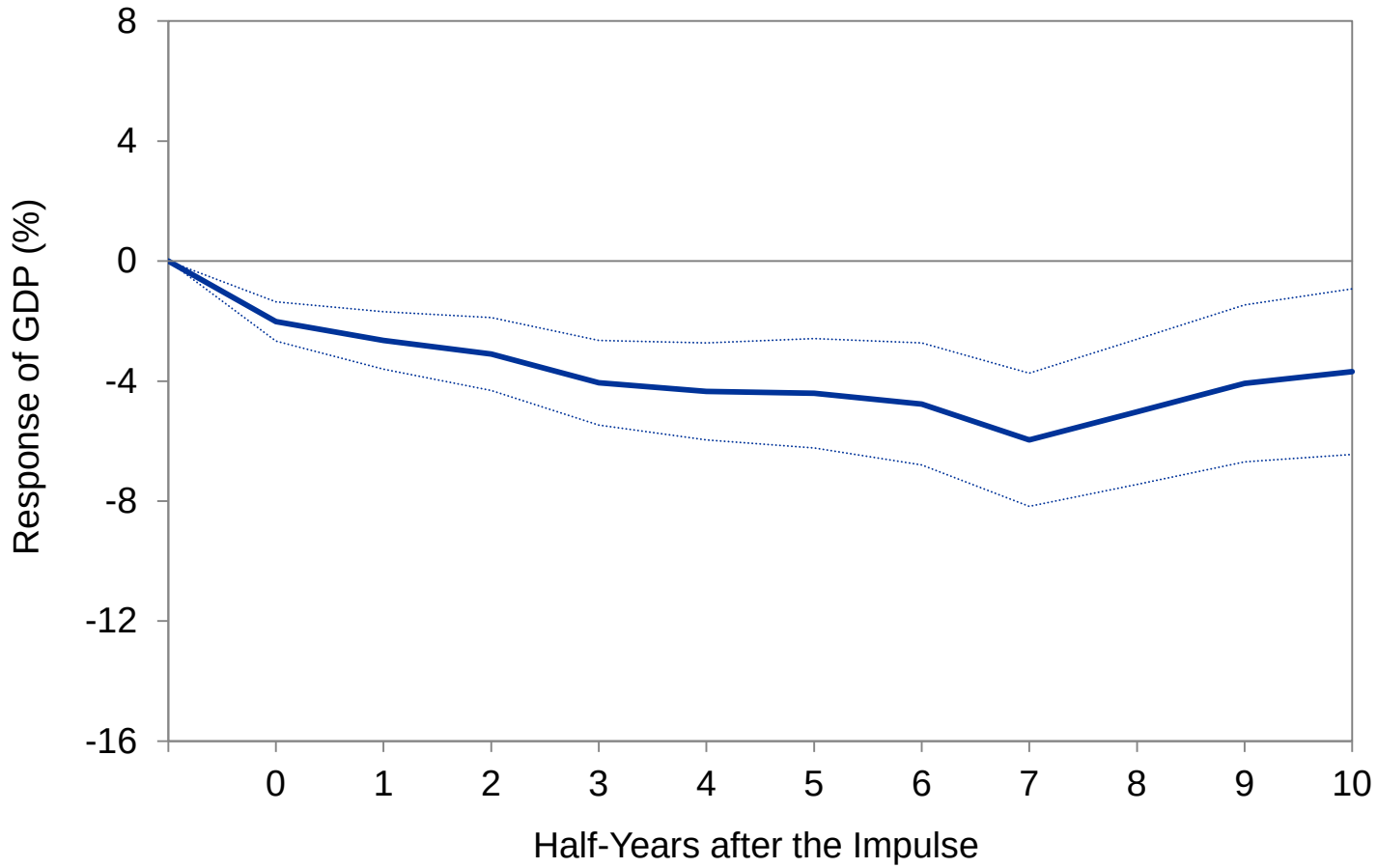
From: Romer and Romer, "Macroeconomic Policy and the Aftermath of Financial Crises."

Panel Regression Specification

$$(1) \qquad y_{j,t+i} = \alpha_j^i + \gamma_t^i + \beta^i F_{j,t} + \sum_{k=1}^{4} \varphi_k^i F_{j,t-k} + \sum_{k=1}^{4} \theta_k^i y_{j,t-k} + e_{j,t}^i,$$

- *j* subscripts index countries and *t* subscripts index time
- *i* superscripts denote the horizon (half-years after *t*)
- $y_{j,t+i}$ is the log of real GDP for country *j* at time *t+i*
- $F_{j,t}$ is the financial distress variable for country *j* at time *t*
- α's are country fixed effects and γ's are time fixed effects

Behavior of Real GDP after a Financial Crisis



Notes: The figure shows the response to an impulse of 7 in financial distress. Dashed lines show the two-standard-error confidence bands.

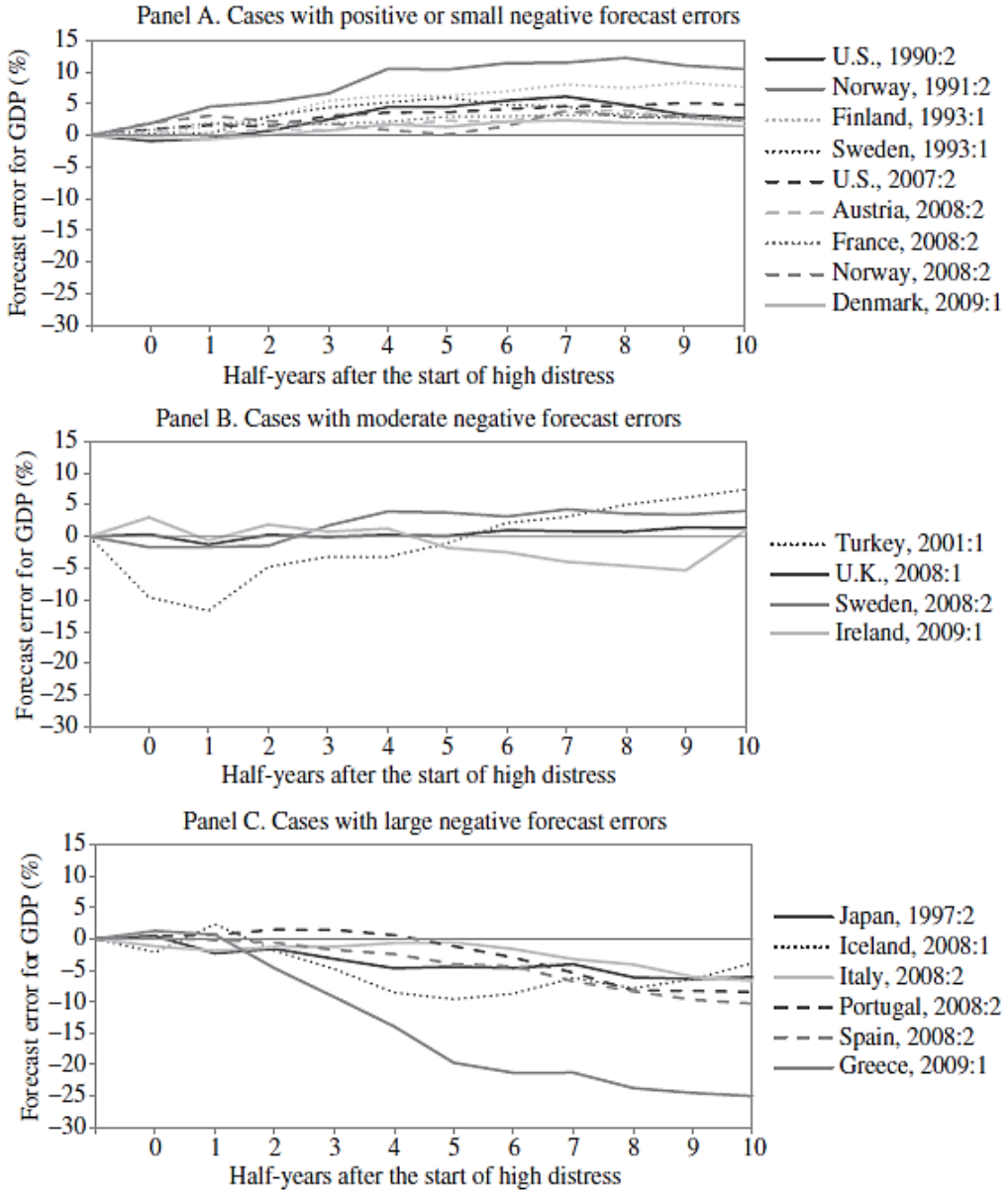


FIGURE 3. GDP forecast errors for episodes of high financial distress.

The Role of Macroeconomic Policy Space

- What is policy space?
- Why focus on that, rather than actual policy?

Measures of Policy Space

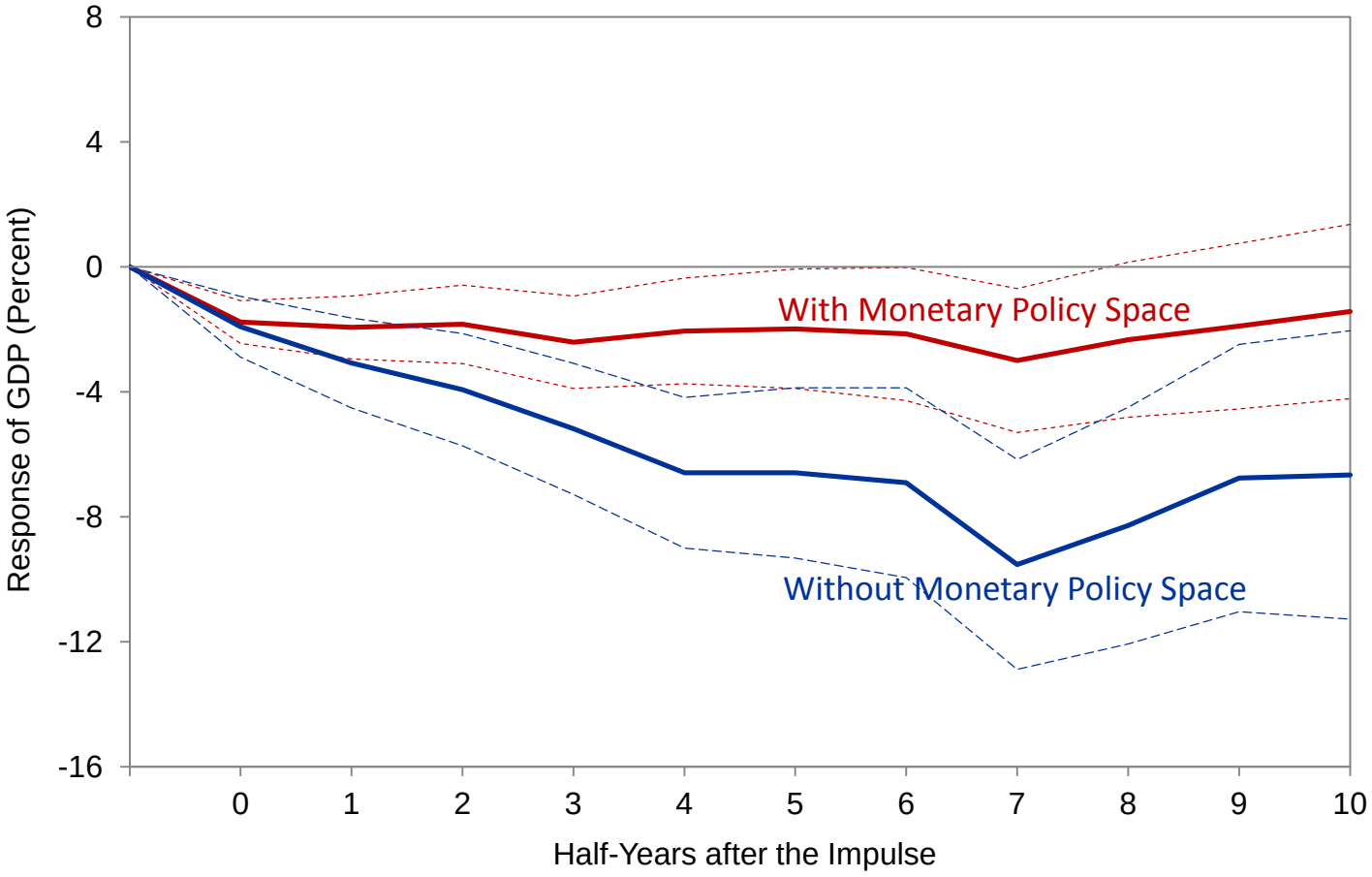
- Monetary Policy Space
  - Baseline: Is the policy interest rate greater than 1.25% at end of previous half year?
  - Variations
- Fiscal Policy Space
  - Negative of the debt-to-GDP ratio in previous calendar year.
  - Variations
- Are these sensible measures?

Panel Regression with Interaction Term

$$(2) \qquad y_{j,t+i} = \alpha_j^i + \gamma_t^i + \vartheta^i S_{j,t} + \beta^i F_{j,t} + \delta^i (F_{j,t} \cdot S_{j,t})$$
$$+ \sum_{k=1}^{4} \rho_k^i S_{j,t-k} + \sum_{k=1}^{4} \varphi_k^i F_{j,t-k} + \sum_{k=1}^{4} \omega_k^i (F_{j,t-k} \cdot S_{j,t-k}) + \sum_{k=1}^{4} \theta_k^i y_{j,t-k} + e_{j,t}^i,$$

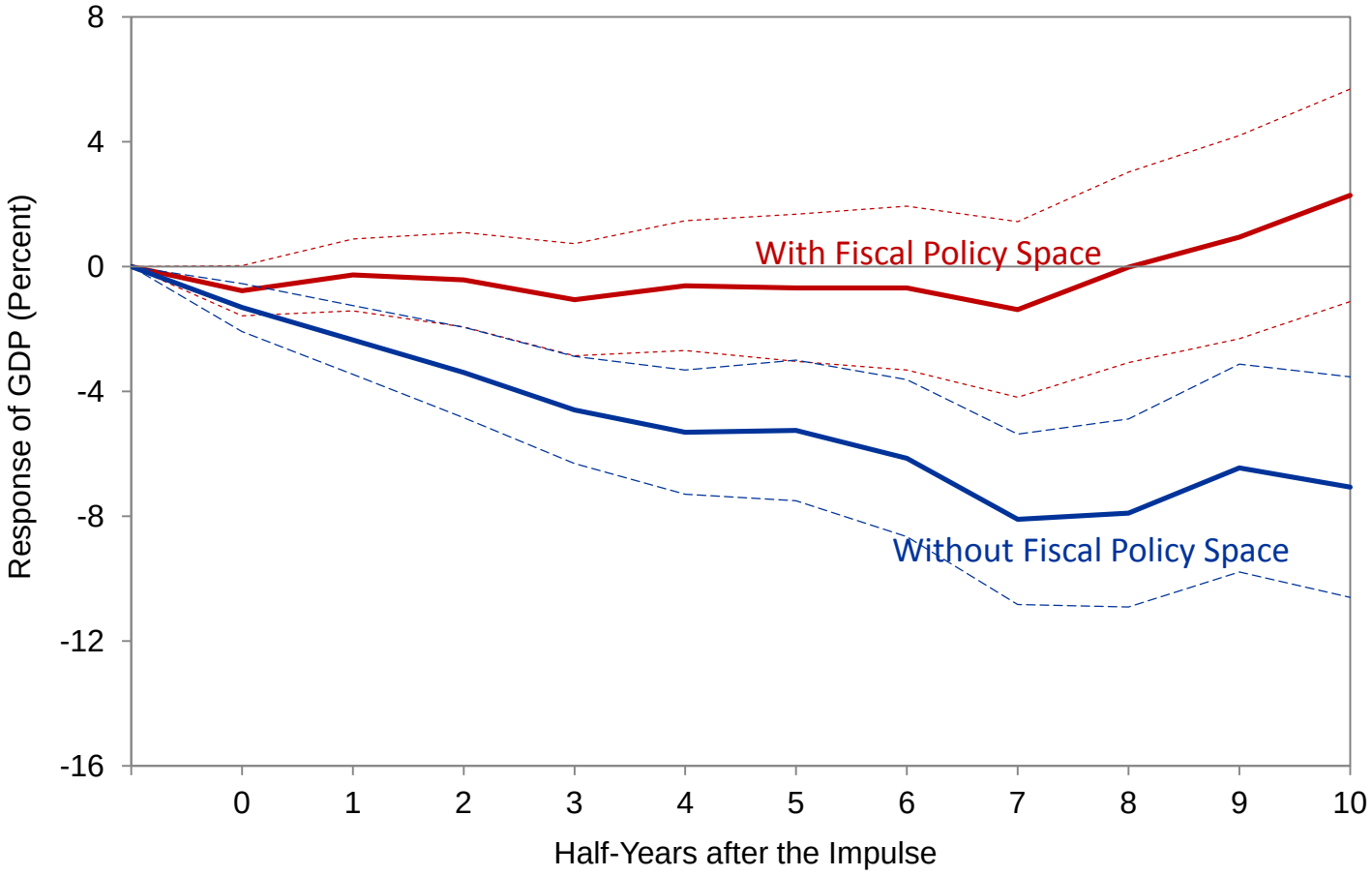
- *j* subscripts index countries and *t* subscripts index time
- *i* superscripts denote the horizon (half-years after *t*)
- $y_{j,t+i}$ is the log of real GDP for country *j* at time *t+i*
- $F_{j,t}$ is the financial distress variable for country *j* at time *t*
- $S_{j,t}$ is a measure of macroeconomic policy space
- α's are country fixed effects and γ's are time fixed effects

Behavior of Real GDP after a Financial Crisis
With and Without Monetary Policy Space



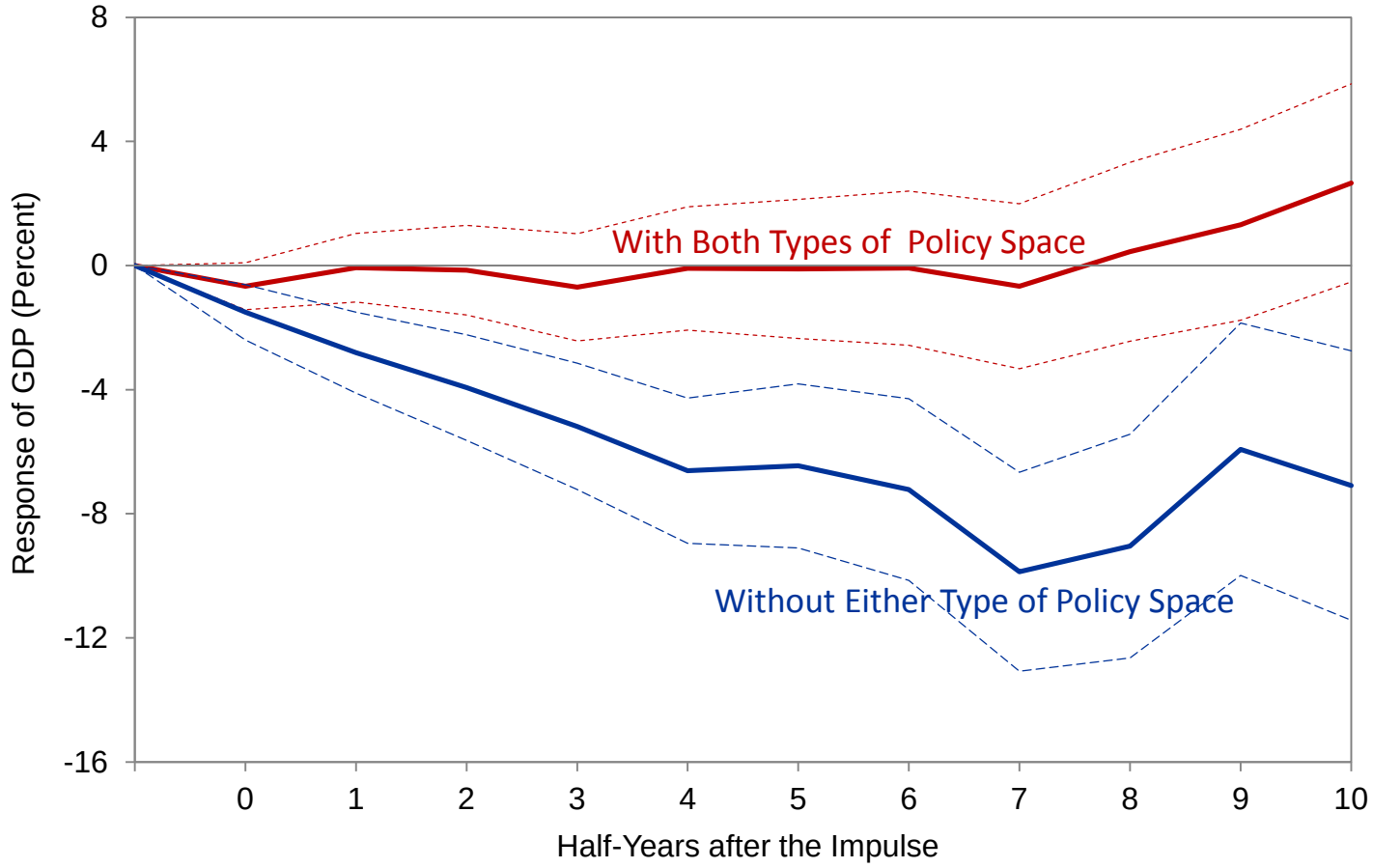
From: Romer and Romer, "Macroeconomic Policy and the Aftermath of Financial Crises."

Behavior of Real GDP after a Financial Crisis
With and Without Fiscal Policy Space



From: Romer and Romer, "Macroeconomic Policy and the Aftermath of Financial Crises."

Behavior of Real GDP after a Financial Crisis
With *Both* Monetary and Fiscal Policy Space and Without *Either* Monetary or Fiscal Policy Space



Evaluation of the Exercise

Specification for the Monetary Policy Response

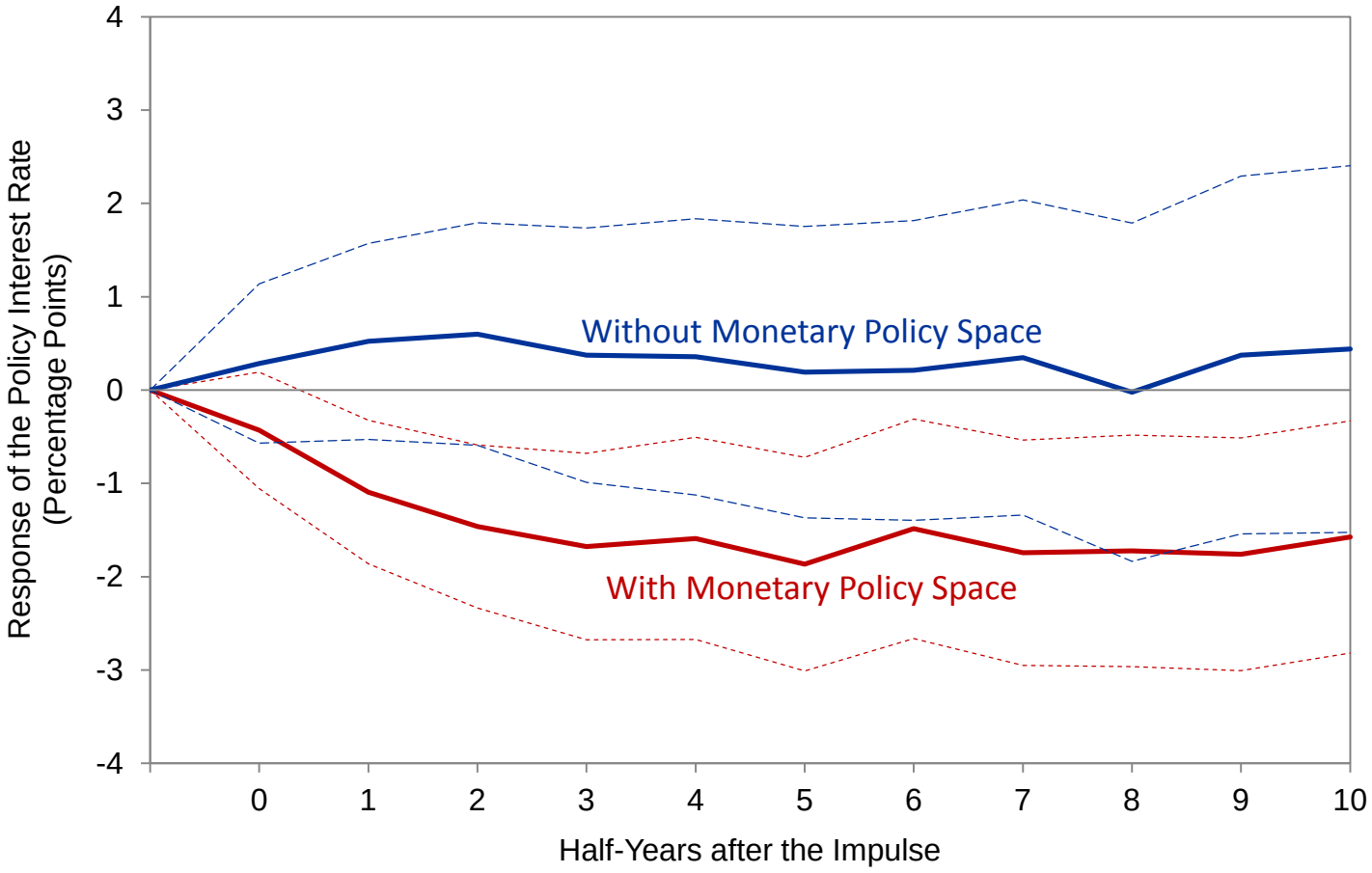
$$(3) \qquad r_{j,t+i} - r_{j,t-1} = \alpha_j^i + \gamma_t^i + \vartheta^i S_{j,t} + \beta^i F_{j,t} + \delta^i (F_{j,t} \cdot S_{j,t})$$

$$+ \sum_{k=1}^{4} \rho_k^i S_{j,t-k} + \sum_{k=1}^{4} \varphi_k^i F_{j,t-k} + \sum_{k=1}^{4} \omega_k^i (F_{j,t-k} \cdot S_{j,t-k}) + \sum_{k=1}^{4} \theta_k^i \Delta r_{j,t-k} + e_{j,t}^i,$$

- $r_{j,t+i}$ is the policy interest rate for country *j* at time *t+i*
- $F_{j,t}$ is financial distress in country *j* at time *t*
- $S_{j,t}$ is (monetary) policy space for country *j* at time *t*
- *j* indexes countries and *t* indexes time
- *i* denotes the horizon (half-years after *t*)
- α's and γ's are country and time fixed effects

Behavior of the Policy Interest Rate after a Financial Crisis

With and Without Monetary Policy Space



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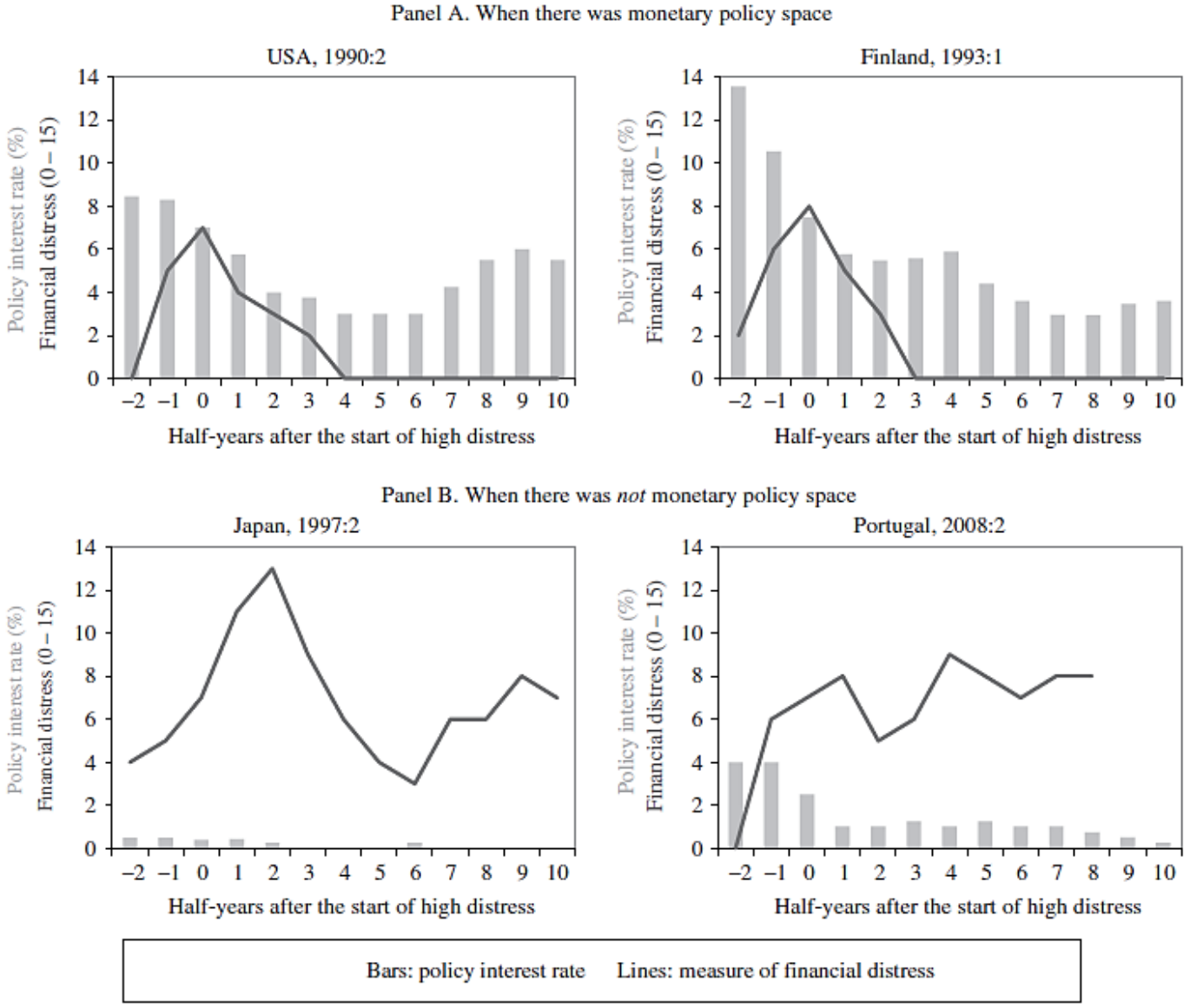


FIGURE 10. Behaviour of the policy interest rate in selected episodes of high financial distress, when there was and was not monetary policy space.

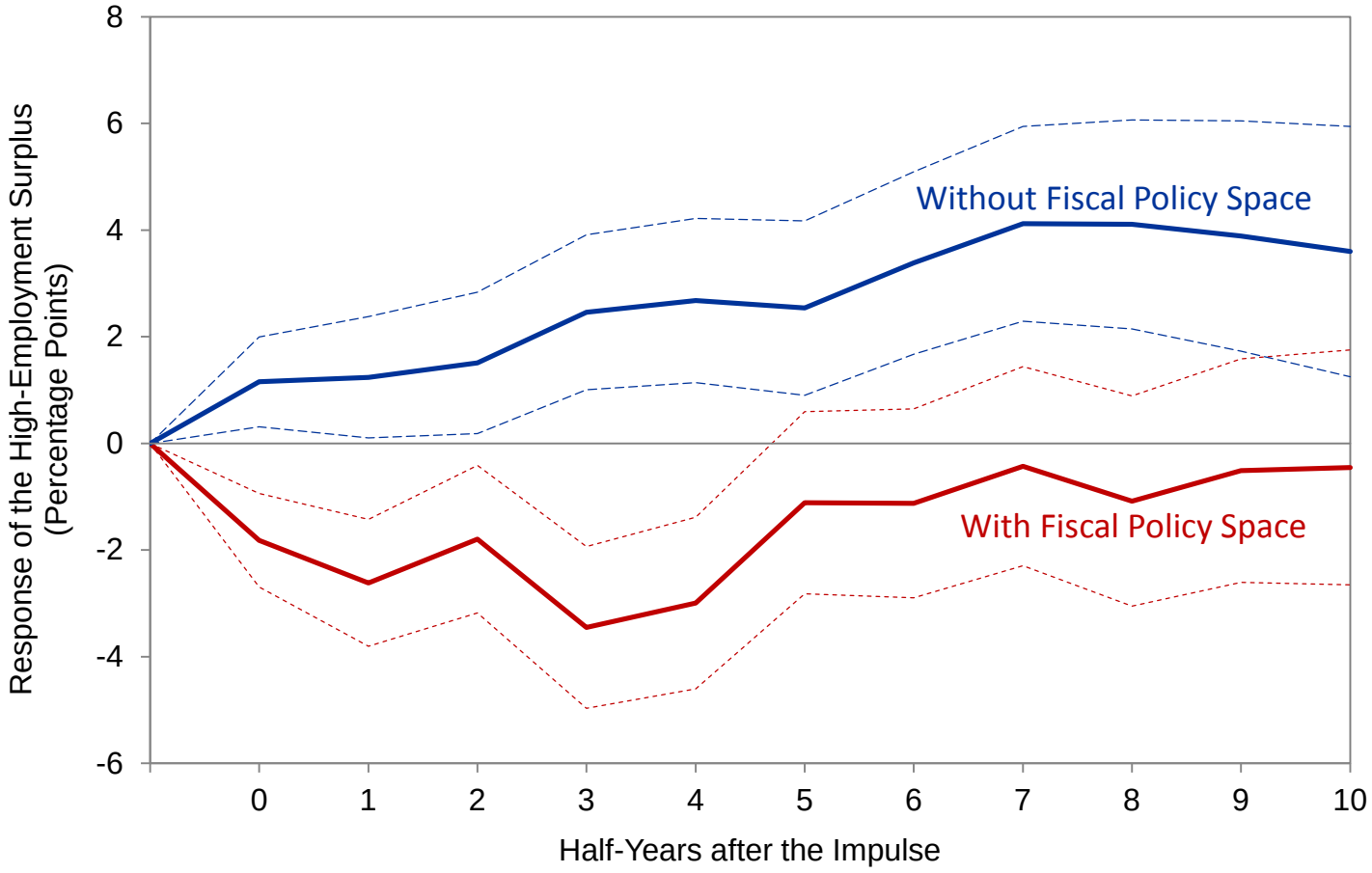
Specification for the Fiscal Policy Response

(4) $$\left(B_{j,t+i} - B_{j,t-1}\right) - \tau \cdot \left(y_{j,t+i} - y_{j,t-1}\right) = \alpha_j^i + \gamma_t^i + \vartheta^i S_{j,t} + \beta^i F_{j,t} + \delta^i \left(F_{j,t} \cdot S_{j,t}\right) +$$

$$\sum_{k=1}^{4} \rho_k^i S_{j,t-k} + \sum_{k=1}^{4} \varphi_k^i F_{j,t-k} + \sum_{k=1}^{4} \omega_k^i (F_{j,t-k} \cdot S_{j,t-k}) + \sum_{k=1}^{4} \theta_k^i \left(\Delta B_{j,t-k} - \tau \cdot \Delta y_{j,t-k}\right) + e_{j,t}^i$$

- $B_{j,t+i}$ is the actual budget surplus for country *j* at time *t+i*
- τ is an estimate of the cyclical sensitivity of the surplus
- $F_{j,t}$ is financial distress in country *j* at time *t*
- $S_{j,t}$ is (fiscal) policy space for country *j* at time *t*
- *j* indexes countries and *t* indexes time
- *i* denotes the horizon (half-years after *t*)
- α's and γ's are country and time fixed effects

Behavior of the High-Employment Surplus after a Financial Crisis
With and Without Fiscal Policy Space



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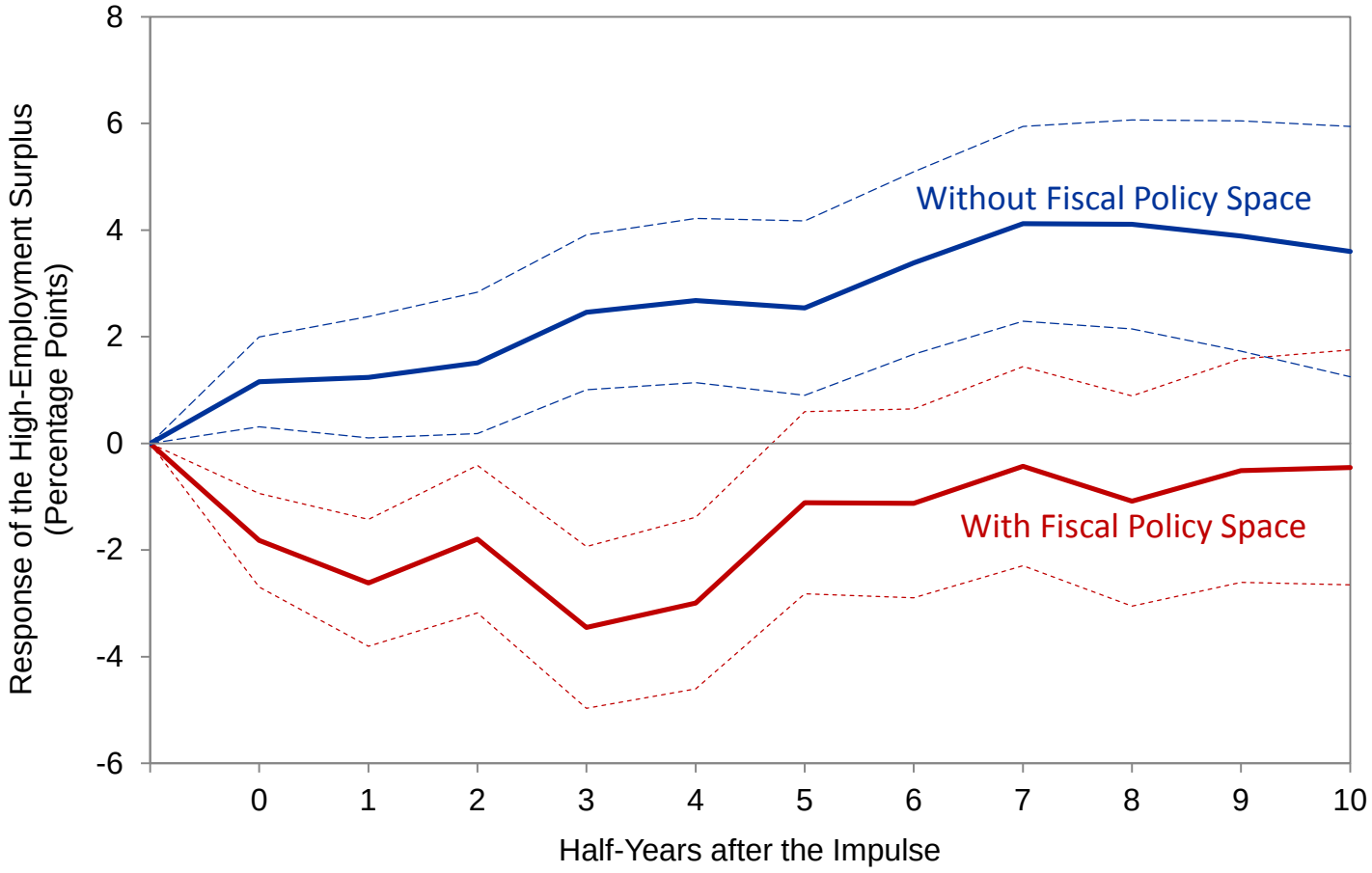
Behavior of the High-Employment Surplus after a Financial Crisis
With and Without Fiscal Policy Space



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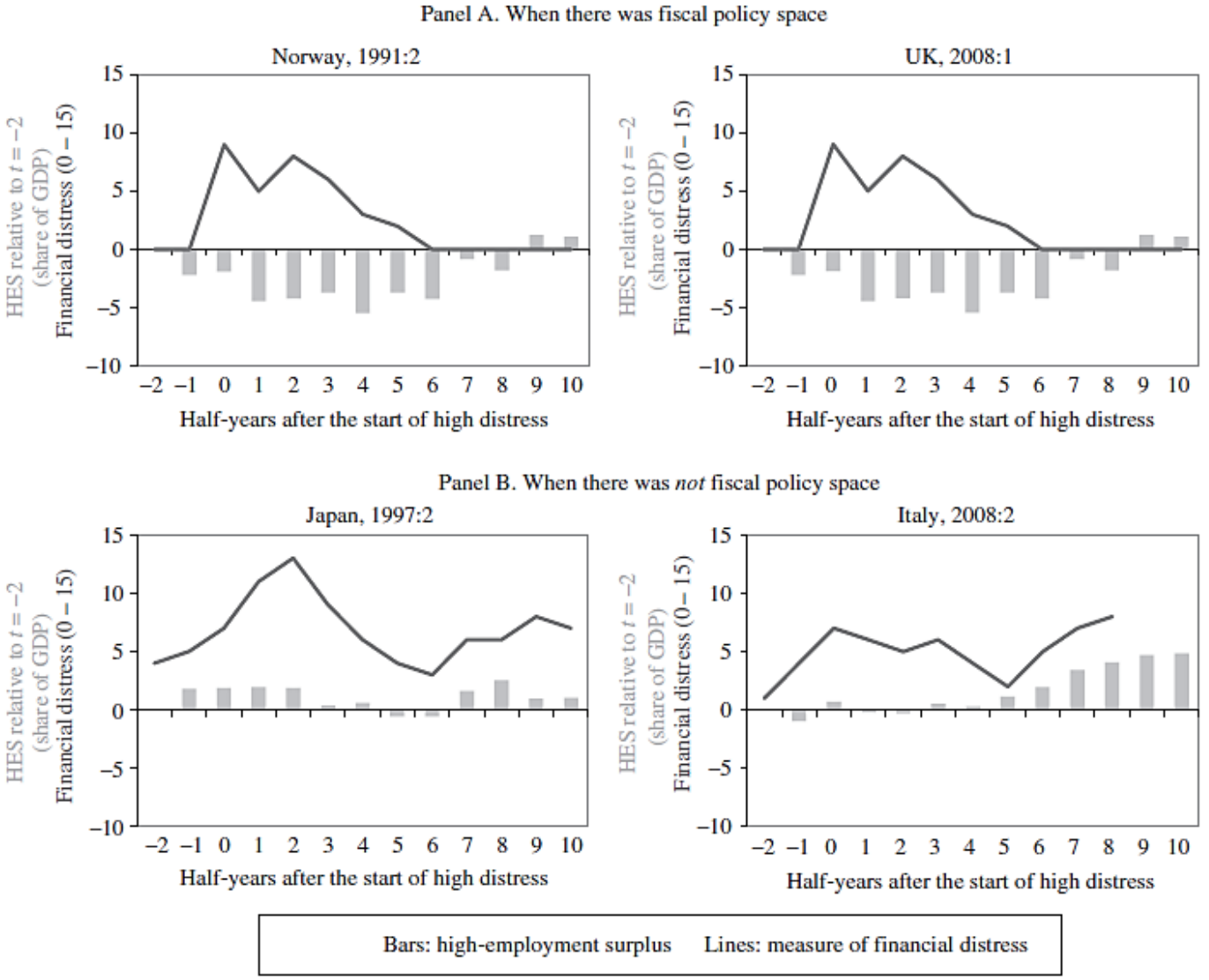

FIGURE 12. Behaviour of the high-employment surplus in selected episodes of high financial distress, when there was and was not fiscal policy space.

Extending and Improving the Analysis

IV. Jordà, Schularick, and Taylor: "When Credit Bites Back"

Data

- Annual data for 14 advanced economies, 1870-today.
- GDP, bank loans, interest rates, house prices, stock prices, etc.
- Any concerns about the data?
- How do JST date financial crises?
- How do they date business cycle peaks and troughs?

TABLE 1

BUSINESS CYCLE PEAKS

AUS	N	1875	1878	1881	1883	1885	1887	1889	1896	1898	1900	1904	1910
		1913	1926	1938	1943	1951	1956	1961	1973	1976	1981		
	F	1891	1894	1989									
CAN	N	1871	1877	1882	1884	1888	1891	1894	1903	1913	1917	1928	1944
		1947	1953	1956	1981	1989	2007						
	F	1874	1907										
CHE	N	1875	1880	1886	1890	1893	1899	1902	1906	1912	1916	1920	1933
		1939	1947	1951	1957	1974	1981	1990	1994	2001			
	F	1871	1929	2008									
DEU	N	1879	1898	1905	1913	1922	1943	1966	1974	1980	1992	2001	
	F	1875	1890	1908	1928	2008							
DNK	N	1870	1880	1887	1911	1914	1916	1923	1939	1944	1950	1962	1973
		1979	1987	1992									
	F	1872	1876	1883	1920	1931	2007						
ESP	N	1873	1877	1892	1894	1901	1909	1911	1916	1927	1932	1935	1940
		1944	1947	1952	1958	1974	1980	1992					
	F	1883	1889	1913	1925	1929	1978	2007					
FRA	N	1872	1874	1892	1894	1896	1900	1905	1909	1912	1916	1920	1926
		1933	1937	1939	1942	1974	1992						
	F	1882	1907	1929	2007								
GBR	N	1871	1875	1877	1883	1896	1899	1902	1907	1918	1925	1929	1938
		1943	1951	1957	1979								
	F	1873	1889	1973	1990	2007							
ITA	N	1870	1883	1897	1918	1923	1925	1932	1939	1974	1992	2002	2004
	F	1874	1887	1891	1929	2007							
JPN	N	1875	1877	1880	1887	1890	1892	1895	1898	1903	1919	1921	1929
		1933	1940	1973	2001	2007							
	F	1882	1901	1907	1913	1925	1997						
NLD	N	1870	1873	1877	1889	1894	1899	1902	1913	1929	1957	1974	1980
		2001											
	F	1892	1906	1937	1939	2008							
NOR	N	1876	1881	1885	1893	1902	1916	1923	1939	1941	1957	1981	2008
	F	1897	1920	1930	1987								
SWE	N	1873	1876	1881	1883	1885	1888	1890	1899	1901	1904	1913	1916
		1924	1939	1976	1980								
	F	1879	1907	1920	1930	1990	2007						
USA	N	1875	1887	1889	1895	1901	1909	1913	1916	1918	1926	1937	1944
		1948	1953	1957	1969	1973	1979	1981	1990	2000			
	F	1873	1882	1892	1906	1929	2007						

From: Jordà, Schularick, and Taylor, "When Credit Bites Back."

What do you think of the recession-based approach?

- It is not precise about the timing
    - Was there a crisis “around” a recession?
- Why not use the full time series?
- What happens if no recession around a crisis?

Measure of Excess Credit Growth (ξ)

- "We construct a measure of 'excess credit' built-up during the previous boom: the rate of change in the ratio of bank loans to GDP, in deviation from its mean, and calculated from the previous trough to the subsequent peak."

$$\frac{\left[\frac{Loans}{GDP}^{Peak} - \frac{Loans}{GDP}^{Previous\ Trough}\right]}{Years\ from\ Trough\ to\ Peak} - Mean$$

- I don't know what the mean refers to (full sample, country- or time-specific?).

- Is this a sensible variable to consider?

Questions JST Ask

(i) Are financial recessions significantly different, that is, more painful, than normal recessions?
(ii) Is the intensity of credit creation, or leveraging, during the preceding expansion phase systematically related to the adversity of the subsequent recession/recovery phase?

Unconditional Response

$$\Delta_h y_{it(r)+h} = \theta_N N + \theta_F F + u_{it(r)}$$

- Where $\Delta_h y_{it(r)+h}$ is the cumulative change in per capita GDP in country *i* in recession *t(r) h* years after the business cycle peak.
- *N* is a dummy variable for a non-financial recession and *F* is a dummy variable for a recession including a financial crisis.

TABLE 5

UNCONDITIONAL RECESSION PATHS, NORMAL VERSUS FINANCIAL BINS

Log real GDP per capita (relative to year 0, ×100)	Year 1 (1)	Year 2 (2)	Year 3 (3)	Year 4 (4)	Year 5 (5)
Normal recession (N)	−2.0**	−0.0	2.0**	3.3**	4.5**
	(0.2)	(0.3)	(0.4)	(0.6)	(0.7)
Financial recession (F)	−2.7**	−3.1**	−2.5**	−0.9	1.0
	(0.3)	(0.6)	(0.8)	(1.1)	(1.2)
F-test equality of coefficients, normal = financial (p)	0.11	0.00	0.00	0.00	0.01
Observations, normal	173	173	173	173	173
Observations, financial	50	50	50	50	50
Observations	223	223	223	223	223

NOTE: Dependent variable: $\Delta_h y_{it(r)+h}$ = (change in log real GDP per capita from year 0 to year h) ×100. Standard errors in parentheses.
** $p < 0.05$.

From: Jordà, Schularick, and Taylor, "When Credit Bites Back."

Unconditional Response, Allowing for Interaction Effects with Excess Credit Growth

$$\Delta_h y_{it(r)+h} = \theta_N N + \theta_F F + +\beta_{h,N} N\left(\xi_{t(r)} - \overline{\xi_N}\right) + \beta_{h,F} F\left(\xi_{t(r)} - \overline{\xi_F}\right) + u_{it(r)}$$

- Where $\Delta_h y_{it(r)+h}$ is the cumulative change in per capita GDP in country *i* in recession *t(r) h* years after the business cycle peak.
- *N* is a dummy variable for a non-financial recession and *F* is a dummy variable for a financial recession
- $N\left(\xi_{t(r)} - \overline{\xi_N}\right)$ is an interaction term between a non-financial recession dummy and excess credit growth in preceding expansion (minus mean excess credit growth in non-financial recessions).

TABLE 6

NORMAL VERSUS FINANCIAL BINS WITH EXCESS CREDIT AS A CONTINUOUS TREATMENT IN EACH BIN

Log real GDP per capita (relative to year 0, ×100)	Year 1 (1)	Year 2 (2)	Year 3 (3)	Year 4 (4)	Year 5 (5)
Normal recession (N)	−1.9**	0.3	2.2**	3.4**	4.5**
	(0.2)	(0.4)	(0.5)	(0.7)	(0.9)
Financial recession (F)	−3.3**	−3.9**	−3.5**	−1.6	0.7
	(0.4)	(0.7)	(1.0)	(1.4)	(1.6)
Excess credit × normal recession ($N \times (\xi - \overline{\xi_N})$)	0.0	−0.2	−0.0	−0.2	−0.2
	(0.1)	(0.2)	(0.3)	(0.4)	(0.4)
Excess credit × financial recession ($F \times (\xi - \overline{\xi_F})$)	−0.1	−0.7**	−0.4	−0.9*	−1.0
	(0.2)	(0.3)	(0.4)	(0.6)	(0.6)
F-test equality of coefficients, normal = financial (p)	0.01	0.00	0.00	0.00	0.03
F-test equality of coefficients, interaction terms (p)	0.45	0.13	0.46	0.28	0.31
Observations, normal	119	119	119	119	119
Observations, financial	35	35	35	35	35
Observations	154	154	154	154	154

NOTES: Dependent variable: $\Delta_h y_{it(r)+h}$ = (change in log real GDP per capita from year 0 to year h)×100. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$. In each bin, recession indicators (N, F) are interacted with demeaned excess credit, ($\xi - \overline{\xi_N}$, $\xi - \overline{\xi_F}$).

From: Jordà, Schularick, and Taylor, "When Credit Bites Back."

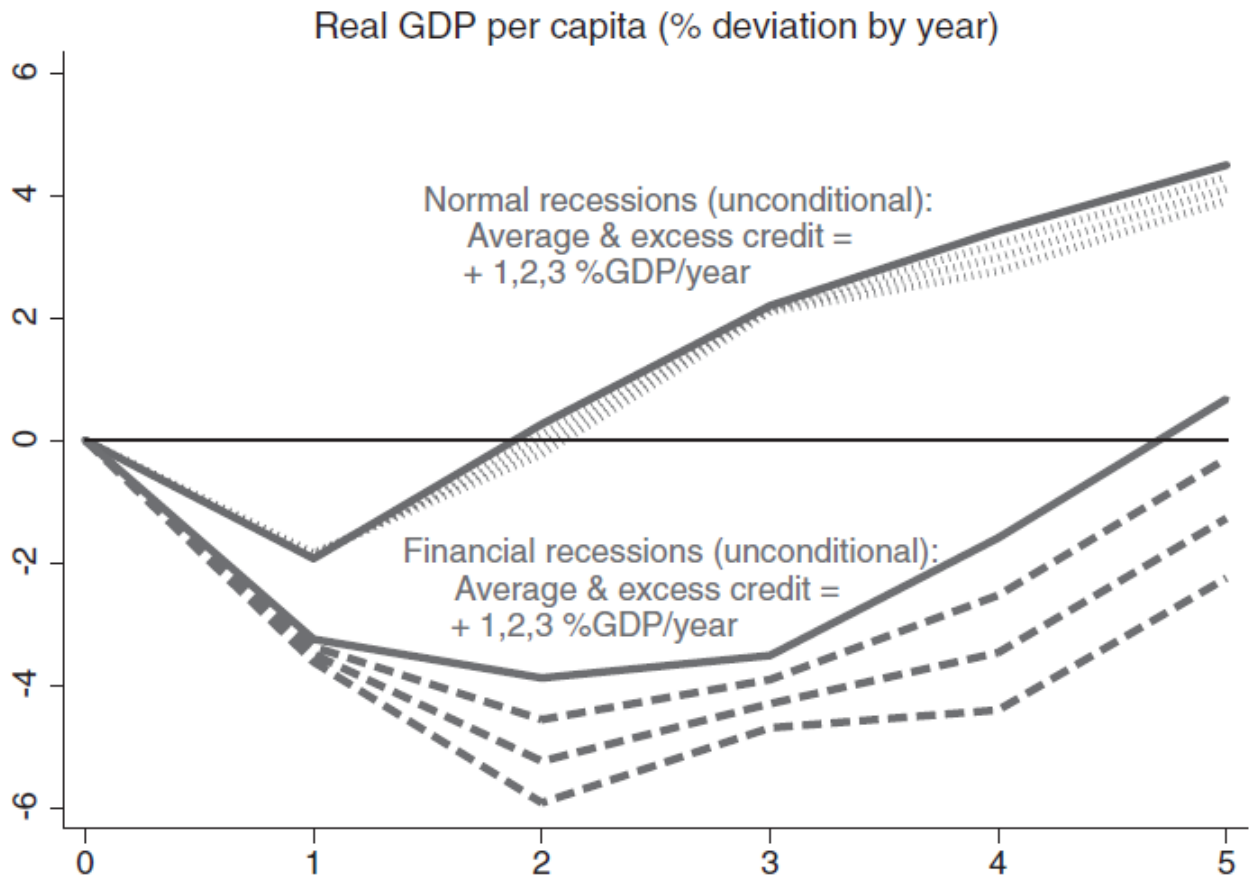

FIG. 1. Unconditional Paths under Continuous Excess Credit Treatment.

NOTES: See text. Solid lines show paths from Table 6, when excess credit ξ is at its mean in each bin. Dotted and dashed lines show paths when ξ is perturbed in three increments of $+1$ percentage points per year in each bin.

From: Jordà, Schularick, and Taylor, "When Credit Bites Back."

Conditional Response

$$\Delta_h y^k_{it(r)+h} = \alpha^k_i + \theta^k_N N + \theta^k_F F + \beta^k_{h,N} N(\xi_{t(r)} - \overline{\xi_N}) + \beta^k_{h,F} F(\xi_{t(r)} - \overline{\xi_F})$$
$$+ \sum_{j=0}^{p} \Gamma^k_j Y_{it(r)-j} + u^k_{it(r)}; \quad k = 1, \ldots, K; \quad h = 1, \ldots, H, \quad (3)$$

- Seven variable system, k= growth rate of real GDP p.c., growth rate of real loans p.c., CPI inflation rate, short-term i on government bonds, long-term i on government bonds, I/GDP, current account/GDP.

- *N*, *F*, and ξ are defined as before.

TABLE 8

LP Conditional Paths—Seven-Variable System, Normal versus Financial Bins and Excess Credit

Log real GDP per capita (relative to year 0, ×100)	Year 1 (1)	Year 2 (2)	Year 3 (3)	Year 4 (4)	Year 5 (5)
Normal recession (N)	−1.3**	0.7	3.2**	3.8**	4.8**
	(0.4)	(0.6)	(0.9)	(1.1)	(1.2)
Financial recession (F)	−2.8**	−4.1**	−3.6**	−2.8	−1.4
	(0.6)	(1.0)	(1.4)	(1.8)	(1.9)
Excess credit × normal recession ($N \times (\xi - \overline{\xi_N})$)	−0.3	−0.7**	−0.8*	−0.9*	−0.7
	(0.2)	(0.3)	(0.4)	(0.5)	(0.6)
Excess credit × financial recession ($F \times (\xi - \overline{\xi_F})$)	−0.4*	−1.0**	−0.4	−1.3*	−0.9
	(0.2)	(0.4)	(0.5)	(0.7)	(0.7)
F-test equality of coefficients, normal = financial (p)	0.01	0.00	0.00	0.00	0.00
F-test equality of coefficients, interaction terms (p)	0.57	0.47	0.49	0.62	0.82
Observations, normal	92	92	92	92	92
Observations, financial	29	29	29	29	29
Observations	121	121	121	121	121

Notes: Dependent variable: $\Delta_h y_{it(r)+h}$ = (change in log real GDP per capita from year 0 to year h) ×100. Standard errors in parentheses.* $p < 0.10$, ** $p < 0.05$. Country fixed effects not shown. See text for a list of controls not shown here. LM test: All excess credit coefficients equal zero: $F(10,585) = 3.026$; $p = 0.001$. In each bin, recession indicators (N, F) are interacted with demeaned excess credit, $(\xi - \overline{\xi_N}, \xi - \overline{\xi_F})$.

From: Jordà, Schularick, and Taylor, “When Credit Bites Back.”

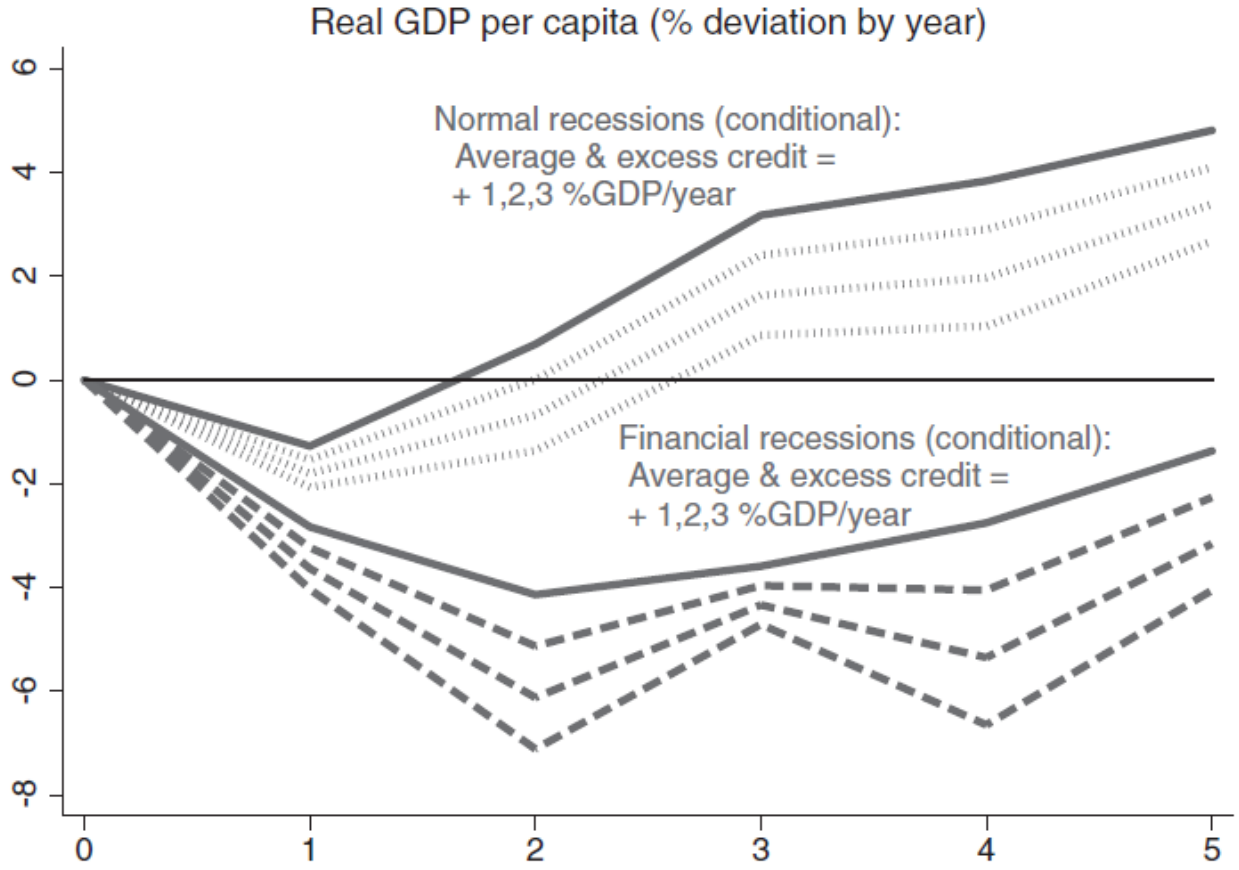

FIG. 2. Conditional Paths, Continuous Excess Credit Treatment.

NOTES: See text. Solid lines show paths from Table 8, when excess credit ξ is at its mean in each bin. Dotted and dashed lines show paths when ξ is perturbed in three increments of $+1$ percentage points per year in each bin. For each case all the controls are set to their historical mean values and the average country fixed effect is imposed.

From: Jordà, Schularick, and Taylor, "When Credit Bites Back."

Evaluation