Credit Booms Gone Bust

Monetary Policy, Leverage Cycles and Financial Crises, 1870–2008

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Motivation

- Financial crisis has triggered new interest in the role of credit in the macroeconomy
  - Policy relevance: are credit booms dangerous?
    - *Should policymakers focus on them?*
    - *Are large financial sectors more crisis-prone?*
  - Advanced vs. emerging markets financial crises
    - *Not so different when it comes to banking crises?*
- Importance of economic history
  - We need a longer view to build better theory
  - Rare events problem
    - *A lot of observations needed to say anything*

What's new?

- A massive new 140 x 14 annual panel database bringing together long-run credit and monetary data
  - *Countries:* Australia, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, UK, US
- Many questions we could not answer without these data
  - Long-run trends: shifting importance of money vs. credit aggregates?
  - Better analyze the causes and consequences of "rare event" crises

Outline

1 – Descriptive: new annual bank credit data

- 1870-2008 for N=14 (+other macro aggregates)
- Global trends: what has happened in the long run?
- Event study: what has happened in financial crises

2 – Predictive: are crises credit booms gone bust?

- "Early warning"? Can credit data help us forecast financial crisis?
- Control for other potential causal factors
- Predictive ability?

Part 1: Descriptive

- Data: Standard macro variables 1870-2008 plus

  Bank loans = Domestic currency lending by domestic banks to domestic households and non-financial corporations (excluding lending within the financial system). Banks are monetary financial institutions and include savings banks, postal banks, credit unions, mortgage associations, and building societies.

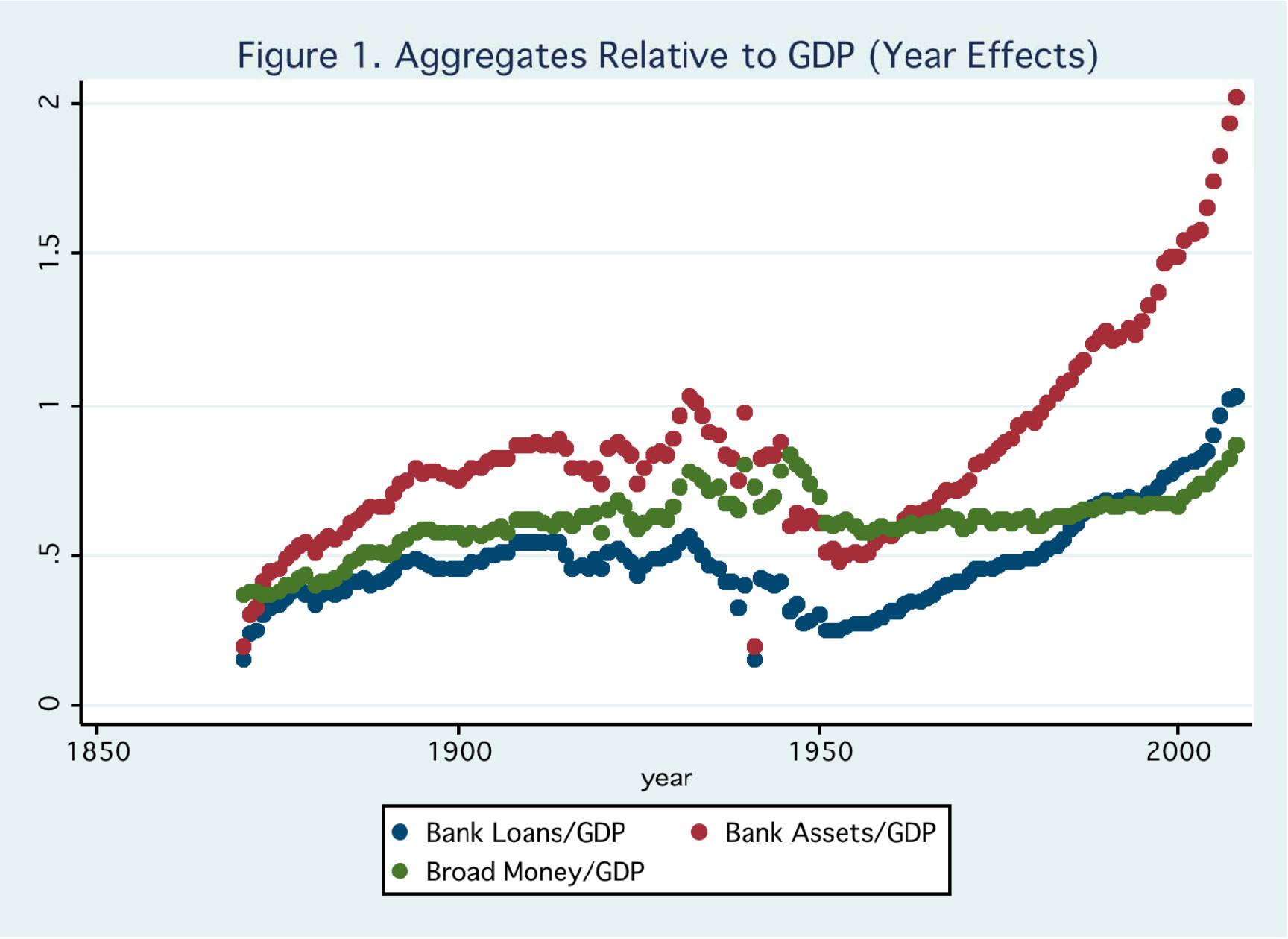
  Bank assets = Sum of *all* balance sheet assets of banks with national residency (excluding foreign currency assets).

- Construct global trends in banking sector balance sheets
  - For any X_{it} estimate country-fixed effects regression

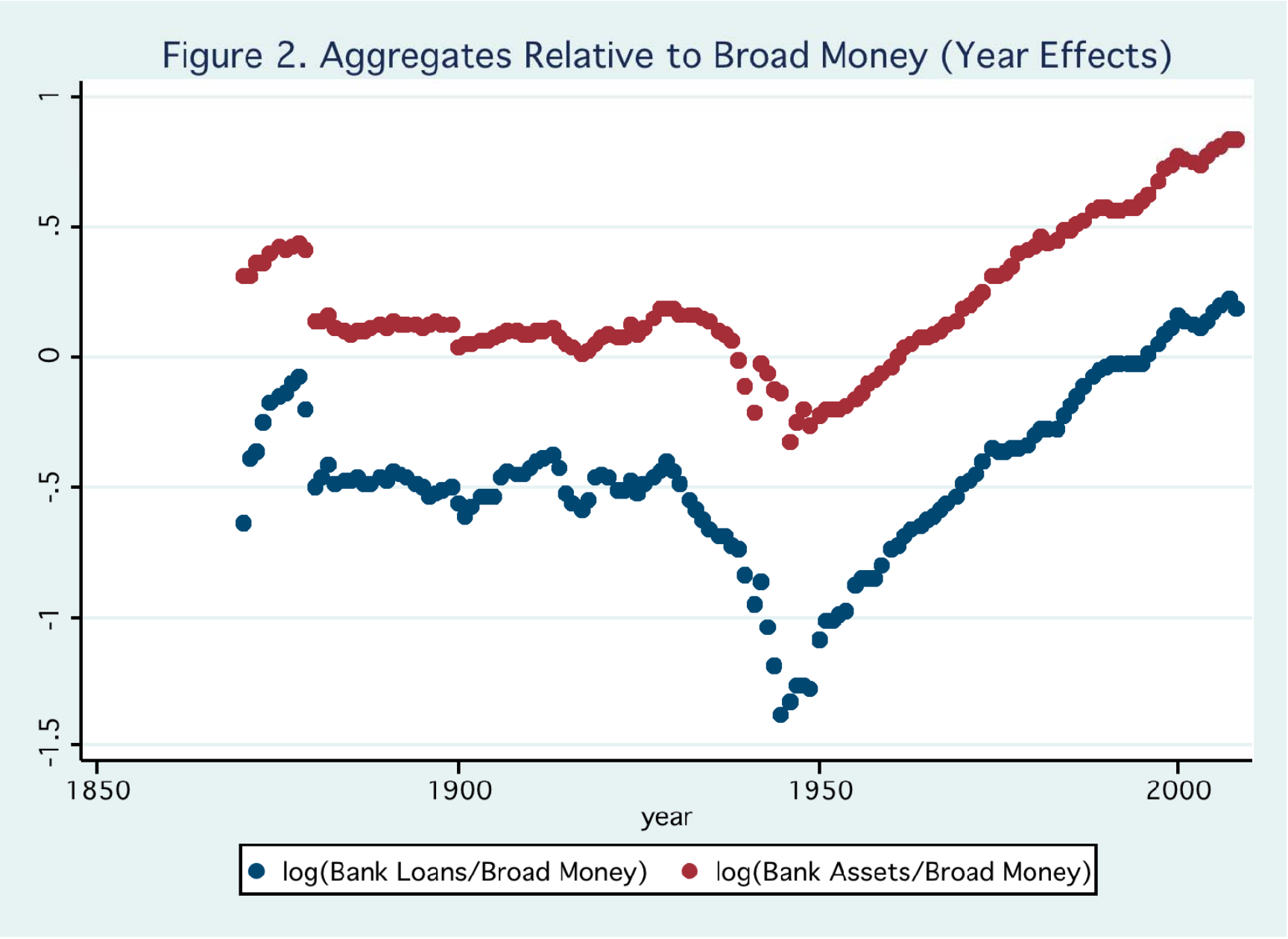
    $$X_{it} = a_i + b_t + e_{it}$$

    then plot the estimated year effects b_t to show the average global level of X in year t.

Growth of Banking



Growth of Funding Leverage



Trends

- Age of Money (1870-1970s)
  - Money and credit were tightly linked and maintained a fairly stable relationship relative to GDP
  - Both aggregates collapsed in the Great Depression
  - Recovery from the collapse from 1940s to 1970s in a period of low leverage/financial repression/regulation (with no financial crises)
- Age of Credit (1970s-2008)
  - Unprecedented rise of leverage and growth of non-monetary liabilities of banks
  - Decoupling of credit from money

Policy Responses in Financial Crises

- Event analysis
  - Use **Bordo et al.** and **Reinhart-Rogoff** event definitions (systemic financial crises), with 1 or 2 minor adjustments
  - Track aggregates in years 0–5 after an event
- Compare the pre and post WW2 eras
  - Look for evidence that changes in central bank policies after the Great Depression have made a difference

Crisis windows

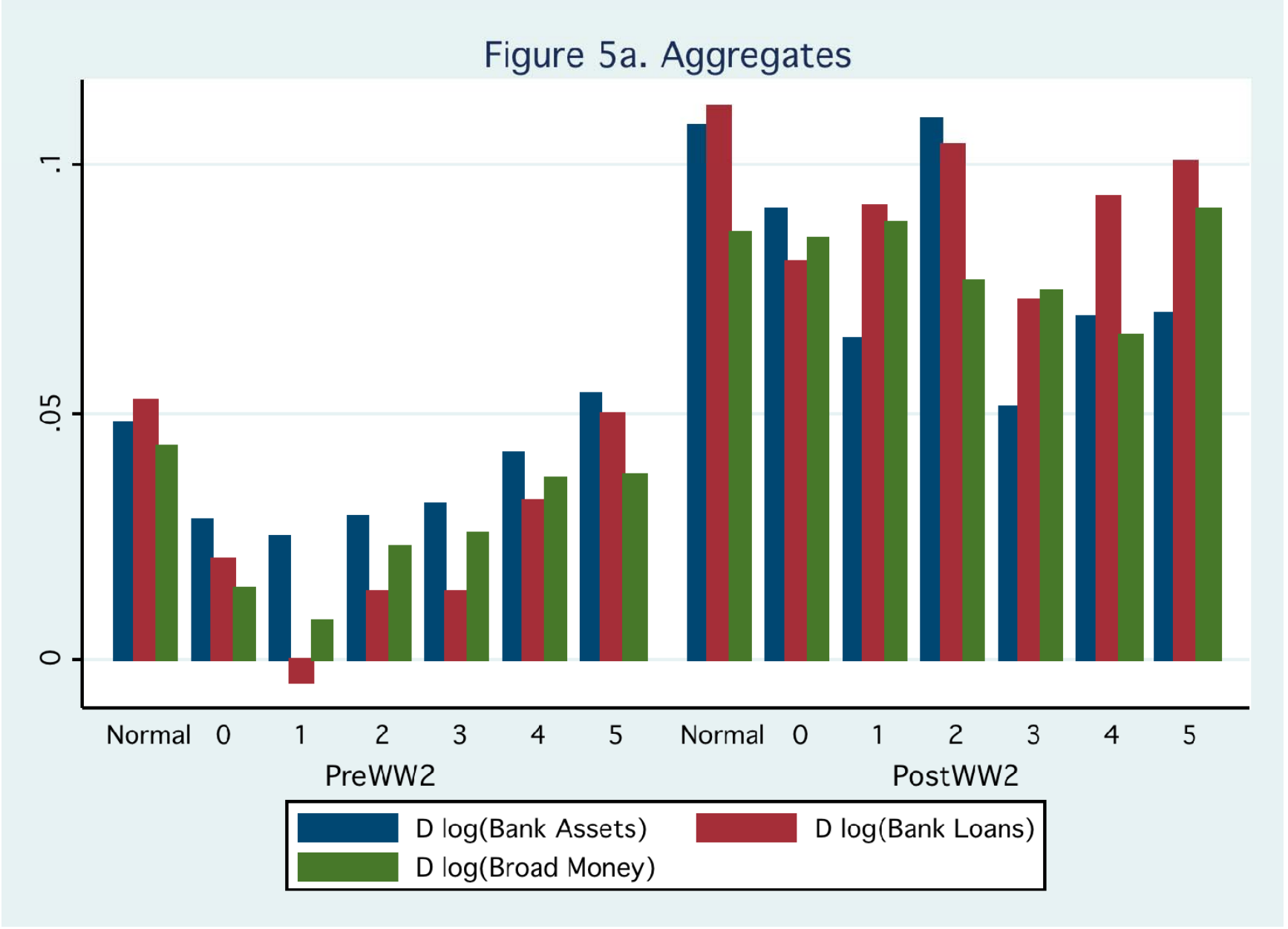
APPENDIX TABLE 1 BANKING CRISIS DEFINITIONS

Country	ISO	Financial crisis (first year)
Australia	AUS	1893, 1989
Canada	CAN	1873, 1906, 1923, 1983
Denmark	DNK	1877, 1885, 1902, 1907, 1921, 1931, 1987
France	FRA	1882, 1889, 1904, 1930, 2008
Germany	DEU	1880, 1891, 1901, 1931, 2008
Italy	ITA	1887, 1891, 1907, 1931, 1930, 1935, 1990, 2008
Japan	JPN	1882, 1907, 1927, 1992
Netherlands	NLD	1897, 1921, 1939, 2008
Norway	NOR	1899, 1921, 1931, 1988
Spain	ESP	1920, 1924, 1931, 1978, 2008
Sweden	SWE	1876, 1897, 1907, 1922, 1931, 1991, 2008
Switzerland	CHE	1870, 1910, 1931, 2008
United Kingdom	GBR	1890, 1974, 1984, 1991, 2007
United States	USA	1873, 1884, 1893, 1907, 1929, 1984, 2007

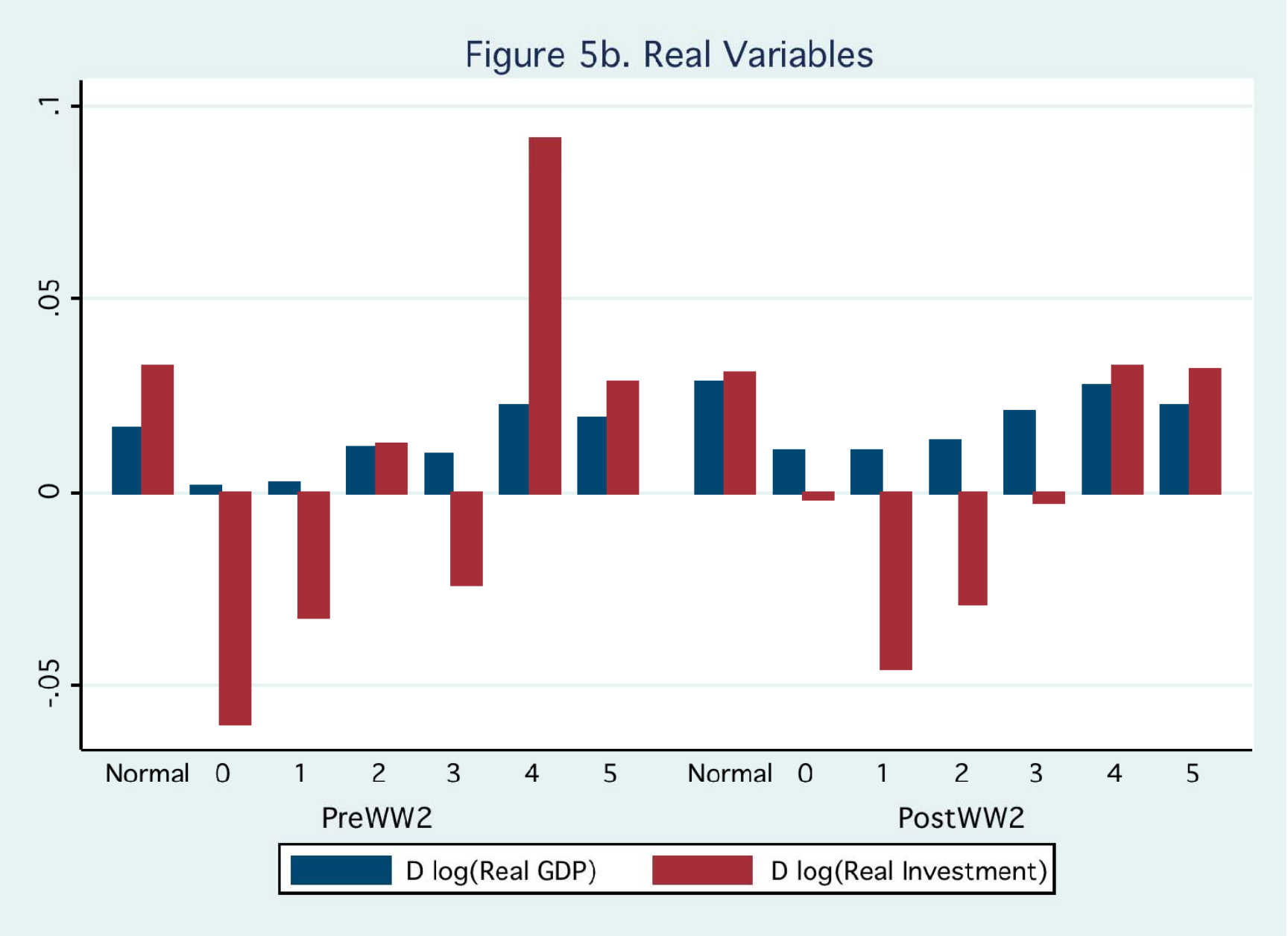
Notes: As described in the text, our crisis coding follows previous work, notably Reinhart and Rogoff (2009, RR), and Bordo, Eichengreen, Klingebiel, and Martinez-Peria (2001, BEKM). We corroborated the coding with Laeven and Valencia (2008) as well as Cechetti et al. (2009). There are only three major cases where these sources differ and which we need to discuss briefly:

1. We code the USA in crisis from 1984, following RR who have the US in the S&L crisis from 1984. Some other studies, e.g. Laeven and Cecchetti code the S&L crisis starting in 1988 only. Yet the number of bank failures had started to increase rapidly earlier.
2. We do not code the Barings crisis in the UK 1995, but RR do. We consider it to be an isolated event, not a sufficiently widespread crisis.
3. RR and BEKM code a banking crisis in Germany in 1977. We did not find sufficient evidence for a widespread banking crisis in Germany in that year.

Money and Credit in Financial Crises



Real Variables in Financial Crises



A Few Cross-Regime Comparisons

Cumulative log level effect, after years 0–5 of crisis, versus noncrisis trend, for:	Pre–WW2	Pre–WW2, excluding 1930s	Post–WW2
Log broad money	–0.141***	–0.103***	–0.062
	(0.027)	(0.029)	(0.039)
Log bank loans	–0.236***	–0.179***	–0.148***
	(0.044)	(0.048)	(0.053)
Log bank assets	–0.113***	–0.078**	–0.239***
	(0.034)	(0.037)	(0.048)
Log real GDP	–0.045**	–0.018	–0.062***
	(0.020)	(0.020)	(0.017)
Log real investment	–0.203**	–0.114	–0.222***
	(0.094)	(0.093)	(0.047)
Log price level	–0.084***	–0.047*	+0.009
	(0.025)	(0.027)	(0.028)

Notes: *** denotes significance at the 99% level, ** 95% level, and * 90% level. Standard errors in parentheses

Interpretation of Results

- Lessons of the Great Depression
  - Since WW2, central banks have strongly supported money and credit in the wake of financial crises
  - 'Success' in preventing deleveraging of the financial sector and deflationary tendencies
  - But not in reducing output costs: Bailing out finance but failing to protect the real economy
- Unintended consequences?
  - Policy intervention possibly created more of the very hazards it was intended to solve
  - More financialized economies may be harder to stabilize

Part 2: Predictive
Are Crises Credit Booms Gone Bust?

- Crisis prediction framework

  Economic conditions at t-1, t-2,… → crisis at time t

$$\text{logit}(p_{it}) = b_{0i} + b_1(L)\,\text{D}\log CREDIT_{it} + b_2(L)\,X_{it} + e_{it}$$

  where logit(p)=ln(p/(1-p)) is log of the odds ratio and L is the lag operator.

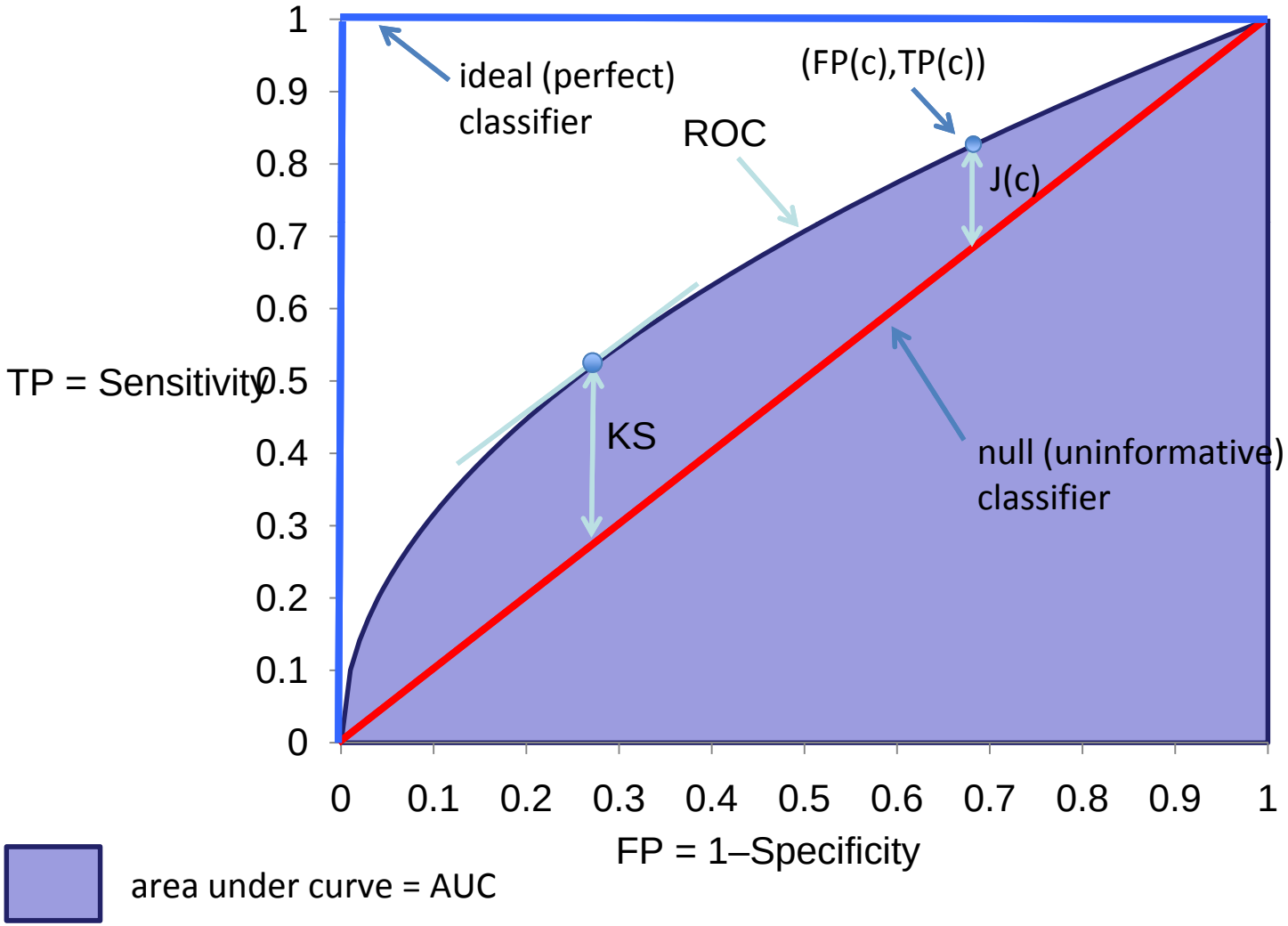
- Key finding: credit emerges as the single best predictor of future financial instability

Baseline Model

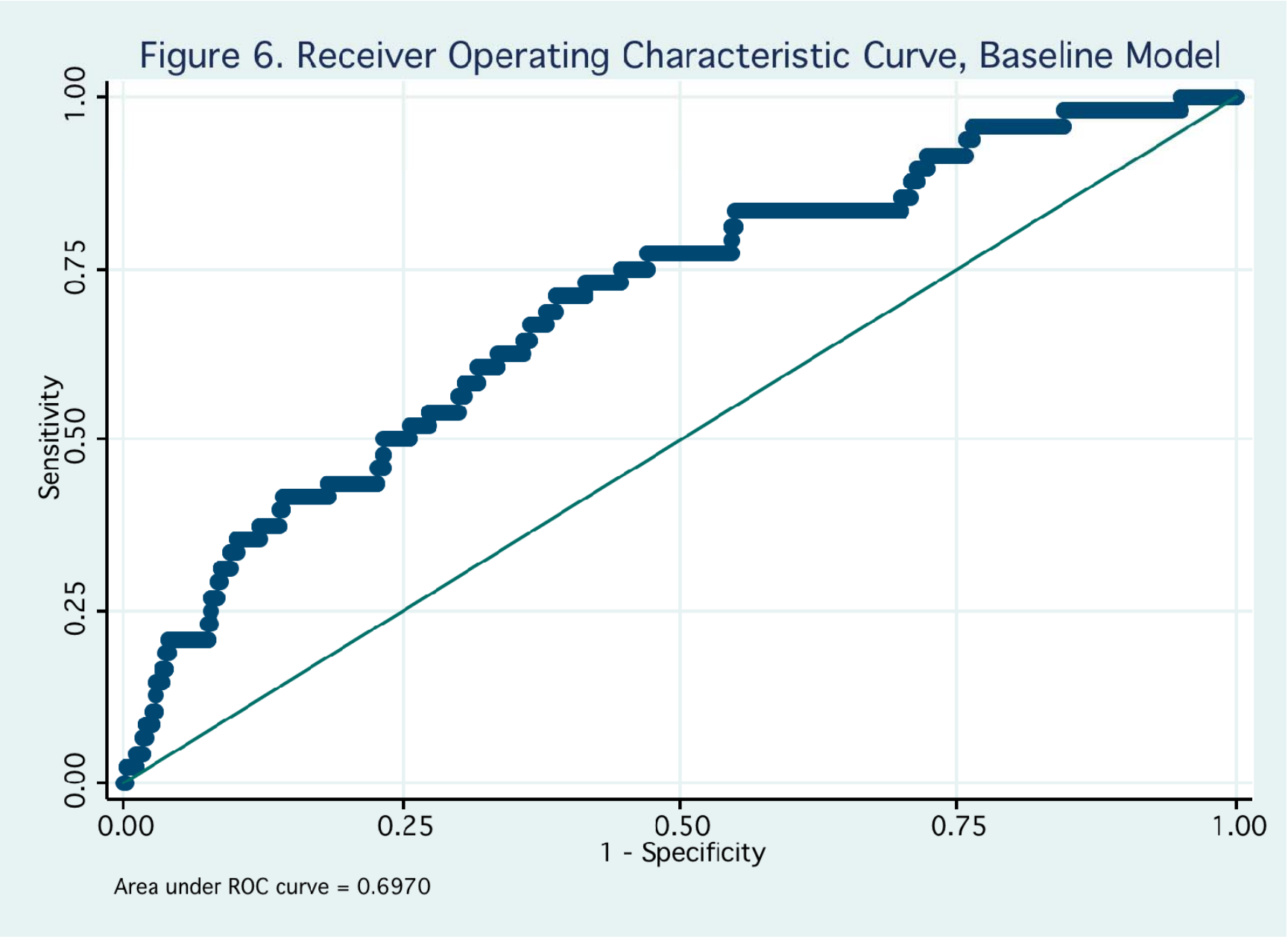
Specification (Logit country effects)	(6) Baseline	(7) Replace loans with broad money	(8) Replace loans with narrow money
L.Dlog(loans/P)	-0.108	1.942	-0.890
	(2.05)	(2.94)	(1.37)
L2.Dlog(loans/P)	7.215***	5.329**	2.697
	(1.99)	(2.52)	(1.68)
L3.Dlog(loans/P)	1.785	2.423	2.463
	(1.83)	(2.63)	(1.77)
L4.Dlog(loans/P)	0.0517	-1.742	-2.244
	(1.49)	(2.51)	(1.65)
L5.Dlog(loans/P)	1.073	4.275*	1.210
	(1.78)	(2.30)	(1.82)
Observations	1285	1361	1394
Groups	14	14	14
Avg. obs. per group	91.79	97.21	99.57
Sum of lag coefficients	10.02***	12.23***	3.235
se	3.235	3.544	3.129
Test for all lags = 0, χ^2	17.22***	18.35***	5.705
p value	0.0041	0.0025	0.3360
Test for country effects = 0, χ^2	7.789	9.333	8.627
p value	0.857	0.747	0.800
Pseudo R^2	0.0596	0.0481	0.0343

How Good is the Model?

Predictive Ability Testing: the ROC Curve and Diagnostics

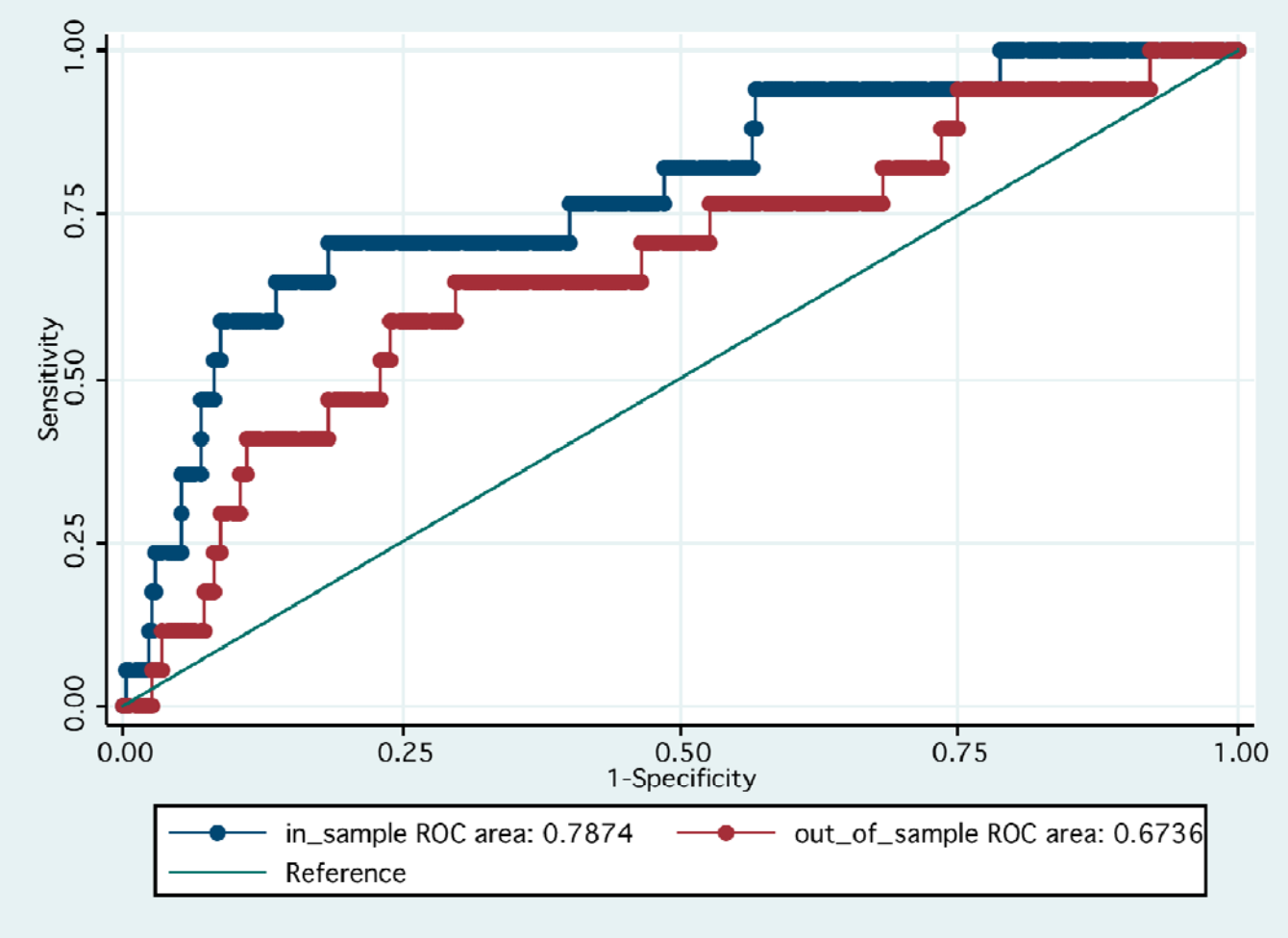


Baseline Model — ROC curve



In-Sample and Out-of-Sample

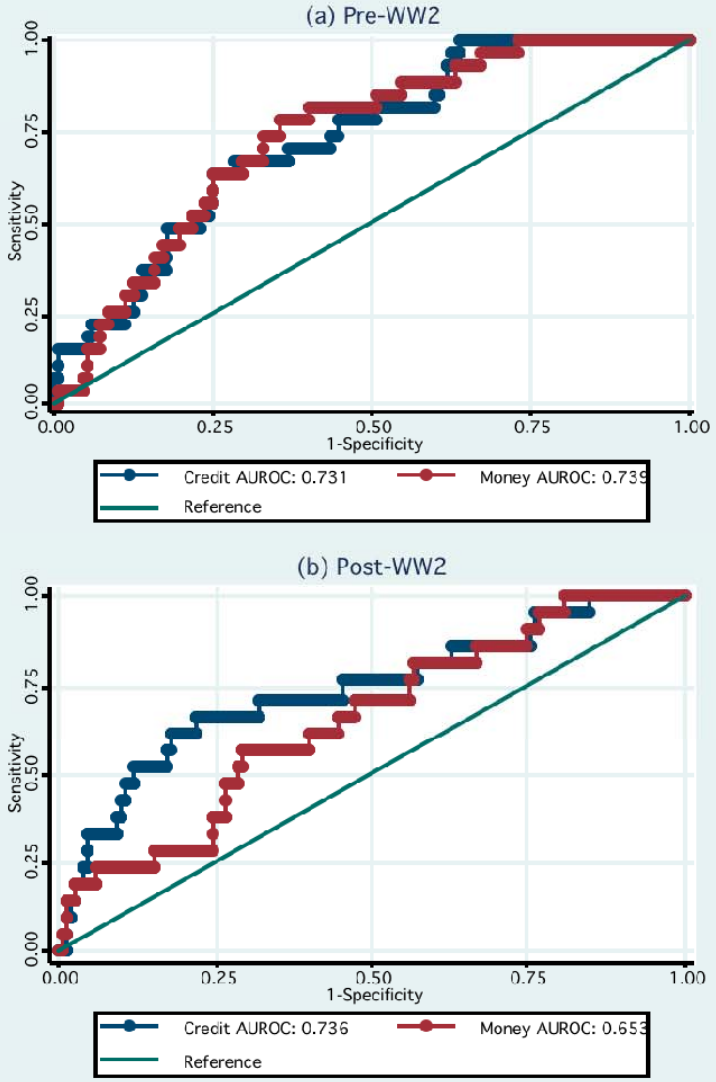
- The gold standard" – out of sample predictive power
- Who could have known? What is a good AUROC?



Credit v Money — Pre & Post WW2

Money and credit similar pre-WW2, but after WW2 credit is far superior

Figure 7. ROC Comparisons for Credit and Money Models



Robustness Checks

- Credit growth remains dominant variable for predictive ability
- Larger financial sectors seem more crisis-prone (cf. Rajan 2005)

Add 5 lags of	Significant	Credit still significant?	AUROC
Real GDP growth	Y	Y	0.711
Nominal interest rate	N	Y	0.712
Investment/GDP	Y	Y	0.737
Credit/GDP	**Y**	**Y**	**0.750**
Credit/GDP and stock prices	**Y**	**Y**	**0.781**
BASELINE			0.697

Interactions

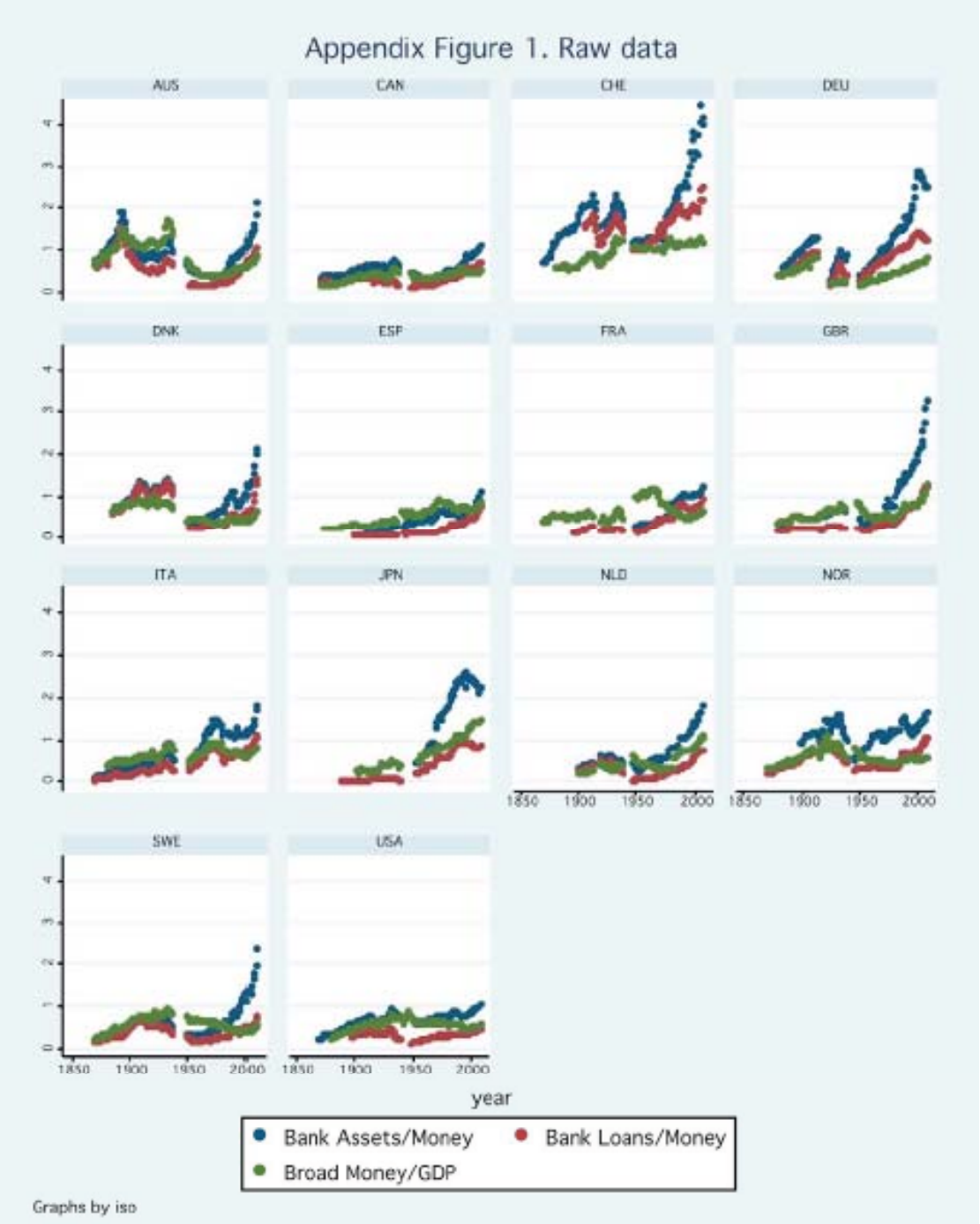
- Are credit booms more dangerous in large financial sectors? No.
- Are credit financed asset booms more dangerous? Somewhat.
- Are asset price booms are more dangerous in larger financial sectors? Yes.

Add 5-year moving average of	Interaction significant?	Credit still significant?	AUROC
Baseline			0.66
Credit growth x credit/GDP	N	Y	0.69
Credit growth x stock prices	Y	Y	0.67
Stock prices x credit/GDP	**Y**	**Y**	**0.71**

Conclusions

- Major lessons
  - Credit = Money?
    In the distant past, yes. Not any more.
  - Policy success?
    The real responses to financial crises are no better now than in the "barbarous" pre-WW2 era.
  - Early warning?
    Credit aggregate contains information about likelihood of future financial crises.
- Policymakers ignored credit at their peril
  - "BIS view" vs. "old conventional wisdom"
  - Larger financial sectors (relative to GDP) seem more crisis prone.
  - Asset price booms in highly 'financialized' economies are risky.

Raw data


Appendix Figure 1. Raw data
AUS
CAN
CHE
DEU
DNK
ESP
FRA
GBR
ITA
JPN
NLD
NOR
SWE
USA
0
1
2
3
4
1850
1900
1950
2000
year
Bank Assets/Money
Bank Loans/Money
Broad Money/GDP
Graphs by iso