



# Financial Levees: Capital Inflows, Financial Market Structure, and Banking Crises

*Mark S. Copelovitch*

Department of Political Science &  
La Follette School of Public Affairs  
University of Wisconsin – Madison  
[copelovitch@wisc.edu](mailto:copelovitch@wisc.edu)

*David Andrew Singer*

Department of Political Science  
MIT  
[dasinger@mit.edu](mailto:dasinger@mit.edu)

# What Causes Banking Crises?



# Likely Culprits?

## Large Capital Inflows (“External imbalances”)

- Widely seen as underlying cause (Reinhart and Reinhart; Bernanke; Reinhart and Rogoff; Caballero; Chinn and Frieden; Portes)
- Capital → credit boom → asset bubble → crisis
  - Related variables: financial liberalization; loose monetary policy; government distortions
- **Problem:** capital inflows are not always destabilizing

## Lax Regulation

- Measurement issues (tautology)

## Financial Innovation

- Securitization; decentralized risk management

# Understanding Banks' Risk Taking

- Banks manage portfolio risk based on macroeconomic conditions, regulations, and competition
- Key determinant of bank risk: *structure of national financial systems*
  - Financial systems channel excess savings to borrowers
  - Banks usually play a key role in this process as intermediaries...
    - Accept deposits; issue loans (often long-term) to creditworthy borrowers; careful monitoring of borrowers
  - ...but sometimes they have competition
    - Securities markets provide an alternative source of funds
    - Direct relationship between investor and company

# Banks, Securities Markets, and Risk: A Stylized View

## Banks in isolation

- Illiquid assets create incentives for conservative lending, careful monitoring
  - Borrowers likely to have solid balance sheets, competent managers, low-risk business plans

## Securities markets in isolation

- Highly liquid markets imply fewer incentives to monitor
  - Ease of exit implies myopic risk-acceptant investors
  - Monitoring is decentralized

# Banks in a Financial System with Prominent Securities Markets

- Companies can choose between banks and markets for financing
- Increased competition incentivizes banks to take on more risk to *compete* with markets
  - Banks' conservative bias erodes
- Creates incentives for banks to avail themselves of financial market innovations (e.g., asset securitization)
  - Banks become riskier

# Our Argument

## Interaction between capital inflows and market structure

- Banking crises are more likely when large capital inflows meet a financial system with prominent securities markets.
  - The flood of capital intensifies and concentrates risk in the banking system
- The dangers of capital inflows are attenuated by “traditional” bank-dominated financial systems with less extensive securities markets.
  - Conservative banking systems as “levees” against the flood of foreign capital

# Empirical Analysis

## Data and models

- 33-69 countries, 1981-2011, N=599-1704
- Event history models: conditional logit with controls for duration dependence
- Explanatory variables measured as 5-year, lagged moving averages

## Dependent variables

- Banking crisis = 1 if country  $i$  experiences a banking crisis in year  $t$
- Two measures of banking crises (correlation = 0.57)
  - All crises (Reinhart and Rogoff): N=348 (20.9%), 1981-2009
  - Systemic crises (Laeven and Valencia/World Bank): N=342 (15.8%), 1981-2011

## Specification

- $$Crisis_{it} = \beta_0 + \beta_1 \text{Current Account Deficit} + \beta_2 \text{Market Structure} + \beta_3 \text{CurrAcct} * \text{Mkt Structure} + \beta_4 \text{Regime type} + \beta_5 \text{GDP per capita} + \beta_6 \text{GDP growth} + \beta_7 \text{Inflation} + \beta_8 \text{OECD average growth} + \beta_9 \text{Commodity prices} + \beta_{10} \text{US real interest rate} + \beta_{11} (\text{Last crisis}) + \beta_{12} (\text{Last crisis})^2 + \beta_{13} (\text{Last crisis})^3 + \varepsilon$$



# Measuring Financial Market Structure

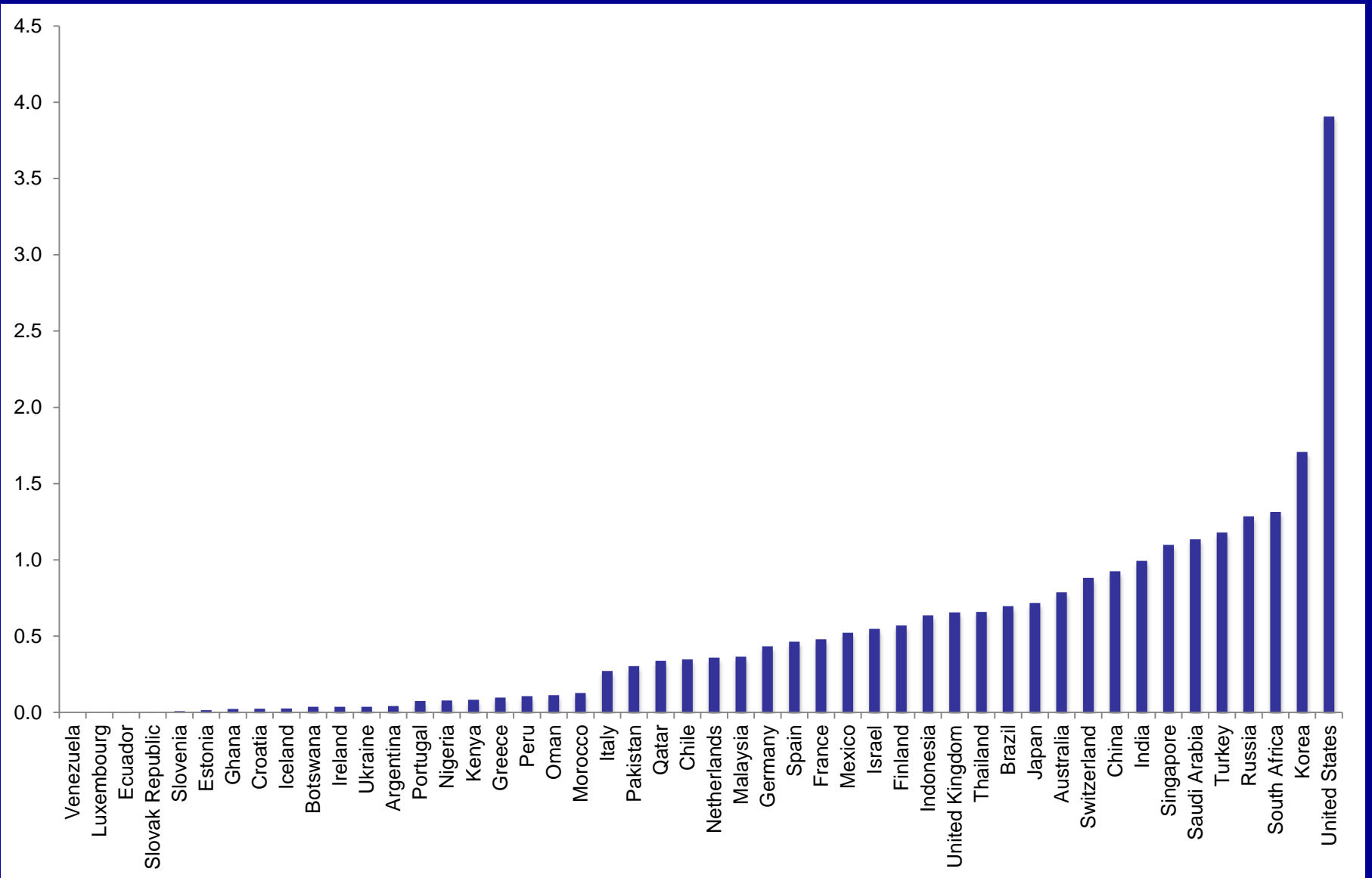
## No single, ideal measure

- Relative size of banking sector to securities markets
- Absolute size of non-bank financial markets
- Regulatory environment

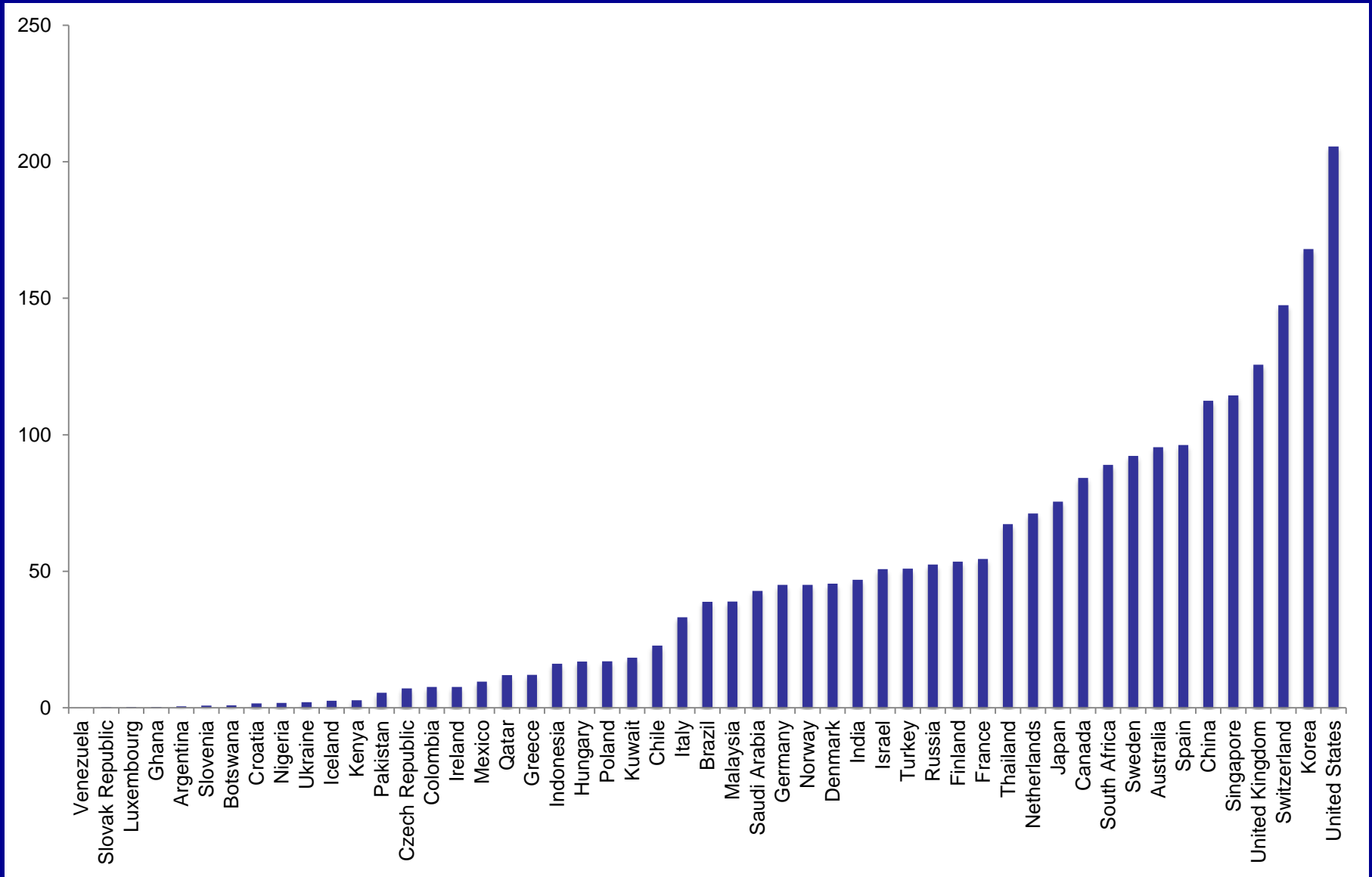
## Five independent variables

- Market/bank ratio: stock market volume traded / domestic bank credit
- Stock market volume traded (% GDP)
- Stock + private bond market capitalization (% GDP)
- Domestic credit by non-bank institutions (% GDP)
- Regulatory measure of depth/liberalization (IMF/Abiad et. al. 2008)
  - *Has a country taken measures to develop securities markets (0/3)?*

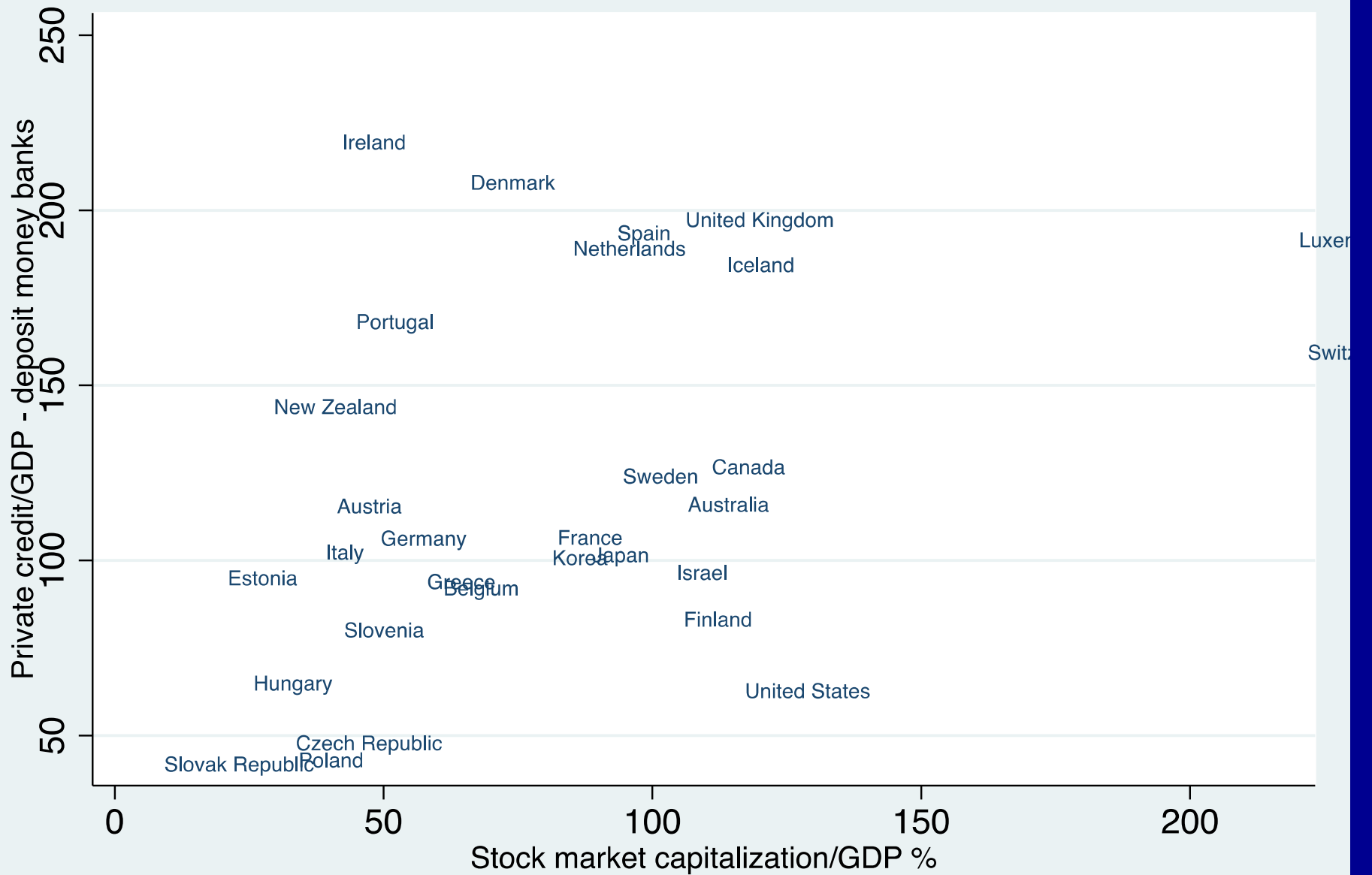
# Market/Bank Ratio (Stock Market Volume/Bank Credit), Selected Countries, 2011



# Stock Market (Total Volume Traded, % GDP), Selected Countries, 2011



# Bank Credit to Stock Market Capitalization, OECD countries, 2008



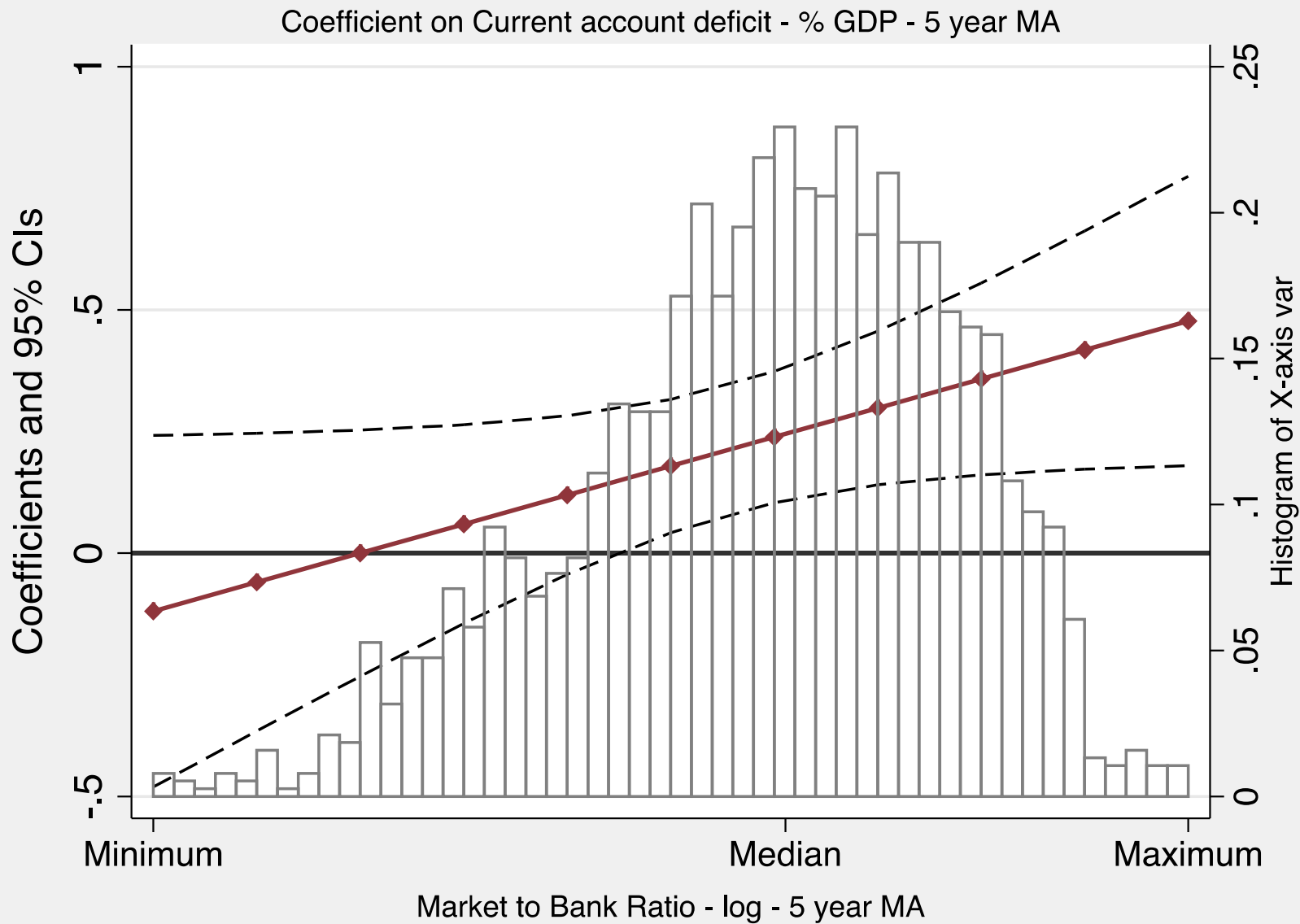
# Conditional Logit Models – Banking Crises

Model	1	2	3	4	5	6	7	8	9	10
Dependent variable (banking crisis classification)	Reinhart-Rogoff	Laeven-Valencia	Reinhart-Rogoff	Laeven-Valencia	Reinhart-Rogoff	Laeven-Valencia	Reinhart-Rogoff	Laeven-Valencia	Reinhart-Rogoff	Laeven-Valencia
Financial market structure variable	Market-bank ratio (log)	Market-bank ratio (log)	Stock market total shares traded (% GDP, log)	Stock market total shares traded (% GDP, log)	Stock + bond market capitalization (% GDP, log)	Stock + bond market capitalization (% GDP, log)	Non-bank credit (% GDP, log)	Non-bank credit (% GDP, log)	Securities Market Development Index (Abiad)	Securities Market Development Index (Abiad)
Current account deficit	0.372 [0.106]***	0.187 [0.092]**	0.047 [0.145]	0.000 [0.184]	0.304 [0.435]	0.430 [0.623]	0.187 [0.067]***	0.224 [0.064]***	-0.024 [0.073]	0.021 [0.066]
Financial market structure	-0.593 [0.303]*	-0.215 [0.225]	0.135 [0.352]	0.412 [0.300]	0.585 [0.518]	1.261 [0.661]*	-0.172 [0.092]*	-0.223 [0.095]**	-0.363 [0.280]	-0.126 [0.292]
Current account*market structure	0.058 [0.030]*	0.042 [0.032]	0.066 [0.047]	0.049 [0.045]	0.011 [0.103]	-0.014 [0.143]	0.016 [0.014]	0.045 [0.015]***	0.100 [0.041]**	0.023 [0.053]
Polity score	-0.125 [0.131]	-0.076 [0.111]	-0.172 [0.104]*	-0.132 [0.124]	-0.153 [0.138]	-0.191 [0.213]	-0.014 [0.027]	-0.058 [0.037]	-0.034 [0.033]	-0.052 [0.036]
GDP per capita (constant \$2005)	2.850 [1.599]*	5.204 [1.435]***	0.828 [1.646]	4.527 [1.602]***	-0.525 [1.732]	1.008 [2.526]	0.509 [0.543]	3.172 [0.812]***	1.063 [0.723]	2.981 [0.767]***
GDP growth (constant \$2005)	-0.053 [0.104]	-0.083 [0.113]	-0.108 [0.092]	-0.100 [0.120]	-0.229 [0.104]**	-0.339 [0.103]***	-0.069 [0.054]	-0.042 [0.044]	-0.072 [0.064]	-0.030 [0.054]
Inflation (annual % log)	0.378 [0.647]	1.014 [0.683]	0.586 [0.627]	1.208 [0.682]*	0.859 [0.753]	2.228 [1.083]**	0.267 [0.447]	0.198 [0.517]	0.301 [0.516]	0.304 [0.611]
Non-farm commodity prices	0.037 [0.010]***	0.054 [0.011]***	0.040 [0.009]***	0.052 [0.011]***	0.054 [0.012]***	0.069 [0.014]***	0.033 [0.007]***	0.049 [0.008]***	0.034 [0.007]***	0.048 [0.008]***
OECD average growth rate (%)	-0.486 [0.192]**	-0.333 [0.064]***	-0.558 [0.189]***	-0.295 [0.066]***	-0.502 [0.235]**	-0.345 [0.092]***	-0.207 [0.117]*	-0.295 [0.071]***	-0.298 [0.111]***	-0.317 [0.138]**
Real US interest rate (%)	0.499 [0.177]***	0.515 [0.124]***	0.500 [0.173]***	0.479 [0.128]***	0.487 [0.200]**	0.577 [0.174]***	0.214 [0.089]**	0.312 [0.093]***	0.280 [0.083]***	0.312 [0.120]***
Years since last crisis	-0.739 [0.115]***	-1.007 [0.149]***	-0.800 [0.122]***	-1.028 [0.161]***	-0.809 [0.176]***	-0.877 [0.202]***	-0.818 [0.074]***	-1.020 [0.097]***	-0.824 [0.078]***	-0.911 [0.101]***
Years since last crisis <sup>2</sup>	0.038 [0.007]***	0.046 [0.008]***	0.043 [0.007]***	0.048 [0.008]***	0.044 [0.011]***	0.039 [0.010]***	0.047 [0.005]***	0.050 [0.005]***	0.047 [0.005]***	0.045 [0.005]***
Years since last crisis <sup>3</sup>	0.000 [0.000]***	-0.001 [0.000]***	-0.001 [0.000]***	-0.001 [0.000]***	-0.001 [0.000]***	0.000 [0.000]***	-0.001 [0.000]***	-0.001 [0.000]***	-0.001 [0.000]***	-0.001 [0.000]***
<i>Log-likelihood</i>	-220.04	-182.62	-224.63	-183.48	-142.13	-100.14	-456.59	-404.71	-421.56	-332.14
<i>Pseudo R-squared</i>	0.41	0.55	0.41	0.55	0.45	0.62	0.33	0.46	0.35	0.39
<i>Number of countries</i>	50	54	50	54	34	33	64	84	58	69
<i>Number of observations</i>	887	1,021	893	1,028	599	642	1,663	2,164	1,533	1,704
<i>Years in sample</i>	1990-2009	1990-2011	1990-2009	1990-2011	1991-2009	1991-2011	1981-2009	1981-2011	1981-2009	1981-2011

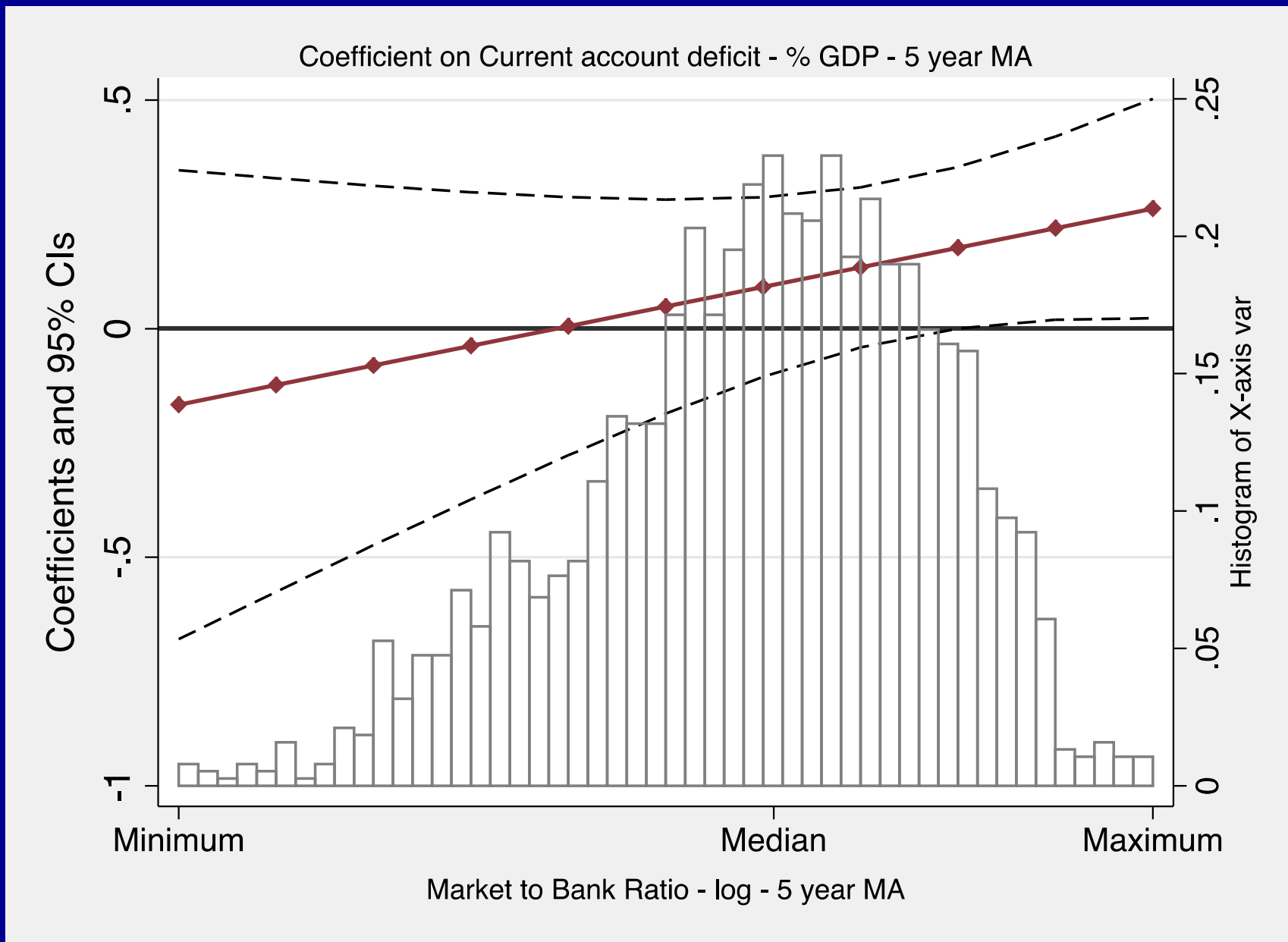
\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

Conditional (fixed effects) logit models; robust standard errors clustered on country

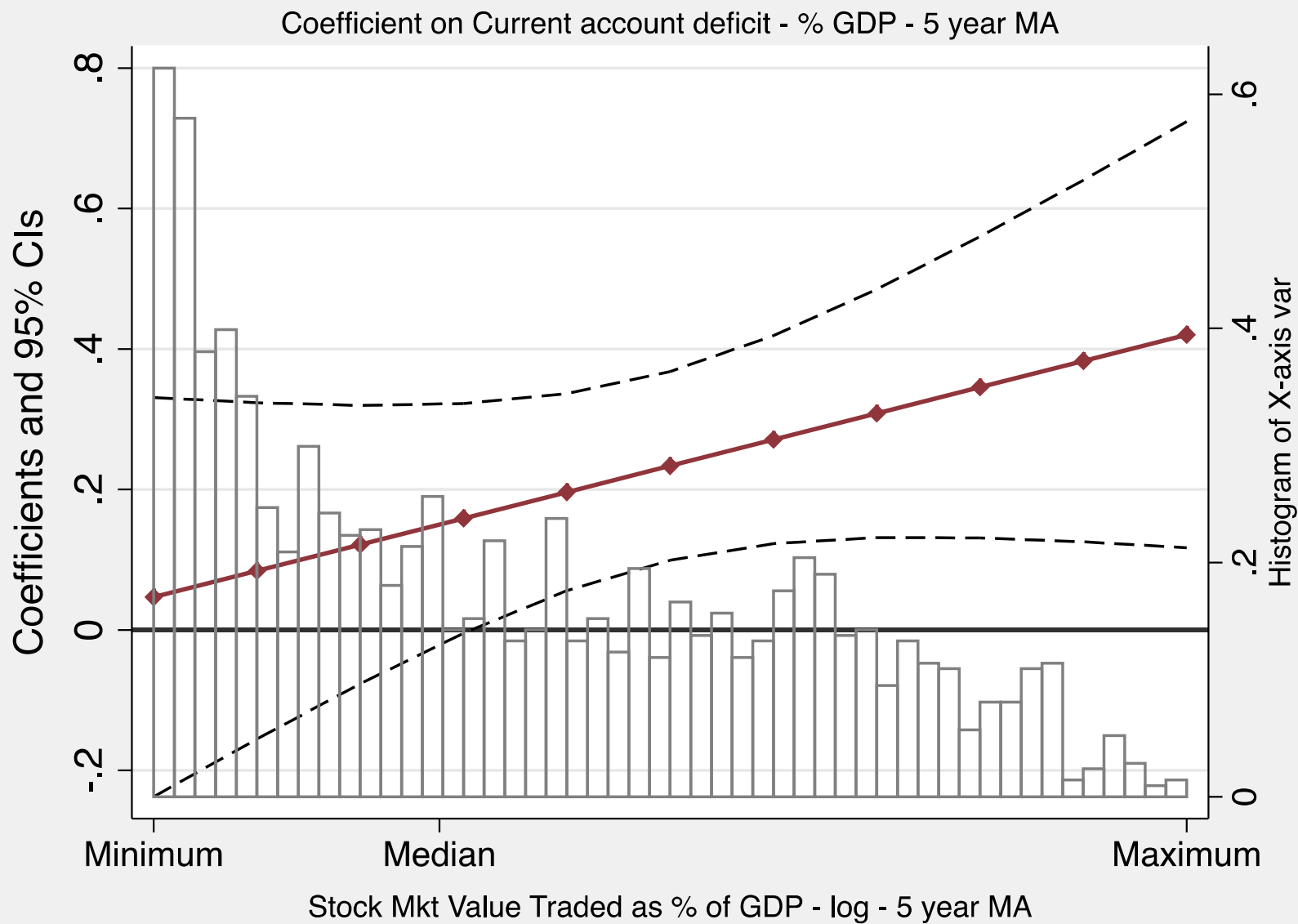
# Interactive Marginal Effects – Banking Crisis (Reinhart-Rogoff)



# Interactive Marginal Effects – Banking Crisis (World Bank/Laeven-Valencia)

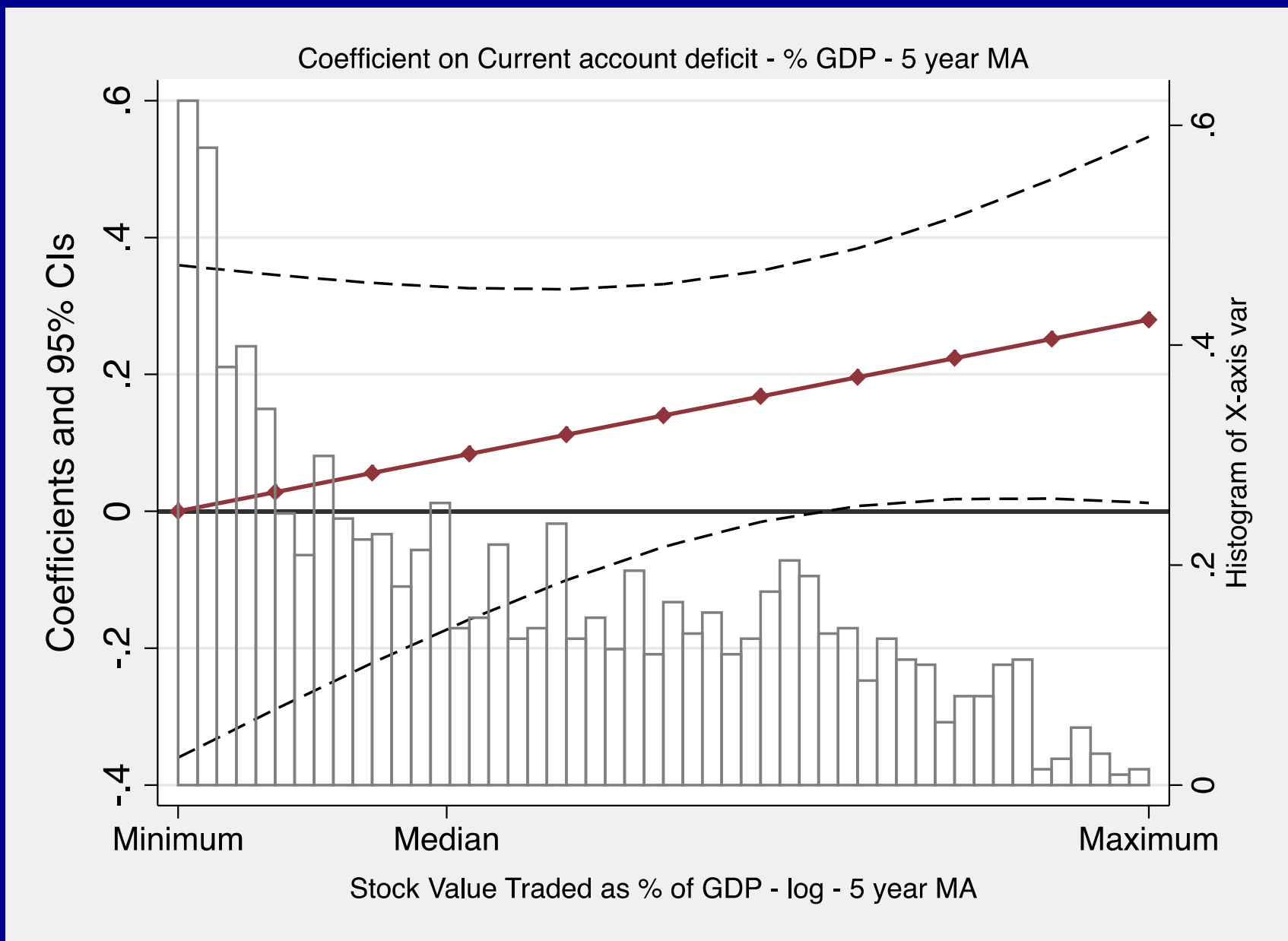


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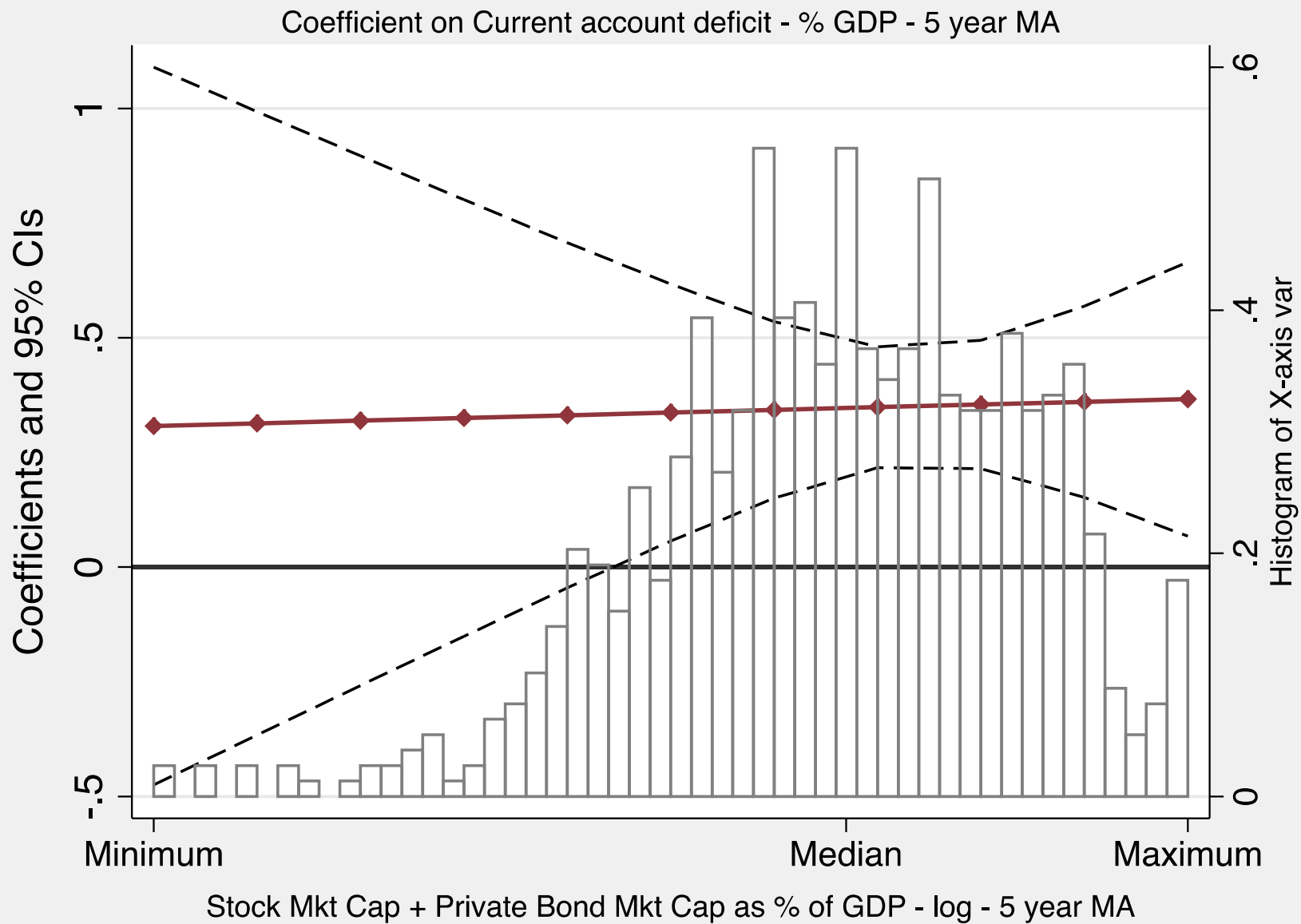




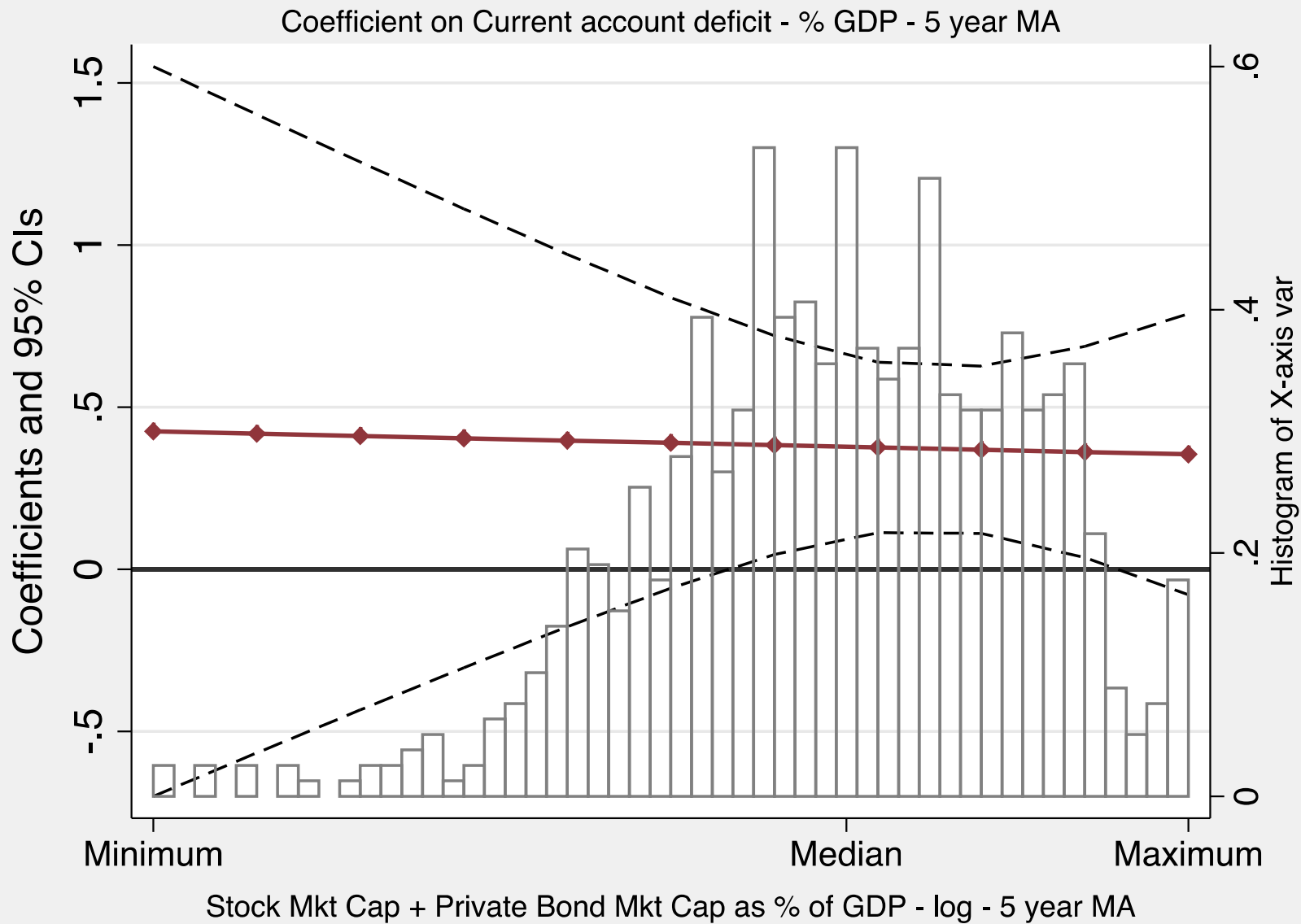
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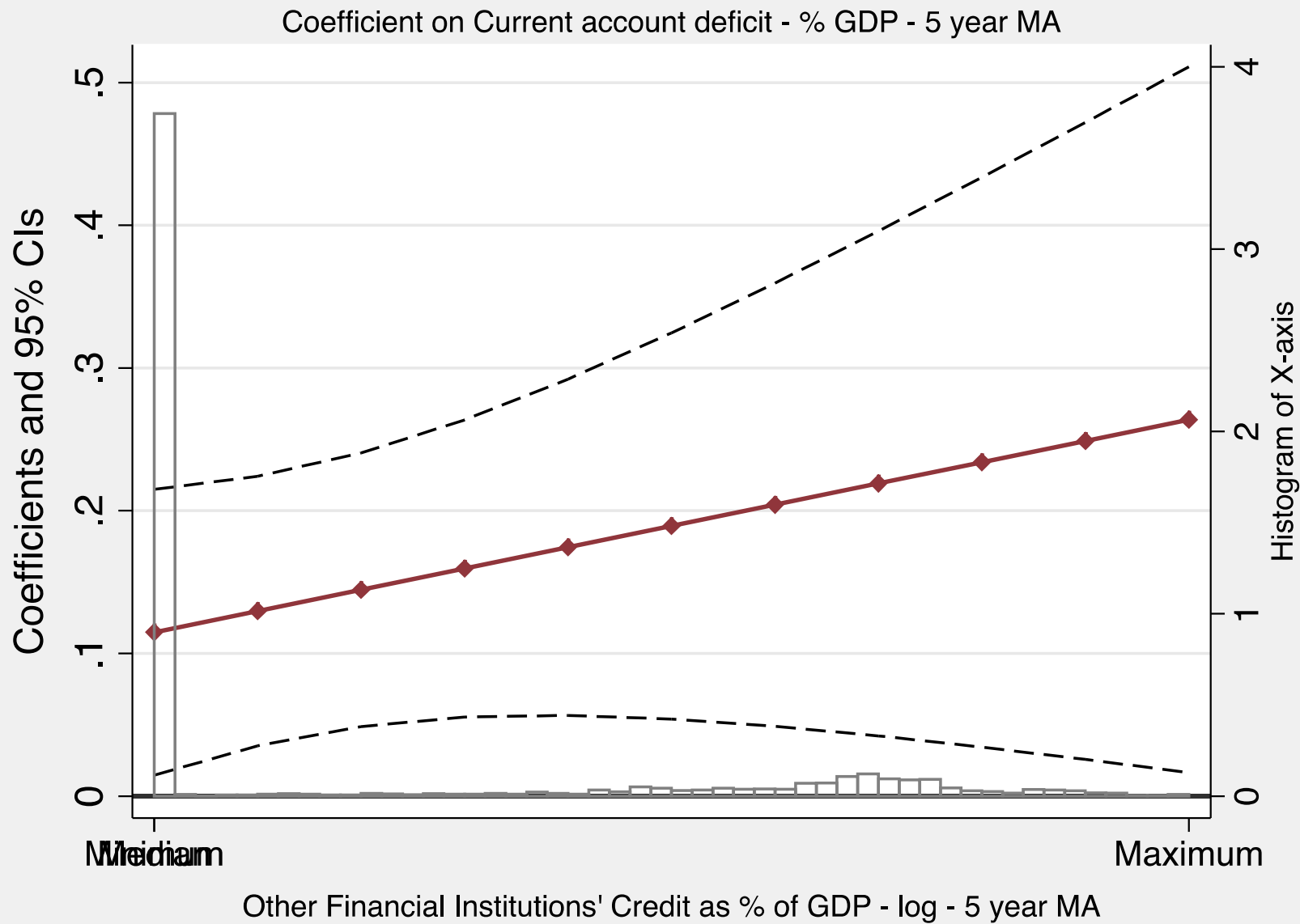
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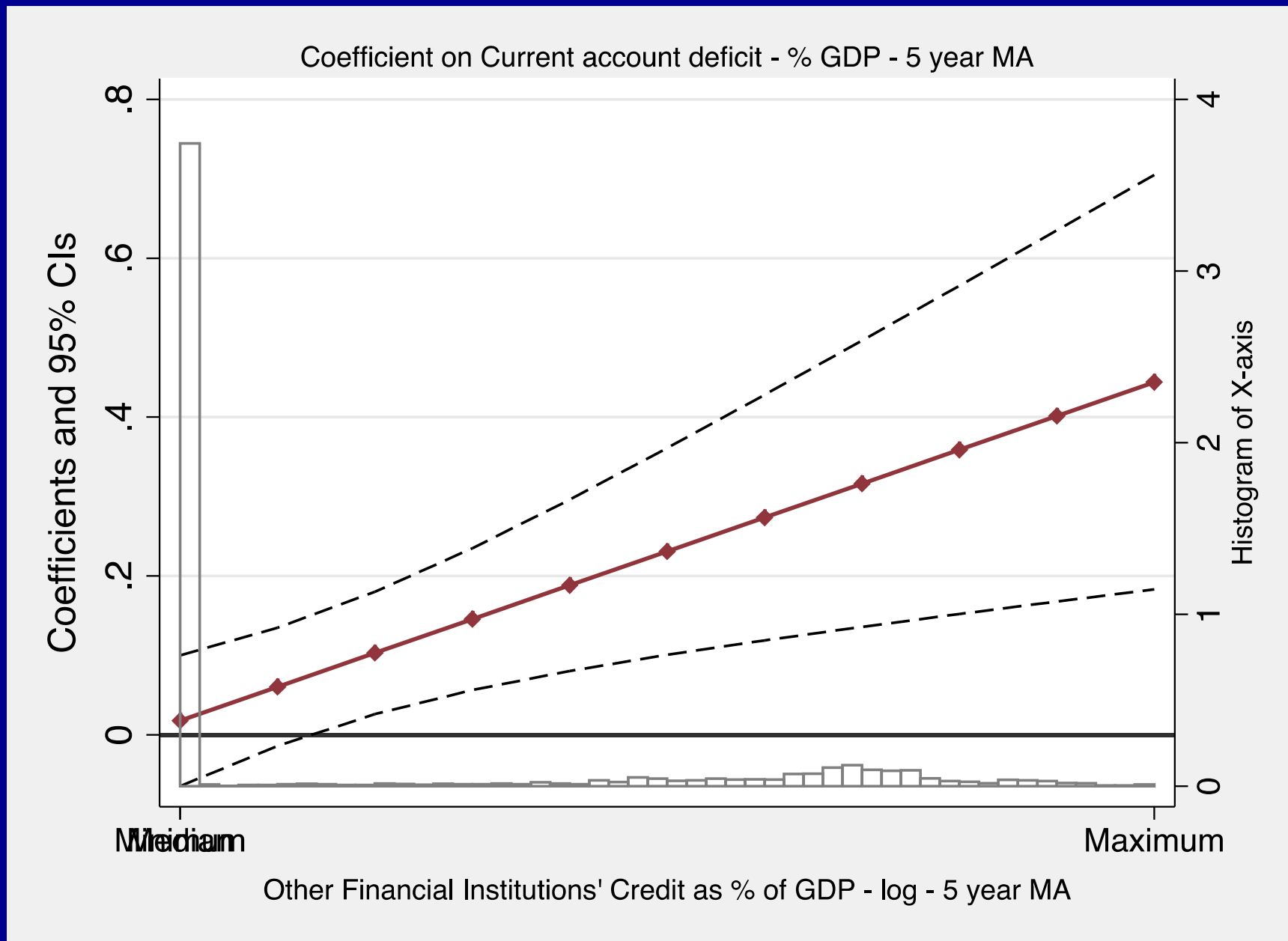
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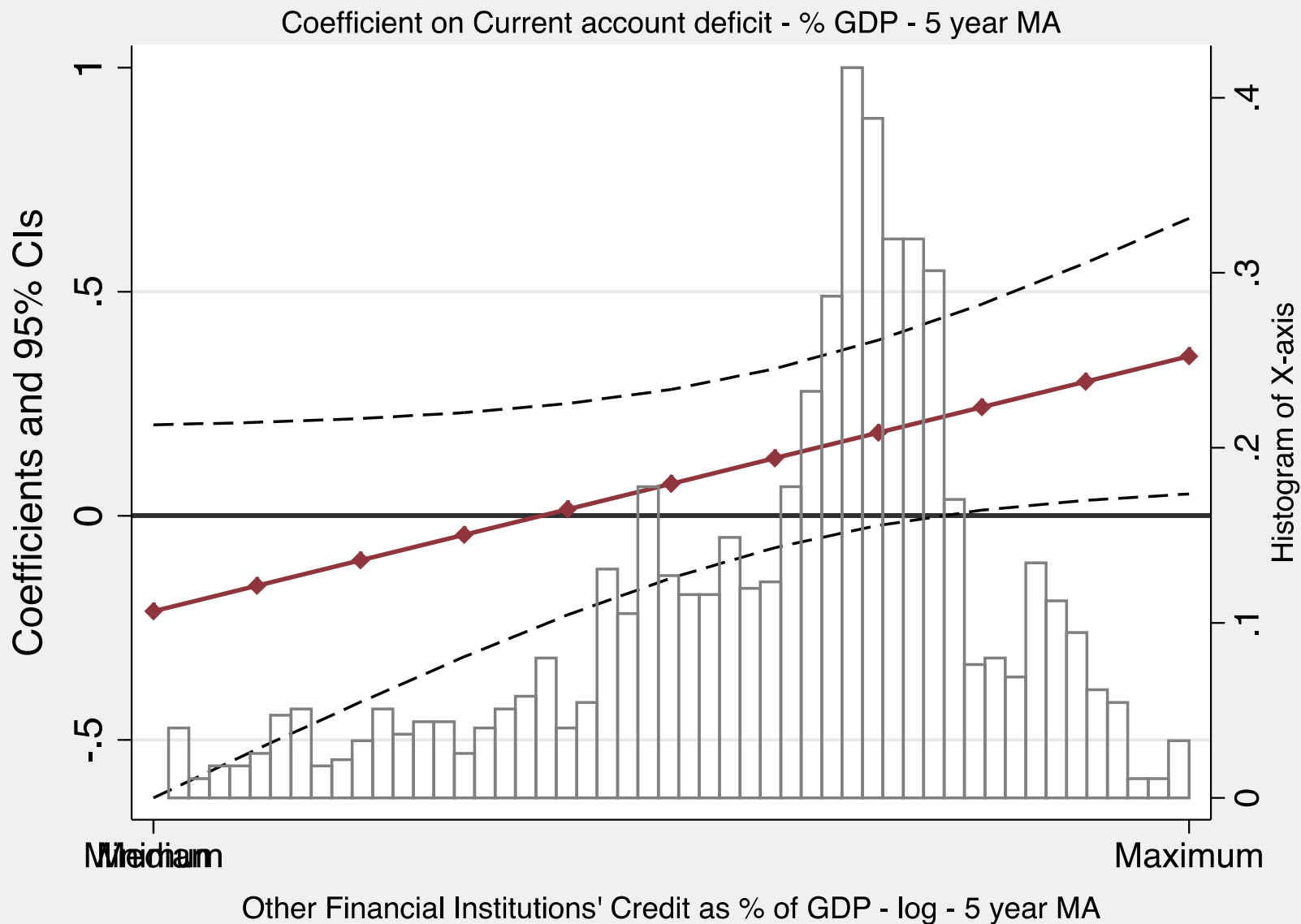
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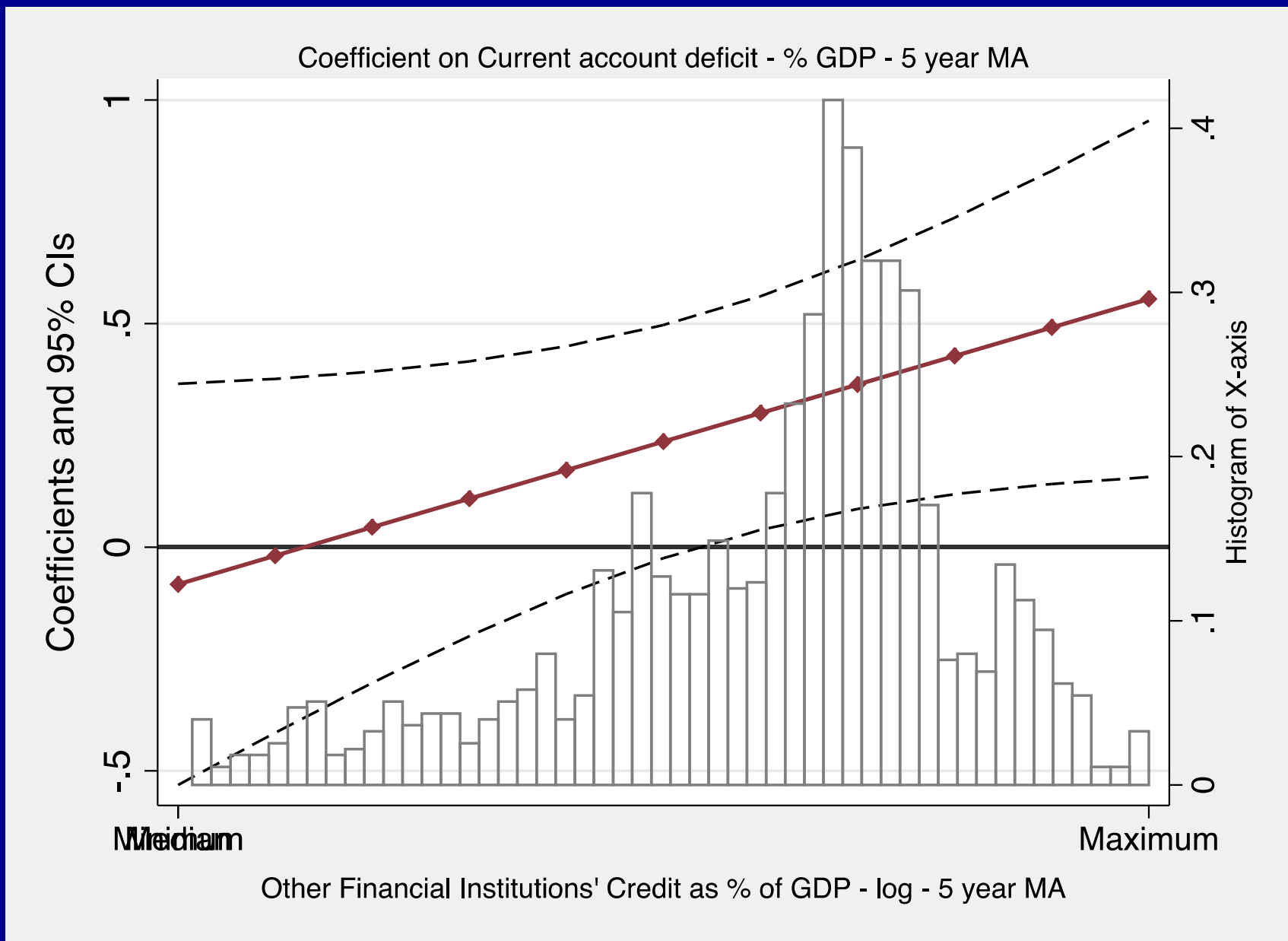
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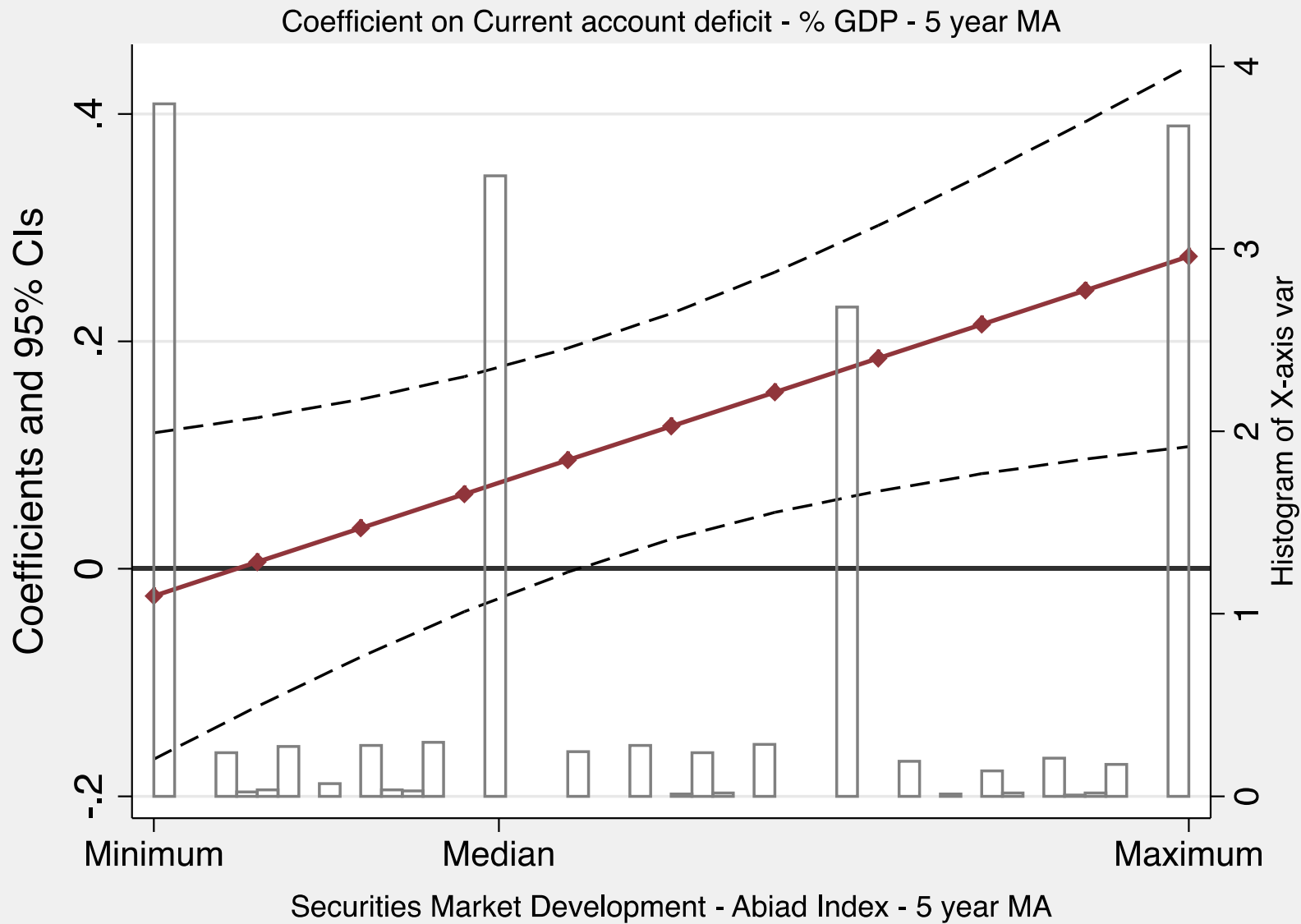
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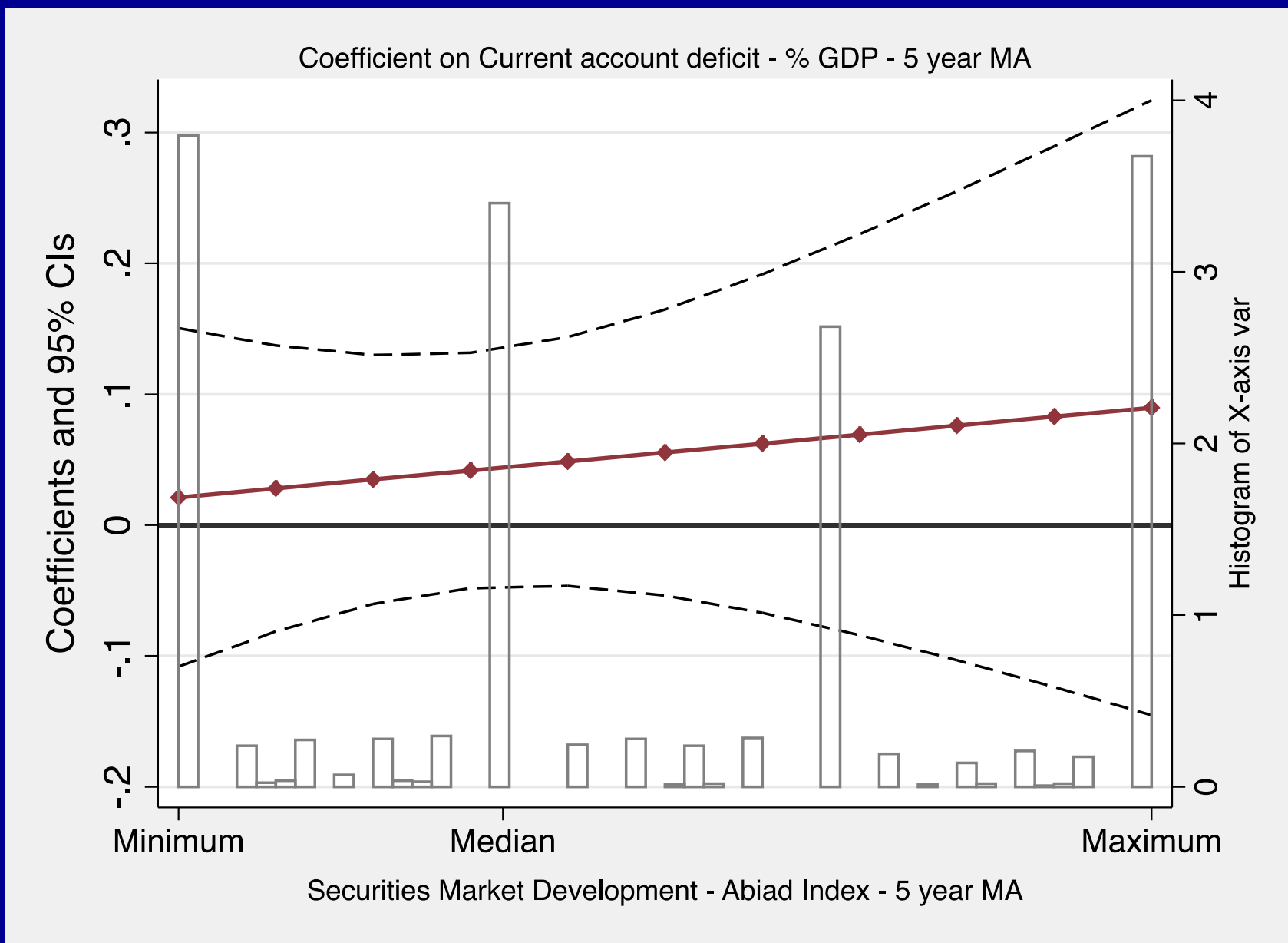


# Interactive Marginal Effects – Banking Crisis (Reinhart-Rogoff)





# Interactive Marginal Effects – Banking Crisis (World Bank/Laeven-Valencia)



# Findings and Implications

## Main result

- Banking crises are more likely when large capital inflows meet a financial system with prominent securities markets
- Robust empirical evidence across a broad sample of countries/variables over the last three decades

## Implication

- The dangers of capital inflows are attenuated by “traditional” bank-dominated financial systems with less extensive securities markets.
  - Conservative banking systems as “levees” against the potentially destabilizing flood of foreign capital

# Next Steps

## Refine measurements of banks and markets

- Better metrics/data for absolute/relative market size and regulation

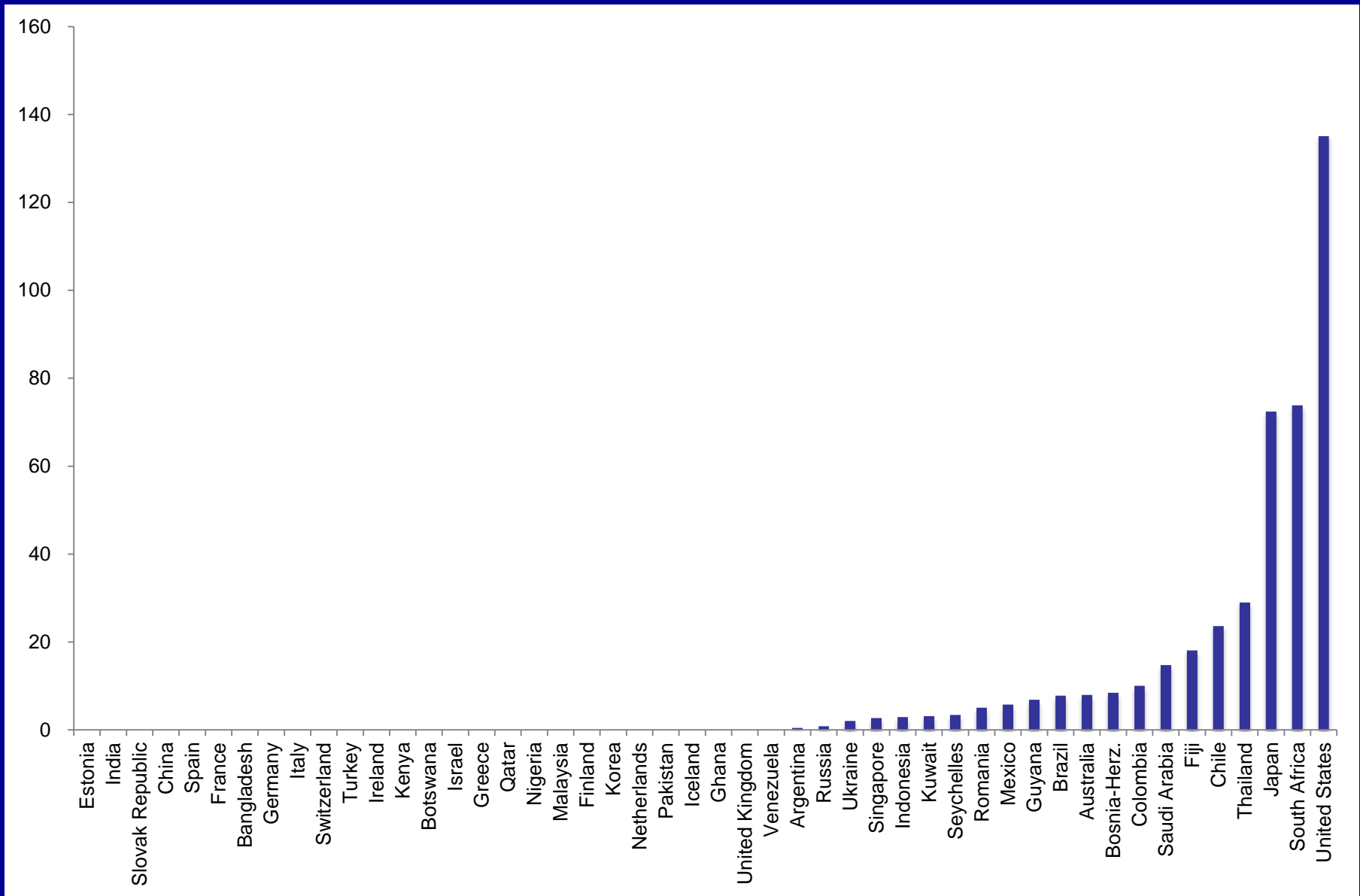
## Test for causal mechanisms

- Micro-level analysis of bank risk
- Capital and leverage ratios; other measures?
- Currently gathering bank-level data from US, Spain, and Denmark

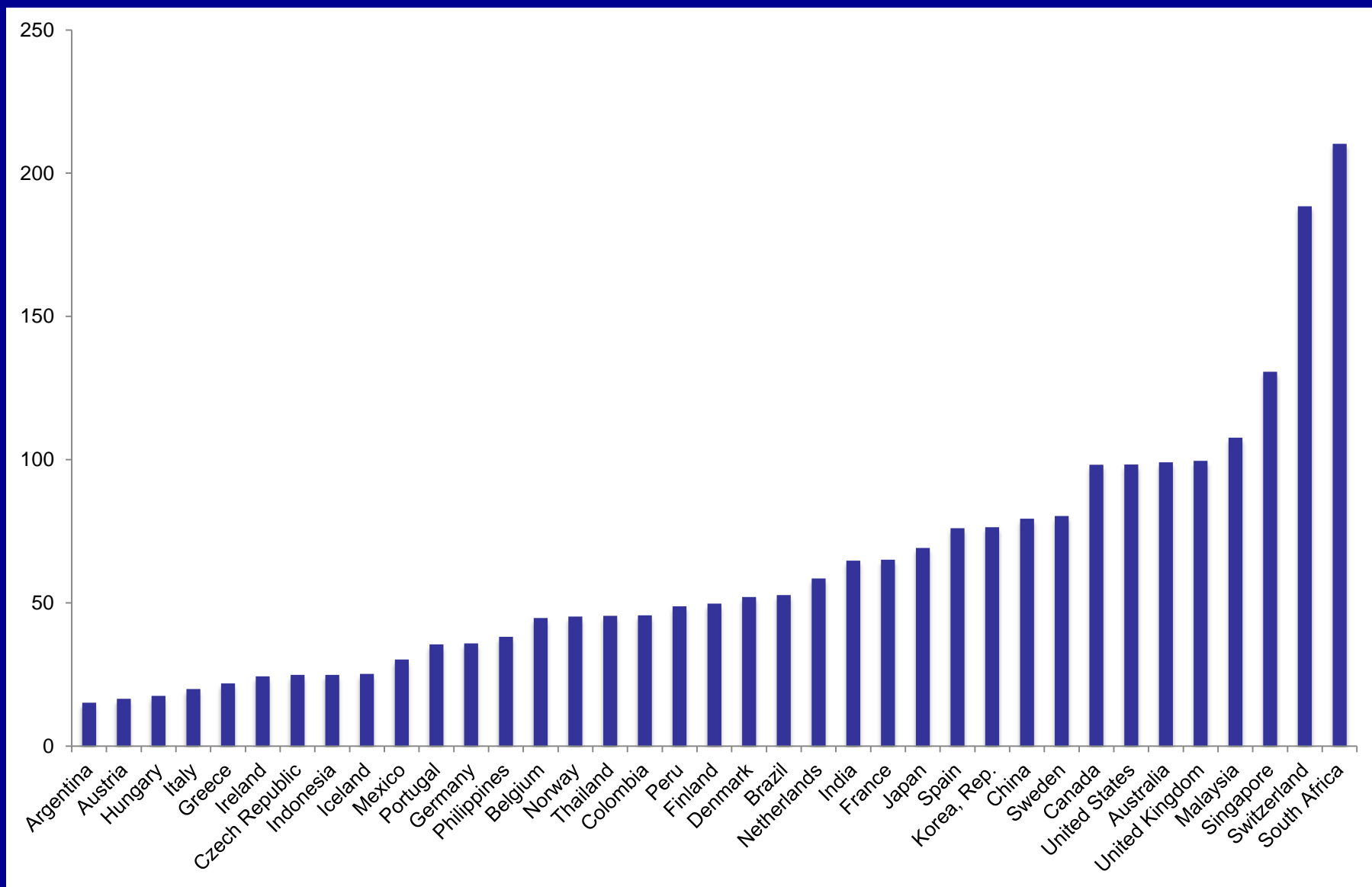
## Case studies

- Explain the political origins of variation in financial market structure
- Key cases: US, UK, Germany, Canada

# Domestic Credit by Non-Bank Institutions (% GDP), Select Countries, 2011



# Stock + Bond Market Capitalization (% GDP), Select Countries, 2009



# Securities Market Development Index (IMF), 2005, Selected Countries

Scale	Selected countries
0=no securities markets exist	Albania
1=Introduction of auctioning of T-bills and/or establishment of a securities commission	Algeria, Azerbaijan, Bulgaria, Cameroon, Costa Rica, Cote D'Ivoire, Nicaragua, Senegal, Uganda, Ukraine
2=Further measures to develop securities markets: tax exemptions; medium/long-term governments bonds; policies to develop corporate bonds/equity markets; and/or introduction of primary dealer to development government bond markets	Bangladesh, Brazil, China, Colombia, Ecuador, Egypt, Ghana, Indonesia, Kazakhstan, Kenya, Morocco, Pakistan, Peru, Philippines, South Africa, Thailand, Turkey, Uruguay, Vietnam
3=Further policies: measures to develop derivatives markets; deregulation of portfolio investment/pension funds; full deregulation of stock exchanges	Argentina, Australia, Canada, Chile, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, India, Ireland, Israel, Italy, Japan, Korea, Malaysia, Mexico, Netherlands, New Zealand, Nigeria, Norway, Poland, Russia, Singapore, Spain, Sweden, Switzerland, Tunisia, United Kingdom, United States

# Bank credit to Non-bank credit, 1970-2010

