The scarring effects of deep contractions

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Introduction

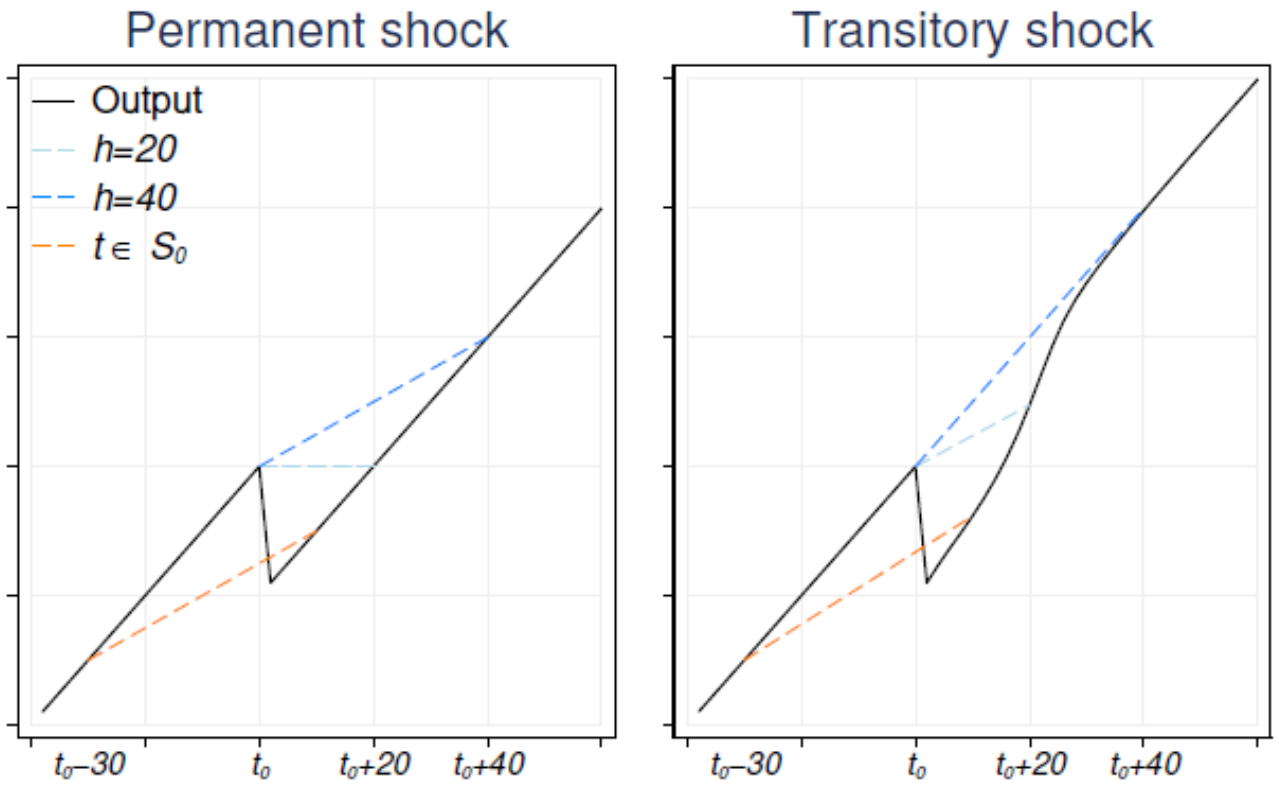
- Economies can experience contractions that are characterized by non-linearities and scarring effects
  - GFC is a well-known example; maybe also Covid or Russian invasion (eg FSB (2022))
  - Growing empirical evidence (see Cerra et al, JEL (2023))
- But little understanding of the conditions for scarring to occur
- Important questions for policy and modelling:
  - Do economies eventually recover after contractions?
  - Are big contractions different from smaller ones? Are there differences between expansions and contractions?
  - Does the nature of the contraction matter? (eg whether it is caused by monetary policy, energy prices, financial crises,…)

What do we do and find?

- What do we do?
  - Develop a new statistical test for scarring based on the properties of long-horizon growth rates
  - Apply the test to a panel of 24 AEs and EMEs from 1970 to the present
- What do we find?
  - Only deep contractions have highly persistent scarring effects
    - —Effects are nonlinear and asymmetric: no scarring after mild contractions or expansions
  - Scarring reflects the *size* of the contraction rather than its *cause*
    - —Scarring effects of financial crises well known
    - —We also find scarring effects for contractions associated with sharp monetary policy tightenings or oil shocks

Approach

Method illustrated



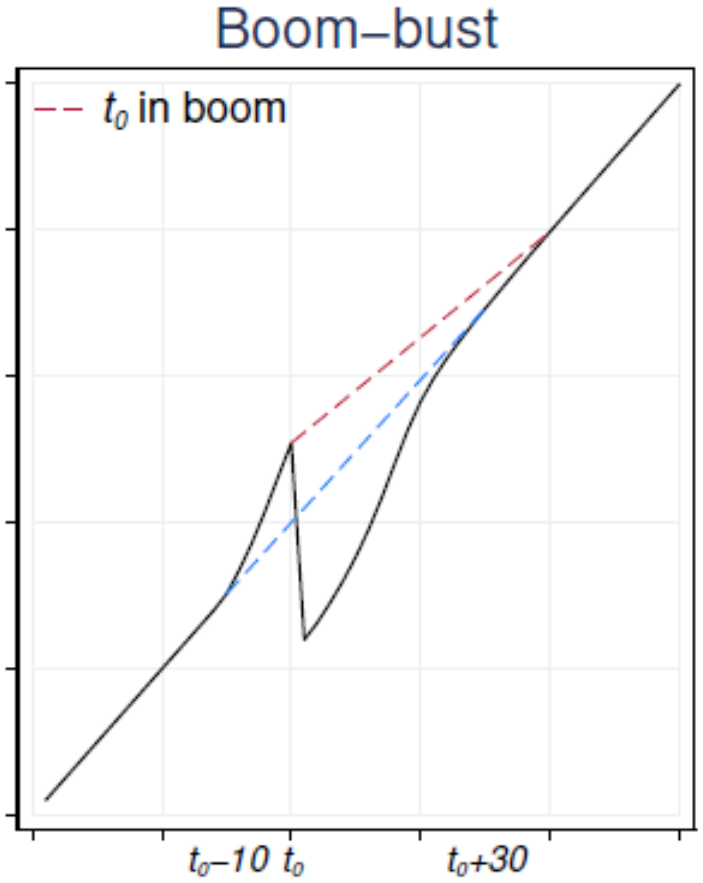
- Test: Is the mean of the set of *h*-period ahead growth rates at t_0 significantly below the mean of the other *h*-period ahead growth rates?

Issues in implementing this test

- Identifying t_0
  - Agnostic approach, focus on percentiles of annual growth distribution
- Choosing the horizon h
  - Somewhat arbitrary, needs to be long enough and not too long
  - We look at 10 years (1-15 years as robustness)

Possible biases

- Contractions may follow booms → bias in favour of finding scarring
  - As robustness: follow Blanchard et al (2015) and drop “boom periods”



Possible biases

- Contractions may follow booms → bias in favour of finding scarring
  - As robustness: follow Blanchard et al (2015) and drop “boom periods”
- Growth slowdown → bias unclear
  - A) Lowers h-period growth rates at t_0 → biases in favour of finding scarring
  - B) Lowers estimate of “normal” growth → biases against
    - —Check with lots of different filtering approaches

Data

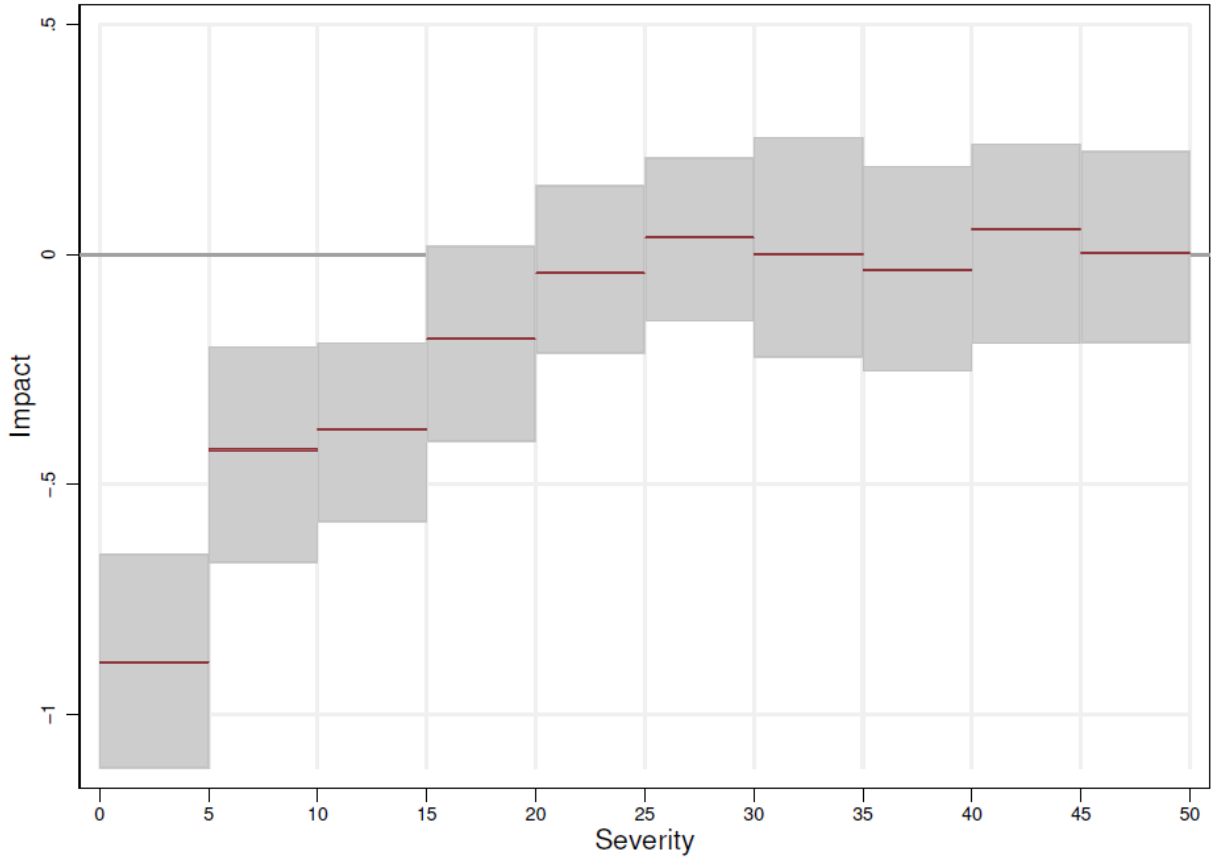
- Real GDP (seasonally adjusted)
- Quarterly series: 1970Q1 to 2019Q4
- 24 countries (19 AEs, 5 EMEs)
  - Australia, Austria, Belgium, Brazil (EME), Canada, Denmark, Finland, France, Germany, Italy, Japan, Korea (EME), Mexico (EME), the Netherlands, Norway, New Zealand, Portugal, Sweden, Singapore (EME), South Africa (EME), Spain, Switzerland, the United Kingdom, and the United States

Identifying contractions

- *h*-quarter ahead real GDP growth rate: $y_{i,t}^{h} = 100 \cdot \ln(\frac{Y_{i,t+h}}{Y_{i,t}})$
  - Remove slow-moving trend
    - Baseline: HP filter with lambda = 400,000
    - Robustness: (a) no detrending; (b) a Hamilton projection filter based on country-specific local projections with a lag-length of four and projection horizon of 20 years (Hamilton (2018)); and (c) remove 20-year rolling averages from $y_{i,t}^{h}$
  - Normalise $y_{i,t}^{h}$ by country specific means and standard deviations
- Size of contractions based on distribution of $y_{i,t}^{4}$
  - Look at intervals α = 0th-5th, 5th-10th,…,45th-50th of percentiles
  - For each α, collect quarters $t_{0,i}$ at the start of the contraction: $T_{0\alpha} = \cup_i t_{0,i}$
- Test if mean of $y_{i,t\in T_{0\alpha}}^{40}$ is different from overall mean of $y_{i,t}^{40}$
  - Bootstrap standard errors to account for serial and cross-correlation (Politis and Romano (1994))

Results

Only severe contractions have scarring effects

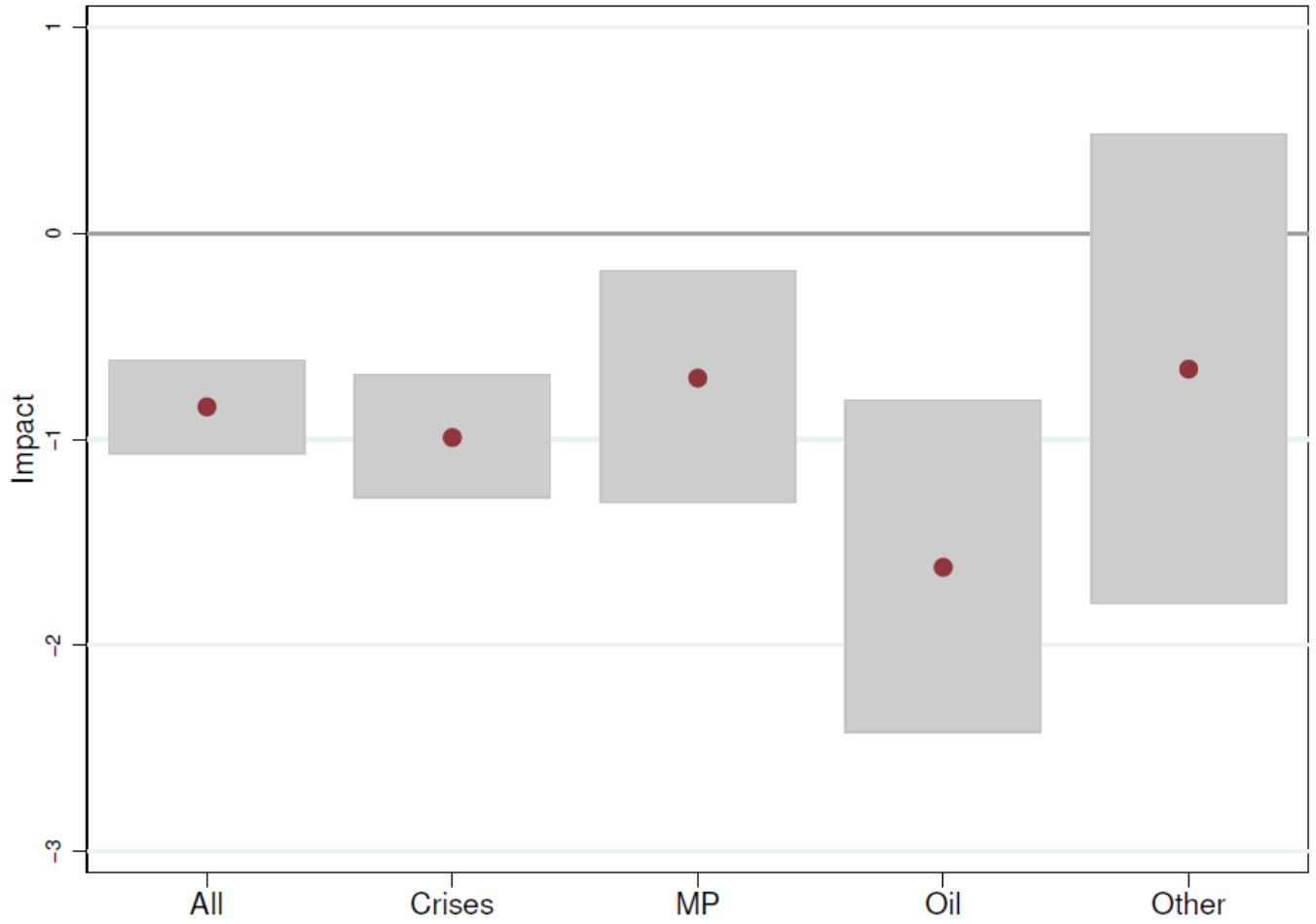


- Economically significant:
  - For most severe contractions, reduction in 10-year growth rates, c. 4.75% loss in level of GDP

Classifying severe contractions

- For very severe contractions (below 5th percentile) we classify approximate causes
  - Financial crises
    - —Laeven and Valencia (2018), Reinhard and Rogoff (2009) and the ESRB dataset (Lo Duca et al (2016))
  - Oil shocks
    - —1973-74 and 1978-79 oil price shocks
  - Monetary policy tightening to combat high inflation
    - —Significant increase in nominal interest rates
    - —For the US: Zarnowitz (1999) and Blinder (2022)
  - Other

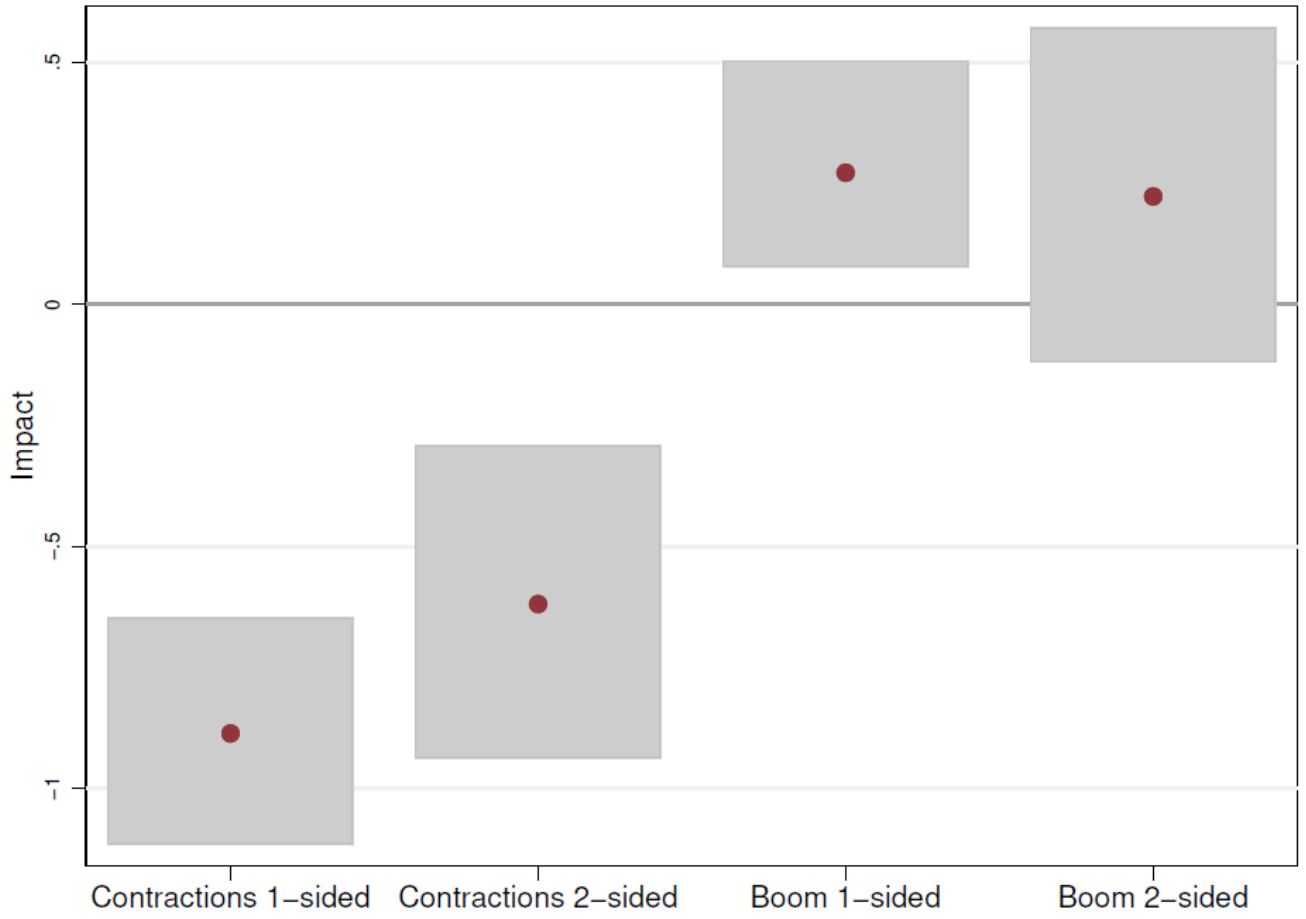
The size of economic contractions rather than their cause matters for scarring



Expansions versus contractions

- With endogenous growth, the effects should be symmetric, ie large positive expansions should also have permanent effects
- Problem:
  - Mean growth is lower if scarring for contractions → standard test may signal permanent effects for expansions
- Implement a “two-sided” version of the test
  - Identify $t_{0,pos}$ and $t_{0,neg}$ then drop opposite S_o (ie $S_{o,neg}$ if you test for positive effects)
  - Problem: data intensive

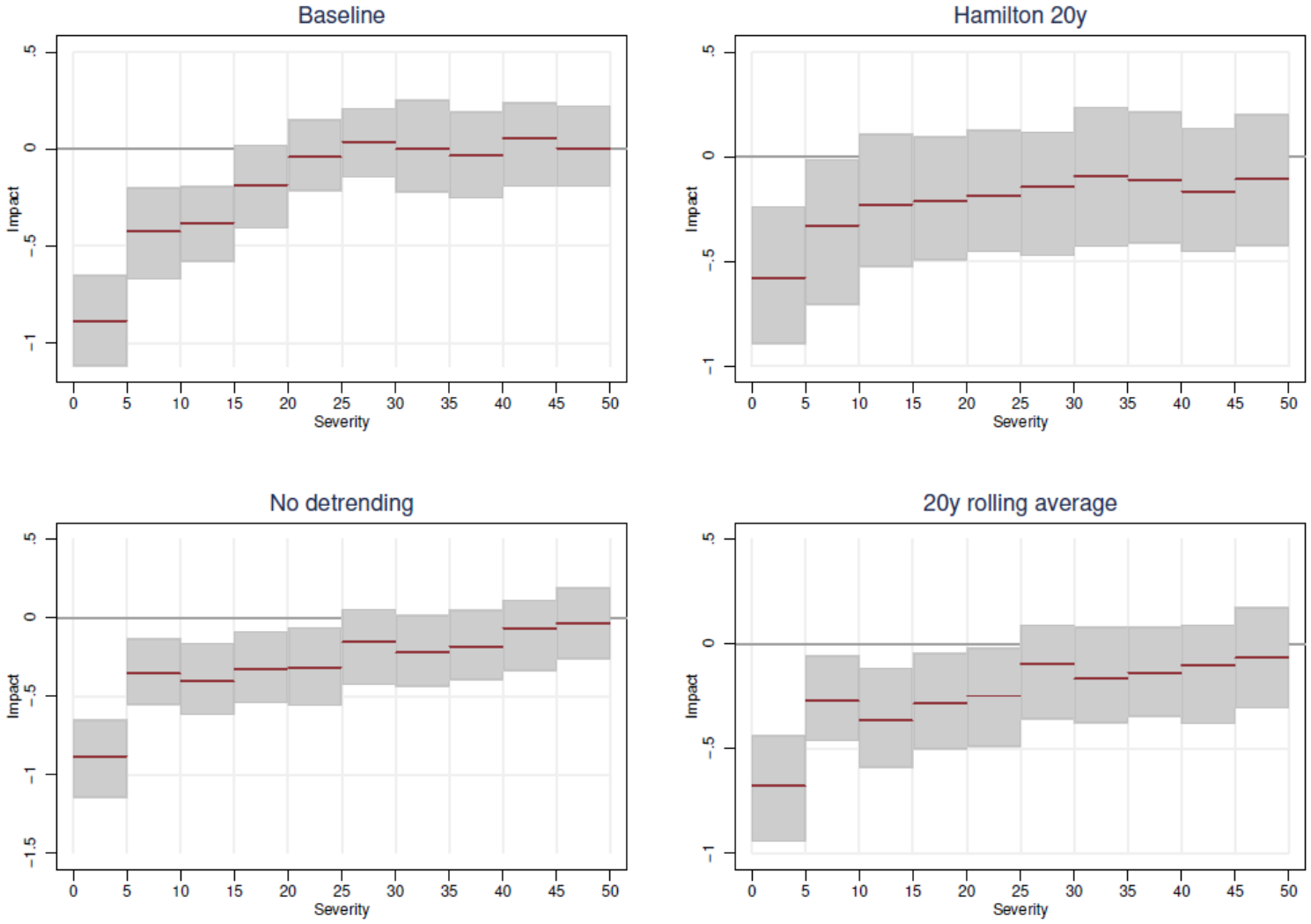
Only contractions have long-run effects



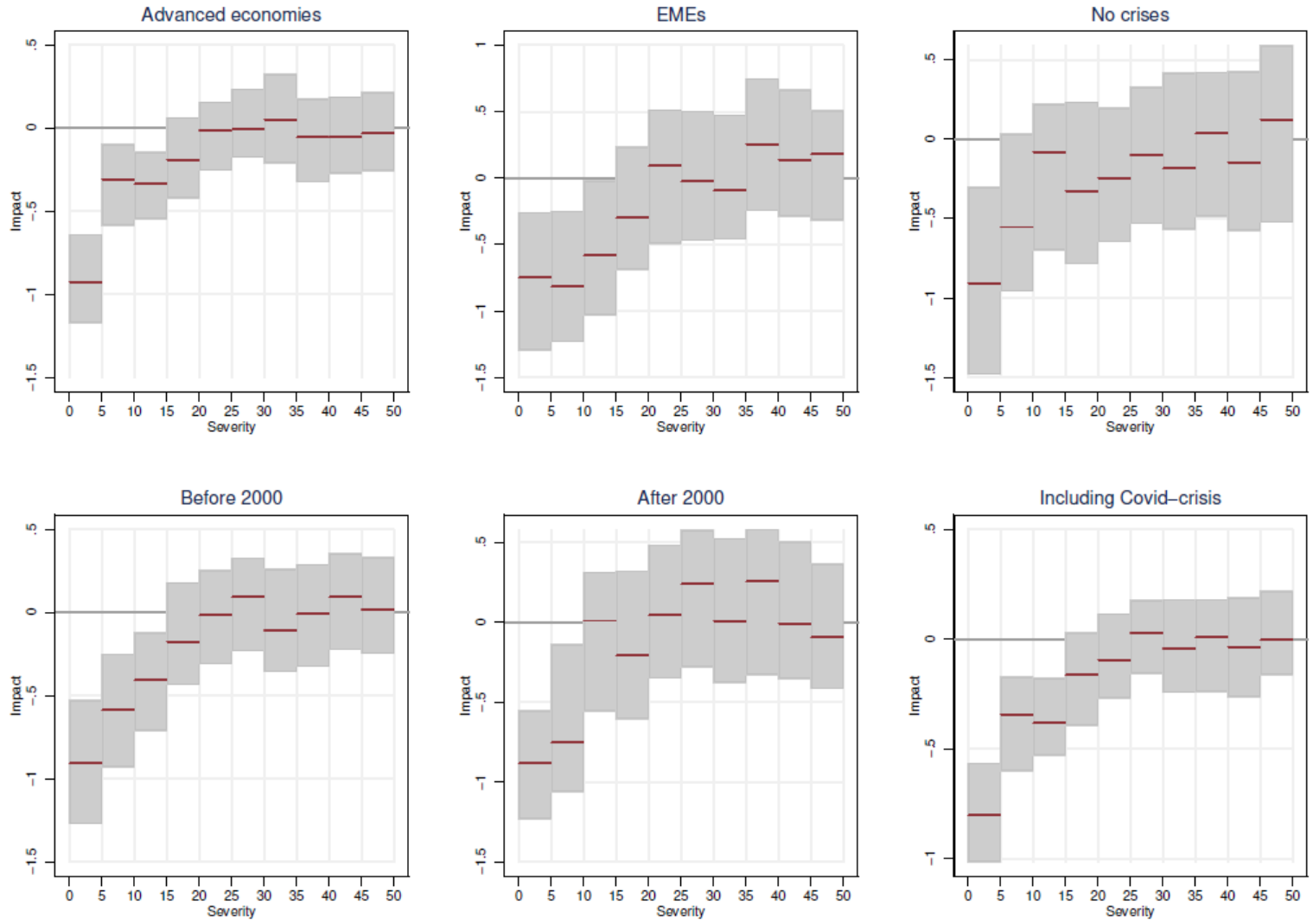
- Difference in mean growth rates following 5th and 95th percentile annual growth outturns vis-à-vis rest of sample

Robustness

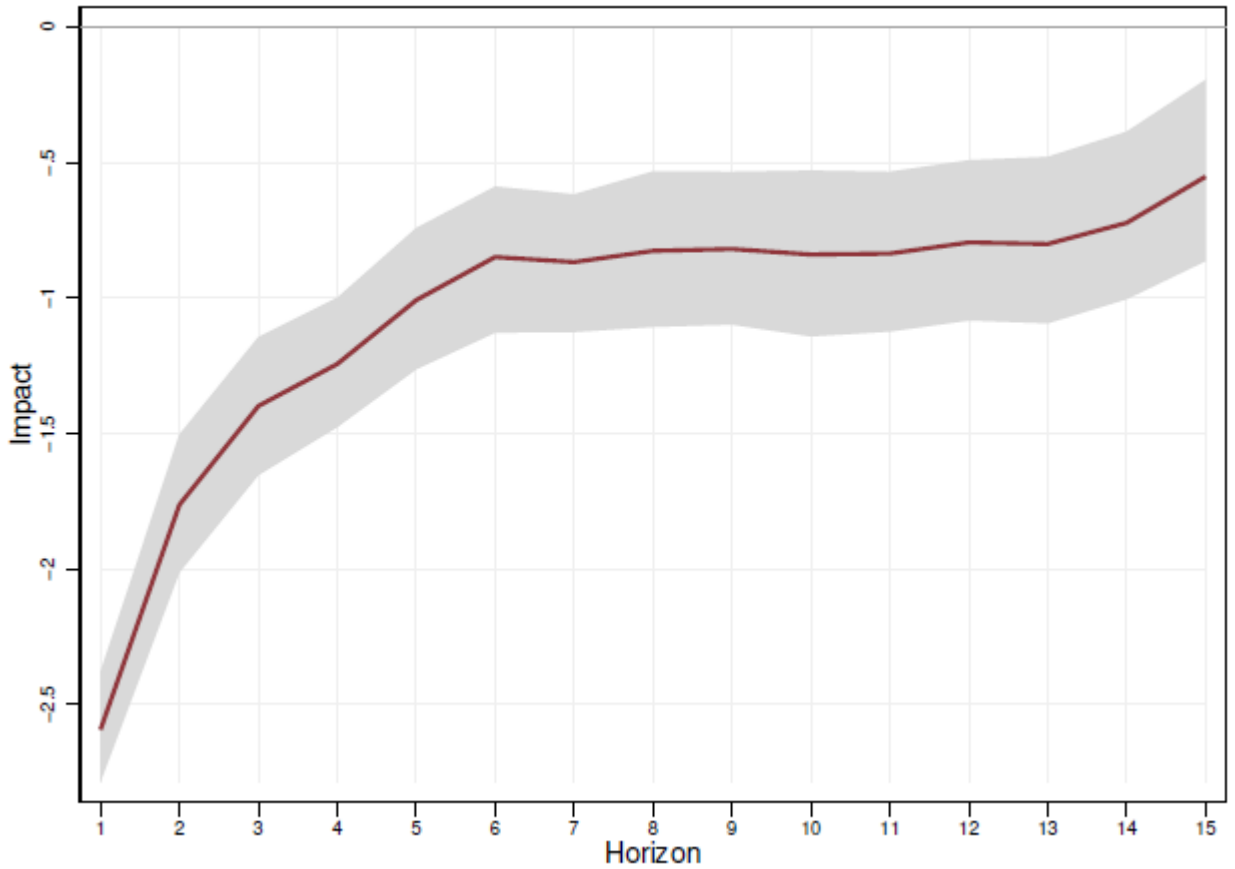
Scarring effects of contractions robust to different detrending methods



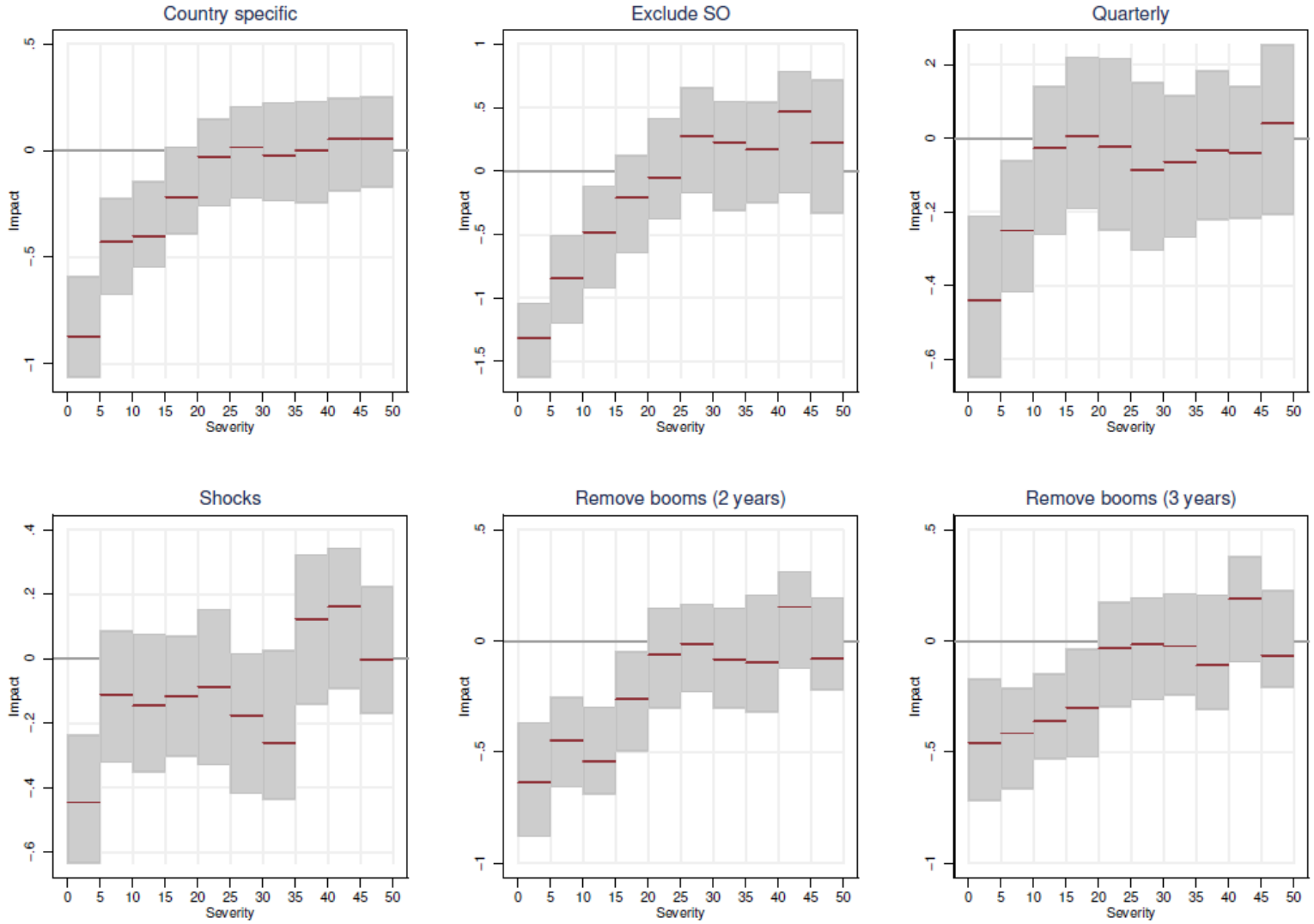
Sample splits do not affect the key results



Scarring gets only slightly weaker for even longer horizons



Results not dependent how contractions are defined



Policy implications

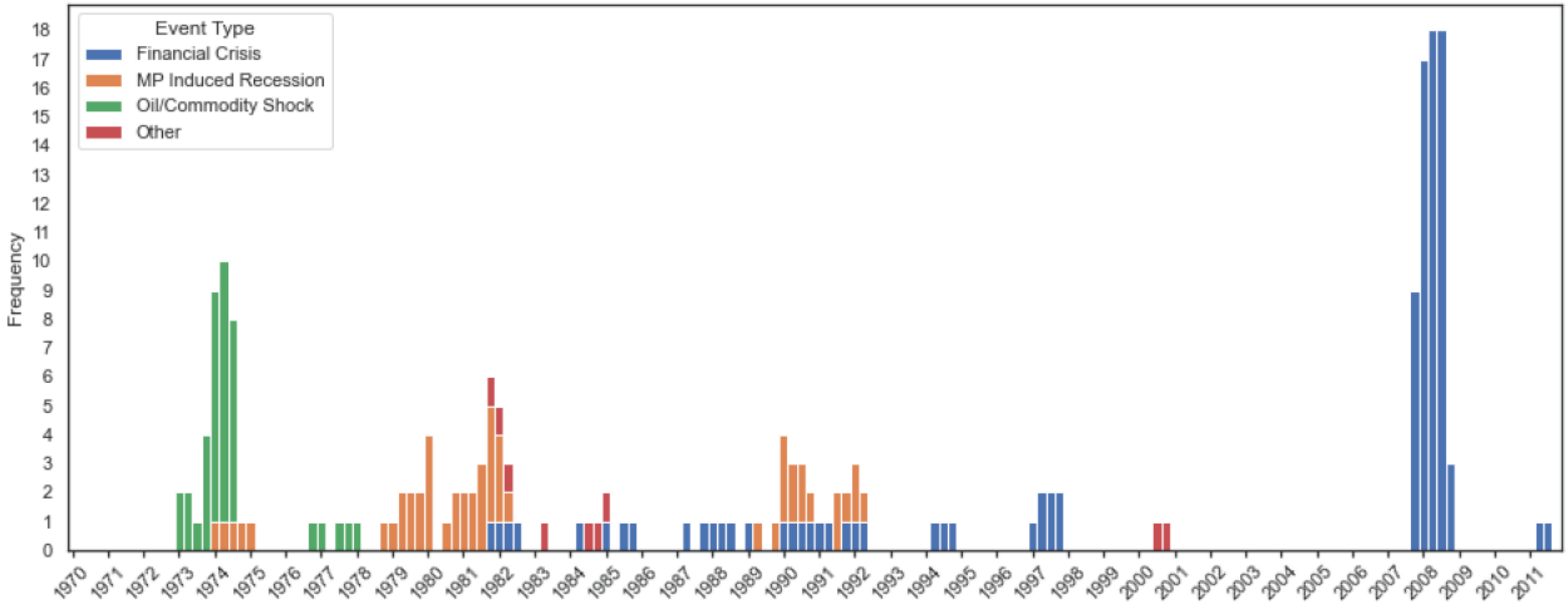
"Authorities should make it one of the major objectives of policy—macroeconomic, financial regulatory, or macroprudential—to stay further away from the dark corners" (Blanchard (2014))

- Beware developments that can lead to big contractions (eg credit booms)
  - Stress testing and macroprudential policies
- Asymmetric policy responses with respect to booms and busts?
- Do not rely on macroeconomic models that assume the economy will revert to its previous trend
  - Eg output gap measures will be wrong

Conclusions

- Severe contractions lead to economic scars that never heal
  - These effects seem to operate when annual growth contracts below the 20th percentile
- The effects are non-linear and asymmetric
- The size of economic contractions rather than their cause matters for scarring

Additional slides


Event Type
Financial Crisis
MP Induced Recession
Oil/Commodity Shock
Other
Frequency
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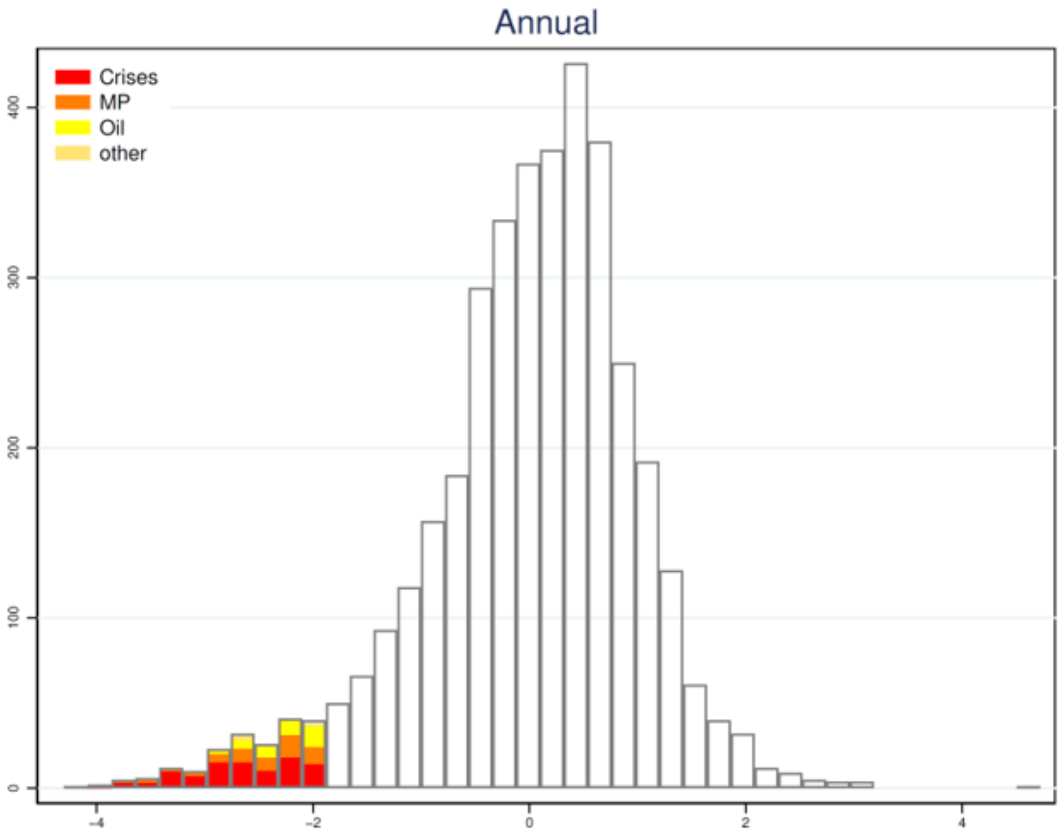
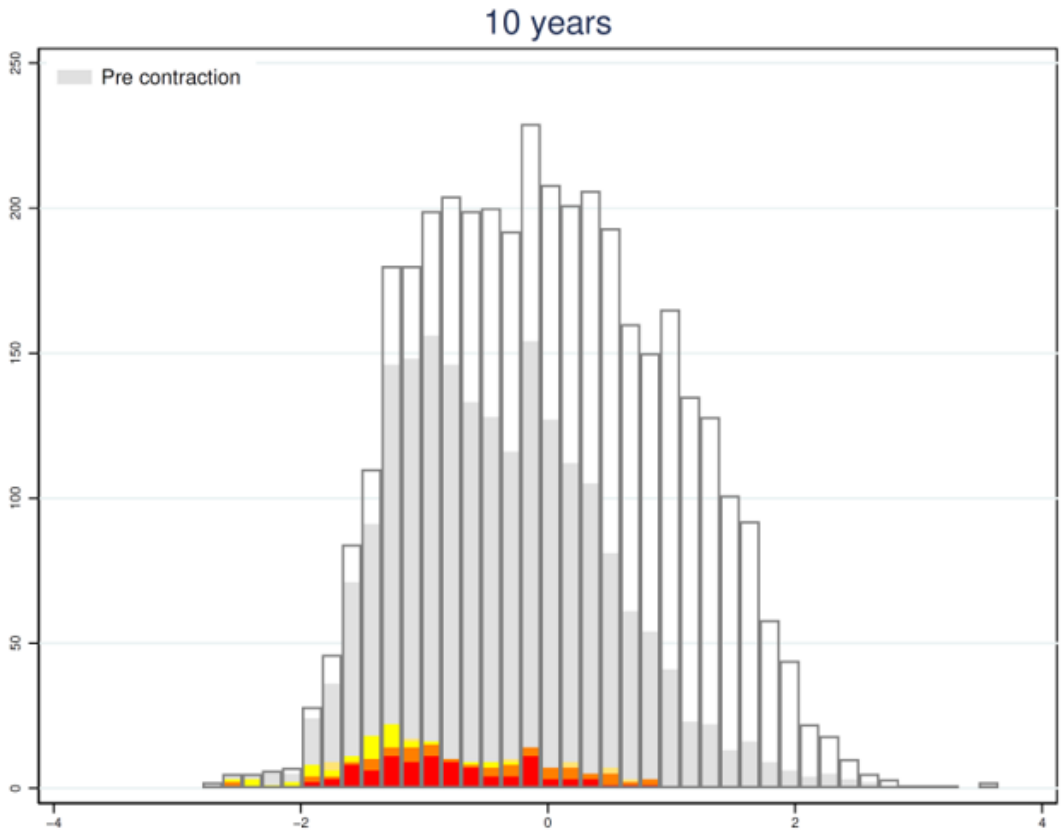
Related literature

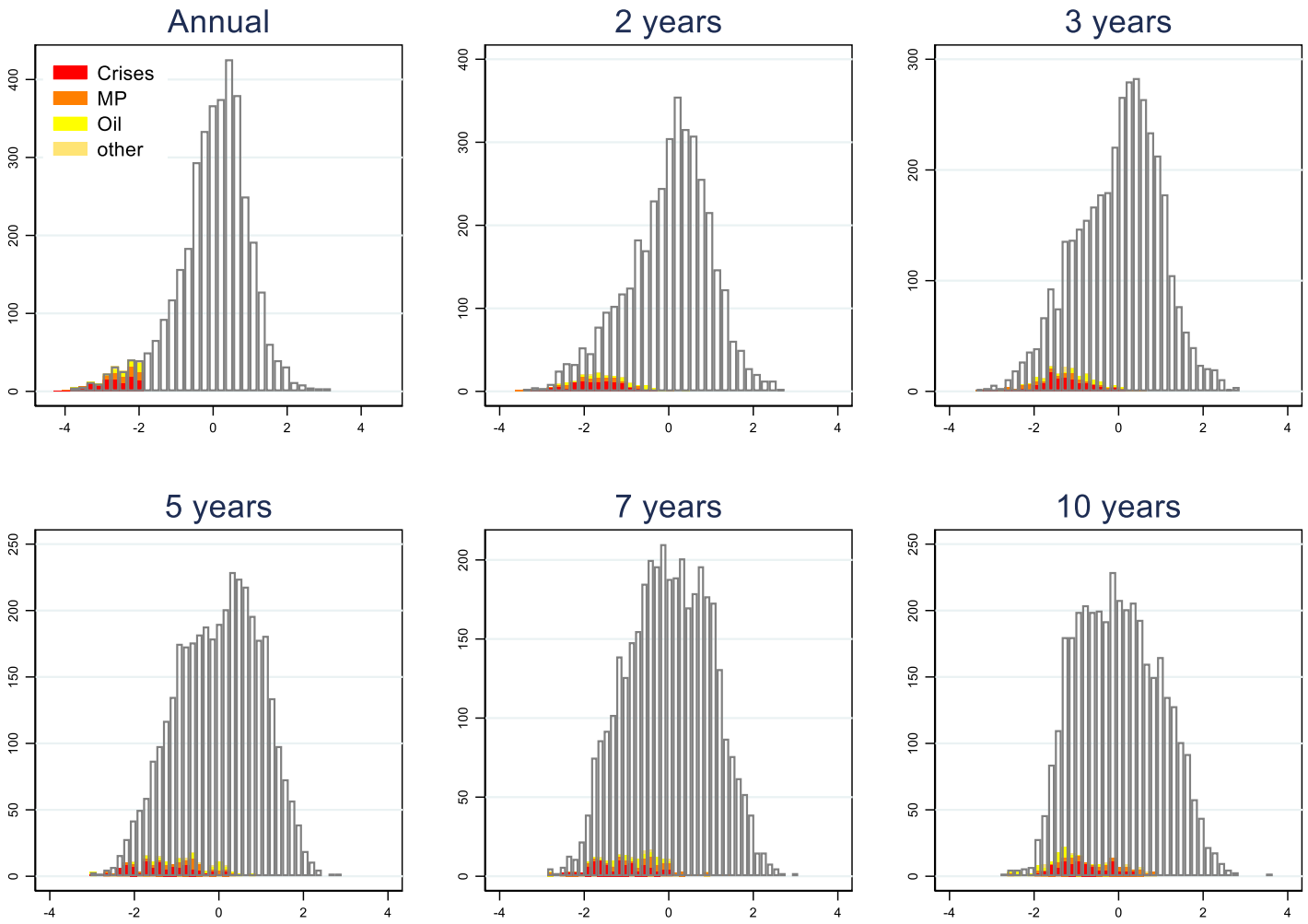
- Large literature on stationary vs unit-root dynamics
  - Eg, Nelson & Plosser (1982); Cochrane (1986); Cerra & Saxena (2008); Darne (2009); Shelley and Wallace (2011); and Cushman (2016)
  - Still open debate; weak statistical power; other types of non-stationarity
  - Symmetric and “linear” effects; all shocks permanent
- Look at GDP movements around turns in business cycles or events
  - Eg Cerra & Saxena (2005); Claessens et al. (2012); Reinhart & Rogoff (2014); Jorda et al (2013, 2015))
  - Local projection test (Jorda et al 2022)
- Identify shifts in trend output around downturns (eg Blanchard et al (2015) or Ball (2014))

Scarring is also evident in the unconditional distribution

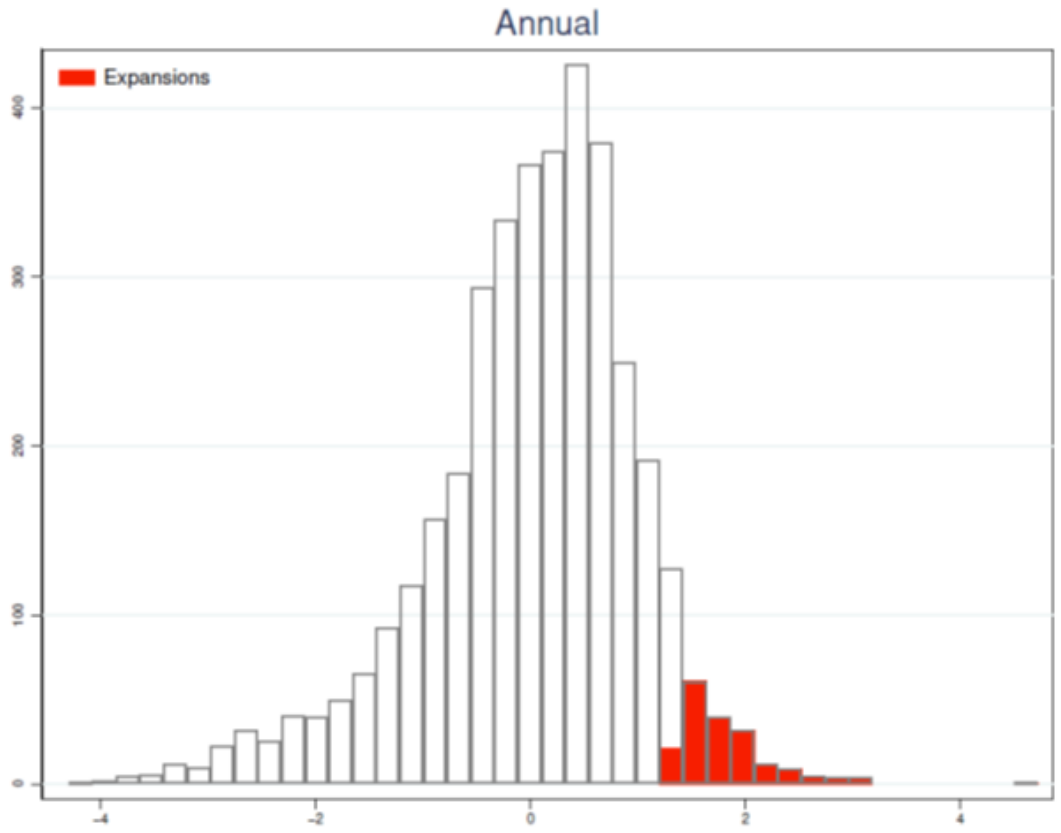


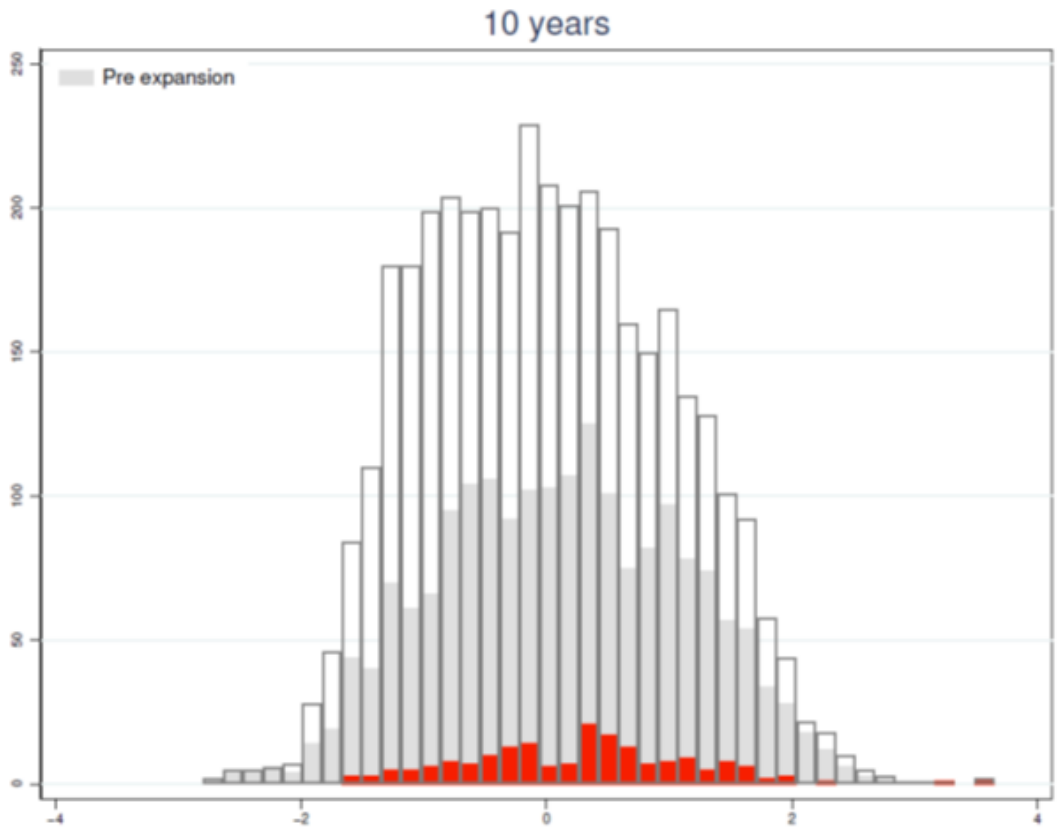


Bimodality at different horizons



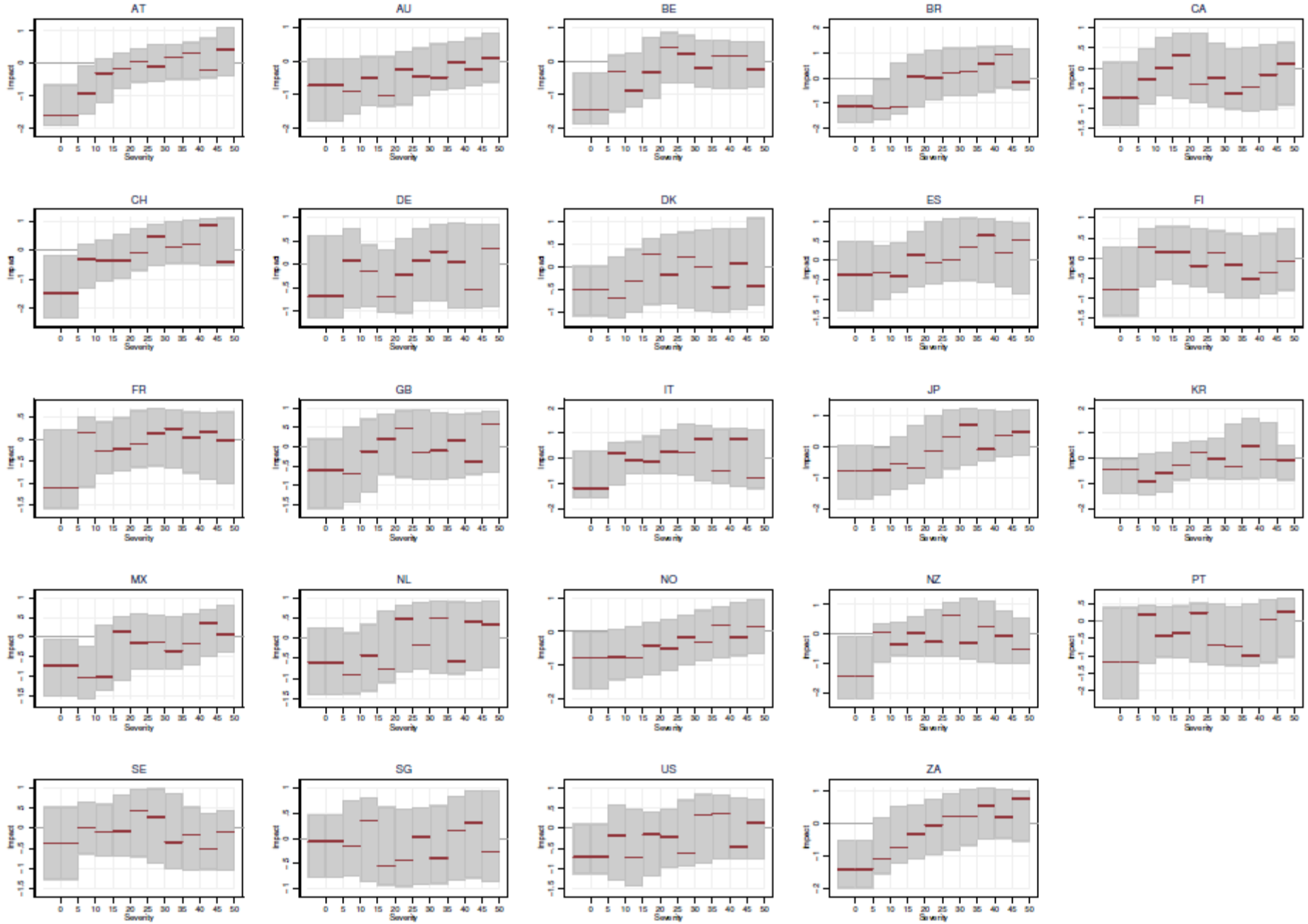
Histogram for expansions





Connection to macroeconomic models

- Autoregressive models with Gaussian shocks (eg RBC or DSGE models) are not consistent with non-linearities and asymmetries
- Endogenous growth models can generate scarring effects, but are typically symmetric
- Models with occasionally-binding constraints and financial frictions generate asymmetric and nonlinear responses, but not permanent scarring
- Two types of models seem to fit:
  - Models with occasionally binding financial constraints and endogenous growth (eg Queralto (2020))
  - Models of debt traps (eg Mian et al (2020))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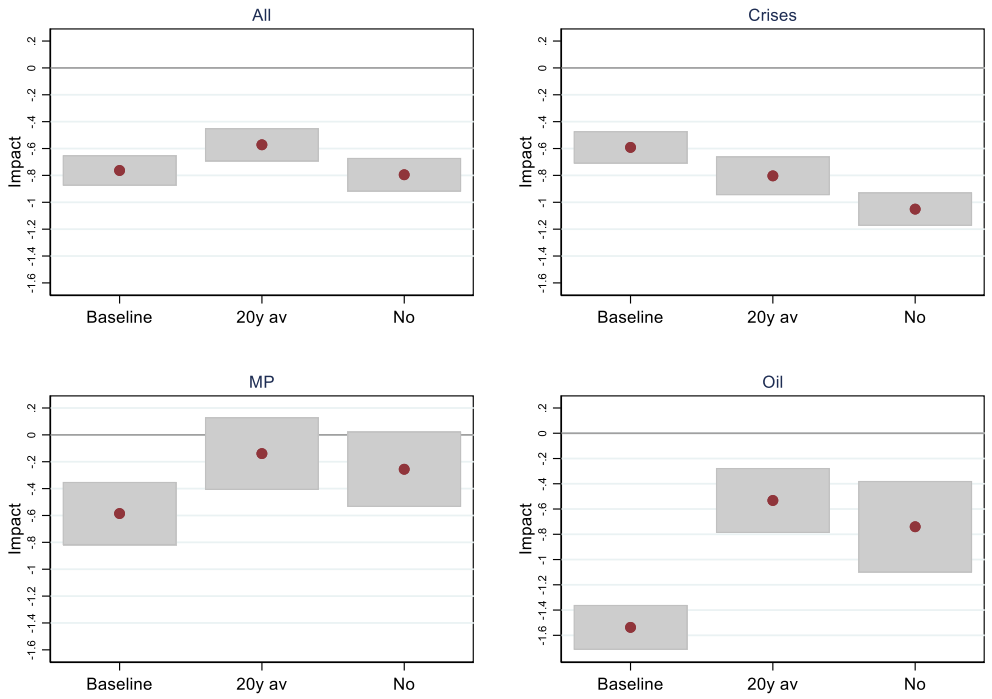
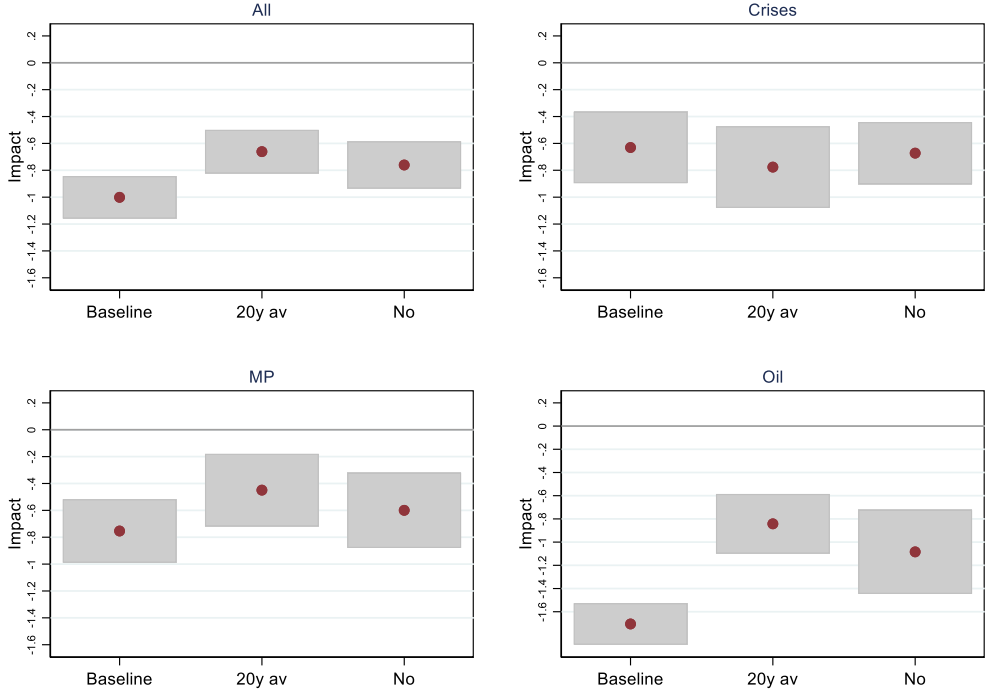
SE
SG
US
ZA
Impact
Severity

Events – different detrending methods

Full sample



Sample up to 2000



Country	Fin Crisis	MP Induced	Oil Shock
AT	08q1, 08q2, 08q3	80q1	74q1, 74q2, 74q3, 77q4
AU		81q3, 81q4, 82q1, 82q2, 90q1, 90q2, 90q3, 90q4	73q4
BE	07q4, 08q1, 08q2, 08q3	80q1, 92q1	74q1, 74q2, 74q3
BR		80q3, 80q4, 89q2, 89q4, 90q1, 91q3	
CA	08q1, 08q2, 08q3	81q1, 81q2, 81q3, 81q4, 82q1, 90q1, 90q2, 90q3	
CH	08q1, 08q2, 08q3	74q1, 74q2, 74q3, 74q4, 75q1	
DE	08q1, 08q2, 08q3, 08q4		74q1, 74q2,
DK	89q1, 07q4, 08q1, 08q2, 08q3,	80q1	74q1
ES	08q1, 08q2, 08q3, 11q2, 11q3	92q1, 92q2,	
FI	90q1, 90q2, 90q3, 90q4, 91q1, 91q2, 08q1, 08q2, 08q3, 08q4		
FR	07q4, 08q1, 08q2, 08q3		74q1, 74q2, 74q3
GB	07q4, 08q1, 08q2, 08q3	79q2, 79q4, 80q1	73q1, 73q2, 74q2, 74q3,
IT	08q1, 08q2, 08q3		74q1, 74q2, 74q3,
JP	07q4, 08q1, 08q2, 08q3		73q1, 73q2, 73q3, 73q4
KR	97q1, 97q2, 97q3, 97q4,	78q4, 79q1, 79q2, 79q3, 79q4	
MX	81q4, 82q1, 82q2, 82q3, 85q3, 85q4, 94q2, 94q3, 94q4, 08q1, 08q2, 08q3		
NL	08q1, 08q2, 08q3, 08q4	80q4, 81q2, 81q4, 82q1	78q1,
NO	87q2, 87q4, 88q1, 88q2, 88q3, 07q4, 08q2, 08q3		
NZ	85q1		74q2, 74q3, 76q4, 77q, 177q3
PT			73q4, 74q1, 74q2, 74q3
SE	91q4, 92q1, 92q2, 07q4, 08q1, 08q2, 08q3		
SG	97q2, 97q3, 97q4, 07q4, 08q1		
US	07q4, 08q1, 08q2, 08q3	79q3, 81q1, 81q3, 81q4	73q4, 74q1, 74q2
ZA	84q2, 08q2, 08q3	91q3, 91q4	