Research Agenda on Sovereign Debt and Default

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A little bit about me

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- 2012 – 2016:
  Assistant Prof. at McMaster University (Canada)
- Since 2016:
  Prof. at ND Econ (first Assistant, now Associate) and Fellow at Kellogg.
- Teaching: Intermediate Macro (UG), International Economics (UG and PhD)

Plan for today's conversation

1. Brief overview of the topic
2. My research agenda and things I think are important to study more
3. More detailed discussion of one **new paper**
4. Open-ended discussion

Note: comments, questions, and interruptions are most welcome at any point!

Overview – Definitions

What is a "sovereign"?
Central, State/Provincial, or Local/Municipal Governments and all other entities that borrow with an explicit government guarantee.

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What is a "sovereign default"?

Loosely speaking: failure to pay.

Technically: *the failure to meet a principal or interest payment on the due date. This includes situations in which the sovereign forces an exchange of old debt for new debt with less-favorable terms or converts debt into a different currency of less value.*

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- As an asset class: roughly 20%.
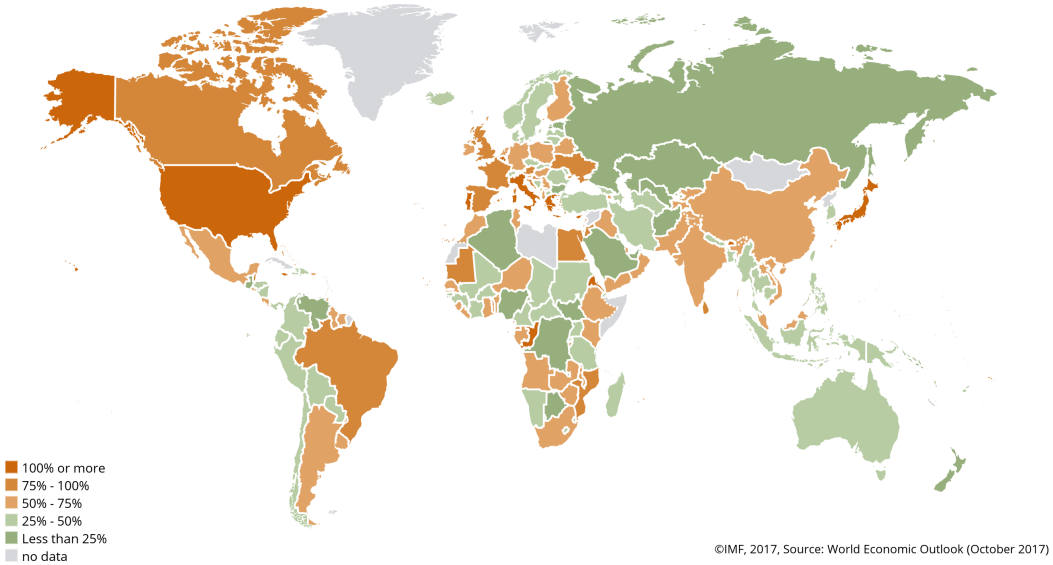
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- Differences between advanced and developing countries:
  - Advanced: larger debt ratios and lower interest cost (spreads)
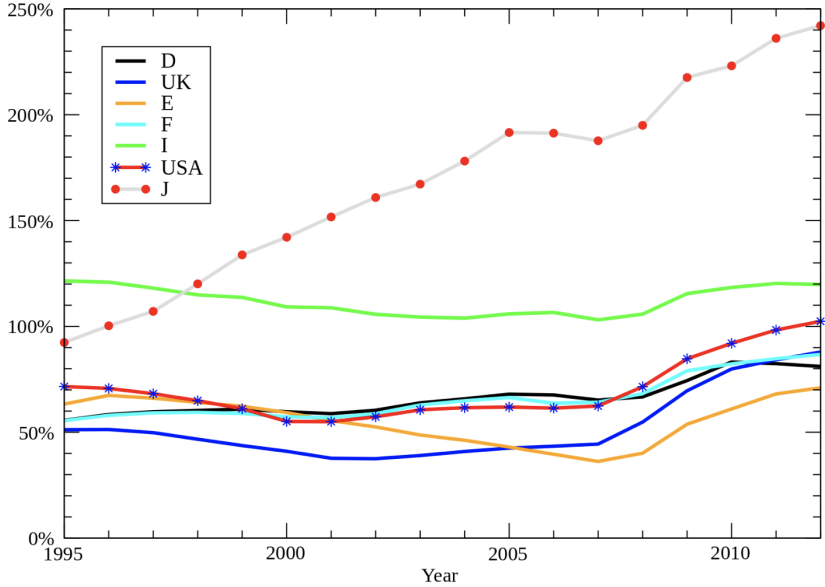 - Developing: lower debt rations and higher spreads

  - "Debt Intolerance": *the extreme duress many emerging markets experience at external debt levels that would seem quite manageable by the standard of advanced countries* (Reinhart and Rogoff, 2010)

Debt around the world

General government gross debt (Percent of GDP, 2018)

- 100% or more
- 75% - 100%
- 50% - 75%
- 25% - 50%
- Less than 25%
- no data

©IMF, 2017, Source: World Economic Outlook (October 2017)

Debt in (selected) advanced countries

Overview – Sovereign defaults

- Defaults are "rare events" $\rightarrow$ think 2, 3, or 4% unconditional probability.
- History shows that there are "default cycles": periods where a high percentage of all countries are in a state of default or restructuring.
- 5 default cycles:
    1. Napoleonic wars
    2. 1820s - 1840s
    3. Early 1870s, lasted 2 decades
    4. Great depression 1930s - 1950s
    5. 1980s and 1990s: emerging markets wave.

Percent of countries in default (1800 − 2006)
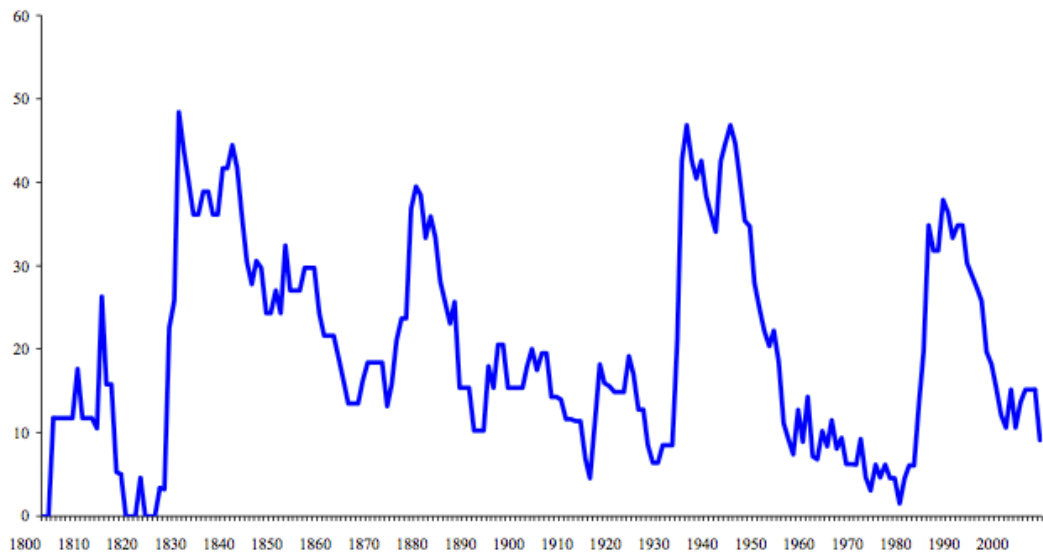
Overview – How frequent and long are defaults?

Country	Number of Defaults 1824-2014	Probability of Default all years	years not in default	Years in State of Default per Default Episode
Argentina	5	0.026	0.035	10
Brazil	7	0.037	0.047	6
Chile	3	0.016	0.020	14
Colombia	7	0.037	0.058	10
Egypt	2	0.010	0.012	11
Mexico	8	0.042	0.056	6
Philippines	1	0.005	0.006	32
Turkey	6	0.031	0.037	5
Venezuela	10	0.052	0.079	6
Mean	5.4	0.029	0.039	11

Debt among (selected) defaulters (1970-2000)

Country	Average Debt-to-GNP Ratio	Debt-to-GNP Ratio in Year of Default
Argentina	37.1	54.4
Brazil	30.7	50.1
Chile	58.4	63.7
Colombia	33.6	
Egypt	70.6	112.0
Mexico	38.2	46.7
Philippines	55.2	70.6
Turkey	31.5	21.0
Venezuela	41.3	46.3
Average	44.1	58.1

Interest rate spreads among (selected) defaulters (1999-2013)

| | Average Country Spread | |
| | All | Years Not |
Country	Years	In Default
Argentina	15.8	7.43
Brazil	5.61	5.61
Chile	1.44	1.44
Colombia	3.70	3.70
Egypt	2.46	2.46
Mexico	3.47	3.47
Philippines	3.49	3.49
Turkey	4.10	4.10
Venezuela	9.24	9.23
Average	5.5	4.5

Research agenda

- Why are defaults costly? Sovereign-bank nexus.

- What accounts for high levels of debt, and high and volatile interest rates in EMEs?

- Can we design debt contracts better? What about debt relief policies?

- How should a government manage its foreign reserves?

Research agenda

- Why are defaults costly? Sovereign-bank nexus.

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- Can we design debt contracts better? What about debt relief policies?

- How should a government manage its foreign reserves?

- Lately: interaction of the above with geopolitical risk.

Research agenda — TODAY

- Present an outline of a new paper

- Tackles the issue of misreporting in external debt statistics

- New data and new model

- Related to the topic of "debt intolerance"

Hidden Debt Revelations

Sebastian Horn (World Bank)   David Mihalyi (World Bank, Kiel)

Philipp Nickol (UDE, Kiel)   César Sosa-Padilla (Notre Dame, NBER)

How reliable are public debt statistics?

- Public debt is a cornerstone of macro analysis

- Growing recognition that debt statistics are plagued by major limitations ("hidden debt"), but little academic work

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Can we quantify the underreporting problem?

- **Key idea:** When previously unreported debt gets disclosed, past debt statistics need to be revised.

- We track data revisions across all past editions of the World Bank's debt statistics to quantify the extent, characteristics and timing of hidden debt and its revelation.

Our paper

Empirics: Novel dataset of the full history of World Bank debt reports

- Debt statistics are systematically underreported

- Hidden debt builds up in good times and is revealed in bad times

- Hidden debt is associated with high creditor losses ("haircuts") during defaults

Theory: Model of sovereign debt & default with hidden debt revelations

- Higher default incentives and lower debt-carrying capacity,

- higher borrowing costs,

- significant welfare losses

Mozambique's Hidden Debt Scandal

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MARKETS

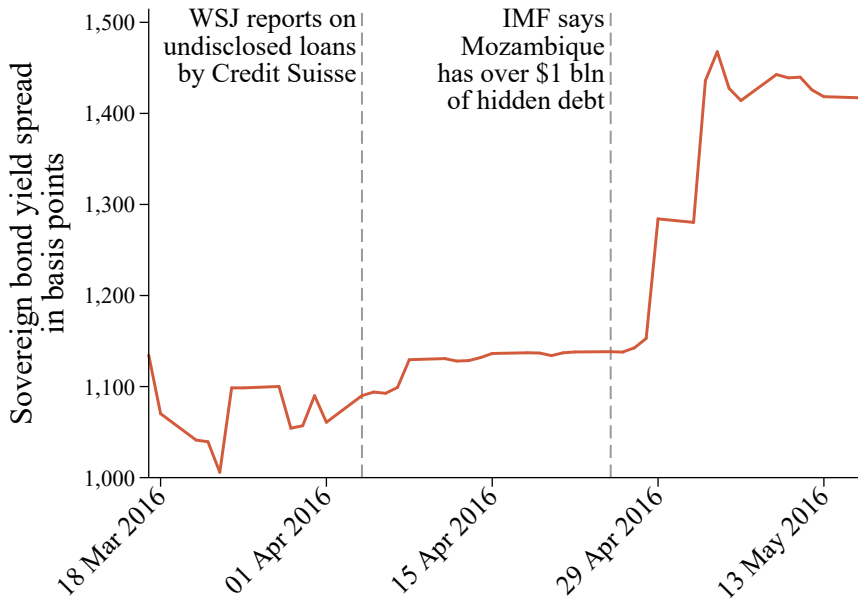## IMF Calls for Audit of Mozambique's Undisclosed Debt
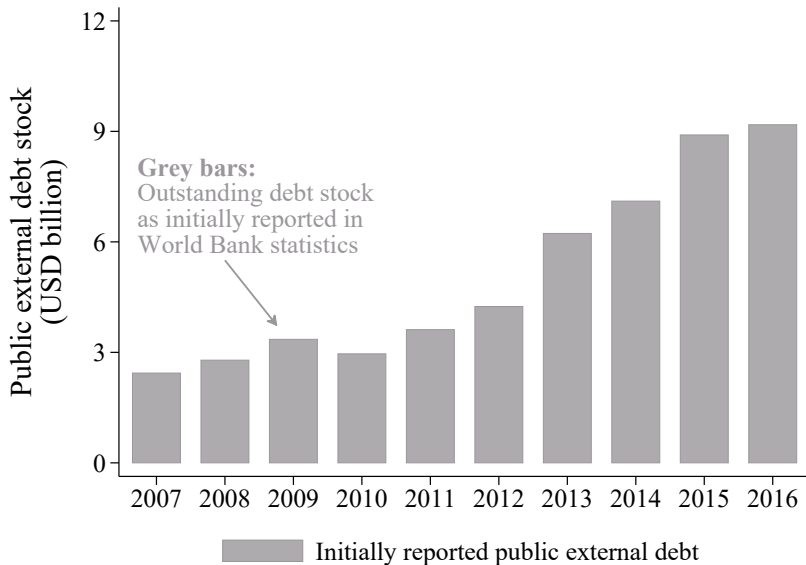
Global Economy ✓ Added

Hidden loans leave once-promising Mozambique with heavy costs

IMF suspends financial aid as analysts see worst national crisis since civil war 20 years ago
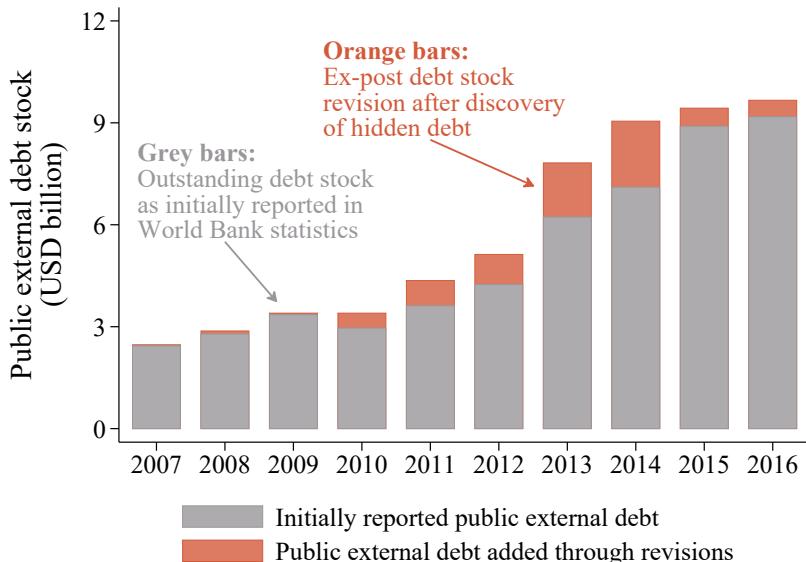
Motivation: Mozambique's hidden debt scandal

WSJ reports on undisclosed loans by Credit Suisse

IMF says Mozambique has over $1 bln of hidden debt

Sovereign bond yield spread in basis points

18 Mar 2016 — 01 Apr 2016 — 15 Apr 2016 — 29 Apr 2016 — 13 May 2016

Mozambique's initially reported debt stocks, 07-16

Grey bars:
Outstanding debt stock as initially reported in World Bank statistics

Initially reported public external debt

Mozambique's initially reported debt stocks, 07-16, revised

Quantifying hidden debt

A new and comprehensive database of debt data revisions

We digitize all past vintages of the World Bank's International Debt Statistics and its predecessors, 1973–2023, and systematically track ex-post revisions to debt and loan statistics across the entire reporting history of 140 developing and emerging market countries.

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We digitize all past vintages of the World Bank's International Debt Statistics and its predecessors, 1973–2023, and systematically track ex-post revisions to debt and loan statistics across the entire reporting history of 140 developing and emerging market countries.

Interpretation:

- All data points are reported by debtors and at nominal values (no estimates, no valuation effects)
- Reporting rules have been stable across 50 years
- Our measure is a lower bound for true hidden debt

▸ Caveats   ▸ FX revisions   ▸ CLR   ▸ PNG data revisions   ▸ CDF   ▸ Excl. latest   ▸ IMF reporting violations   ▸ Composition

Quantifying hidden debt and its revelation

We measure **hidden debt** in country i and year t as the difference in debt between the initial publication (vintage v_0) and the latest publication (vintage V):

$$HiddenDebt_{i,t} = Debt_{i,t}^V - Debt_{i,t}^{v_0}$$

We measure **hidden debt revelations** as the amount of debt added retroactively to a country i's debt statistics by vintage v:

$$HiddenDebtRevelations_i^v = \sum_{t=t_0}^{T} \left(Debt_{i,t}^v - Debt_{i,t}^{v-1} \right)$$

Key empirical findings

1. **Debt statistics are systematically underreported**
   - Revisions are noisy, but show statistically significant upward bias
   - Right-skewed distribution with fat tail

2. Hidden debt builds up in good times and gets revealed during bad times
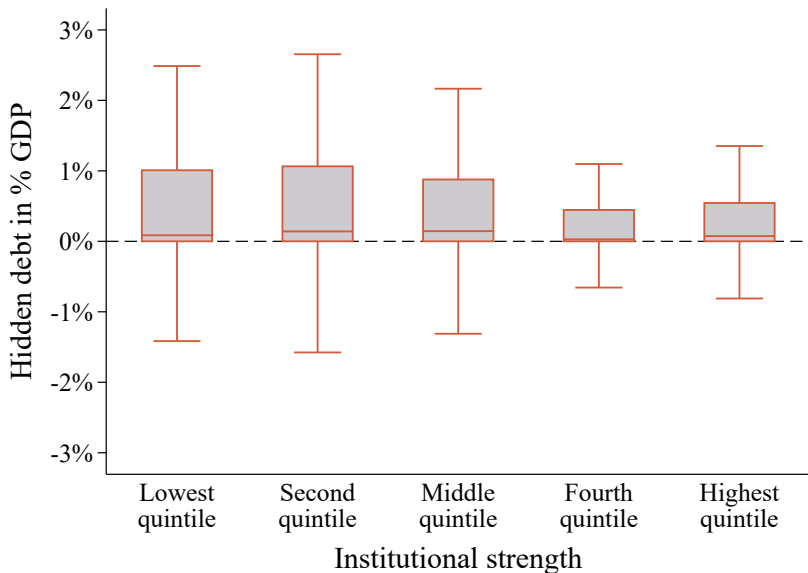   - Mechanism: Outside monitoring (IMF programs, debt restructurings)

3. Underreporting is associated with larger creditor losses ("haircuts") and particularly lengthy debt restructuring episodes

1. Debt stocks are systematically underreported
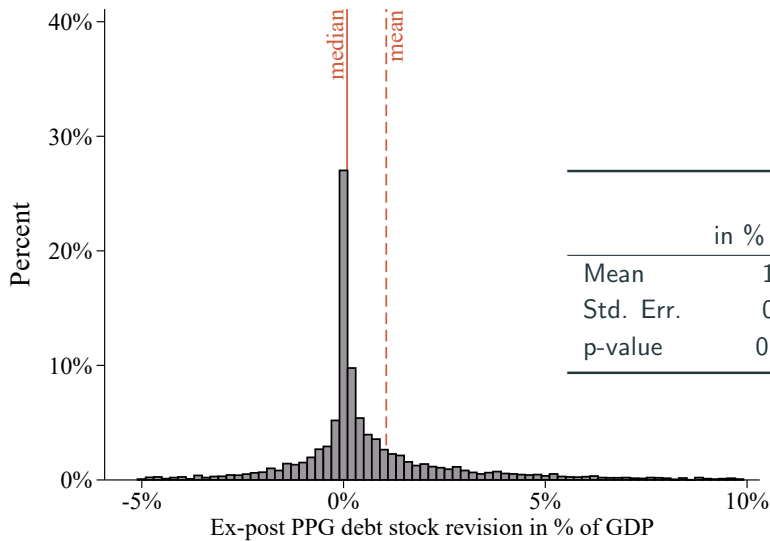
	Debt stock	
	in % of GDP	in USD mln.
Mean	1.06	159.22
Std. Err.	0.13	42.02
p-value	0.000	0.000

Hidden debt is most severe in countries with weak institutions...
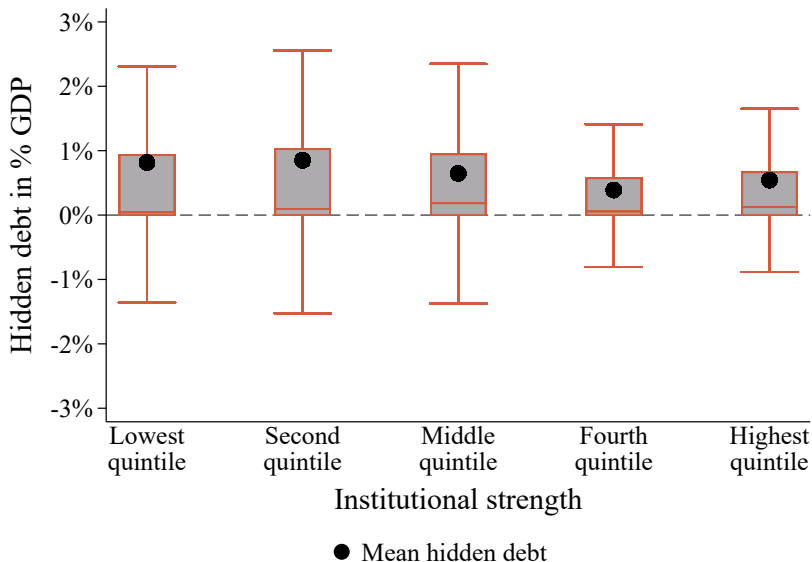
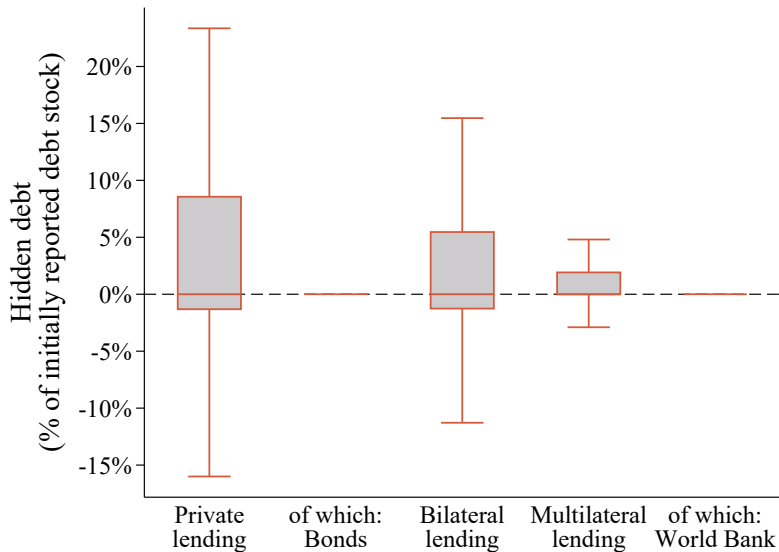**Hidden debt is most severe in countries with weak institutions...**

Debt management under weak institutional strength
(Source: World Bank, MENA)

Hidden debt is most severe in countries with weak institutions…

Mean hidden debt

... and for non-bond private & bilateral creditors

Key empirical findings

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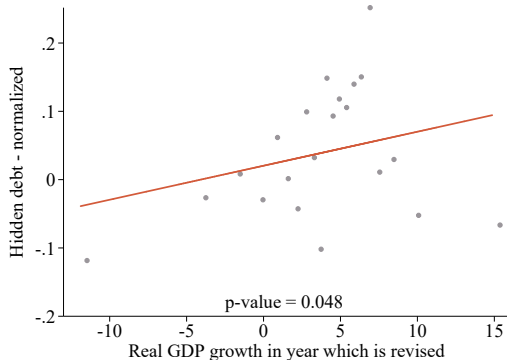## 2. Hidden debt builds up in good times, gets revealed in bad times

A) Which years are being revised?
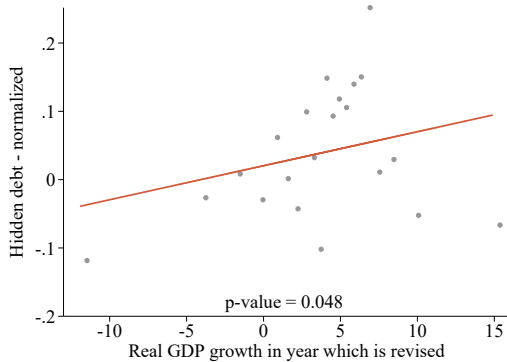
2. Hidden debt builds up in good times, gets revealed in bad times

A) Which years are being revised?

B) When do revelations happen?
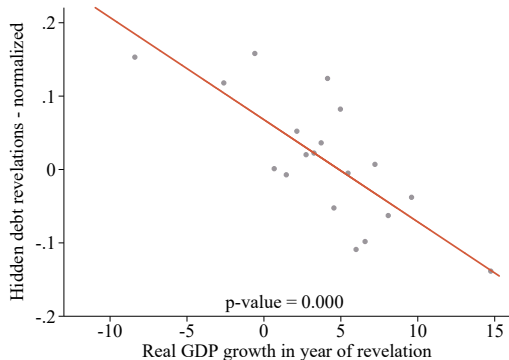
Key Mechanism: Outside monitoring

	Dep. variable: Hidden debt revelations, 1975-2022			
	(1)	(2)	(3)	(4)
Real GDP growth	-0.04**			-0.04**
	(0.02)			(0.02)
External sov. default		0.15***		0.12**
		(0.05)		(0.06)
IMF program			0.13***	0.12**
			(0.04)	(0.05)
Observations	3796	3924	3924	3796
Country FE	✓	✓	✓	✓
Vintage FE	✓	✓	✓	✓

- The average IMF program discovers USD 200 million in previously unreported debt.
- No evidence for strategic disclosure by government. ▸ Politics

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Hidden debt associated with large creditor losses during crises

	Haircut		Duration of spell	
	(1)	(2)	(3)	(4)
Hidden debt	0.24**	0.25***	0.62***	0.69***
	(0.11)	(0.10)	(0.21)	(0.19)
Controls		✓		✓
Observations	153	140	153	140
R-squared	0.031	0.308	0.057	0.183

A one standard deviation increase in hidden debt is associated with

- an increase in the haircut of 5 percentage points
- an increase in the duration of the default spell of 13.8 months

A Sovereign Default Model with Hidden Debt Revelations

Main model elements

1. Sovereign default model with long-term debt and positive recovery

2. Hidden debt accumulation process
   - Use novel data to estimate this

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3. Risk-averse lenders that face simple information acquisition problem
   (monitoring decision) $\rightarrow$ revelation
   - Incentive: hidden debt dilutes the recovery rate $\rightarrow$ monitoring avoids this...
     but, it's costly

Why do we need a model?

1. We want to quantify the effects of hidden debt (and its revelation) on:
    1.1 Asset prices (i.e. the country spreads)
    1.2 Welfare

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2. Want to perform policy counterfactuals:
   2.1 How costly is it to be subject to hidden debt?
   2.2 Would borrowing countries benefit from higher/cheaper oversight?

Spread response to hidden debt revelations

Dep. variable: Next-period spreads		
	Model	Database
Revelation size	1.37***	0.22***
	(0.05)	(0.08)
Growth	-1.21***	-1.45***
	(0.02)	(0.34)
Debt/GDP	1.82***	0.73*
	(0.02)	(0.42)
New borrowing	4.36***	-0.26
	(0.05)	(0.24)
Constant	4.49***	4.71***
	(0.02)	(0.11)
Observations	201,430	595
R-squared	0.09	0.49
Fixed Effects	✓	✓
Clustered SE	✓	✓

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- A one s.d. increase in Revelations increases spreads by 1.37% (model) and 0.22% (data)

The costs of hidden debt

We run two distinct exercises to analyze the welfare costs of hidden debt.

1. **Full information economy:**
   - We make ε and h public knowledge
   - What are the welfare gains of eliminating hidden debt?
   - $\rightarrow$ Average gain equivalent to 5.5 % permanent consumption increase

2. **Greater oversight:**
   - We take the existence of hidden debt as given
   - What are the welfare gains (and losses) of inducing greater oversight by lowering the costs of monitoring?
   - Countries with strong fundamentals gain, countries with weak fundamentals lose

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Welfare gains from greater oversight ($f \downarrow$)
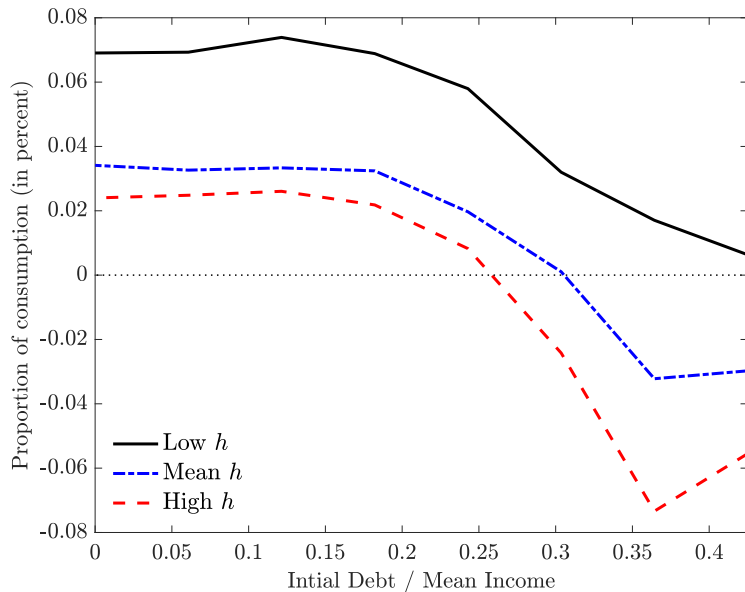
Conclusion

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Novel data: First to quantify size, timing and characteristics of hidden debt

1. Debt statistics are systematically underreported, important implications for debt sustainability assessments
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Theory: Sovereign debt model with hidden debt and revelations

- $\uparrow$ default incentives, $\downarrow$ debt-carrying capacity ("debt intolerance")
- Uncertainty about debt leads to higher spreads
- Transparency can be costly if countries already have high hidden debt

Appendix

Measuring Hidden Debt: Caveats

- Any loan initially missing from IDS *may* have been reported in some other database
  - still violation of WB req. but implies less secrecy

- A revelation in IDS may have followed a revelation from elsewhere w/ a lag
  - So: caution in interpreting our measure as "news shocks"

- By construction, our measure is a <u>lower bound</u> for the true level of unreported or hidden debt.

Debt stock revisions in % of GDP by regions

	N	Mean	Median	Std. Err.	p-value
Europe	315	-0.23	0.01	0.19	0.232
Asia	1246	0.65	0.00	0.20	0.001
Middle-East and North Africa	689	0.01	0.04	0.26	0.962
Sub-Saharan Africa	1874	1.63	0.10	0.32	0.000
Latin America	1358	1.69	0.48	0.22	0.000

Debt stock revisions in % of GDP by income groups

	N	Mean	Median	Std. Err.	p-value
Low income	1471	1.43	0.01	0.39	0.000
Lower middle income	1519	0.59	0.11	0.13	0.000
Upper middle income	957	0.55	0.03	0.11	0.000
High income	17	0.41	0.00	0.31	0.203

	N	Mean	Median	Std. Err.	p-value
1970s	892	1.51	0.59	0.25	0.000
1980s	1030	1.88	0.15	0.44	0.000
1990s	1216	1.40	0.13	0.36	0.000
2000s	1279	0.24	0.01	0.13	0.061
2010s	1172	0.56	0.05	0.11	0.000

Debt flows are systematically underreported
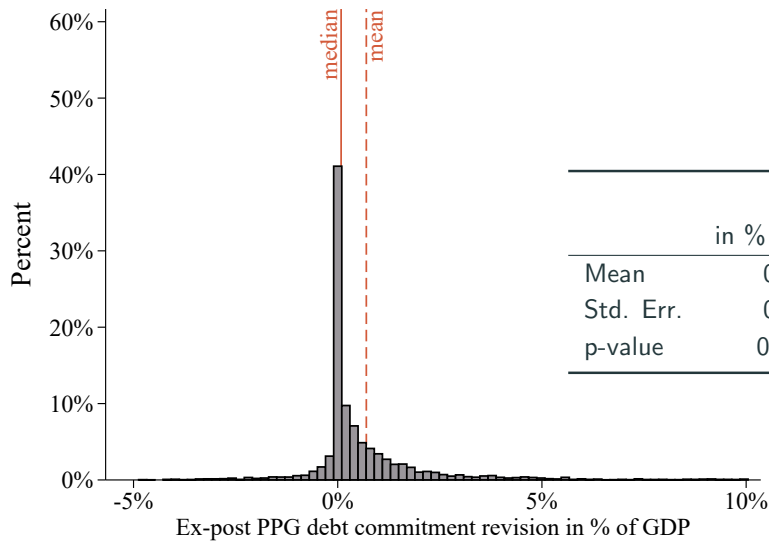
	Debt flows	
	in % of GDP	in USD mln.
Mean	0.70	148.60
Std. Err.	0.06	18.68
p-value	0.000	0.000

Ex-post PPG debt commitment revision in % of GDP

- Ex-post revisions to the USD exchange rate could lead to large ex-post revisions to the outstanding debt stock for debtor countries with large amounts of non-USD debt
- Using the IMF's IFS we quantify revisions to exchange rate data
  - Using year-on-year revisions to the yearly average and end of period exchange rate data between 2019 and 2021, we find
  - The average ex-post revision of the period average exchange rate ranges between -0.00044 percent and 0.00158 percent.
  - The average ex-post revision of the end of period exchange rate ranges between -0.00396 percent and 0.00130 percent.
- → Revisions to exchange rates are far too low to explain the sizeable magnitude of debt stock revisions we document.

Years after contingent liability realizations are not associated with higher hidden debt revelations

Percent — Ex-post private debt stock revision in % of GDP

median · mean
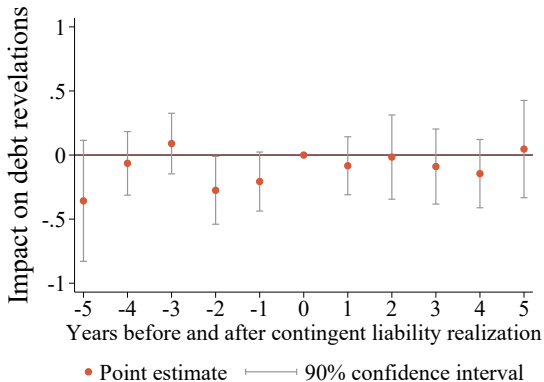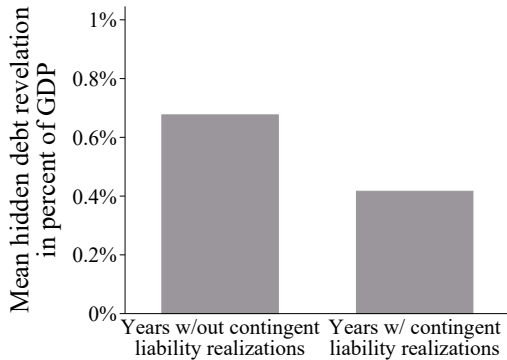
Private non-guaranteed debt is underreported

Ex-post private debt stock revision in % of GDP

Time to revelation:
Mean: 7.61 years
Median: 4 years

Cumulative frequency distribution

Years between unreported
borrowing and revelation

—— Unweighted
—— Weighted by revision size
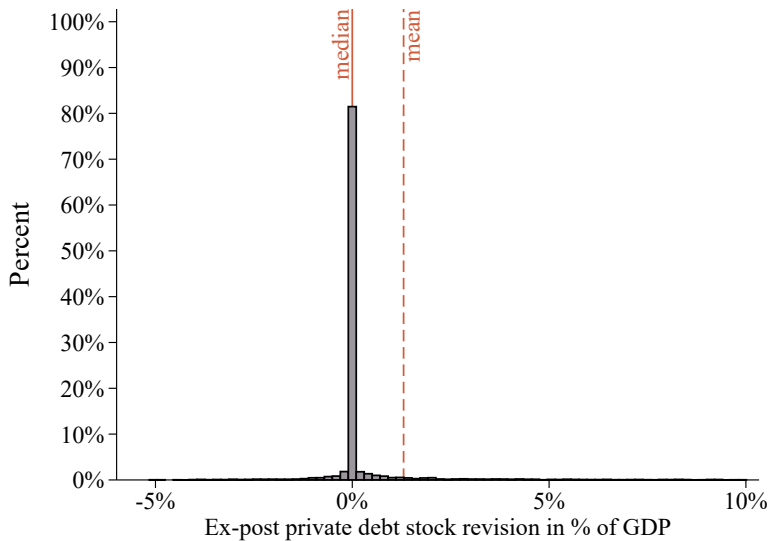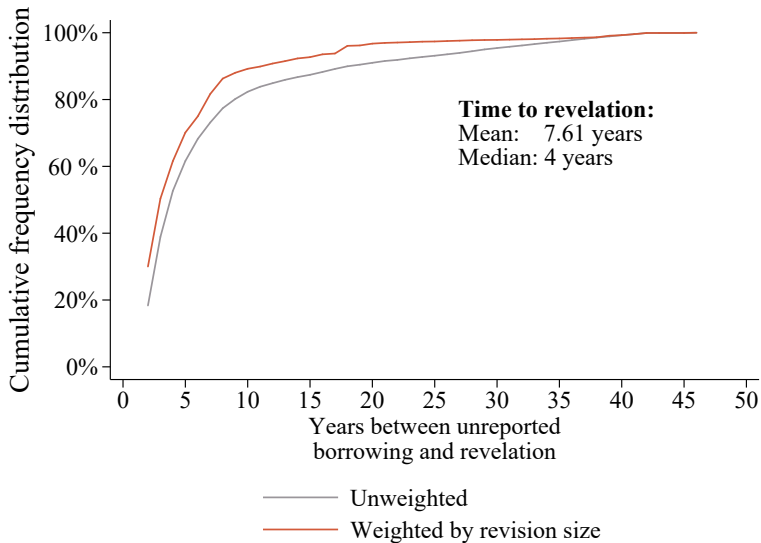
Revision patterns are robust to excluding two subsequent vintages

	N	Mean	Median	Std. Err.	p-value
Panel A: Debt stocks					
In % of GDP	5702	1.06	0.09	5.77	0.000
excl. first year	5550	0.88	0.05	5.32	0.000
excl. first two years	5515	0.76	0.02	5.52	0.000
In mln USD	5702	159.22	5.00	1,909.90	0.000
excl. first year	5550	121.82	3.00	1,635.39	0.001
excl. first two years	5515	97.61	1.00	1,434.19	0.001
Panel B: Commitments					
In % of GDP	5695	0.70	0.08	4.17	0.000
excl. first year	5542	0.48	0.01	5.45	0.000
excl. first two years	5508	0.40	0.00	2.93	0.000
In mln USD	5695	148.60	6.00	1,169.82	0.000
excl. first year	5542	91.54	1.00	965.71	0.000
excl. first two years	5508	64.81	0.00	838.86	0.000

IMF reporting violations are followed by hidden debt revel.

Country	Date discussed	Revelation (mln. USD)	Vintage
Argentina	September 17, 2004	57	GDF 2006
Burkina Faso	February 2, 2005	12	GDF 2006
Chad	June 23, 2003	4	GDF 2005
Djibouti	December 20, 2002	0	GDF 2004
Dominica	April 8, 2004	0	GDF 2006
Dominica	July 3, 2005	12	GDF 2007
Ghana	June 28, 2001	115	GDF 2003
Hungary	February 21, 1990	1,226	WDT 1991–92
Nepal	January 18, 2006	127	GDF 2007
Tajikistan	February 7, 1999	0	GDF 2000
Tajikistan	February 13, 2002	23	GDF 2003
Tajikistan	November 12, 2002	78	GDF 2004
Turkey	April 26, 2005	1,270	GDF 2007
Uganda	July 30, 2004	0	GDF 2006
Ukraine	December 13, 1995	49	GDF 1997

Debt stock revisions are driven by revisions to underlying flows

⏵ back

- To investigate what drives debt stock revisions we can use the law of motion for the debt stock:

$$\Delta DOD_{i,t} = NFL_{i,t} + \Delta IXA_{i,t} + IXR_{i,t} + DFR_{i,t} + \Delta XCV_{i,t}$$

- If revisions to the debt stock are not driven by revisions to one of its components, revisions are an indication of reporting inconsistencies

- Calculating contributing shares to the debt stock revisions

$$share_X^y = \frac{\sum_{i=1}^{I} \sum_{t=1970}^{T} |x_{i,t}^y|}{\sum_{i=1}^{I} \sum_{t=1970}^{T} \left(|RNFL_{i,t}^y| + |R\Delta IXA_{i,t}^y| + |RIXR_{i,t}^y| + |RDFR_{i,t}^y| + |\epsilon_{i,t}^y| \right)}$$

- The majority of debt stock revisions is accompanied by revisions to underlying debt flows, confirming that most upward revisions in the debt stock are caused by the ex-post addition of previously unreported borrowing.

Debt stock revisions are accompanied by revisions to underlying debt flows

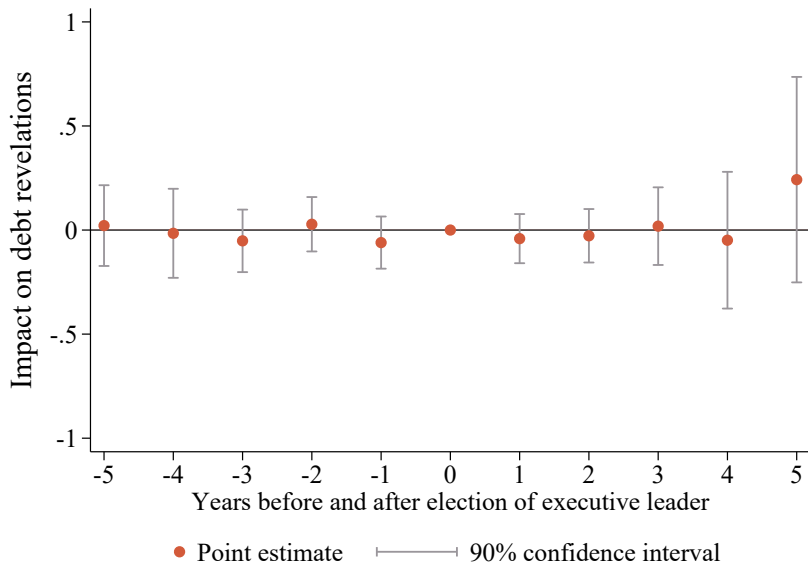Legend: Net debt flows, Debt Forgiveness, Reporting inconsistencies, Interest capitalized, Change in arrears
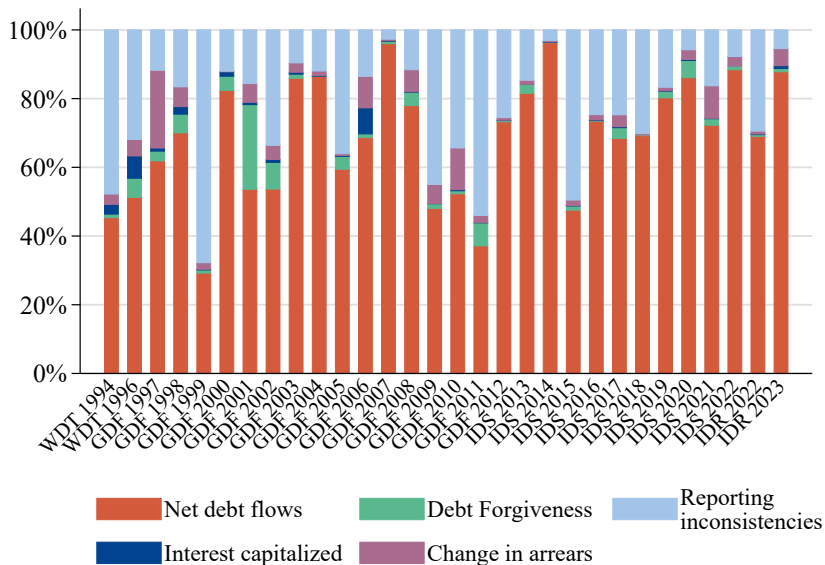
	(2)	(3)	(4)	(5)	(6)
Executive election	0.03				0.04
	(0.06)				(0.06)
Legislative election		0.01			0.00
		(0.05)			(0.05)
Regular change in leadership			-0.01		-0.03
			(0.04)		(0.05)
Irregular change in leadership				-0.05	-0.05
				(0.10)	(0.12)
Real GDP growth					-0.04**
					(0.02)
IMF program					0.11**
					(0.05)
External sov. default					0.10*
					(0.06)
Observations	3511	3510	3924	3924	3411
R-squared	0.054	0.057	0.044	0.044	0.063
Country FE	✓	✓	✓	✓	✓
Vintage FE	✓	✓	✓	✓	✓

Point estimate   ├────────┤ 90% confidence interval

Point estimate   ├───────┤ 90% confidence interval

Point estimate   ⊢————⊣   90% confidence interval

Point estimate   ⊢————⊣   90% confidence interval