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SOVEREIGN DEBT IN THE 21ST CENTURY:  
LOOKING BACKWARD, LOOKING FORWARD

Kris James Mitchener  
Christoph Trebesch

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Sovereign Debt in the 21st Century: Looking Backward, Looking Forward  
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### **ABSTRACT**

How will sovereign debt markets evolve in the 21st century? We survey how the literature has responded to the Eurozone debt crisis, placing “lessons learned” in historical perspective. The crisis featured: (i) the return of debt problems to advanced economies; (ii) a bank-sovereign “doom-loop” and the propagation of sovereign risk to households and firms; (iii) roll-over problems and self-fulfilling crisis dynamics; (iv) severe debt distress without outright sovereign defaults; (v) large-scale “sovereign bailouts” from abroad; and (vi) creditor threats to litigate and hold out in a debt restructuring. Many of these characteristics were already present in historical debt crises and are likely to remain relevant in the future. Looking forward, our survey points to a growing role of sovereign-bank linkages, legal risks, domestic debt and default, and of official creditors, due to new lenders such as China as well as the increasing dominance of central banks in global debt markets. Questions of debt sustainability and default will remain acute in both developing and advanced economies.

Kris James Mitchener  
Department of Economics  
Leavey School of Business  
Santa Clara University  
Santa Clara, CA 95053  
and NBER  
kmitchener@scu.edu

Christoph Trebesch  
Kiel Institute for the World Economy  
Research Area on International Finance  
Kiellinie 66,  
24105 Kiel,  
Germany  
and CEPR and CESifo  
christoph.trebesch@ifw-kiel.de

## 1. Introduction

In 2020, as we enter the second decade of the 21st century, sovereign debt levels around the world are reaching record highs. The Covid-19 pandemic and its economic effects have triggered a global sovereign borrowing boom that is almost unparalleled in history. How will governments deal with rising debt burdens? Why are creditors willing to lend to highly indebted sovereigns and what happens if they suddenly stop doing so? Can we expect a new wave of defaults, and, if so, what toll will they take on economies, both developing and developed? These are highly topical questions, but all of them have antecedents in history.<sup>1</sup>

In this survey, we look back to better understand the challenges that lie ahead. In particular, we examine the large body of sovereign debt research that has emerged since the crash of 2007-9 and the subsequent eurozone debt crisis of 2010-12. Most previous surveys on the topic have focused on sovereign debt problems of developing countries in the past decades, motivated by defaults in Latin America, Africa, and Asia in the 1980s, 1990s, and 2000s.<sup>2</sup> Our perspective is global and long-run: we compare sovereign debt markets and crises in advanced economies to those in emerging markets and throughout history, going back 200 years and more.

Our survey emphasizes advanced economy<sup>3</sup> debt problems, not just because many recent influential contributions have this focus, but also because the collateral damage from the default of a present-day rich, “financialized,” and highly-integrated economy looks very different from that in an emerging market. Simply put, a default by Spain or Italy can have different consequences than a default by Mozambique, Venezuela, or Lebanon. That said, in a post-pandemic world, high debt burdens and potential sovereign repayment problems will likely remain a challenge in both advanced and emerging markets for the coming years or decades.

We are particularly interested in lessons from the most recent major debt crisis – in the eurozone - and the many scholarly contributions written in response to it. What can we learn from what happened in Europe between 2008 and 2013? Were the events a harbinger of what is to come in other countries and regions? What features of the eurozone crisis were “new” and which ones are likely to play a role in future debt crises?

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<sup>1</sup> Early research on sovereign debt and default includes Clarke (1878), Manes (1918), Feis (1930), Winkler (1933) and Borchard and Wynne (1951).

<sup>2</sup> For example, see Panizza, Sturzenegger, and Zettelmeyer (2009) and Aguiar and Amador (2014). Surveys have also taken a longer-run historical perspective on defaults (Oosterlinck 2013).

<sup>3</sup> By “advanced economies,” in general, we mean high-income, high-productivity, industrialized countries, many of which also have developed financial markets (though the variation in financial development is greater the farther we go back in time). Since our analysis is retrospective, a better term might be “leading economies,” since measures such as GDP per capita can change considerably over longer sweeps of history. For simplicity, in the empirical analysis, we focus on 20 of today’s industrial economies: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States.

More specifically, this survey is structured around eight core features of the eurozone crisis, each of which receives its own section:

- Debt problems return to advanced economies
- Debt crises without default
- The transmission of sovereign risk to firms and the macroeconomy
- Bank-sovereign linkages and the emergence of “doom loops”
- Roll-over risks: why multiple equilibria and bond maturity matter
- The rise of domestic debt and default
- The return of official lending (by sovereigns and central banks)
- Growing legal risk in sovereign defaults and restructurings

Our goal is to highlight new insights from the literature on each of these features, placing them in the context of both theory and history. The theoretical view helps us to discipline our reading of events and of empirical results. The long-run view, in turn, helps to understand whether the models developed in response to the eurozone debt crisis hold more generally. Where appropriate, we supplement the discussion of the recent research with empirical “mini tests” from history, so as to place the lessons learned in a broader perspective.

Section 2 sets the stage by exploring the re-emergence of sovereign debt problems in advanced economies. The eurozone debt crisis reminds us of two recurrent features from history: (i) debt crises happen relatively frequently and (ii) they happen in high-income or “advanced economies” as well as in lower or middle-income economies (often referred to as emerging markets). Indeed, history is replete with examples of defaults in the leading economies of the time – Spain in early modern Europe, France in the wake of the Napoleonic wars, Argentina during the Belle Epoque, and the U.S. when it abrogated the gold clause in the 1930s. In the past decades, however, researchers focused almost exclusively on sovereign lending problems in developing countries. This changed after 2009, when sovereign risk and repayment problems suddenly became a central macroeconomic policy issue in Athens, Dublin, and Rome. To place the crisis in perspective, we review the historical cases of advanced-economy default, such as those during the Great Depression and WWII, and discuss the growing literature on “debt overhangs” and debt sustainability in advanced economies.

Section 3 characterizes the phenomenon of “debt crises without default.” According to traditional metrics, such as the definitions used by Reinhart and Rogoff (2009) or rating agencies like Standard & Poor’s, the eurozone crisis would not be classified as a “debt crisis.” The reason is that no eurozone country missed payments and only one country, Greece, restructured its debt. It did so preemptively and without missing payments. Thus, despite a rapid surge in sovereign bond yields in the eurozone periphery, there was no payment default. Such an outcome is not without precedent. It is reminiscent of several recent emerging-market crises, in which governments avoided default and instead serviced their debt in full, despite rapidly increasing bond yields (e.g. Mexico in 1994/95, Brazil in 1998 and 2001, Turkey in 2001, and the Philippines in 1998). Using 150 years of data, we document that “debt crises without

default” are not new, but have become the new normal since the 1990s. In the past two decades, only about 20% of episodes with severe debt distress ended up in a sovereign default.

Section 4 explores why sovereign debt crises are costly. Theoretical models typically assume that defaults give rise to “output costs,” implying a decline in GDP during default. Until recently, however, the literature had been rather silent on the underlying microeconomic reasons for these output costs. Moreover, the literature had difficulty explaining why GDP declined so strongly in Greece, Portugal, or Spain in 2010-12 even though there was no payment default in these countries. Recent theoretical and empirical contributions address both issues by examining specific channels of how sovereign risk (a collapse in sovereign bond prices, rather than an outright default) is transmitted to banks, households and firms, resulting in less investment and lower welfare.

The feedback between distressed banks and fiscally-distressed governments is explored in more depth in Section 5. Sovereign-bank linkages during the crisis have become known as “doom loops,” and these motivated an entirely new area of research. We first describe the literature that examines how “doom loops” emerge and how they can amplify economic downturns. We then draw on long-run data to explore the history of sovereign-bank “doom loops” over the past 200 years. We find that “doom loops” are by no means a new phenomenon, but they have become much more prevalent. We document nine “doom loops” prior to World War II, and a further 13 in emerging markets since the 1980s. We speculate that, in contrast to the past, policy makers today perceive them as critical, because recent crises have occurred in highly financialized economies, and because governments, banks, and their regulatory agencies have become more intertwined.

Another notable feature of the eurozone crisis was the debate about “self-fulfilling” crises and “multiple equilibria”. Ireland and Portugal, for example, experienced problems in refinancing existing debts, as bond yields surged rapidly. Some observers interpreted this as an expectations-driven panic. Section 6 explores the recent theoretical advances of modeling rollover risk, multiple equilibria, and self-fulfilling crises as well as a new generation of models with long maturity bonds. We discuss how institutional constraints, such as Europe’s monetary union, could have played a role in tipping countries into “bad equilibria” and whether self-fulfilling crises will be more prevalent the future.

The eurozone crisis primarily involved *domestic* sovereign bonds, in the sense that governments had issued these bonds in their own currency (the euro), on domestic markets, and mostly using local law contracts. The lines were blurred by the fact that the bondholders were both domestic and foreign, and because member countries could not set their own monetary or exchange rate policy in responding to the crisis. In spite of this, the crisis can be seen as part of a larger trend towards a more domestic debt issuance, and perhaps as a consequence, more domestic debt default. Section 7 examines the recent literature on the rise of domestic currency debt worldwide and the motives for issuing debt at home or abroad.

Section 8 discusses the fact that the eurozone crisis involved large-scale “sovereign bailouts,” i.e. government-to-government lending via the European Stability Mechanism (ESM), as well as a heavy reliance on the European Central Bank (ECB) to alleviate debt distress and fiscal pressures. We place these recent official-to-official debt flows into a historical perspective and discuss the literature exploring the implications of these bailouts for private debt markets and the domestic economy. We show that central banks have, again, become large-scale holders of sovereign debt, at levels not seen since WWII. Overall, policy makers appear to have become more averse to defaulting compared to the past, perhaps due to the increased risk of doom-loops, cross-border crisis spillovers, and self-fulfilling crisis dynamics.

Relatedly, Section 9 examines why it has become harder to restructure sovereign debt and negotiate debt relief with private creditors in an ad hoc manner. We take stock of the legal environment under which sovereign debt now operates, and discuss research on the rise of creditor litigation in London and New York as an increasingly important “enforcement technology.” We also focus on the “holdout problem” – when groups of creditors refuse to participate in a negotiated restructuring, as happened for the English-law bonds in Greece’s 2012 debt exchange. These developments appear to have strengthened the hands of creditors and raised the cost of default for debtors.

## **2. The return of debt problems in advanced economies**

The wave of defaults of the 1980s triggered a large body of work on sovereign lending in low- and middle-income economies and default involving international banks.<sup>4</sup> During the 1990s and 2000s, after the re-emergence of emerging market bond lending in the wake of the Brady deals, the literature moved on to study sovereign bonds and bond defaults, again focusing on periphery countries such as Argentina, Mexico, Russia, and Ecuador. Research on advanced-country debt also flourished, but it largely abstracted from aspects of sovereign risk and default.<sup>5</sup> Instead, the emphasis was on fiscal policy, optimal debt management, and deficit spending (see e.g. Barro 1979, Alesina and Tabellini 1990, Bohn 1998, Alesina and Passalacqua 2016). The outbreak of the 2008 financial crises and a sovereign debt crisis involving high-income countries in Europe was a striking development and served as motivation for researchers to pivot and focus on default risk in richer countries. Ang and Longstaff (2013) and Chernov, Schmid, and Schneider (forthcoming), for example, study default risk in the United States, a country whose bonds are often regarded as “riskless.”

### *2.1. “Advanced countries do not default”*

The fact that few studies examined default risk in advanced or “leading” economies is unsurprising. Since World War II, no advanced country had entered a debt crisis, in contrast to the large number of defaults in the developing world. The view that advanced countries “do not

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<sup>4</sup> See Eaton and Fernandez (1995) on the early literature and Tomz and Wright (2013) for an empirical survey.

<sup>5</sup> As stated in the introduction, by advanced countries we refer to industrialized economies. See Footnote 4.

default” gained currency after World War II (as described in Reinhart, Reinhart, and Rogoff 2015), and the notion even survived in the midst of the eurozone crisis – when the IMF issued a policy paper entitled “Default in Today’s Advanced Economies: Unnecessary, Undesirable, and Unlikely” (Cottarelli et al. 2010). Public debt levels in advanced economies declined during the 1960s and 1970s and, despite an increase in the 1980s and 1990s, were still in line with historical averages (see Figure 2).

Advanced countries, *ceteris paribus*, were regarded as more resilient, owing to their more diversified economies (e.g., less reliance on commodity exports), more developed institutions, more resources to tax, and greater “state capacity.” In line with this, Reinhart, Rogoff, and Savastono (2003) showed that advanced countries can sustain higher levels of debt and are less likely to default in the wake of adverse shocks. Reinhart, Rogoff and Savastono (2003) in part, attribute this higher “debt tolerance” to better institutions for economic and crisis management (in line with North and Weingast 1989 and Acemoglu et al 2003).<sup>6</sup> For example, some have argued that powerful central banks, such as the ECB, are important pillars of crisis management (e.g. Martin and Philippon 2017). It has also been argued that advanced countries benefit from having traditionally issued most of their debt in domestic currency and under domestic law (see Section 8).<sup>7</sup> Indeed, once domestic debt and default are accounted for, the advanced economies appear somewhat less “debt tolerant” (Reinhart and Rogoff 2011b).

## *2.2. A brief history of advanced country defaults*

Figure 1 puts recent experiences in a long-run perspective. Advanced-country default is not new, but rather the norm, historically, as documented by Suter (1992), Reinhart and Rogoff (2009) and Meyer, Reinhart, and Trebesch (2019). For example, prior to the 19th century, the Spanish empire defaulted more than a dozen times, including in periods when it ruled large parts of the world (Philip II was particularly notorious). The kings of France were also serial defaulters between 1500 and 1800. In the 19<sup>th</sup> century, the first wave of advanced country defaults occurred during the Napoleonic wars, when Austria, France, the Netherlands, Prussia, and Sweden, among others, ceased payments on their external debts (see Figure 1). The remainder of the 19<sup>th</sup> century was dominated by defaults in Latin America and other developing countries, even though Spain, Portugal, and Austria defaulted repeatedly as well.

Advanced countries once again became the epicenter of international sovereign debt problems after WWI, particularly in Europe, due to the large-scale bilateral official loans extended between governments during and after the war. The so-called “war debt question” dominated international headlines and international economic conferences throughout the 1920s and came to an end, only in 1934. In that year, all main European debtor countries, except Finland,

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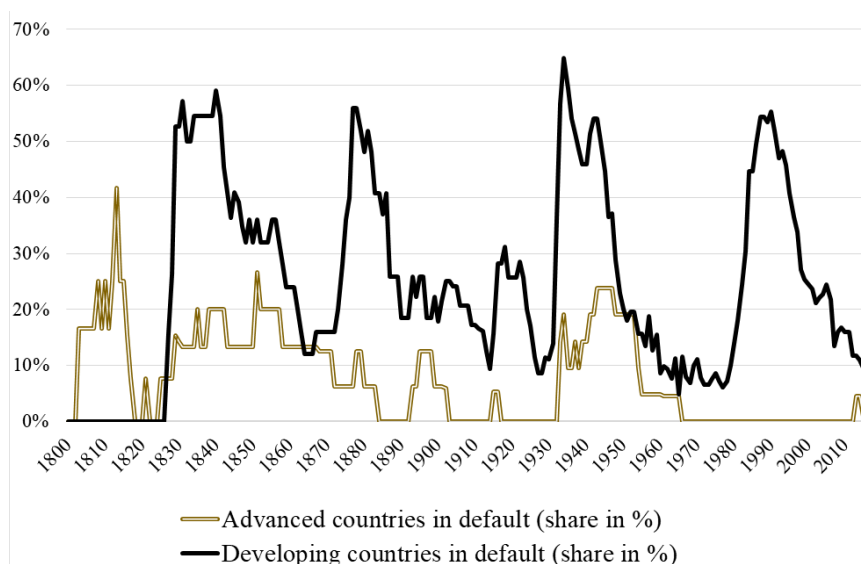
<sup>6</sup> On the importance of institutions for sovereign risk and default, see Schultz and Weingast (2003), Van Rijkeghem and Weder (2009), Kohlscheen (2007) and Trebesch (2019).

<sup>7</sup> Some also argue that advanced countries have more to lose from a default, mainly due to high costs to their reputation (e.g. Phan and Wright 2019), which serves to constrain their behavior.

defaulted unilaterally on their debts towards the US and the UK (Moulton and Pasvolsky 1932, Lloyd 1934, Reinhart and Trebesch 2016a, Hall et al. 2019).

During the interwar era, several advanced countries also defaulted on their debt to *private* creditors (e.g. Eichengreen and Portes 1986, 1989), with the United States’ abrogation of the gold clause in 1933 and Germany’s sovereign debt default receiving renewed attention recently (Edwards, Longstaff, and Martin. 2015 and Edwards 2018; Galofré-Vilà, et al. 2019; Straumann 2019). Dozens of lesser-known restructurings and debt “conversions” were also arranged with domestic creditors during the 1930s (Reinhart and Rogoff 2015, Meyer 2020). In addition, the governments of Germany, Italy, and Japan were in default on their external debts during World War II. These defaults ended with a series of restructurings in the late 1940s and 1950s, most prominently in the London agreement of 1953, which settled Germany’s debts to private and official creditors. After this, defaults became a rarity in advanced economies.

Figure 1: Defaults in advanced and emerging economies, external private debt, 1800-2015



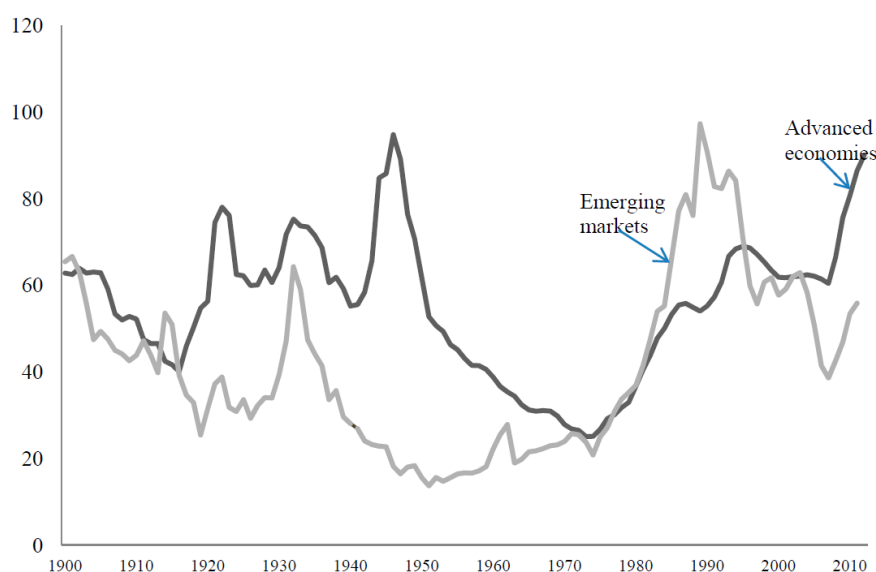
Note: Data and sample of independent countries from Reinhart and Rogoff (2009).

### 2.3. Debt sustainability and debt overhang – a new literature

After 2008, advanced countries saw a strong increase in debt-to-GDP levels (Figure 2), which nurtured concerns about aging populations and low growth (Cecchetti, Mohanty, and Zampolli 2010, Yared 2019).



Figure 2: Government debt as a percent of GDP: 1900-2011



*Note:* Data and graph from Reinhart and Rogoff (2009), unweighted country averages.

The return of advanced-economy debt problems motivated new research in two areas. The first explores sovereign “debt overhang,” or the implications of high debt levels for growth and investment.<sup>8</sup> This work was sparked by an article of Reinhart and Rogoff (2010), which documented a negative correlation between debt levels and growth, and argued that it was particularly problematic when public debt rose above 90% of GDP. More than two dozen papers have re-examined this issue, focusing on the choice of the debt thresholds, the potential endogeneity of debt, the role of weighting and data coverage, and on heterogeneity across countries and time.<sup>9</sup> Most of the follow-up studies also find a negative correlation between debt and growth. However, there is no consensus about the importance of a 90% threshold and on whether the relationship between these variables is causal (Checherita-Westphal and Rother 2012; Eberhardt and Presbitero 2015). A subsequent paper by Reinhart, Reinhart, and Rogoff (2012) expands their original dataset and finds that advanced countries that enter a high-debt spell (exceeding 90% of GDP) typically stay above that threshold for two decades or more. At the same time, interest rates often remain low or decline during such spells, reminiscent of the current situation in Japan or Southern Europe where high debt levels are part and parcel with low sovereign bond yields.

A second research stream examines debt sustainability in advanced economies. In comparison to earlier approaches (e.g. Blanchard 1990), the new literature introduces uncertainty, examines non-linearities, and has a more quantitative focus. For example, Ghosh et al. (2013) build on the “fiscal reaction function” approach of Bohn (1998) to estimate “fiscal space,” defined as the distance between a country’s current debt level and its estimated “debt limit,” when debt

<sup>8</sup> Theory work on the topic goes back to Cohen and Sachs (1986) and Krugman (1988). More recently, see Aguiar, Amador, and Gopinath (2009).

<sup>9</sup> For examples, see Kumar and Woo (2010), Herndon, Ash, and Pollin (2014), Cecchetti, Mohanty, and Zampolli (2011), and Panizza and Presbitero (2014).

solvency and repayment are no longer assured. The estimated debt limits differ notably across 23 advanced economies, ranging between 150 and 250% of GDP (see also Mendoza and Ostry 2008). Another example of work in this area is Collard, Habib, and Rochet (2015). They find a large variation in sustainable debt limits across the OECD, with some countries close to hitting their “maximum sustainable debt ratio.” Another branch explores debt sustainability in the setting of dynamic general equilibrium models (e.g. D’Erasmus, Mendoza, and Zhang (2016) or Bi (2012). Many recent analyses of debt sustainability share a commonality in that they have a non-linear relationship between debt levels and sovereign risk premia. Once public debt passes a certain (country-specific) upper threshold, interest rates increase rapidly, so that debt suddenly becomes unsustainable. This relates to the literature on self-fulfilling debt crises, which we discuss in Section 6.

In addition, new contributions on debt sustainability have been motivated by the current low-interest-rate environment. In his presidential lecture to the American Economic Association, Blanchard (2019) argued that “public debt may have no fiscal cost” if interest rates ( $r$ ) remain below the rate of growth ( $g$ ) for the time being. With close to zero interest rates, governments can potentially borrow and roll over their debts without needing to increase taxes in the future. However, Mehrotra and Sergeyev (2019) and Mauro and Zhou (2020) suggest that negative  $r - g$  differentials are quite common over the past 200 years. Both papers also point to the large uncertainty over future interest rates and shocks, including the possibility of abrupt bond yield reversals and subsequent defaults.

### **3. Debt crises without default**

The eurozone crisis is widely regarded as a sovereign debt crisis (e.g. Lane 2012, Brunnermeier and Reis 2019). However, according to the prevalent definition of debt crises, it was not. As discussed by Ams et al. (2019), most researchers identify a sovereign default as involving either (i) missed payments (a legal default) and/or (ii) a debt restructuring at terms that are worse than the original terms, implying creditor losses (“haircuts”) and/or coercion imposed by the sovereign (This is also the definition used by rating agencies, such as S&P. See also Reinhart and Rogoff 2009).

The traditional definition thus fails to classify most eurozone crisis countries as being in crisis. Only Greece and Cyprus met the criteria, and only for a single year each, due to their debt restructurings in 2012 and 2013, respectively.<sup>10</sup> No other European government defaulted, despite very high bond yields, very high credit default swap (CDS) premia, and a loss of market access, most notably in Portugal and Ireland. Put differently, Europe went through a deep debt crisis, but bondholders continued to receive payments in full and on time. In a similar vein, several prominent emerging market crises, e.g. Mexico (1994/95), Thailand (1997/98), Brazil (1999 and 2002), Turkey (2001), or Russia (2015) did not result in a default or restructuring of

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<sup>10</sup> Even these two countries did not miss a single payment because the debt exchanges were arranged preemptively (Asonuma and Trebesch 2016, Zettelmeyer, Trebesch, and Gulati 2013).

external debt.<sup>11</sup>

We term these events as “sovereign debt crises without default.” These are crises with high sovereign bond yields and debt rollover problems, but no missed payments or legal default. Pescatori and Sy (2007) argue that default events are no longer a reliable indicator of debt-servicing difficulties. They therefore propose to broaden the definition of debt crises to include episodes with yield spreads above 1000 basis points, which they refer to as a “psychological barrier by market participants.” Broner, Lorenzoni, and Schmukler (2013) and Aguiar et al. (2016) follow a similar route, identifying debt crises as episodes with strong increases in bond yields quarter-on-quarter or what some have called “spread crises” or “spread spikes” (Krishnamurthy and Muir 2017).

How frequent are debt crises without default in advanced countries and emerging markets? And are they really a recent phenomenon? To address these questions, we use the dataset of Meyer, Reinhart, and Trebesch (2019), which covers historical foreign currency bonds, and combine it with modern-era yield data from Thomson Eikon (domestic currency sovereign bonds from advanced countries) and from JP Morgan EMBIG (emerging market foreign-currency bonds). Spreads are computed by subtracting a proxy for “safe assets”, i.e. the UK and US long-term bond yield until WWII (using the Meyer, Reinhart, and Trebesch 2019 data), and the US and German Bund bond yield in the modern (post-1995) period.<sup>12</sup> We then classify periods with high and/or rapidly increasing bond yield spreads and match them with data on outright defaults and restructurings from Reinhart and Rogoff (2009) and Meyer et al. (2019).<sup>13</sup> The sample starts in 1870, when bond yield spreads become available for more than 20 countries.<sup>14</sup>

“Spread crises” are identified by combining the methodology by Pescatori and Sy (2007), who focus on the widely used 1000 basis point threshold, and by Aguiar et al. (2016) and Krishnamurthy and Muir (2017), who focus on rapid spread increases. More specifically, we identify a crisis if either the spread surpasses 1000 basis points in a given quarter and/or if spreads increase very rapidly, defined as a spread increase that is at least in the 99th percentile

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<sup>11</sup> Over the past 20 years, the share of countries in default have decreased notably, despite two waves of debt servicing problems in emerging markets (1998-2002 and around 2008), as well as in 2010-2012 in Europe. Roughly 25 sovereign defaults and restructuring episodes have occurred since the 2000s in comparison to approximately 100 such events in the 1980s alone (Meyer, Reinhart, and Trebesch 2019). In addition, about half of the recent sovereign bond restructurings were preemptive in nature, defined as debt exchanges before payments are missed (Asonuma and Trebesch 2016).

<sup>12</sup> In the post-1995 high-income sample, we use US yields to compute bond spreads for Australia, Canada, Japan, New Zealand, Norway, Singapore and Switzerland, and German Bund yields for EU members, namely Austria, Belgium, Czech Republic, Greece, Finland, France, Ireland, Italy, Portugal, Sweden and Spain.

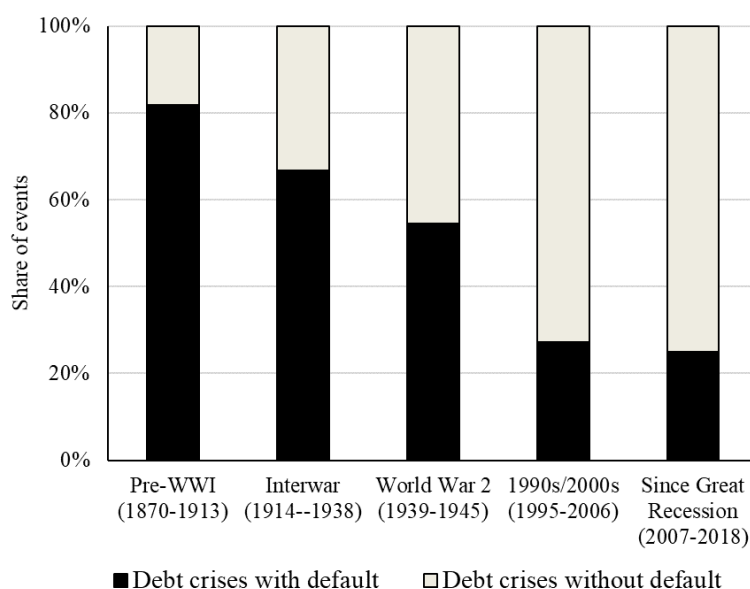
<sup>13</sup> Specifically, our sample includes the following 45 countries. Argentina, Australia, Austria, Belgium, Bulgaria, Brazil, Canada, Switzerland, Chile, China, Colombia, Costa Rica, Czech Rep. (only modern), Germany (only historic), Denmark (only historic), Ecuador, Egypt, Spain, Estonia (only historic), Finland, France, Greece, Grenada (only historic), Hungary, India (only historic), Ireland, Italy, Japan, Mexico, Norway, New Zealand, Panama, Peru, Philippines (only modern), Poland, Portugal, Russia, Singapore, Sweden, Thailand, Turkey, Ukraine (only modern), Uruguay, Venezuela, South Africa.

<sup>14</sup> We include all sovereigns with at least 10 years of bond yield data (min 20 years in the historical sample). The years 1946-1994 are excluded, since there was no liquid market for emerging market sovereign bonds.

of quarterly spread increases.<sup>15</sup> The “spread crisis” ends if the spread falls below its pre-crisis average.<sup>16</sup>

With this approach we identify 97 “spread crises” between 1870 and 2014. Of these, 53 cases (55%) coincide with an outright default, while 44 cases do not, and can thus be termed “debt crises without default”. Interestingly, however, the share of debt crises with default has been declining notably since 1870. This can be seen in Figure 3, which plots the fraction of “spread spikes” with and without default across eras. Before WW I, more than 80% of debt crises involved a default. This share fell during the interwar years and even more so during WWII, when half of the “spread spikes” saw a default. In the modern era, only about 25% of debt crises involve an outright payment default.

Figure 3: Sovereign debt crises with and without default (share of events in %)



*Note:* Debt crises or “spread spikes” are measured by high or rapidly increasing sovereign bond yield spreads (see text for details). Defaults involve missed payments and/or restructuring with creditor losses.

As our results indicate, “debt crises without default” are by no means new, but they have become increasingly common since the 1990s. Figure 4 illustrate this by plotting sovereign bond yields spreads for selected cases. Historically, one of the rare examples of “debt crises without default” is Argentina during the belle époque (fiscal crisis of 1876) as well as during

<sup>15</sup> The resulting threshold in the historical period (pre-WWII) is a quarter-on-quarter spread increase of 451 basis points. In the modern (post-1995) period the threshold is 378 basis points. Of course, crisis definitions based on “thresholds” are ex post and ad hoc, and require that the data are driven by an objective and invariant probability distribution – something that may not hold over long sweeps of history as pointed out by Oosterlinck et. al. (2015) and one reason why we allow our threshold to vary.

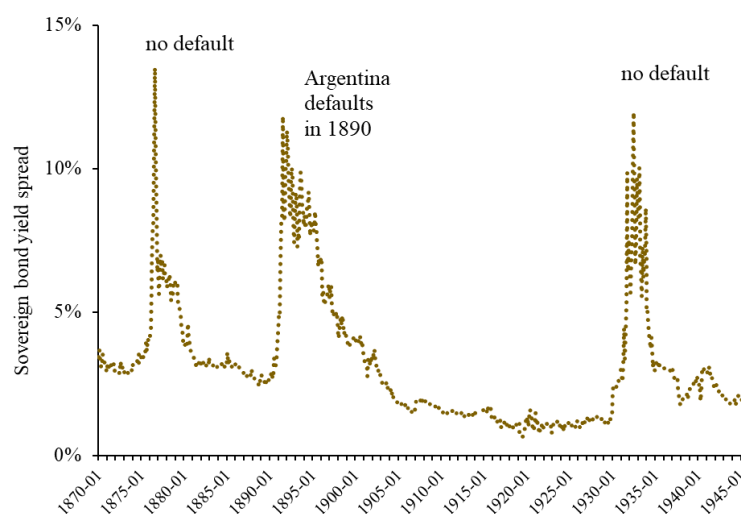
<sup>16</sup> To avoid excessively long crisis spells we add a one quarter standard deviation to the pre-crisis spread (using country-specific standard deviations) and use that as exit threshold. Spread spikes that occur in the same year (four or less quarters apart) are combined into one crisis spell.

the 1930s (Great Depression), shown in Panel A. In both episodes, the country avoided defaulting despite severe distress.

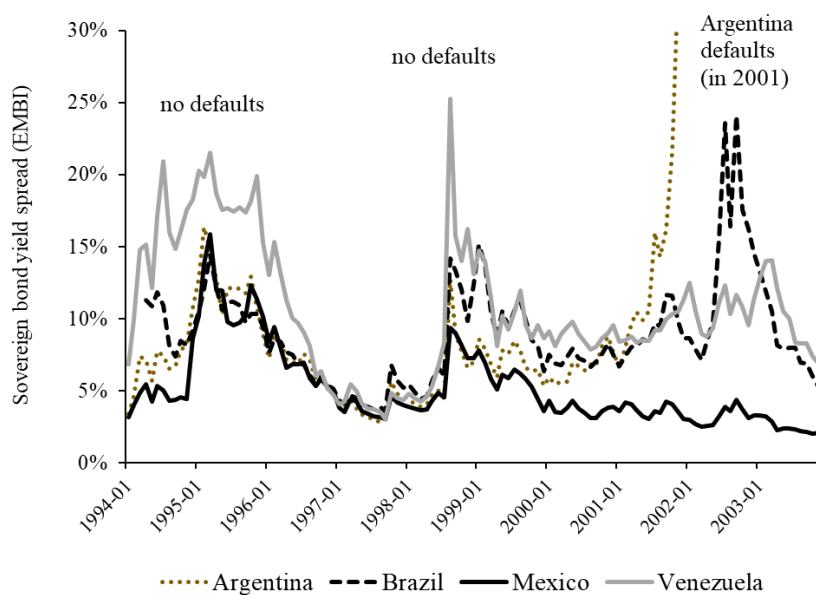
Similarly, Panel B shows that Brazil, Mexico and Venezuela went through periods of severe debt distress without defaulting in the 1990s and early 2000s, while Panel C focuses on the eurozone crisis. Despite quickly increasing bond spreads in 2010 and 2011, neither Portugal nor Ireland ended up defaulting.

Figure 4: Selected episodes of debt crises without default

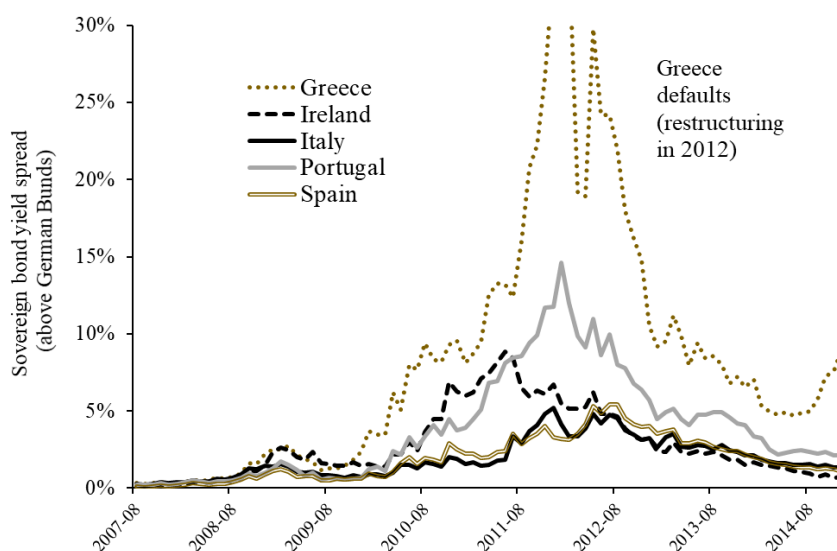
Panel A: Argentina 1870-1945: three debt crises but only one default



Panel B: Latin America in the 1990s: only Argentina defaults



Panel C: Eurozone debt crisis: only Greece defaults



The historical evidence thus suggests that the nature of sovereign debt crises has changed over the past 200 years. The probability of outright default has decreased while yield spikes without missed payments have become more frequent. Today, the large majority of debt distress spells end benignly for creditors, in the sense that the bonds continue to be serviced in full. More generally, Mauro, Sussman, and Yafeh (2002) find that the probability of sharp increases in bond spreads has gone up compared to the 19<sup>th</sup> century, as has the co-movement of bond yields across countries. Put differently, the “global factor” and contagion in sovereign risk pricing has become more important in recent decades, while country-specific fundamentals have become less so (see also González-Rozada and Yeyati 2008 and Longstaff et al. 2011).

#### 4. The transmission of sovereign risk to firms and the macroeconomy

The eurozone debt crisis also re-shaped how the field thinks about the consequences of sovereign risk and default. A new generation of sovereign debt models focuses on micro-level effects, in particular the costs borne by firms and households when sovereigns face debt distress. This body of work also draws attention to the central role of banks and financial markets for propagating sovereign default risk, including the feedback effect between sovereign credit and the financial sector, known as “doom loops.” In this section we focus on the propagation of sovereign risk to firms, households, and the macroeconomy. We then devote Section 5 to sovereign-bank linkages.

One of the oldest puzzles regarding sovereign debt is why countries ever bother to pay back their loans to foreign creditors, since, unlike for corporations, enforcement is cumbersome, and no insolvency regime exists. Over the past four decades, the two main explanations as to what

motivates countries to service their debts are “reputation” and “sanctions.” According to the first view, a default hurts the government’s reputation and thus implies a loss of access to international capital markets as well as higher borrowing costs (as in Eaton and Gersovitz 1981). In addition, defaults can trigger sanctions of diplomatic, legal or military nature, thereby impairing a country’s ability to trade in international goods and capital markets (as in Bulow and Rogoff 1989a). There is some historical evidence for the operation of both of these channels. However, the fact that sovereigns can typically borrow again after a default, often at comparatively low rates, casts doubt on the notion that observed penalties or “pure reputational effects” are sufficient to discipline borrowers.

Starting with Aguiar and Gopinath (2006) and Arellano (2008), a new strand of literature developed quantitative models that could match a set of “stylized facts” on sovereign debt and default (see Aguiar and Amador 2014 for a survey). For example, many of these models assume that aggregate output falls by roughly 2% in response to default. This “output cost” assumption helps to generate equilibrium levels of debt that are more in line with what is observed in the data.

Subsequent empirical research appears to confirm the existence of sizable output costs associated with default, typically in the range of 1-4 percentage points of real GDP per capita growth in the first few years post-default (e.g. Borensztein and Panizza 2009, Furceri and Zdzienicka 2012, Kuvshinov and Zimmermann 2019).<sup>17</sup> Moreover, there is growing evidence that the characteristics of the debt crisis matter. Defaults involving high creditor losses or “haircuts,” long negotiation delays, and “coercive” government measures such as a unilateral payment suspension are associated with higher output losses and increased subsequent borrowing costs (Cruces and Trebesch 2013, Trebesch and Zabel 2017, Catão and Mano 2017, Asonuma et al. 2019).<sup>18</sup>

However, this literature does not explore the underlying reasons *why* sovereign defaults lead to a decline in output, nor does it try to model the cost of sovereign risk in the absence of default, as observed during the eurozone debt crisis. To grapple with these features, researchers have been examining the microeconomic channels through which sovereign default risk can lead to macroeconomic effects. For example, Mendoza and Yue (2012) develop a general equilibrium default model in which firms rely on external finance to purchase imported production inputs from abroad. Building on Eaton and Gersovitz (1981), both the government and domestic firms are excluded from international capital markets after a sovereign default. In each period, the sovereign weighs the cost of this market exclusion and lost output versus the benefit of not servicing the debt. In equilibrium, if the sovereign chooses to default, firms cannot finance their working capital from abroad, forcing them to shift to domestic inputs and other imperfect substitutes, and resulting in efficiency losses and a decline in output. This transmission

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<sup>17</sup> Levy Yeyati and Panizza (2011) show that most of the output contraction occurs in the quarters prior to a sovereign credit event, suggesting that it is mostly the expectation of a default that drives the output losses and not the actual breach of contracts.

<sup>18</sup> For a theoretical analysis of “hard” and “soft” default see Gordon and Guerron-Quintana (2019).

mechanism, from sovereign risk to corporate financing, explains why defaults are associated with deep recessions in the model.

More recent studies draw on the eurozone debt crisis to unearth the mechanisms explaining the decline in output. Corsetti et al. (2012) use a New-Keynesian model to show that sovereign risk affects corporate borrowing conditions through a fiscal channel, as higher sovereign bond yields result in a pessimistic shift in expectations about future tax hikes, social unrest or tariff increases. The increased corporate funding costs then contribute to lower output and macroeconomic instability.<sup>19</sup> Focusing on the case of Greece, Gourinchas, Philippon, and Vayanos (2017) similarly show that a sovereign-bond yield shock leads to contractionary fiscal policy, increasing the likelihood of loan defaults in the private sector and thereby resulting in higher corporate borrowing costs, lower productive investment, and, in turn, lower output. In a similar vein, Arellano, Bai and Bocola (2019) combine a micro-founded general equilibrium model with a detailed firm- and bank-level empirical analysis. The model features heterogeneous firms and banks, and shows that a large increase in sovereign bond yields also affects corporate interest rates because banks that suffer losses on their government bond holdings tighten lending standards and ration credit.<sup>20</sup> This pass-through of sovereign risk is larger for firms with large borrowing needs and for those more exposed to banks that hold many government bonds. These mechanisms are tested in a large cross-section of Italian banks and firms, with evidence for both channels. The empirical results are then used to estimate the model. They find that a 100-basis-point increase in sovereign bond yields increases corporate borrowing rates by 70 basis points, and results in a 0.7% decline in output, mostly due to the direct (firm borrowing) effect.

In the empirical literature, a large new body of work has emerged using novel datasets and methods to identify causal effects of sovereign-default risk on firms and the aggregate economy. The analysis by Hébert and Schreger (2017) is noteworthy since it is the first to make use of a natural experiment to identify the cost of sovereign default risk. They use data from Argentina to show that higher sovereign bond yields cause a decline in the stock price of Argentine firms.<sup>21</sup> Specifically, the analysis exploits plausibly exogenous variation in Argentina's sovereign risk due to a series of New York court rulings in *NML vs Argentina*, which the media coined the "sovereign debt trial of the century" (see Section 9). The key identification assumption is that the judge's rulings contained relevant news that changed the probability of a sovereign default, but did not affect domestic firms directly. They find that a 10-percentage point increase in default probability reduces the market value of Argentine firms by six percentage points, on average, with larger effects for exporters, financial firms, and foreign-owned corporations. A

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<sup>19</sup> This relates to an earlier literature, which shows that sovereign bond spreads influence business cycles and domestic borrowing costs in emerging markets (Neumeyer and Perri 2005 and Uribe and Yue 2006).

<sup>20</sup> Their mechanism is similar to Gennaioli, Martin, and Rossi (2014), Bocola (2016) and others, which are presented in greater detail in the next section.

<sup>21</sup> In earlier work, Arteta and Hale (2008) and Das, Papaioannou, and Trebesch (2010) find that sovereign debt crises are accompanied by a sizable drop in external borrowing by domestic firms. Esteves and Jalles (2016) come to the same conclusion using historical data on emerging markets prior to WWI.



related natural experiment from the legal sphere is the bankruptcy of the city of Detroit, which is used as an instrument by Chari, Leary and Phan (2020) to estimate the impact of bond yield shocks on the domestic economy of Puerto Rico. They find that higher (quasi-sovereign) default risk mostly affects employment in industries that are dependent on government demand.

Other recent papers study the impact of sovereign rating changes and/or declines in sovereign bond prices on domestic corporations. Almeida et al. (forthcoming) exploit exogenous variation in the link between sovereign ratings and bank ratings, which arises from rating agencies' sovereign ceiling policies, and show that sovereign downgrades reduce firm investment and financial leverage. Ferrando, Popov, and Udell (2017) use a unique ECB database of survey information of more than 28,000 small and medium size enterprises (SMEs) in Europe to examine the effects of sovereign distress on the provision of credit. Based on a difference-in-differences methodology, they find that SMEs in countries experiencing sovereign distress face quantity and price rationing by banks. Brutti and Sauré (2015) and Bahaj (2020) use narrative approaches and high-frequency CDS data during the eurozone crisis to show how sovereign risk propagated across borders, thus raising borrowing costs for the domestic private sector.

What these theoretical and empirical contributions have in common is that sovereign risks and corporate risks are closely intertwined. Moreover, these studies focus on the transmission (or “pass through”) of sovereign risk, measured by an increase in sovereign bond yield spreads or CDS premia. This, in turn, is closely linked to the channel of financial intermediation. In the next section, we will therefore delve into the role of banks and the financial system as a link between the public and the private sectors in episodes of sovereign distress.

## **5. Sovereign bank linkages: the (Re?)-emergence of doom loops**

### *5.1. Defaults and their effects on the financial sector*

The feedback between distressed banks and sovereigns featured prominently in the 2008 crisis and the European debt crisis, so much so, that commentators coined several terms to describe this interaction, including “doom loops,” “diabolic loops,” and “vicious cycles” (see e.g. Brunnermeier et al. 2016). Fears of the consequences of a Greek default in 2011-2012 were centered on sovereign-bank linkages, particularly as to whether the balance-sheet exposure to Greek bonds could trigger bank failures and worsen the economic downturn in Greece and Europe. In addition, the sovereign debt crises in Russia (1998) and Argentina (2001) suggested that government defaults directly affect bank balance sheets. Using country-level data, Borensztein and Panizza (2009) and Reinhart and Rogoff (2011a) were among the first to show that sovereign defaults help to predict banking crises. In the wake of the Eurozone crisis, new strands of empirical and theoretical research built on these insights to better understand the mechanism behind the feedback loops as well as their economic costs.

Early theoretical contributions on the sovereign-bank nexus include Brutti (2011), Bolton and Jeanne (2011), and Gennaioli, Martin, and Rossi (2014) (GMR). What these three models have

in common is that bank holdings of sovereign bonds generate contagious spillovers when default takes place. This creates costs akin to the default-induced output losses in Arellano (2008), and reduces the incentives for sovereigns to default, even in the absence of direct sanctions or reputational penalties.

Brutti (2011) proposed a model that explains the coincidence in timing of defaults and banking crises in emerging market economies. A default can induce a liquidity crisis that reduces domestic production and investment, especially if the private sector has incomplete access to credit markets and is forced into holding government bonds directly (or indirectly through the banking sector). Bolton and Jeanne (2011) focus, instead, on financially integrated economies, such as in the eurozone. In their model, financial integration creates incentives for domestic banks to diversify their holdings of government bonds across countries. This generates risk diversification benefits *ex ante*, but results in costly spillovers in case a foreign government defaults.

GMR (2014) show that lending by the banking sector can sharply decline in case of a sovereign default, especially if banks hold large amounts of sovereign bonds. In the model, unlike in earlier theoretical work, the central cost of default is the damage done to bank balance sheets. This results in a decline in bank lending and, consequently, a drop in investment and output. GMR apply their model to panel data between 1980 and 2005, and find that debt crises tended to be followed by a decline in private credit, especially in financially developed economies and when banks have significant government debt on their books. In follow-up research, GMR (2018) expand their empirical analysis, using bank-level data across 191 countries and until 2012. They find that, on average, banks hold roughly 9% of their assets as government bonds. In 20 instances of default, lending drops more by those banks that are heavily exposed to government bonds. Sosa-Padilla (2018) builds a closely related model in which a government's decision to default triggers a banking crisis through non-performing sovereign bonds, which in turn leads to a decline in the provision of credit to the private sector and output losses. His theoretical contribution is to endogenize the output cost of default.<sup>22</sup>

These models help to rationalize the concerns about a sovereign payment default in a highly financialized economies like Spain or Italy. What this literature does not explain, however, are the potential sovereign-risk spillovers in countries that did not default. More recent work therefore considers whether beliefs about the *potential* default are sufficient to disrupt financial intermediation and stunt growth.

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<sup>22</sup> Perez (2015) proposes a second channel through which a sovereign default can create output costs via the banking system. In addition to the spillovers arising from banks' balance sheet exposure, his model contains a "liquidity channel." When governments default, less public debt is issued and bonds have low returns. As a result, banks shift from holding public debt to investing in lower productivity projects than they otherwise would, which ties up capital and will, all else being equal, lead to a lower aggregate output. See also Engler and Grosse Steffen (2016).

Bocola (2016) develops a model along these lines, where *news* that the government may default in the future can have adverse effects for bank lending and economic growth. When the price of the debt falls on secondary markets, the bank's net worth declines and bank funding costs rise. Banks respond by reducing lending to the private sector, which results in less capital expenditure and investment, which, in turn, can generate a recession. Bocola calls this the conventional *liquidity channel*, but he also models a second channel, which he terms the *risk channel*. The belief that a default will occur in the future can alter a bank's willingness to lend to non-financial firms today. As banks become more cautious, they pass this along to their private sector customers by raising rates on loans. Banks also perceive private sector lending as riskier, resulting in sales of private-sector assets and lower bank net worth. The combination of precaution and perceived greater risk thus induces banks to reduce their exposure to the private sector, leading to a decline in lending and capital expenditure, a lower output. To understand the relative contributions of these channels, Bocola (2016) structurally estimates the model using data on the Italian debt crisis and shows that the risk channel accounted for 45% of the "pass through" of sovereign risk to firms' borrowing costs. He also finds that Italian output would have also been about 1% higher annually without this sovereign distress effect. The paper thus provides an explanation as to why "debt crises without default" matter for the real economy.

A closely-related empirical literature reinforces this point by showing how distress in European sovereign bond markets spilled over into the domestic banking sector, ultimately causing a credit crunch and higher firm borrowing costs. Acharya, Eisert, Eufinger, and Hirsch (2018), for example, find that poorly capitalized banks holding sovereign bonds reduced their syndicated lending by up to 50% at the height of the debt crisis. Similar results are reported by Altavilla, Pagano and Simonelli (2017) using data for euro-area banks, and by Bofondi, Carpinelli, and Sette (2018) and Bottero, Lenzu, and Mezzanotti (2020) using granular Italian data at the loan-, bank- and firm-level.

## 5.2. Bank distress and spillovers to sovereigns

Given their interconnected nature, doom loops could also arise from problems in the banking sector. If market participants expect distress in the banking sector and subsequent bank bailouts by the government, they will price that risk into sovereign spreads, triggering a decline in bond prices and, possibly, a rollover crisis.<sup>23</sup> This, in turn, will affect bank balance sheets, further increasing the likelihood of a banking crises.

Acharya, Drechsler, and Schnabl (2014) develop a three-sector model to explore these feedback loops. The model features a financial sector with high leverage and exposure to systematic risk in the corporate sector. Financial firms face the possibility of bank runs, giving rise to government bailouts. Specifically, governments will respond by issuing new sovereign bonds

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<sup>23</sup> Historically, costly rescue packages have taken many forms, including bank nationalizations, capital injections, guarantees for bank liabilities, toxic asset purchases, liquidity support from the central bank, deposit freezes, and bank holidays (Laeven and Valencia 2013).

and transfer the proceeds to banks so that their supply of credit does not fall. The new bond issuances, in turn, lead to debt dilution and higher sovereign credit risk, which then feeds back to the financial sector by reducing the value of its holdings of government bonds as well as the value of its government guarantees. Several testable predictions arise from this model, which are confirmed in their empirical analysis with sovereign and bank CDS premia. First, the announcement of a bailout initially reduces credit risk in the financial sector, but also increases sovereign credit risk. Second, after the bailout, there is significantly more co-movement between sovereign and bank credit risk, even after controlling for banks' own equity returns. In sum, the paper shows that the bank bailouts were a "pyrrhic victory," with short-term beneficial effects that ultimately haunted sovereigns across Europe.<sup>24</sup>

Several other papers corroborate these findings. Mody and Sandri (2012), for example, trace the origins of the European debt crisis to the bailout of Bear Stearns in early 2008, which raised market expectations of costly government bank bailouts. The sovereign-bank feedback loop intensified after the nationalization of Anglo Irish Bank in January 2009 and, in particular, with the skyrocketing Greek bond yields in 2010. Relatedly, Acharya and Steffen (2015) show that banks in the periphery of Europe increased their holdings of domestic sovereign bonds, rather than decreasing them, as the eurozone crisis escalated, leading to a stronger feedback loop. Moreover, Ang and Longstaff (2013) use CDS spread data from US states and eurozone countries, finding that a significant portion of sovereign risk is linked to financial market conditions rather than driven by macroeconomic fundamentals. This is in line with Morelli, Ottonello and Perez (2019), which shows that, in 2008, after the Lehman collapse, emerging market bonds held by more-distressed global banks were subjected to larger price declines.

### *5.3. Are sovereign-bank doom loops becoming more severe? A historical perspective*

This subsection moves beyond the recent experience and explores historical precedents. Have sovereign-bank linkages intensified in recent years, perhaps because the economy has become more financialized as a whole (Jordà, Schularick and Taylor 2016)? Or has the issue of sovereign-bank contagion merely resurfaced in recent years? Shedding light on this question has implications for policy as well as for the external validity of the newer generation of sovereign debt models with financial intermediation. In addition, the theoretical discussion above raises an empirical question that history can help to answer: which typically comes first, banking crises or sovereign debt crises? Here we provide additional evidence on these questions.

There are good reasons to believe that banks and sovereigns have maintained close ties over the past centuries. Many of the initial banks owed their very existence to sovereigns. States, meanwhile, were often given privileged access to banking services. Indeed, before secondary markets emerged, private bankers often lent to sovereigns to finance wars and secure borders. There is also a long history of mutual assistance between banks and sovereigns. In wartime,

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<sup>24</sup> For a related model, see Farhi and Tirole (2018).

banks aid sovereigns by absorbing new domestic debt issues. In turn, banks often receive emergency funding (e.g., liquidity support by a central bank) or direct capital infusions from states when in need (e.g. Reinhart and Rogoff, 2009).<sup>25</sup> And in peacetime, banks can aid sovereigns by holding large amounts of bonds in their portfolios – to guarantee a market for the sovereign bonds and to allow nations to rollover their debt – a form of financial repression that was practiced after World War II (Reinhart and Sbrancia 2015).

Against this backdrop, we look for evidence of diabolic loops before the eurozone debt crisis. Since financial crises are rare events, and because banking crises cum sovereign crises occur even less frequently, we take a 200-year perspective. Our data and approach for identifying doom loops builds on Mitchener (2014) and Maerean and Mitchener (2016). In a first step, we draw on existing databases of historical crises to pinpoint twin sovereign-bank crises that were coincident in timing – a necessary condition for the crises to be causally related.<sup>26</sup> We define a “twin crisis” episode in year  $t$  when a banking crisis overlaps with a default during the period  $[t - 3; t + 3]$ . By our definition, twin crises are thus a maximum of two years apart. Our data exercise spans 70 countries from 1800-2008 – with the sample’s start date determined by the approximate date sovereign bonds became widely traded on secondary markets.<sup>27</sup>

With a view to Section 3 on “debt crises without default”, we also consider cases where sovereign bond “spread spikes” coincide with banking crisis events. That is, we consider debt crises even if there was no payment default, but merely debt distress as captured by rapidly rising bond yields. To identify “spread spikes,” we use monthly sovereign bond yields for all countries that had banking crises during our sample period and for which we could gather sovereign bond yield data. Our pre-WWI sample contains 53 countries; thereafter, our sample consists of 42 countries.<sup>28</sup> To compute spreads, we subtract a proxy of the risk-free rate, using the current yield on the UK consol for the period through 1913 and the U.S. long-term bond thereafter. To allow for comparability of spreads across countries, we follow Krishnamurthy and Muir (2017) and construct a normalized spread – the bond spread divided by the sample average spread for a given country. Specifically, we define a spread crisis in year  $t$  if the annual change in the normalized spread is higher than the threshold  $\bar{\Delta}$ .  $Spread_{i,t} - Spread_{i,t-1} > \bar{\Delta}$ . The cutoff was selected after examining the distribution of spread innovations and is equal to

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<sup>25</sup> An alternative view suggests that quickly backstopping and recapitalizing banks (as was done in the EMS crisis of the early 1990s) may limit losses to tax revenue and output and thus short-circuit the doom loop (Corsetti et.al. 2020).

<sup>26</sup> Crisis dates and frequencies are based on Reinhart and Rogoff (2009), *Annual Reports of the Corporation of Foreign Bondholders*, the *Annual Reports of the Foreign Bondholders Protective Council*, Mitchener and Weidenmier (2008), Mitchener and Weidenmier (2010), and Bordo et al. (2001).

<sup>27</sup> At the beginning of the 19th century, wealthy households held the bulk of sovereign bonds, but banks became increasingly important investors subsequently (Ferguson 2006). By 1883, the bonds of foreign governments accounted for 23% of all securities quoted on the London Stock Exchange (Michie 1999, p.89, table 3), with large investment houses dominating the issuance of these bonds (Michie, 1999; Fishlow 1985).

<sup>28</sup> The main data source for constructing pre-World War I bond spreads is the *Investor's Monthly Manual* (IMM). Additional bond quotations were hand collected from the newspaper *Berliner Börsen-Zeitung* (BBZ) and consist of monthly prices of government securities quoted and traded on the Berlin stock exchange from 1870-1913. We use the Global Financial Database for data thereafter.

the 90th percentile.<sup>29</sup> Using this approach, 177 spread crises can be found during 1870-1913 and 57 spread crises during 1920-1935.<sup>30</sup> Note that our threshold is much less strict than in Section 3 on “debt crises without default,” where we use the 99<sup>th</sup> percentile, because our aim here is to capture as many potential events as possible.<sup>31</sup>

Using the sample of spread crises, we search for overlapping banking crises, in a two-year window before or after. Since coincidence in timing is insufficient for identifying linkages between sovereigns and banks (i.e., yields may rise and banks may fail if economic shocks are simply large), we follow Friedman and Schwartz (1963) Jalil (2015), Richardson (2007), Wicker (1996) and other scholars who have used a “narrative approach” to identify financial crises historically. We use a narrative approach to explore whether twin crises were, in fact, more deeply related. That is, we draw on articles in newspapers and periodicals, memoirs of bankers, businessmen, and policy makers, and reports of regulatory agencies to examine how banking distress and sovereign bond spikes/defaults interacted. The result is a taxonomy of historical sovereign-bank feedback events that can be compared to recent experience.

***Evidence from realized defaults:*** The first two rows of Table 1 show the number of banking and sovereign debt crises identified for five different periods: pre-1870, the first era of globalization (1870-1913), the interwar period, the Bretton Woods era, and post-Bretton Woods. There were 59 banking crises and 36 sovereign debt crises in the first era of globalization, but only six were twin crises. Before 1870, the number of twin episodes was even smaller, just two, while in the interwar period, there were 10 twin crises. The total number of banking crises was quite small in the Bretton Woods period, leading to only one twin crisis episode. The largest number of twin crises (23 events) is in the modern period until 2008.

Table 1 further reports information on the sequencing of the crises for the twin episodes. We distinguish between simultaneous twin crises when: (i) the banking and debt distress occurred in the same year (row 4); (ii) the debt crisis occurred prior to the banking crisis (debt-bank twin crises shown in row 5); and when the financial turmoil started prior to the public default (bank-debt crises shown in row 6). Across all sub-periods, banking crises have generally *preceded* debt crises. This remains true in the most recent period: of the 23 twin crises since Bretton Woods, 15 were characterized by the banking crisis occurring first. Our detailed historical analysis is consistent with Reinhart and Rogoff (2011a) and Laeven and Valencia (2013), who show that, in general, banking crises are significant predictors of debt crises. Other studies show mixed results on this point.<sup>32</sup>

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<sup>29</sup> The 90th percentile is 0.18 for the first sample and 0.99 for the second sample period.

<sup>30</sup> During default, countries experienced more spread crises as spreads were more volatile and suffered larger increases. For example, 78% of the spread crisis episodes take place in defaulting countries during 1870-1913.

<sup>31</sup> The country coverage and time periods in the two data sets also differ slightly. When using definitions and data from Section 3, we find a slightly different set of twin crises based on “spread spikes,” but no additional cases of “doom loops” once the narrative evidence is also considered.

<sup>32</sup> Borensztein and Panizza (2009) indicate the opposite pattern for approximately the same period, 1975-2000. Using data from the 1980-2005 period, Gennaioli, Martin, and Rossi (2014) find more episodes where the

Table 1: Twin crises (bank &amp; debt) since 1800

Crisis type	19th century (pre-1870)	Pre-WWI (1870-1913)	Interwar (1919-1939)	Bretton Woods (1945-1973)	Post-BW (1974-2008)
Total banking crises	37	59	51	3	117
Total sovereign debt crises	39	36	30	20	60
Twin crises (bank & debt)	2	6	10	1	23
.....of these:					
simultaneous (same year)	1	1	2	0	6
debt crisis first	0	1	2	1	2
bank crisis first	1	4	6	0	15

Note: The period covered is 1800-2010, where WWI and WWII are excluded.

Table 2 reports on the subset of twin crises with elements of a doom loop at work – meaning a banking crisis that spilled over to the sovereign or vice versa (i.e., we rule out episodes that are simply coincident in timing, but show no historical narrative evidence of a “connection.”).<sup>33</sup>

Based on our data and methodology, Peru, in 1875, is our first documented case of a doom loop. The income obtained from guano, a fertilizer and major export of the country, was central for servicing the external debt. In the early 1870s, exports of guano began to decline and fiscal deficits grew; further, the income from nitrate sales, another important and growing export of the country, was insufficient to fill the gap. Debt-servicing costs continued to grow faster than revenues. After the Banco Nacional del Peru failed in 1875, the government allowed note-issuing banks to increase emission if they in turn lent these paper notes to the government (primarily to meet debt obligations) in order to prevent a widespread banking panic. Further, the government intended to employ these banks as local consignees of nitrate production in a drive to nationalize the nitrate industry and use the nationalization proceeds for debt repayment. The nitrate producers balked at the government's nationalization program, which included land for government-bond swaps. Facing insufficient revenues, the government then suspended interest payments on its external debt in December 1875.<sup>34</sup>

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banking crisis started subsequent to the default. A comparable result is found in Balteanu and Erce (2018) for a similar time period. The differences in findings may partly be explained by differences in methods, samples, and crisis dating. For example, Bordo and Meissner (2016) document how different crises chronologies are among leading authors.

<sup>33</sup> From the perspective of timing, Germany might also seem like a candidate during the interwar period. It had a banking crisis in 1931 and defaulted on sovereign debt, beginning in 1932. However, its banking crisis appears unrelated (Doerr, Gissler, Peydro, and Voth 2019), and its sovereign debt presents a unique challenge in terms of analysis: it is reparations debt from WWI, the political dynamics of which may be entirely different from what is discussed in this survey. For detailed accounts of individual episodes and more information on the precise linkages between banks and sovereigns or vice versa, see Maerean and Mitchener (2016).

<sup>34</sup> See Marichal (1989), Marichal (2014) and Vizcarra (2009).

Table 2: “Doom Loops” prior to the eurozone crisis

Pre-WWI (1870-1913)	Interwar (1920-1939)	Post-Bretton Woods (1974-2008)
Peru (1875)	Austria (1931)	Argentina (1980)
<i>France (1882)</i>	Greece (1931)	Mexico (1981)
Portugal (1890)	Romania (1931)	Philippines (1981)
Argentina (1890)	Poland (1931)	Chile (1982)
<i>Norway (1899)</i>		Algeria (1990)
		Venezuela (1993)
		Indonesia (1997)
		Ecuador (1998)
		Russia (1998)
		Turkey (2000)
		Argentina (2001)
		Uruguay (2002)
		Dominican Rep. (2003)

*Note:* “Doom loops” are events where debt and banking crises overlap and in which historical narratives point toward close linkages between sovereign and banking sector distress. The two cases in italics are banking crises that overlapped with “spread crises,” but in which there was no payment default.

A second twin crisis with elements of a doom loop arose during the well-known Baring Crisis of 1890, which culminated in Argentina’s default. In short, debt sustainability issues became apparent when the Argentine government started violating its legal obligations and began paying off gold liabilities with massively depreciated domestic currency. Shortly thereafter, the investment house of Baring failed in floating a 25 million gold peso loan in London on Argentina’s behalf, and runs on the banks of issue, Banco Nacional and the Banco de la Provincia de Buenos Aires, followed. Panicky depositors feared a “sudden stop” in the supply of foreign capital, a situation that would put the government and banks (tacitly linked to the government) at risk. Fearing a meltdown of its banking system, the government authorized new paper notes to meet the heavy withdrawals of panicky depositors. But this intervention spooked investors: sovereign bond yields spiked and foreign capital fled Latin America (Marichal, 1989). Argentina's fiscal position worsened, and the country defaulted on its external debt in the same year.

In the spring of the same year, 1890, a third pre-WWI “doom loop” had begun in Portugal, when the country had trouble placing new debt in Paris. A banking crisis followed in the fall of 1890, with the central bank providing critical support to the bank Montepio Geral. Despite guarantees by the central bank to other banks and railways, capital quickly flowed out of Portugal – even prior to the shock of the Baring Crisis, which only accelerated this trend. Continuing problems in the banking system and current account deficits led the country to abandon the gold standard and eventually to a partial default on its debt in the summer of 1892.



Four more twin crises with “doom loop” elements develop in the interwar years. These are Austria, Greece, Poland, and Romania in 1931. In each of them, there was large-scale government support of the banking sector – whether it was through a direct bailout, through liability guarantees, or through bank nationalizations.

After World War II ended, we identify another 13 cases with “doom loop” features prior to the Great Recession of 2008, all of which occurred in developing and emerging-market economies. These cases can be grouped in two clusters and are well documented in the recent literature, in particular in Caprio and Klingebiel (2003) and Laeven and Valencia (2013, 2018), as well as in Das, Papaioannou and Trebesch (2012). The first cluster is during the debt crises of the 1980s and early 1990s (see Cline 1995). The second occurs in the late 1990s and early 2000s, when emerging markets were rattled by the Asian financial crisis, the Russian financial crisis, and the defaults in Argentina, Uruguay and the Dominican Republic (see Sturzenegger and Zettelmeyer 2006 for detailed accounts).

***Additional evidence from “spread crises”:*** Thus far, the methodology for identifying doom loops only considers realized defaults. We now also look at banking crises that coincide with “spread crises”, i.e. rapid yield spread increases, using the methodology described above. We find seven cases before WWI and 10 cases between 1920-1935. Since many factors besides banking crises drive risk premia, we again rely on the narrative approach to discern whether there is a connection between financial sector distress and sovereign debt distress. As it turns out, mapping historical spread spikes onto the timing of banking crises reveals a number of “false positives.” For example, political factors (wars, coups d’état, and border tensions) rather than banking troubles drove spread spikes in Brazil (1890), Russia (1875), Chile (1898), Uruguay (1898), and Italy (1935). In other instances, financial problems were mild, the dates of banking crises did not align, or the historical record simply did not show any connection between government debt policy and the banks.<sup>35</sup>

For example, the Netherlands (1921), Argentina (1931), Belgium (1931), Finland (1931), Sweden (1931), and Switzerland (1931) appear to be more promising candidates for doom loops, but the narrative records reveal only weak evidence of a connection between banks and sovereigns.<sup>36</sup> In several of the European cases, government rescue operations appear to have brought about stability to weak commercial banking systems and led to a faster recovery from the global depression of the 1930s (Eichengreen, 1992).<sup>37</sup> Moreover, markets do not seem to

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<sup>35</sup> For example, Australia (1931) is an episode where the financial troubles were very mild (Fisher and Kent 1999), Bordo et al (2001), Taylor (2015). For the case of South Africa (1877) and Germany (1925), there seem to be some dating errors by those who have previously classified them as banking crises. In India (1921), the narrative evidence suggests that there was no feedback loop between the banks and the state.

<sup>36</sup> Hungary and Poland had banking crises in 1931 and defaulted on war loans in 1932, making them possibilities as well. However, like the candidate spread-crisis countries listed here, scholars interpret the twin crises as only loosely connected, with the banking crises emanating from the global shock of the failure of the Credit Anstalt in Austria in 1931 (Eichengreen, 1992). And, unlike the countries listed in Table 2, for this period, there is little evidence of a government bailout of banks.

<sup>37</sup> In Netherlands (1921) episode, Nederlandsche Bank offered assistance to the financial sector which was considered successful and averted general runs on banks. In particular, the Netherlands Bank intervened in favor

have punished sovereigns for these bailouts: debt was rolled over and yields did not increase appreciably after governments intervened to support banking systems. As a result, and in contrast to the dynamics described in Acharya, Drechsler, and Schnabl (2014), no doom loop emerged as a result of bank assistance programs.

Despite the many false positives, we nevertheless identify two additional doom loops during “spread crises,” namely France in 1882 and in Norway in 1899. In France, banks had lent heavily to private entities in the Austro-Hungarian empire in the late 1870s and early 1880s, but when that government refused to allow the Banque de Lyon to establish a new lending bank in Trieste, the lending bubble burst. In response, investors dumped bank stock and commenced a run on the Banque de Lyon. A panic at the Lyon Bourse soon ensued – leading to the collapse of both the bank and the exchange. Fear spread to the Paris Bourse, where another prominent investment bank, Société de l'Union Générale, had also set up multiple lending facilities in the Austro-Hungarian empire. An emergency loan of roughly 80 million francs, authorized by the government and initiated by the Banque de France, kept the Paris Bourse from collapsing as well. (The Banque de France in turn had to borrow from the Bank of England to provide liquidity to the commercial banking market). Government bond spreads reacted negatively to these events.

In Norway in the late 19th century, rapid population growth in the capital Christiania (modern-day Oslo), fueled a lending boom by the commercial banking sector. Six new banks were established from 1897-1898, in addition to the eight already lending to fuel the real estate boom. In June 1899, Discontobanken, a newly established bank, saw a large borrower default on loans, leading to a run on the bank. The central bank of Norway provided direct support to the distressed lender, but the loan proved to be insufficient and the central bank assumed the bank's entire balance sheet. Norges Bank then found itself providing liquidity support to other struggling banks with significant exposures to the real estate market, but also began rediscounting bills more broadly to the entire banking sector. To backstop the central bank, the government turned over nine million kroner to the Norges Bank. Sovereign spreads rose dramatically during the crisis and the period of emergency lending, consistent with the theoretical literature discussed above.

When we sum the cases based on realized defaults with the spread-spike cases of Norway and France, we find nine instances of bank-sovereign “doom loops” prior to WWII and 13 episodes in emerging markets prior to 2008. It is possible that alternative methodologies may reveal

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of the mid-sized Bank-Associatie and Marx & Co. banks in 1922, and it also saved the extremely large Rotterdamsche Bankvereenig later in 1924. In Argentina (1931), the state bank, Banco de Nacion aided the private banks through rediscounts. In Belgium (1931), the National Bank offered support to several banks in 1932 and 1933 and, after some bank failures, the government stepped in and set up a company to mobilize banks' frozen loans. In Finland (1931), the Bank of Finland aided four banks with credits on special terms. In Sweden (1931), the Skandinaviska Kredit bank had to be supported by the Swedish National Debt Office. The support loan totaled 200 million SEK. In the last episode from our list, Switzerland (1931), the Swiss Volksbank and the Swiss Diskontbank were bailed out directly by the government.

additional cases; however, our reading of the long lens of history suggests that doom loops were relatively rare events until more recently.

Why might that be the case? It could be that, in the past, banks had more limited exposure to sovereign bonds on their balance sheets or that regulators today have unintentionally encouraged banks to “bulk up” on sovereigns. It could also be that market participants reacted differently to bailout announcements, or that expectations about their occurrence have changed. The higher frequency more recently could also reflect rising “financialization” (i.e., the increasing dependence on the financial sector for well-being and economic growth), making government bailouts in crises more likely. Additional empirical and theoretical research will no doubt help shed light on these potential explanations.

## **6. Rollover crises, multiple equilibria, and bond maturity**

As the eurozone crisis unfolded, it became increasingly apparent that solvency risk and liquidity risk were interacting. By the late 2000s, several eurozone economies faced challenges in refinancing existing stocks of public debt or placing new issuances, either because the offered rates were exceptionally high relative to previous borrowing or investors were unwilling to purchase more debt when governments turned to public markets. Shocks to “fundamentals,” such as rapidly rising budget deficits in Ireland and Spain and large upward debt revisions in Greece in 2009, induced credit market participants to re-evaluate the ability of some governments to repay their obligations in the future. This heightened credit risk changed their willingness to refinance maturing debt and to demand greater compensation in the form of higher rates. However, the higher rates created a dangerous feedback effect, pushing eurozone economies closer to default. Commentators refer to these debt management problems as “rollover” or refinancing risk.

What drives rollover crises? And why did debt distress and rollover problems hit sovereigns in the eurozone while other advanced countries that also experienced weakening fundamentals and growing debt burdens (such as the U.S., Japan, and England) were spared? This section draws on a large volume of new theoretical research, in particular models emphasizing the self-fulfilling nature of debt crises, to address these questions and related issues.<sup>38</sup> Since maturity is a central factor in these models and for default-risk modeling, in general, we examine the growing theoretical literature that features long-maturity sovereign bonds, and then explore cycles and trends in bond maturity over the course of the past 150 years.

### *6.1. Advances in modeling rollover risk and self-fulfilling crises*

Understanding whether crises are driven by investor expectations and beliefs has a long history, with important contributions by Obstfeld (1996), Calvo (1988) and Cole and Kehoe (1996,

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<sup>38</sup> Rollover risk in corporate debt markets received renewed theoretical attention in the wake of the crisis (e.g. He and Xiong 2012). Disruptions in the financial sector compounded debt overhang and the rollover risk of firms, and reduced corporate investment during the eurozone debt crisis (Kalemli-Özcan, Laeven, and Moreno, 2018).

2000). Models with self-fulfilling crises formalize some version of the following intuition: if markets come to believe that a crisis or default is more likely, they will price that into the interest rates of the sovereign, which in turn increases the likelihood that a country will default.<sup>39</sup> Unlike earlier generations of sovereign debt models, Cole and Kehoe and Calvo show how the self-fulfilling nature of debt crises can give rise to multiple equilibria. Recent theoretical advances build on their pioneering work by examining the elements of sentiment-driven crises that produce multiple equilibria, such as whether commitments to “good behavior” are rewarded by markets and whether the maturity of the debt matters.

Several new papers in this genre, use the eurozone debt crisis as motivation for modeling self-fulfilling crises. For example, Conesa and Kehoe (2015) argue that rising debt-to-GDP ratios in the GIIPS countries were inconsistent with earlier-generation models, which showed that a rational response to the possibility of a self-fulfilling debt crisis was to pay down debt. To reconcile theory with recent events, Conesas and Kehoe (2015) develop a model showing that a government can rationally risk a self-fulfilling debt crisis and “gamble for redemption” when the economy is in a recession and recovery is uncertain. In such a situation, the government weighs the benefits of issuing more debt (more consumption smoothing, less painful adjustment) against the costs (that market participants will be more likely to engage in a speculative attack). Lenders and the government both hope for a recovery so that the government chooses not to cut spending and debt grows further. While rational, this “gamble for redemption” can sow the seeds of an eventual default and for the crisis to be self-fulfilling. The model helps to rationalize why crisis countries in the eurozone opted for debt accumulation rather than a more painful adjustment. It also contrasts from Reinhart and Rogoff’s (2009) view based on eight centuries of historical observations, that governments and lenders often delude themselves to lend and borrow more because they believe that “this time is different.”

A related view is that the crisis countries were trapped in a “debt spiral,” with increasing debt levels pushing up interest rates and vice versa. Lorenzoni and Werning (2019) follow this line of inquiry and construct a model with multiple-equilibria and limited commitment that illustrates how debt dynamics were at the center of the observed rapid increase in interest rates during the eurozone crisis. They define “slow moving” debt crises as a situation characterized by rising interest rates that lead to greater debt accumulation which, in turn, induces a higher probability of default. They also explore policy options to reduce the vulnerability to these types of crises. When a fiscal rule is actively followed to combat rising deficits, the government’s commitment to repay can be sufficient to prevent a self-fulfilling crisis. However, debt dynamics turn out to be quite sensitive to the stock of debt and other fundamentals: even when the equilibrium is unique, their model delivers a tipping point at which debt, interest rates, and

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<sup>39</sup> Empirically, it is difficult to identify “bail out” expectations from other influences that simultaneously affect bond prices or yields. Bernal, Oosterlinck, Szafarz (2010) use quasi-natural experimental evidence from the 1918 Bolshevik repudiation of Russian bonds and segmented trading markets of these bonds to demonstrate that markets price bailout expectations.

default probabilities will rise over time and eventually lead to default. Initial debt levels are therefore crucial, pointing to the importance of keeping deficits in check. A further interesting feature of their model is that a large share of short-term debt exposes governments to greater refinancing risk, which can potentially amplify feedback effects.<sup>40</sup>

Bocola and Dovis (2019) also focus on multiplicity and the role that debt maturity plays in self-fulfilling crises. Their model seeks to understand whether the eurozone bond spread crisis was driven by “fundamental risks,” defined as growing default risk due to low output and high debt, or by “non-fundamental risks,” meaning lenders believe that debt will not be rolled over, resulting in a self-fulfilling crisis. In their model, government decisions about debt maturity are critical for understanding the nature of default risk. If rollover risk is important, then a government has an incentive to lengthen the maturity of its bonds to reduce the payments that are coming due. The alternative is to choose shorter maturities as a way to raise more resources (the same trade-off features in other models with long maturity bonds discussed below). Thus, in this framework, the observed maturity choice of governments reveals the nature of the crisis. Going short suggests that fundamental risks are at work, while going long point towards rollover risks. Based on this idea, they calibrate their model using Italian data and find that rollover risk accounts for no more than 20 percent of Italy’s spread spike during the eurozone crisis. Most of the increase in interest rates appears to be explained, instead, by economic fundamentals.

The models discussed thus far help to rationalize how the crisis could escalate so quickly in peripheral Europe, yet they do not help to explain why it hit the eurozone, specifically. Several authors make contributions along those lines by focusing on the institutional constraints of monetary unions and political unions. De Grauwe (2011) argues that entering into a monetary union (MU) and issuing debt is analogous to emerging-market economies issuing debt in foreign currency: in both situations, it can lead to self-fulfilling debt crises. A country joining a MU loses control over the currency in which it issues debt, so that it becomes more susceptible to investors losing confidence in the country’s bonds. Once in the “bad equilibrium” and facing a recession, markets re-assess the prospects of default, potentially triggering both a liquidity and solvency crisis. Relatedly, Aguiar et al. (2015) explore the interaction between fiscal and monetary institutions in a monetary union and its implications for rollover crises. In their model, countries joining a MU are incentivized to issue too much debt because monetary and fiscal authorities can only imperfectly commit to inflation targets and repayment of debt, respectively. This can give rise to coordination problems and rollover crises. Monetary unions naturally respond to this externality by imposing institutional constraints on borrowing, i.e. debt limits.

Bianchi and Mondragon (2018) similarly focus on whether EMU membership increases the likelihood that an economy is subjected to a rollover crisis. The paper adds downward nominal

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<sup>40</sup> Gros’s (2012) multiple equilibria model also has a “slow moving” component, where the government’s decision on the amount to pay to creditors emerges over time and is dependent on the cost creditors can impose on the debtor as well as the cost of additional revenue.

wage rigidities and foreign currency debt to a Cole and Kehoe type model, and shows that, in countries lacking monetary independence, a sudden change in investors' desire to rollover debt can induce a recession. Due to the rollover crisis, the member state would need to tighten its fiscal belt to meet its debt payments, making default a more attractive option – an outcome that would rationalize investors' initial belief that the country would default. The authors calibrate their model and find that, with fixed exchange rates, rollover crises are seven times more likely to happen. Using Spanish data from the 2000s, they find that Spain would have been insulated from a rollover crisis, if it had exited the eurozone and had the ability to pursue monetary policy for macroeconomic stabilization. In line with these findings, Corsetti et. al. (2014) demonstrate how currency unions can spread distress among its constituent members. Using a new Keynesian model, they demonstrate that the combination of a debt distressed member and procyclical fiscal policy throughout the union raises the likelihood that the entire MU experiences a belief-driven deflationary downturn.

If debt crises are self-fulfilling, what are the implications for policy? Corsetti and Dedola (2016) suggest that unconventional monetary policy can be an effective way to reduce the likelihood of a self-fulfilling crisis. In their model, central banks can purchase a sufficient quantity of sovereign debt (it can “turn on the printing press”) such that it is not optimal for a government to default on its debt.<sup>41</sup> A similar channel is explored in Roch and Uhlig (2016), who consider the role of a “bailout agency” in reducing the likelihood of a debt crisis, more specifically those crises driven by sunspots as in Cole and Kehoe (2000). They model an institution similar to the ECB's outright monetary transactions (OMT) program, which was announced in 2012 with potentially unlimited purchases of distressed members' government bonds. A key result from the model is that their bailout agency would need to be willing to potentially purchase (nearly) the entire amount of newly-issued debt to prevent a default.

A growing body of theoretical research thus points to rollover problems as an important element in the eurozone debt crisis. That said, it is unclear whether the dynamics in Europe represent a historical anomaly – possibly due to the institutional straight-jacket of the single currency area - or whether self-fulfilling crises have become more prevalent, in general. An informed assessment is complicated by the fact that, compared to the thriving work in theory, very little empirical research on rollover crises or sentiment-driven defaults has emerged.<sup>42</sup> A first, yet unsolved challenge is to measure rollover risk and tabulate rollover crises over long sample

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<sup>41</sup> Between May 2010 and November 2011, the ECB purchased roughly 200 billion euros of sovereign bonds (4 percent of eurozone GDP), although it offset the potential for monetizing with sterilization policies (Lane, 2012). See Bacchetta, Perazzi, and Can Wincoop (2018) for another study exploring whether monetary policy can be used to ward off a self-fulfilling debt crisis.

<sup>42</sup> Among the few exceptions is De Grauwe and Ji (2013). They identify structural breaks and periods when market sentiment diverged from fundamentals during the eurozone crisis, as captured by variables such as the current account, the real effective exchange rate, debt-to-GDP, and debt-to-government revenue. Based on their results, they argue that much of the rise in sovereign debt spreads in 2010-11 was unrelated to economic fundamentals, consistent with self-fulfilling crisis dynamics.

periods, and to distinguish these from solvency crises or “fundamental-driven” defaults.<sup>43</sup> Further, there is scant evidence on the costs of rollover crises and little analysis of which policies are most effective at reducing rollover risks, such as debt maturity management or liquidity buffers (IMF, 2011). There is thus considerable scope for future research using both modern and historical data.

## *6.2. Advances in Modeling Default Risk with Long Maturity Debt*

The previous sub-section alludes to the importance of debt maturity in driving default risk, yield spreads, and rollover crises. The theoretical literature of the past decade has recognized this and moved away from models with one-period bonds towards models that incorporated longer maturities instead. As shown by Chatterjee and Eyigungor (2012) and Hatchondo and Martinez (2009), accounting for long-term debt is an important step forward for matching models and data, in particular with regard to bond spreads and default frequency. These models also allow to examine the risk of debt dilution, a key concern in recent theoretical work and among investors. Debt dilution arises when new debt is emitted before the existing debts have been paid off, resulting in higher default risk for the existing debt holders. Chatterjee and Eyigungor (2015) show that, without clear seniority or priority rules, debt dilution in today’s debt market makes borrowing more expensive, because governments cannot fully commit to limiting their future debt issuance. Relatedly, Hatchondo, Martinez and Sosa-Padilla (2016) find that debt dilution accounts for 78% of overall default risk for Spain between 1960-2013.

A central insight from this new line of literature is that maturity choice is endogenous and procyclical, with notable shifts occurring during periods of distress and rollover risk – such as during the eurozone crisis. Using data from 11 countries Broner, Lorenzoni, and Schmukler (2013) show that, during crises, emerging markets tend to borrow short term and the cost of borrowing long-term increases. To explain this finding, they construct a model in which the government chooses the optimal maturity structure, subject to rollover risks. Because longer-term bonds incorporate news on the possibility of default over long horizons, their prices are more volatile than short-term debt and risk-premiums will be higher in comparison. As a result, when investors’ risk aversion increases, the government will shift issuance toward short-term debt.

Arellano and Ramanarayanan (2012) also explore the sovereign’s time-varying maturity structure, but focus on the hedging motives of the borrowers rather than the incentives of lenders. When default risk is low, governments issue more long-term debt as a hedge against fluctuations in spreads. On the other hand, when the likelihood of default is elevated, the government prefers to issue debt that matures more quickly because the incentive to repay is greater. Their model is able to match two stylized facts in the data. First, bond maturity shortens in crisis periods, i.e. spells with increasing sovereign bond spreads. At the same time, the spread

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<sup>43</sup> As a first step along these lines, Cohen and Villemot (2015) examine 97 countries from 1970-2004 and find that roughly a tenth of all debt crises can be described as a self-fulfilling crisis, defined as an endogenous weakening of a country’s fundamentals.

on short-term bonds increases by more than that on long bonds. As a result, the yield curve will invert as countries approach default. This stylized fact is confirmed in the study by Asonuma, Niepelt and Ranciere (2017), which finds that the yield curve inversion also implies that creditor losses (haircuts) in restructuring are typically higher on short-term bonds.

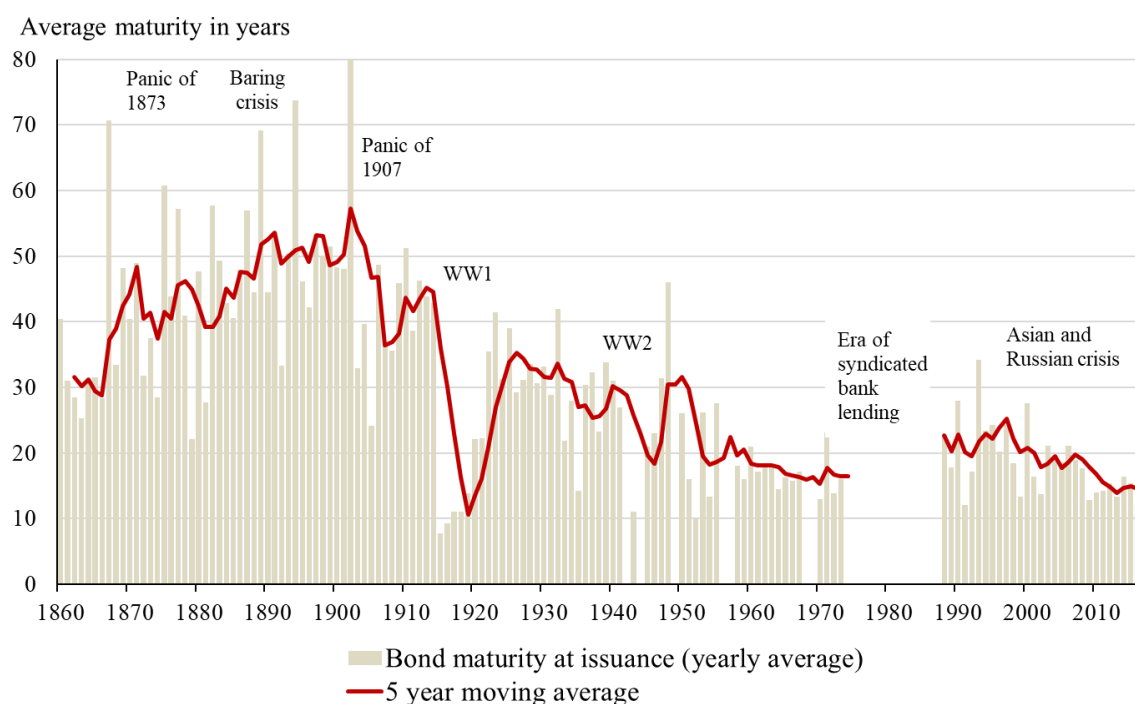
Aguiar et al. (2019) build a related model to address the puzzle of why sovereigns with elevated default risk move toward issuing short-term bonds even though this seems to increase the likelihood of rollover crises. Their answer is fiscal discipline, which forces governments to “go the short route,” i.e. to abstain from issuing long-term bonds in distress. In their model, the sovereign takes the price of bonds, which depends on the total outstanding debt and thus on the likelihood of default, as a given. When default risk is high, the cost of issuing long-term bonds increases, generating fiscal losses and making it difficult to go long. One-period bonds thus serve as a way for the bond market to discipline the borrower, given that it lacks the ability to commit either to repayment or to future emissions. As a result, the government ends up “preferring” short-term debt, as observed in the data from crisis periods. The central finding from these studies, both in theory and data, is that sovereign bond maturity shortens during periods of rising default risk – a point further corroborated by Perez (2017) and Bai, Kim and Mihalache (2015).

So far, the literature has largely focused on emerging market data from the past three decades. In contrast, there is little research on the impact of default risk for maturity choices in advanced countries or when looking further back in history. Figure 5 shows sovereign bond maturity cycles over the very long run, using data from Meyer, Reinhart and Trebesch (2019). The average maturity is calculated for each year between 1860 and 2015, and includes sovereign bonds denominated in US dollars or British pound sterling trading in the financial market centers of London and New York.

The figure reveals two main stylized facts over the course of history. First, consistent with the recent literature, average bond maturity tends to decline in periods of crises and distress. This can be seen by the drop in the red (moving average) line in major financial crashes such as the Panic of 1873, the Baring crisis of 1890, as well as after the Asian and Russian crises of 1997/98. The maturity decline is even more pronounced during the two world wars, especially during WWI, when average maturity dropped from 45 years in 1914 to less than 15 years in 1919-2021. These periods are characterized by rising sovereign bond spreads, thus confirming the maturity-shortening patterns observed in the modern data.



Figure 5: Maturity cycles of sovereign bonds, 1860-2015



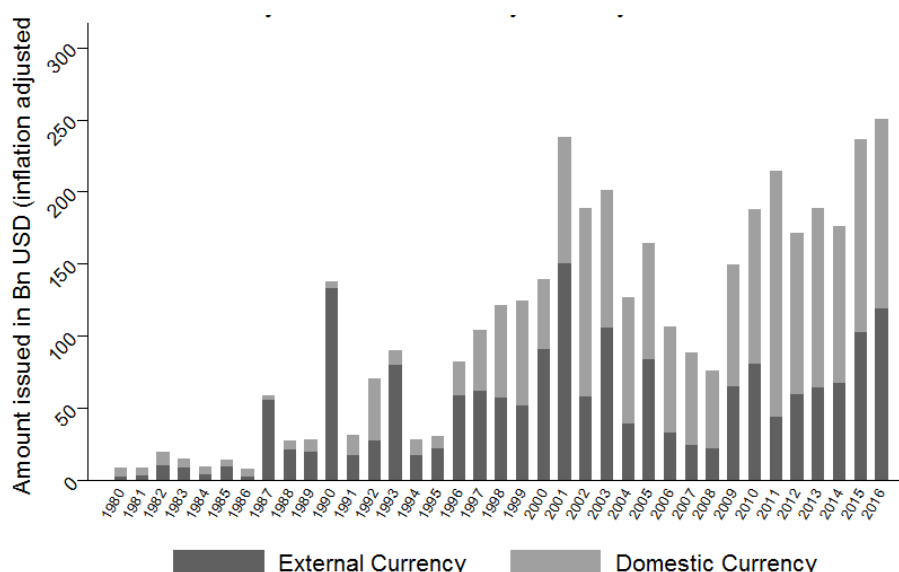
*Note:* Data from Meyer, Reinhart, and Trebesch (2019). The sample includes external sovereign bonds traded in London and New York, which are denominated in US dollars or British pound sterling. In the historical sample (i.e., until the mid-1970s), bonds of both advanced and emerging market economies are included. Since then, only emerging market sovereign bonds are included (using JP Morgan's EMBI sample). The gap between 1975 and 1988 is the era of syndicated bank lending, when developing countries did not issue external sovereign bonds. The red line shows five-year moving averages.

Second, the graph displays pronounced time trends. Bond maturity was considerably longer in history, with average maturities exceeding 30 years prior to WWI and more than 20 years during the interwar period. After WWII, average maturities declined further, to an average maturity of less than 15 years. This change in bond duration matches Ellison and Scott's (2020) findings for the UK. They show that, since the widespread issuance of perpetuities (i.e., the consols) pre-WWI, the average maturity of British government debt has fallen considerably. Why has maturity declined so markedly over the course of the past 150 years and what explains the observed cycles in maturity choice beyond default risk and crises? These are puzzles that are ripe for future research.

## 7. The rise of domestic debt and default

Another notable feature of the past two decades is the growing dominance of debt issued in domestic currency and under local law. The distressed borrowers of the eurozone crisis, Greece, Ireland, Italy and Spain, all issued debt under domestic law and in the common, domestic currency, the euro. In addition, emerging markets saw a boom in domestic-debt issuance since the early 2000s, a phenomenon that appears to coincide with a generalized process of deleveraging and disinflation.

Figure 6: The domestic bond boom – data on 100+ EME and developing country sovereigns



Note: Data from the ongoing “One million bonds project” by Stoppok and Trebesch (2020). The graph shows amounts issued as external currency and domestic currency sovereign bonds for more than 100 developing and emerging market countries 1980-2016.

Figure 6 shows a strong increase in the share of domestic currency debt in total public debt issuance over time. In the 1990s, Eichengreen, Hausmann and Panizza (2005) found only few developing countries that borrowed long-term debt in their own currency, a phenomenon they termed “original sin.” According to this concept, many countries had no choice but to issue long-term debt in foreign currency, exposing them to global shocks and exchange-rate risk. Since then, however, many countries seem to have overcome this hurdle, with domestic debt issuance hitting new records, in particular in the 2010s.<sup>44</sup> Foreign currency borrowing has not disappeared, but now most emerging markets issue a significant amount of their government debt in local currency.<sup>45</sup> In a longer-run perspective, this trend is reminiscent of the historical experience, as many emerging markets issued debt domestically in the 19<sup>th</sup> century and during the interwar years, with similar maturities as external debt (Reinhart and Rogoff 2009, Mitchener and Weidenmier 2015).

In response to these changing trends, researchers have started to examine contractual features of sovereign debt issuance more closely, including the currency denomination (as mentioned,

<sup>44</sup> Eichengreen and Hausmann (1999) defined “original sin” as a situation in which “the domestic currency is not used to borrow abroad or to borrow long-term even domestically.” Subsequent research has defined it as the inability to borrow in domestic currency abroad. Here, we interpret the concept simply as limits to domestic borrowing.

<sup>45</sup> Du and Schreger (2016) collect data for 14 developing countries and show that the average share of external government debt issued in local currency is now roughly 60%. Ottonello and Perez (2019) sample of 18 countries suggests a somewhat lower figure, but still has the share of local currency debt growing from 10 to 39% over the past decade or so.

local or hard currency), but also where the bond was issued (marketplace and governing law), and who holds the debt (investor residence and senior claimants).

One branch in this new literature explores the phenomenon of domestic default and restructurings, which had received little attention earlier.<sup>46</sup> Reinhart and Rogoff (2011b) present the “forgotten history of domestic debt” showing that, over a long sweep of history, domestic borrowing and defaults are more common than previously known. They document what they call *de jure defaults*, defined as missed payments or restructurings of domestic debt, as well as *de facto* ones, e.g. arising from surprise inflation that erodes the value of outstanding domestic debt.<sup>47</sup> They also show that many domestic defaults occur in tandem with external ones, but far from all.

The boom in domestic debt issuance and the increasing number of domestic defaults also raises thorny issues about the relative seniority of domestic versus external creditors during crises, as examined in theory papers such as Guembel and Sussman (2009), Broner, Martin, and Ventura (2010), Broner and Ventura (2016), or D’Erasmus and Mendoza (2018). Broner et al. (2014), for example, suggest that domestic creditors are senior to external ones (meaning domestic debt is less likely to be defaulted on), possibly because governments care more about the welfare of domestic investors. Over the past 30 years, evidence on the claim that domestic creditors are senior in debt crises situations is mixed, also because researchers have used different definitions of what constitutes domestic debt, namely by currency, holder, and jurisdiction. Sturzenegger and Zettelmeyer (2006), Jeanneret and Souissi (2016) and Erce and Mallucci (2018) show that, in some emerging-market crises, domestic creditors were favored, while in other crises no significant differences were detected. During the euro crisis, Brutti and Saure (2016) document large-scale “debt repatriation,” meaning that foreign investors sold their sovereign bonds to residents, which they interpret as evidence that domestic holders were perceived as senior. Historically, the picture is clearer: Meyer (2020) documents that domestic currency bonds faced a significantly higher probability of default and higher haircuts than foreign currency bonds. More work is needed to understand the determinants and consequences of domestic default and the role that seniority and the political economy plays in this context.

Another strand of research in this area explores whether governments substantially benefit from issuing domestic debt rather than external debt. One potential benefit is that domestic debt allows more hedging against shocks because there is no currency-mismatch between government revenue and debt repayment and because monetary and exchange-rate policy can be adjusted to reduce the debt’s real value, i.e., through inflation. In line with this, recent empirical evidence on historical episodes (Bordo, Meissner, and Stuckler 2010) as well as on more recent periods (Dell’Erba, Hausmann, and Panizza 2013, Catão and Milesi-Ferretti 2014) shows that a higher ratio of external indebtedness is associated with a higher likelihood of debt

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<sup>46</sup> As discussed above, related research explores domestic default in currency unions (Aguilar et al. 2015), and their associated redenomination risks (e.g. De Santis 2019, Kriwoluzky, Müller, and Wolf 2019).

<sup>47</sup> Whether and how public debt can be inflated away is further studied by Aizenman and Marion (2011), Hilscher, Raviy, and Reis (2014) and Krause and Moyer (2016).

distress and defaults. Moreover, Du and Schreger (2016) show that local currency sovereign bonds are less risky than commonly thought. Using a dataset of domestic sovereign bonds in 14 emerging markets, they develop a methodology to measure local currency bond risks by benchmarking against a synthetic domestic risk-free rate, yielding two important insights. First, domestic-currency bonds are more insulated against global shocks than foreign-currency bonds, meaning that they exhibit lower cross-country correlations and are less driven by global risk factors and global crises. Second, average risk premia on domestic bonds for EMEs are sizeable, but in comparison, they are lower (not higher) than on external bonds. Both findings help to explain the growing appeal of borrowing in local currency.

The resolution of debt distress and defaults is another reason why issuing domestic debt can be advantageous for sovereigns. Legal scholars have long emphasized that domestic defaults are easier to resolve, mainly because bonds issued under local law can be amended by an act of parliament, as happened in Greece 2012 (Buchheit and Gulati 2018).<sup>48</sup> There is no such “local law advantage” for debt issued in foreign jurisdictions, where creditors are protected by the rule of law abroad and have more options for legal enforcement via courts (see Section 9 as well as Chamon, Schumacher, and Trebesch et al. 2018 and Schumacher, Trebesch, and Enderlein 2018). Beyond the legal realm, governments can also exert “moral suasion” on their domestically regulated banks and institutions, meaning they can pressure them into purchasing domestic sovereign debt or into accepting a debt exchange offer. Recent research documents that such “moral suasion” played an important role in the eurozone crisis and in earlier crises involving domestic debt (Acharya and Rajan 2013, De Marco and Macchiavelli, 2016, Ongena, Popov, and Van Horen 2019). This is consistent with Reinhart and Sbrancia (2015) and Reinhart and Rogoff (2015), which suggest that debt conversions and other tools of “financial repression” were used to resolve debt overhangs in advanced countries in the 19<sup>th</sup> and 20<sup>th</sup> century (see also Chari, DAVIS, and Kehoe 2020). Compared to domestic banks, it is much more difficult for sovereigns to exert pressure on external creditors who have less skin in the game and whose incentives often are unaligned (Reinhart and Trebesch 2015). This may be one of the reasons why external debt crises tend to take much longer to resolve than domestic ones, dragging on for years or even decades (Reinhart and Rogoff 2009). Put differently, “home bias” in sovereign debt issuance can help when your home is in distress since domestic creditors may be more prone to roll over debt and to share the burden of crisis resolution.

If domestic debt has obvious benefits, why, then, do countries continue to issue debt in foreign currency and in foreign markets? A series of recent theory papers explores this question, focusing on two potential explanations: inflation risk and policy credibility. The research emphasizes that governments are unable to commit to monetary policy, exchange-rate policy, and debt policy, making it hard for them to issue domestic bonds. Such commitments prove particularly problematic for emerging market borrowers and commodity exporters that face

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<sup>48</sup> Prior to the debt exchange of 2012, the Greek parliament passed a law that retroactively inserted collective action clauses (CACs) into outstanding domestic law bonds, so that a majority of bondholders could vote on the exchange of all outstanding Greek bonds, at a haircut above 50% (Zettelmeyer, Trebesch, and Gulati 2013).

frequent, negative terms-of-trade shocks (Drechsel and Tenreyro 2018). Indeed, maintaining credible commitments has proven difficult for EMEs since at least the 19<sup>th</sup> century. Even when developing countries committed to hard pegs during the classical gold standard era, frequent commodity-price shocks led investors to price expected depreciation into domestically-issued bonds of EMEs (Mitchener and Pina 2020).

An example of this line of research is Du, Pflueger, and Schreger (forthcoming), which uses a New-Keynesian model to examine how the credibility of monetary policy and risk-averse borrowers affects the currency composition of sovereign debt. They provide empirical evidence that countries with more credible monetary policies are able to issue more domestic debt. Their model offers an explanation: governments lacking credible commitments will pursue “excessively countercyclical” inflation policies *ex post*, resulting in higher risk premia on local currency debt and, thus, less domestic issuance. Ottonello and Perez (2019) also study the currency composition of sovereign debt. In their model, domestic currency issuance provides a means for governments to hedge against income shocks. Since exchange rates depreciate during recessions, a greater share of debt issued in domestic currency will reduce the real debt burden and attenuate some of the real shock. However, as in other models of this type, the perverse incentives to inflate or depreciate away the debt are constrained by investors who bake it into bond prices and yields *ex ante*. In equilibrium, the government must take this into account in choosing the amount of home-currency debt it issues. Relatedly, Engel and Park (2018) show in a model of a small, open economy that governments with more discipline in their monetary policy are able to borrow more in local currency and thus can hedge shocks better. These theoretical results are consistent with the evidence in Burger and Warnock (2006), which finds that local currency bond markets are more developed in countries where institutions are more developed and inflation is stable. And, it may also relate to events in Europe after 1999. Aguiar et al. (2015) show that countries can gain inflation credibility by joining a currency union: this may have fostered the domestic borrowing boom in the eurozone after 1999. Further, recent research suggests that the issuance of domestic-currency debt has increased in the last 20 years, especially for advanced economies with good fundamentals (including stable inflation and low debt-GDP ratios). Interestingly, this trend appears to have been accelerated by the 2008 crisis (Hale, Jones, Spiegel 2020).

The findings in this literature suggest that, with financial development, emerging market countries will issue a significant amount of debt in their home currency and under local law going forward. Consequently, it would not be surprising if we witness more domestic sovereign defaults in the 21<sup>st</sup> century.

## **8. The return of official sovereign lending (by states and central banks)**

As we have shown, many of the recent advances in research have focused on sovereign debt in the form of bonds, typically contracted with commercial banks or investment banks. However, there are other types of lending that have, once again, become an important source of government financing, in particular official loans, including sovereign-to-sovereign lending.

Considerably less is known about official sovereign lending, both empirically and theoretically. In this section, we sketch historical and modern trends in official lending and summarize a small emerging literature on the topic.

Figure 8 shows that international official lending (defined as loans extended by governments and multilateral institutions to other governments) has been a regular part of the sovereign debt landscape over the past 200 years, with particularly pronounced periods during financial crises and wars. Official lending has shown a strong resurgence since the mid-2000s for at least three reasons. First, sovereign bailouts, i.e. cross-border crisis lending, reached new heights between 2008 and 2012. Second, new sovereign lenders have emerged, partly filling the gap left by the traditional 20<sup>th</sup>-century bilateral lenders, such as the US government. Most notably, the government of China has become a major global creditor, extending large-scale loans to developing countries around the world, often with strings attached (such as preferential access to raw materials). Third, due to reserve accumulation by EMEs as well as large-scale domestic bond purchase programs in advanced countries, central banks have become major holders of sovereign debt. Relatedly, short-term lending flows between central banks of different countries have surged in the form of central bank “swap lines.”

### *8.1. Bailouts and international rescue lending: patterns, determinants, and consequences*

Roubini and Setser (2004) and Barkbu, Eichengreen and Mody (2012) review the history of rescue lending and sovereign bailouts over the past decades. One central insight is that both the likelihood and size of sovereign bailouts have grown. The rescue packages arranged by the IMF and regional institutions, such as the European Stability Mechanism (ESM), were larger than anything we had seen since World War II, and easily surpassed the scale of rescue lending during the 1980s debt crisis, the Asian crisis of 1997/98, the Mexican peso crisis of 1994, and the Russian crisis of 1998. At the same time, the reliance on debt restructurings with private creditors (“bail-ins”) has declined. Ireland, Portugal and Spain received record amounts of official support in 2010-2012; however, with the exception of Greece, private bondholders were paid in full and on time and did not face a debt restructuring or “haircut.”<sup>49</sup>

Figure 7 shows the trend toward larger international bailouts. IMF program size has increased notably over time, in particular in advanced countries and large emerging markets. Of the 20 largest IMF lending programs since WWII, almost all (17) occurred since 1998 (Reinhart and Trebesch 2016b). Adding to this trend, the IMF recently arranged the largest program in history, Argentina’s 2018 USD 57 billion program. Moreover, since the start of the global pandemic, more than 100 member countries have signed up for IMF emergency financing.

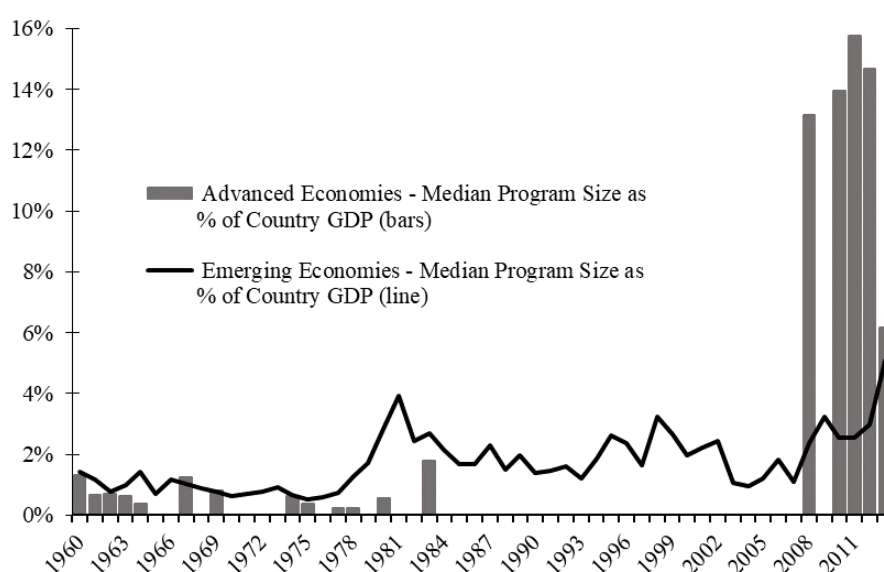
Cross-border lending by sovereigns and other official creditors, such as central banks, is also an important feature of historical debt markets. Bordo and Schwartz (1999) show that “country rescues,” as they call them, occurred regularly since the 19th century, albeit they were smaller

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<sup>49</sup> There was also a minor debt restructuring in Cyprus involving a subset of the debt and a low haircut.

and more ad hoc than today. In line with this, Horn, Reinhart and Trebesch (2020) find dozens of events of international rescue-lending in response to financial crises, e.g. during the Baring crisis of the early 1890s and the Panic of 1907. More generally, building on a newly-assembled database, they find that total sovereign-to-sovereign lending is large, often exceeding total private lending to sovereigns, particularly during disasters and wars, such as WWI and WWII. Figure 8 shows that the record bailouts between 2008 and 2012 pale in comparison to the huge cross-border official transfers during and after the world wars. The 1950s and 1960s also stand out as an era of large-scale official flows, while private cross-border investments were impeded by widespread capital controls and tight regulation of financial markets.

Figure 7: Sovereign bailouts: IMF programs, 1960-2013



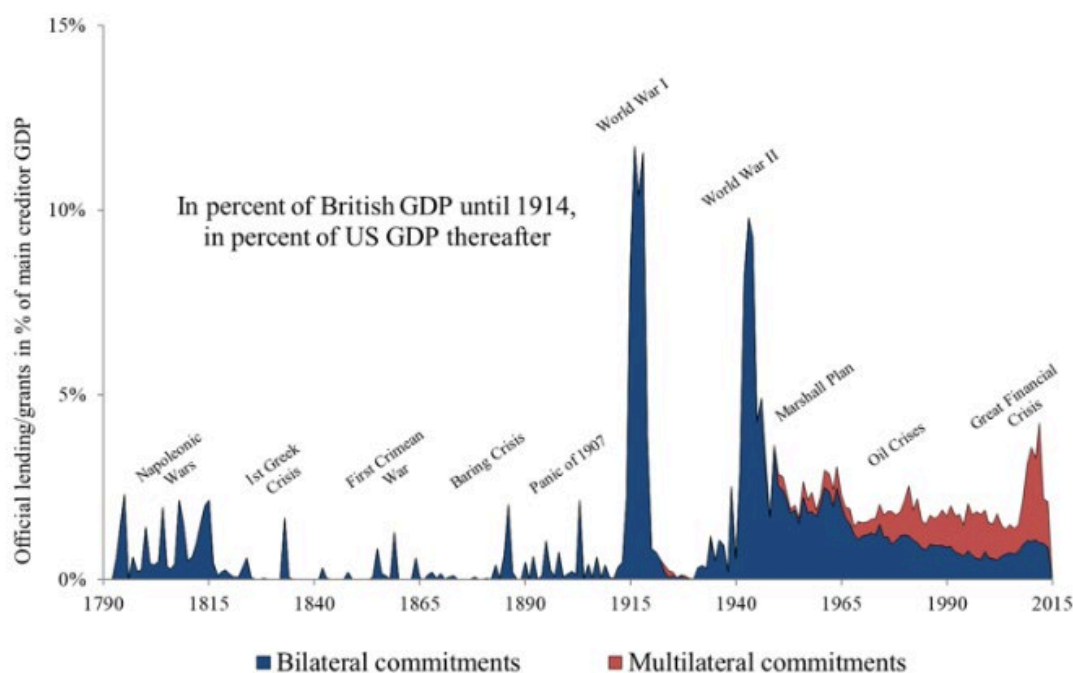
Sources: IMF MONA, WDI, Reinhart and Trebesch (2016b)

Why are governments willing to extend international rescue loans to other governments and what explains their size and direction? Relatedly, why do some of the largest bailouts occur between neighboring countries, e.g. by the US towards Mexico or within a monetary union? Tirole (2015) addresses these questions with a model of “country solidarity,” in which the main driver of rescue lending is the fear of adverse, cross-border spillovers. Rescue lending is largely a function of economic self-interest, since assisting a crisis country reduces the potential for collateral damage to the rescuer’s economy. The existence of negative spillovers to nearby economies has been well documented in historical debt crises (e.g. Mitchener and Weidenmier, 2008). By that same rationale, rescue lending will increase with the scale of economic and financial integration between two countries. This helps to explain the large and spontaneous “ex-post” bailouts arranged between the highly integrated eurozone economies in 2010-12. The same basic mechanisms also influence the optimal “ex-ante” insurance contract. Tirole (2015) shows that, in case of large asymmetries between countries, healthy economies have no

incentives to enter a join-and-several liability contract ex-ante, e.g. via eurobonds. Instead, in a setting like the eurozone, the optimal contract relies on market financing and a borrowing cap.

Gourinchas, Martin and Messer (2020) and Azzimotti and Quadrini (2018) also find that international bailouts between integrated economies are “ex-post” efficient and welfare improving since they reduce the crisis costs of both creditor and recipient country. The driving force is the same: governments are willing to extend rescue loans to other governments in order to reduce the economic externality caused by a default or “euro exit”. Gourinchas, Martin and Messer (2020) further show that the entire surplus of such bailouts goes to the fiscally strong “northern” countries. This is because the creditor government has no incentive to give more than the bare minimum transfer that keeps the debtor country from defaulting. As a result, in equilibrium, the bailed-out country is indifferent between a default and a bailout, and is not made better off by rescue lending. This result is consistent with Jeanne and Zettelmeyer (2001), who find that the cost of international bailouts is largely borne by domestic taxpayers rather than by the taxpayers from abroad.

Figure 8: Official international lending, 1790–2015 (bilateral and multilateral)



*Note:* Data and graph from Horn, Reinhart, Trebesch (2020). Gross aggregate official lending commitments by multilateral (in red) and by bilateral creditors (in blue) in percent of the main creditor’s GDP. The data includes commitments through grants and loans, but excludes official portfolio investments and central bank swap credit.

Using newly collected data, Horn, Reinhart and Trebesch (2020) and Schneider and Tobin (2020) study the determinants of bilateral rescue lending empirically. Both papers confirm theoretical priors: official lending during crises is significantly larger between countries that have close trade and financial linkages, measured by trade and banking exposure. This finding



holds both in historical and modern data, and suggests that “country solidarity” is largely a function of economic self-interest of the creditor government.

Having discussed why international bailouts occur, what are their consequences? Besides reducing costly, cross-border spillovers, one potential effect of international bailouts is to lower the likelihood of default and debt restructurings on private debts (Dellas and Niepelt 2016). This may be one reason for the increasing prevalence of “debt crises without default” (Section 3), such as in Portugal in 2011/12, which avoided default largely due to the large-scale and concessional ESM and IMF loans.

In line with this, Schlegl, Trebesch and Wright (2019) find that private creditors have become increasingly senior compared to bilateral government-to-government creditors. Building on a newly constructed database of haircuts and arrears towards official and private creditors, they show that sovereigns favor foreign banks and bondholders when it comes to repayments. The default probability is significantly higher for bilateral creditors, i.e. on debts owed to other sovereigns. In addition, the size of haircuts suffered by bilateral official creditors is significantly higher than that on private (bank and bond) debt.

International bailouts thus lower the expected losses of private creditors, which reduces sovereign bond yields, as emphasized in Dell’Ariccia, Schnabel, and Zettelmeyer (2006), Roch and Uhlig (2018) and Gourinchas, Martin, and Messer (2020).<sup>50</sup> The reduced borrowing costs may, however, have the unintended effect of inducing overborrowing, especially by countries with weak fundamentals. This, in turn, raises the probability of default in equilibrium, with destabilizing effects on political and economic unions (Fink and Scholl 2016, Roch and Uhlig 2018). One possibility for addressing this type of debtor moral hazard is to agree to fiscal rules (Dovis and Kirpalani 2020), or alternatively, to demand that the debtor country implement reforms (Müller, Storesletten and Zilibotti 2019) and adhere to policy conditionality (Jeanne, Ostry and Zettelmeyer 2008).<sup>51</sup>

It may also matter how bailouts are implemented as suggested in the case of bank rescues by Bianchi (2016). Broad-based or “systemic” bailouts are likely to cause fewer distortions in comparison to “idiosyncratic bailouts,” which are the result of country-specific decisions. The optimal bailout strategy, however, has not been studied sufficiently in the case of sovereigns, leaving a number of questions for researchers to explore in the future including: how many policy conditions and reforms should be demanded as part of a bailout; whether long-term

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<sup>50</sup> An alternative view is discussed in Steinkamp and Westermann (2014).

<sup>51</sup> The perverse incentive benefits of international financial bailouts and cooperation also matter in the context of banking crises, which create increasingly large financial spillovers across borders. Fahri and Tirole (2018) find that a government that expects to be bailed out by a foreign country may not sufficiently supervise its domestic banking sector and will tolerate excessive holdings of its sovereign bonds in local banks. These distortions can be reduced by combining a commitment for “solidarity” in cases of crisis with a strong centralized banking supervision. Similarly, Niepmann and Schmidt-Eisenlohr (2013) find that the anticipation of rescue lending from abroad creates incentives to free-ride, resulting in insufficient domestic bank bailouts. It is therefore welfare-enhancing for countries to cooperate, either ex-ante or ex-post.

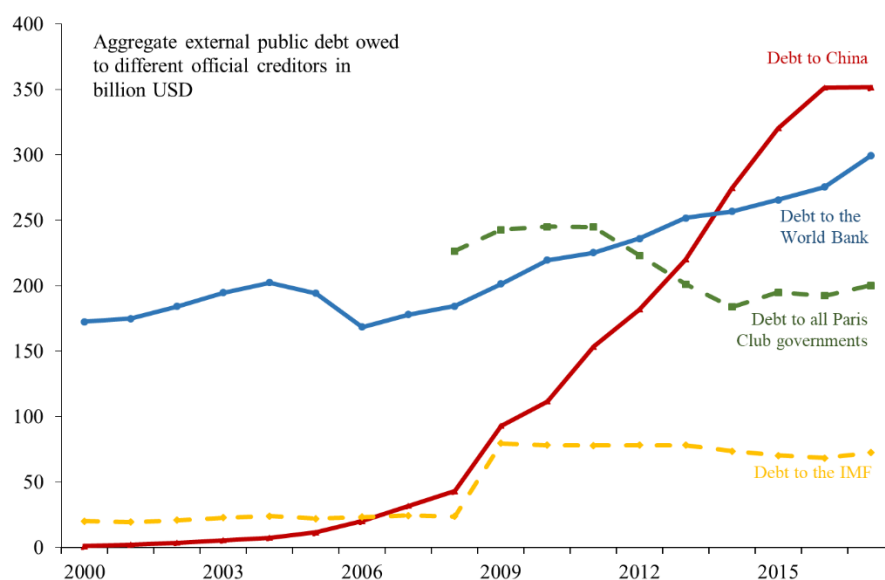
rescue loans are preferable to short- and medium-term credits, such as the typical three-year IMF programs (e.g. Corsetti, Erce and Uy 2018); and, the risk sharing benefits of rescue lending (multilateral, regional, or bilateral, see, e.g. Horn 2020).

## 8.2. New creditor powers and institutions

In contrast to research on the IMF or the ESM, there is little work analyzing official lending and international bailouts initiated by emerging market governments, such as China, Saudi Arabia, India or Russia, despite the fact that these nations play an increasingly important role in today's global financial safety net. "South-to-south" lending flows have been steadily increasing, including lending between emerging market governments or via new regional financial arrangements, such as the Arab Monetary Fund and the Asian Infrastructure Investment Bank (Scheubel and Stracca 2016).

China, in particular, has emerged as the largest official creditor to developing countries over the past 20 years – even surpassing the total lending portfolio of the World Bank (Figure 9). As discussed by Horn, Reinhart and Trebesch (2019), almost all of this lending is state-controlled, meaning that the loans are extended by state-owned banks and other public entities. Moreover, the usual push and pull drivers of international capital flows do not apply in the same way, as China's lending is partly driven by non-commercial motives, such as access to raw materials abroad or by (geo-)political aims.

Figure 9: China has become the largest official creditor to developing countries



*Note:* This figure shows aggregate public debt to different official creditors for all 122 developing and emerging market countries contained in the World Bank International Debt Statistics (excluding China). Debt to China is estimated by Horn, Reinhart and Trebesch (2019). Debt to all 22 Paris Club governments is taken from the Paris Club website (available since 2008). Debt to the IMF and the World Bank Group (IBRD plus IDA) is from the World Bank's International Debt Statistics. Source: Horn, Reinhart and Trebesch (2019).

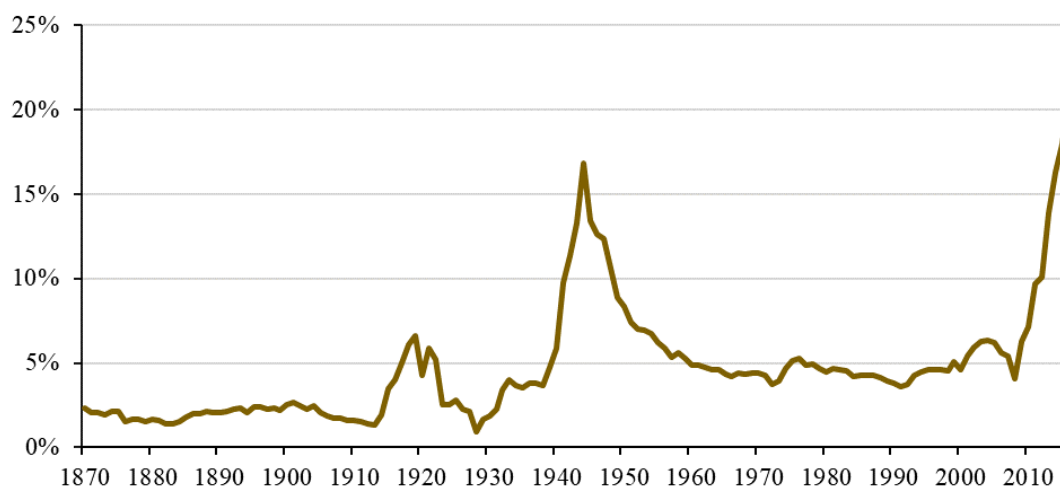
The rise of China as an international lender is reminiscent of Britain during the 19<sup>th</sup> century, when London became the “banker to the world”, comingling foreign policy and foreign investment objectives (Feis 1930). It also parallels the rise of the United States as a global creditor power in the first half of the 20<sup>th</sup> century, most famously via its “lend and lease” programs and the Marshall plan during and after WWII, which involved large sums of bilateral US lending around the world (Mikesell 1962).

### *8.3. Central banks have (again) become a large holder of sovereign debt*

A further reason for the re-emergence of official finance is the increasingly dominant role of central banks as sovereign-debt investors. Central-bank holdings of advanced-economy sovereign debt rose from just 10% in 2004 to more than 30% by the end of 2019 (Arslanalp and Tsuda 2012). The large-scale sovereign bond purchase programs of the past 15 years have turned central banks into the single most important sovereign creditor. “Quantitative easing” policies in the US, the UK, and Japan, as well as crisis-related bond purchase programs (e.g. by the ECB), were implemented in several waves after 2008. As a result, sovereign bonds worth trillions of US dollars moved from the balance sheets of private investors to those of central banks (see D’Amico et al. 2012 and Krishnamurthy, Nagel, and Vissing-Jorgensen 2018). Another important driver for the growing creditor role of central banks has been the reserve accumulation by emerging markets, a trend that accelerated after the Asian crisis of 1997-8 and that resulted in large-scale purchases of US and eurozone sovereign bonds, most notably by the People’s Bank of China (see Gourinchas and Jeanne 2013 and Alfaro, Kalemli-Ozcan, and Volosovych 2014). As a result of the global pandemic, central banks will only become more influential for sovereign debt markets worldwide, given the further wave of bond buying that has been announced since March 2020. In effect, during crises, central banks have turned into “the buyer of last resort”, with large effects on bond yields and government market access (Acharya, Pierret and Steffen 2018).

Figure 10 shows that these developments are reminiscent of earlier periods, in particular the interwar years and the decade around WWII. In those eras, advanced-economy central banks were already playing the role of “buyer of last resort” – helping to finance the record sovereign debt issuance by Great Britain, France, the US and other countries (Ferguson, Schaab, Schularick 2015). Starting with the Great Depression, the share of advanced-economy government debt held by domestic central banks increased dramatically, reaching its apex around 1945. Due to the crisis induced by the global pandemic, we are now quickly approaching this previous historical peak. Thus, while private investors are retreating, official investors are becoming an ever more important financier of governments worldwide.

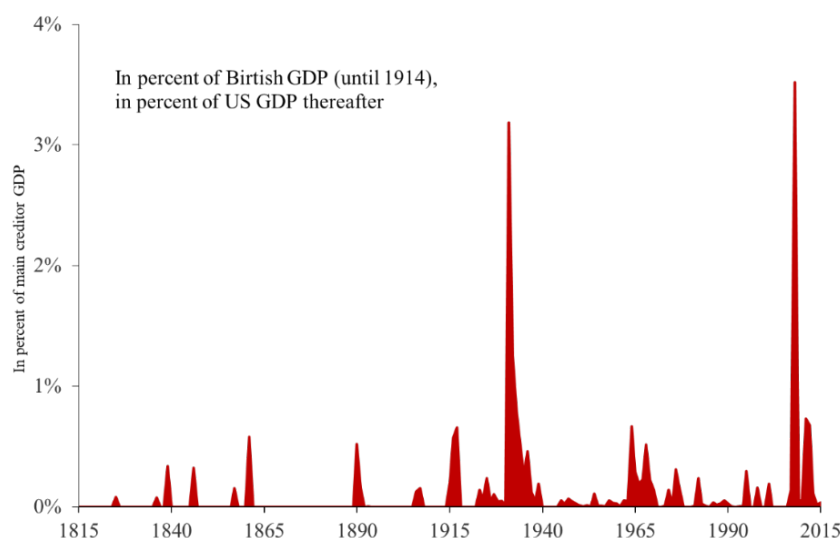
Figure 10: Central bank holdings of governments debt (as % of GDP, 1870-2016)



*Note:* Data on sovereign debt holdings by central banks by Ferguson, Schaab, Schularick (2015, and updated 2020). Countries included in the sample are Australia, Canada, Finland, France, Germany, Italy, Japan, Norway, Sweden, Switzerland, UK, US.

Alongside the increased central bank bond purchases at home, we are also witnessing a return of central bank lending beyond domestic borders in the form of central-bank swap lines. In particular, since 2008, the US Federal Reserve has developed a swap-line network with more than a dozen foreign central banks, allowing participants to obtain short-term (dollar) liquidity. Tooze (2018) and Bahaj and Reis (2018) show that the swap line drawings in 2008 and 2020 played a decisive role in reducing financial market distress and in lowering the cost of dollar funding for banks and firms in recipient countries.

Figure 11: Central bank lending across borders, 1815-2015



*Note:* The graph shows a time series from Horn, Reinhart and Trebesch (2020) based on ongoing research on cross-border central bank lending since 1815. The data includes central bank short-term credits to foreign central banks as well as bilateral swap line drawings (after WWII), shown in percent of UK GDP until 1914 and in percent of US GDP thereafter.

A little-known fact is that the volume of these cross-border emergency dollar loans was substantial, surpassing USD 500 billion in 2008 and USD 400 billion in March 2020. Even less well known is the increasing role of China's central bank as a creditor to foreign countries. As of 2018, the People's Bank of China has signed swap agreements with more than 40 foreign central banks and for drawing rights amounting to USD 550 billion in total (Horn, Reinhart and Trebesch 2019).<sup>52</sup>

This type of central bank coordination, however, is nothing new. On the contrary, credit lines and short-term loans between central banks were widespread in the 19th century as well as during the interwar gold standard system and after WWII (Eichengreen 1992, Flandreau 1997, Eichengreen 2008). Moreover, swap lines by the US Federal Reserve were first extended on an ad hoc basis in 1936 and became increasingly institutionalized beginning in the 1960s (Bordo, Humpage and Schwartz, 2015). And yet, the scale of cross-border central bank lending in 2008 exceeded those periods. This is visible in Figure 11, which shows a time series of overseas central bank lending in percent of British GDP (until 1914) and US GDP thereafter. The 2008 peak exceeds the previous one in 1930-31, when the central banks of Austria, Hungary, Germany and Britain received large-scale rescue credits in the wake of a sudden stop in private capital flows, domestic bank runs, and increasing pressure on the gold standard system.

In summary, recent evidence suggests that we are entering a new era in which official creditors fundamentally shape sovereign debt markets worldwide – a partial reversal to the era of official finance and financial repression of the 1950s. We are only starting to understand the implications of these developments for governments and private investors alike.

## **9. Holdouts and legal risk in sovereign debt restructurings**

A fundamental factor shaping sovereign debt markets is the “enforcement technology” available to creditors in the event of a default. These range from legal sanctions, to “reputational sanctions,” and to punishments outside of the debt contracts (Bulow and Rogoff 1989ab; Shleifer 2003; Bolton and Jeanne 2007; Aguiar and Amador 2014). Questions of enforcement are so central because, unlike corporations, sovereigns have long been protected by the doctrine of “sovereign immunity,” which helped to shield public assets from being seized and liquidated.

In this subsection, we briefly discuss the evolution and characteristics of sovereign debt enforcement over a long horizon, focusing our attention on the most recent developments.<sup>53</sup> In particular, we highlight the increasing risks of disruptive holdouts and litigation strategies in situations of default, which have strengthened creditor bargaining power in the past decade.

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<sup>52</sup> According to their data, since 2013, Pakistan, Argentina, Mongolia, Russia, and Turkey have all made use of their standing lines with the PBOC. For example, as of end-2018 China had extended USD 18.9 billion to Argentina (3 % of GDP) and USD 1.75 billion to Mongolia (around 15 % of GDP).

<sup>53</sup> See Panizza, Sturzenegger and Zettelmeyer (2009) for an earlier survey on the topic.

Given the evolving legal environment, restructuring external sovereign debt in an ad hoc manner appears to have become more challenging.

### *9.1. Enforcement in history: banker collusion, market exclusion, and military threats*

Enforcement technologies have taken different forms throughout history. Their exact form has depended on the relative power of creditors versus debtors, the sources of lending (bankers, markets, other states), and the likelihood of third-party involvement (e.g., international agencies, such as the IMF). In early modern Europe, coalitions of direct lenders, not markets, financed sovereigns and enforced repayment. Drelichman and Voth (2014) examine lending by 16<sup>th</sup>-century Genoese bankers to Philip II, the King of Spain. Philip II was a serial defaulter, so bankers used collusion and lending moratoria to enforce repayment. Social and monetary sanctions ensured compliance with their commitment not to lend when the sovereign defaulted. According to the authors, this sustained lending to Philip II over many decades.<sup>54</sup>

In the 19<sup>th</sup> century, a variety of sanctions were employed, often resulting in market exclusion, i.e. a “financial embargo” of defaulting countries. First, market conventions at the time prohibited sovereign defaulters to issue bonds on the London Stock Exchange (LSE). This was an important deterrent to defaulting, since the LSE was the primary market for raising funds until the end of the 19<sup>th</sup> century (Flandreau and Flores 2009, 2012). In addition, Flandreau, Gaillard, and Panizza (2010) show evidence on reputational sanctions via “gatekeeping.” That is, the most reputed investment banks that placed sovereign debt in the 19<sup>th</sup> century would only deal with sovereigns with a good repayment record, thus punishing defaulters. Military and diplomatic threats were another main enforcement tool in sovereign debt markets of the 19<sup>th</sup> century, such as the occupation of France after their defeat at Waterloo.<sup>55</sup> Mitchener and Weidenmeier (2010) argue that such “supersanctions” were a credible and powerful enforcement device from the mid-19<sup>th</sup> through the early 20<sup>th</sup> century.<sup>56</sup> Specifically, they show that the threat of sending gunboats or placing countries under “fiscal house arrest” played a substantial role for government decisions to repay, for crisis resolution, and for the evolution of bond yields.<sup>57</sup> They find that 64% of sovereign defaulters experienced supersanctions.

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<sup>54</sup> An alternative interpretation is offered by Alvaréz-Nogal and Chamley (2014, 2016), who argue that what sustained Philip’s borrowing was not the Genovese cartel, but the expectation that short-term debt would be converted into long-term debt, with the latter being guaranteed by the revenues of the cities represented in the Cortes or Spanish Parliament.

<sup>55</sup> In the wake of Waterloo and the signing of the Second Treaty of Paris in November 1815, France’s public finances were in shambles. Yet allies were demanding that France pay the costs of the Napoleonic War. In the following ten years, France managed to triple its sovereign borrowing, borrowing at low interest rates that were comparable to the British consol. How did it do so? According to Oosterlinck, Ureche-Rangau, and Vaslin (2014), the threat of military intervention initially guaranteed repayment. Later on, France benefited from reforms it enacted to improve the state of public finance, which reassured markets.

<sup>56</sup> Military sanctions had long been viewed as rare and isolated incidents although probabilities of intervention, conditional on default, were not computed (Lindert and Morton 1989; Lipson 1985).

<sup>57</sup> See, also, the results in Esteves (2013), which emphasizes the role that committees of bondholders can potentially play in regulating debt. A number of follow-up studies provide detailed accounts of the applications of supersanctions during the 19<sup>th</sup> century. See, for example, Tuncer (2015) on Turkey and Maerean and Sharp (2018) on Southeast Europe.

Similar to the story for the French after Waterloo, Mitchener and Weidenmier (2005) find that the threat of military intervention reassured bondholders and lowered the sovereign bond yields, especially of Central American and Caribbean countries. This was due to a notable shift in US foreign policy following the 1904 Roosevelt corollary to the Monroe doctrine, which implied that the US government may intervene militarily in case of default, and actually intervened in Santo Domingo in 1905 to show that the threat was credible. Tomz (2007) focuses on understanding the role of reputation and reputational sanctions throughout history, arguing this could have been an additional way of regulating debt during this period.

In the interwar years and in the decades following World War II, the ability of private creditors to impose direct or indirect sanctions weakened. Eichengreen and Portes (1989, 1990) and Eichengreen (1991) explain that no effective mechanism existed to exclude defaulting countries from the main international bond market at the time: the New York Stock Exchange. They also show that the involvement of creditor governments in sovereign-debt renegotiation became less frequent and did not yield substantial benefits for private bondholders. Moreover, “the use of military force for debt collection was basically a thing of the past” (Eichengreen and Portes 1989, p. 232). Since the 1990s, rating agencies took over the original role of issuing houses as gatekeepers, but with less teeth (Flandreau, Gaillard and Packer 2011), while other direct enforcement devices such as legal sanctions and creditor litigation played a limited role, at least until the 1980s (Waibel 2011, Sturzenegger and Zettelmeyer 2006).

### *9.2. Enforcement today: the erosion of sovereign immunity and the rise of creditor litigation*

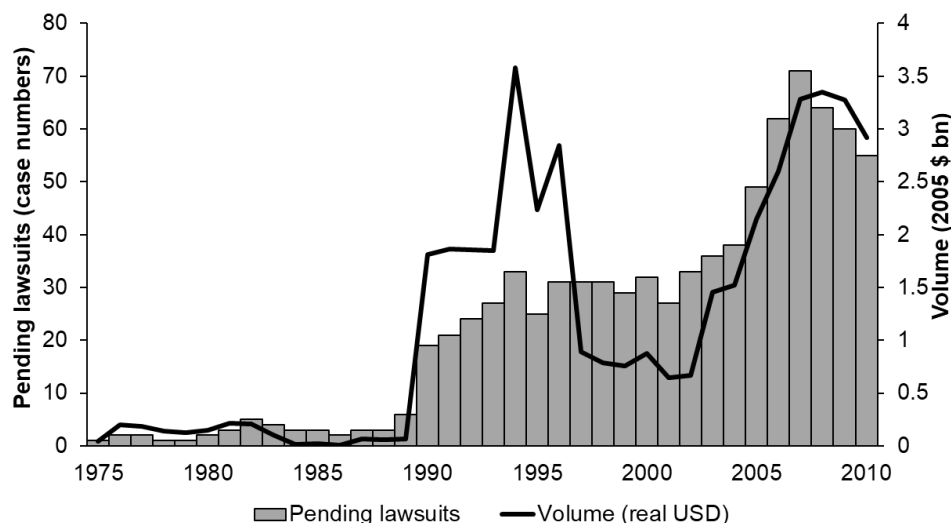
In the past 20 years, with the rise of holdout litigation, the threat of market exclusion and creditor sanctions has once again gained prominence. Schumacher, Trebesch and Enderlein (2015) document the gradual erosion of sovereign immunity, which was set in motion by the passage of the Foreign Sovereign Immunities Act of 1976 in the U.S. The act adopted a stricter doctrine of immunity for sovereigns, meaning that defaulting sovereigns were no longer shielded against lawsuits in New York. A series of subsequent court decisions in London and New York strengthened the hand of creditors and weakened the available legal defense options of sovereigns.

The result was more lawsuits and legal threats, especially since the early 2000s when specialized distressed debt funds entered the market. Figure 12 shows the increase in the incidence of creditor lawsuits on sovereign debt issued in New York or London.

Legal disputes are now a regular consequence of defaults, changing the nature of debt resolution. In the 2000s, half of all sovereign debt restructurings involved legal disputes with creditors, with the cases often stretching on for many years. A typical strategy deployed by distressed debt funds (sometimes called “vulture funds”) is to buy up defaulted debt at a deep discount, reject the government’s debt restructuring offer, and litigate for full repayment via a lawsuit in London or New York. In addition, litigious creditors often attempt to seize government assets abroad, including commodity exports, central bank assets held in the US, or

even presidential airplanes and dinosaur fossils on exhibition. Ultimately, the aim is to force the sovereign into an out-of-court settlement with a handsome payout. Of course, the side effect of this creditor activity can be deadweight losses for the debtor economy, disruption of international trade, and delays in crisis resolution (Benjamin and Wright 2009, Pitchford and Wright 2012).

Figure 12: The incidence of sovereign creditor litigation 1970-2010



Note: The bars show the number of outstanding creditor lawsuits against sovereigns in US and UK courts for each year between 1976 and 2010 (left axis). The black line reflects the total amount under litigation in 2005 US dollars excluding accrued interest or penalty interest (face value, right axis). Source: Schumacher, Trebesch and Enderlein (2018)

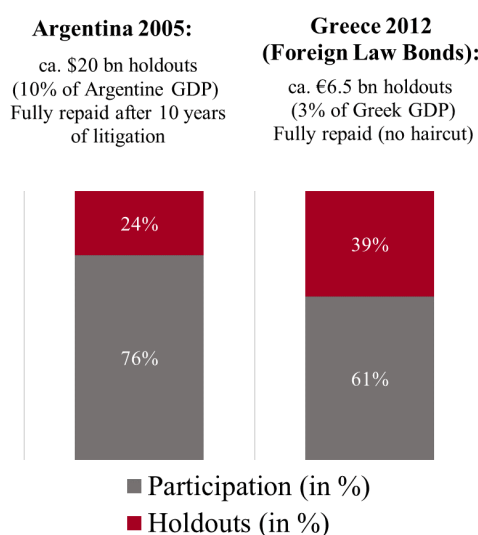
The recent success of holdout and litigation strategies was apparent after Argentina's 2005 restructuring, which resulted in large-scale holdouts and dozens of lawsuits filed in New York and elsewhere. Most importantly, creditors to Argentina threatened to attach debt repayments to other, non-litigious creditors, by invoking *pari passu*. According to New York courts, the *pari-passu* clause implies that sovereign borrowers must pay all creditors "equally and without preference," meaning that holdout creditors must be paid at the same rate as those creditors that participated in a restructuring and accepted a haircut (for details see Gulati and Scott 2012, Cruces and Samples 2016, Buchheit and Gulati 2017). The use of *parri passu* in sovereign debt contracts dates back to the 1800s, although a minority of bonds issued then contained the clause, and it took until the *Elliot vs. Peru* judgment in Brussels and the New York decision in 2012 regarding Argentine debt for courts to recognize the clause as meaning differential settlements were not permissible (Chabot and Gulati, 2014). As a consequence of the legal dispute, Argentina has been barred from issuing new external debt for almost 15 years. In 2016, a newly elected government reached a \$10 billion settlement with creditors holding out, many of whom ended up making double-digit returns on their investment.

A further notable success of holdout creditors was Greece 2012, where almost half of the holders of foreign-law Greek bonds refused to participate in the debt restructuring and were



fully repaid instead (see Figure 13). But Argentina and Greece are not outliers, as shown in Schumacher, Trebesch and Enderlein (2018) and Fang, Schumacher and Trebesch (2020). Legal threats and holdout tactics played a significant role in almost all recent debt crises, including in Ukraine 2015 and in the ongoing defaults of Lebanon and Venezuela (see also Buchheit and Gulati 2017).

Figure 13: Holdouts in recent restructurings: Argentina 2005 and Greece 2012



Note: Holdouts are those bonds not participating in the bond exchange offer.  
Source: Fang, Schumacher and Trebesch (2020).

Moreover, recent research shows that creditor litigation is costly ex-post. For example, creditor-friendly judgments in the Argentina lawsuit caused a significant decline of Argentine bond and stock prices (Ahmed and Alfaro 2017, Hebert and Schreger 2017). In addition, Schumacher, Trebesch and Enderlein (2018) show that litigation is associated with a loss of market access for debtor countries. Since the early 2000s, no sovereign was able to tap international bond markets while at the same time facing the legal threat of asset seizures through foreign courts. Relatedly, Buchheit, Gulati and Tirado (2013) argue that, during the euro crisis, concerns about holdouts and litigation (the risk of “ending up like Argentina”) increased the willingness of policymakers to pay bondholders in full and instead arrange large-scale sovereign bailouts, e.g. in Portugal or Ireland.

These trends suggest that sovereign debt is becoming more enforceable and that litigation is a relevant cost of default. Foreign courts increasingly act as a third-party enforcement mechanism, in the spirit of classic sovereign debt theory (e.g, Bulow and Rogoff, 1989b). They can explicitly or implicitly impose an embargo on new borrowing or block debt repayments on performing bonds. This interpretation helps to bridge two strands of the sovereign debt literature, namely the “reputation view,” suggesting that governments repay because of the threat of exclusion from credit markets and output losses, and the “sanctions view,” according

to which repayment occurs due to the threat of sanctions. The risk of litigation combines both elements – a legal sanction resulting in lost market access.

Broner, Martin and Ventura (2010) add an additional perspective on enforcement power in recent decades. Since foreign creditors can sell their bonds to domestic creditors, who have electoral leeway over their governments, they argue that secondary markets act as an enforcement device in modern democracies. Arguably, this political-economy channel worked less well in the 19<sup>th</sup> century, with limited enfranchisement and relatively less sovereign debt issued in domestic capital markets (in part due to less developed financial institutions).

How do the developments fit in a longer historical perspective? One way to interpret recent trends is that enforcement technologies are returning to their long-run equilibrium after a few decades of decline and stagnation. On the one hand, if the shift towards stronger creditor rights persists, it could be beneficial for sovereign debt markets, as it may act as a disciplining device that limits overborrowing and facilitates quicker restructurings (e.g. Shleifer 2003, Pitchford and Wright 2012). That being said, it is far from clear whether the recent creditor successes will prove long-lasting and robust, given UK and US court systems are based on case-law traditions and continuously evolve. This puts creditors' most effective weapon, *pari passu*, at risk.

However, in the short and medium run, the risks of holdouts and creditor litigation is likely to make the resolution of debt crises more difficult, maybe excessively so (Bolton and Jeanne 2007). This could prove a major challenge in the wake of the economic distress caused by the global pandemic. Given this backdrop, there are several areas that call out for further research. One is understanding the consequences of legal and holdout risks, both ex-ante (for borrowing costs) and ex-post (as a cost of default and as a hurdle for crisis resolution). A second is delving deeper into the process of holdout and litigation strategies, the creditors involved, and the financial returns to holding out. A third is examining potential policy interventions that target the “holdout problem,” including analyzing relevant bond clauses, such as collective action clauses (e.g. Carletti et al. 2020), but also regarding more statutory sovereign insolvency frameworks (e.g. Gianviti et al. 2010, Bolton et al. 2020).

## 10. Conclusion

The Great Recession and the eurozone debt crisis inspired a wave of empirical and theoretical research on sovereign debt, rivaling that produced after the Latin American debt crisis of the 1980s. It reinvigorated work on classic questions, such as the reasons for sovereign lending and default, the costs of default, and debt workouts. Scholars have poured these “old wines” into new bottles, often looking for underappreciated or overlooked elements, such as the transmission of sovereign risk to firms and how that, in turn, affects investment and output. It also spurred work on “new wines” or features of crises, perhaps most importantly sovereign-bank “doom loops” and the increasing financialization of the global economy.

As the eurozone debt crisis unfolded, much of it felt quite new, but in hindsight, our survey reveals that many of its features bear a striking resemblance to earlier crises in emerging and advanced economies. The parallels are particularly strong with Mexico's 1994-5 crisis. Both episodes featured (i) roll-over problems and self-fulfilling crisis dynamics, (ii) severe debt distress without default, (iii) sudden stops in private capital flows followed by large-scale rescue lending (bailouts) from abroad, (iv) a shortening of bond maturities during distress, and (v) contagion to other sovereign bond markets in the region. From today's perspective, there is therefore much truth in the statement of former IMF director Camdessus that the so-called Tequila crisis was "the first crisis of the 21st century." Indeed, our survey suggests these features will more than likely be part of future crises as well.

Our survey also highlighted features that are idiosyncratic to the eurozone debt crisis, such as the role of monetary unions for borrowing and default decisions, but also emerging trends that happened to coincide in timing with it. For example, as more EME governments issue their debt domestically, and the debt is often sold to domestic banks, domestic debt defaults and the challenge of bank-sovereign linkages will likely matter in the coming decades in emerging markets as well. It also appears that the risk of holdouts and increased litigation will not be subsiding, as enforcement options for creditors are stronger than they have been in a very long time. Finally, the renewed importance of official creditors and cross-border rescue lending, including central bank "swap lines" and rising creditor powers such as China, is another changing feature of the international landscape of sovereign debt.

The research trends of the past decade show that, in addition to important theoretical advances, empirical methods have improved, drawing from applied microeconomics and increasingly relying on state-of-the art research design for causal identification. There are also promising developments that combine micro-based sovereign debt models with heterogeneous creditors and firms that can be tested using large-scale, micro-level data. Looking ahead, more opportunities will emerge from the development of rich new datasets with tens of thousands of bonds and banks, or going back far in time.

Many questions and puzzles remain, suggesting some directions for future research. How will advanced and developing country governments deal with the large public debt burdens going forward, especially if interest rates were to increase again? How much more debt can the market absorb given that the level of public indebtedness is already at historic highs? What are the implications of the expanding central bank holdings and growing sovereign bailouts by official creditors? In case of future turmoil, will self-fulfilling panics, rollover crises and bank-sovereign "doom loops" become more pertinent? And, last but not least, how will the rise of China and other emerging powers influence global debt markets in the decades to come?

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