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BANKING-CRISIS INTERVENTIONS ACROSS TIME AND SPACE

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### **ABSTRACT**

We present a new database of banking-crisis interventions from the Roman Empire to the present, covering 1,946 interventions in 20 categories across 143 countries. We demonstrate that crisis-intervention patterns are significantly related to income and fiscal variables and to measures of the political system and currency regime. GDP losses following crises are economically significant and are larger for wealthier countries, with some evidence that these losses are mitigated by democratic political systems and liberal currency regimes. Finally, intervention frequencies reached an apex during the post-Bretton Woods era, continuing a secular increase since at least the late 17th century.

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A data appendix is available at  
<http://www.nber.org/data-appendix/w29281>  
A database in several formats + appendices about database construction is available at  
<https://som.yale.edu/faculty-research-centers/centers-initiatives/program-on-financial-stability/intervention-paper-and-database>

Banking crises are pervasive. Such crises are costly for economies, for public trust, and for political stability. These costs motivate government action, but what form should that action take? What kinds of interventions work? How exactly should they be structured and sequenced? To answer these questions, we would like to learn from long-run empirical evidence, and to do this well requires a database of past actions. But no such comprehensive database exists. In this paper, we describe our process to construct such a database and analyze the patterns of interventions across time and space.

Since the 1990s, scholars have made considerable progress in building databases and chronologies of banking crises. We build upon this work, starting with a union of such events from four major chronologies, a set that we denote as “canonical crises”.<sup>4</sup> One goal of our project is to identify all government interventions during these canonical crises, but another goal is to catalogue similar types of interventions done at other times. One reason to extend the scope in this way is that the existence of an intervention may be a sign that there was indeed a banking crisis that was overlooked by the past literature. But perhaps more intriguing is the possibility that such interventions played a role in successfully preventing an incipient crisis, and those would certainly be interventions worthy of further study. Since the time periods around such interventions may signify previously unidentified or incipient crises, we label them as “candidate crises”. Thus, every intervention in the database is associated with either a canonical or a candidate crisis, and we refer to the union of those two groups simply as “crises”.

In crises, governments have used a broad policy arsenal, acting through monetary, fiscal, and regulatory authorities. Many of these interventions operate by shoring up some component of bank balance sheets. In a crisis, a weakness of bank (or other intermediary) balance sheets carries negative externalities for other parts of the economy or the public sector. In the acute, “panic”, phase of a crisis, concerns about bank solvency can induce short-term creditors to run on a bank, decreasing its ability to sustain its liabilities. The traditional lender-of-last-resort (LOLR) function of central banks is just a direct replacement of such liabilities. If the panic has been driven by some short-term dislocation of markets, then such emergency *lending* may be all that is necessary. In cases where the government is confident of the ultimate solvency of banks but still concerned

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<sup>4</sup> These four chronologies are Reinhart and Rogoff (2009), Schularick and Taylor (2012), Laeven and Valencia (2020), and Baron, Verner, and Xiong (2021). We discuss our selection of these chronologies later in this introduction, and then provide more details in Section II.

about future runs, then an alternative action would be to extend *guarantees* to liabilities that go beyond any existing deposit insurance. Such guarantees, which work on the same part of the balance sheet as does the LOLR, were widely used during the global financial crisis.

If bank-solvency concerns are real and lasting, governments may need to consider interventions on other parts of the balance sheet. Instead of just replacing or guaranteeing liabilities, the government can provide equity through *capital injections*, which could reassure depositors of solvency and reduce the incentive to run. Such investments are complex to structure and have political challenges. Nevertheless, their use has increased greatly in the modern era.

In some cases, the solvency of the banking system is threatened by the concentration of certain kinds of assets. The credit booms that precede crises are often focused on specific asset classes and loan types, and banks face a coordination problem in exiting or restructuring them. In those cases, governments often move to the left side of the balance sheet through *asset management* programs, which can solve this coordination problem. When banks are clearly insolvent, the government may still have a role to play in the *restructuring* of these failed institutions, effectively reorganizing the full stack of assets, liabilities, and equity. In some cases, that government role is legally prescribed (many countries do not allow banks to go through regular bankruptcy processes), and in other cases the government role is intertwined with the provision of deposit insurance.

Thus far, each of the categories listed would typically include some outlay or contingent commitment from either the fiscal or monetary authority. But there are other types of interventions that do not have any direct effect on government finance, but instead use government's power to change or suspend *rules* and regulations. Through most of history, bank holidays and more general suspensions of convertibility were a common feature of crisis responses. In the modern era, governments often resort to suspensions of regulatory-capital requirements and to market-based changes like short-sale bans in equity markets. Finally, there is a catchall category of *other* interventions that do not fit neatly into the italicized categories above. This group includes, for example, major communications from senior officials, such as President's Roosevelt's first radio address in March 1933 (during the peak of the U.S. Great Depression), and Mario Draghi's "whatever it takes" speech during the Eurozone financial crisis in 2012 – both representing verbal actions designed to assuage markets amid ongoing banking sector turmoil.

In total, our seven broad categories of interventions are (1) *lending*, (2) *guarantees*, (3) *capital injections*, (4) *asset management*, (5) *restructuring*, (6) *rules*, and (7) *other*. Note that these categories do not include some of the main macroeconomic policies used in crises, such as fiscal stimulus, currency devaluation, or capital controls. This omission is deliberate and necessary. For our purposes, the defining feature of an intervention is that the government action is taken for the main purpose of stabilizing the financial sector. Therefore, by definition, our scope does not include general fiscal- or monetary-policy actions targeted to aid the entire macroeconomy. It is not feasible to catalogue all such actions the same way as we do here for just the financial sector, nor to use any such catalogue to isolate the impact of such policies on just that sector.

Our paper is most closely related to database projects that seek to empirically map and analyze banking distress dynamics across space and time – with perhaps the most closely related one being Laeven and Valencia (2020), one of the four chronologies that constitute the set of canonical crises we use as the starting point for our database construction. Laeven and Valencia cover countries across all income groups since 1976 and – setting the work apart from similar chronologies – also systematically document crisis interventions associated with a crisis event across seven intervention categories.<sup>5</sup> The differences between our project and theirs is driven mostly by different objectives. The Laeven and Valencia paper fits within their larger project analyzing the patterns of financial crises in the post-Bretton Woods period, of which they study 151 cases in-depth. Our focus in this paper is a nuanced classification and analysis of the interventions themselves, even when such interventions occur outside of previously identified crisis periods. This approach allows for extensions further back in time and for inclusion of interventions during candidate crises. The current version of our database includes 1,946 interventions across 911 crises, of which 456 are canonical crises and 455 are candidate crises.

Several other papers have taken a more holistic view of interventions, but rather than to build a comprehensive database they survey samples of major systemic events to analyze intervention responses. Goodhart and Schoenmaker (1992) is an early example, documenting 104 bank interventions in advanced economies dating from the mid-1970s. Calomiris, Klingebiel, and Laeven (2005) provide a general overview of crisis-resolution strategies with recourse to cross-

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<sup>5</sup> Specifically, the authors distinguish between the following interventions categories: (1) deposit freezes; (2) bank holidays; (3) guarantees on bank liabilities; (4) extensive liquidity support; (5) nationalizations; (6) recapitalizations; and (7) asset purchases. (1) – (2) are components of our *rules* category, and (5) – (6) components of our *capital injection* category; (3), (4) and (7) have directly corresponding categories in our framework.

country empirics, with specific crises-containment patterns also being the focus in De Juan (1999), Honohan and Klingebiel (2001), Detragiache and Ho (2010), and recently Calderon and Schaeck (2016).<sup>6</sup>

While comprehensive treatments of crisis interventions are incomplete, there are many studies of specific subsets of interventions. This literature falls into three groups: (1) studies of multiple types of interventions in a specific single crisis context across different countries;<sup>7</sup> (2) studies of interventions in a single specific country across different unique banking crises;<sup>8</sup> and (3) detailed treatments on the effects and empirics of one specific intervention category over time and space (for instance, the effects of bank bailouts).<sup>9</sup> Not least, with the creation of the database described in this paper, we hope to greatly reduce the overhead for authors looking to do such investigations in the future.

The rest of the paper proceeds as follows. In Section I, we further divide the seven categories into 20 specific intervention sub-types. In many cases, the division into sub-types is based on whether the intervention was broad-based for a large group of institutions, or narrowly tailored as an *ad hoc* intervention for a single bank. We consider our classification system to be a logical method of organizing and rationalizing interventions as acting on different parts of the balance sheet of the financial system, a method which then allows for an intuitive graphical representation and potential analyses of balance sheet-specific financial and economic intervention effects.

In Section II, we discuss the database-construction process. This process has several steps. First, we compile a master list of canonical crises from four major crisis-chronology projects:

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<sup>6</sup> There is also an extensive literature that deals with optimal crises responses from a theoretical perspective – for instance Freixas (1999), Farhi and Tirole (2012), or Jeanne and Korinek (2020) – or is primarily concerned with qualitatively ranking optimal crises responses and governance frameworks without recourse to any novel historical datasets – say, as in Beck et al. (2010). Our contribution does not for now seek to directly tie into this strand, or to qualitatively judge the specific historical intervention responses aggregated.

<sup>7</sup> Bignon, Flandreau, and Ugolini (2011) discuss selected crises responses during the gold-standard period by European fiscal and monetary authorities; Grossman (1994) focuses on cross-country banking sector policies during the Great Depression; Goldstein (1998, chapters 3 and 4) discusses “cures” deployed during the Asian Financial Crisis. More recently, some notable contributions from the extensive GFC literature include Aït-Sahalia et al. (2012), Igan et al. (2019), and Bernanke, Geithner, and Paulson (eds. 2020).

<sup>8</sup> A large number of historical case studies – far too numerous to credit here extensively – have over time assessed specific single crises and recorded authorities’ associated interventions. We draw on many these event studies to determine relevant actions, and list this literature systematically as part of Appendix E.

<sup>9</sup> Contributions assess the effects and evolution of a specific intervention (sub-) category within our intervention universe, at times with recourse to unique spatial and chronological intervention datasets: for instance, recapitalizations have received particular attention (Philippon and Schnabl 2013), as have asset-management responses (Klingebiel 2000), blanket guarantees (Laeven and Valencia 2012), or deposit-guarantee policies (Demirguc-Kunt and Detragiache 2002). Similarly, multiple discussions focus more specifically on the binary “bailout or bankruptcy” choice facing policymakers in their crisis response (Rosas 2006; Levitin 2010).

Reinhart and Rogoff (2009), Schularick and Taylor (2012), Laeven and Valencia (2020), and Baron, Verner, and Xiong (2021).<sup>10</sup> The union of these four sources includes 456 canonical crises. Next, for each canonical crisis, we consult the sources cited by the original authors, along with an extensive primary and secondary literature. These two steps yield a list of 1,178 specific interventions. In some cases, we do not find evidence of any interventions that meet our criteria, or we find evidence that policymakers deliberately abstained from an intervention: such crises are listed as “no intervention” in the database.

The same sources used to identify interventions during canonical crises often have evidence of interventions taken at other times. These additional interventions can show up in the historical record for several possible reasons. In some cases, such interventions may have successfully prevented a major crisis, so that existing crisis chronologies do not record an event at that time: but these new events could be particularly relevant to eventually reach normative results on optimal crisis policy design. In other cases, such interventions may be trace evidence of a crisis that did occur but was not detected by the methods of the canonical papers. One advantage of the intervention-prism used in this process is that it allows for the identification of such candidate crises. This is particularly important in the pre-1800 period, when the previous methods of crisis-detection are unlikely to be comprehensive. But we view the main purpose of our database to identify the interventions themselves, and we leave to later work any conclusive statements about the inclusion of our candidate crises in comprehensive crises lists. This additional step adds an additional 768 interventions, which are grouped temporally and geographically into 455 candidate crises. 125 of these candidate crises (associated with 187 specific interventions) occur before 1800.<sup>11</sup>

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<sup>10</sup> We further considered additional crisis chronologies including Bordo et al.’s (2001) extensive documentation, whose crises dates are covered, and those of Duca et al. (2017), or Romer and Romer’s (2017) methodologies. In particular, we recognize efforts to qualify existing crisis-dating conventions, for instance via establishing quarterly level crisis metrics, but we were not able to identify annual-level crisis events in any of these which are not covered in any of the four existing databases discussed above, or being otherwise outside the scope of our additional intervention events recorded. Schularick and Taylor (2012), and Baron, Verner, and Xiong (2021) both incorporate the Bordo et al. crisis (2001) chronology, while the Duca et al. (2017) and Romer and Romer (2017) crises chronologies are comparatively concise, focusing on 50 systemic events in the EU+Norway from 1970 (in addition to 43 non-systemic episodes), and semi-annual distress events in 24 OECD countries between 1967-2012, respectively.

<sup>11</sup> For the present paper, the database time period ends in 2019, and thus does not include any Covid-era interventions. We have an ongoing project to catalogue those interventions, which were far more numerous than in any prior crisis and will eventually be absorbed into the full database. In 2020 and 2021, almost every country in the world made multiple interventions to shore up the financial system, but the canonical crisis thresholds were not triggered, and it will likely be ultimately classified as “candidate crises” for more than a hundred countries in our database. The

Taken together, the current database includes 1,946 interventions, spread over 911 total crises. Our earliest intervention is recorded in Roman times, a financial crisis in the year 33 A.D., which saw the Senate appoint a dedicated “banking commission” and intervened via a cash disbursement to struggling debtors;<sup>13</sup> there is afterwards a large chronological gap, related to the historical (and financial) “Dark Ages” where primary source evidence is traditionally extremely sparse. But from our next data point onwards, several government-led liquidations of banks in Genoa in the 1250s, observations get increasingly more regular. For any *ex post* constructed database, researchers will be interested in exact details of sample selection, both to understand the database itself and to be aware of any possible biases induced by that selection. Perhaps most important is the choice of size threshold for an intervention to be included in the database. A tradeoff is unavoidable here: pick a threshold too high, and many interesting examples will be left out; pick a threshold too low and we will be unable to detect many qualifying interventions in the historical record. Furthermore, since data availability varies by country and over time, and since events in larger countries are more likely to register in the historical record, there are unavoidable sources of bias.

Section III summarizes the patterns of interventions across crises, and analyzes the mixture and likelihood of different interventions as a function of a country’s income, debt capacity, government size, currency regime, and political system. The most pronounced patterns here are in the *guarantee* and *lending* categories. We find that countries are more likely to have a *guarantee* intervention when they are wealthier, have greater debt capacity, and have more democratic political systems. We find that countries are more likely to have a *lending* intervention if they are wealthier and have a more liberal currency regime.

Section IV looks at the GDP losses for both canonical and candidate crises. For this analysis, we define the “GDP gap” as the sum of per-capita GDP below trend growth for the five years following a financial crisis. When compared to a control group of non-crisis base years, we find this total loss to be 17.6 percent (of base-year) GDP for canonical crises and 9.2 percent for candidate crises. We then regress these crisis-level losses on the same control variables used in the previous section, finding evidence that losses are greater in canonical crises for wealthier

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importance of studying candidate crises is perfectly illustrated by the Covid era, as it is possible that these interventions were exactly the kinds of “successful” programs that ultimately prevented a full-blown crisis.

<sup>13</sup> We classify this 100M sesterces cash disbursement as “other” in our taxonomy – it targeted a section outside of the bank sector balance sheet itself, but was deployed with the main policy aim to address bank balance sheet concerns. For further details see Frank (1935).



countries, countries with more autocratic political systems, and countries with more rigid currency regimes.

Section V uses the full database of crises (both canonical and candidate) to calculate the share of advanced-economy GDP experiencing some form of bank stress in any given year. The time-series reveals stark long-run international trends, but also allows more granular secular associations between specific currency and monetary regimes, and respective levels of bank stress. Notably, the series suggests that the four decades since the 1980s represent only the most recent apex in an entrenched trend towards growing absolute intervention frequencies over multiple centuries.

Section VI concludes with a summary of our results and proposals for future applications. Several appendices supplement the text. Online Appendix A describes the database-construction process in greater detail, thus allowing other scholars to supplement the database without having to repeat our searches. Online Appendix B shows how the various data elements are represented in the database, with Appendix C containing robustness results for our regressions. Online Appendix D is the database itself. Appendix E lists all of the primary and secondary sources used for the database construction. Finally, Appendix F contains specific country notes, including details on the country-level historical GDP and exchange-rate data used to calculate intervention sizes, geographic coverage notes, and a discussion of particular intervention cases that might be seen as borderline cases, or open to alternative types of intervention classifications.<sup>14</sup>

## I. **Intervention Categories**

Figure 1 shows the 20 individual types in the seven major categories. The categories are situated on a stylized balance sheet, which can be thought of as representing either a single institution or the entire financial sector. We discuss the elements of the major categories from left to right in Figure 1, beginning with *asset management* (on the asset side), then *guarantees* and *restructuring* (which can operate on both sides of the balance sheet), then *lending* and *capital injections* (liabilities and equity side). The final two categories of *rules* and *other* do not fit directly into this framework, but, as we will see, they usually have balance-sheet implications as well.

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<sup>14</sup> These appendices are included as a single separate online appendix file to this paper. They are also available along with spreadsheet versions of the database at [Program on Financial Stability | Yale School of Management](#).

### ***Asset Management:***

- Broad-based asset management program (BBAM): authorities intervene by partially or fully transferring balance-sheet assets of several institutions or of a major share of the entire financial sector, either to a designated asset management vehicle (AMCs), or to another public or private financial institution. Includes the presentation of plans, or statements of intent by authorities, or the mere enabling of such transfers.
- Ad hoc asset management program (AHAM): authorities intervene by partially or fully transferring balance sheet assets at one financial institution or of a minor overall share of the entire financial sector, either to a designated asset management vehicle (AMCs), or to another public or private financial institution. Includes the presentation of plans, or statements of intent by authorities, or the mere enabling of such a transfer.

### ***Guarantees:***

- Account guarantees (AG): authorities intervene by announcing new deposit insurance or modifying an existing deposit insurance program in a material way.
- Other liability guarantees (OLG): authorities intervene to guarantee existing, future or a combination of existing and future bank liabilities of a single or of multiple financial institutions not related to deposit liabilities.
- Asset guarantees (ASG): authorities intervene by guaranteeing certain items on the asset side of the balance sheet. Blanket guarantees (BG): authorities intervene by guaranteeing multiple items on the balance sheet of one or multiple financial institutions, spanning either one or both of asset and liability components.

**Figure 1:** Overview of major intervention categories and subcategories used (the balance sheet view).

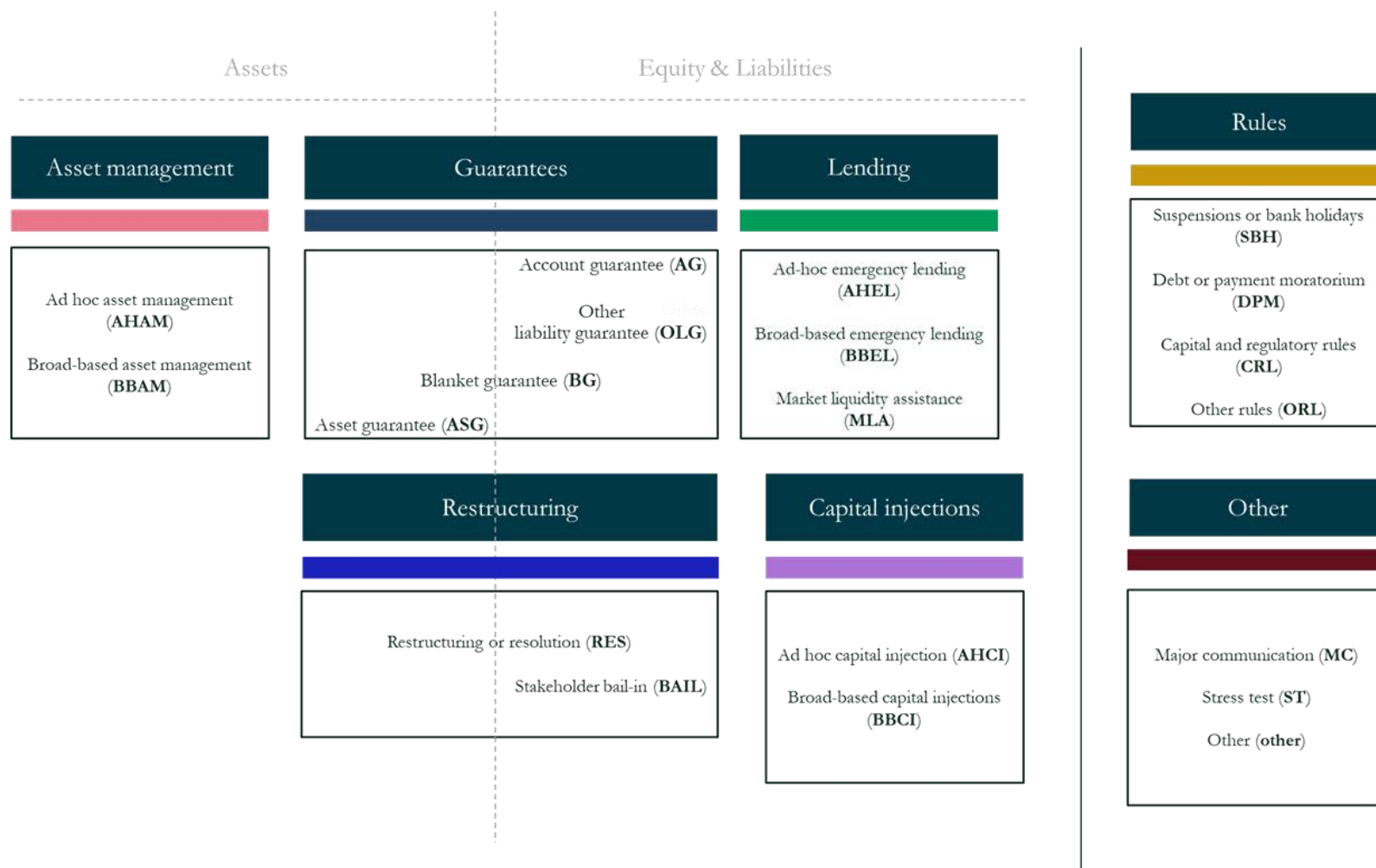


Figure 1 displays the seven major intervention categories (separate boxes) and the 20 types associated with each major category (items within boxes), with items located on a stylized balance sheet for the financial sector. The category and type labeling follow the definitions and descriptions detailed in Section I of the paper.

### ***Restructuring:***

- Restructuring or resolution (RES): authorities intervene by mandating a restructuring, resolution or liquidation process of one or more impaired financial institutions. Such a process does not have to be led operationally by any public authority, and can be undertaken on the operational level fully by the private sector, at the instigation of authorities, or merely involving suasion by authorities. Such restructuring often operates on both sides of the balance sheet.
- Stakeholder bail-in (BAIL): authorities intervene by forcing bondholders or other stakeholders to assume expected or already materialized losses, or forego privileges associated with ownership of a particular asset on the balance sheet of one or multiple affected banks. Historically, this category in also regularly involves cases where authorities decide to seize personal assets and property of bank owners to meet existing liabilities. With very few exceptions, the overwhelming majority of cases in this subcategory are also associated with an additional flag to indicate private-sector participation. In their modern form, “bail-in” interventions such as the March 1990 forced deposit conversion in Brazil (“Collor Plan”, see Crabtree 1991), or the Cypriot equivalent in 2013 – when authorities decided to involve uninsured depositors and bondholders at the Bank of Cyprus’ resolution process (IMF 2014) – are typical examples of this type.

### ***Lending:***

- Broad-based emergency liquidity (BBEL): authorities intervene to provide liquidity to the affected institution(s), via the use of fiscal or monetary channels, providing such assistance either to the entire or a major section of the banking sector. We exclude actions that merely ease financial conditions in the most general sense – such as monetary policy rate reductions – but do include instances where monetary authorities consciously meet a sharp rise in private-sector liquidity demand, for instance by fully discounting eligible paper in the context of a rise in market uncertainty. Historically, on the monetary side these actions are often officially phrased as “discounting freely” or “lending freely” in times of stress. We also include changes in the accepted collateral at the discount window of central banks in this category, to the extent that these changes are enacted against the backdrop of

financial-sector instability. Note, however, that this category does not include changes to reserve requirements – such actions fall into the *rules* group, as described below.

- Ad hoc emergency liquidity (AHEL): authorities intervene to provide liquidity to the affected institution(s), via the use of fiscal or monetary channels along the lines of BBEL, but without providing such assistance indiscriminately to the entire or major portions of the banking sector.
- Market liquidity assistance (MLA): authorities intervene with a key motivation to stabilize liquidity in a specific wholesale-funding market that is under stress. MLAs focus on markets that a central bank believes are critical to financial stability. In common with traditional interventions, MLAs may rely on individual institutions as intermediaries or market-makers to pass on liquidity. It may be described as constituting a “market maker of last resort” action.

#### ***Capital Injections:***

- Broad-based capital injections (BBCI): authorities intervene by directly assuming ownership interest in multiple institutions. Includes the presentation of plans or statements of intent by authorities, even if actual assumption of ownership does not occur.
- Ad hoc capital injections (AHCI): authorities intervene by directly assuming ownership interest in a single institution, or in a clear minority group of total institutions comprising a subset of the banking or wider financial system.

#### ***Rules:***

- Stock market closures, bank holidays, or suspensions of convertibility (SBH): authorities intervene by announcing a stock market closure (either temporary or open-ended), authorizing a suspension of payment convertibility at individual institutions or the entire banking sector; or proceed to implement a general suspension of convertibility on the level of the central bank, if undertaken against the backdrop of banking sector volatility. We do not include general suspensions that occur primarily to safeguard against capital flight or a currency attack, to the extent that these broader macroeconomic motivations are clearly identifiable.

- Debt or other payment moratoria (DPM): authorities intervene by implementing either a partial or general moratorium on debt-service obligations at least partly involving creditors in the banking sector, against the backdrop of distinct banking-sector volatility. Moratoria that are primarily associated with broader political or macroeconomic problems, and not distinctly justified by banking sector volatility are not covered in this category. However, we do include here rare instances of debt *cancellations*.<sup>15</sup>
- Capital and regulatory rules (CRL): authorities intervene by relaxing existing capital requirement or accounting rules, or other rules that would improve the outlook of the future capital adequacy of institutions in the banking sector, and are not covered in the other *rules* sub-categories. Changes in accepted collateral at the discount windows of central banks are not captured in this category – they are to be found under broad-based emergency lending (BBEL), above.
- Other rules (ORL): authorities intervene by amending legal arrangements affecting the banking or financial industry that do not fall into one of the other “rules” sub-categories specified above.

***Other:***

- Stress testing (ST): authorities intervene by mandating a detailed investigation of the sustainability or robustness of one or multiple banking institutions. We record the date that the launch of such an exercise is publicly made known, where such information is available.
- Major communication event (MC): we use this category to denote instances where authorities have made a significant public announcement with regards to the banking or wider financial sector which induced significant changes in market expectations or the de facto assessment of the health or profitability of the banking or financial sector. Famous examples here are FDR’s “fireside chat” on the banking crisis in March 1933, and the July 2012 speech by ECB President Mario Draghi to do “whatever it takes” to save the Eurozone.

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<sup>15</sup> For instance, the Czech state in April 1932 cancels its own deposit claims in two domestic banking institutions to alleviate the ongoing distress in the Great Depression context. See League of Nations (1935, 13f.).

- Other intervention type (Other): authorities intervene to alleviate an existing or an anticipated stress event in the banking or wider financial system with a policy tool that does not fall under any of the aforementioned categories. We include instances in this category where authorities set up central banks, either by founding an entirely new monetary institution, or by assuming ownership of a formerly private institution with no such previous public mandate – examples are the establishments of the Danish Rigsbank in 1813, or the Turkish Central Bank in 1930 amid respective banking crises (Suvla 1933; Maercher 2010).

Finally, there are crises in the combined database that do not appear to have any associated interventions. When that occurs, we designate the intervention as a NO/I (“no intervention”) in the single row representing that crisis in the database. This notation appears when either we cannot find any relevant intervention measure for a confirmed canonical crisis instance, or in all cases where our minimum event criteria for a candidate crisis are matched with regards to an institutions’ total liabilities – but where we do find evidence of a deliberate abstention by policymakers from an intervention.

We record interventions according to the above classifications even if authorities undertake actions that merely *enable* a particular type of intervention – even if *de facto* such a policy action does not eventually materialize. For instance, if political authorities approve the establishment of an asset management company (AMC) to purchase impaired banking assets – but subsequently this AMC does not actually proceed to transfer meaningful amounts of banking system assets, we would still designate the policy action as a “BBAM”.

## **II. Database Construction**

This section describes the construction and summary statistics of the database. We begin with a core set of canonical crises, built from the union of the databases constructed by Reinhart and Rogoff (2009) (R/R), Schularick and Taylor (2012) (S/T), Laeven and Valencia (2020) (L/V), and Baron, Verner, and Xiong (2021) (B/V/X). Section A discusses the crisis definitions used in those papers and illustrates their various unions and intersections. Section B describes the rules and thresholds we use to go from the list of canonical crises to our database of interventions related to

those crises. That data gathering process also yields a set of interventions that are not associated with an existing canonical crisis; that set is used to build the supplementary list of candidate crises.

### **A. Canonical Crises**

We combine four of the most widely used chronologies to construct our sample of canonical crises. We are aware of the multiple subsequent database updates that individual authors provided in non-published form, but limit our following data and discussion strictly to the published lists:<sup>16</sup>

**(1)** L/V: Laeven and Valencia (2020) cover a total of 165 countries over the period of 1976-2016, identifying a total of 151 systemic banking crises, for which the crisis start year is provided. The authors define a systemic banking crisis if one of two conditions hold:

- (i) “Significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and/or bank liquidations).”
- (ii) “Significant banking policy intervention measures in response to significant losses in the banking system.”

As per the second crisis definition, the authors are unique across the included chronologies in investigating systematically the policy responses associated with bank stress events since 1976, and rely on a mixture of qualitative and quantitative measures to define a “significant” policy intervention: to measure intervention sizes, the authors calculate direct intervention “costs” associated with each crisis across fiscal and liquidity measures, though technically a policy intervention can be deemed “significant” on purely qualitative grounds in the framework.<sup>17</sup> General intervention patterns are then studied in more detail, across seven intervention groups.

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<sup>16</sup> Such subsequent updates include recurrent online updates of the “JST” database in S/T’s case, and in R/R’s case updates recorded via the BFFS database, see <https://www.hbs.edu/behavioral-finance-and-financial-stability/data/Pages/global.aspx>. For a general discussion on trends and findings associated with banking crises chronologies over the past years, see Bordo and Meissner (2016), and Sufi and Taylor (2022).

<sup>17</sup> The authors do not strictly quantify a “significant” bank nationalization, define any minimum levels for “bank holidays” or “deposit freezes”, or “significant” guarantees that can be deployed: if a bank stress event is associated with policy responses across these three sub-dimensions, it can be deemed “systemic” (c.f. *ibid.*, 310).



(2) R/R: Reinhart and Rogoff (2009) cover a total of 70 countries over the period of 1800-2008, identifying a total of 315 systemic banking crises. A systemic banking crisis is identified if one of two conditions are given:

- (i) “bank runs that lead to the closure, merging, or takeover by the public sector of one or more financial institutions or
- (ii) if there are no runs, the closure, merging, takeover, or large-scale government assistance of an important financial institution (or group of institutions), that marks the start of a string of similar outcomes for other financial institutions.”

R/R are unique for their extensive temporal sample, beginning observations in the early 19<sup>th</sup> century. They were also the first across our four chronologies to provide a long-run banking-crisis exercise. Against this backdrop, we use R/R as our default chronology wherever databases differ in their exact dating of a common banking crisis: in such cases, our crisis designation shows which other canonical databases also include the event, but follows the R/R *start year*, with additional crises start years in other databases that fall within a crisis period in R/R being discarded to avoid double-counting.

(3) S/T: Schularick and Taylor (2012) cover a total of 14 countries over the period of 1870-2016. As in previous approaches, the authors narratively identify banking crises, focusing on advanced economies. A total of 79 crises are identified – with no specific focus on their resolution or policy responses – and the authors provide the following crisis definition:

“In line with the previous studies, we define financial crises as events during which a country’s banking sector experiences bank runs, sharp increases in default rates accompanied by large losses of capital that result in public intervention, bankruptcy, or forced merger of financial institutions. We have corroborated the crisis histories from Bordo et al. (2001) and Reinhart and Rogoff (2009) with alternative codings found in the databases compiled by Laeven and Valencia (2008), as well the evidence described in Cecchetti, Kohler, and Upper (2009).”

(4) **B/V/X**: Baron, Verner, and Xiong (2021) cover a total of 46 countries over the period of 1870-2016. The authors differ from earlier chronologies by systematically using bank-equity return data to identify crises, with quantitative thresholds in a bank-equity return variable as the key criterion. We include all events the authors here identify as belonging to the “B/V/X crisis list”, including war years.<sup>18</sup> Their methodology yields a sample of 214 banking crisis (start years), 49 of which represent crises that do not appear in the other canonical papers. The authors feature some details on crises resolutions, and define a banking sector “crash” as follows (ibid., 55):

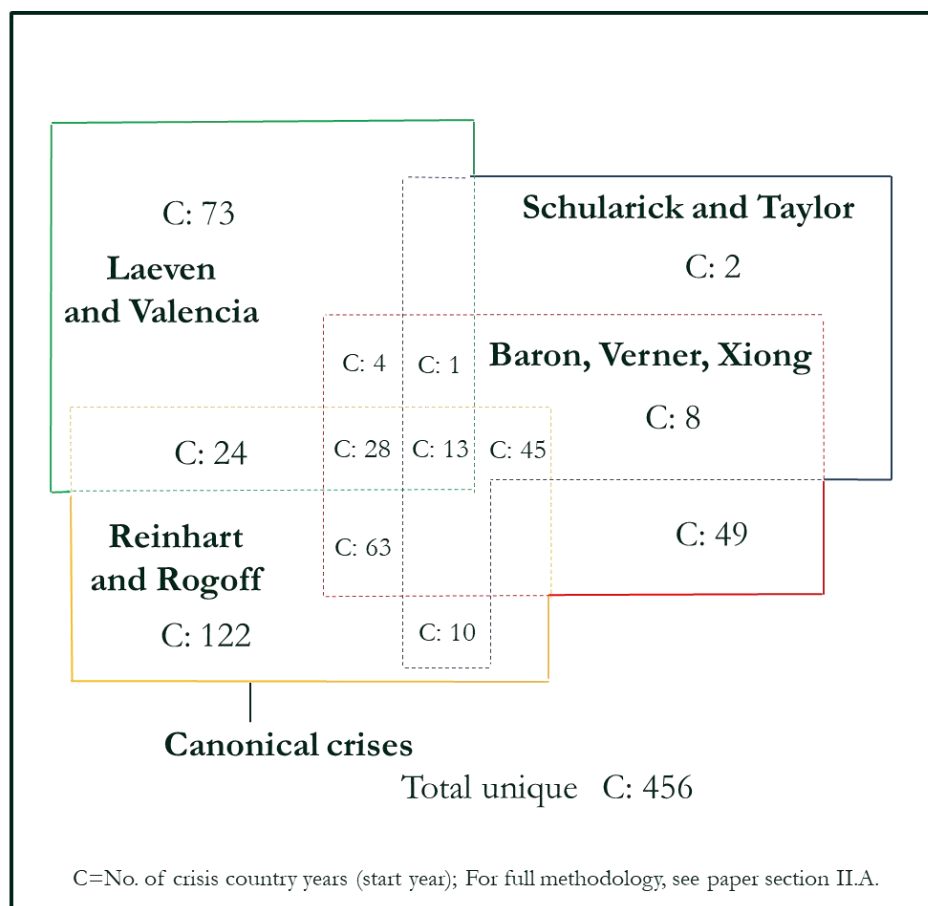
“We define a “bank equity crash” as an annual bank equity decline of over 30%. We separate these bank equity crashes into panic versus non-panic episodes based on a systematic reading of the narrative evidence for each of these episodes. We define panics as episodes of severe and sudden withdrawals of funding by bank creditors from a significant part of the banking system, which could include withdrawals of funding from insolvent banks or illiquid but fundamentally solvent banks.”

Figure 2 displays the universe of the 456 canonical crises, built from the union of these four chronologies. We observe that despite the methodological differences in the identification processes, there is a non-trivial overlap in the outputs.

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<sup>18</sup> B/V/X exclude a total of 25 crises in the “BVX crisis master list” from subsequent equity analyses given war years. We include these years: while stock markets were often shut down in these periods, other relevant forms of banking interventions often took place.

**Figure 2:** Existing “canonical” crises chronologies and crises distribution.



“C”: number of individual crisis start years; overlapping areas (dashed borders) denote crises and associated interventions identical in the respective canonical chronology covered by the particular area. Figures outside dashed areas represent crises unique to a particular chronology. “Baron, Verner, Xiong” denotes Baron, Verner, and Xiong (2021), “Laeven and Valencia” denotes Laeven and Valencia (2020), “Reinhart and Rogoff” denotes Reinhart and Rogoff (2009), and “Schularick and Taylor” denotes Schularick and Taylor (2012).

## B. Cataloguing Interventions and Candidate Crises

We begin the search for interventions with the bibliography in R/R. Often, the same references that previously served as evidence for R/R to identify a banking crisis also elaborate on the wider circumstances of the event, and detail particular policy responses. In many instances, however, the existing banking-crises references are silent on the exact policy response: it is evident that some intervention took place, but we do not have the necessary details for our database. In these cases, we turn next to IMF or World Bank country reports, which are helpful for the post-1970 intervention documentation. For many crises prior to 1970, it is necessary to consult primary

sources, often in the language of the crisis country. Online Appendix A describes our systematic search of those sources, and Online Appendix E provides a full bibliography of all primary and secondary sources.

A plethora of potential interventions emerges from a comprehensive historical search. Yet, a significant share of these interventions may not be of sufficient size when measured in terms of fiscal or monetary outlays or balance sheet sizes involved; and for obvious reasons, the further one attempts to go back in time, the harder it would be to aim for a certain degree of comprehensiveness if only the loosest selection criteria apply.

While we do not restrict our analysis just to interventions during the canonical crises, we do have time-varying size thresholds for inclusion outside of such crises. These thresholds are necessarily arbitrary and are driven mostly by our judgement about the size of intervention likely to appear in our sources, thus giving us the best chance at comprehensiveness above those thresholds.

Specifically, we include an intervention outside of canonical crises if we have reason to believe that the gross fiscal or monetary volume, or the total liability volume of at least one institution affected by the policy, associated with the intervention is

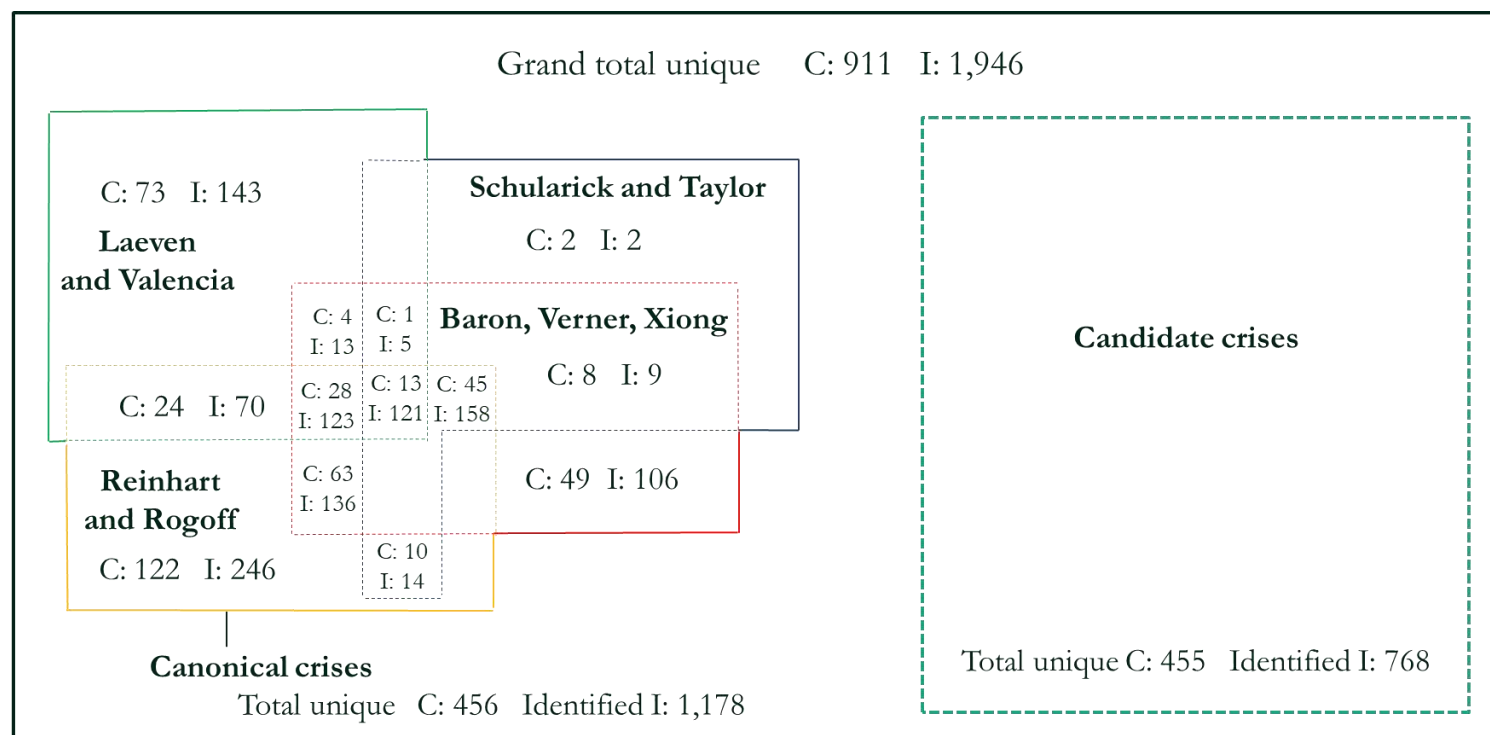
- At least 5,000 Florentine florins in the case of all pre-1800 events, or at least 1,000 British Pounds deployed, or respective exchange rate equivalents;<sup>19</sup>
- From 1800-1914, at least either 50,000 British Pounds, or 50,000 U.S. Dollars (using the foreign exchange equivalent based on current exchange values);
- During 1915-1945, for advanced economies at least either 5M British Pounds, or 5M U.S. Dollars in total bank liabilities involved or in gross fiscal or monetary outlays deployed; and for emerging economies at least either 1M British Pounds or 1M U.S. Dollars for the respective intervention or total liability volumes involved.
- And from 1946-, for advanced economies at least either 50M British Pounds, or 50M U.S. Dollars in total bank liabilities involved, or in (gross) fiscal or monetary outlays deployed; and for emerging economies at least either 30M British Pounds or 30M U.S. Dollars for the respective intervention or total liability volumes involved.

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<sup>19</sup> One of our main long-run exchange rate (and respective gold content) sources are Karaman, Pamuk, and Yildirim-Karaman (2020). For full details on exchange rate bases, see the country notes in Online Appendix F.

Figure 3 illustrates the final composition of the database, which includes a total of 1,946 interventions. The left side of Figure 3 shows the distribution of 1,178 total interventions for the 456 canonical crises. As in Figure 2, the data is displayed in a Venn diagram showing the interventions corresponding to crises from each of the component databases. The right side of Figure 3 represents the interventions identified outside of the canonical-crisis periods. These 768 interventions are spread over 455 candidate crises. As we stated earlier, we are *not* claiming that these candidate crises should necessarily be classified as “banking crises” under the definitions used by earlier studies. Rather, we claim only that these candidates are worthy of further investigation, most importantly because they may represent periods of bank stress where interventions played a role in preventing a crisis. Furthermore, we do not claim to have uncovered all interventions or candidate crises; hence, the largest rectangle in the figure also includes open space to be filled by future discoveries.

**Figure 3:** Composition of full intervention database, and breakdown of “canonical” and “candidate” crises.



C=No. of crisis country years (start year); I=No. of interventions identified for respective crises years. For full methodology, see paper section II.A and B.

“C”: number of individual crisis start years; “I”: number of interventions associated with all crises; overlapping areas (dashed borders) denote crises and associated interventions identical in the respective canonical chronology covered by the particular area. Figures outside dashed areas represent crises and interventions unique to a particular chronology. “Baron, Verner, Xiong” denotes Baron, Verner, and Xiong (2021), “Laeven and Valencia” denotes Laeven and Valencia (2020), “Reinhart and Rogoff” denotes Reinhart and Rogoff (2009), and “Schularick and Taylor” denotes Schularick and Taylor (2012)

### **III. Intervention Patterns**

In this section, we examine the pattern of interventions across countries with respect to national measures of income, government size, debt capacity, currency regime, and political system. Section A gives summary statistics for the full dataset. Section B describes each of the national measures and discusses the “mix” of interventions relative to each measure. With that background, Section C presents and interprets regression results using intervention categories as dependent variables and the set of national measures as regressors. \

#### **A. Summary Statistics**

Table 1 displays the distribution of the 1,946 interventions. The table shows that *lending* interventions – in the form of ad hoc emergency lending (AHEL), broad-based emergency lending (BBEL), or market liquidity assistance (MLA) – have been the most common group, with 561 cases accounting for 28.9% of the total. In order, the remaining groups are *guarantees* (317 for 16.3%), *capital injections* (288 for 14.8%), *rules* (282 for 14.4%), *restructuring* (252 for 13.0%), *asset management* (82 for 4.2%), and *other* (52 for 2.7%).

The table shows a clear shift in the pattern of interventions over time. Prior to 1945, the two largest categories were *rules* and *lending*, which combined for more than 50% of all interventions in every subperiod. Since 1945, both of these categories have had lower shares of the total, and in the last 50 years they comprise less than 30% of all interventions. During this same period, there has been a marked shift towards *capital injections*, which has been the largest category since 1972 and comprises more than one-quarter of all interventions since 2000. This occurred amid a parallel recovery of *guarantees* intervention measures, which over the past two decades have once more become more important than *lending* or *other* categories (re-claiming a prominence last recorded only in the pre-1750 era).

**Table 1:** Intervention types by period and category

<i>Intervention distribution by period</i>								
<i>share of all interventions (n)</i>	Pre-1800	1800-1869	1870-1913	1914-1945	1946-1971	1972-1999	2000-2019	<i>Total</i>
<b><u>LENDING</u></b>	<b><u>2.9 (57)</u></b>	<b><u>4.3 (84)</u></b>	<b><u>4.2 (82)</u></b>	<b><u>6.3 (121)</u></b>	<b><u>0.1 (14)</u></b>	<b><u>6.1 (118)</u></b>	<b><u>4.4 (85)</u></b>	<b><u>28.9 (561)</u></b>
AHEL	1.8 (40)	2.6 (50)	1.9 (36)	3.4 (63)	0.0 (2)	2.6 (53)	1.5 (29)	13.8 (273)
BBEL	0.7 (14)	1.4 (27)	2.0 (39)	2.8 (54)	0.1 (10)	3.3 (62)	2.3 (42)	13.0 (248)
MLA	0.1 (3)	0.3 (7)	0.4 (7)	0.2 (4)	0.0 (2)	0.1 (3)	0.8 (14)	1.9 (40)
<b><u>CAPITAL INJECTIONS</u></b>	<b><u>0.3 (6)</u></b>	<b><u>0.3 (5)</u></b>	<b><u>0.5 (9)</u></b>	<b><u>2.2 (37)</u></b>	<b><u>0.1 (10)</u></b>	<b><u>6.2 (120)</u></b>	<b><u>5.4 (101)</u></b>	<b><u>14.8 (288)</u></b>
AHCI	0.3 (6)	0.3 (5)	0.4 (7)	1.6 (29)	0.0 (3)	3.4 (68)	3.4 (64)	9.4 (182)
BBCI	0.0 (0)	0.0 (0)	0.1 (2)	0.5 (8)	0.1 (7)	2.8 (52)	2.0 (37)	5.6 (106)
<b><u>GUARANTEES</u></b>	<b><u>1.4 (27)</u></b>	<b><u>1.0 (16)</u></b>	<b><u>1.7 (30)</u></b>	<b><u>2.7 (52)</u></b>	<b><u>0.0 (2)</u></b>	<b><u>3.7 (89)</u></b>	<b><u>5.2 (101)</u></b>	<b><u>16.3 (317)</u></b>
AG	1.0 (17)	0.2 (4)	0.7 (13)	1.0 (19)	0.0 (2)	2.2 (46)	1.6 (32)	6.9 (133)
ASG	0.1 (1)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	1.0 (12)	0.8 (16)	1.5 (29)
BG	0.1 (1)	0.1 (2)	0.2 (4)	0.3 (5)	0.0 (0)	1.0 (13)	0.2 (5)	1.5 (30)
OLG	0.5 (8)	0.6 (10)	0.7 (13)	1.6 (28)	0.0 (0)	1.0 (18)	2.4 (48)	6.9 (125)
<b><u>RULES</u></b>	<b><u>2.6 (55)</u></b>	<b><u>2.8 (50)</u></b>	<b><u>2.0 (39)</u></b>	<b><u>3.3 (65)</u></b>	<b><u>0.1 (6)</u></b>	<b><u>2.2 (41)</u></b>	<b><u>1.1 (26)</u></b>	<b><u>14.4 (282)</u></b>
DPM	1.0 (22)	0.2 (5)	0.3 (5)	0.8 (18)	0.0 (1)	0.3 (6)	0.0 (0)	2.6 (57)
SBH	1.2 (22)	1.5 (28)	0.8 (16)	1.7 (35)	0.1 (3)	0.8 (14)	0.3 (5)	6.5 (123)
CRL	0.1 (1)	0.2 (3)	0.0 (2)	0.0 (1)	0.0 (0)	0.1 (4)	0.6 (13)	1.1 (24)
ORL	0.5 (10)	0.7 (14)	0.8 (16)	0.6 (11)	0.0 (2)	1.0 (17)	0.3 (8)	4.0 (78)
<b><u>RESTRUCTURING</u></b>	<b><u>1.3 (25)</u></b>	<b><u>1.3 (26)</u></b>	<b><u>0.7 (12)</u></b>	<b><u>1.6 (31)</u></b>	<b><u>0.1 (6)</u></b>	<b><u>5.3 (111)</u></b>	<b><u>2.1 (41)</u></b>	<b><u>13.0 (252)</u></b>
RES	0.6 (14)	0.8 (17)	0.6 (11)	1.5 (30)	0.1 (6)	4.9 (101)	1.1 (22)	10.3 (201)
BAIL	0.5 (11)	0.5 (9)	0.0 (1)	0.0 (1)	0.0 (0)	0.5 (10)	1.0 (19)	2.5 (51)
<b><u>ASSET MANAGEMENT</u></b>	<b><u>0.0 (2)</u></b>	<b><u>0.0 (0)</u></b>	<b><u>0.2 (3)</u></b>	<b><u>0.2 (13)</u></b>	<b><u>0.0 (0)</u></b>	<b><u>2.2 (39)</u></b>	<b><u>1.3 (25)</u></b>	<b><u>4.2 (82)</u></b>
AHAM	0.0 (0)	0.0 (0)	0.0 (0)	0.1 (2)	0.0 (0)	0.2 (5)	0.5 (8)	0.8 (15)
BBAM	0.0 (2)	0.0 (0)	0.2 (3)	0.1 (11)	0.0 (0)	2.0 (34)	0.9 (17)	3.5 (67)
<b><u>OTHER</u></b>	<b><u>0.6 (10)</u></b>	<b><u>0.1 (4)</u></b>	<b><u>0.5 (9)</u></b>	<b><u>0.3 (8)</u></b>	<b><u>0.0 (2)</u></b>	<b><u>0.5 (11)</u></b>	<b><u>0.2 (8)</u></b>	<b><u>2.7 (52)</u></b>
MC	0.0 (1)	0.0 (0)	0.0 (0)	0.0 (1)	0.0 (1)	0.0 (2)	0.1 (2)	0.2 (7)
ST	0.0 (0)	0.1 (1)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (2)	0.0 (1)	0.2 (4)
OTHER	0.5 (9)	0.1 (3)	0.5 (9)	0.3 (7)	0.0 (1)	0.4 (7)	0.1 (5)	2.1 (41)
<b><u>NO/I</u></b>	<b><u>0.2 (4)</u></b>	<b><u>0.7 (13)</u></b>	<b><u>1.5 (28)</u></b>	<b><u>1.0 (19)</u></b>	<b><u>0.0 (1)</u></b>	<b><u>2.4 (45)</u></b>	<b><u>0.1 (2)</u></b>	<b><u>5.8 (112)</u></b>
<i>total</i>	9.6 (186)	10.2 (199)	11.0 (215)	17.7 (344)	2.1 (40)	29.4 (572)	20.0 (390)	100.0 (1946)

Figures in brackets measure absolute number of interventions, outside of brackets share as percentage of all-time total interventions. Intervention tags correspond to subgroups (see Figure 1 and discussion in Section I): AHEL – ad hoc emergency liquidity; BBEL – broad-based emergency liquidity; MLA – market liquidity assistance; BBCI – broad-based capital injection; AHCI – ad hoc capital injection; AG – account guarantee; ASG – asset guarantee; BG – blanket guarantee; OLG – other liability guarantee; DPM – debt or payments moratorium; SBH – bank suspension or bank holiday; CRL – capital and regulatory rules; ORL – other rules; RES – restructuring or resolution; BAIL – stakeholder bail-in; BBAM – broad-based asset management; AHAM – ad hoc asset management; ST – stress test; MC – major communication; OTHER – other intervention; NO/I – no intervention (not included in total).



**Figure 4:** Intervention policy mix, by crisis type and by economic, fiscal, and political variables, 33 A.D. – 2019.

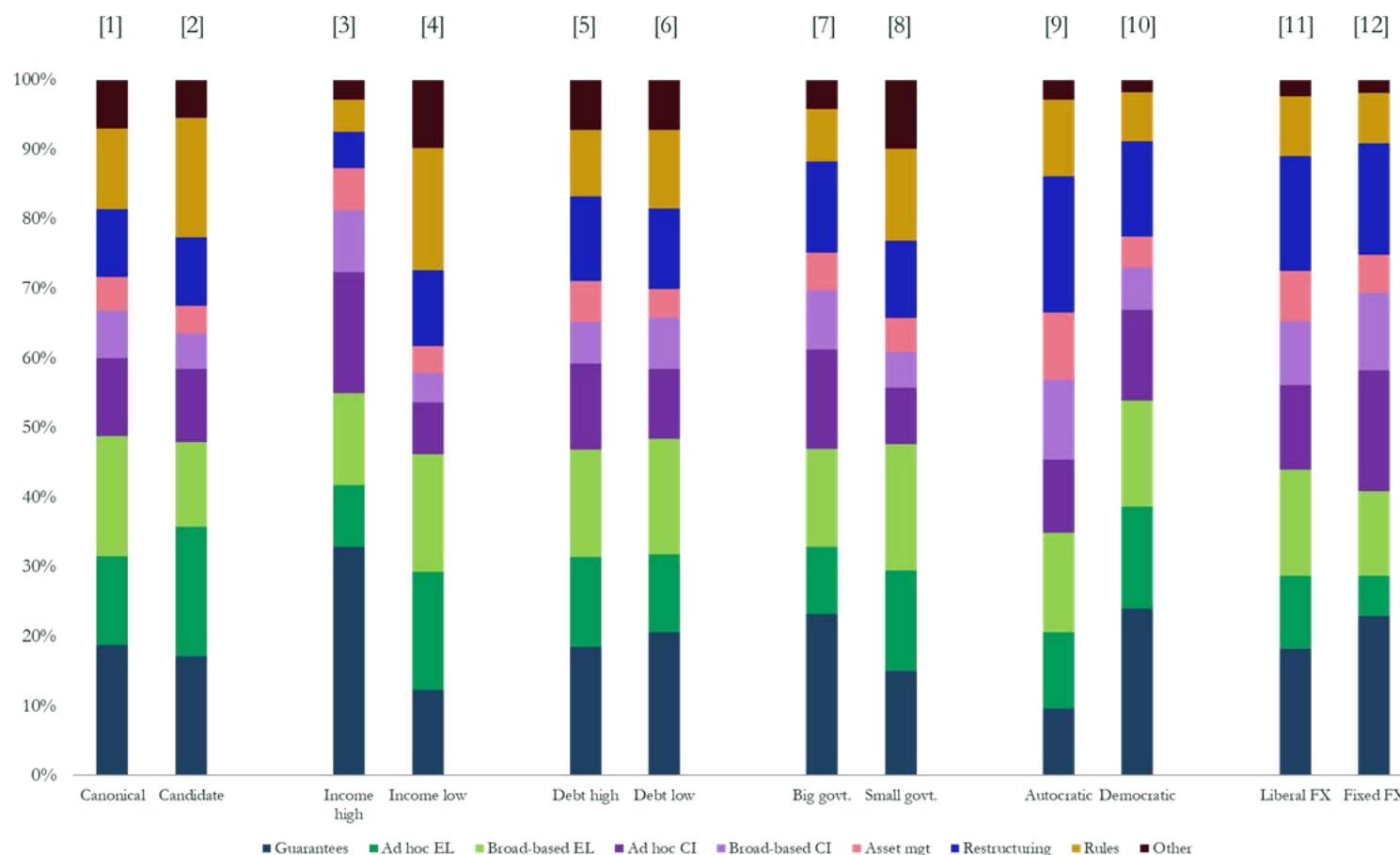


Figure 4 displays the composition of major intervention categories, by categorical (1-2), income (3-4), fiscal (5-8), political (9-10), and financial (11-12) variables as defined in text. For full notes on historical real GDP data used, refer to text above and country notes in Online Appendix F. Overwhelmingly, real per capita series on the basis of the latest Maddison Project estimates are used, and via underlying sources therein: real per capita levels are benchmarked to 2011 USD levels; readers should consult the full documentation and notes in Bolt and van Zanden (2020), and associated online spreadsheets via: [Maddison Project 2020 release](#). We use Nuvolari and Ridolfi's (2021) GDP data for France and Pfister's (2022) data for Germany, both of which are benchmarked to 1990 Geary-Khamis Dollar (GK\$) levels. Note that real p.c. sample has different source basis from our GDP sample detailed in Appendix E, with details on historical GDP bases and calculations there. Interventions without income datapoints are excluded. FX regime "Liberal FX" denotes currency regime observations on the "fine classification" basis in Ilzetzki, Reinhart, and Rogoff (2019) with values of 7 or higher; "Fixed FX" with lower than 7. For Big/small government and Debt high/low samples, samples are split at median value of all observations. "NO/I" observations are included in "other" category throughout.

## B. Intervention Mixes: Definitions and Simple Comparisons

Figure 4 shows the relative frequency of intervention categories relative to a single crisis or country variable. We use the same color scheme for intervention categories as we did for the balance sheet representation of Figure 1. The goal here is to see if anything stands out from this visual representation.

The first pair of columns shows the distribution of interventions between canonical and candidate crises. In both cases, the largest category is *lending*, with the majority of those interventions broad-based (BBEL) in canonical crises and ad-hoc (AHEL) in candidate ones. That appears to be the most notable difference between the two columns. From this visual display, the distribution of intervention categories looks similar between the two types of crises.

The next pair of columns, (3) and (4), shows a comparison between countries with a per capital real GDP of <8,000 USD and those >30,000 USD.<sup>20</sup> Here, the differences are striking. The high-income countries rely heavily on *capital injections* and *guarantees*, with these two categories comprising more than half of all interventions in those countries. In contrast, those categories make up less than a quarter of the interventions in low-income countries. In those countries, the two most common categories are *rules* and *lending*, which together make up almost two-thirds of all interventions. These differences combine both time-series and cross-sectional variation, since more countries meet the “high-income” definition in the more recent years of the sample. In the regression evidence presented later in this section, we attempt to disentangle these two sources of variation.

We are also interested in the relationship between crisis response and fiscal capacity. We can think of this capacity in two connected ways. First, governments have limited borrowing capacity (“fiscal space”). Second, governments differ in the political willingness and human capacity to use this available space. Intuition suggests that both of these factors might matter, and recent theoretical work supports that intuition. Acharya, Drechsler, and Schnabl (2014) analyze optimal bailout policies to investigate the feedback loops between sovereign debt risks and banking-sector risk. Their model treats the existing debt stock of the government as a constraint

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<sup>20</sup> Real per capita GDP series are mainly sourced from Bolt and van Zanden (2020), and authors therein. We thank Ulrich Pfister for sharing his latest German GDP compilations, on which we rely via Pfister (2022), and thank Leonardo Ridolfi for providing context to his most recent French data (Nuvolari and Ridolfi 2021). Note that the source basis for this exercise differs in multiple ways from the calculation of intervention size / GDP figures in table V, for which we utilize aggregate NGDP series, as also detailed in Online Appendix F.

on the bailout size. In addition, the authors also demonstrate a link between bank stress and a subsequent rise in debt/GDP, through the deployment of recapitalizations. In Gennaioli, Martin, and Rossi (2014), worsening debt sustainability (including the debt stock) constrain governments from bailing out large parts of the banking sector during a crisis, making sovereign defaults particularly costly to the domestic banking sector, especially when it holds large shares of the sovereign debt stock. Stavrakeva (2020) also builds on post-2008 observations that fiscal capacity – defined as efficiency of tax collection relative to GDP – determines bank bail-outs and other intervention decisions during banking crises, but focuses on ex ante crisis regulatory implications of levels of fiscal capacity.

The most informative empirical work on this subject is even more recent. Laeven and Valencia (2020) showed that systemic banking crises are associated with gross fiscal costs for government interventions between 6.7% (DMs) and 10.0% (EMs) measured as a share of GDP, implying the necessity for meaningful fiscal space to address systemic bank distress. At a more granular level, Acharya et al. (2021) identify fiscal constraints as predictive of bank recapitalizations in Europe during and after the GFC. The most significant predictive variable across measures was revealed as revenues/GDP. “Fiscal constraints” are significant by themselves when measured in terms of fiscal pressure: specifically, the share of debt maturing during the current fiscal year is associated with falling bailout probabilities in a significant way. While the existing stock of government debt by itself was negatively associated with bailout probabilities but not statistically significant, the debt stock/GDP became statistically significant – with a *positive* sign – once added on top of the revenue/GDP variable. There was no statistically significant association of any of the fiscal variables once tested against *any* kind of banking-sector intervention (recapitalizations or lending).

By combining our new database with long-run time series of government debt and spending from other scholars, we can get a long-run multi-crisis view of these patterns. Specifically, we merge our intervention observations with two datasets: the gross central government DEBT/GDP level of the affected economy in the year immediately preceding the crisis, drawing on the data since 1800 for a large country sample in Reinhart and Rogoff (2009); and second, a measure of state capacity, EXP/GDP, defined as the ratio of non-interest government expenditures to GDP in the year immediately preceding the crisis start, using the long-run empirics in Mauro et al. (2015).

Columns (5) and (6) of Figure 4 show the intervention mixtures for the DEBT/GDP variable. Here, we define the “high category” as all observations above the median level of 42.8% and the

“low” category as below this median level. Interestingly, the mixtures appear to be very similar between these two groups. Both intuition and the results of previous studies (cited above) led us to expect some differences here, but no substantial ones are apparent. We will see the same null result in the regression results of Section C.

For the EXP/GDP category, shown in columns (7) and (8), the differences are more apparent. We define “Big Government” and “Small Government” groups along the all-time median level of the sample, which yields a cutoff of 21.8% as the EXP/GDP ratio dividing the Big Government and Small Government groups. The stacked columns show that Big Government countries tend towards the more aggressive fiscal responses of guarantees and capital injections, while the Small Government group tends towards lending and rules.

Intervention choices may also be influenced by a country’s political regime; costly bail-out decisions for banks, for instance, might be more politically feasible where democratic control is weak; while in democracies the electoral cycle might encourage intervention options that “kick the can down the road” rather than deal with regulatory problems right away. To assess the relationship between political regimes and intervention choices, we source data on a country’s political regime from the POLITY V project, via Marshall and Gurr (2020). Among other indicators, the project assigns an annual numerical value to rank a country’s “regime authority spectrum” on an annual-level 21-point scale, ranging from -10 (strongly authoritarian, hereditary monarchy) and +10 (strongly democratic, consolidated democracy) for a total of 167 countries beginning in the year 1800. Over time, the data set shows a positive time trend in the POLITY value across all countries: while by 1900, only 22% of country observations are classified as “democratic”, this share stands at 59% by 2015. This data allows us to trace the precise link between political regime and intervention dynamics for the vast majority of cases over the past 220 years.

In columns (9) and (10) of Figure 4, we compare the intervention mixtures of “Autocracies” (POLITY measure less than negative five) and “Democracies” (POLITY measure greater than five). Here, the most salient difference appears to be a relative preference for *guarantees* among the Democracies – a result also reinforced by the regression results.

Intervention decisions might also be systematically related to the currency regime of the affected country; for example, large-scale emergency lending programs may be constrained by the existence of fixed exchange rate regimes (pegs); twin-crisis dynamics – where policymakers

have to address currency attacks or capital withdrawals at the same time as banking sector distress – could also leave distinct patterns on policy choices over time. A nuanced classification of de facto exchange rate regimes on an annual level was recently undertaken by Ilzetki, Reinhart, and Rogoff (2019) for a total of 194 countries over 1940-2016. Among other variables, the authors present a “fine” FX regime classification framework which uses a 15-point scale ranging from highly inflexible (no legal tender or pre-announced peg = 1,2) to highly flexible (freely floating, freely falling, or dual market = 13, 14, 15) exchange rate arrangements. For the vast majority of intervention observations since 1940, we are able to match corresponding entries for FX regime from their database.

The last two columns of Figure 4 summarize the intervention mix for regimes that are either “Liberal” (FX measure more than 7) or “Fixed” (FX measure less than 7). We see some evidence here that the fixed regimes are more constrained in their *lending* programs, as they comprise a smaller fraction of interventions than for liberal regimes.

### C. Regression Results

The simple comparisons of Figure 4 allowed us to summarize the data, but does not allow for any formal tests. For that, we estimate logit regressions for each intervention category, using all of the crisis- and country-specific measures from Figure 4 as regressors. The results of this exercise are given in Table 2. Each column of the table gives the results for a different dependent variable. In each specification, the dependent variable is set equal to one if the specific intervention type was used in a crisis, and zero otherwise. Thus, the units of observation are at the crisis level, and there is a zero or one observation for each type of intervention in each crisis. Of the 911 unique crises in our database, we have complete data on all the regressors for 273 of them. Online Appendix C shows robustness checks with fewer regressors, allowing for a larger sample size of crises; the main results discussed below are robust to these different specifications

**Table 2:** Regression results for major intervention categories and dependent variables.

<i>Intervention type</i>	Guarantees	Lending	Capital injection	Restructuring	Asset mgt.	Rules	Other
<i>Candidate</i>	-1.409 (0.304)	-0.670 (0.271)	-0.881 (0.281)	-0.150 (0.272)	-1.705 (0.447)	0.648 (0.385)	-0.029 (0.576)
<i>INCOME (log)</i>	0.609 (0.226)	0.642 (0.201)	0.255 (0.196)	-0.454 (0.200)	0.408 (0.247)	-0.014 (0.261)	-0.148 (0.382)
<i>Polity</i>	0.100 (0.033)	0.040 (0.027)	-0.042 (0.027)	0.036 (0.029)	-0.064 (0.033)	0.064 (0.043)	0.072 (0.067)
<i>FX regime</i>	-0.012 (0.034)	0.085 (0.031)	-0.058 (0.031)	-0.008 (0.031)	0.028 (0.041)	0.045 (0.044)	0.120 (0.070)
<i>DEBT/GDP</i>	-0.015 (0.005)	-0.002 (0.004)	0.0003 (0.004)	-0.008 (0.004)	0.002 (0.005)	0.007 (0.006)	0.009 (0.008)
<i>EXP/GDP</i>	-0.004 (0.016)	-0.025 (0.015)	0.020 (0.015)	0.034 (0.015)	-0.027 (0.020)	-0.046 (0.023)	-0.034 (0.032)
<i>Year</i>	0.014 (0.012)	-0.009 (0.010)	0.021 (0.011)	-0.010 (0.010)	0.043 (0.019)	0.015 (0.015)	-0.001 (0.022)
<i>Constant</i>	-33.1 (23.0)	11.4 (20.1)	-43.7 (22.1)	21.8 (20.5)	-90.2 (38.1)	-31.8 (28.9)	-1.2 (43.6)
<i>N</i>	273	273	273	273	273	273	273

Table 2 displays the results of logit regressions at the crisis level, where each crisis (candidate or canonical) is one observation. Data begins in 1800. Each column represents a single regression, with the dependent variable given in the top row. The intervention categories in the first row follow the category definitions introduced in Section I. For each regression, the dependent variable is equal to one if that category of intervention is present in a crisis, and zero otherwise. INCOME is measured in logs, using data from the same year as the dependent variable. CANDIDATE takes on a value of one for a candidate crisis, and zero for a canonical crisis. Sources for the income data are given in Appendix F.  $DEBT/GDP$  = total gross central government debt/GDP (domestic+external), sourced from Reinhart and Rogoff (2009).  $EXP/GDP$  = non-interest government expenditure/GDP, sourced from Mauro et al. (2015). We exclude all observations where at least one of the variables in income,  $DEBT/GDP$ , or  $EXP/GDP$  is missing. All variables are measured for  $t-1$ , the year preceding the crisis start date.

Before interpreting the results of these regressions, one important caveat is necessary: the observations across these crises are not independent, and there is not good way to adjust for this problem given the limitations of the data. Our remaining sample of 273 crises includes several global or regional crises, so that we will have multiple countries making intervention decisions at similar times. Furthermore, most countries are in the final sample for several different crises, and could be some time dependence in their crisis responses, even if these crises are separated by many decades. In the discussion that follows, all statements about statistical significance are subject to this caveat.

Among the major categories of interventions, the most interesting results are for *guarantees* (column 1) and *lending* (column 2). For guarantees, there are four coefficients significant at the one-percent level: INCOME (positive), POLITY (positive), DEBT/GDP (negative), and CANDIDATE (negative). Thus, for any given crisis, we are more likely to see a guarantee intervention if the country has higher income, is more “democratic”, has a *lower* DEBT/GDP ratio, and is canonical. The DEBT/GDP result is consistent with the findings in Panetta et al. (2009), which shows that the effectiveness of debt-guarantee programs in the GFC was related to the sovereign spread of the guaranteeing country; since guarantees are only as useful as the credit-quality of the guarantor, a country with little fiscal space is unlikely to derive much benefit from them.

For lending, there are two coefficients significant at the one-percent level: INCOME (positive) and FX regime (positive). Here, for any given crisis, we are more likely to see emergency lending activity if the country has a higher income or if it has a *more* flexible currency regime. This latter result is consistent with the constraints of a fixed-exchange rate system, where any emergency lending would put pressure on the currency.

#### **IV. GDP losses in Canonical and Candidate Crises**

In this section, we investigate the GDP losses from Canonical and Candidate crises, and analyze the relationship of these losses with the same country variables introduced in the previous section. For this analysis, our key variable is the “GDP gap”, which we construct in several steps. First, for every “base year”, we estimate the trend (geometric) growth of GDP per capita using the prior 15 years of data. We do not use data from the base year itself. Next, we extrapolate that trend growth for five years, beginning at the end of the base year. This step yields an extrapolated GDP prediction for each of the next five years. We then compare the actual GDP in each of those years with this extrapolated GDP. The sum of the (percentage) differences for these five years represents the GDP gap for that base year. It is the “area under the trend GDP line”.

We repeat this exercise for every base year for which we have GDP data in the prior 15 and following five years. Figure 5 summarizes the results of this exercise on our universe of data, including non-crisis base years as a control. For all crises, the GDP gap has a mean of -8.9 percent and a median of -7.9 percent. By this measure, canonical crises are more severe, with a mean of -12.7 percent (median = -11.1 percent), as compared to the corresponding measures of -4.3 percent

**Figure 5:** GDP gaps associated with Financial Crises, sub-types, and non-crises years.

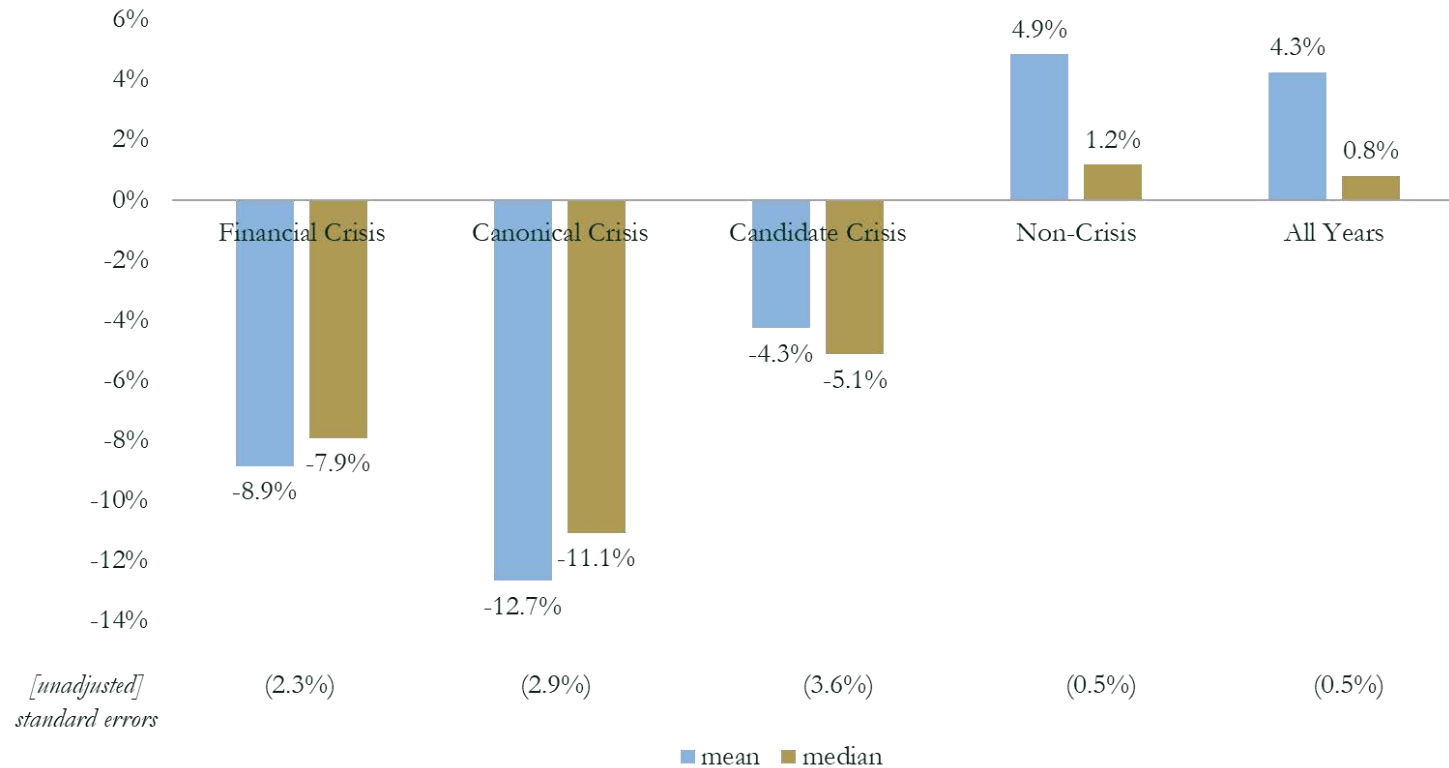


Figure 5 displays the mean and median GDP gap sum associated with different categories of country-years. GDP gap sum is defined as sum of annual real GDP per capita difference to GDP growth trend-implied real per capita GDP, over  $t$  to  $t+4$ , with trend path using the realized (log) real GDP path over  $t-14$  to  $t$ . With  $t$  = crisis start year. Income data as per sources in Appendix F. “Financial crisis” sample includes all candidate and canonical crises; “all years” includes all annual-level GDP gap sum observations for which underlying (log) real per capita GDP is available for countries in intervention sample via Bolt and van Zanden (2020) and sources therein.



**Table 3:** Regression results for all crises, by crisis type, and dependent variables.

	Combined		Canonical crises		Candidate crises	
<i>Candidate</i>	0.1464 (0.0755)	0.0685 (0.0596)	-	-	-	-
<i>INCOME (log)</i>	-0.2287 (0.0370)	-0.2672 (0.0426)	-0.2306 (0.0416)	-0.2815 (0.0585)	-0.3621 (0.0791)	-0.2783 (0.0680)
<i>Polity</i>	0.0071 (0.0055)	0.0113 (0.0060)	0.0160 (0.0074)	0.0133 (0.0083)	-0.0028 (0.0097)	0.0063 (0.0101)
<i>FX regime</i>	0.0114 (0.0078)	0.0179 (0.0068)	0.0123 (0.0082)	0.0239 (0.0092)	0.0108 (0.0156)	0.0089 (0.0109)
<i>DEBT/GDP</i>		-0.0012 (0.0009)		-0.0018 (0.0011)		0.0005 (0.0017)
<i>EXP/GDP</i>		0.0054 (0.0034)		0.0057 (0.0042)		0.0046 (0.0058)
<i>Year</i>	0.0022 (0.0028)	0.0029 (0.0023)	0.0033 (0.0043)	0.0031 (0.0043)	0.0049 (0.0041)	0.0032 (0.0029)
<i>Constant</i>	-2.4627 (5.4536)	-3.7137 (4.5573)	-4.8310 (8.4863)	-4.0594 (8.5654)	-6.5296 (8.0010)	-4.2002 (5.6543)
<i>N</i>	334	261	203	146	131	115

Table 3 displays the results of logit regressions at the crisis level, where each crisis (candidate or canonical) is one observation. Data begins in 1800. Each column represents a single regression, with the dependent variable given in the top row. The intervention categories in the first row follow the category definitions introduced in Section I. For each regression, the dependent variable is equal to one if that category of intervention is present in a crisis, and zero otherwise. *INCOME* is measured in logs, using data from the same year as the dependent variable. *Candidate* takes on a value of one for a candidate crisis, and zero for a canonical crisis. Sources for the income data are discussed in Appendix F. *DEBT/GDP* = total gross central government debt/GDP (domestic+external), sourced from Reinhart and Rogoff (2009). *EXP/GDP* = non-interest government expenditure/GDP, sourced from Mauro et al. (2015). We exclude all observations where at least one of the variables in income, *DEBT/GDP*, or *EXP/GDP* is missing. All variables are measured for t-1, the year preceding the crisis start date.

(mean) and -5.1 percent (median) for candidate crises. The control group of “non-crisis” base years, which represents the vast majority of the data, has a positive mean GDP gap of 4.9 percent (median = 1.2 percent).<sup>23</sup> At the bottom of the figure, we report standard errors for the estimates of the mean, unadjusted for the unknown cross-sectional and time-series dependence across crises. While we cannot say anything definitive about statistical significance, the differences are clearly economically significant. The mean GDP gap for canonical crises is 17.6 percentage points greater than the control non-crisis case. That’s represents a substantial difference in real performance.

The mean candidate crisis GDP gap is almost exactly halfway between the canonical and non-crisis means. This is an intriguing result. It could be that some of the candidate crises are just small financial crises that went undetected by past filters. It might also be that the interventions of these candidate crises actually prevented more significant damage to GDP. It could also be that some of these candidate crises are just noise with nothing real going on. It will require a detailed look at any given candidate crisis to make that determination.

Table 3 shows results of regressions of the GDP gap on the same country variables used in Table 2. In these regressions, there are some differences depending on whether we examine canonical or candidate crises, and also on the number of regressors used (sample size changes due to missing data), so we show several different specifications in the table. The table reports coefficients and standard errors, with the standard caveat about unknown cross-sectional and time-series dependence. The first two columns show results for the full set of crises and the next four columns show the corresponding results when we split the sample into candidate and canonical crises. In all of these specifications, the coefficient on INCOME is *negative* and significant at the one-percent level, suggesting that negative GDP gaps are more severe for higher-income countries. Also, there is some evidence that both POLITY and FX Regime are related to the severity of GDP losses, particularly in canonical crises. When we include the full set of regressors in column (2) (full sample) and column 4 (canonical sample), the coefficient on FX regime is positive and significant at the five-percent level, suggesting that more flexible currency regimes are associated with smaller GDP losses. When we drop the fiscal variables to add more observations in column

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<sup>23</sup> The mean GDP gap is positive for non-crisis years because of positive trend growth rates across the whole sample – this trend causes the growth to be higher in the five years after a base year than for the fifteen prior years.

(3) (canonical sample), the POLITY variable is positive and significant at the five-percent level, suggesting that more democratic countries have smaller GDP losses.

Of course, in a perfect world we would test for the relationship between GDP gaps and specific interventions. Scholars and policymakers would all like to know which types of interventions reduce GDP gaps in a crisis. But the obvious endogeneity problems prevent a straightforward statistical analysis, since interventions are clearly influenced by crisis severity as well. We hope that the availability of the full intervention database will allow future scholars to perform detailed case studies and identify natural experiments and useful instruments.

## **V. Bank Stress over the Very Long Run**

One application of the database is a new investigation into the question whether “the crisis problem is growing more severe”, in the spirit of previous findings (Bordo et al. 2001; Reinhart and Rogoff 2013; Bordo and Meissner 2016). Consistent with the rest of this paper, our crisis definition in the following covers both existing crises identified in the canonical papers, and also adds the candidate crises identified by the existence of intervention decisions. In this respect, our crisis definition is broader than that considered by the previous literature. Since we view our work as a complement and not a replacement for that literature, we will use the broader term of “bank-stress period” instead of “crisis” for the long-run macro perspective discussed in this section.

Figure 6 displays the share of advanced economy (DM) GDP displaying bank stress – combining all canonical and candidate crises since the mid-17<sup>th</sup> century. We display the full annual distribution of interventions across both crises groups over time, for all countries, by major intervention group, and record separately the associated share of advanced economy GDP that is experiencing an intervention event of any form during the respective year. The GDP shares used here follow the shares constructed and discussed further in Schmelzing (2020), which builds on Maddison (2008) and subsequent extensions (Bolt and van Zanden 2020, and sources therein), covering eight leading advanced economies over the past centuries (Northern Italy, the U.K., the Netherlands, France, Germany, Spain, the U.S. (from 1790), and Japan (from 1870)).<sup>24</sup>

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<sup>24</sup> Trends observed by this GDP weighting are generally robust to alternative approaches, such as DM population shares, or expanded DM GDP country samples.

With this analysis, we can place 20<sup>th</sup> and 21<sup>st</sup> century bank-stress events into a very long historical context. We observe that, indeed, advanced-economy bank distress appears to be becoming gradually more and more frequent, from an initial basis in the second half of the 17<sup>th</sup> century that saw on average 1.7% of DM GDP experiencing bank stress in any given year prior to the outbreak of the War of the Spanish Succession (1701). This figure almost quadruples to 6.1% of DM GDP during the first half of the 18<sup>th</sup> century, with notable peaks being closely linked to geopolitical tail events: generally, it becomes clear that even prior to the classical gold-standard arrangements, both bank stress episodes and authorities' recourse to a wide menu of policy responses was clearly a regular feature of the international financial system.

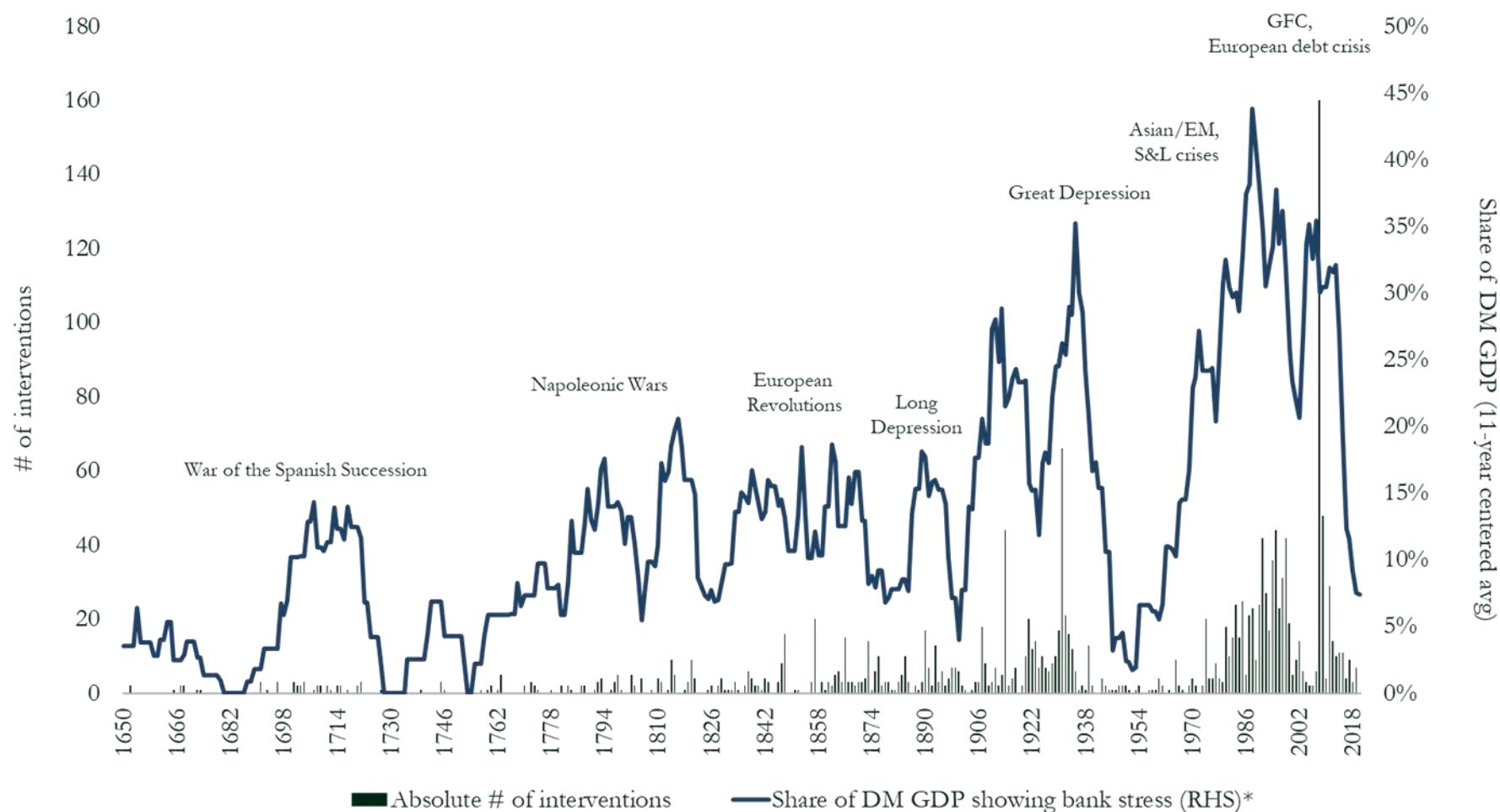
In the early industrial era, the two great escalations in bank stress occur during the late phase of the Napoleonic Wars – we count 37 interventions spread across 19 separate bank-stress periods between 1810-1821, many related to public banks in need of recapitalizations, restructurings, or suspensions in the wake of invasions or (post-war) escalating debt monetization – as well as the years 1847-1848 – this latter date marking the high tide of domestic revolutions across Europe, a two-year period that had 25 interventions, but one that has received comparatively little attention thus far relative to its financial importance.<sup>26</sup>

By this count, the years 1907, 1914, and 1931 mark years of intervention clusters, with 1914 experiencing 47 interventions, clustered in July and August after the declaration of War (1914 thus marking the third largest intervention year on record), and 1907 witnessing a notable number (18) of bank assistances and liquidity programs in- and outside the U.S. The year 1931, meanwhile, with 71 recorded interventions, experiences the largest number of interventions in the entire sample outside of 2008 (when we record 172 individual interventions), and contributes to a total of 137 interventions during the main Great Depression years of 1929 through 1933.

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<sup>26</sup> Osterhammel (2014) offers a comprehensive account of international political events for these years. Dedicated economic and financial work is rarer given the scale of volatility, but Berger and Spoerer (2001) provide economic context, and Ferguson (2006) documents the pan-European bond market sell-off in 1848.

**Figure 6:** Distribution of total interventions, by year, and share of advanced economy GDP exhibiting “bank stress”, 1665-2019.



The left axis in the Figure takes an intervention-level view, and reports the total number of interventions in each year (“# of annual events”) for the full database, summing all canonical and candidate crises intervention observations for each respective year. The right axis takes a GDP-weighted view for advanced economies, focused on the subset of eight leading DM countries (Italy, the U.K., Netherlands, France, Germany, Spain, the U.S. [from 1790], and Japan [from 1870]). Canonical or candidate crises intervention observations in the respective year for one of the eight countries results in a positive observation for the year of its respective DM GDP share, with shares for all eight countries then summed for each year. Eleven-year centered moving average is displayed for this measure. GDP weights based on Schmelzing (2020).

Subsequently, while the immediate post-war decades are notable for a relatively muted stress incidence, the post-Bretton Woods period is unique over the four-century period observed here, with a record 20.2% of DM GDP being under bank stress in an average advanced economy year. Indeed, between 1980 and 1999, we record an average of 24 relevant interventions per annum across the globe.

By this evidence, it appears that the post-Bretton Woods banking crisis frequency is higher than that experienced under the classical gold standard (Bordo et al. 2001; Sufi and Taylor 2022): even prior to the 2008 GFC, the international financial system was prone to a gradually but consistently rising intervention frequency persisting across historical regimes, and meaningfully intensifying in the second half of the 20<sup>th</sup> century.<sup>28</sup> On average, the percentage of DM GDP under bank stress over the 1665-2019 period displayed below shows an increase of 3.4 basis points per year, with the uptick from the virtually intervention-free Bretton Woods period to the floating era resembling the reversals of fortune during the quiet 1870s and the immediate pre-WWI years.

## **VII. Conclusion**

In the historical record, crises are like fires and the government interventions in those crises are analogous to firefighting. The existing crisis chronologies were built by looking for direct evidence of the fire. This has been an important exercise for macroeconomics and finance because the historical record is clear about the existence of the most severe crises, and these examples are the most quantitatively important for welfare. But if we are interested in the efficacy of crisis resolutions, we also need to study the cases where we observe the firefighting, but no long-term damage apparent from the fire. This exercise is fruitful because it is often easier to observe trace evidence of firefighting than to directly observe the fire itself. The main goal of our project is to build a database that includes as many interventions as possible, both with and without other indicia of a crisis.

To accomplish this goal, we introduce a classification system for banking-crisis interventions, describe the construction of a database based on that system, and then provide statistics about cross-sectional and time-series patterns from this database. The classification system is mapped onto the financial-sector balance sheet and includes 20 types of interventions in seven major

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<sup>28</sup> Note that this trend is not explained by a higher responsiveness of authorities to an otherwise static level of bank stress, since we control for “no intervention” responses.

categories. The current version of the database includes 1,946 interventions dating back to Roman times. One contribution of our intervention-based prism is that it allows for the identification of 455 “candidate crises”, where we find evidence of an intervention in the historical record, but no crisis event is found in the canonical chronologies. These candidate crises may have been missed by earlier filters or may instead be examples of successful interventions worthy of further study.

The data show a changing pattern of interventions over time, with governments opting primarily for *rules* and *lending* interventions for most of the sample period, with *capital injections* emerging as the most popular intervention in the last fifty years. Overall, while crisis-fighting might have seemed to be about the “lender of last resort” for much of history, in today’s world governments are intervening all over the balance sheet. Regression evidence suggests that wealthier countries are more likely to engage in several types of interventions, and that countries with limited debt capacity and more autocratic political systems shy away from making guarantees, and those with more rigid currency regimes do less emergency lending.

We feel that the identification of candidate crises is a main contribution of the paper, and the evidence on GDP losses after crises suggests that there is much more to learn about these events. We compute a GDP gap for all crises and find that the universe of candidate crises falls right in between the control group and the universe of canonical crises. Importantly, there are economically significant differences between candidate crises and non-crisis years. We also find that post-crisis GDP losses are larger for wealthier countries, with some evidence that these losses are lower in countries with more democratic political systems and more liberal currency regimes.

Finally, the intervention-prism allows for a longer historical view about the “crisis problem”; intervention frequencies suggest that the crisis problem in the financial sector has indeed reached an apex during the post-Bretton Woods era, but our evidence suggests that it is part of a more deeply entrenched development that saw global intervention frequencies and sizes gradually rise since at least the late 17<sup>th</sup> century.

**Online Appendix Material (in separate file):**

**Appendix A – Notes on Sample Selection and Identification Process of Historical Crises.**

**Appendix B – Database Elements and Structure.**

**Appendix C – Robustness Checks for Regression Results.**

**Appendix D – Full Intervention Chronology, 1,946 Cases, 33 A.D. – 2019.**

**Appendix E – Appendix Bibliography (Covering Appendix A-B, D, F).**

**Appendix F – Details on Long-Run GDP and Intervention Size Calculations.**

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This section only contains references cited in the main body of the paper. For the full list of references used in all subsequent appendix sections, including the full list of sources in the main database, please consult Online Appendix E.

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