The Complex Crises Database: 70 Years of Macroeconomic Crises

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Keywords: Financial crises; Narrative Economics; IMF; Text Analysis; Complexity.

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70 Years of Macroeconomic Crises [*]

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Abstract

While the recent empirical literature on macroeconomic crises focused on a limited subset of events (e.g. banking, currency and sovereign), macroeconomic crises are usually characterized by large scale domino effects that involve a much wider and heterogeneous array of sectors and transform them into highly complex events. This data limitation, in turn, hampers the understanding of these chaotic and painful episodes for researchers and policymakers alike. After building a raw corpus of roughly 23,000 International Monetary Fund country reports, we harness the power of text mining to produce a new database on crises discussion: the database covers 20 different types of economic, financial and non economic events for a sample of 181 countries over the period 1950-2019. We document a substantial rise in complexity of macroeconomic crises throughout the XX and XXI^{th} century and a higher centrality of the non-fundamental channel in the system.

Keywords: Financial crises; Narrative Economics; IMF; Text Analysis; Complexity

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Introduction

> *"As research methods advance, and as more social media data accumulate, textual analysis will be a stronger field in economics in coming years. It may allow us to move beyond 1930s-style models of feedback, the "multiple rounds of expenditure", and get closer to all the kinds of feedback that really drive economic events."*
>
> Shiller (2019)

Macroeconomic crises originate in different areas of the economic system, propagate through various channels and ultimately, disrupt different sectors of economic activity. A peripheral and localized shock e.g. the collapse of the housing market at the onset of the Global Financial Crisis (GFC), can start a domino effect that extends far beyond the initial disruption and breeds into highly complex outcomes. While in the last decades the empirical crises literature has been growing substantially, it has only devoted particular attention to a limited subset of crises: mainly, banking crises, sovereign debt default and currency crashes (e.g. Laeven and Valencia (2013), Reinhart and Rogoff (2013)). Although these crises are central and critical components of macroeconomic dynamics, it would be deceptive to isolate them from non economic and less conventional events. These events, such as epidemics, political uncertainty, violent conflicts or migration crises might act as causes, consequences and amplification mechanisms, whose occurrence determines the speed, intensity and duration of economic and financial downturns. Reconstructing the complex narratives of periods of high macroeconomic volatility in a quantitative and coherent framework is an herculean challenge that can both enrich the historical understanding of crises and provide empirical support to highlight specific mechanisms in theoretical frameworks.

In this paper, exploiting the recent technological advances in terms of computational power, image recognition and text mining techniques, and the overseer role the International Monetary Fund (IMF) played over the last 70 years for its membership, we provide new and rich material for the analysis of macroeconomic crises. First, we provide accessibility to a raw text database of roughly 23,000 documents - country reports and program related - covering the whole IMF membership throughout the period 1950-2019. Second, we manually compile an IMF crisis-specific dictionary and propose a simple term-frequency approach to capture and quantify Fund discussions about a large variety of economic and non economic crisis events for each country and year. The large time span (70 years) and country coverage (181 countries) as well as the scope of crises covered within a comparable framework complement and extend standard datasets of macroeconomic crises and provide useful material for a deeper understanding of the complexity at play during these highly chaotic events.

We provide evidence that crises complexity, measured as the number and intensity of correlations between

the different term-frequencies, has increased massively starting from the first wave of financial globalization, with a move from a sparse network with mostly real and domestic crises in the Bretton Woods era into a highly dense one, financially dominated, in the recent decade. Furthermore, we highlight another connected trend: the rise in centrality of non-fundamental drivers, expectations, in the unfolding of complex events. All in all, this evidence calls for new strategies of crises prevention and mitigation by policymakers.

The paper is structured as follows. Section 1 summarizes the relevant literature on text mining and details the construction of the corpus and of the vocabulary and the method used to compute the 20 crisis indicators. Section 2 presents a general overview of the dataset, validating it against standard benchmarks and reporting examples of non-standard indicators. Section 3 shows evidence of rising crises complexity throughout the sample period. Lastly, section 4 concludes.

1 From Qualitative Judgements to Quantitative Measures

The analysis of macroeconomic crises necessarily suffers from important data limitations that often limit and bias the general understanding of these highly chaotic and painful episodes. Sometimes, however, "*[d]ifferent terrains [simply] call for different vehicles*" (Akerlof, 2020), with the emergence of new techniques that contribute to the rise of novel perspectives and findings. Natural Language Processing (NLP) and text analysis have gained great popularity over the recent period in academia: this development has been fueled by the evolution of information technologies and the booming of the big data area. These techniques have permitted to transform large quantities of text into numerical data, extracting valuable insights and avoiding labor-intensive reading and manual coding. In the social sciences, this type of empirical approach has been used to analyse a large spectrum of subjects, ranging from the political slant of media to drivers of consumer decision-making.[1]

In macroeconomics, it has proved a useful tool to capture the perceptions of economic agents as well as a good complement to the traditional economic and financial data. A first strand of literature harnesses sentiment-analysis i.e. the interpretation and classification of emotions (positive, negative and neutral) to enhance the forecasting of economic fluctuations and upcoming crises as well as providing an additional understanding of the swings in assets prices. Fratzscher and Reynaud (2011) assess the degree of favorableness in the Public Information Notices (PINs) issued after Executive Board discussions of IMF *Article IV Consultations* with member countries. The sentiment classification depends on the authors' interpretation of IMF information and results in a quantitative score that goes from -2 to +2. For a set of 36 emerging market economies over the period 2001-2007, they find that the degree of favorableness significantly influences sovereign spreads. García (2013) constructs a sentiment index from the financial columns of *The New York Times*. The author uses a dictionary approach to classify positive and negative words in each article. He finds that news content helps predict stock returns at the daily frequency, especially during recessions. Exploiting a similar dictionary approach, Fraiberger (2016) constructs a sentiment index over the period 1987 -2013 across 12 countries: to do so, he analyzes a corpus of economic news articles produced by *Reuters*. He finds that information from news articles is not incorporated into Consensus forecasts. Huang et al. (2019) build monthly sentiment indices for 20 countries from 1980 to 2019 using *Financial Times* news articles. Instead of a predefined dictionary, they use a *word2vec* algorithm (Mikolov et al., 2013), an unsupervised technique focusing on the distribution of words, to map them into a high-dimensional space and then count the occurrence of precise semantic clusters across the articles. Following this initial clustering, they classify each group according to its general sentiment (fear, risk, hedging and crisis). They

[1] See Gentzkow et al. (2019) for a comprehensive review.

find that their sentiment indices spike ahead of financial crises and conclude that these new indices could complement traditional forecasting methods with early real time data. Fayad et al. (2020), working on a corpus of IMF *Article IV Consultations* including all member countries in the period 2000-2018, develop a sentiment index measuring the reception of policy advice at the time of the consultations: they find that, although authorities of member countries largely agree with Fund advice, there is sizeable heterogeneity connected with different country-specific economic and political characteristics.

Uncertainty and risk measures are the second avenue of research. These studies, rather than relying on the emotional intent of words, exploit solely their presence or frequency within a document. In their seminal work, Baker, Scott R. et al. (2016) create an economic policy uncertainty (EPU) index for the United States from 1985 onwards counting the number of articles in the 10 leading US newspapers with words related to the economy, uncertainty and policymaking. They then extend the same methodology to include all G10 economies. Ahir et al. (2018) use the same approach with quarterly *Economist Intelligence Unit* (EIU) country reports: they produce an uncertainty index for 143 individual countries on a quarterly basis from 1996 onwards. Recently, a modified versions of this index, the World Pandemic Uncertainty index, has been published to improve the understanding of the economic consequences of epidemics.[2] Ghirelli et al. (2019) refine this methodology for the Spanish case extending both the newspaper coverage and enriching the set of keywords to search for. Engle et al. (2020) construct a climate change news index relying on a corpus from *The Wall Street Journal* (WSJ) covering the time span 1980-2017. The authors convert WSJ term counts into "term frequency–inverse document frequency" and compare the resulting scores to a corpus of authoritative texts on the subject of climate change: they use this new measure and a portfolio approach to build climate change hedge portfolios.[3]

Finally, different authors rely on a simple reading methodology for the identification of financial crisis episodes. Romer and Romer (2017) create a new semiannual measure of financial distress in a sample of 24 advanced economies from 1967 to 2007. This measure is based on the manual coding of the *OECD Economic Outlook*: after reading all the documents, the authors classify the degree of financial distress for a certain country/half-year on a scale from 0 to 15. They then use this new series to explore the behavior of economic activity following financial crises. Vannier (2020) develops a conceptual framework to guide the choice of key elements entailed in such a methodology and applies it to date the start of currency crises: he proposes a narrative taxonomy of currency crises for 54 countries based on 315 IMF publications – mainly article IV consultations - covering the time span 1970-2020.[4]

[2] https://blogs.imf.org/2020/04/04/global-uncertainty-related-to-coronavirus-at-record-high/

[3] Another notable mention goes to Choi and Varian (2012) and Scott and Varian (2014) that use *Google Trends* data and a term-frequency approach to nowcast economic activity.

[4] Manual coding has also been used for other purposes e.g. Hernandez (2020) characterizes the policy discourse in IMF–Argentine *Article IV Consulta-*

Compared to the previous literature, our contribution is twofold. First, we significantly improve accessibility to IMF documents for economists and social scientists alike: we provide a raw text database of roughly 23,000 documents - country reports and program related - covering the whole IMF membership throughout the period 1950-2019. Previously, Mihalyi and Mate (2019) introduced a text dataset of country reports published by the IMF between 2004 and 2018 for 201 countries. We build on their work and extend the sample of documents backwards exploiting Optical Character Recognition (OCR) and auto correction techniques to overcome the accuracy hurdle that hindered previous work.[5] Second, we manually compile an IMF crisis-specific dictionary and propose a simple term-frequency approach to capture and quantify Fund discussions about a large variety of economic and non economic crisis events for each country and year. This algorithmic approach allows us to process in a computationally feasible way the large volume of data available and ultimately, to capture the entire complexity of events associated with episodes of macroeconomic volatility.

In the remainder of the section we present the source, country and time coverage of the corpus, explaining in detail the data acquisition and processing part, describe the construction of the lexicon and illustrate the empirical method used to extract crisis discussion indices from IMF texts.

1.1 The Corpus of IMF Documents

The IMF is an international organization created in July 1944 at the Bretton Woods conference. Its primary mandate is to preserve the stability of the international monetary system i.e. the system of exchange rates and international payments. Although the institution is mostly known for its role of financial assistance for countries experiencing balance of payments difficulties, its mandate is larger and ranges from the provision of technical assistance and the strengthening of local capacity to the production of regular forecasts for its member countries. In this paper, we exploit the surveillance activity of the Fund and concentrate on drawing a quantitative synthesis of country-specific outlooks.

The Fund regularly monitors and evaluates the situation of economic and financial systems in order to identify contingent sources of risk. Surveillance is carried out at different levels: (i) from a global and wide perspective in publications such as the World Economic Outlook, (ii) on more specific topics/regions in recurrent publications such as the Global Financial Stability Report, Fiscal Monitor, External Sector Report, Regional Economic Outlook or (iii) at a country level in the Article IV and other country reports e.g. the Recent Economic Developments series. Moreover, surveillance is often also a key condition associated with the Fund financing programs. Hence,

tions.

[5] "We choose 2004 as our starting year because...from earlier periods...the majority are scanned PDF which make text recognition difficult and imprecise"(Mihalyi and Mate, 2019).

program-related documents such as requests for assistance or program reviews also contain important surveillance elements. To produce credible and comprehensive information about the economic outlook of its member countries, the Fund relies on an evolving conceptual framework for assessing country risks (Ahuja et al., 2017) and large teams of economic experts that work in close relationship with national authorities and main economic actors, collecting and analysing a large variety of quantitative and qualitative information. This research culminates in the production of regular and formal economic reports which provide background information for political, economic and financial decisions.

The privileged relationship of the Fund with national authorities of almost all countries in the world, the close interactions of its staff with leading scholars and policy makers as well as the rigorous editorial process ensure an evident comparative advantage compared to other textual sources such as newspapers and tweets. Fund documents exhibit a number of desirable characteristics; first of all, they are long and detailed: they depict meticulously the real time outlook of the economic situation. While newspapers might neglect some elements in favor of others or not correctly grasp the situation at hand, this risk is minimized by the Fund. Second, they are extremely cautious: each word is discussed, weighed and negotiated and follows a strict protocol of revision and publishing. This revision system, commonly supervised by the Strategy, Policy and Review (SPR) department leads to a situation of homogeneous linguistic i.e. a high likelihood that linguistic findings based on one document apply to another (Kilgarriff, 2001). Homogeneous wording is the kingpin of our lexicon approach: it allows us to compile consistently a dictionary of expressions the Fund uses to refer to different occurrences of the same type of events. The heterogeneous wording that characterizes other textual sources would render this methodology non-viable.

The scraping of the IMF archives for all documents for each of the IMF member countries provides around 250,000 references produced between 1947 and 2016. In addition to the references of documents available in the archives, we also scrape the current IMF website to obtain references for the documents published after 2016.[6] The reference provides rich metadata: mainly, the title of the document, the day of publication and the link to the attached document in PDF format. We perform a semantic analysis on the title to retain only the relevant types of documents i.e. documents related to individual country surveillance.[7] This leaves 39,000 references for which we download the associated PDF. Sometimes, however, metadata exhibit inconsistencies: thus, from this original sample, we further remove a number of misclassified documents.[8][9] This further cleaning leaves us with

[6] Respectively, https://archivescatalog.imf.org and https://www.elibrary.imf.org.

[7] We consider these as country reports and program-related documents. See section A.1.1 in the Appendix for more details on the procedure.

[8] Titles may contain reference to Article IV or programs and be of different nature e.g. a Working Paper on the evaluation of program outcome. In turn, these documents are problematic since they discuss specific topics and confuse information about different countries.

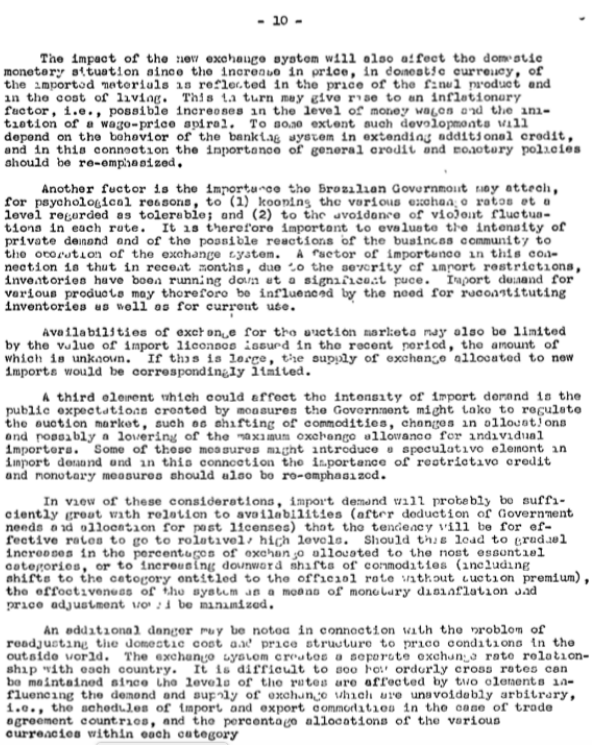
[9] Technically, to automate the process and not revise one-by-one the documents, we compile a list of keywords that commonly appear on the first page of these misclassified documents and exclude the document from the term-frequency calculation (see section 1.3) if we detect one of them on the first page.

a final corpus of 23,465 documents covering the time span 1950-2019.

To read and convert these documents into text suitable for statistical analysis, we have to overcome a substantial accuracy hurdle: most of the early reports feature wandering baselines (horizontal lines on which the letters "sit") and ink splodges (Figure 1a), resulting in a highly imprecise text recognition with standard libraries available in modern statistical softwares (Figure 1b). At the same time, more advanced image recognition technologies i.e. OCR require a much longer computational time to process the enormous amount of information available. In order to obtain the maximum accuracy while making the task computationally feasible, we decide to harness the power of cloud services: in particular, we choose to use Google Cloud's Vision API (see Figure 1c).[10]

Figure 1: Converting Documents to Text Data

(a) Original Document



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The impact of the new exchange system will also affect the domestic monetary situation since the increase in price, in domestic currency, of the imported materials as reflected in the price of the final product and in the cost of living. This in turn may give rise to an inflationary factor, i.e., possible increases in the level of money wages and the initiation of a wage-price spiral. To some extent such developments will depend on the behavior of the banking system in extending additional credit, and in this connection the importance of general credit and monetary policies should be re-emphasized.

Another factor is the importance the Brazilian Government may attach, for psychological reasons, to (1) keeping the various exchange rates at a level regarded as tolerable; and (2) to the avoidance of violent fluctuations in each rate. It is therefore important to evaluate the intensity of private demand and of the possible reactions of the business community to the operation of the exchange system. A factor of importance in this connection is that in recent months, due to the severity of import restrictions, inventories have been running down at a significant pace. Import demand for various products may therefore be influenced by the need for reconstituting inventories as well as for current use.

Availabilities of exchange for the auction markets may also be limited by the value of import licenses issued in the recent period, the amount of which is unknown. If this is large, the supply of exchange allocated to new imports would be correspondingly limited.

A third element which could affect the intensity of import demand is the public expectations created by measures the Government might take to regulate the auction market, such as shifting of commodities, changes in allocations and possibly a lowering of the maximum exchange allowance for individual importers. Some of these measures might introduce a speculative element in import demand and in this connection the importance of restrictive credit and monetary measures should also be re-emphasized.

In view of these considerations, import demand will probably be sufficiently great with relation to availabilities (after deduction of Government needs and allocation for past licenses) that the tendency will be for effective rates to go to relatively high levels. Should this lead to gradual increases in the percentages of exchange allocated to the most essential categories, or to increasing downward shifts of commodities (including shifts to the category entitled to the official rate without auction premium), the effectiveness of the system as a means of monetary disinflation and price adjustment would be minimized.

An additional danger may be noted in connection with the problem of readjusting the domestic cost and price structure to price conditions in the outside world. The exchange system creates a separate exchange rate relationship with each country. It is difficult to see how orderly cross rates can be maintained since the levels of the rates are affected by two elements influencing the demand and supply of exchange which are unavoidably arbitrary, i.e., the schedules of import and export commodities in the case of trade agreement countries, and the percentage allocations of the various currencies within each category

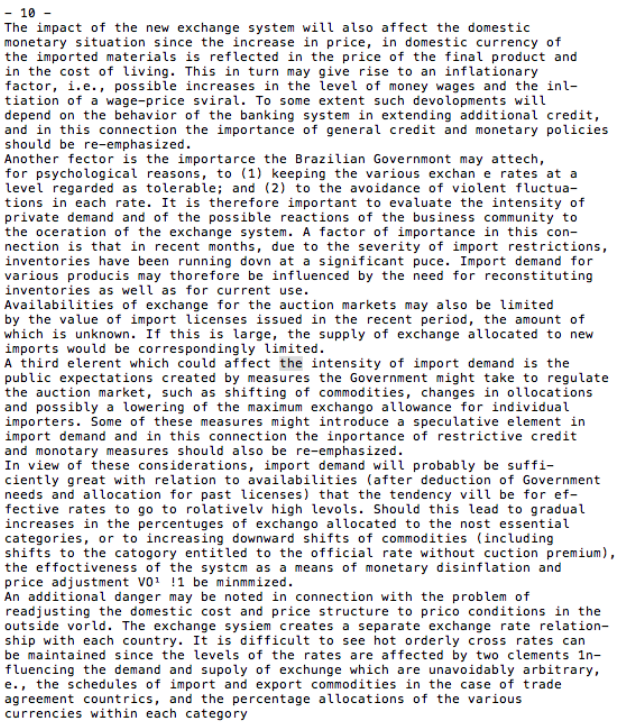
(b) Normal Extraction

10 w The impact of t h e :lea exchauee system w i l l also a f f e c t tho dorntlstic 4 monetary s i t u a t i o n s i n c e t h e i n c r e a m in price, i n dornest?'c curreucy, of t h e m p o r t c d v o t e r i a l s 1s r e f l e r t e d i n the p r l c e of t h e f x w l p r o d u c t and 111 the cost of l l v i l l g . T h i s -??.Ittrn may g i v e r l se to an i n f l a t i o n a r y f a c t o r , i.e., p o s s i b l e i n c r e a s e s I n t h e l e v e l or money waLcs a%l t h e n l t l e t i o n of a wage-price s p i r a l . T o s o m e e x t e n t s u c h devslopmcllts will depend on t h e b e h a v i o r of t h e banki-lk syszen: in extendin3 a d d i t j o n a l c r o d i t , and in t h i s c o n n e c t r o n t h e i m p o r t a n c e of g e n e r a l c r e d i t and n o m t o r y p o l x i e s should be re-empha sized Another f a c t o r is t h e fmporta*-co t h e B r o z l l l a r r Govarnmcnt m y a t t e c h , for p s y c h o l o g i c a l reEtsons, t o (1) Iceenin5 t h e various e;:chaL?: e m t = s s t a l e v e l recurded a s tolerable; and (2) t o t h c dvoidem-e of vio3ellt f l u c t u a t i o n s i n each r u t e . It 1s theref'ore i m p o r t a n t t o e v a l u a t e t l w i n t e n s i t y of p r i v a t e demahd and of t h o possible r e a c t i o n s of t h e b u v i n c s s ccmmunity t o t h e orcLndtIo!l of t h e cxcha:lge system. A p a c t o r of i m p o r t a n c e I n this COLIn e c t i o n is t h a t i n recedt nontils due ',o the severity cf lmport r s s t r i c t l o n s , i n v e a t a r i e s have beell runnLng down e t a signlP1coc.t puce. Import deaand f o r various products may thcreforc be i n f l u e a c e d by the need for r e c o a q t i t u t i n g i n v e n t o r i e s a s a e l l 0 S for c u r r e n t uke. A v a i l a b i l j t i e s of exck an,e for the? e u c t i b n n1arl:eto m y a l s o be limited by t h e w l u e of i m p o r t liccnscs L s s u r d i n t h e r e c e n t F s r i o d , t h e amount of which i s unkllorrn. If t h s i s L a z : e ,t h e supply of exchanLe q l l o c a t e d t o new imports would he correspondin&Ly l i m i t e d . k t h i r d element tvhfch c o u l d Effect t h c i n t o n s l t y of import demand is tho p u b l i c expectdtioas c r e a t e d by measures t h e Government m i g h t t o k e t o r e g l l e t e t h e auction market, s u c h o s s h l f t i n g of commodities, c h a n g e s In o l l o c a t l ons and p o s s l b l y a lowering of t h e nlaxllnurn cxcbangc a l l o w a n c e for n c l l v l d u a l t importers. Some of these measures n n g h t introduce o s p e c u l n t l v c e l e t n o n t In import demand end 111 t h i s c o n n e c t i o n the ic,portance of r e s t r i c t l v c credit and monotary measures should a l s o bo re-omphaalzcd. I n v x w of t h e s e c o n s i d e r a t i o n s , i m p o l ' t d e m n d vi111 prot;sbl> be s u f f l c i e n t l y g r e a t v n t h r e l a t i o n t o a v a i l a b i l i t i e s (o f t c r deduction of Covernlnent needs 8 x 3 o l l o c a t l o n f o r p a s t licenses) t h a t the t e n d e m y xirill be f o r eff e c t i v e r a t e s t o g o t o r o l a t l v e l a h i g h l e v e l s . Should t;l? E:l e a d t o grudclsl increases in t h e pcrcentoGcs of exchan3c a l l o c a t e d t o the rlost e s s o n t l e l c a t e g o r i e s , or t o i n c r e e s l n g doirnvv3rd s h l f t s of conmodlties (l n c i u d l n g s h i f t s t o t h e c a t c g o r y e n t i t l e d t o the a f f l c l o l r a t e : r l t k L z u t c u c t l o n prernium), t h e e f f c c t l v e n e s s of +,he systcm a s a means of m o n e h r y d l s l n f l a t l o n JL1d price adJustment 1 / 0 1 :1 be rnlnl~nized. An a d d l t l o n a l danger m y be noteu i n c o n n e c t i o n with t h e w o b l m of r e a d g u s t l n e the d o r m s t l c cost a d prlcc s t r u c t u r e t o p l c c c o n d l t l o n s in the o u t s i d e world. The exchange ;ystcm crrldtos a s e p o n t e exchdn;z r a t e relationship v i t h e a c h c o u n t r y . It i s d i f f i c t t l t t o me bo:r orderly cross r a t e s c a n be r n a f n t a i n e d s i m e the l e v e l s of tile r a t e s are a f f e c t e d by t \ J o c l e n e n t s UI= f l u e n c l n g t h e demond and suF?l;r of exchan;e whlcll aye u n a v o i d a b l y srbitrdry, i.e., t h e schedtles of import and e x p o r t cornmodltles i n t h o c a s e of trade 1 agreement countrlcs, and t h e percentage a l l o c a t i o n s of t h e v a r i o u s curreacies within e a c h c a t e g o r y

A full list of these keywords is available in Table 8.

[10] For the details, see section A.1.3.

(c) OCR Extraction



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- 10 -
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currencies within each category
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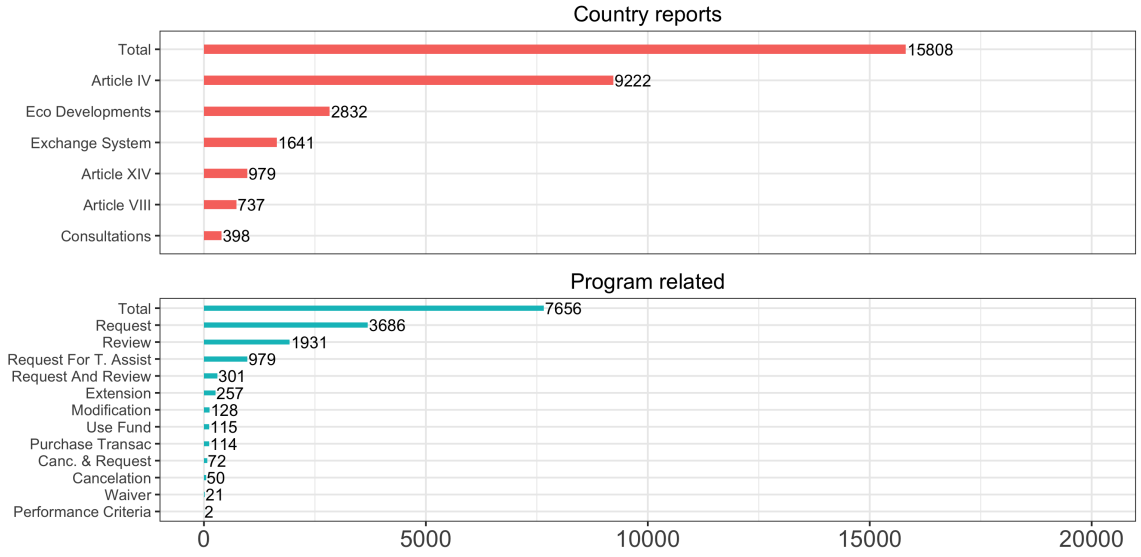
Source:*IMF Archives*
Note: Panel (a) shows an extract from the document *1953 Consultations - Brazil*, Panel (b) the associated text extraction with a standard library (*pdf_text* function from the *pdftools* R package) and Panel (C) the associated OCR extraction performed using Google Cloud Vision.

Figure 2 shows the composition of the final corpus, dividing between country reports and program-related documents. Country reports comprise two thirds of the total: the most common documents are Article IVs, followed by Recent Economic Developments. While the former are the last step of the *Article IV consultation* and are published with the prior agreement of country authorities, the latter are internal documents that provide background for the whole process and prepare in advance their analysis (Vannier, 2020). While *Article IVs consultations* should be conducted annually, in practice the final publication often has biennial frequency, especially in earlier years. In addition, countries that are in disagreement with Fund analysis may refuse the release of Article IVs. Hence, including Recent Economic Developments in the corpus is fundamental to compensate the otherwise inevitable loss of information. Article XIV and Article VIII documents appraise the motivation behind the introduction and maintenance of exchange rate restrictions, and thus are particularly useful to capture episodes of currency volatility. Lastly, simple Consultations are an "archaic" version of Article IVs, mostly present in the 50s and 60s and replaced afterwards. Program-related documents are, instead, mainly composed by Requests and Reviews, with other minor documents, e.g. Modifications, Waivers etc., completing the picture. In Appendix A.1, we present an overview of the different types of documents: their purpose, whether or not they are currently issued by the Fund and whether their production is or was regular (Table 9). Furthermore, we also show the evolution in the number of individual country reports and program-related documents over time (Figure 12).[11]

[11] We find a strong correspondence between the description of the documents and their evolution over time. For instance, Article VIII and Article XIV

Figure 2: Size of the Corpus



Source: *Complex Crises Database* (CCD)

The documents in the corpus exhibit an extensive coverage, covering almost every country in the world (Figure 3).[12] While Latin American countries have been widely covered by the Fund, developments in some countries of Africa and Central Asia are less documented. Rather than a shortcoming, however, this geographical distribution of the corpus reflects deep historical reasons: most nations in Africa were colonized by European states in the early modern era and gained independence relatively late compared to Latin American countries.[13] Similarly, different Central Asian nations gained independence only after the fall of the Soviet Union in 1992.[14] North-American and European countries reveal, instead, a uniform pattern.

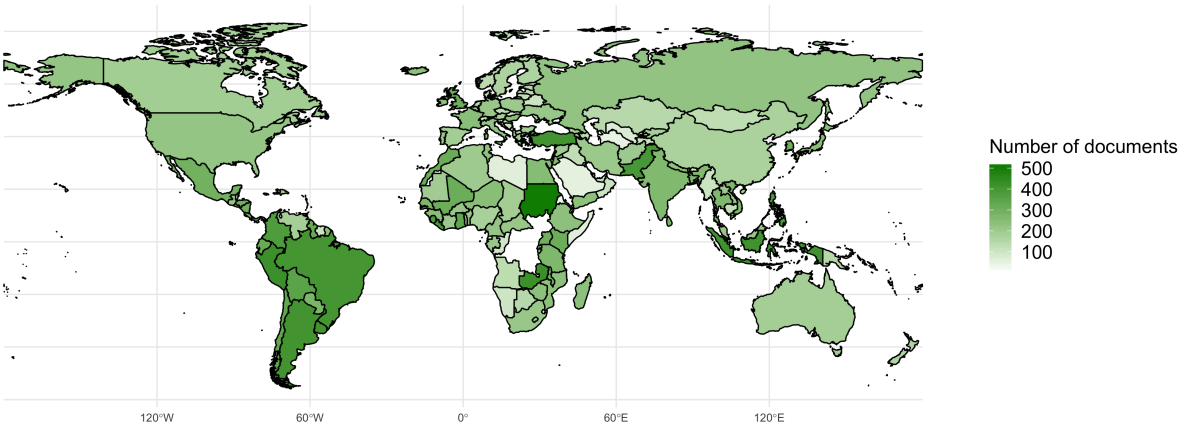
documents that are published for countries maintaining exchange restrictions, disappear at the turn of the 21st century (Figure 12a).

[12] With the exception of non-IMF members, 11 in total: Cuba, East Timor, North Korea, Liechtenstein, Monaco, Taiwan, and Vatican City.

[13] Many countries in the early 1960s, but some after 1970 e.g. Guinea-Bissau from Portugal in 1973 and even afterwards e.g Zimbabwe from Britain in 1980.

[14] Obviously, this is only part of the explanation: the other part is that large Latin American countries requested a high number of programs compared with other geographical groups.

Figure 3: Country Coverage



Source: *Complex Crises Database* (CCD)

Reports on high income countries appear, on average, more than a decade earlier in the sample compared to lower income groups (Table 1): this result is coherent with advanced economies being the earliest clients of the Fund.[15] In Appendix A.1, we report the detailed number of documents by country and the year the first document was published (Table 10).[16]

Table 1: Start Date by Income Group

Income Group	Avg. Start Year
High income	1959
Low income	1971
Upper middle income	1974

Source: *Complex Crises Database* (CCD)

Note: Avg. Start Year is the average publication year of the first document in the final corpus of IMF reports.

To the best of our knowledge, in this work we provide accessibility and consider the to-date broadest corpus of relevant IMF documents both in time, country coverage and type of report. This rich material allows us to adopt a holistic stance toward the analysis of crisis events and to ensure a general perspective for all income groups, thus re-balancing the crisis literature toward low-income countries. Furthermore, since it encompasses a long time horizon, it allows us to draw comparisons between the early Bretton Woods era and the most recent period: in this way, it corrects the usual focus bias on financially dominated crises for the post 1980 decades.

[15] "Advanced economies had been [the Fund] earliest and largest clients before the emerging market economies started to dominate its activity in the 1980s." (Reinhart and Trebesch, 2016).

[16] From the table other patterns emerge: for example, small islands such as Antigua & Barbuda and Vanuatu are the least covered in the sample.

1.2 The Lexicon of Crises

A proper lexicon is a dictionary of words, based on prior knowledge that provides a list of synonyms or near-synonyms describing the occurrence of an event. The rising interest for unsupervised and more complex text mining techniques is largely motivated by the necessity to by-pass the construction of a lexicon, a long and cumbersome process. Moreover, a large number of corpora displays little information on its actual content that is highly heterogenous, making prior knowledge largely irrelevant. In this respect, the format of IMF documents and the homogeneous language of the corpus largely eased the identification of the patterns and recurrent expressions commonly used by Fund staff.

In practice, the lexicon has been constructed by a first identification of each category according to prior knowledge on the dates and locations of the major disruptions to the macroeconomic outlook.[17] A careful reading of these well-known events formed the building stone of the vocabulary identification for each category and the first iteration in the process. Following this, preliminary term frequencies (see section 1.3 below) provided indices for each country and document that, in turn, served as guideline toward finding the most relevant documents. In this second step, we both control the veracity of the identification and add or correct the words and expression to include in the lexicon. This two-step process was repeated as long as evident marginal improvements were noticeable. In order to have a comprehensive and accurate lexicon, capturing extensively the occurrence of specific events, but also limiting potential Type 1 and Type 2 errors, we establish and follow a number of coding rules. The main guidelines are the following. First, we refrain from adopting a predetermined length for n-grams: no fixed number of words was defined. The lexicon includes both single words e.g. *epidemia*, *flood* or *rainfall* and longer expressions such as *large real depreciation* or *slowdown of economic activity*. We limit words with multiple meanings including the associated adjective in the expression, for example *trade war* indicates instances of trade conflicts, while *civil war* indicates armed battles. The couple noun+adjective was constructed using expert knowledge combined with manual reading of the documents. Regular expressions and anchors have been extensively applied to capture plural forms and avoid other matching errors.

The final dictionary counts almost 700 expressions organized in 20 categories. Table 2 provides an extract of the vocabulary included in the lexicon.[18] The heterogeneity in the number of expressions for each category is large, ranging from 64 words for contagion to 7 for migration crises. Nevertheless, this difference reflects some structural characteristics of the corpus itself: namely, the diversity of expressions increases with the degree of economic relevance of the category. Economists easily find a number of synonyms for well-established eco-

[17] Wikipedia provided a complementary source of initial information, in particular for non-economic events e.g. https://en.wikipedia.org/wiki/List_of_natural_disasters_by_death_toll.

[18] Table 11 reports the full vocabulary.

nomic phenomena, but less so for more unconventional events that are, hence, characterized by redundancies. Moreover, some categories contain by construction shorter terms that can refer to a multiplicity of complicated expressions. For example, *Paris club* is directly associated with debt rescheduling and thus, useful to capture a variety of phrases. No generic expression of the sort exists for regional crises, forcing us to include the different variations (*regional crisis*, *crisis in the region*, *crisis in neighboring countries* etc.), therefore increasing the number of expressions in the category. The political crises group is also particularly large. We ascribe this to the diplomatic tone necessarily adopted by Fund staff: numerous euphemisms are often used to substitute harsher terms, requiring a careful tracking of the different variants of an expression (e.g *political atmosphere*, *political instability*, *political turmoil*, *political uncertainty*,etc.).

Table 2: Lexicon Summary

Category	Total number	Examples
Contagion	64	regional crisis, crisis in the region, spillovers from the global crisis, systemic crisis ...
Political	60	political turmoil, internal security situation, political atmosphere, political crisis ...
Expectations	60	crisis risks, market reversal, economic sentiment remains poor, market sentiment has collapsed ...
BoP	54	Shortage of foreign exchange, bop crisis, balance of payment crisis, capital account crisis ...
Epidemics	42	epidemic, epidemia, pandemia, pandemic ...
Sovereign	41	rescheduled debt, external payments crisis, difficulties in servicing its external debt, difficult time in rolling over its debt ...
Commodity	40	oil crisis, rice crisis, crop crisis, crop failure ...
Banking	38	bank resolution, bank crisis, Banking sector restructuring, restructuringof nonperforming loans ...
Housing	35	home prices have been declining, drops in real estate prices, house price trends, home-price overvaluation ...
Sev. Recession	34	severe economic crisis, very difficult economic circumstances, Severe recession, severe crisis ...
Wars	28	war damage, insurgency crisis, security crisis, civil conflict ...
World	28	world-wide recession, global economic crisis, global crisis, world recession ...
Soft recession	28	slowdown in the economic activity, slowdown in economic growth, slowdown of the economy, slowdown of output ...
Inflation	26	inflation pressure, inflationary pressure, high.{0,10}inflation, high rate of inflation ...
Trade	26	trade war, trade policy tension, trade tension, trade conflict ...
Financial	20	financial stability crisis, international monetary crisis, crisis in financial market, financial risks ...
Currency	15	exchange rate crisis, large real depreciation, foreign exchange crisis, severe disruption of exchange markets ...
Nat. disaster	14	flood, drought, rainfall, torrential rains ...
Social	13	social risk, social strain, social.*turmoil, social disruption ...
Migration	7	refugee, migrant, inward migration, population inflow ...

Note: Authors' own elaboration.

In the selection of the categories, we gave particular attention to cover both economic and non-economic crises, domestic and non-domestic, in the real and the financial sector. Although the macroeconomic literature has devoted much less attention to the specific role of political crises, epidemics, violent conflicts, social tensions or migration outcomes, we deem these events of great importance in the general macroeconomic dynamics.[19] The categories include real domestic perturbations such as economic slowdowns and recessions, but also financial market related disruptions e.g. financial crises, currency crises and banking crises. Nonetheless, identifying the nature of the crisis is not always clear-cut. Since the keyword approach made further refinements difficult, we had to accept this ambiguity for a number of crises: for example, the category contagion refers to instances of both trade and/or financial contagion.[20] Similarly, a number of authors in the sovereign crisis literature have isolated precisely the domestic instances of default from external ones ((Reinhart and Rogoff, 2009; Bordo et al.,

[19] The Covid-19 crisis showed how little prepared are traditional macroeconomic models to deal with such events and fostered a new literature seeking to integrate epidemiologic and macroeconomic models (Bodenstein et al., 2020; Kaplan et al., 2020; Martin S. Eichenbaum et al., 2020).

[20] See Fratzscher (2003) for a review.

2000)) but this distinction is difficult to implement with the keyword approach employed in this paper.

The present lexicon includes different nuances of intensity within the same category. For instance, the Contagion category includes different shades of external crisis: either contagion from a crisis in other countries (*"crisis spillovers", "crisis in the region"*,etc.), slowdown of activity in partners (*"regional situation turned adverse", "adverse exogenous events"*,etc) or regionally located crisis (*"Mexican crisis", "Crisis in Argentina", "2002 crisis", "Asian crisis"*, etc.).[21] The only categories for which a clear separation between expressions referring to moderate intensity events and large collapses was necessary are those related to output dynamics. The first category, Soft Recession, refers to the "peak to trough" moment in the business cycle and denotes the regime shifting from expansion to recession (*"slowdown in economic activity", "economic decline", "slowdown of output"*, etc.), a sluggish recovery (*"low rate of economic growth", "activity remains weak", "sluggish recovery"*,etc.) or a moderate contraction (*"contraction of output", "decline in economic activity", "output is estimated to have contracted"*,etc.). In contrast, the category Severe recession includes instances of effective output collapses i.e. deep troughs of the business cycle (*"severe economic crisis", "sharp decline in output", "deep recession", "very difficult economic circumstances"*). Non-fundamental drivers of economic activity and crises have been largely documented in the macroeconomic literature: business confidence, panics, euphoria or adverse expectations are well-known drivers of economic activity (e.g. Akerloff and Shiller (2009)). To capture these non-fundamental drivers, we include a specific category, Expectations, that includes the perception of general risk (*"crisis risk", "potential risk", "upward risk"*,etc) the shift in expectations from economic agents (*"market confidence", "general uncertainty", "uncertainty among market participants"*,etc), clear non-fundamental crises (*"self-fulfilling crisis", "speculative attacks"*) and call for forward guidance (*"signals to market", "bolster confidence", "restore market confidence"*, etc).

The lexicon is highly dependent on the corpus on which it is applied. In the present case, omissions of some categories may not denote the absence of an event, but rather an irrelevance for macroeconomic stability with respect to the main stream economic models: not all non-conventional crises produce potential or realized consequences for economic activity. They may thus not enter as a risk in the outlook produced by Fund staff.[22] The lexicon for these categories produces an interesting sub-sample of the more economically relevant occurrences with a cross-country comparability that is often missing in such areas.

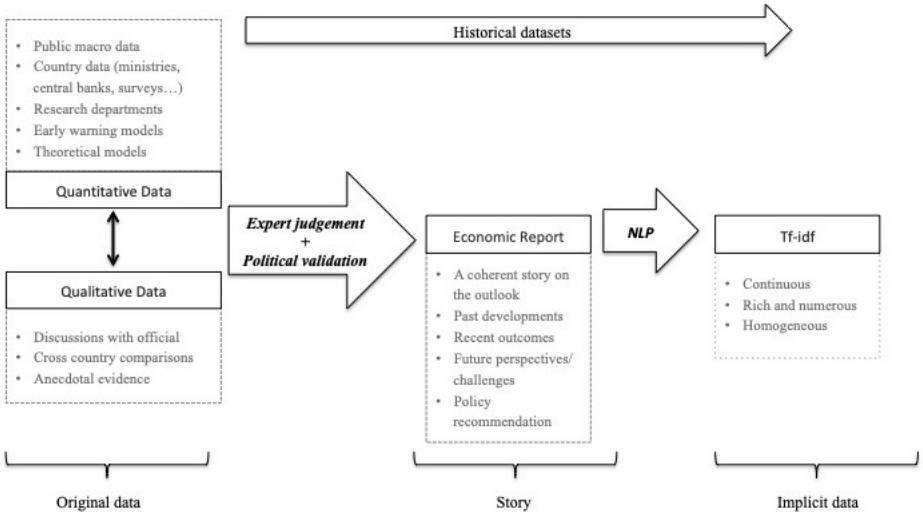
[21] World-wide crises have their dedicated category to capture contagion and shocks not regionally located, but concerning major economies (*"World-wide recession", "international crisis", "turbulence in international markets", "worsening international environment", "ongoing global downturn"*, etc)

[22] Non-conventional in the sense of macroeconomic theory.

1.3 The Extraction Method

The calculations of the indices used throughout the paper follows a term-frequency approach. After compiling the lexicon for each category, we count the number of times each document contains keywords belonging to a single category and divide by the total number of characters in the text: $tf_{ij} = \frac{N_{ij}}{N_i}$. In practice, this process of term matching depends on the pre-processing method chosen: in particular, the unit of tokenization can be different.[23] We decide to tokenize the documents by sentence to not impose any predetermined length on the keywords we will search for.

Figure 4: Sketch of the Data Generating Process



Note: The diagram shows the whole process of text analysis in a stylized way. IMF reports are a combination of quantitative and qualitative data concerning different events that are properly ranked in terms of importance and then transformed into words. The purpose of the NLP method is to extract from the story these initial data.

The choice of this naive approach rather than more advanced text analysis techniques stems from the nature of our corpus and the research question raised in this paper. While in a large number of corpora there is little information on the actual content of the documents, in this case we have already a predefined list of the main topics we seek. Thus, looking at the whole distribution of words and, in particular, frequent words is less informative than focusing on the lower frequencies of specific expressions.

The implicit process of data construction is summarized in Figure 4 that lays out the different components and the sequence leading to the organisation of the original data into economic reports and ultimately, the transformation into quantitative indices. The data presented in this paper is are more numerous than those of standard datasets not only in the scope of crises covered, but also in the quality and number of sources underlying the expert judgement: the Fund has real-time access to a vast amount of information and resources that comprises both quantitative and qualitative data, public and private. These sources are compiled, analyzed and summa-

[23] A token is an instance of a sequence of characters in some particular document that are grouped together as a useful semantic unit for processing.

rized by "experts" explicitly in charge of rendering coherent facts on the economic outlooks and undergoing events.

The narrative nature is the main characteristic of these new data. While it grants us a clear advantage with respect to the country and time coverage as well as the richness of information available, it may raise doubts about the correspondence between Fund discussions and reality because of potential editorial biases and methodological shortcomings. The first concern stems from the stability of the methodology and the constancy of the concept of crisis over time. For instance, a banking crisis identified in 1970 might not be the same as one detected in 2012. This critic is, however, not specific to narrative data, but applies also to the national accounts, financial records and accounting rules; any work that covers a long time span will be subject to these statistical discrepancies across time and it is not clear whether in this respect a non-narrative methodology would be superior. If anything, the interesting feature of a text-based indicator is that it is much more resilient to structural breaks.[24] A second issue is raised by the role of member countries in the drafting of Fund documents: as long as they have some input in the preparation, a worsening economic outlook may not be revealed to avoid self-fulfilling spells. This, in turn, would introduce a discrepancy between the real and the text outlook. Nevertheless, we do not believe this to be an alarming concern: major economic and non-economic events are discussed thoroughly in these documents.[25] Although suspicions of systematic biases in Fund activity may not be necessarily unfounded (e.g. Hernandez (2020); Dreher et al. (2009); Barro and Lee (2005)), we believe them to be limited to the choice and design of intervention in member countries through programs rather than in the surveillance of countries.

Last but not least, text analysis and large scale data transformation may lead to important noise and potential Type 1 and Type 2 errors, hence undermining the validity of the data.[26] In this specific case, the errors derive from the complexity of language and semantics that may not be perfectly captured through a predefined lexicon. Yet, given the length of the documents, the degree of detail and the emphasis on risky outcomes, the erroneous assessment from misleading sentences is unlikely to change dramatically the information conveyed by our indices. While a false positive will definitely produce a non-zero term-frequency, it is unlikely that in the same document these errors are repeated often enough to blur reality: by the same token, in the case of adverse outcomes, several sentences will be devoted to its description and assessment. Furthermore, to ensure soundness, in the next section we validate our term-frequencies against standard benchmarks found in the literature.

[24] For instance, the IMF staff knows how to interpret differently a current account deficit depending on the exchange-rate regime and capital mobility regime.

[25] See Romer and Romer (2017) for the same point on the *OECD Economic Outlook*.

[26] Detecting discussions relative to a category where there is none and the other way around.

2 The Complex Crises Database (CCD)

The empirical literature on macroeconomic crises is vast and characterized by a large variety of identification methods (mainly, non-parametric, parametric and qualitative), data sources, country and time coverage, frequency and features of the resulting data (binary or continuous measures) as well as focuses (e.g. from real activity drops to exchange rate crashes). We first shortly review the literature on macroeconomic crises, discuss the definitions and main features of the benchmark data-sets for some key indices (sovereign default and economic recession) and then, in the first part of the section, compare them to our term-frequencies, highlighting the correspondence between the two and detailing the major differences.[27][28] In the second part of the section, instead, we zoom in on the behaviour of the narrative indicators for non-economic crises and assert their relevance to understand the economic outlook of individual countries.

Identifying economic crises, defined as a drop in domestic output benefit from the compiling of long GDP series for most countries and several proxies for periods prior to the compilation of standardized national accounts (e.g. Feenstra et al. (2015)). In addition, specific work on the dating procedure in the spirit of Harding and Pagan (2002) and Kose et al. (2020) have provided convincing dating of individual and global economic downturns. For financial crises the literature combined long, qualitative, narrative studies (Kindleberger (1975), Diaz-Alejandro (1985)) with more rigorous, quantitative investigations. Among the latter, Reinhart and Rogoff (2009) stand out as the most comprehensive source of information on the timing of financial crises: for 68 countries, mostly advanced economies and major emerging markets, going back to the nineteenth century, the authors date sovereign defaults, inflation spikes, exchange rate crashes, stock market bursts and banking crises. Similarly, Laeven and Valencia (2013) expand the country coverage to 160 countries focusing on a shorter time period (1970-2017) and identifying, specifically, episodes of systemic banking crises. Finally, Beers and Mavalwalla (2017) report a continuous measure of sovereign crises: for all countries that underwent a default in the period 1960-2016 the authors provide an estimation of the amount of outstanding debt in default.

The current vintage of the Complex Crises Database contains 20 variables, one for each category of the lexicon, where each variable corresponds to the term-frequency computed as detailed in section 1.3. Table 3 provides a classification of the term-frequencies across different dimensions.

[27] For a comprehensive literature review on macroeconomic crises databases, see Vannier (2020).
[28] Even though, for feasibility reasons, we constrain the comparison to some key indices, most arguments we put forward apply to all categories.

Table 3: Typology of Crises

	Variable	Type	Nature
1	Banking crisis	Economic	Financial
2	Financial crisis	Economic	Financial
3	Inflation crisis	Economic	Real
4	Trade crisis	Economic	Real
5	World crisis	Economic	Real and financial
6	Contagion crisis	Economic	Real and financial
7	Expectation crisis	Economic	Financial
8	Housing crisis	Economic	Real
9	B.o.P. crisis	Economic	Financial
10	Currency crisis	Economic	Financial
11	Eco. recession	Economic	Real
12	Eco. slowdown	Economic	Real
13	Sovereign crisis	Economic	Financial
14	Violence crisis	Non economic	Real
15	Nat. disaster	Non economic	Real
16	Commodity crisis	Non economic	Real
17	Political crisis	Non economic	Real
18	Social crisis	Non economic	Real
19	Epidemic crisis	Non economic	Real
20	Migration crisis	Non economic	Real

Note: Authors' own elaboration.

Since the frequency of reports' publication is uneven, with several documents per year in most cases, to harmonize across countries and period we aggregate the term-frequencies at the yearly frequency.[29] This aggregation brings the final dataset to 7,788 yearly observations distributed across 181 countries over the period 1950-2019. The current vintage of the database, both the raw text files and the term-frequencies, can be downloaded with prior authorization from our Harvard Dataverse Repository.

2.1 Economic Indicators: Benchmark Comparison

The comparison of our database with standard benchmarks of macroeconomic crises requires us to take heed of some important *a priori* differences between the aforementioned. These differences, in turn, help to explain discrepancies between the measures, that may not necessarily reflect contradictions, but rather convey different information.

First, a fundamental difference between our term-frequencies and the benchmark originates in their distinct nature. While we aim at capturing crises discussions by the Fund, the literature has usually tried to pinpoint their exact timing. The paramount example is that of policy reactions: if policymakers intervene effectively in a country experiencing debt distress, ultimately avoiding any missing payment or rescheduling, the country/date would not appear in standard sovereign crises data sets. Nevertheless, the debt problem, most probably, has received considerable attention by Fund staff and is thoroughly discussed in their reports. For example, the euro-area sovereign crisis, while generating acute pressure on the debt of several countries (Greece,Spain, Italy,

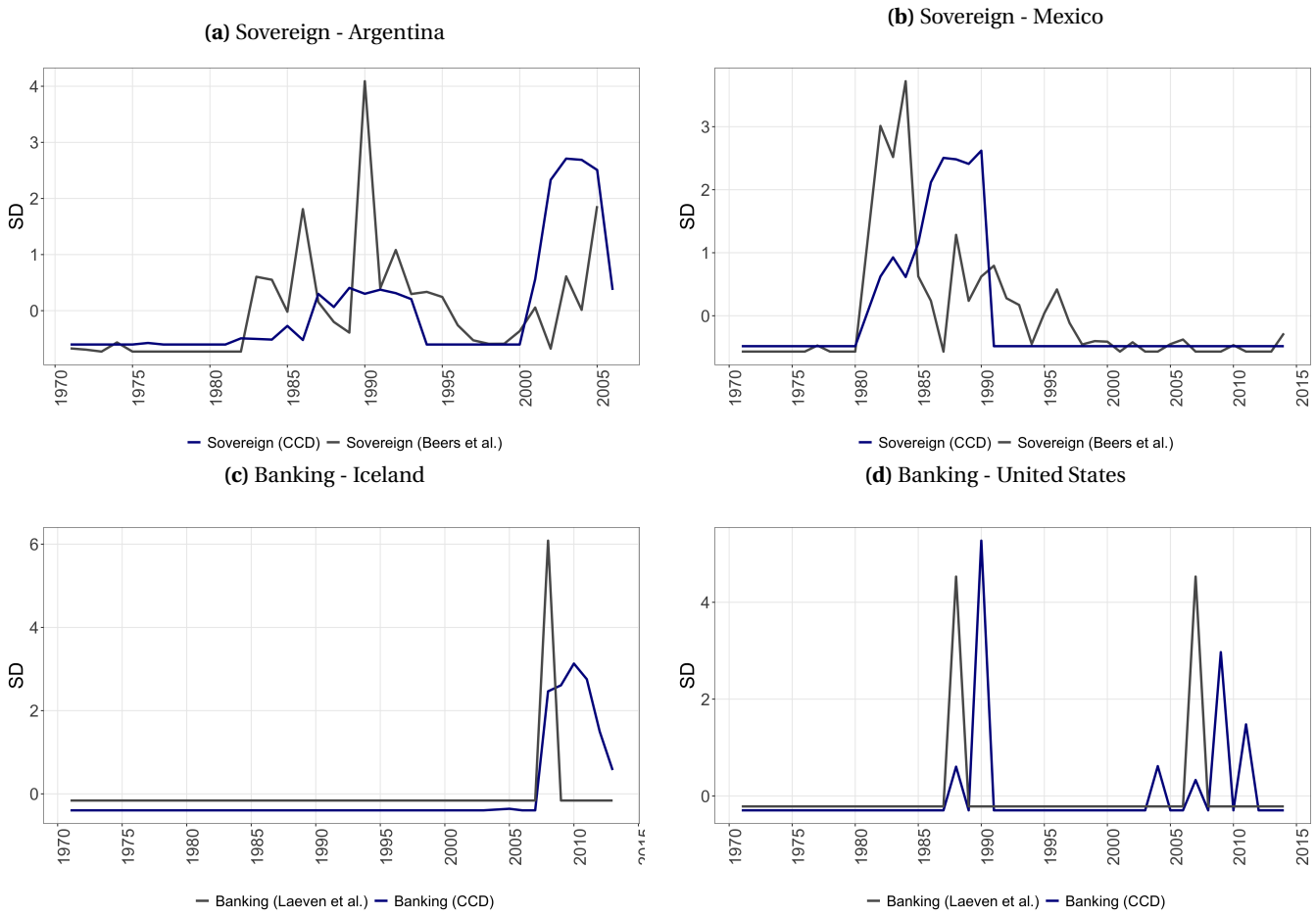
[29] This aggregation ensures a homogeneous frequency and is more suitable for quantitative analysis: however, it comes at a cost of a big information loss. The use of complementary information will be explored in further versions of the data-set.

Portugal), did not materialize in widespread defaults (excepted for Greece). Other similar cases are the Tequila crisis in Mexico (1994-1995), when the IMF's and Fed's external assistance compensated the rollover pressure experienced by the country, and Italy during the collapse of the European Exchange Rate Mechanism, when the speculative attack that weighted on the value of the Lira was fueled by high levels of public debt and rising interest rates. The same argument applies also to crises that have been often foretold, but have never materialized e.g. the United States balance of payments crisis. Furthermore, even if the comparison database does not try to pinpoint the exact timing of a crisis, but conveys another type of information, there still might be differences in the nature of the measure: for example, while both our sovereign term-frequency and the Beers and Mavalwalla (2017) index are continuous measures of default intensity, they lend themselves to different interpretations: the former will tend to peak earlier then the latter, with the most acute moment of discussion likely to be anterior to the default itself (legal procedure and agreement).

Second, one must be cautious about the underlying features of the data. Most of the crises databases employ a binary measure rather than a continuous one to indicate the first year of occurrence of a crisis: in addition, the authors usually decide a time window after the first signal is issued to avoid capturing multiple instances of the same episode. For instance, Reinhart and Rogoff (2013) define currency crises as years of exchange rate devaluations higher than 15%. After the first year, signals are filtered over a 3-year windowss, with all positive signals muted. Laeven and Valencia (2013) use a similar methodology (30% depreciation threshold) with a 5-year window. It follows that a mechanical comparison of our term-frequencies with databases identifying the start of a crisis would result in unsatisfactory low correlation values.

Figure 5 illustrates the points mentioned above.

Figure 5: Banking and Sovereign Term-Frequencies, and Benchmark - Selected Case Studies



Source: *Complex Crises Database* (CCD), Beers and Mavalwalla (2017), Laeven and Valencia (2013)
Note:In the first two panels, the dark grey line represents the normalized amount of debt in default or restructuring from Beers and Mavalwalla (2017), the light grey line is the sovereign term-frequency. In the second panel, the dark grey line represents a dummy variable for the first year of banking crisis from Laeven and Valencia (2013), the light grey line shows the banking term-frequency.

The first panel of the figure compares our sovereign term-frequency to Beers and Mavalwalla (2017) for Argentina and Mexico. For Argentina, in the early 1980s, concerns about default rose, sharply starting from 1982, with local peaks in 1983, 1986 and 1990. Nevertheless, the default becomes effective only from 1987 on-wards: the Argentinean case exemplifies a slow-moving default, anticipated years before its occurrence. For Mexico, in 1982, the outlook is very different, with the term-frequency and the amount in default peaking up simultaneously with little anticipation: while the term-frequency spikes in the first years of the default, capturing widespread Fund discussion, the actual amount, however, reaches its maximum only 4 to 5 years later.[30] The second panel, instead, compares the banking term-frequency to the banking crises start dates from Laeven and Valencia (2013) for Iceland and the United States. In both countries, banking crisis are sudden and unexpected, but their resolution is more gradual. Simple correlation would yield low correspondence irrespective of the validity of the two approaches.

While perfect matching of our index and the benchmark is neither possible nor relevant, a certain degree of

[30] In addition, as mentioned earlier, while for the Tequila crisis in 1995 our term-frequency reaches almost one standard deviation, the **?** remains flat.

correspondence is nonetheless necessary to validate our approach. Table 4 shows the confusion matrix between the Beers and Mavalwalla (2017) and the sovereign term-frequency for different income groups.[31]

Table 4: Sovereign Term-Frequency and Actual Default - Confusion Matrix

Crisis	Default	All	High income	Middle income	Low income	Obs
0	0	34.88%	65.73%	24.88%	11.62%	2324
0	1	11.26%	1.28%	15.12%	16.98%	750
1	0	17.63%	27.16%	16.53%	4.86%	1175
1	1	36.23%	5.83%	43.47%	66.53%	2414

Source: *Complex Crises Database* (CCD), Beers and Mavalwalla (2017)

Note: Default is defined as 1 if the amount of debt in default from Beers and Mavalwalla (2017) is strictly positive. Crisis is equal to 1 if the sovereign term-frequency is strictly positive.

Pooling across all countries, 71% of the country/years observations display a correspondence between the two measures (row 1 and 4, column 3): the result is homogeneous across income groups, although slightly higher for low income countries (78%). Among high income countries, two third of the sample correspond to normal times, defined as periods with neither discussion nor default on debt. The lion's share of of the mismatch come from the occurrence of default discussion without an effective default (18%): as explained earlier, this result mostly stems from the nature of our term-frequency that also captures latent episodes of default.

To better understand what our term-frequencies capture and how it relates to several measure of recessions and default, we run different regressions on the sovereign default and economic recessions benchmarks. Table 5 presents the result for our measure of economic recession.

Table 5: Severe Recession Term-Frequency and GDP Growth - Regressions

	Dependent variable:						
	g	g	g<0	g<0	Phase B	Large B	Phase B2
Y	−0.19	−0.31**					
	(0.20)	(0.14)					
Y>0			0.07***	0.13***	−0.01	0.02*	0.03
			(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
Constant	3.97***			0.06***			
	(0.45)			(0.01)			
Country FE	*No*	*Yes*	*Yes*	*No*	*Yes*	*Yes*	*Yes*
Time FE	*No*	*Yes*	*Yes*	*No*	*Yes*	*Yes*	*Yes*
Controls	*No*	*Yes*	*Yes*	*No*	*Yes*	*Yes*	*Yes*
Robust se	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
F	0.97	3.13***	9.17***	50.15***	3.01***	2.47***	3.61***
Observations	2,061	2,060	2,061	2,061	2,098	2,021	2,098

Source: *Complex Crises Database* (CCD), *OECD Analytical Database*

Note: Y is the severe recession term-frequency. G corresponds to real GDP growth rate. Y>0 and g<0 are dummies equal to 1 when the respective condition is satisfied. Phase B, Large B and Phase B2 are dummies indicating the cyclical component of real GDP obtained following Harding and Pagan (2002). Phase B is equal to 1 for all the years in between the peak and the trough of the cycle. Large B indicates the downturn phases with the largest amplitude. Phase B2 refers to the second half of the downturn. GDP data are from the Analytical Database of the OECD.
***: significant at 1% level, **: significant at 5% level, *: significant at 10% level.

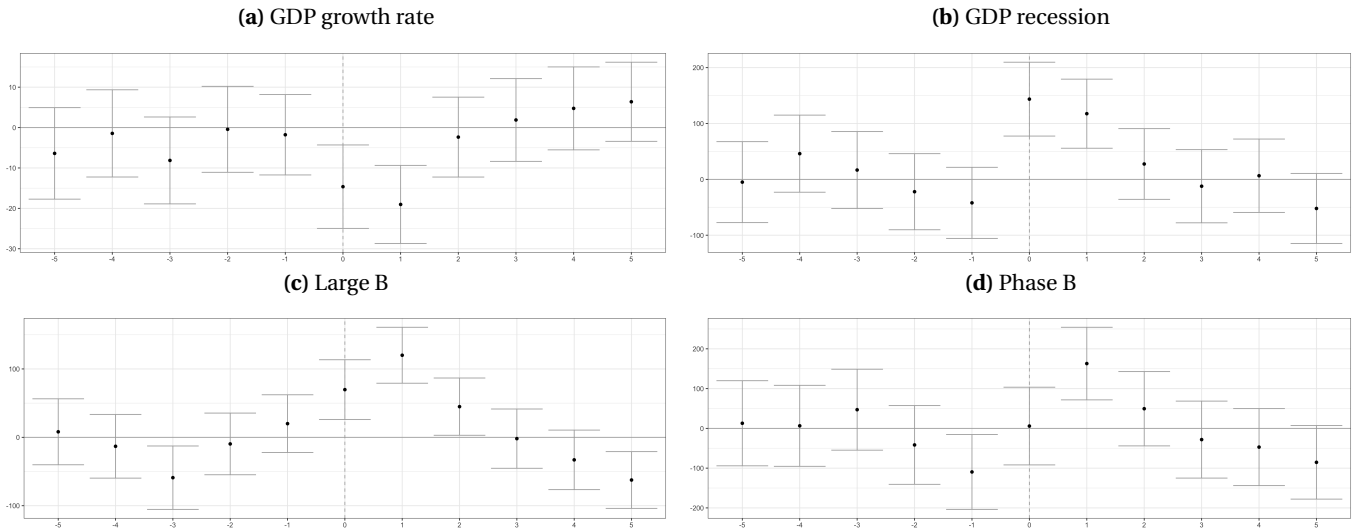
First, we regress the normalized severe recession term-frequency (Y) on the growth rate of real GDP (g) (column 1 and 2). The results show that the term-frequency is significantly negatively correlated with the growth

[31] We convert both indices to binary measures before the comparison to obviate their different meaning.

rate of real GDP after controlling for the other term-frequencies, country and time fixed effects (column 2). For robustness, we regress the term-frequency on a dummy variable equal to 1 when the real GDP growth rate falls below -1%: across both specifications (column 3 and 4), the correlation is positive and significant. Lastly, to show that our measure captures effectively the occurrence of particularly severe economic recessions rather than slowdowns, we observe the correlation between our term-frequency and different dummies indicating the state of the business cycle: Phase B, equal to 1 for all the years in between the peak and the trough of the cycle, Large B, indicating the downturn phases with the largest amplitude and Phase B2, referring solely to the second half of the downturn.[32] The term-frequency does not significantly correlate with the peak to trough, but only with the most severe slumps in economic activity (column 5, 6 and 7).[33] Over the sample of countries and time periods where both output measures and the severe recession term-frequency are available we observe that the narrative indicator significantly matches the economic outcome. Moreover, we confirm that the latter captures the difference between slowdowns and particularly dire recessions.

To enhance the understanding of the timing of our narrative indicator, we also regress the different output measures on the lags and leads of the severe recession term-frequency (Figure 6). We find that output measures are significantly correlated and with the expected sign contemporaneously and for the following one to two years, without any evidence of anticipated warning. This results highlights the real time and backward looking nature of our term-frequencies.

Figure 6: Severe Recession Term-Frequency - Contemporaneous, Backward or Forward looking?



Source: *Complex Crises Database* (CCD), *OECD Analytical Database*

Note: The figure displays estimates obtained regressing the different output measures on five lags and leads of the severe recession term-frequency. Estimates are computed controlling for all other term-frequencies, country and time fixed effects.

[32] For a visual representation of the Harding and Pagan (2002) algorithm, see Figure 13.

[33] Table 12 shows similar specifications for the soft recession term-frequency that should, instead, captures the slowdown of economic activity. While the index is correlated with the both the GDP growth rate and the recession dummy, it is no longer associated with large downturns (Phase B) but only with the second part of the downturn (Phase B2).

We perform a similar validation for the sovereign term-frequency with respect to the benchmark measure of sovereign default. Table 6 shows the results for the different specifications. We first regress the term-frequency (S) on the amount of debt in default (D.Default) [unit] (column 1 and 2): we find that a one standard deviation increase in the term-frequency is unconditionally associated to an increase of 225.39 [unit] of debt in default (column 1), with the result robust to different controls (column 2). Similarly, we show the correlation between a dummy for a strictly positive term-frequency (S>0) and the probability of default (D.Default>0): a one standard deviation increase in the term-frequency of crises increases the probability of default by 7%.

Table 6: Sovereign Term-Frequency and Benchmark - Regressions

	Dependent variable:				
	D.Default	D.Default	D.Default>0	D.Default>0	D.Default>0
S	222.72^{***}	167.77^{***}			0.07^{***}
	(46.29)	(39.23)			(0.01)
S>0			0.44^{***}	0.11^{***}	
			(0.02)	(0.02)	
Constant	362.11^{***}		0.22^{***}		
	(73.79)		(0.02)		
Country FE	*No*	*Yes*	*No*	*Yes*	*Yes*
Time FE	*No*	*Yes*	*No*	*Yes*	*Yes*
Robust se	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
F	$23.15***$	$1.85*$	$388.9***$	$16.63***$	$16.79***$
Observations	6,680	6,678	6,677	6,677	6,678

Source: *Complex Crises Database* (CCD), Beers and Mavalwalla (2017)

Note: S is the sovereign term-frequency. D.Default is the amount of debt in default or rescheduling from Beers and Mavalwalla (2017). S>0 and D.Default>0 are dummies equal to 1 when the respective variable is strictly positive.
***: significant at 1% level, **: significant at 5% level, *: significant at 10% level

All in all, although comparison with other crises database is complicated by differences in the nature and features of our term-frequencies and that perfect matching between the two is neither possible nor relevant, we find that the economic recession and sovereign narrative indicators are highly correlated with their respective benchmark and that they constitute a real-time and backward looking economic assessments of the country's outlook rather than a forward looking measure.

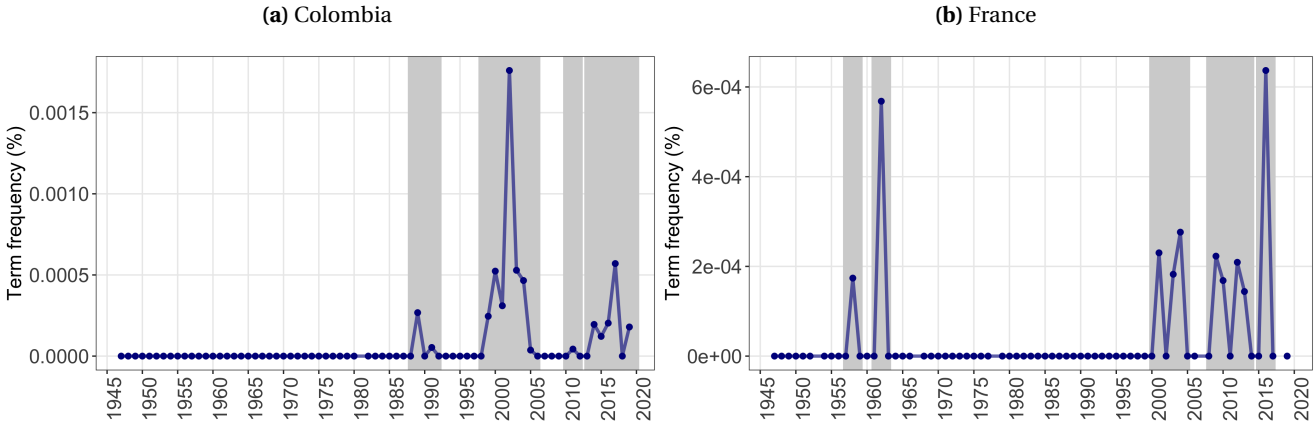
2.2 Non-Economic Indicators: Presentation

The main contribution of the crises discussion database is to provide a extended, comprehensive and comparable set of narrative indicators also for non-economic crises. While detailed data covering specific non-economic events have been already made available (e.g. Global Terrorism Database (GTD), EM-DAT (The Emergency Events Database)), they often incorporate different countries and time periods, hence lacking comparability. Moreover, rather than a proxy for the intensity of the event *per se*, differently from the aforementioned, our indi-

cators signal the relevance of the event for the economic outlook of the country under scrutiny.[34]

Figure 7 provides an illustratory example of the term-frequency for the Violence category.

Figure 7: Examples of Violence Indicator



Source: *Complex Crises Database* (CCD)
Note: The blue line corresponds to the violence term-frequency for, respectively, Colombia and France. Shaded gray areas are years of strictly positive term-frequency.

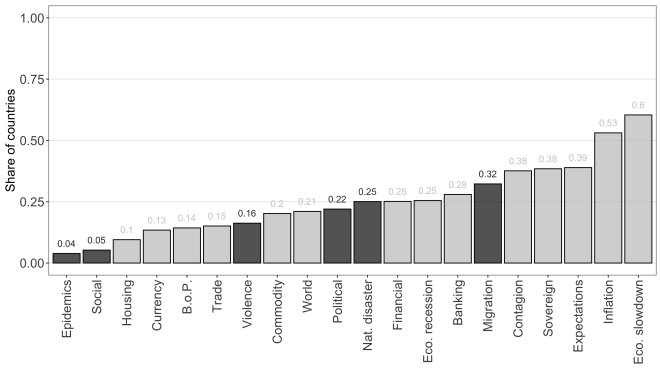
Although the conflict between the Colombian government and the Revolutionary Armed Forces of Colombia (FARC) as well as other guerilla forces started in 1960, it intensified in the mid-1990s as a consequence of the higher wealth accumulated by terrorist groups through drug-related activities. The indicator peaks again in 2017 when the peace referendum between the governemnt and FARC rebels failed as the "No" gained the majority (Figure 7a). For France, the indicator peaks at the end 1950s-early 1960s, in correspondence of the Algerian war, and then shows a turbulent behaviour throughout the XXI^{th} century when the country experienced a series of violent terrorist attacks: it peaks again in 2016 after the November 2015 *Bataclan* attack (Figure 7b).[35]

While a strict focus on non-economic crises is rarely part of the macroeconomic academic debate, that usually emphasizes purely financial outcomes, Fund staff discusses frequently these topics in their reports and especially so for precise income groups (Figure 8). For high income countries, migration issues appear in more than one fourth of total annual observations (32%), followed by natural disasters (25%) and political crises (22%). For middle and low income countries, natural disasters are discussed habitually: more than half of total annual observations (51% and 58% respectively), becoming the second most widely considered issue. Similarly, political instability occupies a greater role in lower income groups (28% and 34%). Further, epidemics and violence issues also fill up a substantial part of the analysis in low income countries (roughly 25%).

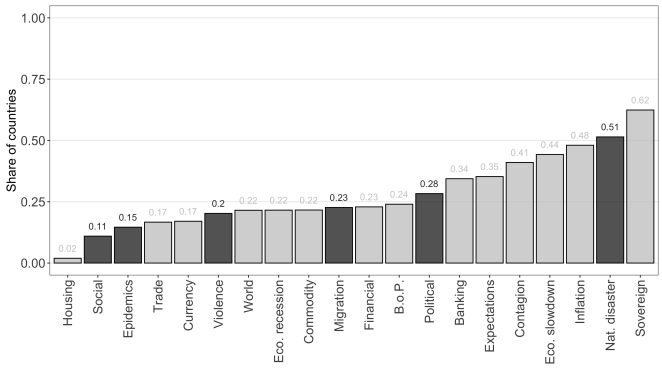
[34] In the present case, omissions of some categories may not denote the absence of an event, but rather an irrelevance for macroeconomic stability: not all non-conventional crises produce potential or realized consequences for economic activity. Thus, they may not enter in Fund staff discussions.
[35] For an event study of the natural disaster indicator, see 14.

Figure 8: Non-economic Crises: Breadth of Discussion

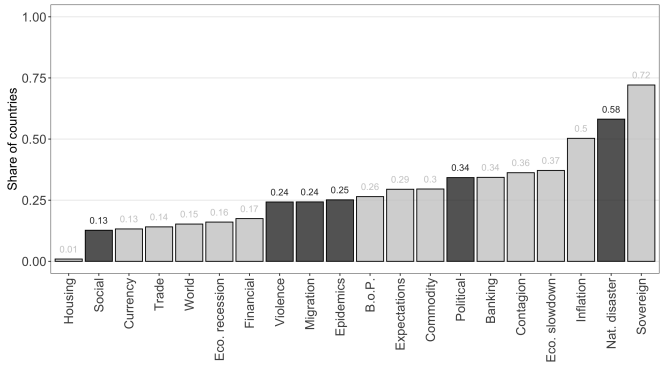
(a) High Income



(b) Middle Income



(c) Low Income



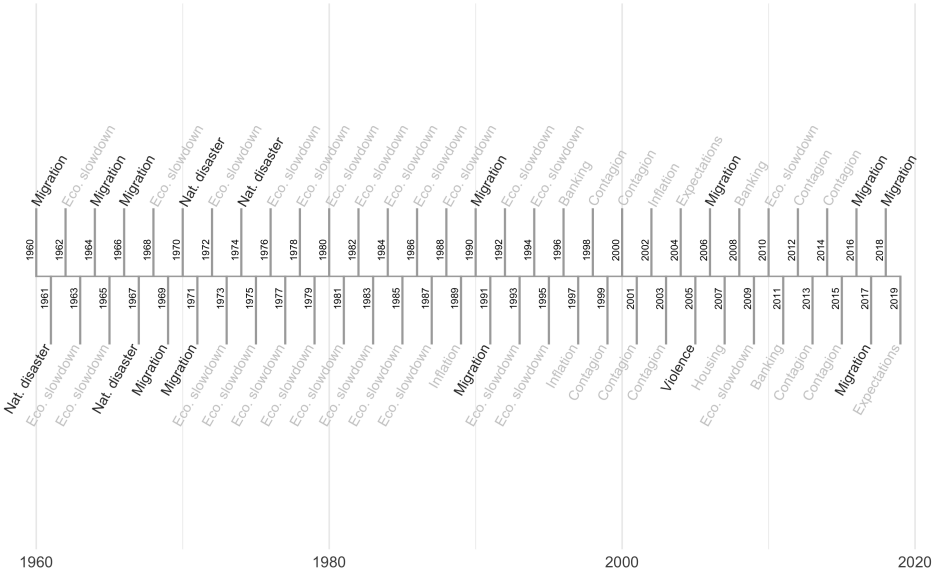
Source: *Complex Crises Database* (CCD)
Note: The bars denote the unconditional frequencies of the occurrence of crises discussions. Formally, it is the proportion of periods with strictly positive term-frequency. Dark-gray bars represent non-economic categories.

One might argue that, however, breadth does not coincide with depth of topic discussion: Fund staff might still discuss some categories in a shallow way, but do so in every report. If this is the case, non-economic events may be less critical for the economic outlook of a country than we are trying to argue. In Figure 9 we compute the mean of the 20 term-frequencies for each year of the sample, pooling across different countries, and then report the category corresponding to the highest value: the pattern that emerges contrasts for different income groups. While for high income countries non-economic events are rarely the most discussed category, outmatched by financial outcomes and output slowdowns (Figure 9a), for low income countries, non-economic events and specifically natural disasters are covered painstakingly in Fund publications (Figure 9b).[36]

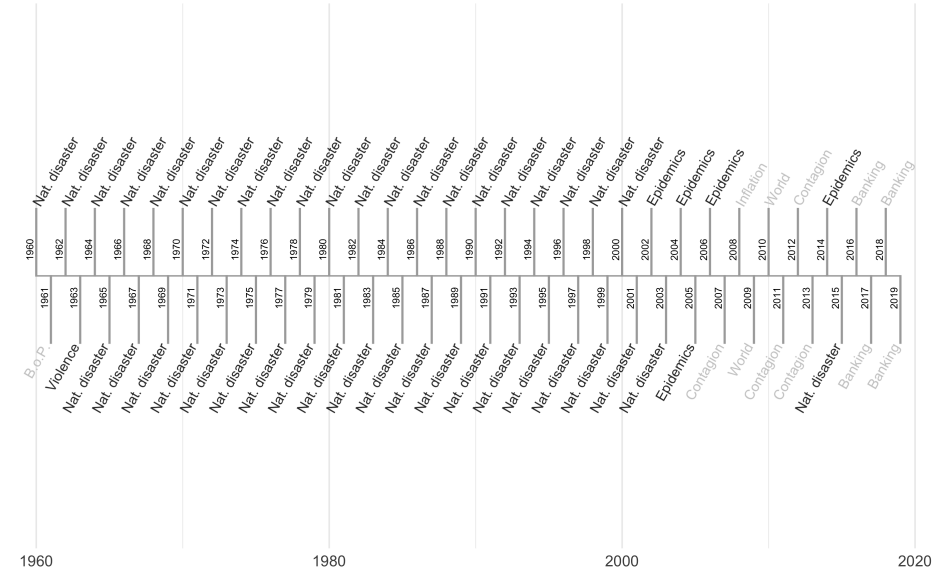
[36]Another interesting pattern is that for high income countries, when non-economic events are the year priority, the relevant category is migration crises: for instance, migration concerns where at the forefront of the economic discourse following the fall of the Berlin wall and the uncertainty regarding the stability of the the URSS entering the 1990s.

Figure 9: Non-economic Crises: Depth of Discussion

(a) High Income



(b) Low Income



Source: *Complex Crises Database* (CCD)
Note: The figures displays, for each year, the category with the highest unconditional mean between the 20 term-frequencies. Dark-gray labels represent non-economic categories.

In short, although non-economic events usually fall into the cracks of the macroeconomic discourse, they can be pivotal to comprehend the economic outlook of a country and in particular, of middle and low-income groups. The richness of this database and the potential for rapid and flexible extension constitute an element of novelty in the empirical crises literature.[37]

[37] Other types of non-economic events might be of utter importance in the future e.g. cyber attacks. In light of this, it is essential to have a framework that is easily expandable.

3 70 Years of Crises: A Rising Complexity

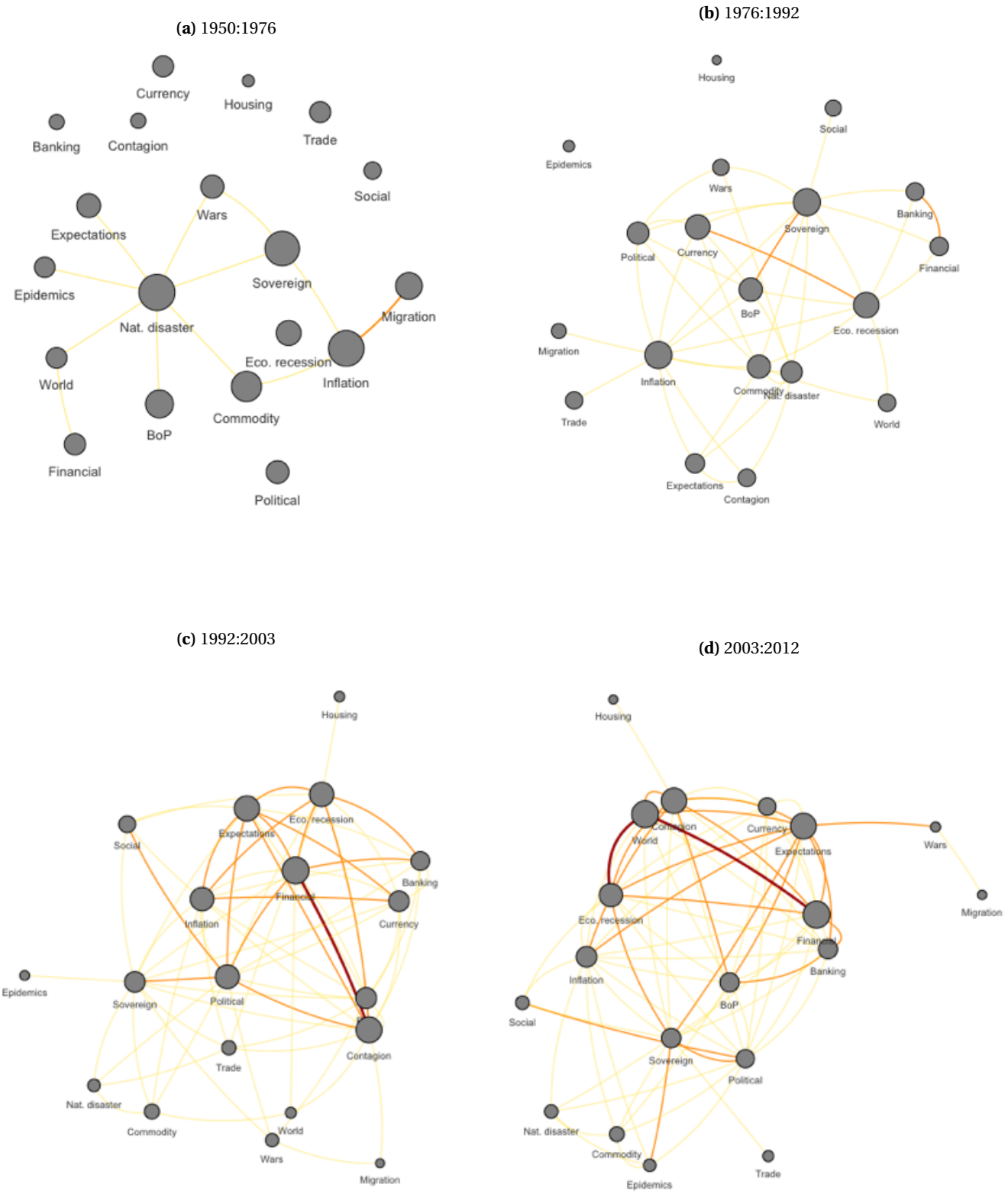
The new material presented so far allows us to adopt a holistic stance toward macroeconomic crises and explore a dimension, complexity, left, because of the data limitations we already discussed, relatively untouched by previous empirical literature. In this section, borrowing from network theory (Jackson, 2010)) and looking through the Fund lens, we highlight some compelling patterns in the evolution of the "crisis system" over the last 70 years. In particular, we underline the rising co-occurrence of crises and the exponential rise in importance of the non-fundamental *expectations* channel.

Figure 10 presents the evolution of the "crisis system", constructed considering each category in the database as a node in the network and the contemporaneous correlations across term-frequencies as their edges.[38] The resulting pattern provides prima facie evidence on the rising complexity of the system: links between term-frequencies have both become more frequent and thicker, increasing approximately 6-fold. During the earliest period (1950-1976), the network is relatively sparse and mainly organized around real crises, natural disasters and inflation crises in primis (Figure 10a). Figure 10b portrays the initial stretch after the collapse of the Bretton-Woods system: numerous novel connections appear and several sub-networks emerge. While the sub-network around natural disaster persists as well as the one around inflation, a new cluster around sovereign crises appears. Among the others, we note the strong interconnection of sovereign and balance of payment crises, currency crashes and deep economic recessions and banking and financial turmoil. The early 1980s clearly stand out as a period of structural change from a shallow system to a deeper network where financially related elements gradually take over.[39] This trend consolidates at the end of the century: this decade is characterized by the persistence of a cluster around sovereign crises, the move to the periphery of the natural disaster node and the clear emergence of a financial *clique* composed by contagion, financial turmoil, banking crises and expectations. Finally, starting from the 21st century, all nodes become connected to the network, with the *clique* between the financial components of the systems consolidating while real shocks move further away to the periphery.

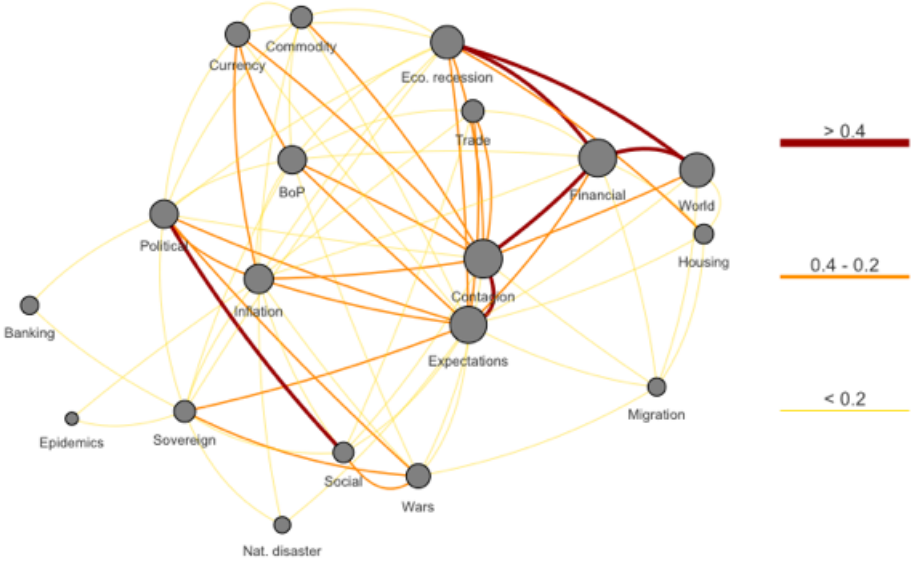
[38] The division in time bins is based on previous knowledge and corresponds to well-known events: the Bretton Woods system, the first wave of financial globalization, the second wave of financial globalization, the run-up to the GFC and the recent post-GFC period.

[39] See Diaz-Alejandro (1985) for a detailed chronicle of the first wave of financial globalization and deregulation.

Figure 10: A Network of Crises



(e) 2012:2019



Source: *Complex Crises Database* (CCD)
Note: Adjacency matrix built from pairwise correlations between term-frequencies: minimum correlation to display edge equal to 0.1. Size of nodes proportional to their eigencentrality. Legend indicates correlations between categories. Visualization of the network through the ForceAtlas2 algorithm (Jacomy et al., 2014).

Table 7 summarizes the previous visual observation calculating the average shortest path by time period.[40] We find a roughly 3-fold reduction in the shortest path that holds for all income groups: we confirm that the overall evolution of the system concerns all income groups and underline the profound and lasting structural shift toward a more dense and financially dominated system. Similarly to the international financial network (Haldane, 2009), the "crises system" displays increasingly the features of a "small world" where particular disturbances spread quickly across the whole system.

Table 7: Average Shortest Path

Income Group	Min. Corr	1950:1976	1976:1992	1992:2003	2003:2013	2013:2019
High income	0.2	17.78	16.15	13.49	13.35	5.48
Low income	0.2	-	17.37	13.28	7.27	5.54
Upper middle income	0.2	18.39	13.43	9.8	11.18	4.02

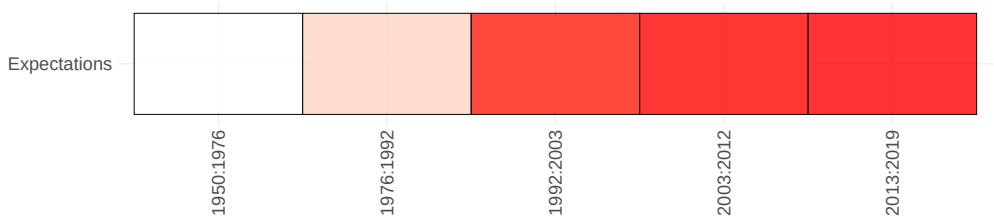
Source: *Complex Crises Database* (CCD)
Note: Average shortest path is the mean shortest distance (number of links) between any single pair of nodes. Adjacency matrix built from pairwise correlations between term-frequencies. Minimum correlation indicates that pairwise correlations lower than the respective value are set equal to 0 when building the adjacency matrix. If two nodes are not connected, their shortest distance is set equal to the number of nodes in the network. Algorithm does not converge for Low Income countries in the period 1950-1976 and is replaced by missing value.

Lastly, we focus on a specific category, expectations, and track its behaviour over time within the system. This

[40] The average shortest path of a network indicates how far, on average, are all pairs of nodes based on the geodesic distance (i.e. shortest path): thus, a lower shortest path indicates that perturbations transmit more rapidly across the network

category is of particular interest given its the only one characterized by a non-fundamental attribute. Moreover, while the role of manias and panics has been deemed central for the unraveling of macroeconomic crises by different strands of the narrative literature (e.g. Kindleberger (1975), Akerloff and Shiller (2009)), its actual contribution has been difficult to quantify given the intrinsic challenge in measuring this channel and comparing it to the fundamental one. Figure 11 shows the evolution of the eigenvector centrality for the expectations category over the different time periods: while expectations are mostly peripheral until the early 1990s, they gain an increasingly prominent role in the last 30 years, thus confirming their present key role as complexifying element.[41]

Figure 11: Centrality of Expectations Channel



Source: *Complex Crises Database* (CCD)

Note: The eigencentrality of a node is the associated i_{th} element of the eigenvector with the largest eigenvalue for the given adjacency matrix. It indicates the importance of a node based on the number of connections it has with other "important" (well connected) nodes. Scales of red indicate the eigenvector centrality during a precise time period, where a brighter red indicates higher eigencentrality. The adjacency matrix is built from the correlation matrix of all categories within the period under consideration.

[41] The basic idea of eigenvector centrality is that a node importance is not only determined by the fact that the node is directly connected to many other nodes, but also by whether or not it is connected to well-connected nodes. For a more thorough explanation, see Jackson (2010).

4 Conclusion

In this paper, we provide accessibility to researchers to a raw text database of roughly 23,000 documents covering the whole IMF membership throughout the period 1950-2019, building on and improving significantly over the closest paper in the field (Mihalyi and Mate, 2019). Moreover, to capture and quantify Fund discussions about a multiplicity of adverse economic and non economic events, we manually compile an IMF crisis-specific dictionary and propose a simple term-frequency approach. The large time span (70 years) and country coverage (181 countries) of the resulting database as well as the scope of crises covered within a comparable framework complement and extend standard datasets of macroeconomic crises and provide useful material for a deeper understanding of macroeconomic volatility episodes.

Comparing some key economic indicators (severe recession and sovereign) to standard benchmarks found in the literature, we confirm that the term-frequencies constitute an accurate real-time and backward looking economic assessment of the countries' outlook. In addition, we show that, while non economic events tend to fall into the cracks of the academic macroeconomic discourse, they occupy a substantial amount of discussion in Fund reports for all income groups and especially so for lower income groups. Finally, exploiting the vast amount of data at our disposal, we introduce the notion of crises complexity, defining it as the co-occurrence of crises. We study its evolution within the last 70 years and find that it has risen considerably: in particular, the system underwent a clear structural break starting from the early 1980s, shaping from a simple network dominated by real crises in the Bretton Woods era to a highly complex, financially dominated one, in the recent post-GFC period. Within the system, we highlight the rise in centrality of the non-fundamental expectations channel.

Taken altogether, these last findings have far-reaching implications for domestic policymakers and Lenders of Last Resort (LOLR) institutions. First, they highlight the intrinsic difficulty in forecasting. While the economic system can remain stable for long periods, a small perturbation can spread quickly across sectors and breed into complex outcomes. Instead of point estimates, it would be better to provide alternative scenarios based on an assessment of emerging threats to systemic stability. Second, the rising complexity of crises calls for an adequately diversified program toolbox available from LOLR instituions: while the IMF has recently expanded its emergency facilities in face of the Covid-19 pandemic, the question of adequacy remains open for future research and discussion. Similarly, the rising centrality of the non-fundamental channel calls for a heavy focus on the managing of expectations by policymakers.

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A From Qualitative Judgements to Quantitative Measures

A.1 The Corpus of IMF Documents

A.1.1 Scraping and Semantic Analysis

1. Scrape the URLs of all documents country by country using the form from the IMF archives website and consolidate into a single database of 250,000 documents that contains the title of the file, the date of publication and the country of interest
2. Find documents related to programs using a text analysis of the title. Specifically, find the occurrence of the following list of expressions: "arrangement under the flexible credit line", "letter on economic policy","stand-by arrangement", "extended arrangement", "extended fund facility", "enhanced structural adjustment", "poverty reduction and growth", "structural adjustment facility".
3. Separate "requests" from "reviews" and isolate the number of the review excluding misleading expressions such as "request for increase in quotas", "request for enhanced article iv" or "request for postponement"
4. Find the name of the countries in the title and check for mismatch with the metadata information, correct when necessary by considering the country name specified in the title.
5. Find consultations and surveillance documents: "article iv consultation", "article xiv consultation", "recent economic developments", "selected issues", "article viii", "background papers", "consultations", "exchange system", ,"economic report".
6. Find technical assistance documents

This initial cleaning of the metadata to maintain only relevant documents resulted in approximately 39,000 files remaining. After downloading all the PDFs, an additional cleaning was performed to remove files with less than 5 pages and files containing specific terms in the first page.

A.1.2 First Page Analysis

Table 8: List of Keywords for Problematic Documents

Keyword
minutes of executive board meeting
minutes of executive board minutes
executive board attendance
final minutes of executive board meeting
this is a working paper
working paper
a working paper of the international monetary fund
background paper
provides background to the paper
attached paper provides background information
background documentation for
draft issues paper
selected issues(?! (financial stability system assessment){0,1}the imfs transparency policy allows for the deletion)
poverty reduction strategy paper
enhanced heavily indebted poor countries initiative
individual economy assessments
global financial stability report
debt sustainability analysis
triennial surveillance review
interim surveillance review
report on the observance of standard and codes

Note: Authors' own elaboration.

A.1.3 PDF Extraction

1. Convert PDFs to images: this step is necessary because Google OCR works only on images (pdf2img library).
2. Image Pre-processing: remove noise from images and make text prominent to improve accuracy when applying OCR (OpenCV library).
3. OCR Text extraction
4. Text Preprocessing: apply auto correction techniques to increase the accuracy and erase spelling mistakes (spellchecker library)
5. Saving Output Text

A.1.4 Final Corpus

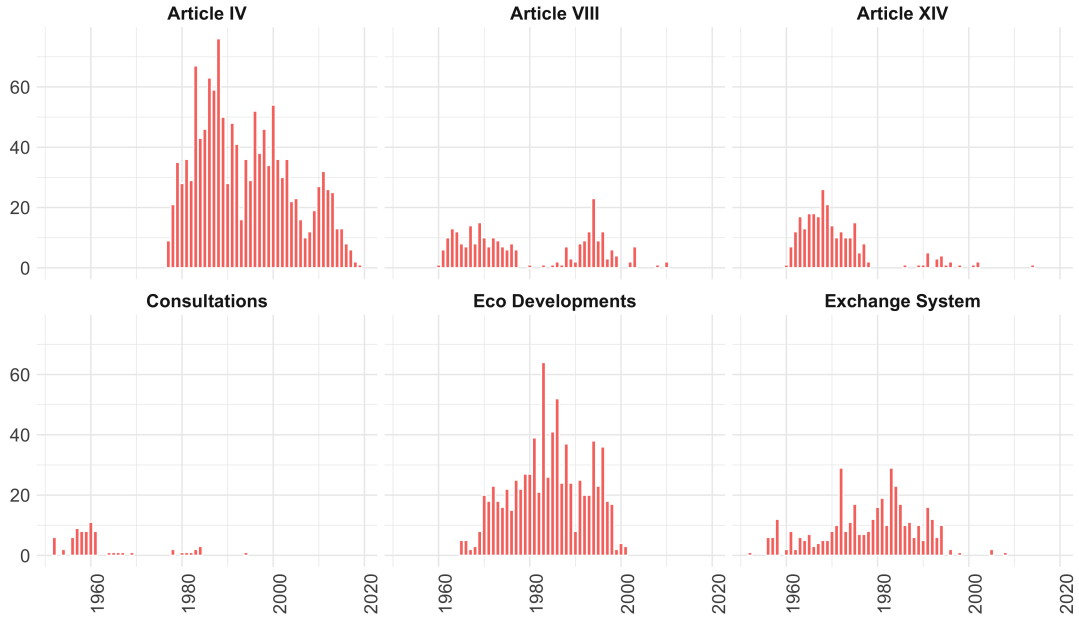
Table 9: Description of IMF Documents

Type of document	Purpose	Currently Issued	Regular production	Details
Article IV	Main tool of bilateral surveillance: inform about developments, vulnerabilities, outlook and furnish recommendations	Y	Y	Annually (not always)
Article VII & Article XIV	Bilateral surveillance of country maintaining exchange rate restrictions: motivate the measures and notify of any change	Y	Y	Required every 12 months: normally included in Article IV, but can be issued independently
Consultations	Bilateral surveillance	N	No info	Old version of Article IV
Exchange system	Communicate changes in par value of exchange rate	N	N	/
Recent Economic Developments	Economic and financial developments and trends in member countries	Y	No info	Internal paper for background analysis of *Article IV consultations*
Request	Set out the agreed policy goals and strategies in the economic program as well as conditionality and how observance will be monitored	Y	N	/
Review	Ascertain whether the relevant conditions for a purchase have been observed by member. If it is the case, the purchase becomes available	Y	Y (Conditional on program)[2]	Prior to purchase by member

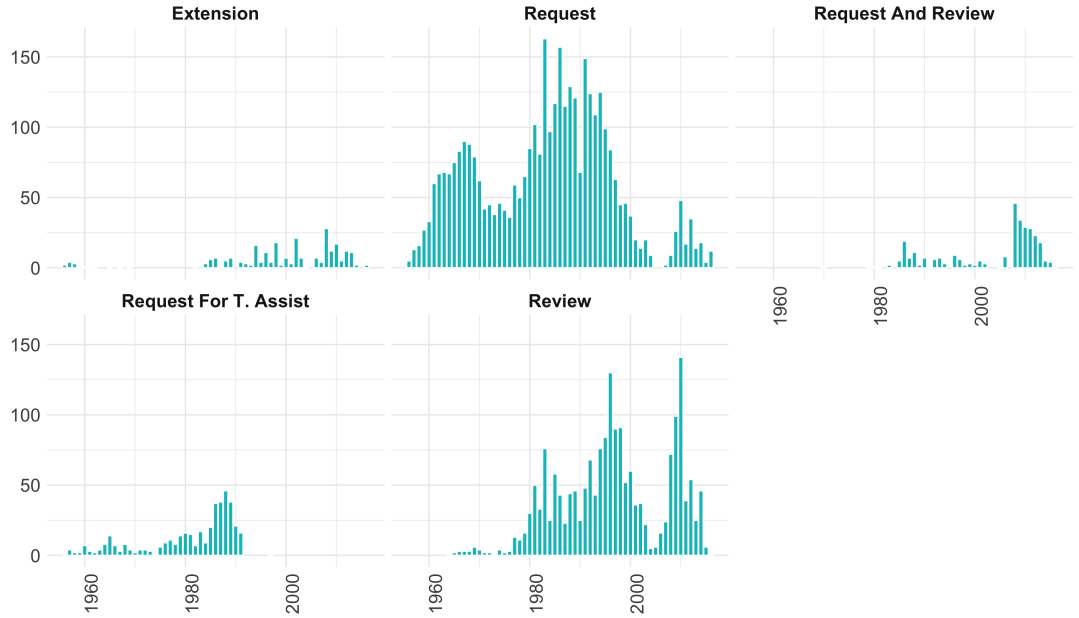
Source: Fritz-Krockow and Parmeshwar (2007)
Note: Some purchases do not require a review, e.g., in case of a Stand-By Arrangement that has quarterly purchases but semi-annual reviews

Figure 12: Number of IMF Documents per Year

(a) Country Reports



(b) Program Related



Source: *Complex Crises Database* (CCD)

Table 10: Country Coverage

	ISO3	Country name	First document	N. of documents
1	AFG	Afghanistan	1956	204
2	AGO	Angola	1989	135
3	ALB	Albania	1991	178
4	ARE	United Arab Emirates	1974	125
5	ARG	Argentina	1957	406
6	ARM	Armenia	1992	204
7	ATG	Antigua & Barbuda	1982	2
8	AUS	Australia	1949	187
9	AUT	Austria	1949	176
10	AZE	Azerbaijan	1992	133
11	BDI	Burundi	1965	223
12	BEL	Belgium	1949	220
13	BEN	Benin	1976	209
14	BFA	Burkina Faso	1984	217
15	BGD	Bangladesh	1972	268
16	BGR	Bulgaria	1990	185
17	BHR	Bahrain	1983	59
18	BIH	Bosnia & Herzegovina	1995	110
19	BLR	Belarus	1992	103
20	BLZ	Belize	1970	132
21	BOL	Bolivia	1949	349
22	BRA	Brazil	1946	402
23	BRB	Barbados	1971	167
24	BRN	Brunei	1973	65
25	BTN	Bhutan	1981	92
26	BWA	Botswana	1971	146
27	CAF	Central African Republic	1968	212
28	CAN	Canada	1955	191
29	CHE	Switzerland	1975	109
30	CHL	Chile	1946	335
31	CHN	China	1981	172
32	CIV	Côte d'Ivoire	1964	206
33	CMR	Cameroon	1967	221
34	COD	Congo - Kinshasa	1972	198
35	COG	Congo - Brazzaville	1969	95
36	COL	Colombia	1947	376
37	COM	Comoros	1978	144
38	CPV	Cape Verde	1978	175
39	CRI	Costa Rica	1947	294
40	CYP	Cyprus	1961	141
41	CZE	Czechia	1990	134
42	DEU	Germany	1953	212
43	DJI	Djibouti	1978	132
44	DMA	Dominica	1978	184
45	DNK	Denmark	1946	133
46	DOM	Dominican Republic	1959	190
47	DZA	Algeria	1966	198
48	ECU	Ecuador	1948	320
49	EGY	Egypt	1946	252
50	ERI	Eritrea	1994	31
51	ESP	Spain	1949	190
52	EST	Estonia	1992	143
53	ETH	Ethiopia	1947	236
54	FIN	Finland	1951	164
55	FJI	Fiji	1971	128
56	FRA	France	1947	243
57	GAB	Gabon	1967	210

	ISO3	Country name	First document	N. of documents
58	GBR	United Kingdom	1947	307
59	GEO	Georgia	1992	187
60	GHA	Ghana	1958	339
61	GIN	Guinea	1965	242
62	GMB	Gambia	1977	196
63	GNQ	Equatorial Guinea	1971	120
64	GRC	Greece	1947	191
65	GRD	Grenada	1975	182
66	GTM	Guatemala	1948	216
67	GUY	Guyana	1967	321
68	HND	Honduras	1947	307
69	HRV	Croatia	1993	106
70	HTI	Haiti	1947	295
71	HUN	Hungary	1982	242
72	IDN	Indonesia	1949	414
73	IND	India	1946	263
74	IRL	Ireland	1958	233
75	IRN	Iran	1948	205
76	IRQ	Iraq	1951	127
77	ISL	Iceland	1948	240
78	ISR	Israel	1953	224
79	ITA	Italy	1949	226
80	JAM	Jamaica	1962	380
81	JOR	Jordan	1953	263
82	JPN	Japan	1953	248
83	KAZ	Kazakhstan	1992	147
84	KEN	Kenya	1965	310
85	KGZ	Kyrgyzstan	1992	182
86	KHM	Cambodia	1970	122
87	KIR	Kiribati	1986	69
88	KNA	St. Kitts & Nevis	1987	101
89	KOR	South Korea	1956	306
90	KWT	Kuwait	1963	136
91	LAO	Laos	1957	201
92	LBN	Lebanon	1952	126
93	LBR	Liberia	1963	392
94	LBY	Libya	1983	63
95	LCA	St. Lucia	1979	92
96	LKA	Sri Lanka	1972	279
97	LSO	Lesotho	1970	192
98	LTU	Lithuania	1992	127
99	LUX	Luxembourg	1971	80
100	LVA	Latvia	1992	130
101	MAR	Morocco	1959	315
102	MDA	Moldova	1992	130
103	MDG	Madagascar	1976	236
104	MDV	Maldives	1978	138
105	MEX	Mexico	1947	296
106	MHL	Marshall Islands	1992	41
107	MKD	Macedonia	1993	125
108	MLI	Mali	1964	312
109	MLT	Malta	1970	132
110	MMR	Myanmar (Burma)	1953	107
111	MNE	Montenegro	2006	41
112	MNG	Mongolia	1990	131
113	MOZ	Mozambique	1985	237
114	MRT	Mauritania	1977	193
115	MUS	Mauritius	1968	190
116	MWI	Malawi	1967	302

	ISO3	Country name	First document	N. of documents
117	MYS	Malaysia	1964	215
118	NAM	Namibia	1989	100
119	NER	Niger	1967	246
120	NGA	Nigeria	1963	177
121	NIC	Nicaragua	1947	303
122	NLD	Netherlands	1983	127
123	NOR	Norway	1948	139
124	NPL	Nepal	1963	238
125	NZL	New Zealand	1955	165
126	OMN	Oman	1972	106
127	PAK	Pakistan	1950	397
128	PAN	Panama	0001	289
129	PER	Peru	1946	423
130	PHL	Philippines	1949	390
131	PLW	Palau	1999	23
132	PNG	Papua New Guinea	1974	148
133	POL	Poland	1986	203
134	PRT	Portugal	1962	208
135	PRY	Paraguay	1946	275
136	QAT	Qatar	1973	94
137	ROU	Romania	1973	298
138	RUS	Russia	1992	224
139	RWA	Rwanda	1962	258
140	SAU	Saudi Arabia	1958	54
141	SDN	Sudan	1958	505
142	SEN	Senegal	1963	274
143	SGP	Singapore	1966	146
144	SLB	Solomon Islands	1978	127
145	SLE	Sierra Leone	1964	379
146	SLV	El Salvador	1957	235
147	SMR	San Marino	1992	45
148	SOM	Somalia	1964	62
149	STP	São Tomé & Príncipe	1978	41
150	SUR	Suriname	1978	104
151	SVK	Slovakia	1993	86
152	SVN	Slovenia	1993	64
153	SWE	Sweden	1952	167
154	SWZ	Swaziland	1983	84
155	SYC	Seychelles	1972	160
156	SYR	Syria	1948	196
157	TCD	Chad	1967	190
158	TGO	Togo	1965	211
159	THA	Thailand	1949	268
160	TJK	Tajikistan	1992	107
161	TKM	Turkmenistan	1992	46
162	TON	Tonga	1985	105
163	TTO	Trinidad & Tobago	1962	172
164	TUN	Tunisia	1957	234
165	TUR	Turkey	1947	406
166	TUV	Tuvalu	2011	14
167	TZA	Tanzania	1965	269
168	UGA	Uganda	1965	301
169	UKR	Ukraine	1992	210
170	URY	Uruguay	1949	408
171	USA	United States	1947	221
172	UZB	Uzbekistan	1992	74
173	VCT	St. Vincent & Grenadines	1980	108
174	VEN	Venezuela	1946	182
175	VNM	Vietnam	1958	274

	ISO3	Country name	First document	N. of documents
176	VUT	Vanuatu	1981	83
177	WSM	Samoa	1973	165
178	YEM	Yemen	1970	237
179	ZAF	South Africa	1948	211
180	ZMB	Zambia	1967	424
181	ZWE	Zimbabwe	1980	237

Source: *Complex Crises Database* (CCD).

A.2 The Lexicon of Crises

Table 11: Full Lexicon

Category	Keyword
B.o.P.	shortage of foreign exchange
B.o.P.	bop crisis
B.o.P.	balance of payment crisis
B.o.P.	capital account crisis
B.o.P.	balance of payment crisis
B.o.P.	balance of payment problem
B.o.P.	balance of payment difficulties
B.o.P.	cessation of official foreign capital inflows
B.o.P.	decline in net international reserves
B.o.P.	pressures in the official foreign exchange market
B.o.P.	external account came under pressure
B.o.P.	external account came under severe pressure
B.o.P.	external account came under serious pressure
B.o.P.	balance of payments problems
B.o.P.	shortage of international reserves
B.o.P.	sharp reduction in international reserves
B.o.P.	strong decline in international reserves
B.o.P.	international reserves exhaused
B.o.P.	decline in reserves
B.o.P.	drop in reserves
B.o.P.	loss of official reserves
B.o.P.	decline in net capital inflows
B.o.P.	decline in international reserves
B.o.P.	decline in official reserves
B.o.P.	official international reserves exhausted
B.o.P.	major loss in net international reserves
B.o.P.	foreign exchange scarcity
B.o.P.	decline in receipts of official foreign loans
B.o.P.	exhaustion of the disposable official international reserves
B.o.P.	capital flight
B.o.P.	flight of capital
B.o.P.	pull-back of capital
B.o.P.	capital flow reverse
B.o.P.	capital flow reversal
B.o.P.	pressure on capital flows
B.o.P.	large capital outflows
B.o.P.	strong balance of payment pressures
B.o.P.	balance of payment assistance
B.o.P.	depleted international reserves
B.o.P.	large external financing needs
B.o.P.	substantial capital outflows
B.o.P.	unforseen balance of payments contingencies
B.o.P.	tail risks to the balance of payments
B.o.P.	large balance of payments imbalances

Category	Keyword
B.o.P.	exhausted official international reserves
B.o.P.	pressure on the capital account
B.o.P.	exceptional balance of payments need
B.o.P.	balance of payment sustainability
B.o.P.	reversal in the flow of private capital
B.o.P.	sharpe reduction in access to international capital markets
B.o.P.	sharp fall in private inflows
B.o.P.	decline in net inflow
B.o.P.	severe external imbalances
B.o.P.	severe internal and external imbalances
Banking	bank resolution
Banking	bank crisis
Banking	banking sector restructuring
Banking	restructuringof nonperforming loans
Banking	undercapitalized banking system
Banking	weak bank capitalization
Banking	reorganization of the banking sector
Banking	restructuring of the banking
Banking	fragility of the banking sector
Banking	fragile banking sector
Banking	banking crisis
Banking	banking system restructuring
Banking	insolvent banks
Banking	insovlvent banking sector
Banking	bailout
Banking	crisis in the banking sector
Banking	take over of private banks
Banking	private banks taken over
Banking	recapitalize private banks
Banking	collapse of the banking sector
Banking	increase in nonperforming loans
Banking	recapitalization of the banks
Banking	recapitalizing the banking system
Banking	recapitalizing the banking sector
Banking	banking system collapsed
Banking	additional nonperforming loans
Banking	collapsed in the banking system
Banking	banking system stability
Banking	pressure on the banking
Banking	bankrun
Banking	bank recapitalization
Banking	deteriorating credit quality
Banking	recapitalization
Banking	bank restructuring
Banking	recapitalize private financial institutions
Banking	confidence in the domestic banking system
Banking	strengthen bank supervision
Banking	financial support package
Commodity	oil crisis
Commodity	rice crisis
Commodity	crop crisis
Commodity	crop failure
Commodity	commodity crisis
Commodity	energy crisis
Commodity	cotton crisis
Commodity	crisis in the cotton
Commodity	severe shortages{1} of rice
Commodity	fall in prices of raw materials

Category	Keyword
Commodity	price of copper continue to drop
Commodity	swing in copper price
Commodity	weakness in the copper price
Commodity	adverse movement in the price of copper
Commodity	decline in coffee prices
Commodity	decline in international coffee prices
Commodity	drop in world coffee price
Commodity	fell of agricultural prices
Commodity	tourism.*suffer
Commodity	terms-of-trade shock
Commodity	deterioration in the terms of trade
Commodity	deteriorating terms of trade
Commodity	adverse terms of trade
Commodity	terms of trade loss
Commodity	unfavorable terms of trade
Commodity	severe drop in terms of trade
Commodity	severe terms of trade drop
Commodity	severe terms of trade shock
Commodity	significant terms of trade loss
Commodity	sharp fall in its terms of trade
Commodity	large terms of trade loss
Commodity	adverse movement in the terms of trade
Commodity	terms of trade were adversely affected
Commodity	dependenceon oil-related revenue
Commodity	budgetary dependency on oil revenue
Commodity	increase in world oil prices
Commodity	drop in world coffee price
Commodity	oil price increase
Commodity	fluctuations in oil prices
Commodity	increase in petroleum price
Contagion	regional crisis
Contagion	crisis in the region
Contagion	spillovers from the global crisis
Contagion	systemic crisis
Contagion	crisis in emerging economies
Contagion	regional financial crisis
Contagion	spillovers from the global crisis
Contagion	vulnerable to external shocks
Contagion	crisis spillover
Contagion	regional economic situation turned adverse
Contagion	contagion from the crisis in neightboring
Contagion	external shocks
Contagion	external shock
Contagion	adverse exogenous events
Contagion	external vulnerability
Contagion	exogenous events
Contagion	contagion
Contagion	fears of contagion
Contagion	spillovers
Contagion	vulnerability to international
Contagion	russian debt crisis
Contagion	asian currency crisis
Contagion	crisis in southeast asia
Contagion	southeast asia crisis
Contagion	crisis in russia
Contagion	crisis in libya
Contagion	libya crisis
Contagion	regional currency crisis

Category	Keyword
Contagion	kosovo crisis
Contagion	cyprus crisis
Contagion	crisis in ukraine
Contagion	regional dimension of the crisis
Contagion	mexican exchange crisis
Contagion	gulf crisis
Contagion	middle east crisis
Contagion	mexican crisis
Contagion	crisis in argentina
Contagion	crisis in russia
Contagion	argentine crisis
Contagion	crisis in mexico
Contagion	the crisis of 1994
Contagion	the 1997 crisis
Contagion	the crisis in 2002
Contagion	2002 crisis
Contagion	euro area crisis
Contagion	eurozone contagion
Contagion	eurozone crisis
Contagion	crisis in europe
Contagion	world financial crisis
Contagion	greek crisis
Contagion	brazil crisis
Contagion	asian and russian crisis
Contagion	asia crisis
Contagion	crisis in turkey
Contagion	argentinan crisis
Contagion	crisis in argentina
Contagion	crisis in greece
Contagion	asian crisis
Contagion	global economic crisis
Contagion	global financial shock
Contagion	international systemic spillover
Contagion	crisis in brazil
Contagion	linkage with the us
Contagion	contagion effects of the thai crisis
Currency	exchange rate crisis
Currency	large real depreciation
Currency	foreign exchange crisis
Currency	severe disruption of exchange markets
Currency	major devaluation
Currency	currency crisis
Currency	currency crash
Currency	large devaluation
Currency	large depreciation
Currency	sharp depreciation
Currency	sharp depreclatlon
Currency	currency attack
Currency	exchange rate crisis
Currency	unsuccessful attempt to.∗maintain the exchange rate unchanged
Currency	foreign currency turmoil
Eco. recession	severe economic crisis
Eco. recession	very difficult economic circumstances
Eco. recession	severe recession
Eco. recession	severe crisis
Eco. recession	economic crisis
Eco. recession	steep recession
Eco. recession	strong recessionary headwinds

Category	Keyword
Eco. recession	sharp slowdown
Eco. recession	sharp declines in output
Eco. recession	significant loss of output
Eco. recession	economic collapse
Eco. recession	deeper recession
Eco. recession	deepening recession
Eco. recession	painful recession
Eco. recession	prolonged recession
Eco. recession	lengthening recession
Eco. recession	severity of the recession
Eco. recession	economic recession
Eco. recession	sharp contraction of economic activity
Eco. recession	strong contraction of economic activity
Eco. recession	large contraction of economic activity
Eco. recession	deep recession
Eco. recession	large economic slowdown
Eco. recession	severe recession
Eco. recession	profond recession
Eco. recession	contraction in output
Eco. recession	deep recession
Eco. recession	severe contraction
Eco. recession	deep contraction
Eco. recession	profond contraction
Eco. recession	large decline in income per capita
Eco. recession	deep economic downturn
Eco. recession	severe economic downturn
Eco. recession	deep economic downturn
Eco. slowdown	slowdown in the economic activity
Eco. slowdown	slowdown in economic growth
Eco. slowdown	slowdown of the economy
Eco. slowdown	slowdown of output
Eco. slowdown	economic decline
Eco. slowdown	activity remains weak
Eco. slowdown	the economy slowed down
Eco. slowdown	declining trend in economic activity
Eco. slowdown	decline in economic activity
Eco. slowdown	slowing down of business activity
Eco. slowdown	slow down
Eco. slowdown	low rates of economic growth
Eco. slowdown	low rate of economic growth
Eco. slowdown	economic activity on a downward trend
Eco. slowdown	depressed level of economic activity
Eco. slowdown	the economic situation worsen
Eco. slowdown	slowing the pace of economic recovery
Eco. slowdown	decline in economic activity
Eco. slowdown	weakening of economic fundamental
Eco. slowdown	recession
Eco. slowdown	contraction of output
Eco. slowdown	sluggish recovery
Eco. slowdown	contraction of economic activity
Eco. slowdown	economic downturn
Eco. slowdown	output is estimated to have contracted
Eco. slowdown	slowdown in the economic activity
Eco. slowdown	slowdown of output
Eco. slowdown	slow economic activity
Epidemics	epidemic
Epidemics	epidemia
Epidemics	pandemia

Category	Keyword
Epidemics	pandemic
Epidemics	virus
Epidemics	infection
Epidemics	\sflu\s
Epidemics	relapsing fever
Epidemics	typhoid fever
Epidemics	leishmaniasis
Epidemics	dengue
Epidemics	mumps
Epidemics	meningitis
Epidemics	poliomyelitis
Epidemics	measles
Epidemics	zika
Epidemics	encephalitis
Epidemics	\ssars\s
Epidemics	\smers\s
Epidemics	nipah
Epidemics	vcjd
Epidemics	\shiv\s
Epidemics	hiv/aids
Epidemics	typhus
Epidemics	hepatitis
Epidemics	h1n1
Epidemics	h5n1
Epidemics	ebola
Epidemics	\ssida\s
Epidemics	rotavirus
Epidemics	\slyme\s
Epidemics	hepatite
Epidemics	chikungunya
Epidemics	dysenteria
Epidemics	dysentery
Epidemics	smallpox
Epidemics	yellow fever
Epidemics	cholera
Epidemics	malaria
Epidemics	coronavirus
Epidemics	covid 19
Epidemics	\splague\s
Expectations	crisis risks
Expectations	market reversal
Expectations	economic sentiment remains poor
Expectations	market sentiment has collapsed
Expectations	increase uncertainty in the international environment
Expectations	heightened risk aversion
Expectations	high level of risk
Expectations	general uncertainty
Expectations	crisis of confidence
Expectations	risk of crisis
Expectations	confidence crisis
Expectations	panic
Expectations	potential risks
Expectations	upward risk
Expectations	market confidence
Expectations	high risk
Expectations	downside risks
Expectations	increase the risks
Expectations	self fulfilling crises

Category	Keyword
Expectations	potential risks
Expectations	restoring market confidence
Expectations	major risks
Expectations	heightening risks
Expectations	deterioration in market sentiment
Expectations	increase uncertainty in the international environment
Expectations	deterioration in market sentiment
Expectations	weakening of investor confidence
Expectations	market confidence
Expectations	uncertainty in international capital markets
Expectations	uncertainty among market participant
Expectations	change in expectations
Expectations	speculative capital movements
Expectations	speculative attack
Expectations	uncertainty among market participant
Expectations	a time of heightened global uncertainty
Expectations	change in investors sentiment
Expectations	reassure the markets
Expectations	extreme global risk aversion
Expectations	provide assurances to financial markets
Expectations	restore market confidence
Expectations	reduce market uncertainty
Expectations	bolster confidence
Expectations	economic credibility
Expectations	slump in confidence
Expectations	undermining confidence
Expectations	confidence crisis
Expectations	signals to markets
Expectations	market confidence sagged
Expectations	vulnerable to abrupt swings in market sentiment
Expectations	heightened risk aversion
Expectations	increase in global risk aversion
Expectations	weakening of market confidence
Expectations	vulnerable to changes in the international investment climate
Expectations	confidence in the liquidity of the foreign exchange market
Expectations	increase uncertainty in the international environment
Expectations	pressures on confidence
Expectations	self-fulfilling
Expectations	shifts in investor sentiment
Expectations	bolstering market confidence
Expectations	confidence crisis
Financial	financial stability crisis
Financial	international monetary crisis
Financial	crisis in financial market
Financial	financial risks
Financial	turmoil in financial markets
Financial	turmoil in international financial markets
Financial	volatility in financial markets
Financial	restore the strength of the financial sector
Financial	unfolding financial crisis
Financial	global market sell-off
Financial	global financial shock
Financial	financial shock
Financial	financial contagion
Financial	financial crisis
Financial	collapse of financial markets
Financial	fire sells
Financial	collapse of equity prices

Category	Keyword
Financial	financial market panic
Financial	global financial turbulence
Financial	viability and health of the financial sector
Housing	home prices have been declining
Housing	drops in real estate prices
Housing	house price trends
Housing	home-price overvaluation
Housing	real house prices declining
Housing	foreclosures
Housing	house price inflation
Housing	house-price inflation
Housing	foreclosures
Housing	bust in housing
Housing	home-price declines
Housing	house-price declines
Housing	house prices fall
Housing	stalling house prices
Housing	slower house price
Housing	slowing housing wealth
Housing	declines in house prices
Housing	headwinds from housing
Housing	problems in housing
Housing	housing downturn
Housing	cooling housing market
Housing	cooling in the housing market
Housing	change in housing wealth
Housing	deceleration in house prices
Housing	slowdown in the housing market
Housing	housing slowdown
Housing	house prices seemed overvalued
Housing	housing boom
Housing	falling house prices
Housing	spillovers from the housing market
Housing	spillovers from housing
Housing	housing market weakness
Housing	slowdown in the housing market
Housing	subprime
Housing	residential investment has declined rapidly
Inflation	inflation pressure
Inflation	inflationary pressure
Inflation	high.{0,10}inflation
Inflation	high rate of inflation
Inflation	severe.{0,10}inflation
Inflation	large.{0,10}inflation
Inflation	virulence.{0,10}inflation
Inflation	unprecedented.{10}inflation
Inflation	sharp.{0,2}increase in domestic prices
Inflation	large increase in.{0,10}prices
Inflation	high pressure on.{0,10}prices
Inflation	inflation.∗critical
Inflation	inflation.∗unprecedented levels
Inflation	despite the acceleration of inflation
Inflation	the rate of inflation accelerated sharply
Inflation	inflation crisis
Inflation	hyperinflation
Inflation	large monetary creation
Inflation	combat inflation
Inflation	halting inflation

Category	Keyword
Inflation	halt to inflation
Inflation	efforts against inflation
Inflation	quick reduction.∗inflation
Inflation	inflation down quickly
Inflation	lowering the rate of inflation
Inflation	entrenchment of inflationary behavior
Migration	refugee
Migration	migrant
Migration	inward migration
Migration	population inflow
Migration	asylum
Migration	immigrant
Migration	immigration
Nat. disaster	flood
Nat. disaster	drought
Nat. disaster	rainfall
Nat. disaster	torrential rains
Nat. disaster	natural calamities
Nat. disaster	power shortage
Nat. disaster	natural disaster
Nat. disaster	earthquake
Nat. disaster	hurricane
Nat. disaster	typhoon
Nat. disaster	cyclone
Nat. disaster	calamity
Nat. disaster	adverse weather conditions
Nat. disaster	tsunami
Political	political turmoil
Political	internal security situation
Political	political atmosphere
Political	political crisis
Political	political uncertainty
Political	political instability
Political	political transition spillovers
Political	political turn-over
Political	policies risks
Political	political turmoil
Political	political risk
Political	unstable political
Political	political instability
Political	poor governance
Political	disturbed political conditions
Political	political and economic developments
Political	political and security situation
Political	economic and political situation
Political	political crisis
Political	unsettled political situation
Political	political tensions
Political	geopolitical events
Political	policy-related uncertainty
Political	policy related uncertainty
Political	geopolitical risk
Political	election related uncertainty
Political	election related uncertainties
Political	governance issues
Political	complex geopolitical situation
Political	geopolitical tensions
Political	geopolitical turmoil

Category	Keyword
Political	weak governance
Political	adverse geopolitical events
Political	adverse geopolitical
Political	unexpected political events
Political	revolution
Political	uncertain policies
Political	uncertainty about policy
Political	political contagion
Political	euro exit
Political	exit of the eurozone
Political	uncertain national election
Political	political transition
Political	political pressures
Political	change of administration
Political	risks linked to the electoral calendar
Political	uncertainty surrounding the outcome of the presidential election
Political	uncertainty regarding the political transition
Political	domestic political developments
Political	politial risk
Political	facilitate an orderly transition to a new administration
Political	uncertainty about the continuity of policies
Political	uncertainty regarding future policies
Political	unstable political environment
Political	military coup
Political	coup d'etat
Political	annulment of the election
Political	parliamentary upheavals
Political	critical political.∗juncture
Political	lack of an approved government
Social	social risk
Social	social strain
Social	social.∗turmoil
Social	social disruption
Social	social climate as deteriorate
Social	social tension
Social	protest
Social	railroad-transport strike
Social	deteriorating social climate
Social	blockade
Social	social unrest
Social	walkouts
Social	events of may-june 1968
Sovereign	rescheduled debt
Sovereign	external payments crisis
Sovereign	difficulties in servicing its external debt
Sovereign	difficult time in rolling over its debt
Sovereign	rescheduling of external debt
Sovereign	rescheduling agreement
Sovereign	suspend service payments
Sovereign	fiscal crisis
Sovereign	debt relief
Sovereign	failure to roll over debt
Sovereign	government bonds crisis
Sovereign	government bonds crisis
Sovereign	bond crisis
Sovereign	debt reprofiling
Sovereign	sovereign debt crisis
Sovereign	public debt crisis

Category	Keyword
Sovereign	default risks
Sovereign	self fulfilling crises
Sovereign	debt restructuring program
Sovereign	governement default
Sovereign	restructuring of debt
Sovereign	suspension of payments
Sovereign	debt swap
Sovereign	debt restructuring
Sovereign	debt rescheduling
Sovereign	debt service reduction
Sovereign	debt restructuring program
Sovereign	rescheduling of the debt
Sovereign	arrears
Sovereign	rescheduling of arrears
Sovereign	arrears in the payment
Sovereign	restructuring of its external debt
Sovereign	restructuring agreements
Sovereign	external payment arrears
Sovereign	debt service reduction
Sovereign	no debt service payments
Sovereign	relation with external creditors
Sovereign	paris club
Sovereign	club of paris
Sovereign	debt relief
Sovereign	debt exchange
Trade	trade war
Trade	trade policy tension
Trade	trade tension
Trade	trade conflict
Trade	excalation of trade restrictions
Trade	disruption of trade
Trade	trade crisis
Trade	trade restrictions
Trade	trade volatility
Trade	weak trade
Trade	disruption to trade
Trade	slowdown in trade
Trade	trade restricting measure
Trade	decline in fdi
Trade	decline in foreign direct investment
Trade	fdi flows declined
Trade	fdi have declined
Trade	trade issues
Trade	slowdown in trade
Trade	trade slowdown
Trade	uncertainty about future trade policy
Trade	uncertainty about trade policy
Trade	trade restraints
Trade	trade policy unpredictability
Trade	slowdown in global trade
Trade	stronger competition of countries
Violence	war damage
Violence	insurgency crisis
Violence	security crisis
Violence	civil conflict
Violence	civil war
Violence	ensuing conflict
Violence	armed conflict

Category	Keyword
Violence	armed internal conflict
Violence	armed domestic conflict
Violence	oingoing conflict
Violence	violent conflict
Violence	atlantic conflict
Violence	internal conflict
Violence	regional conflict
Violence	conflicts in the region
Violence	conflict zone
Violence	conflict regions
Violence	military coup
Violence	military take-over
Violence	coup d'etat
Violence	escalated attacks
Violence	breakdown of cease-fire
Violence	ethnic rivalries
Violence	terrorist attacks
Violence	terrorism
Violence	guerilla offensive
Violence	continuing external aggression
Violence	incidence de la guerre
World	world-wide recession
World	global economic crisis
World	global crisis
World	world recession
World	worldwide recession
World	international crisis
World	global financial crisis
World	deep international recession
World	international downturn
World	internation recession
World	ongoing global downturn
World	deterioration of external environment
World	weakening of international economic activity
World	turbulence in international markets
World	external conditions deteriorated markedly
World	unfavorable developments in the international economic environment
World	deterioration of external environment
World	recession in the world economy
World	international monetary crisis
World	worsening international environement
World	difficult external environment
World	downside risks in the international environment
World	further deterioration in the international environment
World	uncertain external environment
World	slowdown in international economy
World	fragile global outlook
World	international financial turmoil
World	sharply deteriorating external conditions

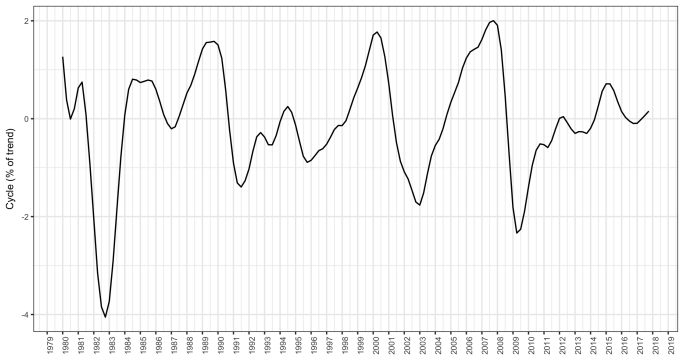
Note: Authors' own elaboration.

B The Complex Crises Database (CDD)

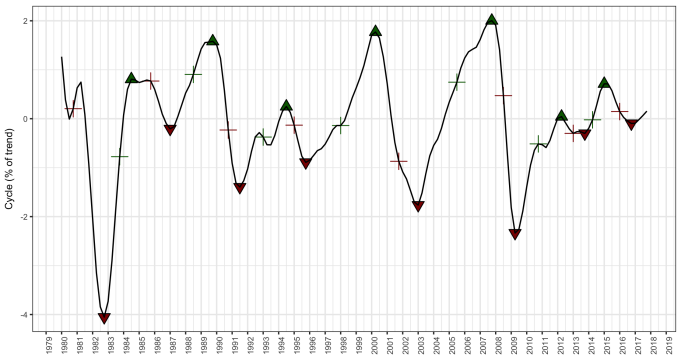
B.1 Economic Indicators: Benchmark Comparison

Figure 13: Locating Turning Points in Economic Activity: United States

(a) Cyclical Component of Output



(b) Turning points



Source: *OECD Analytical Database*

Table 12: Soft Recession Term-Frequency and GDP Growth - Regressions

	Dependent variable:						
	g	g	g<0	g<0	Phase B	Large B	Phase B2
Y soft	−0.73***	−0.31***					
	(0.14)	(0.11)					
Y soft>0			0.03***	0.08***	0.02	0.003	0.04**
			(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Constant	3.89***			0.05***			
	(0.31)			(0.01)			
Country FE	*No*	*Yes*	*Yes*	*No*	*No*	*No*	*No*
Time FE	*No*	*Yes*	*Yes*	*No*	*No*	*No*	*No*
Controls	*No*	*Yes*	*Yes*	*No*	*No*	*No*	*No*
Robust se	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
F	25.83***	3.09***	8.33***	45.65***	2.97***	2.45***	4.06***
Observations	2,061	2,060	2,061	2,061	2,098	2,021	2,098

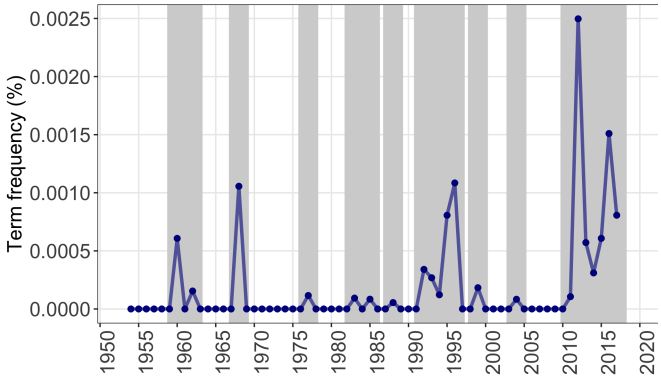
Source: *Complex Crises Database* (CCD), *OECD Analytical Database*

Note: Y soft is the soft recession term-frequency. G corresponds to real GDP growth rate. Y soft>0 and g<0 are dummies equal to 1 when the condition is satisfied. Phase B, Large B and Phase B2 are dummies indicating the cyclical component of real GDP obtained following Harding and Pagan (2002). Phase B is equal to 1 for all the years in between the peak and the trough of the cycle. Large B indicates the downturn phases with the largest amplitude. Phase B2 refers to the second half of the downturn. GDP data are from the Analytical Database of the OECD.
***: significant at 1% level, **: significant at 5% level, *: significant at 10% level.

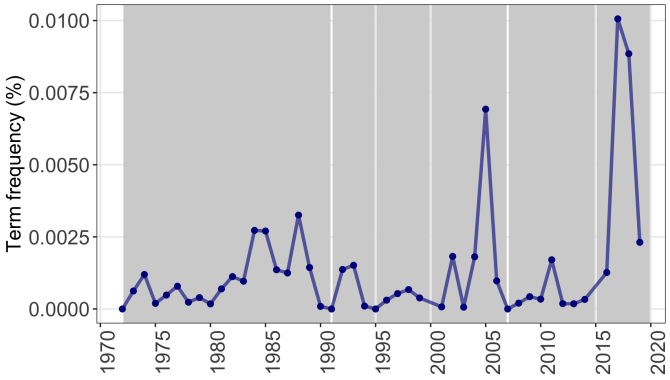
B.2 Non-Economic Indicators: Presentation

Figure 14: Examples of Natural Disasters Indicator

(a) Japan



(b) Sri Lanka



Source: *Complex Crises Database* (CCD)
Note: The blue line corresponds to the natural disaster term-frequency for, respectively, Japan and Sri Lanka. Shaded gray areas are years of strictly positive term-frequency.

Japan has a long history of natural disasters: the geographic position of the archipelago predispose it to different kinds of natural calamities. Four peaks stand out in the last 70 years: 1960, 1968, 1995, 2011: the 1960 peaks correspond to the Typhoon Vera, the 1995 peak to the Kobe earthquake and the 2011 one to the Tōhoku earthquake and the related meltdown of the Fukushima nuclear power plant. All these events constituted major setbacks in the Japanese economy. Sri Lanka displays a startling pattern: a constant vulnerability to natural disaster, with discussions happening almost every year since 1970. Among the largest events peaks, we identify the 2004 Indian Ocean earthquake and the 2017 extensive floods that wrought havoc the country .