Wholesale Funding Crises since 1800[†]

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Abstract

We study the incidence and macroeconomic consequences of wholesale funding crises using a novel narrative chronology and newly constructed data on banks' liability structures for 147 countries from 1800 to 2024. Wholesale crises have occurred with unprecedented frequency over the past three decades and have become more common than retail bank runs, especially in advanced economies. We show that wholesale crises are predictable using observable fundamentals such as non-deposit funding growth and bank capital ratios. The macroeconomic fallout from wholesale funding crises is severe when accompanied by contractions in non-deposit funding, and can exceed the costs of retail deposit runs, consistent with wholesale creditors possessing superior information about bank solvency. While deposit insurance reduces the likelihood of retail bank runs, it increases the probability of wholesale funding crises, indicating that run risk is reallocated from insured retail depositors to uninsured wholesale creditors.

JEL Classification Codes: E44, G01, G20, G21, G28, N20.

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1 Introduction

Bank runs are as old as banking itself. From the suspension of payments by London's goldsmith bankers in the 17th century to queuing depositors during the Great Depression, sudden creditor withdrawals have been a recurring feature of financial instability (Friedman and Schwartz, 1963; Kindleberger, 1978; Calomiris and Gorton, 1991). For much of history, runs were a product of panic among retail depositors, such as regular savers, shopkeepers, or farmers. But over the past few decades, banks' funding structure has shifted towards borrowing from wholesale creditors, such as other banks, money market funds, or repo markets (Huang and Ratnovski, 2011; Vázquez and Federico, 2012; Jordà et al., 2021; Grimm, 2024). As such, large-scale runs with the potential to destabilize the banking sector can now be initiated not only by retail customers but also by providers of such wholesale funding. In fact, such wholesale funding runs are widely seen to have been at the heart of the Global Financial Crisis of 2007-08 (Gorton and Metrick, 2012; Covitz et al., 2013; Krishnamurthy et al., 2014; Schmidt et al., 2016).

Despite the rising importance of non-deposit funding in bank liabilities, there is a lack of systematic evidence on the frequency and consequences of wholesale funding runs. Existing studies have mainly focused on disruptions to wholesale liabilities as part of the 2007-08 crisis, such as the collapse of the asset-backed commercial paper (ABCP) market (Covitz et al., 2013), runs on certain segments of the U.S. repo market (Gorton and Metrick, 2012; Copeland et al., 2014; Krishnamurthy et al., 2014), mass redemptions from institutional money market funds after the Lehman Brothers bankruptcy (Schmidt et al., 2016), or dry-ups in European interbank and wholesale funding markets (Iyer et al., 2013; Pérignon et al., 2018). Valuable as these studies are, they cannot answer several key questions: How common are wholesale runs, and how has their relative likelihood changed over time? How does their macroeconomic aftermath compare to that of retail depositor runs or other types of banking sector distress? Does deposit insurance prevent (insured) retail depositors from running but make panic among (uninsured) wholesale creditors more likely?

We address these questions by constructing the first comprehensive chronology of wholesale funding runs, encompassing 147 countries over more than two centuries (1800–2024). The chronology draws on 487 historical and contemporary sources, including reports from the IMF, BIS, World Bank, and central banks, as well as academic research and newspaper accounts. By wholesale funding crises, we mean sudden, severe withdrawals by non-retail creditors, including other banks, institutional investors, and foreign lenders, other clear signs of stress in banks' ability to borrow from such

creditors.[1] Aided by recent advances in Large Language Models (LLMs), we identify candidate events by exploiting the ability of LLMs to swiftly comb through thousands of pages of documents in any language, which helps to minimize the likelihood of failing to detect run episodes. Based on these candidate inputs and our own careful research, we manually classify episodes on a case-by-case basis. The end product is a dataset covering a grand total of 188 wholesale funding runs spanning across every continent. We merge these events with a comprehensive novel dataset on the funding structure of banking systems, which builds on existing contributions but also extends them by digitizing new time series.

To demonstrate the validity of our database of wholesale run events, we first show that the wholesale runs identified in our chronology are followed by sudden contractions in the noncore funding of a country's banking sector, both in absolute terms and relative to (retail) demand deposits. Second, this contraction of noncore funding is considerably more pronounced during wholesale runs relative to retail runs, suggesting we capture a liquidity squeeze that is specific to the type of runs we are interested in.

The richness of our chronology allows us to provide a comprehensive historical panorama of wholesale funding runs. In the Barings crisis of 1890, London creditors withdrew funding from Argentine banks (Mitchener and Weidenmier, 2008). In 1982, following Mexico's sovereign default, foreign wholesale creditors abruptly cut funding to Latin American banks, contributing to deep regional recessions . In 1998, the Russian default triggered a sudden stop in foreign interbank lending to Peruvian banks (Schnabl, 2012). In 2008, stress in U.S. repo markets caused widespread disruptions to the global financial system (Copeland et al., 2014; Krishnamurthy et al., 2014). In 2011, the euro area interbank market fractured along national lines as French and German banks withdrew funding from southern Europe (Cetorelli and Goldberg, 2011).

These episodes illustrate the long history of wholesale funding disruptions. From these cases, and many others, a few systematic patterns emerge. While wholesale runs are nothing new, they have occurred with unprecedented frequency over the last three decades. In fact, they are now more common than runs by retail depositors, both in advanced and emerging economies. If we consider withdrawals by either wholesale and retail creditors, the frequency of bank runs in the past couple of decades is entirely unprecedented, especially in emerging economies, and considerably higher than during the crisis waves of the 1930s or 1990s. Our answer to the classic question of whether the

[1]For the remainder of this paper, we will use the terms "wholesale funding" and "noncore funding" interchangeably, where both refer to bank liabilities other than demand deposits. Note that our definition of a wholesale funding crisis is somewhat broader than the definition of a "run," which requires there to be an element of panic.

"crisis problem" is growing more severe is thus a resounding "yes", at least when it comes to the frequency of run events (Bordo et al., 2001).

What is equally important to the increasing frequency of runs is where they occur. Our data suggest that the presence of explicit, credible deposit insurance is a strong predictor of which countries see a migration from retail to wholesale creditors being the ones to cause systemic issues to the banking sector. These findings for the first time systematically confirm the view that protecting retail depositors may shift run risk to wholesale creditors (Demirgüç-Kunt and Detragiache, 2002; Calomiris and Jaremski, 2016).

Having provided a new set of empirical facts on the nature of wholesale funding runs around the globe, we next use our more than 220 years of data to investigate the aftermath of these events. By merging our chronology with the Global Macro Database (Müller et al., 2025), we arrive at a cross-country panel spanning 157 countries with macroeconomic data often beginning in the early 19th century. As such, our dataset provides a unique opportunity to document basic facts on the output losses of different types of financial distress. Econometrically, we rely on panel local projections, building on the original work of Jordà (2005).

We document four central findings. First, wholesale runs are linked to a clear and discontinuous decline in GDP, investment, consumption, and employment. In their aftermath, GDP drops precipitously, bottoming out at an output loss of around -9% after five years. Second, this order of magnitude is in fact larger than the estimated output gap from retail bank runs. However, both retail and wholesale runs predict similar GDP losses when they are accompanied by measurable statistical declines in the affected bank liabilities—that is, when they become "systemic" enough to be detectable in the aggregate banking sector statistics (Jamilov et al., 2024).

Third, we ask why runs by wholesale rather than retail creditors are associated with worse output drops. The evidence points to wholesale creditors possessing superior information about fundamentals, as highlighted by micro-level analyses such as Blickle et al. (2024). In particular, we find that wholesale runs are much more predictable with declines in the book or market value of bank equity than retail runs. Put differently, while retail runs sometimes have idiosyncratic origins, as highlighted by the literature on sunspots (Diamond and Dybvig, 1983), wholesale creditors are not easily fooled by rumors and instead tend to run based on genuine solvency concerns. These results complement the existing evidence in Greenwood et al. (2022) who study the predictability of financial crises with rapid credit and asset price growth in the postwar period.

Panic among the wholesale creditors of banks is nothing new: from Buenos Aires in 1890 to Greece in 2011, sudden and large-scale dry-ups of interbank or financial market

liquidity have been a frequent feature of periods of financial distress. However, wholesale creditor withdrawals have occurred at such a rising frequency that runs of one kind or another are now more likely than ever. Deposit insurance is a potential contributor. By insuring retail liabilities, but leaving wholesale creditors without a safety net, it has changed the nature of runs without eliminating them. The result is that modern banking systems are exposed to wholesale funding risks that leave a lasting imprint on the macroeconomy.

Related literature. Our work relates to four strands of research. First, we build on studies of modern wholesale funding markets and their fragility. Evidence from the United States shows that institutional lenders can rapidly withdraw funding in the market for repos (Gorton and Metrick, 2012; Krishnamurthy et al., 2014; Copeland et al., 2014), asset-backed commercial paper (Covitz et al., 2013), and money market mutual funds (Schmidt et al., 2016). Beltratti and Stulz (2012) and Vázquez and Federico (2012) find that higher reliance on noncore funding predicts worse bank performance during crises.

Second, several studies trace out the transmission of wholesale withdrawals on the real economy. Schnabl (2012) traces the 1998 Russia default to a sudden stop in Peruvian bank funding and Iyer et al. (2013) study the transmission of the European interbank liquidity freeze during 2007-08 to Italian firms. Cetorelli and Goldberg (2011, 2012) and Giannetti and Laeven (2012) document how global banks' internal capital markets and "flight-home" lending amplify shocks. Gatev and Strahan (2006) show retail deposits behave as a stable funding source when spreads in commercial paper markets are elevated, suggesting that retail deposits act as stabilizers. The principal contribution of our paper is to put such episodic evidence in a broad historical context, which allows us to establish a set of more easily generalizable stylized facts.

Third, we speak to the literature on financial crises. Narrative accounts such as Kindleberger (1978)'s classic history of financial panics, or Tooze (2018)'s account of the 2007-08 Global Financial Crisis, assign a prominent role to the role of wholesale funding, but do not provide systematic empirical evidence. The aftermath of financial crises of various forms has generally been found to be severe (e.g., Cerra and Saxena, 2008; Reinhart and Rogoff, 2009; Schularick and Taylor, 2012; Baron et al., 2021). Because existing studies use various definitions of what constitutes a crisis (Bordo and Meissner, 2016), they do not allow us to conclude anything about wholesale funding runs. Closest in spirit is our own prior work focusing entirely on *retail* runs rather than wholesale crises (Jamilov et al., 2024). Baron et al. (2021) construct a list of banking panics for 46 countries since 1870, which includes various types of runs and capital flows, and Grimm (2024) shows that banks increasingly rely on noncore funding in the run-up to these panics in a sample starting after World War

II. Different from their work, we specifically study the incidence of wholesale funding runs over more than 220 years, characterize how they differ from retail depositor runs, investigate the role of deposit insurance, and contrast their macroeconomic aftermath with other types of banking sector distress.

Fourth, our work connects to studies of deposit insurance and its unintended consequences. Demirgüç-Kunt and Detragiache (2002) find that deposit insurance can increase banking fragility in weak institutional environments, while Calomiris and Jaremski (2016) review the historical evidence on moral hazard and displacement effects. Using our cross-country, long-run database as a laboratory, we find that the existence of credible deposit insurance is strongly correlated with a migration of bank runs from insured (retail) to uninsured (wholesale) liabilities.

2 A New Dataset on Wholesale Funding Runs, 1800–2024

2.1 Defining Wholesale Funding Crises

We define a wholesale bank run as a sudden withdrawal or withholding of liquidity by non-retail creditors, such as institutional investors or interbank lenders (Huang and Ratnovski, 2011; Iyer et al., 2013; Covitz et al., 2013; Pérignon et al., 2018). The distinguishing feature of wholesale bank runs is their silent but severe nature, which causes the affected institution(s) to experience acute liquidity problems. Given that we are interested in a chronology of episodes on the country-level, we record both runs on single institutions and clusters of institutions.

Our approach for identifying wholesale funding runs employs contractions in outstanding noncore funding across the entire banking sector as a starting point to identify candidate events, which we then extend based on a narrative reading of existing crisis chronologies (Jordà et al., 2017; Baron et al., 2021; Laeven and Valencia, 2018; Reinhart and Rogoff, 2009; Jamilov et al., 2024) on individual countries. We classify episodes into two categories: main cases and borderline cases.

Main cases. Main cases are episodes with substantial evidence of institutional creditor panic and acute wholesale funding stress. These episodes exhibit multiple indicators of wholesale funding withdrawal, including: (1) documented withdrawals by institutional investors, time depositors, or corporate creditors; (2) exclusion from or freezing of interbank markets; (3) sharp increases in wholesale funding costs, such as interbank rates or LIBOR-OIS spreads; (4) sudden credit line withdrawals by other financial institu-

tions; (5) capital flight by foreign institutional creditors; and (6) emergency central bank interventions to provide wholesale liquidity support.

For example, Venezuela's June 1994 crisis qualifies as a main case with explicit evidence of interbank market exclusion. Banco Latino faced "growing difficulty... to access interbank market resources" and was subsequently "excluded from that mechanism" (Banco Central de Venezuela, 1994), combined with documented "withdrawals of large deposits from wholesale banks and simultaneous cuts in interbank lending" (Garcia-Herrero, 2004). Zimbabwe's December 2003 episode provides unambiguous documentation of wholesale funding panic, with direct reference that "in 2003 following the failure of ENG asset management that triggered a wholesale run on banks with contagion effect" (Dzomira, 2014, p. 77). Spain's April 1931 crisis demonstrates complete interbank market breakdown, as Banco de Cataluña was "cut off from its sources of interbank liquidity" and "lacking all sources of interbank liquidity, Banco de Cataluña turned again to the Minister of Finance" (Jorge-Sotelo, 2022). South Korea's July 1997 crisis shows international wholesale creditor withdrawal as "starting in late summer international creditors began to reduce their exposure to Korean financial institutions and to withdraw their short-term credit lines" (Ubide and Baliño, 1999, p. 30), while in September 2008 "foreign banks in Korea rushed to shed won assets. Domestic banks, in turn, faced difficulties in borrowing in the interbank market and much higher costs of obtaining short-term U.S. dollar financing" (Fender and McGuire, 2010, p. 66).

Borderline cases. Borderline cases are episodes with evidence of liquidity stress, funding difficulties, and capital outflows, but lacking the comprehensive documentation of institutional creditor panic that characterizes main cases. These episodes typically exhibit only one or two wholesale funding indicators rather than the multiple corroborating markers present in main cases, and often feature ambiguity about whether the withdrawals were predominantly wholesale or retail in nature. Common patterns in borderline cases include isolated interbank market stress without broader systemic withdrawal, capital outflows documented primarily through exchange rate collapse rather than direct evidence of institutional creditor flight, relatively brief disruptions that were quickly resolved through intervention, or cases where funding difficulties are described in general terms without specific documentation of wholesale creditor behavior.

Brazil's September 2008 episode illustrates a typical borderline case. While there is clear evidence of foreign creditor withdrawal, "net short term foreign loans to Brazilian banks showed outflows of USD11.4 billion in the second half of 2008" (Hennings and Rocha, 2013, p. 3), and frozen international financial markets as "after September 15, 2008,

international financial markets froze and we saw a stop in gross capital inflows (sudden-stop) and gross capital outflows (flight to quality)" (Hennings and Rocha, 2013, p. 3), the evidence lacks multiple corroborating indicators of sustained institutional creditor panic. The crisis showed "the virtual paralysis of the bank credit market starting in September 2008" (de Freitas, 2009), but documentation focuses primarily on capital flow disruptions rather than the comprehensive wholesale funding market breakdown present in main cases. Similarly, Venezuela's December 2008 episode qualifies as borderline as "tensions that appeared in the interbank market during the last two months of the year, especially concerning the short-term interest rate (the overnight rate)." (Banco Central de Venezuela, 2008, p. 58), the evidence does not provide clear documentation of sustained wholesale creditor panic or multiple corroborating indicators of institutional funding withdrawal. The U.S. March 2020 COVID-19 disruption represents another borderline case: despite documented wholesale funding stress through "outflows from U.S. prime MMFs" (Eren et al., 2020, p. 1) and "spikes in indicators of bank funding costs, such as the LIBOR-OIS spread" (Eren et al., 2020, p. 1), the episode was brief and "flow volatility for unsecured wholesale deposits, which is generally higher than retail deposit flow volatility, also increased, but not as much" (Glasserman and Young, 2024, p. 1), suggesting severe but temporary dislocation rather than a sustained wholesale run.

The distinction between main and borderline cases reflects differences in both the quality and quantity of available evidence. Main cases provide clear, specific documentation of institutional creditor withdrawal through multiple channels, while borderline cases rest on more limited evidence that suggests but does not definitively establish wholesale funding panic as the dominant crisis mechanism.

2.2 Narrative Evidence

Following established practice in the literature, we identify episodes of wholesale bank runs through a systematic analysis of historical qualitative evidence. Such a "narrative approach" is useful because variation in banking statistics can easily confuse genuine wholesale funding panics with the regular ebb and flow of bank liabilities induced by other real or financial shocks.

Different from existing work, we leverage recent advances in large language models (LLMs) such as Perplexity and Gemini to help in the identification of events. LLMs have several naturally appealing features for identifying historical events. First, they are able to rapidly find, parse, and summarize online text sources in a matter of seconds. Second, they face no restriction in terms of the language used in the sources, which allows us to draw on an unprecedented number of non-English primary sources. Our chronology

incorporates sources in ten languages: Portuguese, Dutch, Norwegian, Polish, Italian, Russian, and others. This enables us to document wholesale funding crises in countries that are often underrepresented in English-language crisis chronologies (see Table A.2 in Appendix A for details). Third, LLMs often identify historical newspaper archives and also query the text therein, which broadens the availability of source material.

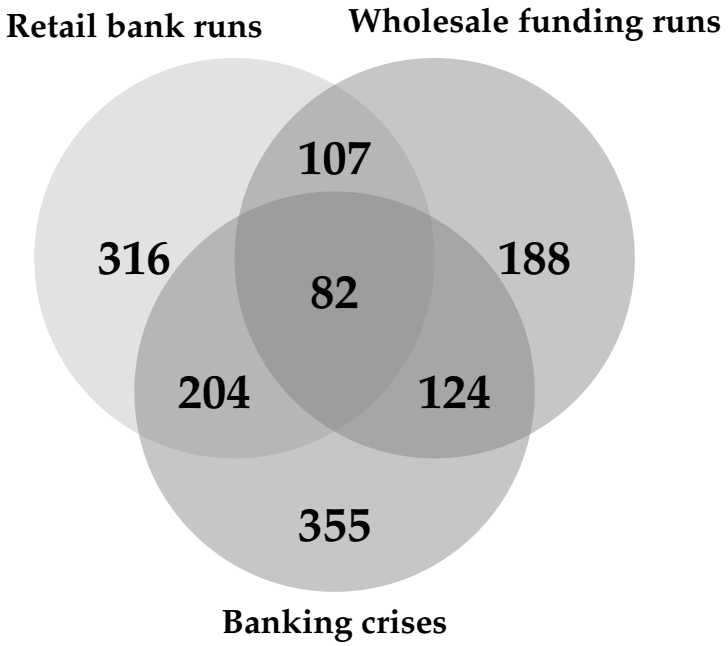
Because LLMs have a tendency to hallucinate and can be imprecise, their output cannot (yet) be directly used as a source of narrative data. However, it serves as an excellent starting point, because it provides us with a comprehensive list of sources and event summaries that we can then manually investigate. As such, we view the use of LLMs as a critical improvement in minimizing the likelihood of "false negatives"—failing to identify wholesale runs that did in fact occur—due to their ability to conduct a sweeping search of content available online.

Our starting point is to identify a series of candidate events that we first investigate using LLMs. We compile a list of all country-year observations that if they (i) appear in any of the crisis chronologies of Reinhart and Rogoff (2009), Laeven and Valencia (2020), Jordà et al. (2017), Baron et al. (2021), or Jamilov et al. (2024); or (ii) see a contraction in any category of wholesale funding of at least 10th percentile year-on-year, based on our newly-constructed data, or foreign liabilities to banks reporting to the Bank for International Settlements' Locational Banking Statistics. We feed each this list of candidate events to multiple LLMs using the AI agent pipeline, and then use the resulting output to conduct our own, manual event classification. Appendix A provides a detailed description of our AI agent methodology, including the specific prompts used, the multi-stage verification process, our classification criteria for main versus borderline cases, and our approach to minimizing type I and type II errors. The full list of wholesale funding run episodes is reported in Table 3.

2.3 Statistical Data on Bank Funding Composition

We construct a new historical dataset on the funding composition of banks, based on five sources: (i) a version of the IMF's International Financial Statistics, as extended by Grimm (2024), who importantly also records information on statistical breaks, bank capital, and bank capital-to-asset ratios, (ii) noncore funding ratios (defined as wholesale to deposit funding) constructed by Jordà et al. (2021), which we multiply with their data on deposits to attain a time series on wholesale funding, and their bank capital ratio measure, (iii) the deposits of internationally active banks reporting to the BIS Locational Banking Statistics, which serves as an additional proxy for foreign wholesale deposits and foreign liabilities, as well as measures of bank capital (ratios), (iv) the OECD Banking Statistics providing

Figure 1: Overlap Retail Bank Runs, Wholesale Funding Runs, and Banking Crises



Notes: This figure visualizes the number of wholesale funding runs, retail bank runs, and banking crises and their respective overlap.

us with additional data on foreign wholesale liabilities, interbank liabilities, liabilities to central banks, bank capital (ratios), and other wholesale bank liabilities, and (v) newly digitized data on wholesale funding from several national sources.

Defining wholesale funding consistently across countries and long periods is difficult. Since the majority of data points come from the International Financial Statistics, however, our classification is reasonably consistent for most of the sample. In particular, we follow Grimm (2024) in defining banks' noncore funding—when using IMF (IFS) data—as the sum of (i) foreign liabilities, (ii) liabilities to other banks, (iii) securities, (iv) loans, and (v) derivatives. To construct consistent time series for noncore funding, we carefully reviewed the data from each individual source and combined them based on our assessment of their relative reliability over different time periods. We began by harmonizing the individual components of noncore funding—such as foreign liabilities—across sources and time. Once the underlying components were harmonized, we aggregated them to construct the overall noncore funding measure. In a final step, we adjusted for any remaining discontinuities due to source changes or methodological breaks by chain-linking overlapping periods in the resulting noncore funding series.

2.4 Comparison with Other Chronologies of Banking Crises

This section compares the coverage of our (JKMMS) measures of wholesale bank runs, noncore funding withdrawal episodes, and systemic bank runs to several existing chronologies of banking crises. We focus our comparison on five sources of crisis dates: Reinhart and Rogoff (2009), Laeven and Valencia (2018), Jordà et al. (2017), Baron et al. (2021), and Jamilov et al. (2024).

Starting in 1800, we identify 188 episodes of wholesale runs in 147 countries, relative to the 151 banking crises in Laeven and Valencia (2018). Wholesale runs are less common than the 316 retail depositor runs from Jamilov et al. (2024).

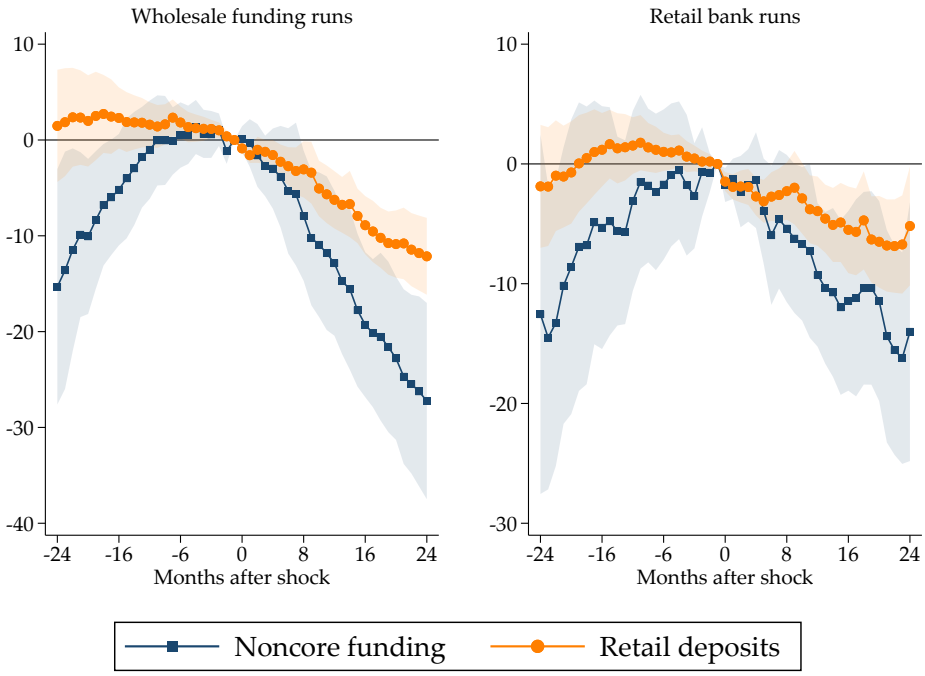
There is considerable but imperfect overlap between wholesale runs, retail depositor runs, and crises. Of our 188 wholesale runs, 124 overlap with banking crises in at least one of the existing chronologies, while 204 of 316 retail runs do. Wholesale and retail creditor runs occur at the same time in 107 out of the 188 wholesale run cases. We identify 82 events in which there are both types of runs *and* a banking crisis (Figure 1).

Wholesale runs, unlike retail depositor panics, are not sunspot events driven by coordination failures among retail agents. As we show in Section 2.5, wholesale runs are more predictable that retail runs using observable fundamentals such as noncore funding growth, capital ratios, and global factors captured by year fixed effects. This *fundamentalness* implies that wholesale runs predominantly occur in countries with sufficiently developed financial systems, where banks rely meaningfully on noncore funding sources and where interbank markets are integrated into the global financial system. Countries without documented wholesale runs in our chronology are concentrated in Sub-Saharan Africa and parts of East Asia (Figure B.1), regions where banking sectors remain predominantly deposit-funded and where English-language and local documentation of interbank market conditions is sparse. The absence of wholesale runs in these countries is thus consistent with both lower exposure to wholesale funding risk and limited *narrative* observability of such events when they do occur.

2.5 Validation

Our primary validation test examines whether wholesale run events are associated with sudden contractions in the relevant portion of bank liabilities. Using our newly-constructed time series on noncore funding at monthly frequency, we estimate local projections of bank liability growth around run events. If our narrative chronology correctly identifies wholesale funding crises, we should observe sharp declines in noncore funding following these events, with comparatively muted responses in retail deposits.

Figure 2: Wholesale Funding Runs, Retail Runs, and Noncore Funding Contractions



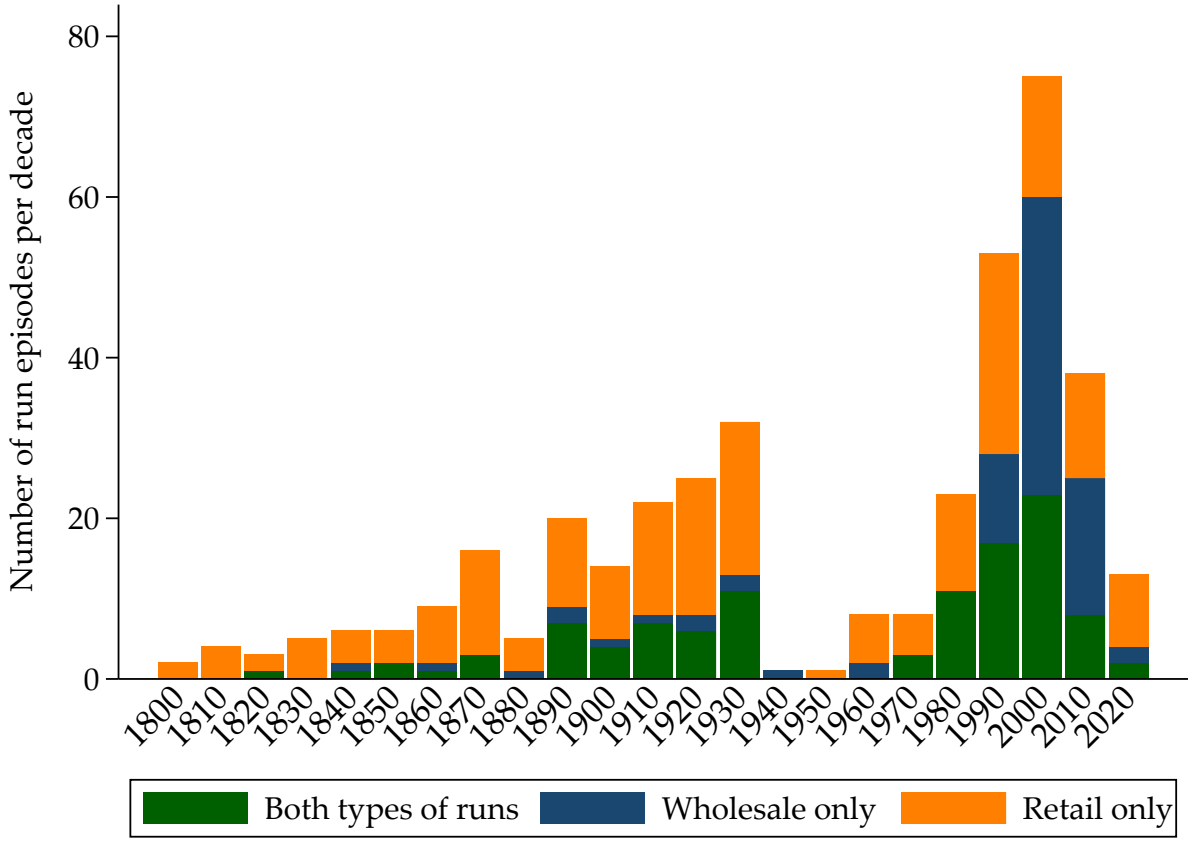
Notes: This figure plots the impulse responses of nominal noncore funding and nominal total retail deposits around (i) wholesale funding runs and (ii) retail bank runs. We specify the following local projections: $\Delta_h y_{i,t} = \alpha_i + \beta_h \mathbf{1}\{\text{Run}_{i,t-1}\} + \epsilon_{i,t}$, where $h \in \{-24, ..., 24\}$ and $\mathbf{1}\{\text{Run}_{i,t-1}\}$ is one for country-month observations for which we have evidence of wholesale funding runs or retail bank runs, respectively, from our bank run chronologies. The error bands depict 95% confidence bands based on Driscoll and Kraay (1998) standard errors.

Figure 2 confirms this prediction. The left panel shows the path of bank liabilities around wholesale funding runs. Noncore funding (navy line) begins declining approximately six months before the run date and falls by more than 30 percentage points within two years of the event. In contrast, retail deposits (orange line) exhibit a much smaller decline, remaining relatively stable in the months surrounding wholesale runs. This differential response is consistent with our classification: the events we identify as wholesale runs are associated with larger withdrawals by wholesale creditors.

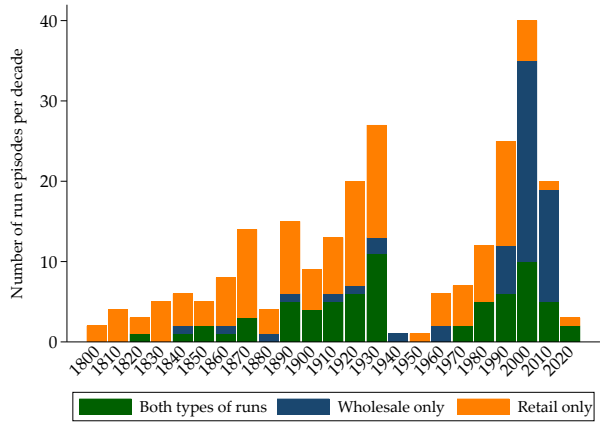
The right panel of Figure 2 presents the analogous exercise for retail bank runs from Jamilov et al. (2024). Here, both liability types contract, but the relative magnitudes shift: retail deposits decline by approximately 20 percentage points, a substantially larger drop than during wholesale run events. Crucially, however, the decline in noncore funding during wholesale runs (left panel) is considerably larger than during retail runs (right panel), confirming that our chronology captures events where wholesale creditor withdrawal is the dominant source of funding stress. We find similar impulse responses when limiting retail deposits to demand deposits (Figure B.2).

Figure 3: Number of Wholesale Funding Runs and Retail Bank Runs

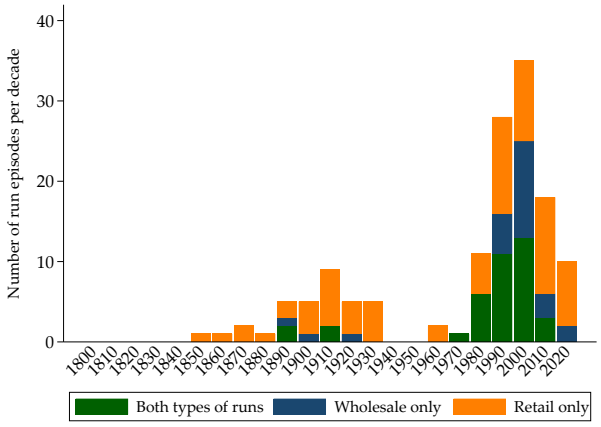
(a) All countries



(b) Advanced economies



(c) Emerging economies



Notes: These figures plot the number of wholesale funding runs, retail bank runs, and episodes of joint wholesale and retail runs for which we have narrative evidence from 1800 to 2024 for each decade and for (i) all countries (top panel), (ii) advanced economies (bottom left panel), and (iii) emerging economies (bottom right panel).

2.6 Additional Data Sources

We merge the narrative chronology and information on banks' funding composition with macroeconomic time series from the Global Macro Database (Müller et al., 2025). These time series represent the most comprehensive archive of historical macroeconomic statistics, combining data from over 100 sources, which allows us to match the long-run coverage of the wholesale chronology. We obtain data on real GDP, the current account, net exports, central bank policy rates, and an indicator for the incidence of a financial crisis (which itself is based on Laeven and Valencia, 2018; Reinhart and Rogoff, 2009; Baron et al., 2021; Jordà et al., 2017).

3 An Economic History of Wholesale Funding Runs

3.1 A Look at Time Series Patterns

Figure 3 plots the number of run episodes around the globe for each decade between 1800 and 2024. We differentiate between three types of runs: runs that feature panic among both wholesale and retail creditors ("joint runs"), wholesale funding runs, and retail depositor runs. To be precise, we plot the number of country-year observations that experience at least one type of run, assign each country-year to one of the three types of events, and then sum the number of events by decade.

Three core facts stand out. First, runs have never been more common than in the last few decades. Even relative to the tumultuous 1930s, the 1990s to 2010s stand out, with runs occurring in more than 60 countries each decade. These results bring fresh evidence to the classic question of whether the "crisis problem" has become more severe (Bordo et al., 2001). The answer from our data is a resounding "yes", at least when it comes to the frequency of various types of bank runs.

Second, the rising frequency of runs can largely be attributed to wholesale funding runs. Whether they occur in isolation or together with panic among retail depositors, wholesale funding runs explain the vast majority of the increasing likelihood of runs. Where retail or wholesale creditors run in isolation, the textbook retail runs have also become much less frequent over the last few decades. The takeaway is that, with the rise of non-deposit sources of bank funding, there has also been a commensurate increase in new types of financial stability risks.

Third, despite the increasing number of wholesale creditor runs, they are not a new phenomenon. Even runs in the 19th frequently featured panic among wholesale creditors. The international fallout of the Baring crisis is one famous example. Following losses on

Table 1: Probabilities of Wholesale Funding Runs, Retail Runs, and Banking Crises

	Narrative wholesale run	Wholesale funding outflow	Systemic wholesale run	Non-systemic wholesale run
Unconditional	1.2	34.5	1.1	0.2
Conditional on a non-systemic retail run	31	53	15	13
Conditional on a systemic retail run	42	59	28	6
Conditional on a banking crisis	32	57	20	6
	Narrative retail run	Systemic retail run	Retail deposit outflow	Banking crisis
Unconditional	1.8	1.2	19.4	2.6
Conditional on a narrative wholesale run	52	37	73	57
Conditional on a wholesale funding outflow	4	2	21	5
Conditional on a systemic wholesale run	45	34	76	50
Conditional on a non-systemic wholesale run	71	32	46	64

Notes: For all country-year observations with deposit data, this table reports unconditional and conditional probabilities of wholesale funding runs, retail runs, and banking crises. The top panel shows both the unconditional and the conditional probabilities of a narrative wholesale funding run, wholesale funding outflow, systemic wholesale funding run (i.e., a narrative wholesale funding run accompanied by a wholesale funding contraction), and non-systemic wholesale funding run (i.e., a narrative wholesale funding run without a wholesale funding contraction). For conditional probabilities, we consider run events happening within ±2 years of a retail run or banking crisis. The bottom panel shows both the unconditional and the conditional probabilities of a narrative retail run, a systemic retail run, a contraction in retail deposits, and a banking crisis, where we again consider a window of ±2 years for conditional probabilities. The dates of banking crises are defined by combining several chronologies as described in Section 2.4, where we take dates from Baron et al. (2021), Laeven and Valencia (2018), Jordà et al. (2017), and Reinhart and Rogoff (2009), in that order of priority.

its Argentinian investments, the Barings Bank of London's bankruptcy led to widespread panic in the interbank market, and was followed by spikes in the bond yields of emerging economies, especially in Latin America (Mitchener and Weidenmier, 2008).

Similar to existing work looking at long periods such as Reinhart and Rogoff (2009) or Schularick and Taylor (2012), we find the years after World War II to be an era of relative financial calm. That said, even the 1960s and 1970s, rarely considered as decades characterized by continuous crises, experienced runs. Among others, isolated retail depositor panics happened in the Philippines (1968) and Australia (1974), while runs by both wholesale and retail creditors were recorded in Great Britain (1974).

The new chronology we have compiled suggests that, in historical context, the last few decades have seen an entirely unprecedented frequency of bank liquidity crises. With the widespread emergence of wholesale sources of bank funding in the 1970s came the accompanying runs, implying that the likelihood of a bank run, either of the classic (retail depositor) or modern (wholesale funding) type, has never been higher.

In Table 1, we then consider the frequency of wholesale funding runs, systemic and not. Unconditionally, narrative wholesale funding runs are relatively seldom (1.2%, which is lower than the unconditional probability of a narrative retail run, standing at 1.8% in the bottom panel) and most of the time systemic in nature (1.1%). These events become more likely conditional on other types of crises, in particular (systemic) bank runs and banking crises. Focusing on systemic wholesale runs, this overlap is far from perfect, however. While systemic wholesale runs make for at most one-quarter of the other crisis events, the reverse relationship (in the bottom panel) is much more heterogeneous. Conditional on a systemic wholesale run, retail deposit outflows are almost guaranteed to go hand in hand with it (76%), but not the other types of events, especially not systemic bank runs (34%). This imperfect overlap also suggests that wholesale and retail runs may respond differently to institutional features such as deposit insurance—a hypothesis we explore in Section 4.2.

3.2 The Predictors of Wholesale Funding Runs

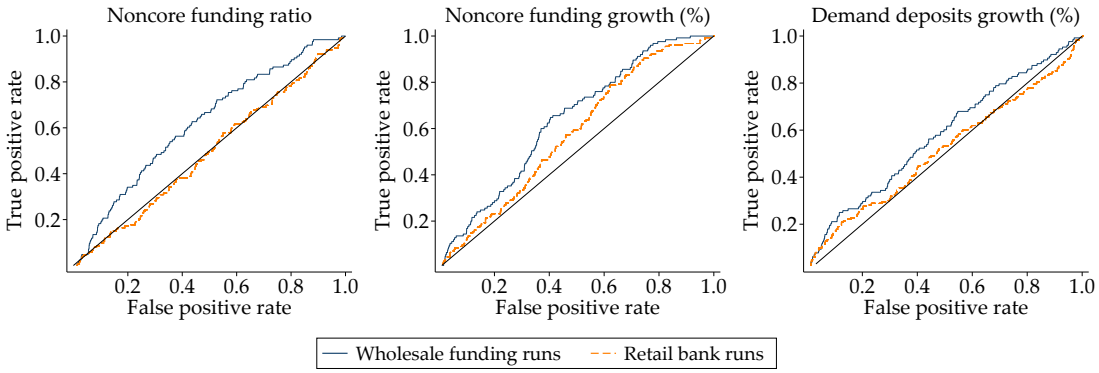
What differentiates episodes of panic among wholesale creditors from other sources of financial fragility? To answer this question, we investigate the overlap between different types of run and crisis events, and also ask which factors help predict retail relative to wholesale runs.

Figure 1 visualizes the overlap between wholesale funding runs, retail depositor runs, and banking crises. The latter are defined using a combination of crisis lists from the existing literature, as discussed in the data section. Because the sample for which these chronologies are available differs, we focus here on observations for which we have information on both run events and crises.

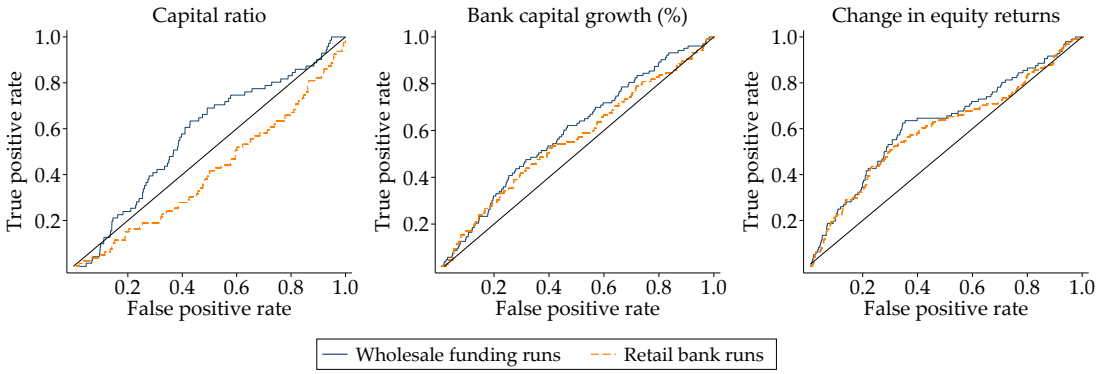
Which factors best explain when different types of runs materialize? We investigate this question by treating it as a classification problem with three types of predictor variables: (i) banks' funding mix (retail vs. wholesale), (ii) solvency factors (as reflected in the book and market value of banks' equity), and (iii) global factors (e.g., due to U.S. monetary policy). In particular, for each type of run $r \in \{\text{Retail}, \text{Wholesale}\}$ and each "block" of predictor variables, we run a logit regression to estimate the probability of a run to several predictors:

Figure 4: Predictors of Wholesale Funding Runs and Retail Bank Runs

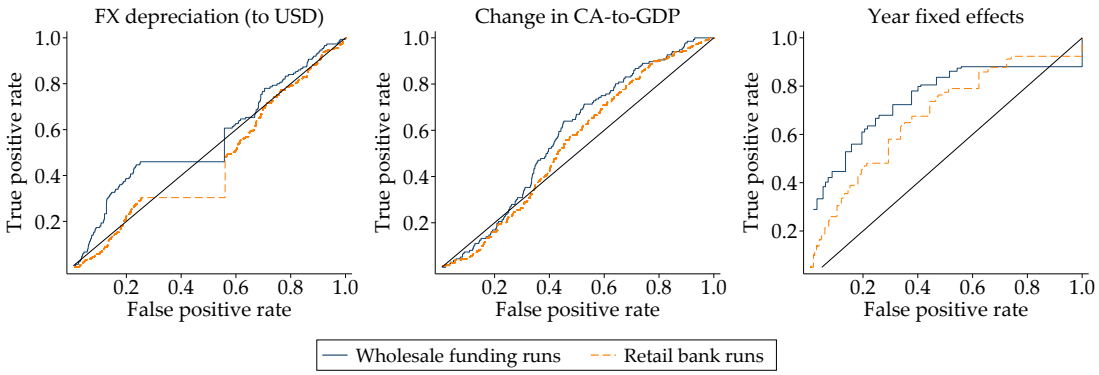
(a) Bank Funding Predictors



(b) Bank Solvency Predictors



(c) Global Predictors



Notes: These figures plot receiver operating characteristic (ROC) curves for (i) wholesale funding runs and (ii) retail bank runs. We construct the ROC curves using three groups of predictors: aggregate bank-funding predictors, aggregate bank-solvency predictors, and global predictors. Panel (a) uses bank-funding predictors, namely the average noncore-funding ratio, the growth rate of noncore funding, and the growth rate of demand deposits. Panel (b) uses bank-solvency predictors: the average capital ratio, the growth rate of bank capital (book value), and the change in equity returns. Panel (c) incorporates global predictors, including the depreciation of the domestic currency against the U.S. dollar, the change in the current-account-to-GDP ratio (CA-to-GDP), and year fixed effects. Changes and growth rates are calculated over the time window from $t-4$ to $t-1$, where t denotes the year of the run. Ratio variables are calculated as four-year averages over the same window.

$$\text{logit}(p^r_{it}) = \alpha^r + \beta^r(L)\mathbf{X}_{i,t-1} + \varepsilon^r_{it}, \tag{1}$$

where $\text{logit}(p^r_{it}) = \log(\frac{p^r_{it}}{1-p^r_{it}})$ is the log of the odds ratio of run type r in country i in year t. The vector $\mathbf{X}_{i,t-1}$ can include several country-specific variables outlined below or year fixed effects γ_t. The lag operator (L) governs the number of predictor lags, which we set to 5.

Because we are interested in the classification ability of these predictors, we plot the Receiver Operating Characteristic (ROC) Curve of these models, which plots the true positive rate (sensitivity) and the false positive rate (1 – specificity) for various thresholds. The area under the curve (AUC) measures the overall performance of the corresponding univariate predictor. A univariate regression model resulting in an AUC of 0.5 suggests no ability to discriminate between run episodes and other periods. The higher/lower the deviation of the AUC value from 0.5, the more the predictor increases/decreases the probability of a run.

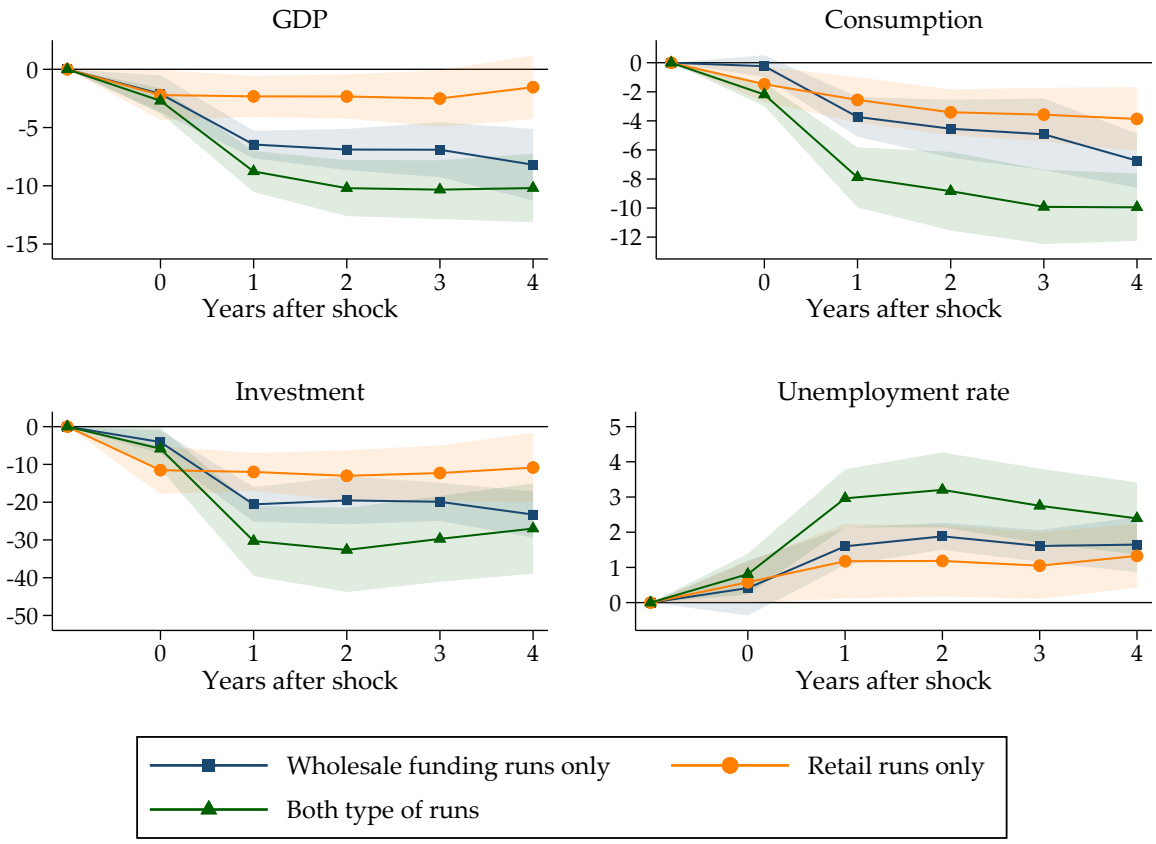
Figure 4 plots the resulting ROCs for three types of predictors. Panel (a) uses for $\mathbf{X_{i,t-1}}$ the growth rate of demand deposits and wholesale funding between four years to one year before the run occurs, as well as the average ratio of wholesale to retail funding within a four-year time window before the run. The results suggest that the composition of banks' liabilities is reasonably predictive of both wholesale and retail runs.

Panel (b) tests for the role of solvency factors, based on both book and market equity. In particular, we include the average bank capital ratio (book equity over assets), the growth rate of bank capital, as well as bank equity returns. We find that wholesale funding runs are much more predictable with an underlying deterioration of bank solvency than retail runs. This is consistent with existing evidence from microeconomic studies suggesting that wholesale creditors are better informed and, thus, more sensitive to worsening fundamentals (e.g., Blickle et al., 2024).

Panel (c) asks whether global factors matter. We consider changes in the log USD exchange rate, changes in the ratio of current account to GDP, and year fixed effects (to proxy for global changes such as U.S. monetary policy). We find that wholesale runs are again considerably more predictable, highlighting a role for external factors, suggesting they are associated with "sudden stops."

All of these findings are, at least qualitatively, robust to excluding borderline cases (Table B.3). In summary, they suggest that wholesale funding runs are distinct from other types of financial distress. Our interpretation is that wholesale creditors react more than retail depositors to concerns about banks' capitalization, and their behavior is closely tied to international factors. These findings are a first indication that, in contrast to

Figure 5: Macroeconomic Aftermath of Wholesale Funding Runs, Retail Bank Runs, and Their Overlap



Notes: These figures plot the impulse response functions of real GDP, real consumption, real investment, and the unemployment rate around wholesale funding runs within and outside episodes of narrative retail bank runs. We focus on the different subsets and overlap of wholesale funding runs with episodes of retail bank runs based on specification (2), where each line comes from a separate regression. The error bands depict 95% confidence bands based on Driscoll and Kraay (1998) standard errors.

idiosyncratic "sunspot" events, wholesale runs emerge systematically on the heels of solvency problems.

4 The Macroeconomic Aftermath of Wholesale Runs

4.1 Evidence from Local Projections

We next turn to characterizing the macroeconomic aftermath of various types of bank runs. In particular, we are interested in testing to what extent wholesale funding runs are

followed by more severe macroeconomic consequences than retail runs. For this purpose, we estimate variants of the following local projection equation building on (Jordà, 2005):

$$\Delta_h y_{i,t} = \alpha_i + \beta_h \mathbf{1}\{\text{Run}_{i,t-1}\} + \boldsymbol{\theta}_h' \mathbf{X}_{i,t-1} + \varepsilon_{i,t+h}. \tag{2}$$

In this specification, $\Delta_h y_{i,t} \equiv y_{i,t+h} - y_{i,t}$ is the h-period long difference of the dependent variable y (e.g., log real GDP) for country i at time t. α_i denotes country fixed effects, and the indicator variable $\mathbf{1}\{\text{Run}_{i,t}\}$ is an indicator variable for a wholesale funding or retail depositor run. $\mathbf{X}_{i,t-1}$ is a 4×1 vector of additional controls with associated coefficient vector $\boldsymbol{\theta}_h$. $\mathbf{X}_{i,t-1}$ includes one lag of the following variables: (i) real GDP growth, (ii) real consumption growth, (iii) real investment growth, and (iv) the change in the unemployment rate.[2] $\varepsilon_{i,t+h}$ is the error term. We consider the prediction horizon $h \in \{0, ..., 4\}$.

We are interested in the sequence of horizon-specific parameter estimates β_h, which capture the impulse response to $\mathbf{1}\{\text{Run}_{i,t}\}$. Since we do not have an instrument for $\mathbf{1}\{\text{Run}_{i,t}\}$, equation 2 is best interpreted as a useful descriptive device rather than capturing the causal effect of a run. In particular, it provides us with estimates of the (conditional) aftermath of runs after accounting for a rich set of dynamics in $\mathbf{X}$.

To account for serial correlation and residual correlation from common shocks in the error term, we cluster standard errors by both country and year, allowing for arbitrary correlation of residuals within the same country over time and within the same year across countries. This is a conservative choice: a lag-augmented version of equation (2) produces similar results because runs are not persistent, and in that case Olea and Plagborg-Møller (2021) recommend using heteroskedasticity-robust standard errors.

Figure 5 shows the results from estimating (2) for narrative wholesale and retail runs, as well as for events where both overlap. Wholesale runs are associated with more severe output losses, consumption drops, investment declines, and unemployment rates. All of these effects are further amplified when wholesale funding and retail runs overlap.

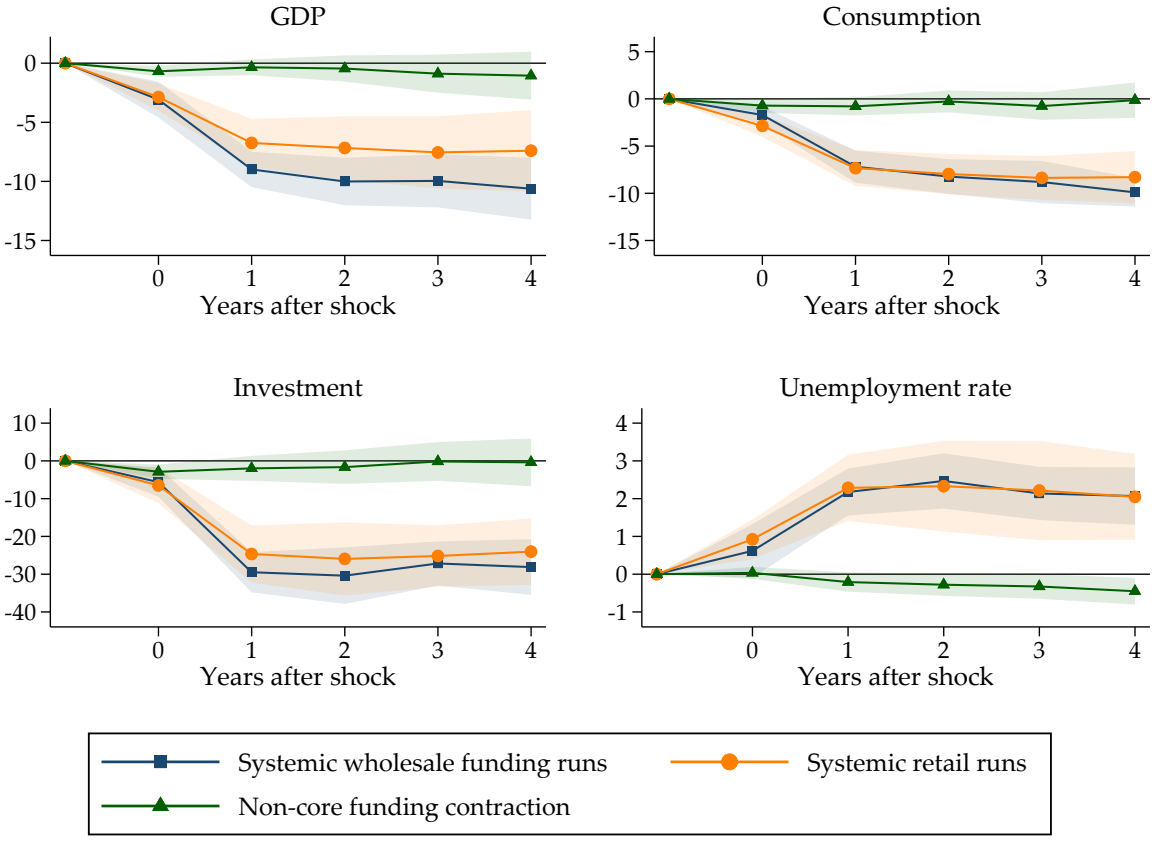
One reason why overlapping wholesale funding and retail runs may be particularly damaging to the macroeconomy is that this raises the probability of at least one of them being systemic. To this end, we consider systemic wholesale funding runs in Figure 6.[3] This subset of wholesale funding runs is associated with even more severe macroeconomic consequences than the total set of events, with output and consumption drops at -10%, investment cuts of -30%, and unemployment reaching almost 3%.

Two observations are worth mentioning. First, non-core funding contractions without

[2] We choose the lag length of one year, which is informed by the Akaike information criterion. The estimated β_h coefficients and their standard errors are not sensitive to the number of lags used in (2).

[3] We present all results when excluding borderline cases in Figures B.4 and B.5.

Figure 6: Macroeconomic Aftermath of Systemic Runs



Notes: These figures plot the impulse response functions of real GDP, real consumption, real investment, and the unemployment rate for (i) systemic wholesale funding runs (navy line), i.e., wholesale funding runs that coincide with noncore funding contractions; (ii) systemic retail runs (orange line), i.e., narrative bank runs that coincide with deposit contractions; and (iii) noncore funding contractions outside of run episodes (green lines). The estimates are based on local projections specified in equation (2). The error bands depict 95% confidence bands based on Driscoll and Kraay (1998) standard errors.

narrative evidence of wholesale funding runs bear no relevance for the macroeconomy. Second, the macroeconomic aftermath of systemic retail runs is almost indistinguishable from that of systemic wholesale funding runs, with the sole exception of output losses, which are three percentage points lower for systemic retail runs.

Finally, as pointed out by Grimm (2024), time deposits in some countries are dominated by large deposits of financial firms but in others by small deposits of household savers. Because they can be both wholesale or retail in nature, we probe for robustness in Figure B.6 by excluding time deposits from the definition of retail deposits and including time deposits as a component of noncore funding. The latter further exacerbates the output losses following systemic wholesale funding runs.

4.2 The Role of Deposit Insurance

Since its nationwide introduction in the United States in 1933, deposit insurance has become ever more popular. Demirgüç-Kunt et al. (2014) estimate that, by the early 2000s, around 80% of high-income countries had an explicit insurance scheme, and around half of middle-income and lower-income economies. As old as the first deposit insurance mechanisms themselves are the debates about their effectiveness in preventing runs.

While the purported benefits of deposit insurance are obvious—when insured, depositors should not have to run on the banks—there are two principal concerns. First, providing an explicit government guarantee for their liabilities might incentivize banks to take excessive risks, which paradoxically could make the financial system less safe. Second, by selectively insuring many (but not all) bank liabilities, deposit insurance could lead to a reshuffling rather than elimination of run risk—from protected (retail) to unprotected (wholesale) creditors.

Are wholesale and retail crises strategic substitutes or complements? What is the role of deposit insurance in shifting banks' funding incentives and, consequently, the incidence of distress? We answer these questions by estimating the following linear probability model:

$$\mathbf{1}\{\text{Run}_{i,t}^{systemic}\} = \alpha_i + \beta_1 \mathbf{1}_{i,t}^{DI,pred} + \theta X_{i,t-1} + \epsilon_{i,t}, \tag{3}$$

where the dependent variables $\mathbf{1}\{\text{Run}_{i,t}^{systemic}\}$ are indicator variables for either (i) a *systemic* wholesale funding crisis or (ii) a *systemic* retail bank run. α_i denotes country fixed effects, the country-level control vector $X_{i,t-1}$ include one lag of real GDP growth rates, and $\mathbf{1}_{i,t}^{DI,pred}$ is a predictor variable defined at the time the run takes place, namely the existence of a garden variety deposit insurance or the existence of an ex-ante funded deposit insurance. Depending on the dependent variable, we estimate equation (3) on two different samples: (i) a sample in which the unit of observation is each country-year with evidence of a wholesale funding crisis episode, and (ii) a sample in which the unit of observation is each country-year with evidence of a retail bank run episode.

Table 2 reports the estimates of the conditional likelihoods of systemic wholesale and retail funding crises, depending on the presence of deposit insurance. We find that deposit insurance is associated with a higher likelihood of wholesale crises (columns 1-2) and a lower likelihood of systemic retail bank runs (column 3-4), although the latter effect is estimated less precisely. This suggests that while the moral hazard problem in the retail deposit market can be mitigated with (credible) deposit insurance, the same does not necessarily hold for wholesale markets.

To test whether the reduced likelihood of systemic retail bank runs comes at the cost

Table 2: Institutional Frameworks and the Likelihood of Runs Becoming Systemic

	$\mathbf{1}_{i,t}^{syswhole} \in \{0,1\}$		$\mathbf{1}_{i,t}^{sysretail} \in \{0,1\}$		$\mathbf{1}_{i,t}^{syswholeonly} \in \{0,1\}$		$\mathbf{1}_{i,t}^{sysretailonly} \in \{0,1\}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DI exists	0.30***		-0.21*		0.66***		-0.09	
	(0.09)		(0.12)		(0.13)		(0.12)	
DI with ex-ante funding		0.27**		-0.25*		0.58***		-0.11
		(0.12)		(0.13)		(0.14)		(0.13)
Country-level controls	Y	Y	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Mean of DV	0.82	0.82	0.65	0.65	0.51	0.51	0.27	0.27
Observations	85	85	165	162	85	85	165	162
R^2	0.39	0.35	0.30	0.30	0.62	0.52	0.33	0.34

Notes: This table reports the estimated coefficients from specifications (3). The unit of observation is a wholesale funding run in country i and year t (columns (1)-(2) and (5)-(6)) or a retail bank run in country i and year t (columns (3)-(4) and (7)-(8)). The dependent variable in columns (1) and (2) is an indicator variable that is equal to one for wholesale funding runs that are also systemic, meaning the runs are accompanied by a noncore funding contraction, and zero for non-systemic wholesale funding runs that are not. The dependent variable in columns (3) and (4) is an indicator variable that is equal to one for retail runs that are also systemic, meaning they are accompanied by a retail deposit contraction, and zero for non-systemic retail runs that are not. The dependent variables in columns (5)–(8) are indicator variables for systemic wholesale funding runs that occur without any evidence of systemic retail bank runs within a three-year window (columns (5) and (6)), and for systemic retail bank runs that occur outside of systemic wholesale funding runs within a three-year window (columns (7) and (8)). *Mean of DV* indicates the mean of the dependent variable (the unconditional probability a run becomes systemic). The predictor variables are measured at the time of the bank run. All columns include country fixed effects and control for the country-level growth rate of real GDP, calculated over the period from t-2 to t-1. Standard errors clustered by country are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

of heightened wholesale crisis risk, we replace the dependent variables with variants equal to one only for crises not accompanied by the other category: systemic wholesale crises without systemic bank runs (columns 5-6) and systemic bank runs without systemic wholesale crises (columns 7-8).

Columns 5-6 show that deposit insurance increases the likelihood of standalone systemic wholesale crises, with coefficients larger than in columns 1–2. If this simply reflected aggregate time trends—a secular rise in wholesale crises and decline in bank runs, with the deposit insurance dummy capturing only this shift—we should also find that the probability of a narrative run turning systemic falls more sharply after deposit insurance in the absence of a wholesale crisis. That is, if the deposit insurance dummy merely proxied for time trends, standalone wholesale crises would become more common after deposit insurance, mechanically reducing the share of systemic bank runs that occur without them. Yet columns 7-8 show the opposite pattern, with less negative and statistically

insignificant coefficients compared to those in columns 3-4. Our findings are therefore consistent with deposit insurance contributing to the substitution of systemic retail bank runs by wholesale crises.

As banks seem to be strategically substituting away from deposits toward non-core funding sources, thereby heightening aggregate liquidity risk, this can also be viewed as an application of the volatility paradox to bank liability structure (Brunnermeier and Sannikov, 2014; Krishnamurthy and Muir, 2025): stability of deposit funding can mask underlying fragility in the banking system that fuels credit growth through uninsured, non-core financing.

5 Conclusion

Where banks rely on wholesale funding sources, they are also exposed to the risk this funding dries up. The financial crises gripping the world economy in 2007-08 in particular were characterized by runs in repo and other wholesale funding markets. Our analysis, spanning more than two centuries and 147 countries, for the first time empirically documents the rising importance of wholesale funding runs relative to traditional retail runs. Indeed, over the past three decades, wholesale runs have become more common than retail depositor runs.

The financial disruptions caused by wholesale run events also leave a clear statistical imprint on the economic history of a country. Variables ranging from GDP, investment, consumption, and employment all predictably falter in their aftermath. These economic costs are more pronounced for wholesale than for retail runs.

Our findings point to a relatively direct policy conclusion. Deposit insurance, by protecting retail creditors while leaving wholesale funding uninsured, appears to have shifted rather than eliminated run risk. The proliferation of wholesale funding crises in countries with credible deposit insurance schemes suggests that regulators must weigh the diversification benefits of non-deposit funding against the financial stability risks it introduces. The comprehensive database we present here provides a foundation for further investigation of these dynamics.

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Wholesale Funding Run Chronology

Table 3: The Wholesale Funding Run List

Country	Year	Growth rate	Affected liabilities	Retail run	Banking crisis	Country	Year	Growth rate	Affected liabilities	Retail run	Banking crisis
Argentina	1890			Yes	Yes		1914			Yes	Yes
	1914			Yes	Yes		1998	-23.0	Foreign	No	No
	1929			No	Yes		2008	-12.8	Foreign	No	No
	1980	> 0		Yes	Yes	Canada	1914	> 0		Yes	No
	1989	> 0		Yes	Yes		1985	> 0		No	Yes
	1995	> 0		Yes	Yes	Chile	1907			Yes	Yes
	2001	-32.6	Non-core	Yes	Yes		1981	> 0		No	Yes
	2008	-25.6	Non-core	No	No		1998	-11.0	Foreign	No	No
Australia	1849			No	No	Colombia	1982	> 0		Yes	Yes
	1891	-1.8	Non-core	Yes	Yes	Cote d'Ivoire	2008	-61.7	Foreign	No	No
	1893	-10.6	Non-core	Yes	Yes	Croatia	1998	> 0		Yes	Yes
	2008	-14.5	Non-core	No	No		2008	-67.9	Non-core	No	No
Austria	1873			Yes	Yes	Cyprus	2008	-7.0	Non-core	No	No
	1929			No	Yes		2011	-11.4	Foreign	No	Yes
	1931			Yes	Yes	Czech Republic	1931			Yes	No
	2008	-15.8	Foreign	No	Yes		2008	-9.2	Non-core	No	No
Bahrain	1990	-12.1	Non-core	Yes		Denmark	1908	> 0		Yes	Yes
	2008	-17.6	Foreign	No			1992	-20.3	Non-core	Yes	Yes
Belgium	2008	-30.2	Foreign	No	Yes		2008	-9.7	Foreign	No	Yes
	2011	-13.3	Foreign	No	Yes		2011	-10.4	Foreign	No	Yes
Belize	2016	-69.6	Non-core	Yes	No	Dominican Republic	2003	-43.2	Foreign	Yes	Yes
Bolivia	1985	> 0		Yes	Yes	Ecuador	1998	-30.7	Foreign	Yes	Yes
Bosnia-Herzegovina	2008	-6.9	Non-core	Yes	No	Estonia	2008	-16.2	Non-core	Yes	No
Brazil	1890			No	Yes	Ethiopia	2008	-65.2	Non-core	No	No
Finland	1991	-4.6	Non-core	No	Yes	India	1991	-10.3	Non-core	No	Yes
France	1847			Yes	Yes		2008	-4.5	Foreign	Yes	No
	1930			Yes	Yes		2013	-13.8	Foreign	No	No
	2011	-12.6	Foreign	No	Yes	Indonesia	1997	-21.3	Foreign	Yes	Yes
Georgia	2008	-30.4	Foreign	No	No		2008	-5.0	Foreign	No	No
Germany	1911	> 0		Yes	No	Ireland	2007	-12.0	Non-core	No	Yes
	1931	-7.1	Non-core	No	Yes		2010	-30.2	Foreign	No	Yes

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Country	Year	Growth rate	Affected liabilities	Retail run	Banking crisis	Country	Year	Growth rate	Affected liabilities	Retail run	Banking crisis
	2008	-6.2	Non-core	No	Yes	Italy	1866			No	Yes
	2011	-5.7	Foreign	No	Yes		1887	> 0		No	Yes
Ghana	2008	-1.3	Foreign	No	No		1893	-4.8	Non-core	Yes	No
Greece	1929			No	Yes		1921	> 0		Yes	Yes
	1931			Yes	Yes		1930	-3.5	Non-core	Yes	Yes
	2008	-16.1	Non-core	No	Yes		2007	-14.4	Foreign	No	Yes
	2010	-20.6	Non-core	No	Yes		2011	-11.1	Foreign	No	Yes
	2012	-20.6	Non-core	No	No	Jamaica	1995	-5.0	Non-core	No	Yes
	2015	-50.3	Non-core	Yes	No		2008	-4.8	Foreign	No	No
Hong Kong	1998	-33.4	Foreign	Yes	Yes	Japan	1920	> 0		Yes	Yes
	2008	-4.6	Non-core	Yes	No		1927	> 0		Yes	Yes
Hungary	1873			Yes	Yes		1997	-11.7	Foreign	Yes	Yes
	1931			Yes	Yes		2003	-8.1	Non-core	No	Yes
	2008	-6.2	Non-core	No	Yes	Jordan	1989	-7.0	Non-core	Yes	Yes
	2010	-20.7	Foreign	No	Yes	Kazakhstan	2008	-25.1	Foreign	No	Yes
	2012	-22.7	Foreign	No	No	Kuwait	2008	-36.2	Foreign	Yes	No
Iceland	1920			No	Yes	Latvia	1994	-1.1	Non-core	No	Yes
	1930			No	Yes		2008	-17.8	Non-core	No	Yes
	2008	-50.2	Foreign	Yes	Yes	Luxembourg	2007	> 0		No	Yes
Malaysia	1997	-21.1	Foreign	Yes	Yes		1931	-10.0	Non-core	No	No
Mexico	1908			No	No		2008	-7.4	Foreign	No	Yes
	1994	> 0		No	Yes	Switzerland	1914	-0.1	Non-core	Yes	Yes
	2008	-12.7	Non-core	No	No		2008	-30.7	Foreign	No	Yes
Moldova	2014	-27.3	Foreign	No	Yes	Thailand	1996	-22.8	Foreign	Yes	Yes
Morocco	2008	> 0		No	No	Turkey	2000	-24.5	Foreign	No	Yes
Nepal	2011	-27.0	Foreign	Yes	No		2020	-7.6	Foreign	No	
Netherlands	1914	> 0		Yes	Yes	Ukraine	1997	-16.1	Foreign	No	Yes
	2008	-12.9	Foreign	No	Yes		2008	-29.3	Foreign	Yes	Yes
New Zealand	2008	-3.8	Foreign	No	No		2014	-33.3	Foreign	Yes	Yes
Nigeria	2008	-19.6	Foreign	No	Yes		2022	-63.0	Non-core	No	
Norway	1931	-4.9	Non-core	Yes	Yes	United Arab Emirates	1990	-8.9	Non-core	Yes	
	1991	-25.3	Non-core	No	No		2008	-11.9	Non-core	No	
	2008	-17.3	Foreign	No	Yes	United Kingdom	1825			Yes	Yes

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Country	Year	Growth rate	Affected liabilities	Retail run	Banking crisis	Country	Year	Growth rate	Affected liabilities	Retail run	Banking crisis
Pakistan	1998	-14.5	Foreign	No	No		1857			Yes	Yes
	2008	-5.8	Foreign	Yes	No		1866			Yes	Yes
Panama	1987	-57.2	Non-core	Yes	Yes		1890			No	Yes
Paraguay	1997	-10.1	Foreign	Yes	Yes		1914			Yes	Yes
Peru	1998	-12.8	Foreign	No	Yes		1931			No	No
	2008	-8.4	Non-core	No	No		1973	-0.1	Non-core	Yes	Yes
Philippines	1974	> 0		Yes	Yes		2007	-16.6	Foreign	Yes	Yes
	1983	-29.4	Non-core	Yes	Yes	United States	1857			Yes	Yes
Poland	2008	-14.3	Non-core	No	No		1873			Yes	Yes
Portugal	1891			Yes	Yes		1893	-10.3	Non-core	Yes	Yes
	2011	-17.1	Foreign	No	Yes		1907	> 0		Yes	Yes
	2014	-25.6	Foreign	No	Yes		1914	> 0		No	No
Qatar	2017	-16.7	Non-core	Yes			1929	-9.2	Non-core	Yes	Yes
Romania	2008	-6.8	Foreign	No	No		1930	-9.2	Non-core	Yes	Yes
Russia	1899			Yes	Yes		1941	> 0		No	No
	1995	> 0		No	Yes		1966	-1.2	Non-core	No	No
	1998	-19.8	Non-core	Yes	Yes		1969	-8.3	Non-core	No	No
	2004	> 0		Yes	No		1974	> 0		Yes	No
	2008	-24.7	Foreign	Yes	Yes		1984	> 0		Yes	Yes
	2014	-28.7	Foreign	No	No		1987	> 0		No	Yes
Slovenia	2008	-14.2	Foreign	No	Yes		1998	-5.4	Foreign	No	No
	2012	-29.9	Non-core	No	No		2001	> 0		No	No
South Africa	2002	-2.2	Foreign	Yes	No		2007	-4.0	Foreign	Yes	Yes
South Korea	1997	-33.8	Foreign	No	Yes		2011	-13.0	Foreign	No	No
	2008	-19.5	Foreign	No	No		2020	-0.5	Non-core	No	No
Spain	1931	-4.8	Non-core	Yes	Yes		2023	-22.0	Non-core	Yes	
	2008	> 0		No	Yes	Uruguay	2002	-22.7	Foreign	Yes	Yes
	2011	-20.5	Foreign	No	Yes	Venezuela	1994	-31.6	Non-core	No	Yes
	2012	-17.2	Non-core	No	No		2008	-22.0	Foreign	No	Yes
Sweden	1907	-8.9	Non-core	Yes	Yes	Zimbabwe	2003	-2.0	Foreign	Yes	No

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Country	Year	Growth rate	Affected liabilities	Retail run	Banking crisis	Country	Year	Growth rate	Affected liabilities	Retail run	Banking crisis

Notes: This table reports all 188 wholesale funding run episodes for which we find narrative evidence. When a run episode spans two consecutive years, we report the first year. A wholesale funding run episode is defined as a series of runs indicating continuous liquidity pressure, for which all runs within one episode can be attributed to the same cause. Runs in consecutive years that cannot be attributed to the same cause are reported as separate events. We report the type of wholesale funding that experienced an outflow and a quantitative measure of the contraction.

ONLINE APPENDIX

A Wholesale Run Classification

A.1 Wholesale Run Candidate Events

The universe of wholesale run candidate events is derived from existing narrative chronologies and is based on non-core funding from the IFS data. The following figure shows the candidacy source of different wholesale run events.

[Insert Table A.1 About Here]

A.2 IFS Data

We follow Grimm (2024) in constructing the non-core funding of each country and begin with monthly non-core funding ratio data from the IFS dataset. First, we remove duplicate observations by retaining the last recorded value for each unique combination of date, country, and indicator. We filter the dataset to retain only December observations, creating an annual time series where each data point represents year-end values. Our analysis focuses on BVX countries. To ensure statistical reliability, we implement a filter that retains only years with more than 10 country observations. This threshold helps eliminate periods with sparse data coverage that could bias our results.

We calculate year-over-year changes in non-core funding ratios, $\Delta R_{i,t} = R_{i,t} - R_{i,t-1}$, where $R_{i,t}$ represents the non-core funding ratio for country i in year t. A significant decline is identified when:

$$S_{i,t} = \mathbf{1}[\Delta R_{i,t} \leq \theta], \quad \text{where } \theta = P_{10}(\{\Delta R_{i,t}\}) \tag{A.1}$$

where $\mathbf{1}[\cdot]$ is the indicator function and P_{10} denotes the 10th percentile. We implement two specifications: a country-specific threshold computed over country i's historical changes ($t \in T_i$), and a global threshold computed across all BVX countries ($i \in I$) and time periods.

A.3 BIS Data

We process BIS (Bank for International Settlements) foreign deposit data to identify candidate wholesale funding stress events in BVX countries. For each country i, we identify extreme negative growth episodes in foreign deposit growth rates, $G^{BIS}_{i,t}$, when:

$$S^{BIS}_{i,t} = \mathbf{1}[G^{BIS}_{i,t} \leq \theta^{BIS}], \quad \text{where } \theta^{BIS} = P_{10}(\{G^{BIS}_{i,t}\}) \tag{A.2}$$

where $\mathbf{1}[\cdot]$ is the indicator function and P_{10} denotes the 10th percentile. We implement two specifications: a country-specific threshold computed over country i's historical growth rates ($t \in T_i$), and a global threshold computed across all BVX countries ($i \in I$) and time periods.

A.4 AI Agent Framework

We develop a multi-agent artificial intelligence (AI) framework for systematic identification and classification of wholesale banking crises. We leverage four Large Language Models (LLMs) through a structured workflow pipeline followed by human review, cross-validation, and refinement. To ensure consistent results, we set the LLM temperature parameter to 0.

Stage 1: Independent Parallel Analysis
Stage 1-A: Primary Financial Investigation (Perplexity)
The Perplexity agent employs the `sonar-pro` model with real-time web search capabilities. The LLM searches for wholesale funding stress indicators with this prompt:

> A wholesale run is a sudden withdrawal or withholding of deposits by non-retail creditors, such as institutional investors or interbank lenders, leading to a liquidity crisis.
>
> Look for indicators such as:
>
> 1. Sudden withdrawal of funds by institutional investors
> 2. Rapid decline in interbank lending
> 3. Sharp increases in funding costs for banks
> 4. Unusual increases in collateral requirements
> 5. Foreign investors withdrawing capital
> 6. Decreased credit lines from other financial institutions
>
> Task: Is there STRONG or NO evidence of wholesale bank run in {country} around {year}? Answer in one word.
>
> Write a brief crisis description (max 80 words), followed by reasoning with at least three relevant quotes from primary sources (max 100 words). Conclude with "REFERENCES:" providing complete BibTeX entries. Each reference must include: unique citation key, full bibliographic fields (author, title, journal/book, year), URL, and urldate fields.
>
> Here are examples of quotes that provide evidence for wholesale bank runs:
> {example1}
> {example2}
>
> Here are counter-examples that DO NOT provide evidence for wholesale bank runs:
> {counterexample1}
> {counterexample2}
>
> Find at least 10 quotes from newspapers, central bank reports, IMF/BIS reports or research papers that document any wholesale run (interbank market stress, liquidity stress, or foreign or nonretail/institutional deposit withdrawal) for {country} in {year}. Must include a verbatim reference quote for the crisis start month. Do not cite wikipedia. Explore non-English sources whenever feasible. Always translate non-English quotes. Make sure that the EXACT QUOTE EXISTS verbatim in the provided source.

Training Through Examples and Counter-Examples

To guide the agents toward accurate classification, we provide positive examples demonstrating strong wholesale run evidence and counter-examples illustrating insufficient evidence. This approach trains the models to distinguish genuine wholesale funding crises from retail runs or general banking stress.

Counter-Examples: Insufficient Evidence

To prevent false positives, we provide counter-examples demonstrating cases where evidence appears suggestive but fails to meet wholesale run criteria. These examples train agents to distinguish between retail deposit runs, general financial stress, and genuine wholesale funding crises.

Example 1: Argentina 1890

Mitchener and Weidenmier (2008, p. 467) note that, "Argentina subsequently experienced a severe banking crisis (in January 1891) brought on, in part, because Banco Nacional's financial position was weakened when it transferred assets to British creditors", showing that international wholesale creditors withdrew funding.

@article{Mitchener2008,
ISSN = {00220507, 14716372},
URL = {https://doi.org/10.1017/S0022050708000375},
author = {Kris James Mitchener and Marc D. Weidenmier},
journal = {Journal of Economic History},
number = {2},
pages = {462–500},
publisher = {Cambridge University Press},
title = {{The Baring Crisis and the Great Latin American Meltdown of the 1890s}},
volume = {68},
year = {2008}
}

Example 2: Australia 1849

Derwent Bank in Australia's critical dependence on interbank funding is documented: "the bank continued in operation until 1849 by borrowing from other banks" (**?**, p. 14). The wholesale run materialized when "these institutions [Bank of Australasia and the Union Bank] withdrew their support" (**?**), forcing liquidation. This demonstrates how the withdrawal of wholesale funding by other banks or institutions triggered the bank's failure.

@TechReport{Fitzgibbon2001,
author={Bryan Fitz-Gibbon and Marianne Gizycki},
title={{A History of Last-resort Lending and Other Support for Troubled Financial Institutions in Australia}},
year={2001},
institution={Reserve Bank of Australia},
url={https://www.rba.gov.au/publications/rdp/2001/pdf/rdp2001-07.pdf},
}

@misc{ADB2025swanston,
author = {Charles Swanston},
title = {Australian Dictionary of Biography},
year = {2006},
url = {https://adb.anu.edu.au/biography/swanston-charles-2713},
urldate = {2025-07-24}
}

Counter-Example 1: Greece 1929

"In the eve of the 1929 crash 85% of the total bank deposits were kept with 6 banks" (**?**, p. 19), magnifying vulnerability to large depositor with- drawals. "The crisis was soon transferred to commercial banking since firms could not repay their loans to the banks and the banks were thus attacked by severe withdrawals of funds by depositors" (**?**, p. 29), reflecting depositor panic.

Note: This is not sufficient evidence as "severe withdrawals of funds by depositors" does not necessarily mean wholesale depositors.

@techreport{Lazaretou2008,
author = {Sophia Lazaretou},
title = {Banking and Central Banking in Pre-WWII Greece: Money and Currency Developments},
institution = {Bank of Greece},
year = {2008},
url = {https://www.bankofgreece.gr/Publications/Paper200886.pdf},
urldate = {2025-08-15}
}

Counter-Example 2: Montenegro 2008

The sources provide clear indications of wholesale funding withdrawal. **?**, p. 25 documents a "substantial bank run" of unusual severity, while **?** quantifies this as "depositors pulling 30 percent of their holdings": a magnitude that signals institutional investors and wholesale funding sources, not just retail depositors. The extraordinary policy responses described, "blanket guarantee" and "emergency liquidity loan" [both sources], represent classic central bank interventions specifically designed for wholesale funding market dysfunction.

Note: None of the given quotes provides evidence for wholesale funding crisis. "substantial bank run", "depositors pulling 30 percent of their holdings", "blanket guarantee" or "emergency liquidity loan" can also be due to a retail bank run.

@misc{Tanner2011,
url = {https://www.reuters.com/article/us-montenegro-idUSTRE73I27420110419/},
urldate = {2024-02-06},
author = {Adam Tanner},
title = {Special Report: In the Wild West Balkans, a Banker's Tale},
note = {{Reuters}},
year = {2011}
}
@techreport{CBM2010,
url={https://www.cbcg.me/slike_i_fajlovi/eng/fajlovi/fajlovi_publikacije/god_izv_o_radu/cbm_annual_report_2009.pdf},
urldate = {2024-02-06},
author = {{Central Bank of Montenegro}},
title = {Central Bank of Montenegro Annual Report 2009},
institution = {{Central Bank of Montenegro}},
type = {Annual Report},
year = {2010}
}

Stage 1-B: Secondary Research Validation (Gemini Agent)

The Gemini agent (`gemini-2.0-flash`) conducts independent parallel research using identical prompting structure. This design choice ensures that both agents approach the same research question from potentially different sources, thereby increasing the probability of comprehensive source coverage.

Stage 2: Consensus Building and Critical Analysis
Then ChatGPT (`gpt-4o`) serves as a critical analyst, implementing a systematic review, where the validation process is a function of quote authentication, and source quality, with the inputs representing the outputs from Perplexity and Gemini agents, respectively. The validation process comprises of two dimensions: quote authentication involves verification of cited quotations against primary sources, and inter-agent agreement assessment provides binary classification of consensus (AGREEMENT: YES/NO). Specifically, we use the following ChatGPT prompt:

> {user_prompt}
>
> Investigate the following two responses. Double-check if the provided quotes are authentic.
>
> You are given the following assessment from Preplexity:
> {perplexity_answer}
>
> You are given the following assessment from Gemini:
> {gemini_answer}
>
> Are there any fallacies in the reasoning? Write a brief paragraph on your reasoning whether Perplexity or Gemini agree (write: "AGREEMENT: YES") or disagree (write: "AGREEMENT: NO").
>
> Following above, your task is to improve the writing of these answer. MAINTAIN THE LATEX FORMAT and proper bibtex citation. Start with "\subsection"

Stage 3: Final Synthesis
The Claude agent (`claude-3-5-sonnet-20241022`) functions as the final LLM quality controller, implementing academic writing and formatting requirements. This stage is constrained to work exclusively with sources identified by the previous agents, preventing the introduction of additional evidence that has not undergone the validation pipeline.

Key functions include:
LaTeX Compliance: Ensures proper latex notation (e.g., 10\% vs 10%)
Citation Standardization: Implements consistent BibTeX with mandatory URLs
Narrative Coherence: Synthesizes multi-agent findings into academically rigorous prose
Evidence Hierarchy: Prioritizes primary sources and contemporaneous documentation
Specifically, we use the following prompt for Claude:

{user_prompt}

Investigate the following two responses. Double-check if the provided quotes are authentic.

You are given the following assessment from Preplexity:
{perplexity_answer}

You are given the following assessment from Gemini:
{gemini_answer}

Here is the examination of the two by ChatGPT:
{chatgpt_answer}

Your task is to improve the writing of this answer. MAINTAIN THE LATEX FORMAT and proper bibtex citation (for example, use 10\% instead of 10% and use \$10 million instead of $10 million). Start with "\subsection"

IMPORTANT: USE SOURCES AND REFERENCES BY PERPLEXITY AND GEMINI ONLY. DO NOT USE YOUR OWN SOURCES.

Stage 4: Human Review

Following the LLM output from Stage 3, we implement a human review process to ensure quality and classification accuracy. This multi-step verification process minimizes both Type I errors (false positives, where non-wholesale runs are incorrectly classified as wholesale runs) and Type II errors (false negatives, where genuine wholesale runs are missed). The human oversight addresses potential LLM limitations including hallucination, citation errors, and misinterpretation of evidence. The human review process follows a structured workflow.

URL Verification and Public Accessibility

The first verification step ensures that all cited sources are authentic and publicly accessible. We manually verify each URL provided by the LLMs to confirm that: (1) the link is functional and directs to the claimed source, (2) the document is publicly available without paywall restrictions where possible, and (3) the source matches the bibliographic information in the BibTeX entry. Sources behind paywalls are retained if they represent authoritative primary documentation (e.g., IMF reports, central bank publications, peer-reviewed journals), but we prioritize public access versions when available. URLs that are broken or misattributed are corrected or replaced with alternative sources.

Month Verification

The second step focuses on establishing the month of wholesale funding run. We search for primary sources that explicitly identify the crisis onset month. Preferred sources include central bank reports, IMF documents, or contemporaneous financial press that state the month directly (e.g., "the interbank market froze in September 2008"). When such explicit temporal references are unavailable, we use the publication date of the earliest newspaper article or secondary source documenting the crisis as a proxy for the start month. All explicit month identifications are quoted with specific source citations.

Quote and Page Number Verification

We manually access each cited document and verify that: (1) the quoted text appears verbatim in the source, (2) the quote is not taken out of context in a way that distorts its meaning, and (3) the quote genuinely provides evidence for wholesale funding stress as opposed to other types of financial stress. During this process, we manually add page numbers and URLs to all citations. This verification serves multiple purposes: it guards against LLM hallucination of non-existent quotations, ensures proper attribution, and facilitates future verification of our evidence.

Evidence Evaluation and Classification

Following verification of sources, timing, and quotations, we conduct an evaluation of the evidence quality to classify each event. We classify events into two categories that reflect the strength of wholesale funding run evidence:

Main Cases: We classify an event as a main case when we have undisputed and strong evidence of a wholesale bank run. Main case criteria require multiple, independent sources documenting institutional creditor behavior such as: explicit references to interbank market freezes or dysfunction, documented withdrawals by institutional investors or non-retail creditors, sharp increases in wholesale funding costs, or central bank emergency liquidity interventions specifically targeting wholesale funding markets. The evidence must directly identify wholesale funding mechanisms rather than generic banking stress. For example, a source stating "interbank lending collapsed as foreign banks withdrew credit lines" would constitute main case evidence, while "depositors withdrew funds" would not, as it fails to distinguish retail from wholesale creditors.

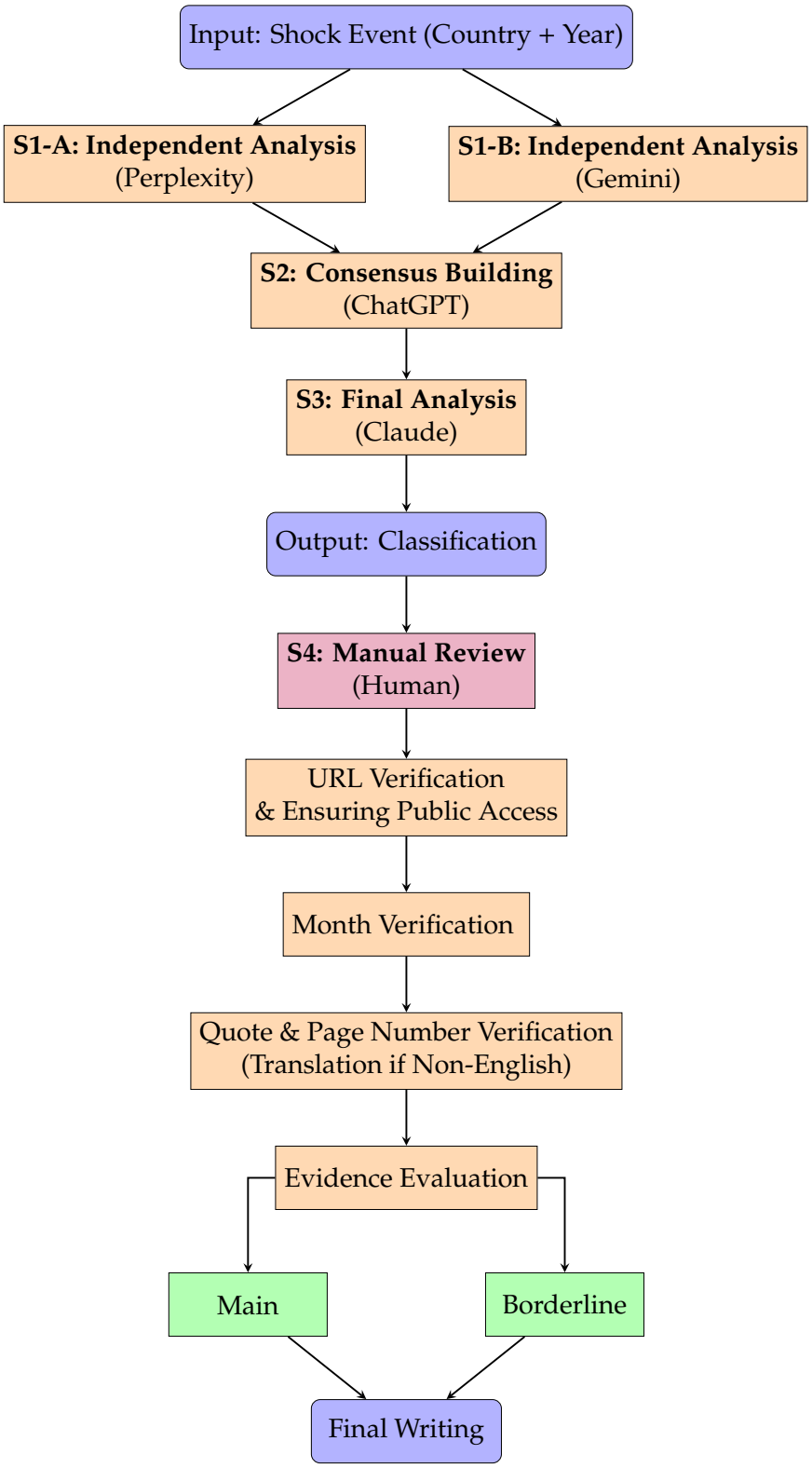
Borderline Cases: We classify an event as borderline when we observe clear indicators of wholesale funding stress but lack direct, explicit documentation of wholesale creditor panic. Borderline cases typically exhibit evidence of: general liquidity stress without specification of the creditor type, documented withdrawal by foreign investors or capital outflow that likely affected wholesale funding but without explicit confirmation, sharp increases in sovereign or bank CDS spreads suggesting wholesale creditor risk reassessment, or central bank interventions that are consistent with wholesale funding difficulties but not explicitly labeled as such. The key distinction is that borderline cases show characteristics consistent with wholesale funding panic, but the available documentation does not provide the explicit, direct evidence required for main case classification. For

instance, a source noting "bank liquidity constraints and significant capital outflows as foreign investors lost confidence" signals evidence of wholesale creditor withdrawal but may not explicitly confirm interbank market effects.

Minimizing Classification Errors

The human review process minimizes Type I errors through several mechanisms. Type I errors (false positives) are minimized by: requiring explicit verification of all quotes and sources, demanding direct evidence of wholesale creditor behavior rather than accepting general crisis indicators, and maintaining the borderline category for ambiguous cases rather than defaulting to main case classification. The multi-step verification process creates multiple checkpoints where potential false positives are identified and either corrected or downgraded. Type II errors (false negatives) are minimized by: the parallel LLM analysis in Stages 1-3 that ensures comprehensive source coverage (including non-English sources), the inclusion of borderline cases that capture wholesale funding stress, and the iterative nature of our review process that allows for reclassification as additional evidence is discovered. The combination of LLM analysis and human verification produces a chronology that is both comprehensive and conservative, balancing the goals of identifying all genuine wholesale runs while maintaining a clear evidentiary standard.

Structure of the AI Agent and Human Review Workflow



A.5 Additional Tables

Table A.1: Comparison of Banking Crisis Chronologies

This table compares seven established banking crisis chronologies with our wholesale runs database (188 events). The *Total* column shows the number of unique country-year crisis events in each source *banking crisis* chronology: Jordà et al. (2017) (JST), Baron et al. (2021) (BVX), Jamilov et al. (2024) (JKMS), Reinhart and Rogoff (2009) (RR), and Laeven and Valencia (2018) (LV). These are complemented by candidate events from International Financial Statistics deposit changes (IFS) and Bank for International Settlements (BIS) deposits data. The remaining columns indicate how many events from each source match at least one wholesale run event within the specified time window: for example, [-3,+3] counts source events that occur within three years (before or after) of a wholesale run event in the same country. The final row (JKMMS) shows wholesale run events that *do not* match any of the seven source chronologies within each time window, revealing that 22-47 events (depending on the window) in our database represent manually identified wholesale funding stress episodes not captured by existing crisis chronologies or data sources.

Source	Total	[-3,+3]	[-2,+2]	[-1,+1]	[-0,+0]
JKMS	315	108	101	93	80
BVX	229	98	89	82	66
RR	303	90	84	74	61
LV	150	58	56	54	43
JST	88	38	35	35	31
IFS	324	117	88	60	24
BIS	86	22	19	13	3
JKMMS	188	22	26	30	47

Table A.2: Non-English Languages in Wholesale Run Chronology

Language	Countries
Spanish	Argentina (1914, 2001), Colombia (1982), Mexico (2008), Dominican Republic (2003), Venezuela (1994, 2008)
Portuguese	Brazil (2008), Portugal (1891)
French	Côte d'Ivoire (2008), Luxembourg (2007)
Dutch	Netherlands (1914, 2008)
German	Switzerland (1914)
Norwegian	Norway (1991, 2008)
Polish	Poland (2008)
Italian	Italy (1930)
Russian	Russia (2008)

Calculating Noncore Funding with JST Database

This section explains how Noncore funding or *NCF* is calculated The following variables are given in JST:

- *noncore* = Noncore ratio (in percentage)
- *ltd* = Loans-to-deposits ratio (in percentage)
- *loans* = *thh* + *tbus*

JST define *noncore* as:

$$noncore = \frac{TA - C - D}{TA - C} \times 100 \tag{A.3}$$

$$ltd = \frac{tloans}{D} \times 100 \tag{A.4}$$

where TA = Total Assets, C = Capital, D = Deposits (unavailable variables).

Derivation

Step 1: Calculate deposits from the loans-to-deposits ratio:

$$D = \frac{loans}{ltd/100} \tag{A.5}$$

Step 2: From the given noncore ratio definition:

$$\frac{noncore}{100} = \frac{TA - C - D}{TA - C}$$

Step 3: Rearranging to solve for $(TA - C)$:

$$\frac{noncore}{100} = \frac{(TA - C) - D}{TA - C} = 1 - \frac{D}{TA - C}$$

$$\frac{D}{TA - C} = 1 - \frac{noncore}{100}$$

$$TA - C = \frac{D}{1 - noncore/100} \tag{A.6}$$

Step 4: Calculate noncore funding:

$$NCF = TA - C - D = \frac{D}{1 - noncore/100} - D$$

$$NCF = D\left(\frac{1}{1 - noncore/100} - 1\right) = D \cdot \frac{noncore/100}{1 - noncore/100} \tag{A.7}$$

Final Formula. Substitute Eq (A.5) in Eq (A.7)

$$\boxed{NCF = \frac{noncore/100}{1 - noncore/100} \times \frac{loans}{ltd/100}} \tag{A.8}$$

B Additional Figures

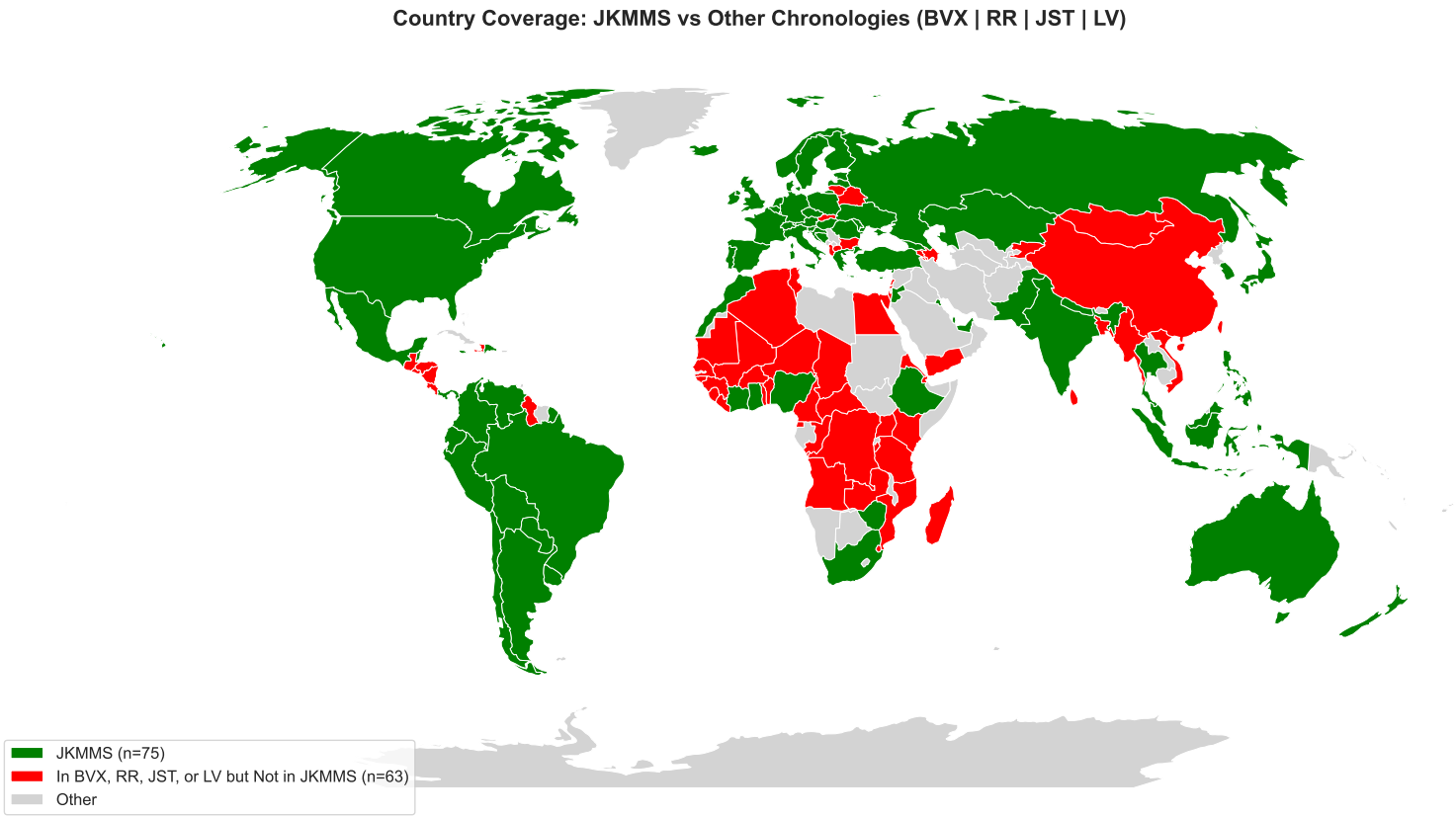
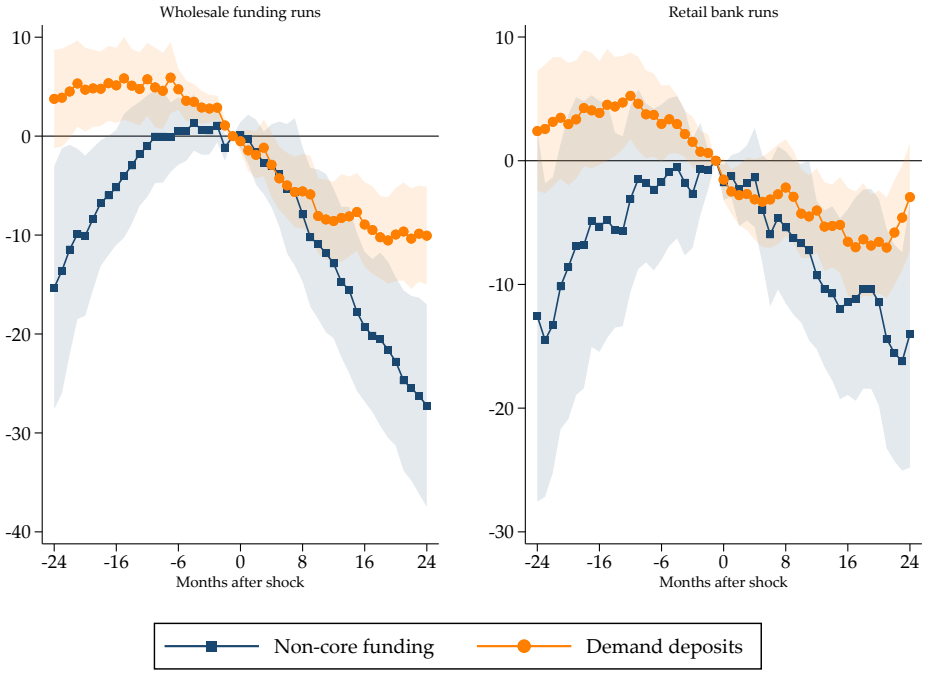


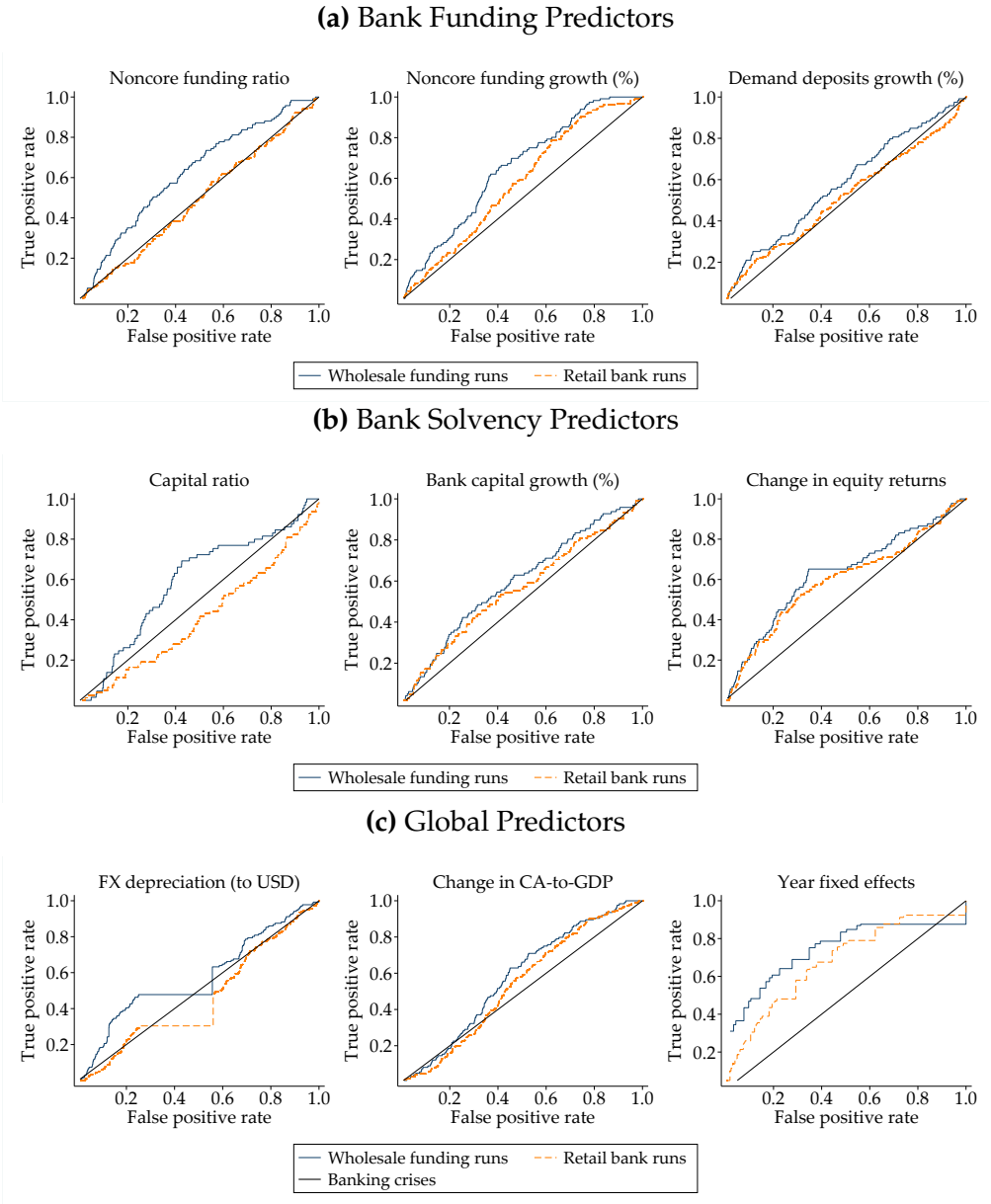
Figure B.1: Country Coverage Map

Figure B.2: Wholesale Funding Runs, Retail Runs, Noncore Funding Contractions, and Demand Deposits



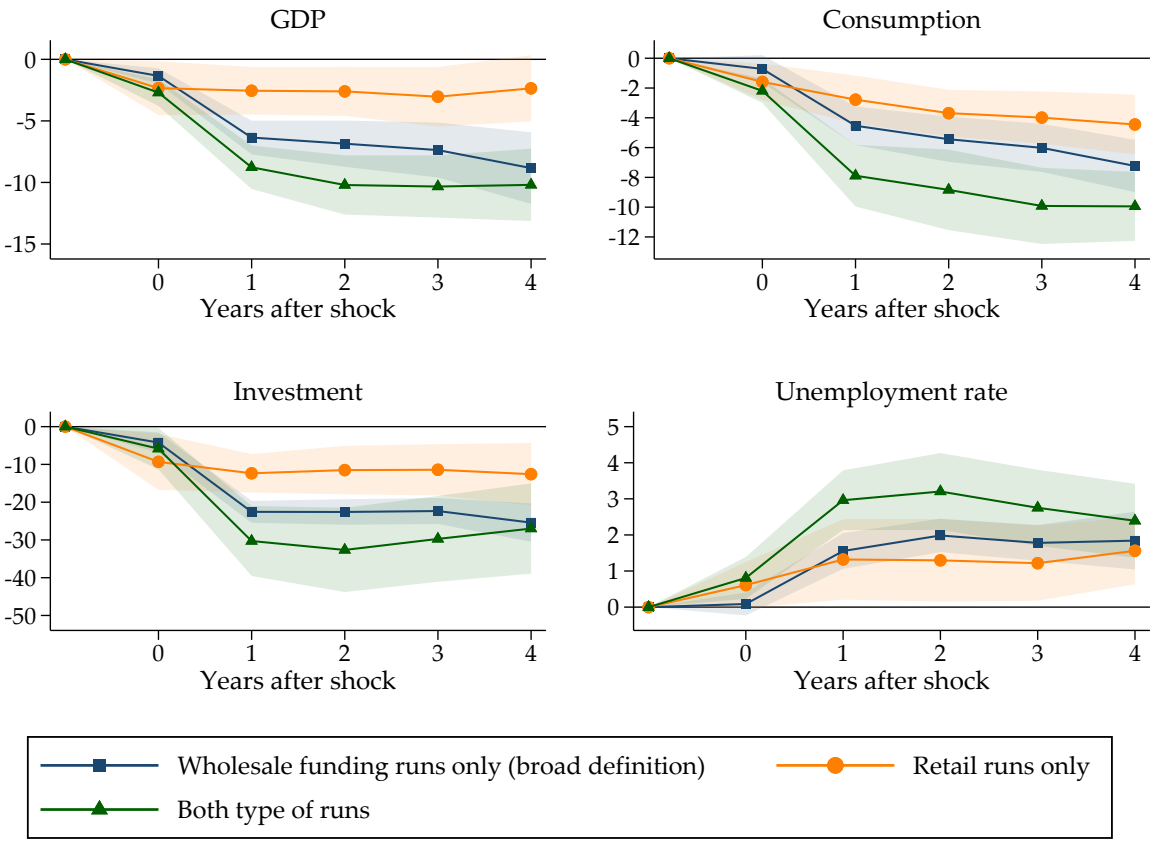
Notes: This figure plots the impulse responses of nominal noncore funding and nominal demand deposits around (i) wholesale funding runs and (ii) retail bank runs. We specify the following local projections: $\Delta_h y_{i,t} = \alpha_i + \beta_h \mathbf{1}\{\text{Run}_{i,t-1}\} + \epsilon_{i,t}$, where $h \in \{-24, ..., 24\}$ and $\mathbf{1}\{\text{Run}_{i,t-1}\}$ is one for country-month observations for which we have evidence of wholesale funding runs or retail bank runs, respectively, from our bank run chronologies. The error bands depict 95% confidence bands based on Driscoll and Kraay (1998) standard errors.

Figure B.3: Predictors of Wholesale Funding Runs and Retail Bank Runs—Excluding Borderline Cases



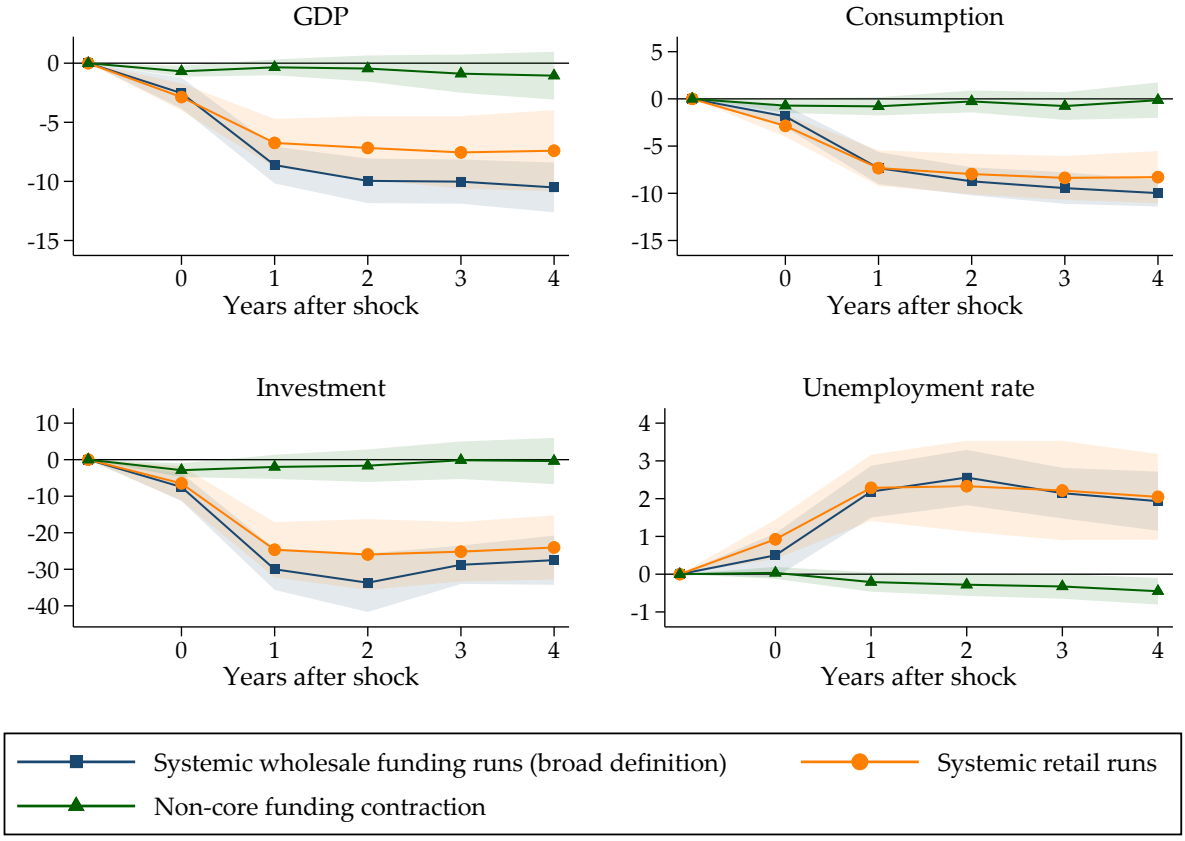
Notes: These figures plot receiver operating characteristic (ROC) curves for (i) non-borderline wholesale funding runs (i.e., cases for which we observe clear evidence of wholesale funding distress and a panic among wholesale depositors) and (ii) retail bank runs. We construct the ROC curves using three groups of predictors: aggregate bank-funding predictors, aggregate bank-solvency predictors, and global predictors. Panel (a) uses bank-funding predictors, namely the average noncore-funding ratio, the growth rate of noncore funding, and the growth rate of demand deposits. Panel (b) uses bank-solvency predictors: the average capital ratio, the growth rate of bank capital (book value), and the change in equity returns. Panel (c) incorporates global predictors, including the depreciation of the domestic currency against the U.S. dollar, the change in the current-account-to-GDP ratio (CA-to-GDP), and year fixed effects. Changes and growth rates are calculated over the time window from $t-4$ to $t-1$, where t denotes the year of the run. Ratio variables are calculated as four-year averages over the same window.

Figure B.4: Macroeconomic Aftermath of Wholesale Funding Runs, Retail Bank Runs, and Their Overlap—Excluding Borderline Cases



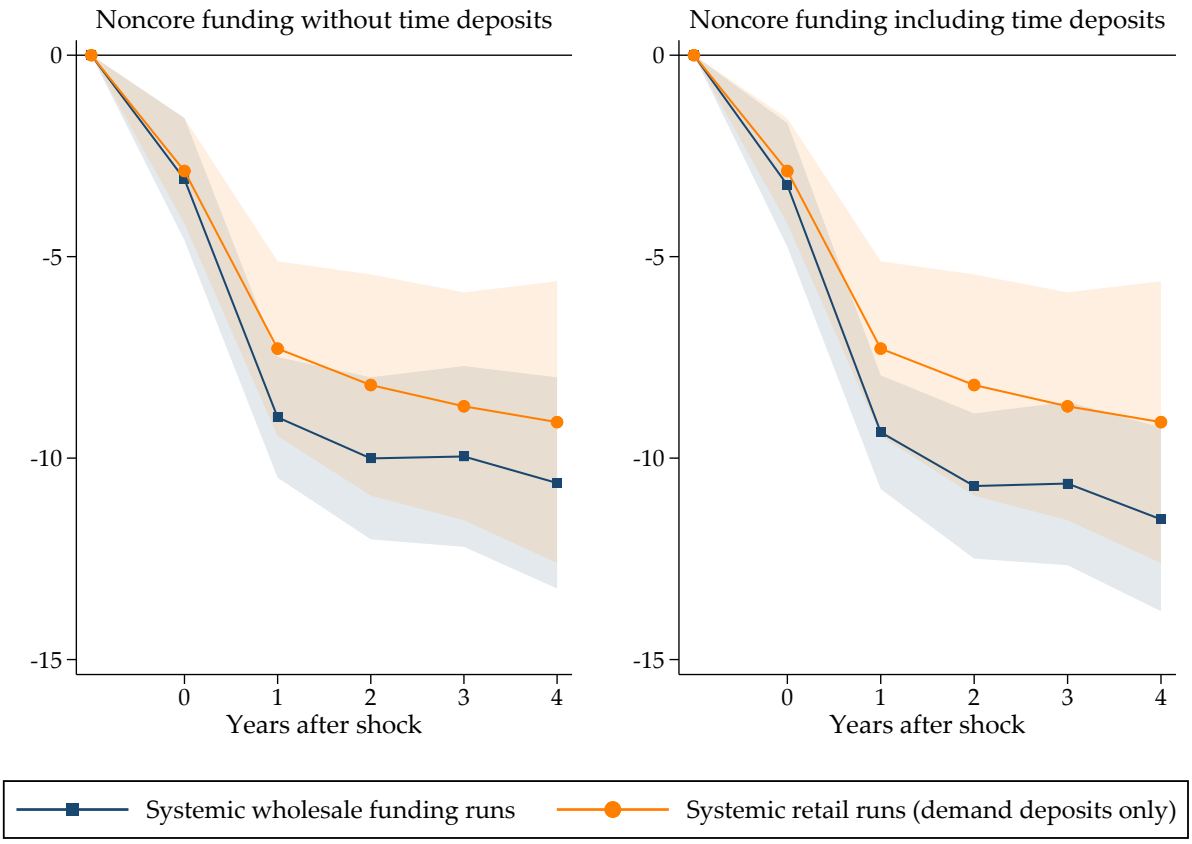
Notes: These figures plot the impulse response functions of real GDP, real consumption, real investment, and the unemployment rate around non-borderline wholesale funding runs (i.e., cases for which we observe clear evidence of wholesale funding distress and a panic among wholesale depositors) within and outside episodes of narrative retail bank runs. We focus on the different subsets and overlap of wholesale funding runs with episodes of retail bank runs based on specification (2), where each line comes from a separate regression. The error bands depict 95% confidence bands based on Driscoll and Kraay (1998) standard errors.

Figure B.5: Macroeconomic Aftermath of Systemic Runs—Excluding Borderline Cases



Notes: These figures plot the impulse response functions of real GDP, real consumption, real investment, and the unemployment rate for (i) systemic non-borderline wholesale funding runs (navy line), i.e., non-borderline wholesale funding runs that coincide with noncore funding contractions; (ii) systemic retail runs (orange line), i.e., narrative bank runs that coincide with deposit contractions; and (iii) noncore funding contractions outside of run episodes (green lines). The estimates are based on local projections specified in equation (2). The error bands depict 95% confidence bands based on Driscoll and Kraay (1998) standard errors.

Figure B.6: Output Losses of Systemic Wholesale and Retail Runs—The Role of Time Deposits



Notes: These figures plot the impulse response functions of real GDP for (i) systemic wholesale funding runs (navy lines), defined as wholesale runs that coincide with contractions in noncore funding, and (ii) systemic retail runs (orange lines), defined as narrative bank runs that coincide with contractions in demand deposits. In both panels, we exclude time deposits from the definition of retail deposits. The left panel uses the baseline definition of noncore funding, which excludes time deposits. In contrast, the right panel includes time deposits in the definition of noncore funding. The estimates are based on local projections specified in equation (2). The error bands depict 95% confidence bands based on Driscoll and Kraay (1998) standard errors.