

Bonds, Business Cycles and Financial Crises^{*}

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Abstract

Do corporate bond markets function as an aggregate “spare tire” when banks are impaired? I study this question using a new long-run dataset of primary bond issuance by issuer sector for 19 countries from the nineteenth century to the present. The data distinguish non-financial corporations, financial corporations, and governments, allowing me to trace how primary bond-market financing is reallocated during systemic banking crises. I find that non-financial corporate bond issuance contracts sharply and persistently after crisis onset rather than expanding to replace impaired bank lending. Three years after a crisis, issuance is roughly one-half below its pre-crisis level, while government issuance rises strongly and financial-sector issuance increases only temporarily. The contraction remains pronounced when issuance is scaled by GDP, investment, or pre-crisis bank credit, and is stable across historical periods, crisis definitions, and alternative specifications. Combining the issuance data with historical credit spreads shows that crises accompanied by larger credit-market repricing experience substantially deeper subsequent contractions in non-financial corporate issuance, consistent with tighter market conditions contributing to the decline. Countries with deeper pre-crisis bond markets subsequently experience stronger investment recovery, but this relationship is not distinctly stronger during banking crises. The results reveal an aggregation wedge between firm-level substitution and aggregate financing: selected firms may retain access to bond markets when banks retrench, but this margin is not large enough to stabilize non-financial corporate financing in systemic crises.

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1 Introduction

A large literature has established that rapid expansions in private sector credit often precede deep recessions and financial crises. Bank-based credit booms in household and corporate debt, in particular, have been shown to predict sharp downturns in output and employment (Schularick and Taylor, 2012; Mian et al., 2017; Müller and Verner, 2023; Ivashina et al., 2024). This research highlights how the sectoral allocation of credit matters for short-run macroeconomic fluctuations. However, despite the growing importance of market-based finance as an alternative to bank credit, the role of corporate bond markets across the business cycle remains much less understood.

This gap is striking. In advanced economies today, bonds account for a significant and rising share of corporate debt (Brunnermeier and Krishnamurthy, 2020), and in Europe, bond markets have become increasingly central (Darmouni and Papoutsis, 2022). Understanding how bond issuance behaves in financial turmoil is critical: when banks withdraw from lending, firms might turn to bonds as a substitute for loans, while investors may prefer bonds over equity in periods of heightened uncertainty.

Recent crises illustrate the stakes. For the 2008 Global Financial Crisis (GFC) Adrian et al. (2013) document a strong use of bond financing by corporates in the US. Novel evidence, however, suggests that at the global level corporate bond issuance declined during the GFC, consistent with the view that bond markets may not provide a sufficient funding buffer during financial stress (Becker and Benmelech, 2021). By contrast, in the midst of COVID-19, corporate bond issuance jumped to record levels in the U.S. and Europe, as firms tapped markets to build liquidity buffers supported by large-scale corporate bond purchase programs from central banks (Halling et al., 2020; Acharya and Steffen, 2020; Bruno et al., 2024). This divergence raises the central research question of this paper: Do corporate bond markets function as an aggregate spare tire during systemic banking crises?

While firm-level evidence suggests that some firms substitute toward bond markets when bank credit tightens, it is not obvious that this mechanism translates into macroeconomic stabilization. Aggregate bond issuance reflects not only substitution by surviving firms, but also entry, exit, refinancing needs, maturity structure, issuer quality, and investor demand. During crises, substitution by large issuers may be offset by selection and exit among marginal firms or by shifts in investor demand toward sovereign debt. Existing evidence is largely confined to recent decades and specific institutional settings. Whether bond markets act as a “spare tire” in the aggregate is therefore an empirical question.

This paper makes three contributions. First, I assemble a new long-run, cross-country dataset on primary bond issuance by issuer sector, constructed from statistical yearbooks, central-bank reports, securities-market publications, ministry-of-finance records, and historical capital-issue statistics. The dataset covers 19 countries from the nineteenth century

to the present. Unlike financial-account transactions or outstanding stocks, gross primary issuance measures the volume of securities brought to market in a given year, making it especially useful for studying primary-market activity during episodes of financial stress.

The data distinguish, where possible, between government, financial-corporate, non-financial-corporate, and total-corporate bond issuance. This sectoral decomposition is central to the paper: the spare-tire hypothesis concerns whether non-financial firms can replace impaired bank credit with market debt, while financial-corporate and government issuance capture different crisis-period financing margins. Hence, total corporate issuance can mask opposite movements across issuer types, especially in modern periods when financial corporations account for a large share of overall corporate bond issuance. To my knowledge, this is the first dataset to provide long-run, cross-country, sector-level evidence on primary corporate bond issuance comparable in scope to historical bank-credit series.

Second, I use this dataset to study the dynamic response of sectoral bond issuance to systemic banking crises. A natural benchmark is that corporate bond issuance expands during banking crises as firms substitute away from banks. The aggregate evidence points in the opposite direction for non-financial firms. In the baseline long-difference local projections, non-financial corporate gross bond issuance falls by about 38 percentage points one year after crisis onset and by about 64 percentage points three years after. The decline is also large relative to normal issuance dynamics: after three years, cumulative NFC issuance growth in crisis episodes is around 112 percentage points below comparable non-crisis country-years. By contrast, government issues rise by about 141 percentage points after one year and remain elevated at longer horizons, while financial sector issues rise by more than 80 percentage points after one year but fade very quickly and turn negative at medium horizons. These results show that banking crises reallocate primary bond-market activity across sectors rather than generating a broad corporate spare-tire expansion.

Importantly, the results do not imply that no firms substitute into bond markets during crises. They instead show that any substitution by selected large or high-quality firms is not large enough to dominate sector-level forces such as issuer exit, deteriorating borrower quality, tighter debt-market conditions, and reallocation of investor demand toward government and financial issuers. Firm-level substitution does not translate into an aggregate issuance expansion, and market finance is insufficient to prevent a sharp collapse in NFC primary financing. The paper therefore identifies an aggregation wedge between firm-level market access and aggregate sectoral financing. In this sense, it complements, rather than contradicts, firm-level evidence of substitution.

To sharpen the interpretation of the quantity response, I combine the issuance panel with the long-run country-level credit-spread data of [Krishnamurthy and Muir \(2025\)](#). Within the observed price sample that overlaps with my issuance data, however, the size of the crisis repricing is strongly informative: banking crises with large spread increases are followed by substantially deeper medium-run contractions in NFC bond issuance.

These price–quantity patterns are consistent with tighter market conditions contributing to the aggregate issuance contraction, although they do not structurally identify a bond-supply shock.

Third, I examine whether pre-crisis NFC bond-market depth predicts post-crisis real recovery. Countries with deeper pre-crisis NFC bond markets experience stronger subsequent investment recovery after banking crises. However, a crisis-specific spare-tire mechanism would imply that the depth-investment slope becomes distinctly more positive when banks are impaired. The data do not show such a sharp state dependence: full-panel interaction estimates show positive depth-investment slopes in both crisis and non-crisis years, with no precise separation between the two. This suggests that bond-market depth captures broader investment resilience rather than a narrow spare-tire mechanism that switches on only when banks are impaired.

The long-run patterns documented in the dataset also serve an important role in the paper: they show that the scale and sectoral composition of primary bond markets changed substantially over time, motivating the crisis analysis and clarifying why aggregate corporate issuance can be misleading without a sectoral split. While a large historical literature has documented the rise and retrenchment of bond markets through country-specific and international studies, systematic and comparable quantitative evidence on primary corporate bond issuance across countries and over long horizons has largely been absent.

The paper therefore shifts the spare-tire debate from whether some firms can access bond markets in crises to whether bond markets stabilize aggregate non-financial corporate financing. The answer in the historical cross-country data is largely no: non-financial corporate issuance contracts, while primary bond-market activity is reallocated toward governments and temporarily toward financial corporations.

The remainder of the paper is organized as follows. Section 2 reviews the related literature. Section 3 describes the construction of the dataset and provides long-run background patterns in corporate and government bond issuance and motivates the subsequent crisis analysis. Section 4 studies the behavior of corporate bond issuance around banking crises and examines the relationship between bond issuance dynamics and real economic outcomes following crises. Section 5 concludes.

2 Literature Review

This paper relates to four strands of literature: (i) credit booms and macroeconomic fluctuations, (ii) corporate bond markets and crises, (iii) theories of financing choices and financial frictions, and (iv) the economic history of bond markets.

Credit Booms and Macroeconomic Fluctuations A robust finding in macro-finance is that credit booms predict financial crises and severe recessions (Schularick and Taylor, 2012; Jordà et al., 2013). The composition of credit matters: household debt booms are

especially dangerous, while the sectoral allocation of corporate bank loans during credit booms also has striking implications for subsequent downturns (Mian et al., 2017; Müller and Verner, 2023). Yet in this line of work, corporate bonds are often omitted or treated inconsistently across countries and time. For example, Müller and Verner (2023) focus on bank loans and note that adding bonds does not materially change their aggregate results, while Ivashina et al. (2024) study corporate debt booms largely through the lens of bank lending. This paper complements this literature by shifting the object of analysis from bank-credit stocks to primary bond-issuance flows. It asks whether market-based debt finance changes aggregate financing dynamics during banking crises, and whether the sectoral allocation of bond issuance resembles the sectoral credit patterns emphasized in the bank-credit literature.

Corporate Bond Markets and Crises A second strand studies directly how firms tap bond markets in times of stress. Evidence from the U.S. and Europe during the GFC suggests that large firms substituted toward bond issuance when bank credit contracted, consistent with the “spare tire” hypothesis (Becker and Benmelech, 2021; Ivashina et al., 2024; Adrian et al., 2013). Becker and Benmelech (2021) argue that the U.S. corporate bond market displayed resilience in crises because issuers were of higher credit quality and investors such as insurance companies and pension funds were less subject to balance sheet constraints than banks. Similarly, Erel et al. (2012) show that capital raising is counter-cyclical for investment-grade firms but procyclical for lower-rated ones, reflecting selective access to markets. In Europe, Darmouni and Papoutsis (2022); Darmouni and Siani (2022) document the growing importance of bond markets, especially for large issuers, while Ayala et al. (2017) highlight the bond boom in emerging markets in the 2000s. More recent evidence shows that during COVID-19, bond markets not only remained open but expanded, supported by policy interventions (Bruno et al., 2024). However, evidence on whether bond issuance is countercyclical in crises is mixed and appears to depend on issuer quality, investor composition, and policy support (Adrian et al., 2013; Becker and Benmelech, 2021; Erel et al., 2012). Existing studies largely focus on recent decades, firm-level issuance margins, and specific institutional settings. This paper asks whether the substitution margin documented for selected firms is large enough to appear in aggregate sectoral primary issuance across countries and historical regimes.

The view that capital markets enhance resilience during banking stress has also been prominent in policy discussions. In remarks following the U.S. banking problems of the late 1980s and early 1990s, Federal Reserve Chairman Alan Greenspan argued that financial “diversity” and the presence of capital market alternatives acted as a “spare tire”, cushioning the real economy when banks retrenched (Greenspan, 1999). This narrative contributed to a broader belief that the expansion of market-based finance strengthens systemic resilience. Whether this interpretation holds systematically across countries and historical crises remains an open question.

The substitution view has both theoretical and empirical foundations. Models of reputation and endogenous financing choice emphasize that firms with sufficient track record or pledgeable income can access markets even when banks are constrained (Diamond, 1991; Holmstrom and Tirole, 1997). Early empirical evidence shows substitution from bank loans toward commercial paper when bank balance sheets deteriorated (Kashyap et al., 1993). These contributions shaped the view that capital markets can provide a buffer during episodes of banking stress.

At the same time, the implications for aggregate outcomes are less clear. Much of the existing evidence operates at the firm level or in specific historical and institutional settings. Recent surveys emphasize the need to better integrate corporate financing decisions into macroeconomic dynamics (Brunnermeier and Krishnamurthy, 2020). Testing whether firm-level substitution translates into aggregate stabilization, across countries and over long historical horizons, therefore remains an open and central question.

Theories of Financing Choices and Financial Frictions The theoretical literature provides mechanisms for why bond issuance might behave differently from bank lending. In models of financial frictions, banks provide monitoring and flexibility in restructuring distressed debt, whereas market-based finance offers lower intermediation costs but less flexibility (Holmstrom and Tirole, 1997). Capital structure theories also provide insight: the pecking order theory (Myers, 1984) suggests that firms issue debt (often bonds) when internal funds are insufficient, while the trade-off theory emphasizes balancing tax shields with distress costs. During recessions, investors’ “flight-to-safety” (Caballero and Krishnamurthy, 2008; Baele et al., 2019) should raise demand for safer corporate bonds, supporting issuance for high-quality firms. At the same time, Greenwood and Hanson (2013) show that issuer quality is cyclical: periods of high issuance are often dominated by riskier firms, which could reverse in downturns. Theory, therefore, predicts both substitution toward bond finance for firms with market access and contraction or selection among marginal issuers. The aggregate response is consequently ambiguous, which motivates measuring primary issuance directly at the country-sector level.

Crouzet (2018) develops a model in which firms endogenously choose between bank loans and bonds. The key distinction is that bank loans can be restructured in distress, while bonds cannot. This flexibility makes bank credit more costly in normal times but more valuable when revenues fall, whereas bond finance is cheaper but inflexible. Firms weigh these trade-offs depending on size and access to markets.

When a shock raises banks’ intermediation costs, the model yields two mechanisms. Large firms with bond market access substitute toward bonds, partially offsetting the contraction in bank lending (“debt substitution”). At the same time, for firms that combine both sources of finance, loans and bonds are complements: tighter bank credit also reduces their bond issuance. The shock furthermore pushes some firms into a pure bond-financed regime, where they lose the flexibility of bank debt, face higher liquidation premia, and

operate at smaller scale. As a result, aggregate borrowing and investment decline despite substitution by the largest firms. Quantitatively, these channels explain about one-third of the investment drop in the model. The framework therefore provides a natural macro-finance benchmark for the empirical analysis in this paper. It predicts that bond finance can substitute for bank credit among firms with market access, but also that this substitution need not stabilize aggregate borrowing or investment. Because loans and bonds may be complements for some firms, and because bond-market access is selective, aggregate bond issuance can contract even when some large firms substitute toward market debt. The model thus formalizes the aggregation wedge at the center of this paper: firm-level substitution does not necessarily imply an aggregate spare-tire response. The empirical analysis below asks which force dominates in long-run country-sector data during systemic banking crises.

In sum, theory predicts substitution toward bond finance for issuers with market access when banks become constrained. However, these mechanisms operate at the firm level. At the aggregate level, substitution may be offset by selection and exit if marginal or lower-quality firms withdraw from primary markets (Greenwood and Hanson, 2013; Erel et al., 2012). In addition, investor-side forces may redirect demand toward safe assets during crises (Caballero and Krishnamurthy, 2008). If sovereign borrowing expands simultaneously, bond market capacity may be reallocated toward public debt rather than corporate issuance. As a result, whether bond markets function as a macro-level “spare tire” is theoretically ambiguous and ultimately an empirical question.

Historical Perspectives on Bond Markets A large economic history literature documents the long-run evolution of bond markets and the shifting balance between bank-based and market-based finance over the twentieth century. This work emphasizes the role of political economy, regulation, and institutional change in shaping financial systems, but it has largely relied on qualitative narratives or country-specific evidence (Rajan and Zingales, 2003; Abraham et al., 2021; Fishlow, 1985). Country-specific studies document specific evolution for certain economies, e.g. for France Hautcoeur (1993) and Hautcoeur and Riva (2012) trace the evolution of corporate debt and market microstructures from the late nineteenth century through the interwar years. In the United States, classic works have reconstructed long-run issuance volumes and analyzed the postwar securities market (Hickman, 1953, 1960; Shapiro, 1959). In the United Kingdom, Michie (1999) documents the rise and retrenchment of market-based financing while in Scandinavia long-run studies show the development of bond financing in countries like Sweden and Norway (Waldenström, 2022a; Skånland, 1967). Scheib (2024) documents the changing capital structure of Italian firms after WWII. For studies that document the evolution of bond markets for other geographical areas such as Europe and North America see for instance Bank for International Settlements (2002); Ayala et al. (2017). Because this literature is often country-specific or focused on institutional detail, comparable cross-country

evidence on primary issuance flows over long horizons has remained limited. This paper contributes a quantitative international dataset that links the historical evolution of bond markets to macro-financial crisis dynamics.

Overall, existing research paints a mixed picture. Corporate bond markets can stabilize financing for some firms when banks are impaired, but access to these markets is selective and may depend on issuer quality, investor composition, policy support, and the supply of safe public debt. The central unresolved question is therefore not whether some firms can issue bonds during crises, but whether this margin is quantitatively large enough to stabilize aggregate non-financial corporate financing.

This paper is not designed to identify within-firm substitution from bank loans to bonds. Instead, it asks whether the spare-tire mechanism appears strongly enough at the sector level to shape aggregate financing dynamics during banking crises. This is a deliberate macro-finance perspective. The macroeconomic relevance of corporate bond markets depends not only on whether selected firms substitute toward bonds, but on whether such substitution offsets issuer exit, deteriorating borrower quality, tighter debt-market conditions, and reallocation of investor demand toward governments or financial intermediaries. By collecting gross primary issuance rather than relying only on financial-account transactions or outstanding stocks, the paper measures directly whether new bond financing expands when banking systems come under stress.

3 A New Data Set on Bond Markets

A central contribution of this paper is the construction of a new long-run, cross-country dataset on primary bond issuance by sector. Unlike existing macro-financial datasets that focus on outstanding bank credit, the series compiled here measure the annual volume of newly issued bonds at the sector level. This captures the allocation of market-based financing across sectors in each country-year and allows, for the first time, a systematic comparison of bond issuance dynamics to the long-run bank credit series widely used in the macro-financial literature. Throughout, I use bond issuance as shorthand for bonds and comparable marketable debt securities covered by the underlying primary-market statistics. Appendix 6 provides the precise instrument-coverage rules and country-specific definitions.

3.1 Construction and Sources

The data set is compiled from a wide range of sources. For the pre-1990 period, and sometimes up to the 2000s, I rely primarily on capital issuance statistics reported in many official government agency sources found in archives such as statistical yearbooks, central bank reports, or ministry of finance publications. Examples include the *Annuaire Statis-*

tique de la France or the *Bank of Thailand's Annual Economic Reports*. In some cases, I also relied on compilations of individual researchers such as [Waldenström \(2022b\)](#) or special publications of long-term historical data by central banks or statistical offices. In many cases I contacted archives, central bank and national statistical offices directly, and they generously supported me in identifying and later digitizing relevant sources, often for the first time.

The degree of detail varies a lot across countries and decades but often sources provide comprehensive breakdowns of securities issued by different sectors. The necessary split of bond vs equity became available for some countries only after they had already published general security issuance statistics for quite some time. For the modern period (post-1990s), I rely on national or international debt securities statistics by the respective central banks or statistical offices. Where series overlap, I reconcile definitions to create continuous time series. In all cases, I focus on the primary capital market and in general I collect three statistics: gross and net issues of bonds as well as outstanding amounts. The last two were usually compiled only years, if not decades, after countries started to publish gross issuance statistics. Hence, it is important to underline that the key baseline series I collect are flows of new bonds issued per year, in contrast to bank-loan datasets that often report stocks, as in e.g. [Müller and Verner \(2023\)](#). This comes with advantages but also drawbacks as discussed below. The degree of detail of capital issuance statistics varies a lot, from very high-level aggregations of a single category of corporations to meticulous categorizations of up to ten or more sub-sectors. Therefore, I construct harmonized, yet often necessarily broader, sector aggregates from the sources. As a starting point and for descriptive visualizations displayed below, I construct a broad sector "Total Corporations". This is an aggregate of all types of corporations from financial to non-financial, private and public.¹ While allowing me to display long-run patterns of corporate vs government bond issues, I use the functional separation between financial vs. non-financial corporations for the empirical analysis later on. For France in particular, this composition matters: very high issuance volumes in the 1990s–2000s reflect the dominance of financial corporations and the prevalence of short-maturity instruments. These features raise questions about interpreting long-run gross flows. To address this, I distinguish between issuance by financial and non-financial corporations as well as the government within the analysis. Furthermore, I treat gross issuance primarily as a financing flow: maturity structures varied substantially across history, becoming shorter over time. While maturity differences are unlikely to bias the following econometric analysis of crisis dynamics, they complicate comparisons of long-run levels. This is not to say that the bond market was significantly smaller before WWII than nowadays, history would suggest otherwise ([Michie](#),

¹For instance, for the Euro Area countries in the sample, after 1990 the constructed sector category "Total Corporations" is the sum of non-financial corporations and financial corporations, whereas financial corporations itself is the sum of the bonds issued by "deposit-taking corporations except CBs" and "non-MFI financial institutions".

2006; Rajan and Zingales, 2003); also see the long-run country data compiled for instance in Giesecke et al. (2011, 2014) for the US on outstanding amounts. However, to the extent that *primary* issues can serve as an indication for real capital raising activity this seems to be true as the data compiled for the pre-WWII periods covers more than 10 countries, many of which are known to have had historically highly developed financial markets at that time.² Appendix A provides additional information on the data construction.

Throughout the analysis, I focus primarily on gross bond issuance rather than net issuance or outstanding amounts. Gross issuance captures the flow of securities brought to the primary market and therefore provides a direct measure of primary-market activity. This is especially relevant during systemic banking crises, when refinancing constraints, redemptions and maturity shortening may lead to large divergences between gross and net flows. Adrian et al. (2013), using the change in outstanding amounts from the Flow of Funds in their analysis of the US bank loan and corporate bond market to the GFC, also note that direct data on new credit flows would be preferable.. My data choice directly speaks to that discussion.

From a historical perspective, gross issuance is also the earliest and most consistently available measure across countries. In many cases, sources began reporting gross issuance decades before publishing net issuance or outstanding amounts, making gross flows uniquely suited for constructing long-run cross-country panels. Because the empirical analysis below focuses on within-country dynamics around crisis dates rather than on cross-country level comparisons, gross issuance provides a clean and conceptually appropriate measure of primary market functioning and, critically, a measure of primary-market activity in times of banking distress.

In addition to corporate sector bond issues I also collect data on government bond issuance as it provides an alternative (safe) asset investors might buy during crisis episodes. This allows me to shed light on the total issuance dynamics of the three macroeconomic sectors: non-financial corporations, the financial sector and governments. I collect data for federal government bond issues as this has the best reporting and allows for cross-country and period comparability.³

Series are reported in nominal local currency and for cases where new currencies are introduced, such as the switch to the new Franc for France, I rescale the earlier series by the official conversion factor. In case overlapping years are reported in different editions of a source such as a statistical yearbook I use the data from the most recent editions and then extend the series backward in time.

The harmonized gross-issuance dataset provides broad but uneven long-run coverage across sectors. Table 1 summarizes the series used in the empirical analysis. Total-

²The great exception might be the UK given its weak data situation. It was not possible to compile data as close in quality as for example for France or the Netherlands.

³A complete country-by-country documentation is provided in Appendix 6.

Table 1: Coverage of harmonized gross issuance series

Sector	Countries	Observations	First year	Last year	Crisis
Government	15	1055	1850	2024	37
Financial corporations	17	1157	1850	2024	43
Non-financial corporations	17	1251	1855	2024	46
Total corporations	19	1536	1855	2024	51

Notes: The table reports coverage of the harmonized gross issuance series. Crisis refers to the number of crises covered for cases where in a given crisis year gross issues data is available for the respective sector.

corporate issuance is available for 19 countries and 1,536 country-year observations, covering 51 banking-crisis onsets. The sectoral split is more restrictive, with 17 countries and 1,157 observations for financial corporations and 17 countries and 1,251 observations for non-financial corporations. Government issuance covers 15 countries and 1,055 observations. Across all sectoral series, the dataset covers 54 distinct banking-crisis onsets for which at least one issuance series is observed.

I combine the bond issuance data with macro-financial statistics from the Global Macro Database by Müller et al. (2025), including GDP, inflation, interest rates, current account balances, investment, and bank credit. Banking-crisis dates are taken from Baron et al. (2021).

3.2 Maturity Structure and Measurement of Issuance

A critical historical dimension for interpreting long-run bond issuance flows is the evolution of bond maturity. Over the twentieth century, average maturities shortened substantially, reflecting changes in regulation, market structure, and investor demand. As a result, identical levels of outstanding debt may correspond to different gross issuance volumes across periods. In addition to these secular shifts, maturities may also shorten temporarily during crises as firms and investors respond to heightened uncertainty. Such crisis-induced shortening would, if anything, mechanically increase gross issuance through more frequent refinancing. The persistent decline in corporate gross issuance following banking crises documented below therefore cannot be explained by maturity compression alone. Because the empirical analysis focuses on within-country responses around crisis dates rather than on cross-period level comparisons, gross issuance is interpreted as a measure of primary market activity and sectoral allocation rather than as a proxy for bond market size.

Total corporate and government bond issuance over the long run

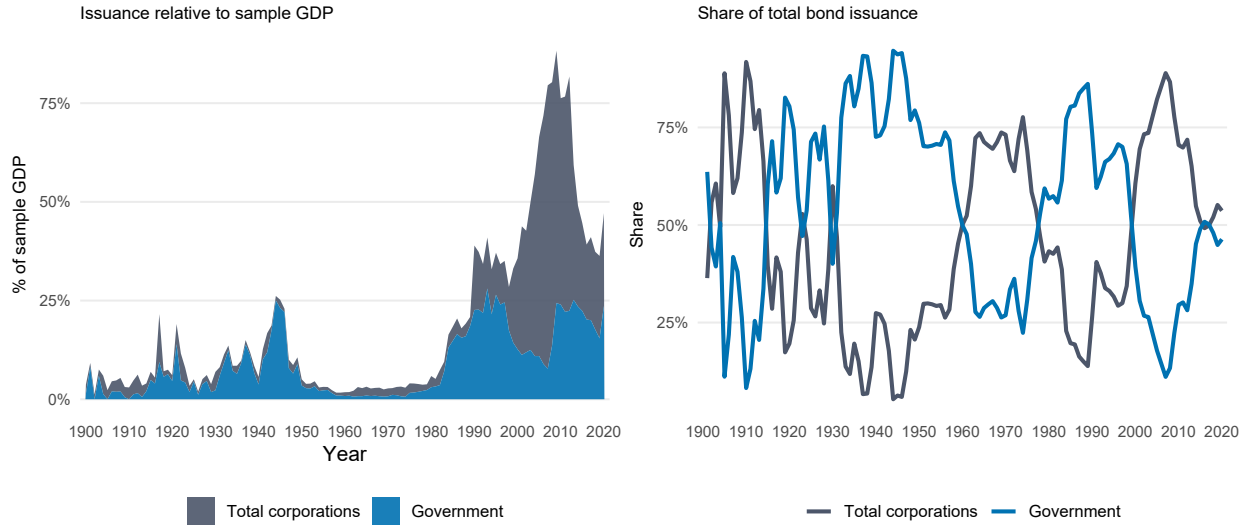


Figure 1: The corporate series is the broad total-corporate aggregate constructed as described in Appendix 6. Corporate and government bond gross issues are summed across countries with available data in each year and scaled by the corresponding sum of GDP (ratio-of-sums within the sample). For the purpose of visualization, the data for this graph is restricted to country-year-sector combinations where data for both government and corporate gross issues both exist. GDP and the gross issues data were converted to USD across countries using the USDfx USD exchange rate series from Müller et al. (2025). Series shown are 2-year moving averages.

3.3 Long-run evolution

To understand how bond markets behave in crises, it is first necessary to understand how primary issuance evolves over the long run. Using newly constructed cross-country data, I document three stylized facts about the size and sectoral allocation of bond markets since 1900. These long-run patterns highlight the time-varying nature of primary issuance and motivate the analysis of how bond market capacity is reallocated during systemic banking crises.

#1 The size and composition of the primary bond market changes substantially over the long run and around major shocks. Figure 1 plots aggregate corporate and government bond gross issuance relative to GDP. Two patterns stand out. First, primary corporate bond issuance exhibits a pronounced “hockey-stick” pattern rather than a U-shape (Rajan and Zingales, 2003). While bond markets were active before World War II, primary issuance collapses in the postwar decades and only regains, and then persistently surpasses, prewar levels after the 1980s. This flow-based evidence differs from stock-based narratives of financial development documented for bank credit (Jordà et al., 2017) as well as stock market capitalization (Kuvshinov and Zimmermann, 2022). This suggests that primary capital-raising activity before World War II may have been more episodic or institutionally constrained than often assumed, especially in the interwar period when

many governments imposed restrictions on securities markets (Michie, 2006).⁴ This pattern is not solely driven by changes in country coverage. Appendix Figure 11 restricts attention to countries observed in the historical, postwar, and modern periods and shows that the postwar trough and subsequent revival remain visible within this fixed long-run cohort.

Second, the composition of issuance varies sharply around major historical shocks. Government bond issuance spikes sharply during wars and systemic crises, temporarily dominating issuance activity and altering the sectoral composition of the primary bond market. This episodic dominance of government issuance highlights that bond market capacity is reallocated across sectors during major macro-financial disruptions. Taken together, these patterns indicate that both the size and the sectoral composition of bond issuance are highly time-varying, motivating a closer examination of sector-specific issuance dynamics around financial crises.

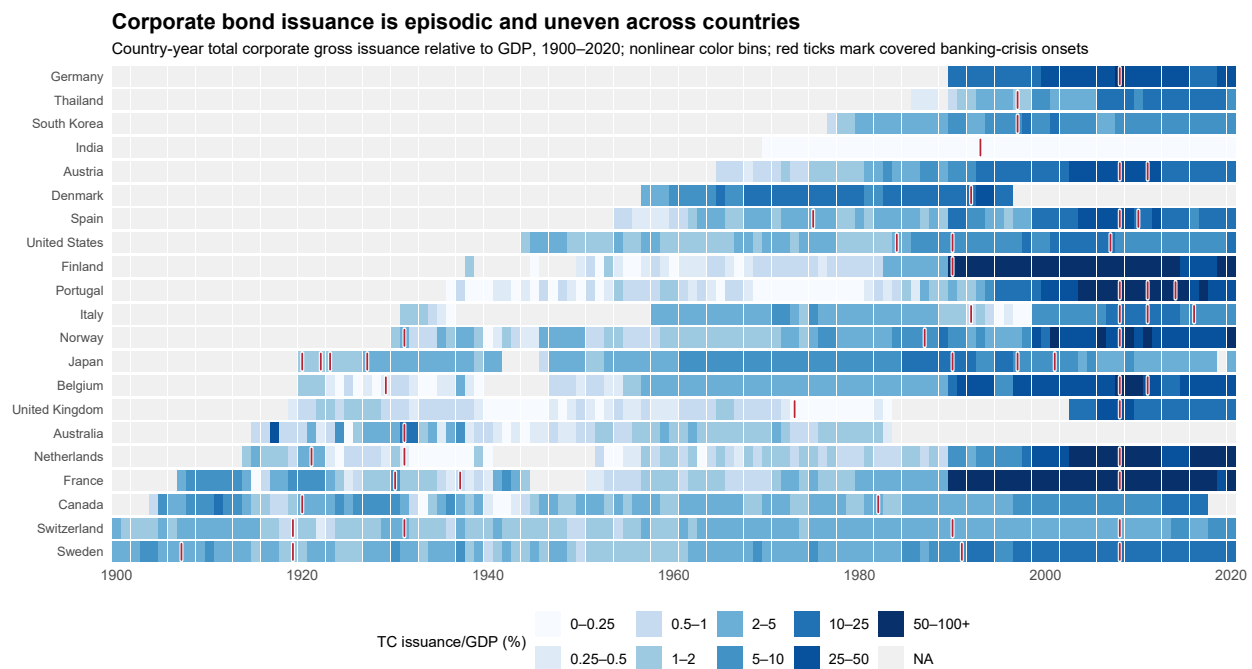


Figure 2: Corporate bond issuance is episodic and uneven across countries. The figure plots total corporate bond gross issuance relative to GDP by country and year from 1900 onward. Darker cells indicate higher issuance intensity. Grey cells denote country-years without observed total corporate gross issuance. Red ticks mark banking-crisis onsets only when total corporate gross issuance is observed for that country-year. The color scale is capped at the 99th percentile for readability. The figure illustrates both the uneven historical coverage of corporate bond issuance data and the concentration of high-issuance episodes in specific countries and periods.

#2 There is substantial and persistent cross-country heterogeneity in the level and timing of corporate bond issuance relative to GDP. While aggregate patterns are informative, they mask substantial cross-country heterogeneity. Figure 2 plots total corpo-

⁴Note that data availability for many countries begins in the interwar period, limiting direct observation of earlier issuance activity.

rate bond gross issuance relative to GDP for individual countries since 1900. Issuance levels, timing, and volatility differ markedly across countries, with late developers such as Thailand and South Korea reaching issuance intensities comparable to those of long-established bond markets in recent decades. This persistent heterogeneity in issuance levels reinforces the importance of focusing on within-country changes around crises rather than cross-sectional level differences, which may reflect institutional structure, financial development, or regulatory regimes.

Financial versus non-financial corporate bond issuance over the long run

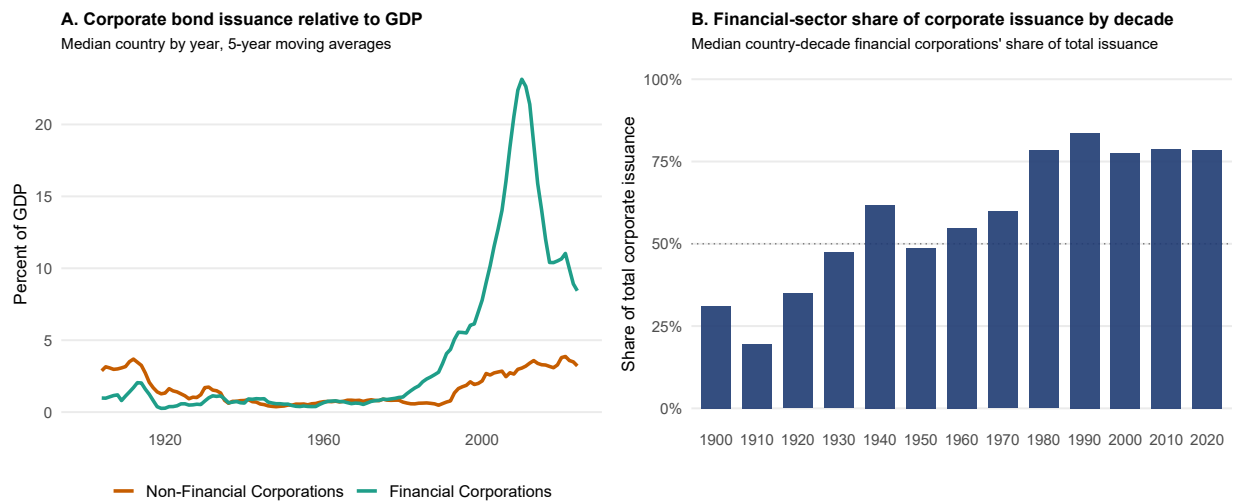


Figure 3: Financial versus non-financial corporate bond issuance over the long run. Panel A plots median-country gross bond issuance relative to GDP for financial corporations (FC) and non-financial corporations (NFC). For each year, the figure first computes issuance relative to GDP at the country level and then takes the cross-country median; series are shown as 5-year moving averages. Panel B reports the median country-decade share of FC issuance in total corporate bond issuance, where total corporate issuance is the sum of FC and NFC bond gross issuance. A value above 50 percent indicates that financial corporations account for the majority of corporate bond issuance.

#3 The post-1980 revival in corporate bond issuance was increasingly driven by financial corporations. Aggregate corporate bond issuance masks important heterogeneity within the corporate sector. Figure 3 shows that financial-corporate (FC) and non-financial-corporate (NFC) bond issuance followed markedly different long-run trajectories. Panel A plots median-country issuance relative to GDP and shows that while FC issuance was historically non-negligible, it rose much more strongly than NFC issuance from the 1980s onward. Panel B shows that this shift also appears in relative terms: the median country-decade share of FC issuance in total corporate bond issuance rises above one half in the postwar period and becomes especially large from the 1980s onward. Thus, the long-run expansion of corporate bond markets was not evenly shared within the corporate sector. This matters for the interpretation of both long-run trends and crisis dynamics below, because aggregate corporate issuance increasingly reflects the behavior of financial rather than non-financial issuers.

Taken together, the descriptive evidence underscores that primary bond issuance is

highly time-varying in both scale and composition. Major disruptions are associated with sharp shifts in issuance activity. This motivates a systematic examination of how corporate bond markets behave during systemic banking crises. The analysis therefore focuses on within-country dynamics around crisis dates, asking whether non-financial corporate issuance expands to substitute for bank lending or instead contracts. Government issuance serves as a benchmark for interpreting these adjustments and assessing whether bond market activity is reallocated across sectors during financial distress.

4 Bond Issuance Dynamics and Financial Crises

How do financial crises shape corporate bond issuance? The theoretical framework reviewed above suggests that bond markets could expand during crises if firms substitute away from constrained banks and if investors shift demand towards relatively safer assets. This section asks whether corporate bond markets act as a “spare tire” during systemic banking crises: do firms substitute toward bond financing when bank lending is impaired? I test this hypothesis at the macro level. First, I document issuance dynamics around crisis onsets using event-study evidence, and then estimate crisis responses in a local-projection framework. The main finding is that aggregate non-financial corporate issuance contracts persistently after banking crises, while government issuance rises sharply and financial-sector issuance increases modestly. Hence, at the macro level, bond markets do not provide broad-based substitution for bank credit but instead, banking crises coincide with a pronounced shift in primary issuance towards the public sector. A key conceptual point is that the “spare tire” hypothesis is fundamentally a firm-level claim: firms with market access may substitute toward bonds when banks retrench. At the aggregate level, however, this substitution margin can be offset by selection and exit of marginal issuers and by crisis-period absorption of bond market capacity through sovereign borrowing and shifts in investor demand, so whether a spare-tire pattern appears in sectoral issuance is ultimately an empirical question.

4.1 Primary Bond Markets Around Financial Crises

First, I study the dynamics of primary bond market activity around systemic banking crises using an event-study design. This allows me to provide a descriptive characterization of how bond issuance evolves in the run-up to, and in the aftermath of, banking crises, separately for non-financial corporations, financial corporations, and governments. I estimate cumulative changes in issuance relative to the year immediately preceding crisis onset and trace these deviations over a symmetric five-year window. This normalization ensures that all estimated responses can be interpreted as deviations from a common pre-crisis baseline, focusing on within-country changes around crises.

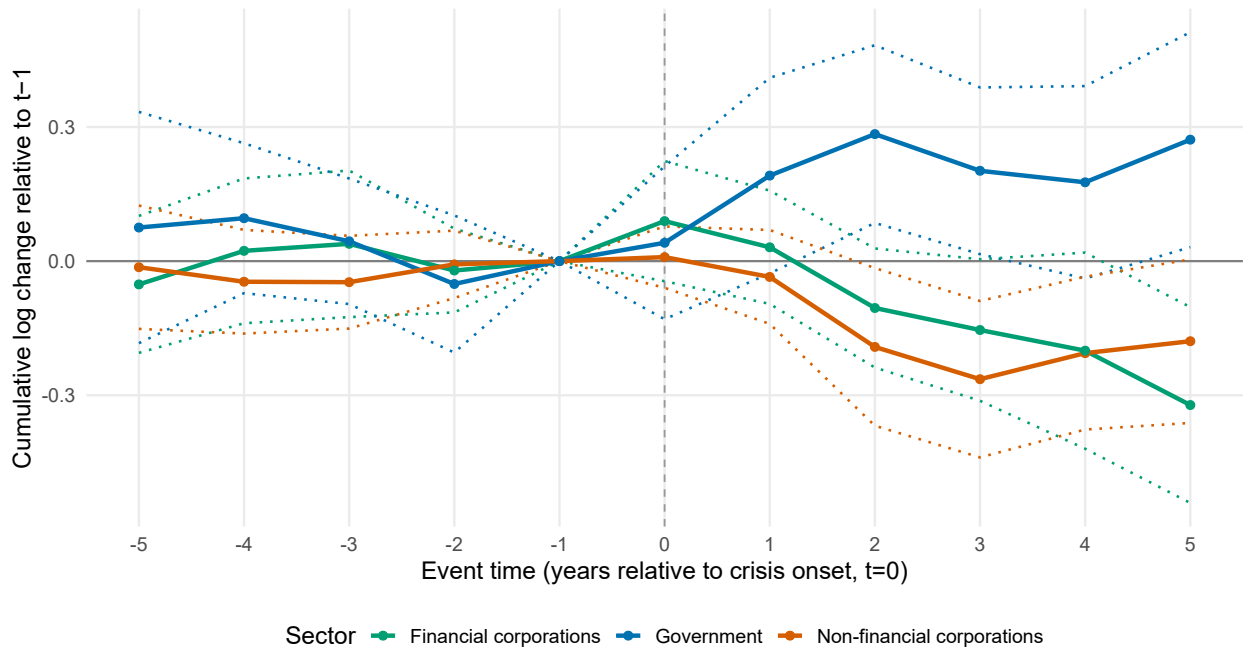
For each horizon $h \in \{-5, \dots, 5\}$, I estimate the following horizon-specific regression:

$$y_{i,t+h} - y_{i,t-1} = \alpha_i + \beta_h 1\{\text{Banking Crisis}_{i,t} = 1\} + \varepsilon_{i,t+h}, \quad (1)$$

where $y_{i,t}$ denotes gross bond issuance relative to GDP in country i and year t , and $1\{\text{Banking Crisis}_{i,t}\}$ is an indicator equal to one in the onset year of a systemic banking crisis. Country fixed effects α_i absorb time-invariant cross-country differences in average issuance levels. Each horizon h is estimated separately using a fixed-effects panel regression.

By construction, $(t - 1)$ is normalized to zero, so β_h measures the cumulative deviation in issuance h years from crisis onset relative to its pre-crisis level. Standard errors are computed using [Driscoll and Kraay \(1998\)](#) standard errors, allowing for both serial correlation and cross-sectional dependence. Confidence intervals are reported at the 90 percent level.

Figure 4: Bond issuance dynamics around banking crises



Notes: Event study of bond issuance around banking crises as described by the setup in Equation 1. The figure shows cumulative changes in log bond issuance relative to GDP, normalized to zero in the year prior to crisis onset ($t - 1$). Event time $h = 0$ corresponds to the crisis year. Estimates are obtained from horizon-specific regressions with country fixed effects. Dotted lines indicate 90 percent confidence intervals based on [Driscoll and Kraay \(1998\)](#) standard errors with horizon-dependent bandwidths.

Figure 4 summarizes the dynamic response of sectoral bond issuance around systemic banking crises following Equation 1. Government bond issuance rises sharply at the onset of a banking crisis and remains elevated in the years that follow, consistent with increased public borrowing during periods of financial distress. Financial corporations expand issuance around crisis onsets, but the increase is modest relative to governments and fades at medium horizons. In contrast, non-financial corporate bond issuance contracts markedly

Non-financial corporate bond issuance around banking crises
Dashed line show point estimates of the GDP-scaled benchmark

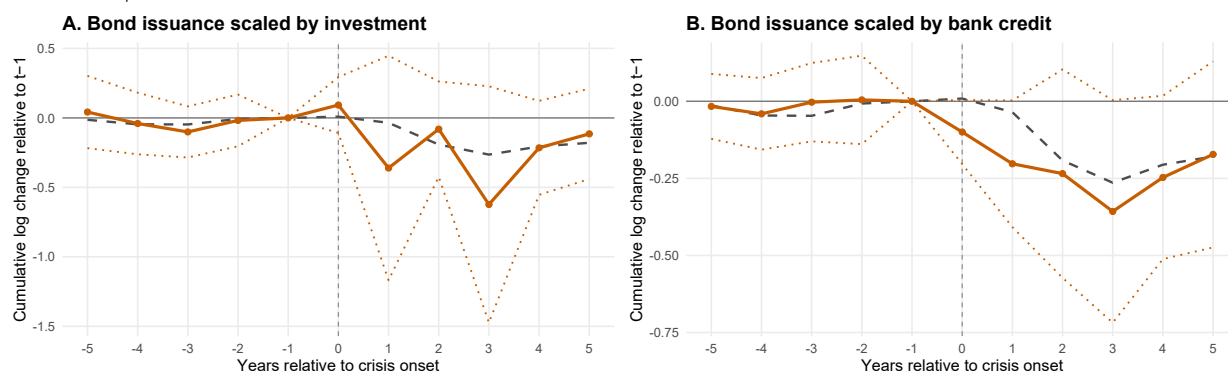


Figure 5: Non-financial corporate bond issuance around banking crises: alternative normalizations. The figure reports event-study estimates for non-financial corporate (NFC) bond issuance using two alternative normalizations. Panel A scales issuance by gross fixed capital formation. Panel B scales issuance by the stock of corporate bank credit, using lagged values to avoid contemporaneous mechanical relationships with issuance. The dashed grey line reproduces the GDP-scaled benchmark. All panels are normalized to zero in the year prior to crisis onset ($t - 1$), so the plotted coefficients measure cumulative deviations from the pre-crisis baseline. Event time $t = 0$ denotes the crisis year. Estimates are obtained from horizon-specific country fixed-effects regressions around banking-crisis onsets. Dotted lines indicate 90% confidence intervals based on Driscoll and Kraay (1998) standard errors with horizon-dependent bandwidths.

following crisis onset. Importantly, there is no evidence of an increase in NFC bond issuance even in the crisis year itself ($h = 0$) and issuance remains persistently subdued relative to its pre-crisis level throughout the post-crisis window. Appendix Figure 19 replicates the event study using log issuance in raw units and the sectoral patterns are highly similar in raw units, reinforcing that the NFC contraction is not purely a scaling artifact of GDP movements. Taken together, the event-study evidence suggests that banking crises are associated with a pronounced reallocation of bond market activity away from non-financial firms and toward governments and financial intermediaries, rather than a broad-based expansion of corporate bond financing.

A remaining concern is that the decline in non-financial corporate bond issuance after banking crises could simply reflect weaker financing demand during downturns rather than a deterioration in market access. To distinguish between these channels, Figure 5 reports the same event-study design using alternative normalizations of NFC issuance. In addition to issuance relative to GDP, I scale issuance by gross fixed capital formation and by the lagged stock of corporate bank credit. The first normalization relates issuance to firms' likely financing needs for capital expenditure, while the second relates issuance to the pre-existing size of bank intermediation.

Two results stand out. First, NFC issuance declines not only relative to GDP, but also relative to fixed investment. This suggests that the contraction is not simply proportional to the fall in investment demand. Second, issuance also declines relative to lagged bank credit. Thus, bond financing does not increase even relative to the banking system's pre-crisis scale. In other words, there is no evidence that bond markets expand sufficiently to

offset disruptions in bank lending at the aggregate level. Taken together, these alternative normalizations reinforce the conclusion that banking crises are associated with a broad-based weakening of primary corporate bond issuance, consistent with reduced market access rather than only weaker financing demand. Appendix Figure 20 further shows that the qualitative crisis pattern is similar when issuance is normalized by fixed investment or by lagged corporate bank credit rather than GDP across all sectors.

4.2 Bond issuance following banking crises: systematic evidence

While the event-study evidence provides a first indication of issuance dynamics around banking crises, this section provides more systematic evidence on the issuance patterns following banking crises using long-difference local projections. This approach is particularly well suited for crisis events, where the object of interest is the total deviation from the pre-crisis baseline rather than short-run year-to-year fluctuations.

The long-difference specification of the local projection framework follows [Jordà \(2005\)](#) and in particular [Jordà and Taylor \(2025\)](#), with the dependent variable defined as the cumulative change in bond issuance relative to the year immediately preceding the crisis. For each horizon $h \in \{0, \dots, H\}$, I estimate:

$$100 \times (y_{i,t+h} - y_{i,t-1}) = \beta_h \text{Crisis}_{i,t} + \Gamma'_h X_{i,t-1} + \alpha_i + \varepsilon_{i,t+h}, \quad (2)$$

where $y_{i,t}$ is either the log of raw issues or the log of issues relative to GDP, depending on the exact specification. The baseline estimation uses log gross issuance rather than issuance scaled by GDP. This choice reflects the object of interest: fluctuations in primary financing activity itself. Scaling by GDP can mechanically mix issuance dynamics with contemporaneous output movements during crises. I therefore use raw issuance as the baseline and then show that the results are robust to normalizing issuance by GDP, fixed investment, and the pre-crisis bank-credit base. The indicator $\text{Crisis}_{i,t}$ equals one in the onset year of a systemic banking crisis, based on the data in [Baron et al. \(2021\)](#). Country fixed effects α_i absorb time-invariant cross-country differences in average issuance levels, allowing the specification to capture the full response of issuance to banking crises, including globally synchronized episodes. The vector $X_{i,t-1}$ includes lags of the dependent variable as well as standard macroeconomic controls, real GDP growth, inflation, the short-term interest rate, and the current account balance, each lagged one and two periods in baseline. The long-difference specification ensures that all estimated responses are interpreted as cumulative deviations relative to the pre-crisis baseline year $t - 1$. Estimation is conducted separately for each horizon h . I use [Driscoll and Kraay \(1998\)](#) standard errors, allowing for serial correlation and cross-sectional dependence. To limit the influence of extreme observations, the baseline results apply a symmetric winsorization at the 2% threshold to the issuance data before taking logs.

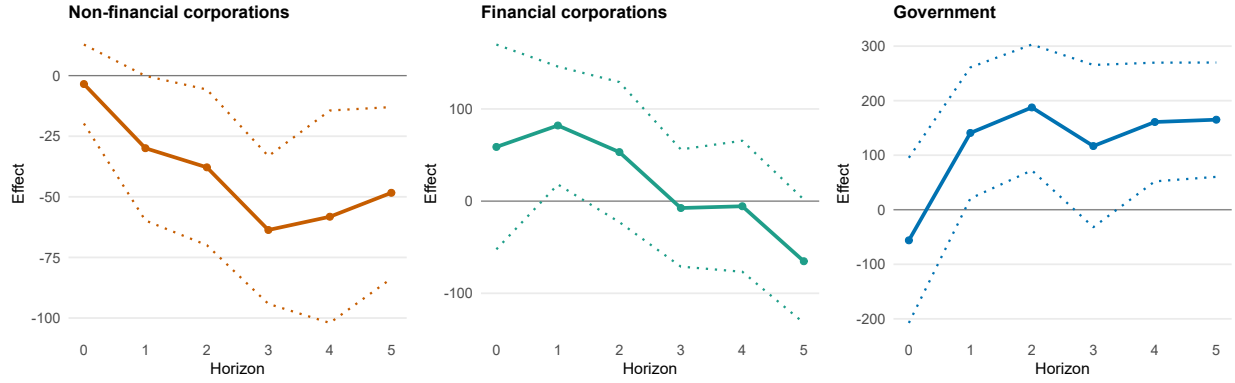


Figure 6: Long-difference local projection estimates of the cumulative response of bond issuance to banking crises. The figure reports the baseline specification based on Equation 2 separately for non-financial corporations, financial corporations, and government issuers. The dependent variable is $100 \times (y_{i,t+h} - y_{i,t-1})$, where $y_{i,t}$ denotes the log of gross bond issuance. Horizon $h = 0$ corresponds to the crisis-onset year, and all responses are measured relative to the pre-crisis year $t - 1$. All specifications include country fixed effects, two lags of the dependent variable, and two lags of macroeconomic controls: real GDP growth, inflation, the short-term interest rate, and the current account balance. The estimation uses Driscoll and Kraay (1998) standard errors, allowing for serial correlation and cross-sectional dependence. Dotted lines denote 90% confidence intervals. Issuance series are winsorized symmetrically at the 2% level prior to log transformation. Vertical scales differ across panels to highlight within-sector dynamics.

A key question is whether crisis issuance dynamics are a feature of the modern postwar era or a more stable historical pattern. To test for structural change, I allow crisis responses to differ between countries with pre-1945 coverage and those observed only in the postwar period by interacting the crisis indicator with an indicator for pre-1945 data availability. This preserves the full sample while providing a direct test of historical stability.

Specifically, I augment equation (2) with interactions between the crisis indicator and a country-level dummy equal to one if a country has any bond issuance observations prior to 1945. This specification preserves the full sample while permitting systematic differences in crisis dynamics between historically well-covered and more recently observed countries. The interaction is also applied to the full set of controls, ensuring that differences in estimated responses are not mechanically driven by changes in macroeconomic volatility, policy regimes, or data availability over time.

Figure 6 summarizes the baseline long-difference local projection estimates for bond issuance following systemic banking crises, using the log of raw issuance as the dependent variable and the full sample baseline model as presented in Equation 2.

Government bond issuance rises sharply following crisis onset and remains persistently elevated relative to the pre-crisis baseline. This pattern is consistent with increased public borrowing to stabilize the financial system and support economic activity during and after banking crises. Financial corporations also expand bond issuance in the aftermath of crises, yet to a much smaller extent than governments, and issuance by financial firms declines again at longer horizons. In contrast, non-financial corporate bond issuance contracts significantly following crisis onset. Notably, there is no evidence of increasing

Table 2: Baseline long-difference local projection estimates

Sector	$h = 1$	$h = 3$	$h = 5$
Non-financial corporations	-38.1* (19.9)	-63.7*** (18.5)	-48.0** (23.8)
	N=988, C=16	N=952, C=16	N=918, C=16
Financial corporations	83.9** (40.0)	-13.3 (42.9)	-80.4* (45.0)
	N=945, C=16	N=909, C=16	N=875, C=16
Government	140.8* (73.0)	116.8 (90.4)	165.1*** (63.7)
	N=858, C=15	N=822, C=15	N=791, C=15

Notes: The dependent variable is $100 \times [\log(\text{Gross Issuance}_{i,t+h}) - \log(\text{Gross Issuance}_{i,t-1})]$. All specifications include country fixed effects, two lags of the dependent variable, and two lags of macroeconomic controls. Standard errors are Driscoll–Kraay. Parentheses report standard errors. N reports number of observations and C number of countries. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

NFC bond issuance even in the crisis year itself. Issuance remains persistently below its pre-crisis level throughout the post-crisis window, indicating that non-financial firms do not systematically substitute toward bond financing during periods of banking distress. Appendix Figure 23 shows that allowing crisis responses to differ between countries with long historical coverage and postwar-only coverage yields similar qualitative conclusions, similarly to allowing for time heterogeneity before and after WWII. While the magnitude of the responses differs somewhat between pre- and post-war crises, the direction of the effects is stable across periods. In particular, the contraction in non-financial corporate issuance following banking crises is present both before and after World War II, suggesting that this pattern is not driven by post-war financial deepening or changes in data coverage. The expansion of government issuance around crises is likewise robust across countries.

In sum, the event-study and long-difference local projection evidence rejects a broad aggregate “spare tire” pattern in primary corporate bond markets. Instead of a crisis-period expansion in NFC issuance, crises coincide with persistent contraction in NFC primary issuance and a sharp increase in government issuance. The dominant sectoral response is therefore reallocation of primary market activity toward the public sector rather than aggregate corporate substitution.

This pattern highlights an important aggregation mechanism. Theoretical models of financing choice emphasize that firms with sufficient scale, reputation, or collateral may substitute toward bond markets when bank lending becomes impaired (Diamond, 1991; Holmstrom and Tirole, 1997; Kashyap et al., 1993; Crouzet, 2018). However, substitution need not appear in aggregate issuance. If market access is limited to a subset of large or high-quality issuers, while marginal firms lose access or exit, total issuance may still decline (Greenwood and Hanson, 2013). In addition, crisis-period portfolio shifts and increased sovereign borrowing can absorb investor demand (Caballero and Krishnamurthy,

2008), further limiting aggregate corporate expansion. The evidence therefore suggests that, at the macro level, substitution does not dominate contraction, pointing at an aggregation wedge between firm-level financing adjustments and sector-level issuance dynamics.

The results are robust to a wide range of specification and sample checks reported in Section 8, including alternative dependent-variable definitions, lag structures, winsorization choices, calendar-year fixed effects, and alternative crisis chronologies. The medium-run decline in non-financial corporate issuance remains quantitatively similar across these specifications and is not driven by historical sample composition, individual countries, or specific crisis episodes. Allowing responses to differ across pre- and post-WWII crises likewise yields similar qualitative dynamics.

Interpretation and concerns. The estimated issuance responses are sector-level dynamics and should not be interpreted as within-firm financing choices. With aggregate historical issuance data, I cannot separately identify within-firm substitution from compositional change (e.g. entry or exit of issuers), so the results speak to whether primary corporate bond markets expand in the aggregate during banking crises. The findings are consistent with selective substitution by large, high-quality issuers combined with the retreat of marginal or lower-rated firms from primary markets, as documented in firm-level studies (Becker and Benmelech, 2021; Erel et al., 2012; Greenwood and Hanson, 2013). In this sense, firm-level substitution does not necessarily translate into aggregate stabilization.

In addition, it is likely that the results are also impacted by changing maturity structures around and after banking crises, especially a shortening of maturities. If the gross issuance response were mainly driven by shorter maturities, one would expect higher rollover needs only later. The immediate post-crisis decline in issuance therefore points to a genuine contraction in issuance activity rather than a mechanical maturity effect. A pure decline in average maturity, holding outstanding debt roughly constant, would increase rollover-related gross issuance only gradually, as newly issued shorter-maturity bonds come due. The immediate post-crisis decline in NFC gross issuance documented here is therefore unlikely to be explained by maturity shortening alone but rather factors such as lower new financing demand, reduced market access, fewer issuers, shrinking debt stocks, firms deferring or canceling issuance or selection into only a set of small but resilient issuers.

Economic magnitude and crisis specificity. While the local projections establish that banking crises are followed by persistent declines in NFC bond issuance, an important question is whether these responses are economically large relative to normal fluctuations in issuance activity. Figure 7 addresses this question by comparing cumulative NFC issuance growth at banking-crisis onsets to the same horizon-specific growth object computed over clean non-crisis country-years.

Two patterns emerge. First, NFC issuance growth following banking crises is substantially weaker than outside crises. While cumulative issuance growth in non-crisis periods remains positive on average, crisis episodes exhibit pronounced negative cumulative growth relative to the pre-crisis baseline, particularly at horizons $h = 1$ to $h = 4$. Second, the magnitude of these declines is large relative to ordinary fluctuations in issuance activity and lasts for several years, suggesting that banking crises are associated with unusually severe disruptions in corporate bond financing.

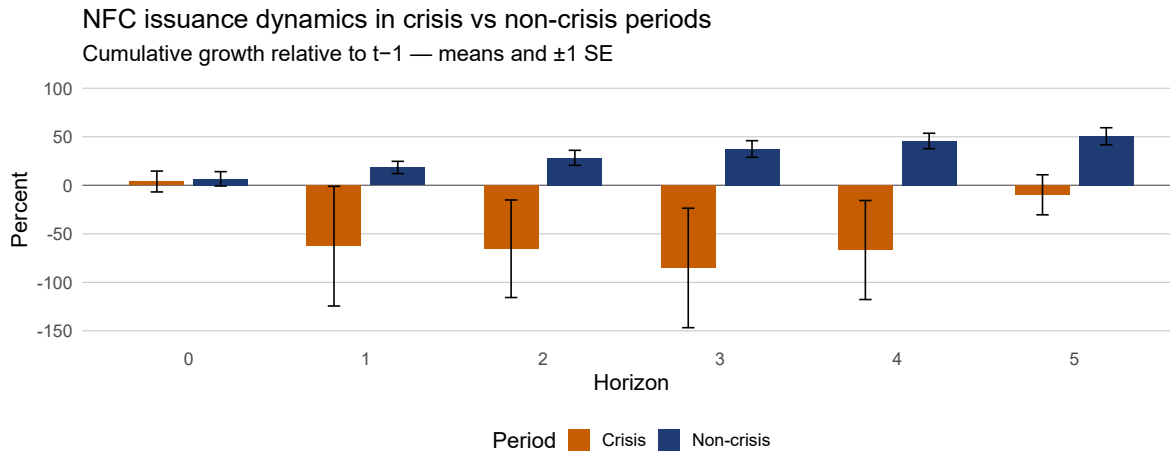


Figure 7: NFC issuance growth in crisis and non-crisis periods. Bars report mean cumulative NFC bond issuance growth relative to the pre-period ($t - 1$) in banking-crisis onset years and in clean non-crisis country-years. For horizon h , the plotted object is $100 \times [\log(1 + \text{Issues}_{i,t+h}) - \log(1 + \text{Issues}_{i,t-1})]$. Non-crisis observations exclude banking-crisis onsets over horizons $h = 0, \dots, 5$. Whiskers denote ± 1 standard error. The figure is descriptive and does not estimate local projections.

Table 3 reports the corresponding numerical values. By year 3, cumulative NFC issuance growth during banking crises is 112 percentage points below comparable non-crisis episodes, highlighting the economic significance of the estimated responses.

Table 3: Magnitude of NFC issuance dynamics in crisis and non-crisis periods

Horizon	Crisis mean	Non-crisis mean	Difference	Crisis N	Non-crisis N
1 year	-50.8	20.3	-71.2	39	882
3 years	-74.4	37.3	-111.7	39	846
5 years	-2.0	56.0	-58.0	39	817

Notes: Crisis observations are banking-crisis onset years. Non-crisis observations are clean country-years outside banking-crisis onset windows. Entries report cumulative log growth in NFC gross bond issuance relative to $t-1$, in percent.

4.3 Interpreting aggregate bond issuance: selection, substitution, and market freezes

Theoretical predictions for the behavior of corporate bond issuance over the financial cycle are ambiguous. In models of financing choice, firms optimally choose between bank and market finance depending on costs and constraints. In expansions, relaxed financial conditions can allow lower-quality firms to access bond markets, increasing issuance along the extensive margin (Erel et al., 2012; Benmelech et al., 2022). By contrast, in crises, a deterioration in bank balance sheets raises the cost of intermediation, potentially inducing firms with bond market access to substitute away from bank credit (Adrian et al., 2013; Crouzet, 2018). At the same time, theories of debt market liquidity and information frictions emphasize that adverse conditions can render debt more information-sensitive, leading to a contraction in issuance and market freezes (Benmelech and Bergman, 2017). The aggregate response of corporate bond issuance is therefore an empirical question.

A large corporate finance literature highlights that access to bond markets is inherently selective. Firms that issue bonds tend to be larger, more profitable, and of higher credit quality, with greater access to collateral and public markets (Erel et al., 2012; Becker and Ivashina, 2014)). In favorable macroeconomic conditions, this access may broaden along the extensive margin, allowing lower-quality or previously constrained firms to enter bond markets. Consistent with this, Benmelech et al. (2022) show that credit conditions affect not only the cost of debt but also the type of securities issued, with lower-quality firms relying more on secured borrowing when conditions deteriorate. These patterns suggest that bond issuance may be strongly procyclical in expansions due to selection into issuance.

At the same time, a growing literature documents substitution from bank lending to bond finance when bank intermediation is impaired. Adrian et al. (2013) show that, during the Global Financial Crisis, large firms with bond market access substituted toward bond issuance as bank lending contracted. Similarly, models of financial intermediation predict that increases in bank funding costs or capital constraints can shift borrowing toward market-based finance (Crouzet, 2018). These findings suggest that bond markets may provide a “spare tire” for firms with sufficient market access.

However, this substitution mechanism is inherently limited. The same shocks that impair bank lending can also tighten conditions in debt markets. When borrower balance sheets deteriorate, debt becomes more information-sensitive, increasing adverse selection and reducing market liquidity (Benmelech and Bergman, 2017). In such environments, primary issuance can decline sharply, as documented during major financial crises. Moreover, collateral constraints and the availability of pledgeable assets become central determinants of market access, with only high-quality or well-collateralized firms able to issue debt (Benmelech et al., 2022). These mechanisms imply that access to bond markets may become more restrictive precisely when aggregate financing needs increase.

Taken together, these mechanisms imply an aggregation wedge between firm-level substitution and aggregate issuance dynamics. While some firms may substitute into bond markets during crises, this substitution is selective and may be offset by the exclusion of lower-quality issuers and by a contraction in overall market liquidity. In addition, investor demand may shift toward safer assets, including government bonds, further limiting funding available to non-financial corporations. As a result, aggregate corporate bond issuance may decline even if a subset of firms increases issuance.

The empirical findings in this paper are consistent with this interpretation. Across a large sample of systemic banking crises, aggregate bond issuance by non-financial corporations declines persistently, while government issuance increases sharply and financial-corporation issuance rises only temporarily. These patterns are difficult to reconcile with a simple aggregate “spare tire” view in which bond markets broadly replace impaired banks. Instead, they support models in which access to market-based finance is selective, state-dependent, and shaped by credit quality, collateral, and investor demand.

Following Müller and Verner (2023), the analysis does not aim to identify a single structural mechanism. Rather, it evaluates which classes of theoretical models are most consistent with the observed aggregate patterns. The results suggest that models featuring selective access, information-sensitive debt, and reallocation toward safer borrowers provide a more accurate description of bond market behavior in crises than models predicting broad-based substitution into bond finance.

4.4 Credit-market repricing and the severity of the issuance contraction

The baseline estimates show that NFC gross bond issuance falls persistently after banking-crisis onsets. Quantity evidence alone, however, does not fully distinguish weaker desired financing from tighter market conditions. The alternative normalizations reported above already show that issuance declines relative to GDP, fixed investment, and lagged corporate bank credit. I complement these tests with country-level credit spreads from Krishnamurthy and Muir (2025), which provide a price measure of risky debt-market conditions over a long international sample. Their historical series are constructed from bond prices and yields, while the modern observations combine corporate bond spreads from central banks and commercial data providers. Because the exact spread object differs across countries and periods, I use the authors’ country-normalized spread series and interpret it as a broad measure of bond-market credit repricing rather than as an issuer-specific NFC borrowing rate.⁵

⁵The strict price sample excludes the Swedish series from 1987 onward because that segment measures the spread on bank loans to non-financial firms rather than a bond-market spread. The historical spread also covers a broad set of risky bonds, including railroads, banks, and sovereign or quasi-sovereign issuers, and is therefore not an NFC-only price measure. Appendix D documents the construction and restrictions in

For each horizon, I augment the baseline long-difference local projection with the interaction between the banking-crisis indicator and the normalized spread change at crisis onset:

$$100(y_{i,t+h} - y_{i,t-1}) = \beta_h \text{Crisis}_{i,t} + \theta_h \text{Crisis}_{i,t}(\Delta s_{i,t} - \overline{\Delta s_C}) + \Gamma'_h X_{i,t-1} + \alpha_i + \varepsilon_{i,t+h}. \quad (3)$$

Here $y_{i,t}$ is again the log of non-financial corporations gross issuance, $\Delta s_{i,t}$ is the author-supplied normalized credit-spread change from $t - 1$ to t , and $\overline{\Delta s_C}$ is its mean among observed crisis onsets. The control set, two-percent winsorization, country fixed effects, and Driscoll–Kraay inference are identical to the baseline specification. Centering the interaction means that β_h is the estimated crisis response at the mean observed spread change, while θ_h measures how the response varies with the severity of repricing.

Figure 8 summarizes the result. Panel A divides the exact constant-origin price sample into low- and high-repricing terciles. NFC issuance remains comparatively resilient after low-repricing crises, but falls sharply after crises in the high-repricing tercile. At $h = 3$, the estimated response is about 31 log points in the low-repricing group and -84 log points in the high-repricing group; the high-minus-low difference is -116 log points with a p -value of 0.006.

Panel B displays the underlying crisis-level price–quantity relationship at $h = 3$. Although individual crises are heterogeneous, larger spread increases are associated with markedly weaker subsequent NFC issuance: the crisis-level slope is -43.4 (standard error 12.1), and the Spearman rank correlation is -0.67 . This scatter is descriptive and does not replace the controlled local projection. The continuous specification in Equation (3), which retains the baseline controls and country fixed effects, delivers the same conclusion: a one-standard-deviation larger spread increase is associated with an additional 38 log-point NFC issuance contraction at $h = 3$ and an additional 32 log-point contraction at $h = 5$.

Appendix D shows that the negative spread gradient is also present when issuance is measured relative to GDP, fixed investment, and the lagged stock of corporate bank credit. This makes a simple proportional scaling of issuance with aggregate investment an incomplete description. At the same time, the estimates should not be interpreted as identifying a structural inward shift in bond supply. Credit spreads combine expected defaults, risk premia, liquidity, investor risk-bearing capacity, and changing issuer composition. The result is best read as evidence that the aggregate issuance contraction is most severe when risky debt markets undergo substantial repricing.

detail.

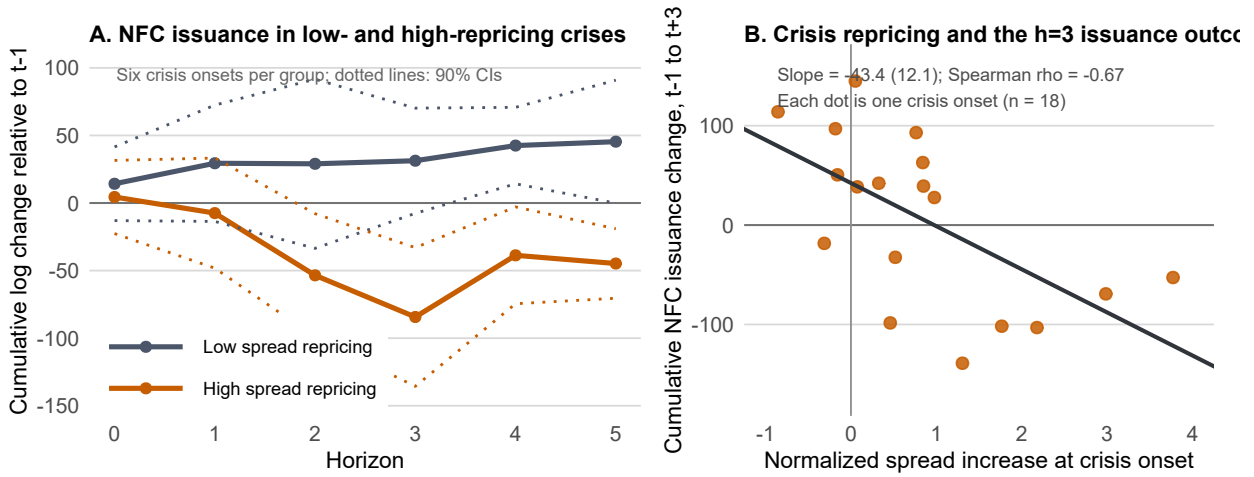


Figure 8: Credit-market repricing and the severity of NFC issuance contractions. Panel A reports jointly estimated baseline LDLP responses for the low- and high-repricing terciles of the exact constant-origin spread sample; each group contains six crisis onsets. Dotted lines denote 90% Driscoll–Kraay confidence intervals. Panel B plots the raw cumulative NFC issuance change from $t - 1$ to $t + 3$ against the author-supplied normalized spread change for the 18 crisis onsets in the exact price sample. The fitted line is the crisis-level linear association; standard errors are clustered by country. The raw scatter is descriptive, while the controlled continuous-interaction estimates are reported in the text and Appendix D.

4.5 Real effects: bond-market depth and post-crisis recovery

The previous sections show that non-financial corporate bond issuance contracts on average after banking crises. This aggregate decline does not imply that bond markets are irrelevant for recovery. A more modest question is whether countries with deeper corporate bond markets before a crisis experience less severe real contractions once the crisis has begun. Motivated by [Krishnamurthy and Muir \(2025\)](#), I therefore examine whether predetermined bond-market depth is associated with post-crisis recovery across banking-crisis episodes.

The theoretical interpretation of this exercise is disciplined by the spare-tire mechanism discussed above. In models in which banking crises occur as shocks to the cost of bank intermediation, such as [Crouzet \(2018\)](#), firms with access to bond markets should be better able to substitute away from impaired bank credit. This mechanism implies not only that pre-crisis bond-market depth may predict better recovery, but also that the relationship between bond-market depth and real outcomes should become stronger during banking crises than in normal times. In other words, a crisis-specific spare-tire channel predicts a state-dependent slope: bond-market depth should be more positively associated with investment recovery when the banking system is impaired.

The empirical exercise below therefore has two objectives. First, I ask whether countries with deeper pre-crisis NFC bond markets recover more strongly after banking crises.

Second, I examine whether this relationship is specific to crisis episodes or instead reflects a broader association between bond-market development and investment dynamics. This distinction is important because a positive depth–recovery correlation alone does not establish a spare-tire mechanism. It may also capture broader financial development, firm composition, institutional quality, or the presence of large firms that systematically invest more in all states of the world.

Let t_0 denote the onset year of a systemic banking crisis. I define pre-crisis (non-financial) corporate bond-market depth as the average ratio of NFC bond gross issuance to GDP over the five years prior to the crisis:

$$\text{Depth}_{i,t_0} = \frac{1}{5} \sum_{s=1}^5 \frac{\text{NFC Bond Issues}_{i,t_0-s}}{\text{GDP}_{i,t_0-s}}.$$

This variable is standardized across crisis episodes. Because it is measured before crisis onset, it is not mechanically driven by post-crisis issuance responses. Note that here I specifically use issuance to GDP to account for activity in the primary capital market relative to the size of a country’s economy. The dependent variable is the subsequent real recovery from the crisis year, i.e. $\Delta_h y_{i,t_0}$, either real GDP or real investment. Measuring outcomes from t_0 rather than from $t_0 - 1$ focuses on recovery after the crisis has begun, rather than on the initial crisis-year decline itself.

For each horizon $h = 1, \dots, 5$, I estimate the crisis-event regression

$$\Delta_h y_{i,t_0} = \beta_h \text{Depth}_{i,t_0} + \theta_h \text{CreditBoom}_{i,t_0} + \phi_h \text{Shock0}_{i,t_0} + \varepsilon_{i,t_0}.. \quad (4)$$

$\text{CreditBoom}_{i,t_0}$ is the change in corporate credit-to-GDP from $t_0 - 4$ to $t_0 - 1$, and $\text{Shock0}_{i,t_0}$ is the crisis-year real GDP growth rate from $t_0 - 1$ to t_0 . Both controls are standardized. The specification is intentionally cross-crisis: country fixed effects are not included in the baseline because the variation of interest is cross-country variation in ex-ante bond-market depth. Standard errors are clustered by country.

Figure 9 shows that pre-crisis NFC bond-market depth is positively associated with investment recovery after banking crises. The association is small at short horizons but rises over the medium run. By five years after crisis onset, deeper pre-crisis NFC bond markets are associated with higher real investment growth. The corresponding GDP estimates are smaller and less precisely estimated, consistent with the idea that any financing margin should appear more clearly in investment than in aggregate output.

This result provides suggestive evidence that bond-market depth is economically relevant. However, it is not by itself evidence of a crisis-specific spare-tire mechanism. A stronger interpretation would require the depth–investment relationship to become distinctly more positive during banking crises than in normal periods. The full-panel interaction exercise in Appendix Table 24 and Figure 34 shows that this is not clearly the

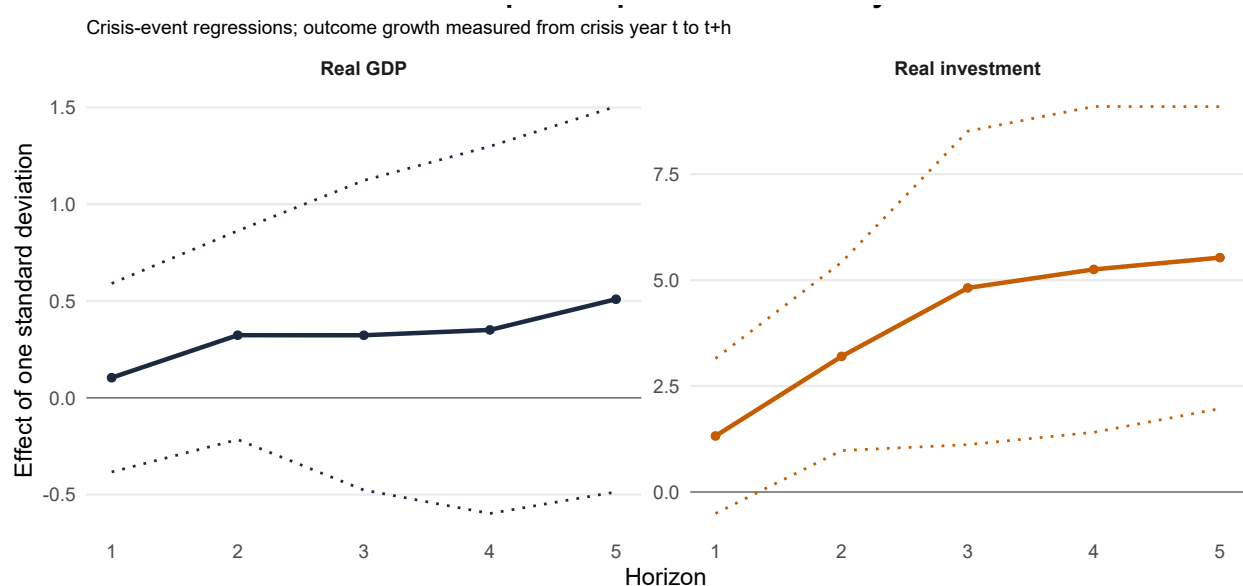


Figure 9: Pre-crisis NFC bond-market depth and post-crisis recovery. The figure reports crisis-event regressions based on Equation 4. The dependent variable is $100 \times (\log y_{i,t_0+h} - \log y_{i,t_0})$, where y is real GDP or real investment. Pre-crisis bond-market depth is the standardized five-year average of non-financial corporate bond gross issuance relative to GDP over $t_0 - 5$ to $t_0 - 1$. Regressions control for the pre-crisis corporate credit boom and the crisis-year real GDP shock. Dotted lines denote 90% confidence intervals based on standard errors clustered by country.

case. NFC bond-market depth is positively associated with investment growth in crisis years, but the corresponding non-crisis slope is also positive and of similar magnitude. The difference between crisis and non-crisis slopes is imprecisely estimated.

The evidence therefore supports a more cautious interpretation. Countries with deeper NFC bond markets tend to experience stronger investment dynamics, including after banking crises, but the data do not show a clean state-contingent activation of bond markets during crises. This finding complements the aggregate issuance results above. Aggregate NFC issuance falls after banking crises, and the real-effects evidence does not overturn that conclusion by revealing a strong crisis-specific substitution channel. Instead, bond-market depth appears to capture a broader investment-resilience margin rather than a narrow spare-tire mechanism that switches on when banks are impaired.

Overall, the real-effects evidence strengthens the interpretation of the paper in two ways. First, it shows that the bond-market dimension is not merely descriptive: pre-crisis NFC bond-market depth is associated with stronger subsequent investment growth. Second, it clarifies the limits of the spare-tire interpretation. The positive investment association is not unique to banking-crisis years, and therefore does not provide strong evidence that bond markets systematically substitute for impaired banks at the macro level. Together with the issuance results, the evidence points to a more nuanced conclusion: corporate bond markets are relevant for investment resilience, but they do not operate as a broad aggregate spare tire during systemic banking crises.

5 Conclusion

This paper introduces a new long-run dataset on sectoral primary bond issuance across 19 countries and uses it to study whether corporate bond markets function as an aggregate spare tire during systemic banking crises. By focusing on gross issuance rather than outstanding stocks or financial-account transactions, the analysis measures primary-market activity directly and traces how new bond financing is allocated across governments, financial corporations, and non-financial corporations over more than a century of financial history.

The central finding is that banking crises are associated with a pronounced reallocation of bond issuance across sectors rather than a broad corporate substitution response. Government borrowing expands sharply and persistently, financial-sector issuance rises temporarily, and issuance by non-financial corporations declines and remains depressed for several years. These patterns are stable across specifications, historical periods, alternative normalizations, and leave-one-out checks. At the aggregate level, corporate bond markets therefore do not act as a systematic substitute for impaired bank lending.

The results do not imply that no firms substitute into bond markets during crises. Instead, they point to an aggregation wedge between firm-level market access and sector-level financing. Substitution by selected large or high-quality firms may coexist with issuer exit, deteriorating borrower quality, tighter debt-market conditions, and shifts in investor demand toward governments or financial intermediaries. The macroeconomic spare-tire hypothesis requires substitution to appear in aggregate non-financial corporate financing, and the historical cross-country evidence shows that it generally does not.

At the same time, bond markets still matter for real outcomes. Countries with deeper pre-crisis NFC bond markets experience stronger subsequent investment recovery after banking crises. However, this relationship is not clearly stronger in crisis years than in normal periods. The evidence therefore points to a broader investment-resilience margin rather than a crisis-specific aggregate substitution mechanism.

These findings speak to both historical interpretation and contemporary policy debates. Historically, they challenge narratives that emphasize the unconditional resilience of corporate bond markets during episodes of banking distress. From a policy perspective, they suggest that the stabilizing role of market-based finance depends not only on market size, but also on issuer composition, investor demand, institutional access, and the interaction between bond markets and bank credit conditions.

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6 Appendix A: The Bond Dataset

6.1 Overview

In this section, I provide a general overview and further details of my data coverage, its collection process, including the types of data collected, references to the original archival material, and details on the construction of the time series on a country-by-country basis.

6.2 Dataset Coverage

Instrument coverage. The dataset covers primary issues of bonds and comparable debt securities reported in official capital-issue statistics, central bank publications, statistical yearbooks, and securities-market reports. The baseline object is gross issuance of debt securities by issuing sector. When sources distinguish bonds from equity, shares, or other securities, I retain only debt securities for the construction of the baseline issuance series. When the source reports a broader debt-security aggregate, I include the series if the category is conceptually close to bond issuance and document the corresponding source definition in the country files.

The treatment of borderline instruments follows the classification in the original source whenever possible. Mortgage bonds and covered bonds are included when they are reported as bond issues and assigned to the issuing sector, typically financial corporations when issued by mortgage-credit institutions. Short-term instruments, such as Treasury bills or commercial paper, are included when they are separately identifiable and outside the bond category. In cases where historical sources report bills jointly with government bond issues, the combined series is retained and documented. Publicly backed corporate issuers, such as railways, utilities, or state-owned enterprises, are classified according to the issuing entity rather than the implicit guarantee. They are therefore included in the corporate sector unless the source explicitly records the issue as central-government debt.

The dataset does not impose a uniform listed/unlisted distinction, because historical sources rarely report this split consistently. Instead, it follows the coverage of the original primary-market statistics. Similarly, foreign listings are included when covered by the domestic source series used for a given country. Appendix 6.2.1 documents these choices country by country.

Time coverage. Coverage varies substantially across countries, sectors, and periods. The dataset expands gradually over time given the uneven availability of long-run primary-market statistics across countries. The sectoral empirical analysis relies on the more restrictive financial-corporation, non-financial-corporation, and government series, whose coverage is summarized in Table 1 and documented in greater detail in Section 6.2.1. The broader total-corporate series provides an additional valuable robustness check, often ex-

tending country, time, and crisis coverage. The qualitative results are similar when this broader aggregate is used.

For the pre-1990 period, and sometimes up to the 2000s, I mostly draw primarily on capital issuance statistics reported in many official government agency sources found in archives such as statistical yearbooks, central bank reports or ministry of finance publications. In some cases I also relied on compilations of individual researchers or special publications of historical long-run data by central banks or statistical offices. In many cases I contacted archives, central bank and national statistical offices directly and they generously supported me in identifying and digitizing relevant sources, often for the first time. Figure 6.2 shows two typical sources I encountered during the process of gathering relevant sources.

TABLEAU VIII. — Émissions des sociétés françaises, non compris les obligations des grandes compagnies de chemins de fer ⁽¹⁾.
Abréviations : N, nombre de sociétés; A, actions; O, obligations (valeurs en millions de francs).
VALEURS MOBILIÈRES. ANNÉES 1924 ET 1925.

OBJET DES SOCIÉTÉS.	A. ENSEMBLE DES ÉMISSIONS D.						B. NON COMPRIS LES ACTIONS D'APPORTS, ETC.					
	SOCIÉTÉS ANCIENNES.			SOCIÉTÉS NOUVELLES.			SOCIÉTÉS ANCIENNES.			SOCIÉTÉS NOUVELLES.		
	N.	A.	O.	N.	A.	O.	N.	A.	O.	N.	A.	O.
1924.												
Pêche, forêts, agriculture.	17	55	8	5	22	17	51	8	3	19		
Alimentation.	69	136	34	35	118	66	131	30	22	29		
Mines et carrières.	13	236	19	39	117	51	233	19	23	61		
Énergie.	11	218	-	5	59	0	140	-	3	21		
Industrie.	4	70	-	-	-	3	70	-	-	-		
Autres industries chimiques.	51	297	22	24	61	49	223	22	13	17		
Caoutchouc.	9	63	2	3	11	8	56	-	2	4		
Papier, imprimerie.	22	18	4	9	22	22	15	1	8	31		
Textile.	55	257	46	55	165	53	233	35	12	38		
Travail des métaux, plumes, pailles, crins.	6	8	3	7	21	6	8	3	4	9		
Cuir et peaux.	0	11	8	12	42	8	14	5	6	7		
Industries du bois.	14	31	3	10	33	13	31	3	7	8		
Travail des métaux mécaniques.	111	559	-	1	15	1	55	-	-	-		
Travail des métaux fers.	2	55	-	-	-	-	-	-	-	-		
Construction, travaux publics.	25	45	37	16	79	25	45	37	6	5		
Énergie électrique.	100	500	107	15	52	95	187	102	9	53		
Terres, polders au fon.	28	52	6	25	52	23	47	3	20	23		
Télégraphes et radiotélégraphes.	21	63	149	13	61	19	53	-	7	8		
Transporte par terre ou air.	6	21	50	3	9	5	15	50	1	2		
Commerce.	112	151	57	98	237	129	433	51	64	96		
Crédit foncier.	-	-	-	-	-	-	-	-	-	-		
Autres sociétés immobilières et banques.	19	100	6	13	84	19	30	6	12	37		
Assurances.	14	5	7	11	9	11	4	7	11	9		
Autres ou objets non spécifiés.	302	3,503	1,331	191	1,919	860	3,194	1,511	350	701		
Total.	1	-	-	-	-	-	-	-	-	-		
Crédit national.	1	-	-	-	-	-	-	-	-	-		
Groupements de sociétés.	1	-	-	-	-	-	-	-	-	-		
Total.	303	3,503	2,937	491	1,919	862	3,195	2,980	350	701		

Source: Annuaire Statistique de la France (1925)

40. 主要 公社債 發行, 残額 및 收益率
Issues, Outstanding Amounts & Yields of Principal Public and Corporate Bonds
Amount in billion won
Yields in percent per annum

年 月 中 During	産業金融債券 Industrial finance debentures			外貨金融債券 Foreign exchange debentures			長期信用債券 Long term credit debentures		
	發行 Issued	残額 Balance	收益率 Yields	發行 Issued	残額 Balance	收益率 Yields	發行 Issued	残額 Balance	收益率 Yields
1977	50.0	64.2	21.0	-	-	-	-	-	-
1978	70.0	124.8	22.6	15.0	15.0	21.0	-	-	-
1979	100.0	187.1	25.7	30.0	30.0	24.2	-	-	-
1980	200.0	326.7	28.3	40.0	40.0	28.9	64.6	64.6	28.3
1981	200.0	437.5	24.6	50.0	50.0	24.2	120.0	178.9	24.6
1982	305.5	597.4	18.2	70.1	81.3	17.8	130.9	282.1	18.2
1983	355.7	643.4	15.1	70.0	90.3	15.0	161.2	333.2	14.7
1984	510.3	881.8	14.8	69.9	66.8	15.5	219.0	427.4	15.0

年 月 中 During	通信公社債券 Telecommunication bonds			公社債 Corporate bonds			新設企業債券 Commercial papers		
	發行 Issued	残額 Balance	收益率 Yields	發行 Issued	残額 Balance	收益率 Yields	發行 Issued	残額 Balance	收益率 Yields
1977	-	-	-	176.5	286.1	20.1	-	-	-
1978	-	-	-	525.3	585.9	21.1	-	-	-
1979	-	-	-	624.6	1,110.0	26.7	-	-	-
1980	-	-	-	953.7	1,839.2	30.1	-	-	-
1981	-	-	-	1,036.1	2,574.3	24.4	1,009.7	605.1	30.0
1982	92.9	92.9	15.5	2,137.3	3,411.8	17.5	2,148.1	611.0	19.2
1983	92.9	14.2	1.4	1,497.2	4,318.6	14.2	3,185.4	826.7	14.4
1984	-	64.8	13.0	1,859.9	5,495.0	14.1	4,701.9	1,667.4	13.6

Source: Korea Statistical Yearbook (1985)

Figure 10: Examples of historical source material. The figure shows examples of original statistical publications used to construct the long-run bond issuance dataset. The left panel reports French capital-issue statistics from the *Annuaire Statistique de la France*; the right panel reports bond-market statistics from the *Korea Statistical Yearbook*.

6.2.1 Country-specific coverage documentation

Table 4: Coverage of constructed gross bond issuance series

Country	Sector	Start	End	Missing years	Obs.	Banking crisis onset years covered
Australia	Government	1915	1983	None	69	1931
	Financial corporations	1915	1983	None	69	1931
	Non-financial corporations	1915	1983	None	69	1931
	Total corporations	1915	1983	None	69	1931
Austria	Government	1953	2021	None	69	2008, 2011
	Financial corporations	1965	2021	None	57	2008, 2011
	Non-financial corporations	1953	2021	None	69	2008, 2011
	Total corporations	1965	2021	None	57	2008, 2011
Belgium	Government	1990	2021	None	32	2008, 2011
	Financial corporations	–	–	–	0	–
	Non-financial corporations	1947	2021	None	75	2008, 2011
	Total corporations	1920	2021	1940–1946	95	1929, 2008, 2011
Denmark	Government	1957	1996	None	40	1992
	Financial corporations	–	–	–	0	–
	Non-financial corporations	–	–	–	0	–
	Total corporations	1957	1996	None	40	1992
Finland	Government	1938	2021	1939–1944, 1946–1949	74	1990
	Financial corporations	1938	2021	1939–1944, 1946–1949	74	1990

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Table 4: Coverage of constructed gross bond issuance series (continued)

Country	Sector	Start	End	Missing years	Obs.	Banking crisis onset years covered
France	Non-financial corporations	1938	2021	1939–1944, 1946–1949	74	1990
	Total corporations	1938	2021	1939–1944, 1946–1949	74	1990
	Government	1921	2021	1945–1950	95	1930, 1937, 2008
	Financial corporations	1907	2021	1945–1950	109	1930, 1937, 2008
	Non-financial corporations	1907	2021	1945–1956	103	1930, 1937, 2008
	Total corporations	1907	2021	1945–1950	109	1930, 1937, 2008
Germany	Government	1990	2021	None	32	2008
	Financial corporations	1990	2021	None	32	2008
	Non-financial corporations	1990	2021	None	32	2008
	Total corporations	1990	2021	None	32	2008
Italy	Government	–	–	–	0	–
	Financial corporations	1931	2021	1937–1957	70	1992, 2008, 2011, 2016
	Non-financial corporations	1931	2021	1937–1957	70	1992, 2008, 2011, 2016
	Total corporations	1931	2021	1937–1957	70	1992, 2008, 2011, 2016
Japan	Government	1920	2024	1942–1945, 2019	100	1920, 1922, 1923, 1927, 1990, 1997, 2001
	Financial corporations	1920	2024	1942–1945, 2019	100	1920, 1922, 1923, 1927, 1990, 1997, 2001
	Non-financial corporations	1920	2024	1942–1945, 2019	100	1920, 1922, 1923, 1927, 1990, 1997, 2001

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Table 4: Coverage of constructed gross bond issuance series (continued)

Country	Sector	Start	End	Missing years	Obs.	Banking crisis onset years covered
	Total corporations	1920	2024	1942–1945, 2019	100	1920, 1922, 1923, 1927, 1990, 1997, 2001
Netherlands	Government	1914	2021	1941–1951	97	1921, 1931, 2008
	Financial corporations	1914	2021	1941–1951	97	1921, 1931, 2008
	Non-financial corporations	1914	2021	1941–1951	97	1921, 1931, 2008
	Total corporations	1914	2021	1941–1951	97	1921, 1931, 2008
Norway	Government	–	–	–	0	–
	Financial corporations	1984	2024	None	41	1987, 2008
	Non-financial corporations	–	–	–	0	–
	Total corporations	1930	2024	None	95	1931, 1987, 2008
Portugal	Government	1969	2021	None	53	2008, 2011, 2014
	Financial corporations	1990	2021	None	32	2008, 2011, 2014
	Non-financial corporations	1990	2021	None	32	2008, 2011, 2014
	Total corporations	1936	2021	None	86	2008, 2011, 2014
South Korea	Government	1977	2024	1983–1985, 1992–1993	43	1997
	Financial corporations	2008	2024	None	17	None
	Non-financial corporations	1993	2024	None	32	1997
	Total corporations	1977	2024	None	48	1997
Spain	Government	1954	2021	None	68	1975, 2008, 2010

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Table 4: Coverage of constructed gross bond issuance series (continued)

Country	Sector	Start	End	Missing years	Obs.	Banking crisis onset years covered
Sweden	Financial corporations	1962	2021	None	60	1975, 2008, 2010
	Non-financial corporations	1962	2021	None	60	1975, 2008, 2010
	Total corporations	1954	2021	None	68	1975, 2008, 2010
	Government	1854	2021	31	137	1878, 1907, 1919, 1991, 2008
	Financial corporations	1850	2021	None	172	1878, 1907, 1919, 1991, 2008
	Non-financial corporations	1855	2021	None	167	1878, 1907, 1919, 1991, 2008
	Total corporations	1835	2021	None	187	1878, 1907, 1919, 1991, 2008
Switzerland	Government	1850	2024	None	175	1870, 1919, 1931, 1990, 2008
	Financial corporations	1900	2024	None	125	1919, 1931, 1990, 2008
	Non-financial corporations	1900	2024	None	125	1919, 1931, 1990, 2008
	Total corporations	1900	2024	None	125	1919, 1931, 1990, 2008
Thailand	Government	1979	2023	1981–1985	40	1979, 1997
	Financial corporations	1998	2023	None	26	None
	Non-financial corporations	1998	2023	None	26	None
	Total corporations	1986	2023	1989	37	1997
United Kingdom	Government	–	–	–	0	–
	Financial corporations	2003	2024	None	22	2008
	Non-financial corporations	2003	2024	None	22	2008

Continued on next page

Table 4: Coverage of constructed gross bond issuance series (continued)

Country	Sector	Start	End	Missing years	Obs.	Banking crisis onset years covered
United States	Total corporations	1919	2024	1984–2002	87	1973, 2008
	Government	1934	2023	1936–1938, 1942, 1944, 1946, 1974–1989	68	1990, 2007
	Financial corporations	1970	2023	None	54	1984, 1990, 2007
	Non-financial corporations	1900	2023	1944–1969	98	1907, 1930, 1984, 1990, 2007
	Total corporations	1944	2023	None	80	1984, 1990, 2007

Notes: The table reports coverage of constructed annual gross bond issuance series. Start and end years refer to the first and last non-missing observations in the final harmonized dataset. Missing years denote internal gaps between the start and end year. Banking crisis onsets covered refer to crisis onset years from [Baron et al. \(2021\)](#) for which the corresponding sector series is observed at $t = 0$. Sources, series-construction details, breaks, switches, classifications, and other documentation are provided in Section 6.5.

6.3 Construction of sector classification for NFC, FC and GOV and other harmonization choices

To construct consistent long-run issuance series by sector, I harmonize original aggregate issuance categories into three broad institutional sectors: non-financial corporations (NFC), financial corporations (FC), and (central) government (GOV). Historical sources differ substantially in their granularity, terminology, and institutional coverage across countries and over time. I therefore map source-specific issuer categories—such as industrial firms, utilities, banks, insurance companies, public credit institutions, and central or local governments—into these three sectors, aggregating categories when necessary.

Central government issuance is typically provided as a distinct category in the original sources. For the corporate sector, I aggregate annual issuance of entities clearly belonging to either the financial or the non-financial sector. The original sectoral classification used in each source serves as the starting point, from which broader and more comparable aggregates are constructed. When institutional boundaries are ambiguous, the classification is conservative and explicitly documented: entities are assigned to the financial sector only when their designation clearly indicates financial intermediation (e.g. banks, insurance companies, or specialized financial institutions). An analogous procedure is applied to the construction of non-financial corporate aggregates.

In borderline cases, I sought additional clarification from national statistical agencies or central banks when possible. When ambiguity could not be resolved based on available documentation, the corresponding issuance is included in the total corporate sector but excluded from the finer split between financial and non-financial corporations. This approach preserves overall coverage while avoiding potentially misleading sectoral assignments.

This harmonization strategy allows the construction of comparable annual sector-level issuance series across countries and long time horizons, while preserving the main economic distinctions relevant for studying financing behavior around banking crises.

For each country, I construct a dedicated “country file” that contains the raw data and documents, for each year–sector observation, the construction of the final series with explicit references to the original sources. When necessary, additional notes detail case-specific decisions, including feedback received from national agencies. This documentation is stored in a dedicated “Notes” tab within each country file and a consolidated summary is available below.

6.4 Treatment of breaks, missing years, and denomination changes

The historical sources used in this project exhibit unavoidable gaps, definitional breaks, and changes in denomination over time. I address these issues using a transparent and

conservative harmonization strategy that prioritizes traceability over mechanical continuity.

Missing years are left explicitly missing and coded as NA. No interpolation or extrapolation is applied to fill gaps in the underlying source material. As a result, observed changes in issuance reflect only information contained in the original sources.

Structural breaks, especially when arising from changes in publication formats, reporting standards, or source coverage, are not mechanically adjusted or smoothed. Instead, such breaks are preserved in the data and explicitly flagged on a case-by-case basis in the country files, particularly for years in which the underlying source or statistical publication changes.

Currency and denomination changes are harmonized using official conversion rates. For euro area countries, all final series are expressed in pre-euro national currencies, with post-1999 data originally reported in euros converted back using the irrevocable conversion rates set at euro adoption. Analogous procedures are applied in other cases of denomination changes, such as the conversion from old to new francs in France. All conversions are applied consistently within country over time and documented in the corresponding country files.

6.5 Country-Specific Data and Source Documentation

Work in progress.

Notes on abbreviations and sectors in the country table

- GOV: federal government
- TC: total corporate sector, which is the total corporate sector aggregate constructed, including financial and non-financial corporations
- NFC: non-financial corporations such as manufacturing or industry
- FC: financial corporations including e.g. banks and insurances

6.5.1 Australia

Table 5: Source construction for Australia: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
NFC	Gross issues	1915–1983	Black et al. (2013) and underlying issue-level data obtained from the authors/Reserve Bank of Australia	Private non-financial corporations; non-financial public trading enterprises (PTEs).	No aggregate NFC issuance series is taken directly from the source. Annual NFC gross issuance is reconstructed from the underlying individual bond issues by summing issues classified as private non-financial corporations and non-financial public trading enterprises. The inclusion of PTEs follows the issuer classification in Black et al. (2013), which treats commercially operated public enterprises as non-financial corporations.
FC	Gross issues	1915–1983	Black et al. (2013) and underlying issue-level data obtained from the authors/Reserve Bank of Australia	Banks; non-bank financial institutions.	Annual FC gross issuance is reconstructed from the issue-level data as the sum of bonds issued by banks and non-bank financial institutions. The bank category includes both privately and publicly owned banks.
TC	Gross issues	1915–1983	Black et al. (2013) and underlying issue-level data obtained from the authors/Reserve Bank of Australia	Private non-financial corporations; non-financial public trading enterprises; banks; non-bank financial institutions.	Annual total-corporate issuance is constructed as the sum of the reconstructed NFC and FC series. Government issuers and non-resident issuers are excluded from TC.
GOV	Gross issues	1915–1983	Black et al. (2013) and underlying issue-level data obtained from the authors/Reserve Bank of Australia	Government.	Annual GOV gross issuance is reconstructed by summing the individual issues assigned to the Government issuer category in the underlying data.

Notes. Australian gross-issuance series are reconstructed from individual bond issues rather than transcribed from published aggregate issuance statistics. The underlying unit-record data were compiled by Black et al. (2013) from historical stock-exchange publications and Reserve Bank of Australia sources and were obtained from the authors/Reserve Bank of Australia. Each issue is assigned an issuer type in the source data, and annual sectoral aggregates are constructed by summing the face value of issues within the corresponding issuer categories. Years in which a sector records no individual issues are coded as zero. The sector mapping follows the institutional classification used in the underlying data. NFC combines private non-financial corporations and non-financial public trading enterprises (PTEs); FC combines banks and non-bank financial institutions; and TC is the sum of these two sectors. Public ownership by itself does not lead an issuer to be classified as government: Black et al. (2013) treat commercially operated PTEs and government-owned banks as corporations, thereby maintaining a consistent issuer classification through later privatisations. Non-resident issuers are excluded from the domestic corporate aggregates. The underlying Black et al. dataset defines bonds as debt securities with an original maturity of at least twelve months and excludes hybrid securities; the present reconstruction follows this source definition. Issues are measured at face value. The historical data primarily cover onshore issuance; the underlying study notes that comprehensive offshore issuance is not available before 1983 and that over-the-counter issuance prior to the early 1980s may be incompletely captured. The supplied issue-level/grouped

data used for the present reconstruction contain observations from 1915 through 1983, marginally extending the 1917 starting date emphasized in the paper. The current dataset retains the coverage supplied in these underlying data.

6.5.2 Austria

Table 6: Source construction for Austria: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1953–1989	Oesterreichische Nationalbank, Mitteilungen, various editions	Bund.	GOV consists of bond issuance by the federal government. Issues by Länder and cities, public-law funds and corporations, and other public-sector entities are excluded from the central-government aggregate.
NFC	Gross issues	1953–1989	Oesterreichische Nationalbank, Mitteilungen, various editions	Electricity enterprises; industry and other domestic corporate issuers.	NFC is constructed from the source categories corresponding to electricity enterprises and industrial issuers. In earlier publications, industry and other domestic issuers are reported jointly and the combined category is retained. Where other domestic issuers become separately identifiable, they are not mechanically assigned to NFC if their sector cannot be established.
FC	Gross issues	1965–1980	Oesterreichische Nationalbank, Mitteilungen, various editions	Inländische Kreditunternehmen.	FC is constructed from gross bond issuance by domestic credit institutions. A comparable gross-issuance series is not available in the earlier source material and FC is therefore left missing before 1965.
FC	Gross issues	1981–1989	Oesterreichische Nationalbank, <i>Statistisches Monatsheft</i> , various editions	Bank debt-security issues.	From 1981, the source provides a more detailed breakdown of bank issuance. FC is constructed using the reported aggregate of bank debt-security issues, combining the relevant bank bond and other bank debt-security categories. The change in source classification is retained as a documented coverage break rather than mechanically adjusted.
TC	Gross issues	1965–1989	Oesterreichische Nationalbank, statistical monthly publications, various editions	Financial corporations, non-financial corporations, and other domestic corporate issuers where separately reported.	TC is constructed from the underlying corporate issuer categories. It includes the NFC and FC components and, where the source reports an additional domestic corporate residual that cannot be reliably assigned to either sector, this category is retained in TC without forcing it into the finer NFC/FC decomposition. TC can therefore exceed NFC plus FC in such years.

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Table 6: Source construction for Austria: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Central government (ECB sector 1311), debt securities.	GOV is constructed from the ECB central-government debt-security series. Monthly gross issuance is summed to annual frequency.
NFC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Non-financial corporations (ECB sector 1100), debt securities.	NFC is constructed from the ECB non-financial-corporation issuer-sector series. Monthly gross issuance is summed to annual frequency.
FC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Banks (ECB sector 1220) and other financial institutions (ECB sector 1235).	FC is a harmonized aggregate constructed for this dataset rather than a directly reported ECB series. It combines debt-security issuance by banks (sector 1220, instrument F33000) with long-term debt-security issuance by other financial institutions (sector 1235, instrument F33200).
TC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Constructed NFC and FC aggregates.	TC is constructed as the sum of the harmonized ECB-based NFC and FC gross-issuance series.

Notes. The historical Austrian series are constructed from successive vintages of Oesterreichische Nationalbank statistical publications, specifically capital market information found in the *Mitteilungen des Direktoriums der Oesterreichischen Nationalbank*, after 1991 called *Statistisches Monatsheft*. FC gross issuance is unavailable before 1965, while the bank-issuance classification becomes substantially more detailed from 1981. Other financial sector issues then from banks is not reported as a category in the source historically. Residual domestic corporate issuance that cannot be assigned reliably to NFC or FC is retained in TC where separately reported. From 1990 onward, the historical OeNB construction is replaced by harmonized series constructed from the underlying ECB issuer-sector data. NFC corresponds to ECB sector 1100; FC combines sectors 1220 and 1235; TC is constructed as NFC plus FC; and GOV corresponds to central government sector 1311. Monthly ECB gross issuance is aggregated to annual frequency by summing the twelve monthly observations

6.5.3 Belgium

Table 7: Source construction for Belgium: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
TC	Gross issues	1920–1926	Baudhuin (1943), <i>Placements: Principes Permanents d'Economie Privée</i> , p. 267	Gross bond issues (<i>obligations</i>) of joint-stock companies.	The earliest Belgian TC observations are taken from a contemporary private statistical compilation. Its continuity with the subsequent official series is supported by the close correspondence between Baudhuin's figures and the Banque Nationale de Belgique (BNB) statistics in the overlapping years.
TC	Gross issues	1927–1936	Banque Nationale de Belgique, <i>Rapport annuel</i> , various editions	<i>Émissions des sociétés industrielles et commerciales belges et congolaises: obligations.</i>	Gross bond issuance is taken directly from the BNB capital-issue tables. The contemporary reporting perimeter includes both Belgian and Congolese industrial and commercial companies. This historical coverage is retained as reported.
TC	Gross issues	1937–1939	Banque Nationale de Belgique, <i>Rapport annuel</i> , various editions	<i>Entreprises privées: obligations.</i>	A change in the presentation of the BNB statistics relabels the earlier industrial-and-commercial-company category as “private enterprises.”
TC	Gross issues	1940–1946	—	—	No annual gross corporate bond-issuance observations are available in the material collected for these years. The observations are therefore left missing and no interpolation is applied.
TC	Gross issues	1947–1957	<i>Annuaire Statistique de la Belgique</i> , various editions	Total bond issues of Belgian companies.	TC follows the complete reported corporate bond-issuance aggregate.
FC	Gross issues	1947–1957	<i>Annuaire Statistique de la Belgique</i> , various editions	Banks; insurance companies; financial and real-estate operations.	FC is constructed by summing the separately identifiable financial-sector categories reported in each year. For some year-sector combinations no issuance are reported, hence taken as numerical zero.
NFC	Gross issues	1947–1957	<i>Annuaire Statistique de la Belgique</i> , various editions	Residual non-financial corporate issuance.	NFC is constructed as the TC aggregate excluding FC components.

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Table 7: Source construction for Belgium: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
TC	Gross issues	1958–1979	<i>Annuaire Statistique de la Belgique</i> , various editions	Total Belgian joint-stock companies.	TC uses the reported total of new bond and cash-bond issues by Belgian joint-stock companies, including continuous issues. The source total is preferred to summing the detailed industry rows. The historical reporting perimeter can include Belgian companies whose activities were located abroad.
FC	Gross issues	1958–1979	<i>Annuaire Statistique de la Belgique</i> , various editions	Banks; financial and real-estate companies.	FC is constructed as the sum of bank issuance and issuance by the source category “financial and real-estate companies.” Banks are added separately because they are not contained in the latter category.
NFC	Gross issues	1958–1979	<i>Annuaire Statistique de la Belgique</i> , various editions	Residual non-financial corporate issuance.	NFC is constructed as the TC aggregate excluding FC components.
TC	Gross issues	1980–1989	<i>Annuaire Statistique de la Belgique</i> , various editions	Belgian-franc issues and foreign-currency/ECU issues; continuous and non-continuous issues.	TC is constructed from the reported aggregate new issues in Belgian francs together with issues denominated in foreign currencies and ECU.
FC	Gross issues	1980–1989	<i>Annuaire Statistique de la Belgique</i> , various editions	Credit institutions, insurance, business services, and rental.	FC follows the broad source category <i>Institutions de crédit, assurances, services fournis aux entreprises, location</i> . This category is broader than the modern financial-corporation sector and may include some business-service, real-estate, and rental activities that cannot be separated consistently from the financial activities in the historical source.
NFC	Gross issues	1980–1989	<i>Annuaire Statistique de la Belgique</i> , various editions	Residual non-financial corporate issuance.	NFC is constructed as the TC aggregate excluding FC components.
GOV	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Central government (ECB sector 1311), debt securities.	GOV is constructed from the ECB central-government debt-security series. Monthly gross issuance is summed to annual frequency.
NFC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Non-financial corporations (ECB sector 1100), debt securities.	NFC is constructed from the underlying ECB non-financial-corporation issuer-sector series. Monthly gross issuance is summed to annual frequency.

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Table 7: Source construction for Belgium: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
FC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Banks (ECB sector 1220) and other financial institutions (ECB sector 1235).	FC is a harmonized aggregate constructed for this dataset rather than a directly reported ECB series. It combines debt-security issuance by banks (sector 1220, instrument F33000) with long-term debt-security issuance by other financial institutions (sector 1235, instrument F33200).
TC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Constructed NFC and FC aggregates.	TC is constructed as the sum of the harmonized ECB-based NFC and FC gross-issuance series.

Notes. The earliest TC observations, for 1920–1926, come from the private statistical compilation of Baudhuin (1943); official BNB statistics are used from 1927 onward. The official pre-war series explicitly covers Belgian and Congolese companies through 1936, reflecting the contemporary statistical reporting perimeter. A reporting break occurs in 1937 when the earlier category of Belgian and Congolese industrial and commercial companies is replaced by the broader heading “private enterprises.” For the post-war period, source categories such labelled “industrial and commercial companies” include banks, insurance companies, and financial and real-estate activities. From 1947 onward, TC is therefore taken from the complete reported corporate total; FC is constructed from the identifiable financial categories; and NFC is obtained from excluding FC issues. From 1980–1989, the available financial-sector aggregate becomes broader and includes credit institutions, insurance, business services, and rental activities. From 1990 onward, the historical national-source construction is replaced by harmonized series constructed from the underlying ECB issuer-sector data. NFC corresponds to ECB sector 1100; FC combines sectors 1220 and 1235; TC is constructed as NFC plus FC; and GOV corresponds to central government sector 1311. Monthly ECB gross issuance is aggregated to annual frequency by summing the twelve monthly observations.

6.5.4 Canada

Table 8: Source construction for Canada: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1904–1937	<i>Canada Year Book</i> , various editions	Dominion government bonds.	The Dominion government category is assigned to GOV. From 1934, the source notes that the Dominion series includes also Treasury-bill financing.
GOV	Gross issues	1938–1947	<i>Canada Year Book</i> , various editions	Federal government bonds.	The reported Federal bond-issue series is used as published. The source explicitly excludes Treasury bills and other financing with a maturity of less than one year. These instruments cannot be added separately from the available source material.
GOV	Gross issues	1948–1958	<i>Canada Year Book</i> , various editions	Federal government bonds.	The reported Federal government bond-issue series is used as published.
GOV	Gross issues	1959–1964	Bank of Canada, <i>Statistical Summary</i>	Government of Canada direct and guaranteed bonds; gross new issues delivered.	The baseline switches to the Bank of Canada series on gross new issues delivered. The reported total across domestic and foreign placements is used. The switch in 1959 is retained as a source and definition break rather than mechanically adjusted to the preceding <i>Canada Year Book</i> series.
GOV	Gross issues	1965–1973	—	—	No observations are available in the archival material underlying the country file. These years are left missing and no interpolation is applied.
GOV	Gross issues	1974–2017	Bank of Canada, <i>Statistical Summaries</i> and <i>Banking and Financial Statistics</i> , various editions	Government of Canada direct and guaranteed bonds; gross new issues delivered.	The reported total is used.
TC	Gross issues	1904–1935	<i>Canada Year Book</i> , various editions	Railway bonds; corporation bonds.	Total corporate issuance is constructed as the sum of railway and corporation bond issuance.
TC	Gross issues	1936–1958	<i>Canada Year Book</i> , various editions	Corporation bonds.	From 1936, the source no longer reports railways as a separate class and notes that remaining railway bond issues are included under “Corporation.” The reported corporation aggregate is therefore used as TC.

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Table 8: Source construction for Canada: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
TC	Gross issues	1959–1973	Bank of Canada, <i>Statistical Summaries</i> , various editions	Corporate bonds; gross new issues delivered.	The baseline switches to the Bank of Canada series on corporate gross new issues delivered. The reported total is used.
TC	Gross issues	1974–2000	Bank of Canada, archival <i>Statistical Summaries</i> , various editions	Corporate bonds; gross new issues delivered.	The reported total is used, including foreign placements where they are included in the published total.
TC	Gross issues	2001–2017	Bank of Canada, <i>Banking and Financial Statistics</i> , Table F9	Corporate bonds; gross new issues delivered.	The reported total is used.

Notes. Canada provides long-run gross issuance series for the federal government and the total corporate sector. GOV refers to the federal Government of Canada; provincial and municipal bond issues are excluded. Railway issues are included in TC when reported separately and, from 1936, are incorporated in the source’s broader corporation category. In 1959, the construction switches from the *Canada Year Book* series to Bank of Canada statistics on gross new issues delivered. The source switch is retained without a mechanical level adjustment. Instrument coverage follows the categories reported in the underlying historical sources. In particular, the Dominion government series includes Treasury-bill financing from 1934, while the Federal bond series for 1938–1947 explicitly excludes Treasury bills, deposit certificates, and other financing with maturity below one year.

6.5.5 Denmark

Table 9: Source construction for Denmark: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1957–1996	Danmarks Nationalbank, <i>Reports and Accounts</i> , various editions	Government paper payable in Danish kroner.	GOV follows the gross-issuance series reported by Danmarks Nationalbank for government paper payable in Danish kroner.
TC	Gross issues	1957–1970	Danmarks Nationalbank, <i>Reports and Accounts</i> , various editions	Mortgage-credit bonds; special-series bonds issued by the Ship Credit Fund; other bonds.	TC is constructed as the sum of the reported non-government bond categories. Mortgage-credit bonds constitute the largest component. “Other bonds” capture the remaining non-government bond issues reported by the source. The Ship Credit Fund was established in 1961; no separate gross issuance from the Fund is present before its establishment, and the category enters the aggregate when gross issues are first reported.
TC	Gross issues	1971–1995	Danmarks Nationalbank, <i>Reports and Accounts</i> , various editions	Mortgage-credit bonds; special-series bonds issued by the Ship Credit Fund; other bonds.	TC continues to be constructed as the sum of mortgage-credit bond issuance, bonds issued in special series by the Ship Credit Fund, and other bond issuance. A change in the presentation of mortgage-credit institutions around 1971 reorganizes the underlying mortgage categories, but the broader mortgage-credit aggregate is retained consistently for the construction of TC.
TC	Gross issues	1996	Danmarks Nationalbank, <i>Reports and Accounts</i>	Mortgage-credit bonds; other bonds.	The Ship Credit Fund is no longer reported as a separate issuance category in the source. TC therefore follows the revised source presentation and is constructed as mortgage-credit bond issuance plus other bond issuance.

Notes. The Danish historical statistics do not provide a sufficiently consistent issuer decomposition to construct separate NFC and FC gross-issuance series. The final dataset therefore uses GOV and a broader total-corporate/non-government bond aggregate only. TC is constructed directly from the non-government bond categories reported by Danmarks Nationalbank rather than by assigning each underlying issuer to a modern institutional sector. In particular, the aggregate contains the large Danish mortgage-credit bond

market, bonds issued by the Ship Credit Fund when separately reported, and a residual “other bonds” category. The latter is retained because its underlying issuers cannot be divided consistently into financial and non-financial corporations over the full sample. The Ship Credit Fund was established in 1961 and subsequently appears as a separate bond-issuance category; by 1996 it is no longer separately reported. The historical source explicitly restricts the government gross-issuance series to paper payable in Danish kroner. This source definition is preserved and documented.

6.5.6 Finland

Table 10: Source construction for Finland: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1938, 1945	<i>Statistical Yearbook of Finland</i> , retrospective bond-loan tables	State, sales of bonds in marks.	Isolated historical gross-issuance observations are available for 1938 and 1945 and are retained. GOV corresponds to the State category; municipal and parish issuance is excluded.
NFC	Gross issues	1938, 1945	<i>Statistical Yearbook of Finland</i> , various editions, retrospective bond-loan tables	Other issuers.	The source's residual "Other" issuer category is assigned to NFC. In 1945 the source reports no sales for this category and the observation is coded as zero. Other pre-1950 years for which gross issues are not reported are left missing.
FC	Gross issues	1938, 1945	<i>Statistical Yearbook of Finland</i> , various editions, retrospective bond-loan tables	Credit institutions.	FC corresponds to bond sales by credit institutions. In 1945 the source reports no issuance for this category and the observation is coded as zero.
TC	Gross issues	1938, 1945	<i>Statistical Yearbook of Finland</i> , various editions, retrospective bond-loan tables	Other issuers; credit institutions.	TC is constructed as NFC plus FC.
GOV	Gross issues	1950–1982	<i>Statistical Yearbook of Finland</i> , various editions	State, sales of markka-denominated bonds.	GOV uses the reported State gross bond-sales series. Municipal and parish bonds are excluded. The historical source excludes the Treasury Bond Loan of 1953 and indemnity bonds distributed by the State. For 1982–1987 the later source classification includes Treasury notes, creating a documented change in instrument coverage.

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Table 10: Source construction for Finland: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
NFC	Gross issues	1950–1982	<i>Statistical Yearbook of Finland</i> , various editions; underlying source Bank of Finland	Other issuers.	The source reports gross bond sales for the State, municipalities and parishes, credit institutions, and “Others.” The “Others” category is used as the gross-issuance counterpart of the harmonized Industry And Other NFC series. This interpretation is supported by the historical outstanding-amount tables, which separately identify industrial corporations and other issuers while also reporting credit institutions as a distinct financial category, and by clarification from the Bank of Finland that the “Others” category includes non-financial corporations.
FC	Gross issues	1950–1982	<i>Statistical Yearbook of Finland</i> , various editions; underlying source Bank of Finland	Credit institutions.	FC corresponds directly to gross bond sales by credit institutions.
TC	Gross issues	1950–1982	<i>Statistical Yearbook of Finland</i> , various editions; underlying source Bank of Finland	Credit institutions; other issuers.	TC is constructed as the sum of FC and the harmonized NFC proxy based on the source’s “Others” category. Municipal and parish issuance is excluded.
GOV	Gross issues	1983–1989	<i>Statistical Yearbook of Finland</i> , various editions; underlying source Bank of Finland	Central government, total issues.	From 1983 the source reorganizes bond statistics by main institutional sector. GOV uses total central-government issues, combining public issues and private placements. The source notes that Treasury notes are included during 1982–1987.
NFC	Gross issues	1983–1989	<i>Statistical Yearbook of Finland</i> , various editions; underlying source Bank of Finland	Enterprises, total issues.	NFC uses total bond issues by enterprises, defined as the sum of public issues and private placements.
FC	Gross issues	1983–1989	<i>Statistical Yearbook of Finland</i> , various editions; underlying source Bank of Finland	Financial institutions, total issues.	FC uses total bond issues by financial institutions, combining public issues and private placements.

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Table 10: Source construction for Finland: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
TC	Gross issues	1983–1989	<i>Statistical Yearbook of Finland</i> , various editions; underlying source Bank of Finland	Enterprises; financial institutions.	TC is constructed as NFC plus FC. The transition from the earlier “credit institutions” and “other issuers” classification to explicit enterprises and financial institutions in 1983 produces a substantial level break, which is retained rather than mechanically adjusted.
GOV	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Central government (ECB sector 1311), debt securities.	GOV is constructed from the underlying ECB central-government debt-security series. Monthly gross issuance is summed to annual frequency.
NFC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Non-financial corporations (ECB sector 1100), debt securities.	NFC is constructed from the ECB non-financial-corporation issuer-sector series. Monthly gross issuance is summed to annual frequency.
FC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Banks (ECB sector 1220) and other financial institutions (ECB sector 1235).	FC is a harmonized aggregate constructed for this dataset rather than a directly reported ECB series. It combines debt-security issuance by banks (sector 1220, instrument F33000) with long-term debt-security issuance by other financial institutions (sector 1235, instrument F33200).
TC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Constructed NFC and FC aggregates.	TC is constructed as the sum of the harmonized ECB-based NFC and FC gross-issuance series.

Notes. For Finland, older source tables separately report industrial corporations, other issuers, and credit institutions. For the harmonized series, industrial corporations and other issuers are combined into an “Industry and Other” category, which provides the closest historical counterpart to the NFC sector. For gross issuance, however, the corresponding historical tables report only the broader residual category “Others” alongside credit institutions. This category is therefore used as the gross-issuance NFC proxy; clarification from the Bank of Finland confirms that it includes non-financial corporations. A substantial reporting break occurs in 1983. From that year onward, the source explicitly distinguishes enterprises and financial institutions and reports both public issues and private placements. The resulting increase in measured NFC and TC issuance is therefore treated as a source and coverage break rather than mechanically adjusted. The post-1983 enterprise category replaces the earlier historical proxy based on “Others.”

From 1990 onward, the national historical construction is replaced by harmonized series constructed from the underlying ECB issuer-sector data despite the large level difference in the overlap with the Finnish historical source. NFC corresponds to ECB sector 1100; FC combines sectors 1220 and 1235; TC is constructed as NFC plus FC; and GOV corresponds to central government sector 1311. Monthly ECB gross issuance is aggregated to annual frequency by summing the twelve monthly observations.

6.5.7 Germany

Table 11: Source construction for Germany: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Central government (ECB sector 1311), debt securities.	GOV is constructed from the ECB central-government debt-security series. Monthly gross issuance is summed to annual frequency.
NFC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Non-financial corporations (ECB sector 1100), debt securities.	NFC is constructed directly from the ECB non-financial-corporation issuer-sector series. Monthly gross issuance is summed to annual frequency.
FC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Banks (ECB sector 1220) and other financial institutions (ECB sector 1235).	FC is a harmonized aggregate constructed for this dataset rather than a directly reported ECB series. It combines debt-security issuance by banks (sector 1220, instrument F33000) with long-term debt-security issuance by other financial institutions (sector 1235, instrument F33200).
TC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Constructed NFC and FC aggregates.	TC is constructed as the sum of the harmonized NFC and FC gross-issuance series.

Notes. The current German series relies on ECB Securities Issues Statistics from 1990 onward. The sector aggregates used in the dataset are constructed from the underlying ECB issuer-sector series rather than taken from pre-assembled ECB NFC, FC, and TC aggregates. NFC corresponds to ECB sector 1100; FC combines sectors 1220 and 1235; and TC is subsequently constructed as NFC plus FC. Monthly gross issuance is aggregated to annual frequency by summing the twelve monthly observations; years without complete January–December coverage are not retained. Historical German issuance data from the Deutsche Bundesbank and historical compilations by Hoffmann and Rahlf are retained in the underlying country file but are not currently incorporated into the harmonized dataset. Their coverage and definitions do not permit a sufficiently consistent decomposition of corporate issuance into financial and non-financial corporations.

6.5.8 Italy

Table 12: Source construction for Italy: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1931–1936	Banca d'Italia, <i>L'Economia Italiana nel Sessennio 1931–1936</i> , Table XXIX	Stato, nuove emissioni.	The central-government category “Stato” is assigned to GOV. Municipal and provincial issues are excluded. The observation assigned to 1935 requires particular caution: the source reports an aggregate covering operations between June 1934 and December 1936, which is assigned to 1935 in the country file.
NFC	Gross issues	1931–1936	Banca d'Italia, <i>L'Economia Italiana nel Sessennio 1931–1936</i> , p. 178, Table XXIX	Obbligazioni industriali, emesse direttamente, nuove emissioni.	NFC issuance includes industrial bonds issued directly by the underlying industrial entities.
FC	Gross issues	1931–1936	Banca d'Italia, <i>L'Economia Italiana nel Sessennio 1931–1936</i> , p. 178, Table XXIX	Land and building credit institutions; agricultural-improvement credit institutions.	FC issuance is constructed as the sum of bond issues by land and building credit institutions and agricultural-improvement credit institutions.
TC	Gross issues	1931–1936	Banca d'Italia, <i>L'Economia Italiana nel Sessennio 1931–1936</i> , p. 178, Table XXIX	Directly issued industrial bonds; industrial bonds issued through parastatal credit institutions; financial-corporation bond issues.	TC is constructed as the sum of NFC, FC, and industrial bonds reported as issued through parastatal credit institutions. The latter category is retained in TC but is not assigned to either NFC or FC because the source groups together industrial financing undertaken through institutions whose issuer-sector classification is ambiguous for the purposes of the harmonized sector split. Consequently, TC need not equal NFC plus FC during 1931–1936.
GOV	Gross issues	1958–1989	Banca d'Italia, <i>Bollettino Statistico</i> , various editions	Titoli di Stato and underlying government debt-security categories.	The series is constructed from reported gross issues of central-government debt securities. For 1969–1988, ordinary Treasury bills (BOT) are reported separately from the main <i>Titoli di Stato</i> aggregate and are added back. Territorial authorities and public enterprises are not included in GOV.

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Table 12: Source construction for Italy: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
NFC	Gross issues	1958–1989	Banca d'Italia, <i>Bollettino Statistico</i> , various editions	Public non-financial enterprises and private enterprises.	NFC issuance combines bond issues by public non-financial enterprises with those of private enterprises. Public-enterprise categories include the state railway and, depending on the reporting period, ENEL, ENI, IRI/EFIM, and Autostrade IRI.
FC	Gross issues	1958–1968	Banca d'Italia, <i>Bollettino Statistico</i> , various editions	Special credit institutions: mobiliare and immobiliare.	FC issuance is constructed from bond issues of special credit institutions classified as financial intermediaries, principally the <i>istituti speciali mobiliari</i> and <i>istituti speciali immobiliari</i> .
FC	Gross issues	1969–1998	Banca d'Italia, <i>Bollettino Statistico</i> , various editions	Special credit institutions, including public-works, mobiliare, and immobiliare sections.	FC combines the financial-intermediary categories reported in the national source. Banca d'Italia data are retained through 1998 because the ECB sector components used to construct the modern FC aggregate do not provide observations for Italy over 1990–1998.
TC	Gross issues	1958–1989	Banca d'Italia, <i>Bollettino Statistico</i> , various editions	Financial and non-financial corporate bond issuance.	TC is constructed as the sum of the corresponding NFC and FC gross-issuance series.
GOV	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Central government (ECB sector 1311), debt securities.	GOV is constructed from the ECB central-government debt-security series. Monthly gross issuance is summed to annual frequency.
NFC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Non-financial corporations (ECB sector 1100), debt securities.	NFC is constructed from the ECB non-financial-corporation issuer-sector series. Monthly gross issuance is summed to annual frequency.
FC	Gross issues	1999–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Banks (ECB sector 1220) and other financial institutions (ECB sector 1235).	FC is a harmonized aggregate constructed for this dataset rather than a directly reported ECB series. It combines debt-security issuance by banks (sector 1220, instrument F33000) with long-term debt-security issuance by other financial institutions (sector 1235, instrument F33200). The underlying ECB components do not provide usable FC observations for Italy over 1990–1998, so the national Banca d'Italia FC series is retained through 1998.

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Table 12: Source construction for Italy: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
TC	Gross issues	1990–1998	ECB Data Portal and Banca d'Italia	Constructed NFC and FC series.	Because the ECB sector components used to construct FC are unavailable over 1990–1998, TC is constructed as the sum of the final sectoral series: ECB-based NFC gross issuance and the retained Banca d'Italia FC gross-issuance series.
TC	Gross issues	1999–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Constructed NFC and FC aggregates.	TC is constructed as the sum of the harmonized ECB-based NFC and FC gross-issuance series.

Notes. Italian historical data are unavailable in the current country file for 1937–1957 and these years are left missing. For 1931–1936, industrial bonds issued through parastatal credit institutions are retained in TC but excluded from the NFC/FC decomposition because their classification by issuer sector is not sufficiently clear from the source. Hence, TC exceeds NFC plus FC whenever this category has entries. For the modern period, the sector aggregates are constructed from the underlying ECB issuer-sector series rather than taken from pre-assembled ECB NFC, FC, and TC aggregates. NFC corresponds to ECB sector 1100; the constructed FC aggregate combines sectors 1220 and 1235; and TC is constructed from the final NFC and FC series. For Italy, the national Banca d'Italia FC series is retained through 1998 because the ECB components required for the constructed FC aggregate are unavailable before 1999. Monthly ECB gross issuance is aggregated to annual frequency by summing the twelve monthly observations.

6.5.9 India

Table 13: Source construction for India: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
TC	Gross issues	1970–2022	Reserve Bank of India, <i>Handbook of Statistics on the Indian Economy</i> , Table 70, “New Capital Issues by Non-Government Public Limited Companies”; underlying source SEBI	Debentures/Bonds; separately reported Bonds where applicable.	TC follows debt-security issuance by non-government public limited companies. The source’s “Debentures/Bonds” category is used throughout and the separately reported “Bonds” category is added where applicable. In 2007–08, for example, the construction combines both reported debt categories. Source values reported in crore rupees are converted to rupees using 1 crore = 10 ⁷ rupees.

Notes. The Indian series is taken from the Reserve Bank of India’s *Handbook of Statistics on the Indian Economy*, Table 70, which reports new capital issues by non-government public limited companies. The debt component is used as a source-based total-corporate bond-issuance proxy. The source does not provide a sufficiently consistent financial versus non-financial issuer decomposition, and separate NFC and FC series are therefore not constructed. The coverage is determined by the source’s legal and statistical population of non-government public limited companies and should therefore not be interpreted as issuance by all Indian corporations. The time convention changes within the source. Observations through 1980 are reported on a January–December basis, while observations from 1981 onward are reported for April–March fiscal years. Fiscal-year observations are assigned to the calendar year in which the fiscal year begins. Where the source reports a separate “Bonds” category in addition to “Debentures/Bonds”, both debt categories are included.

6.5.10 Japan

Table 14: Source construction for Japan: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1919–1941	Bank of Japan, Institute for Monetary and Economic Studies (IMES), Historical Statistics, “Outstanding Amounts of Government Securities and Corporate Bonds”	Government bonds and other government securities.	Annual gross issuance is constructed by aggregating the monthly issue amounts in the Bank of Japan historical database. The underlying database covers April 1919–December 1941 and reports amounts issued, redeemed, and outstanding separately for government securities and corporate bonds. For 1919 the data starts in April, i.e. it is a partial-year observation, and therefore coded as NA for the final compilation.
FC	Gross issues	1919–1941	Bank of Japan, Institute for Monetary and Economic Studies (IMES), Historical Statistics, “Outstanding Amounts of Government Securities and Corporate Bonds”	Bank bonds.	FC is constructed by summing monthly issues of bank bonds to annual frequency. For 1919 the data starts in April, i.e. it is a partial-year observation, and therefore coded as NA for the final compilation.
NFC	Gross issues	1919–1941	Bank of Japan, Institute for Monetary and Economic Studies (IMES), Historical Statistics, “Outstanding Amounts of Government Securities and Corporate Bonds”	Corporation bonds.	NFC corresponds to the non-bank corporation-bond component of the historical database. Equivalently, it is consistent with the harmonized construction of TC less the separately identified bank-bond component. For 1919 the data starts in April, i.e. it is a partial-year observation, and therefore coded as NA for the final compilation.
TC	Gross issues	1919–1941	Bank of Japan, Institute for Monetary and Economic Studies (IMES), Historical Statistics, “Outstanding Amounts of Government Securities and Corporate Bonds”	Bank bonds and corporation bonds.	TC is constructed as the sum of annualized bank-bond and corporation-bond gross issuance. The underlying monthly data distinguish internal and external bonds; both components are retained where reported. For 1919 the data starts in April, i.e. it is a partial-year observation, and therefore coded as NA for the final compilation.

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Table 14: Source construction for Japan: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1946–1984	Statistics Bureau of Japan, <i>Historical Statistics of Japan</i> , Table 14-22-a	Government bonds and other government securities.	GOV uses the reported total issues of government securities. The historical table is reported on a fiscal-year basis and includes the government-security categories covered by the contemporary source.
FC	Gross issues	1946–1984	Statistics Bureau of Japan, <i>Historical Statistics of Japan</i> , Table 14-23-a	Bank debentures.	Bank debentures are assigned to FC. These are securities issued by specialized financial institutions under the institutional arrangements prevailing in the period.
NFC	Gross issues	1946–1984	Statistics Bureau of Japan, <i>Historical Statistics of Japan</i> , Table 14-23-a	Industrial/corporate bonds.	NFC is constructed as TC minus bank debentures. Over this period this residual corresponds closely to the separately reported industrial/corporate-bond component. Convertible bonds are included within the historical industrial-bond category in years in which the source reports them jointly.
TC	Gross issues	1946–1984	Statistics Bureau of Japan, <i>Historical Statistics of Japan</i> , Table 14-23-a	Bank debentures and industrial/corporate bonds.	TC combines the corporate debt-security categories used for the harmonized private corporate sector. Bonds issued by public corporations and local governments, which are separately identified in the source, are excluded from TC.
GOV	Gross issues	1985–1997	Statistics Bureau of Japan, <i>Historical Statistics of Japan</i> , Table 14-22-b	Government securities, total issues.	GOV follows the source-reported government total. The observations are reported on a fiscal-year basis.
FC	Gross issues	1985–1997	Statistics Bureau of Japan, <i>Historical Statistics of Japan</i> , Table 14-23-b	Bank debentures.	FC corresponds to bank debentures, which the source defines as securities issued by financial institutions authorized to issue such instruments under special legislation.
NFC	Gross issues	1985–1997	Statistics Bureau of Japan, <i>Historical Statistics of Japan</i> , Table 14-23-b	Straight bonds; convertible bonds; bonds with subscription rights.	NFC is constructed residually as TC minus bank debentures. Consequently, the harmonized NFC concept is broader than the source's separately reported "straight bonds" series and also incorporates the other non-bank corporate bond instruments included in TC.

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Table 14: Source construction for Japan: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
TC	Gross issues	1985–1997	Statistics Bureau of Japan, <i>Historical Statistics of Japan</i> , Table 14-23-b	Bank debentures; straight bonds; convertible bonds; bonds with subscription rights.	TC is constructed from the corporate debt-security categories reported by the source. Yen-denominated bonds issued by non-residents are excluded and retained separately in the country file.
GOV	Gross issues	1998–2018	Japan Securities Dealers Association (JSDA), <i>Issuing, Redemption and Outstanding Amounts of Bonds</i>	Government bonds.	GOV uses the JSDA government-bond issuance aggregate. The JSDA definition includes government bonds issued through the market and through designated public-sector subscriptions, subject to the instrument exclusions specified in the source documentation.
FC	Gross issues	1998–2018	Japan Securities Dealers Association (JSDA), <i>Issuing, Redemption and Outstanding Amounts of Bonds</i>	Bank debentures.	The separately reported bank-debenture series is retained as the historical FC proxy. This is not an exhaustive institutional-sector measure of all financial-corporation bond issuance: under the JSDA classification, some straight bonds issued by banks are included within the broader corporate-bond category.
NFC	Gross issues	1998–2018	Japan Securities Dealers Association (JSDA), <i>Issuing, Redemption and Outstanding Amounts of Bonds</i>	Corporate straight bonds.	The JSDA corporate-bond series is used as the closest available NFC proxy after the source transition. The classification is not identical to a modern institutional-sector NFC concept: JSDA corporate straight bonds may include bonds issued by banks as well as selected public or quasi-public corporations. The resulting series is therefore interpreted as a source-based proxy rather than an exact NFC sector aggregate.
TC	Gross issues	1998–2018	Japan Securities Dealers Association (JSDA), <i>Issuing, Redemption and Outstanding Amounts of Bonds</i>	Corporate bonds, asset-backed bonds, convertible bonds, privately placed corporate bonds, and bank debentures.	TC retains the broader corporate debt-security universe available in the JSDA statistics. Consequently, during the JSDA period TC need not equal the sum of the narrower NFC proxy and bank debentures.
GOV	Gross issues	2020–2024	Japan Securities Dealers Association (JSDA), <i>Issuing, Redemption and Outstanding Amounts of Bonds</i>	Government bonds.	The same JSDA construction is continued using the later source vintage.

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Table 14: Source construction for Japan: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
FC	Gross issues	2020–2024	Japan Securities Dealers Association (JSDA), <i>Issuing, Redemption and Outstanding Amounts of Bonds</i>	Bank debentures.	The JSDA bank-debenture series is retained as the FC proxy.
NFC	Gross issues	2020–2024	Japan Securities Dealers Association (JSDA), <i>Issuing, Redemption and Outstanding Amounts of Bonds</i>	Corporate straight bonds.	The JSDA corporate-bond series is retained as the NFC proxy, subject to the same institutional-classification limitation as in 1998–2018.
TC	Gross issues	2020–2024	Japan Securities Dealers Association (JSDA), <i>Issuing, Redemption and Outstanding Amounts of Bonds</i>	Corporate debt-security categories and bank debentures.	TC follows the same broad JSDA corporate debt-security construction as in 1998–2018.

Notes. For 1919–1941, the pre-war series are constructed from the Bank of Japan IMES Historical Statistics database. The annual gross-issuance series are obtained by summing the monthly issue flows. The database begins in April 1919 and runs through December 1941. Its underlying source is the Bank of Japan Research Department’s *Statistics of Loans and Debentures*, subsequently published under several revised titles. Through 1997, the corporate-sector split is constructed from a broad TC aggregate and the separately identifiable bank-debenture series. FC is assigned to bank debentures and NFC is obtained residually as TC minus FC. For 1946–1984 this residual is close to the source’s industrial/corporate-bond category. From 1985, the broader TC aggregate additionally contains several corporate instruments, including straight bonds and convertible bonds. A more substantial classification break occurs with the switch to JSDA statistics in 1998. JSDA categories are organized primarily by security type rather than by institutional sector. In particular, “Corporate Straight Bonds” may include straight bonds issued by banks, while “Bank Debentures” cover a specific class of securities issued by designated financial institutions. The post-1998 NFC and FC series should therefore be interpreted as source-based sector proxies given source limitations. TC is broader and includes additional corporate debt instruments such as asset-backed and convertible bonds and, where covered by the source, privately placed corporate bonds. These classification differences are retained and documented. The change in statistical source and classification in 1998 is therefore treated as a source break. Yen-denominated bonds issued by non-residents are excluded from the domestic corporate aggregates. Observations for 1942–1945 and

2019 are left missing due to source limitations.

6.5.11 South Korea

Table 15: Source construction for South Korea: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1977–2004	Bank of Korea, <i>Economic Statistics Yearbook</i> , various editions	Treasury bonds.	The baseline GOV series uses gross issuance of Treasury bonds. Other public-sector securities reported separately by the Bank of Korea are not added to the baseline series. Where a sufficiently comparable Treasury-bond observation is unavailable in the historical source, the observation is left missing rather than reconstructed.
GOV	Gross issues	2005–2024	Bank of Korea statistical database	Treasury bonds.	The historical Treasury-bond series is continued using the corresponding modern Bank of Korea series.
TC	Gross issues	1977–1992	Bank of Korea, <i>Economic Statistics Yearbook</i> , various editions	Corporate bonds.	TC follows the source-reported “Corporate bonds” series. The source separately reports several financial-institution debt instruments, including Industrial Finance Debentures and, in some vintages, Foreign Exchange and Long-term Credit Debentures. The historical “Corporate bonds” category should therefore not be interpreted as an exhaustive institutional-sector aggregate of NFC and FC issuance.
TC	Gross issues	1993–2024	Bank of Korea, <i>Economic Statistics Yearbook</i> and data supplied by the Bank of Korea	Corporate bonds: non-financial firms, non-bank financial institutions, and, from 2000, asset-backed securities.	The series extends the historical Bank of Korea Statistical Yearbook concept. Bank of Korea clarification confirms that this aggregate excludes bonds issued by banks. From 2000 onward it includes asset-backed securities issued by either NFCs or FCs. A separate broader series supplied by the Bank of Korea includes bank bond issuance, but is not used for the long-run TC series in order to preserve continuity with the historical Yearbook definition.
NFC	Gross issues	1993–2024	Bank of Korea, data supplied upon request	Bonds issued by non-financial firms.	NFC is taken directly from the sector-specific series supplied by the Bank of Korea. This is preferred to treating the broader source category “Corporate bonds” as equivalent to NFC issuance.

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Table 15: Source construction for South Korea: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
FC excluding banks	Gross issues	2000–2024	Bank of Korea, data supplied upon request	Bonds issued by financial institutions excluding banks.	The series identifies bond issuance by non-bank financial corporations separately from NFC issuance. It is retained as an intermediate component for constructing the harmonized FC aggregate once bank issuance also becomes available.
Banks	Gross issues	2008–2024	Bank of Korea, data supplied upon request	Bonds issued by banks.	Bank bond issuance becomes separately available in the supplied sectoral series from 2008.
FC	Gross issues	2008–2024	Bank of Korea, data supplied upon request	Financial institutions excluding banks.	The harmonized FC series is constructed as the sum of bond issuance by financial institutions excluding banks and bond issuance by banks. Earlier observations are not backcast because a complete financial-sector decomposition is not available.
Auxiliary FC	Gross issues	1977–2024	Bank of Korea, <i>Economic Statistics Yearbook</i> and modern statistical database	Industrial Finance Debentures.	Industrial Finance Debentures are issued by the Korea Development Bank (KDB). Following clarification from the Bank of Korea, they are classified as financial-sector securities. Although KDB is government-owned, these debentures are not treated as central-government debt. The series is retained separately and is not interpreted as an exhaustive measure of historical FC bond issuance.

Notes. The Korean bond statistics contain several categories whose definitions do not map directly into the harmonized institutional sectors used elsewhere. The TC series follows the Bank of Korea’s historical “Corporate bonds” aggregate. Bank of Korea clarification indicates that this aggregate should not be equated with either NFC issuance or with a complete NFC-plus-FC sector. The corresponding Statistical Yearbook concept covers bonds issued by non-financial firms and non-bank financial institutions and, from 2000 onward, includes asset-backed securities that may be issued by either NFCs or FCs. Bank bond issuance are only available after 2007.

Bank of Korea clarification provided with the post-1992 data establishes that the Statistical Yearbook “Corporate bonds” concept excludes banks: it comprises issuance by non-financial firms and financial institutions excluding banks and, from 2000 onward, asset-backed securities issued by either NFCs or FCs. A separate series supplied by the Bank of Korea includes bank issuance. This precise decomposition is documented for the modern continuation; for the earlier historical observations, the Yearbooks separately

report several financial-institution debenture categories, so the “Corporate bonds” series is likewise not interpreted as an exhaustive NFC-plus-FC aggregate.

Industrial Finance Debentures are reported separately over a much longer period. According to clarification provided by the Bank of Korea, these securities are issued by the Korea Development Bank to finance industrial development and are appropriately classified with financial corporations. The baseline GOV series is deliberately narrower than the full set of Korean public-sector securities and consists of Treasury bonds. Bank of Korea clarification identifies Grain Securities, National Housing Bonds, Foreign Exchange Stabilization Fund Bonds, and Seoul Metropolitan Subway Bonds as additional public-sector securities. These categories are retained separately in the underlying country file but are not added to the baseline GOV series. Monetary Stabilization Bonds are issued by the Bank of Korea for monetary-policy operations and are excluded from both GOV and the corporate aggregates.

6.5.12 Spain

Table 16: Source construction for Spain: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
TC	Gross issues	1954–1961	Banco de España, <i>Boletín Estadístico</i> , December 1965, Table VI-2	Private issues: bonds (<i>Emisiones privadas: Obligaciones</i>).	TC follows the source-reported aggregate of private bond issues, reported in effective amounts. The underlying table does not provide a sufficiently consistent issuer-sector decomposition for constructing separate NFC and FC series over these years. NFC and FC are therefore left unavailable rather than allocated retrospectively.
GOV	Gross issues	1954–1961	Banco de España, <i>Boletín Estadístico</i> , December 1965, Table VI-2	Central administration (<i>Administración central</i>).	GOV corresponds to gross public bond issuance by the central administration. INI, other official bodies, municipalities and provincial authorities, and official credit institutions are separately reported by the source and are excluded from GOV. Source-reported absence of central-government issuance in 1958 and 1959 is retained as zero.
NFC	Gross issues	1962–1964	Banco de España, <i>Boletín Estadístico</i> , December 1975, Tables VI-1 and VI-3	Private non-financial corporations; Instituto Nacional de Industria (INI).	NFC is constructed as the sum of gross bond issuance by private non-financial corporations and separately reported INI issuance. INI is classified as a public non-financial enterprise rather than central government. This provides a broader NFC concept than the private-sector series alone.
FC	Gross issues	1962–1989	Banco de España, <i>Mercado de Valores: Instituciones Financieras, Renta Fija, Series Históricas 1962–1982</i> , Table VI-5; subsequent <i>Boletines Estadísticos</i>	Financial institutions (<i>Instituciones financieras</i>).	FC follows the source-reported gross issuance of financial institutions. The underlying historical tables distinguish the credit system from other financial institutions, including mortgage-credit institutions where separately reported; the published financial-institution total is used.
NFC	Gross issues	1965–1989	Banco de España, <i>Boletín Estadístico</i> , historical and subsequent editions	Non-financial enterprises, total sector.	NFC follows the broader Banco de España aggregate for non-financial enterprises. The series incorporates the relevant public non-financial enterprises, including INI, so INI issuance is not added separately to avoid double counting.

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Table 16: Source construction for Spain: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
TC	Gross issues	1962–1989	Banco de España, historical securities-market statistics and subsequent <i>Boletines Estadísticos</i>	Harmonized NFC and FC components.	TC is constructed as the sum of NFC and FC. The expansion from the pre-1962 private-issues aggregate to separately identified non-financial and financial issuer sectors produces a pronounced coverage break in 1962, which is retained rather than adjusted.
GOV	Gross issues	1962–1989	Banco de España, <i>Mercado de Valores: Administraciones Públicas, Series Históricas 1962–1981</i> , Document No. 8212, Table VI-1; subsequent <i>Boletines Estadísticos</i>	State, negotiable debt (<i>Estado: emisiones de deudas negociables</i>).	GOV uses gross issues of negotiable debt by the State. The State category is interpreted as central government. Other public administrations and public-sector institutions are excluded. The historical series is deliberately restricted to negotiable debt; separately reported non-negotiable liabilities are not added.
INI	Gross issues	1962–1997	Banco de España, historical securities-market tables and subsequent <i>Boletines Estadísticos</i>	Instituto Nacional de Industria.	INI issuance is retained separately as an auxiliary public-enterprise series. It enters the harmonized NFC construction only where NFC must be reconstructed from components; once the source provides a comprehensive non-financial-enterprise total, it is not added separately. Source-reported zeros at the end of the series are retained as genuine zeros.
GOV	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Central government (ECB sector 1311), debt securities.	GOV is constructed from the underlying ECB central-government debt-security series. Monthly gross issuance is summed to annual frequency.
NFC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Non-financial corporations (ECB sector 1100), debt securities.	NFC is constructed from the ECB non-financial-corporation issuer-sector series. Monthly gross issuance is summed to annual frequency.
FC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Banks (ECB sector 1220) and other financial institutions (ECB sector 1235).	FC is a harmonized aggregate constructed for this dataset rather than a directly reported ECB series. It combines debt-security issuance by banks (sector 1220, instrument F33000) with long-term debt-security issuance by other financial institutions (sector 1235, instrument F33200).
TC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Constructed NFC and FC aggregates.	TC is constructed as the sum of the harmonized ECB-based NFC and FC gross-issuance series.

Notes. For 1954–1961, the source reports an aggregate of private bond issues but does not provide a sufficient decomposition to construct separate NFC and FC series. TC is therefore retained directly from the source while the sectoral series remain unavailable. A substantial reporting change occurs in 1962, when securities issuance becomes available by institutional issuer category. From this point onward TC is constructed as sum of NFC and FC.

For 1962–1964, private non-financial-corporation bond issuance is reported separately from issuance by the Instituto Nacional de Industria (INI). NFC is therefore constructed as the sum of these two components. INI is treated as a public non-financial enterprise. From 1965 onward, Banco de España reports a broader non-financial-enterprise aggregate that already incorporates the relevant public enterprises; the total is used directly and INI is not added again.

The financial-sector series begins in 1962. Banco de España’s historical financial-institution tables distinguish the credit system and other financial institutions and report a corresponding gross-issuance total. This source-defined financial-institution aggregate is used as FC.

The government construction is restricted throughout to central government. In the earlier public-issues tables, *Administración central* is explicitly distinguished from INI, other official bodies, municipalities and provincial authorities, and official credit institutions. From 1962 onward the corresponding concept is the *Estado* series for negotiable government debt.

A major source and coverage break occurs in 1990. The final dataset deliberately switches from the historical Banco de España securities-market series to harmonized ECB Securities Issues Statistics. The ECB debt-securities framework has a substantially broader instrument and issuer coverage, producing a large level increase relative to the national historical series in the overlap. The overlap is therefore not used to level-adjust or mechanically splice the two series. For the ECB data, NFC corresponds to sector 1100; FC combines sectors 1220 and 1235; GOV corresponds to central government sector 1311; and TC is constructed as sum of NFC and FC. Monthly ECB gross issuance is summed to calendar-year frequency.

6.5.13 Netherlands

Table 17: Source construction for the Netherlands: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1914–1918	<i>Jaarcijfers voor Nederland</i> , various editions	Dutch state loans (<i>Ned. Staatsschuld</i>).	GOV uses the separately reported Dutch state-loan category. Provincial and municipal issues are excluded.
GOV	Gross issues	1919–1936	<i>Jaarcijfers voor Nederland</i> , various editions	Netherlands and Netherlands Indies state loans (<i>Ned. en N.-I. Staatsleeningen</i>).	The historical source reports Netherlands and Netherlands Indies state loans jointly. The reported aggregate is retained because the two components cannot be separated consistently. Provincial and municipal bonds are excluded.
GOV	Gross issues	1937–1940	<i>Jaarcijfers voor Nederland</i> , various editions	State of the Netherlands (<i>Staat der Nederlanden</i>).	GOV follows the source's revised state-loan category. Provincial, municipal and water-board bonds are excluded.
FC	Gross issues	1914–1940	<i>Jaarcijfers voor Nederland</i> , various editions	Bank and credit-institution bonds; mortgage-bank <i>pandbrieven</i> .	FC is constructed as the sum of bonds issued by banks and credit institutions and mortgage-bank <i>pandbrieven</i> . The terminology changes slightly across successive editions, but these two financial issuer groups can be identified throughout the pre-war sample.
NFC	Gross issues	1914–1940	<i>Jaarcijfers voor Nederland</i> , various editions	Industry; trade; mining; petroleum; shipping; railways and tramways; cultivation companies and, where separately reported, rubber, sugar, tobacco, tea and other cultivation companies.	NFC is constructed by summing all separately identifiable non-financial corporate issuer categories. The precise disaggregation varies across source vintages. Railways and tramways are included in NFC and are also retained separately in the country file as an auxiliary series.
TC	Gross issues	1914–1940	<i>Jaarcijfers voor Nederland</i> , various editions	FC and NFC categories; miscellaneous bonds (<i>Diverse/Diversen obligatiën</i>).	TC includes all identified financial and non-financial corporate bond categories as well as the source's residual "miscellaneous bonds" category. Because the latter cannot be assigned reliably to FC or NFC, TC can exceed FC+NFC. The residual category is retained in TC rather than allocated mechanically to either sector.
GOV	Gross issues	1952–1980	Centraal Bureau voor de Statistiek (CBS), <i>Statistisch zakboek</i> , various editions	State loans (<i>Rijk/Staatsleeningen</i>).	GOV uses central/state government bond issuance. Provinces, municipalities, polders, water boards and other public-law bodies are excluded from the baseline GOV series.

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Table 17: Source construction for the Netherlands: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
FC	Gross issues	1952–1957	CBS, <i>Statistisch zakboek</i> , various editions	Banking and lending institutions.	The earliest post-war FC observations use the consistently identifiable banking and lending-institution category available in the source. Other financial subcategories are not sufficiently consistently reported over these first years to construct the later broader financial-sector aggregate.
FC	Gross issues	1958–1967	CBS, <i>Statistisch zakboek</i> , various editions	Banking, credit and insurance services (<i>Bank-, krediet- en verzekeringswezen</i>).	FC uses the source-reported aggregate for banking, credit and insurance activities. Where Bank voor Nederlandsche Gemeenten is already contained as a subcategory of this aggregate, it is not added separately, avoiding double counting.
FC	Gross issues	1968–1980	CBS, <i>Statistisch zakboek</i> , various editions	Banking, credit and insurance services; Bank voor Nederlandsche Gemeenten / Nederlandse Waterschapsbank; real-estate funds.	FC combines the source's banking, credit and insurance aggregate with Bank voor Nederlandsche Gemeenten and, subsequently, Nederlandse Waterschapsbank when these institutions are reported separately from the financial aggregate. Real-estate funds (<i>Vastgoedfondsen</i>) are also assigned to FC where separately reported. The treatment therefore follows the changing source presentation while avoiding double counting when the public-sector banks are already included within the broader financial category.
NFC	Gross issues	1952–1954	CBS, <i>Statistisch zakboek</i> , various editions	Trade; industry; electricity, gas and water; mining; petroleum; shipping; railways and tramways; religious and charitable institutions; sugar where separately reported.	NFC is constructed by summing the separately reported non-financial private issuer categories. Polders and water boards, which appeared in an earlier working construction, are excluded because they are public-law bodies rather than corporations.
NFC	Gross issues	1955–1956	CBS, <i>Statistisch zakboek</i> , various editions	Industry; trade; electricity, gas and water; cultures; shipping and air transport; railways and tramways; mining; religious and charitable institutions.	The components are summed to obtain a broad private non-financial issuer aggregate. The available sector detail varies with the source table.

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Table 17: Source construction for the Netherlands: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
NFC	Gross issues	1957–1960	CBS, <i>Statistisch zakboek</i> , various editions	Trade, industry and miscellaneous; cultures; shipping and air transport; railways and tramways; mining and petroleum; religious and charitable institutions.	NFC is constructed from the broader trade/industry/miscellaneous aggregate plus the separately reported non-financial issuer categories. Components already contained in the broader aggregate are not added separately.
NFC	Gross issues	1961–1962	CBS, <i>Statistisch zakboek</i> , various editions	Trade, industry and miscellaneous; shipping and air transport; railways and tramways; religious and charitable institutions.	The construction follows the sector detail available in these editions; categories not separately reported are not imputed.
NFC	Gross issues	1963–1969	CBS, <i>Statistisch zakboek</i> , various editions	Trade, industry and miscellaneous; cultures; shipping and air transport; railways and tramways; mining and petroleum; religious and charitable institutions.	NFC is the sum of the corresponding source categories. This remains a broad historical private non-financial issuer concept rather than a retrospective ESA-sector classification.
NFC	Gross issues	1970–1980	CBS, <i>Statistisch zakboek</i> , various editions	Trade, industry and miscellaneous; cultures; shipping and air transport; railways and tramways; mining and petroleum; health care and related institutions.	From 1970, the earlier religious/charitable category is replaced by the source's health-care and related-institutions category. Real-estate funds are not included in NFC and are instead assigned to FC. The remaining source categories are summed to form NFC.
TC	Gross issues	1952–1980	CBS, <i>Statistisch zakboek</i> , various editions	Harmonized FC and NFC components.	TC is constructed as FC+NFC. Provincial and municipal bodies, polders and water boards, and foreign issuers are excluded.
GOV	Gross issues	1981–1989	CBS statistical yearbooks, various editions	Government bonds (<i>Overheid: obligaties</i>).	A new source presentation begins in 1981. GOV follows the source-reported government-bond category.
FC	Gross issues	1981–1989	CBS statistical yearbooks, various editions	Financial institutions: ordinary bonds, subordinated bonds and <i>pandbrieven</i> ; banks for lower government.	FC is constructed as the sum of ordinary bonds, subordinated bonds and <i>pandbrieven</i> issued by financial institutions, plus bonds issued by the separately reported “banks for lower government” category.
NFC	Gross issues	1981–1989	CBS statistical yearbooks, various editions	Other private sector: ordinary bonds and subordinated bonds.	NFC is constructed as the sum of ordinary and subordinated bond issuance reported for the “other private sector” (<i>Overige private sector</i>).
TC	Gross issues	1981–1989	CBS statistical yearbooks, various editions	Harmonized FC and NFC components.	TC is constructed as FC+NFC. The change in source presentation in 1981 is retained rather than retrospectively reallocating the earlier detailed categories.

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Table 17: Source construction for the Netherlands: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Central government (ECB sector 1311), debt securities.	GOV is constructed from the underlying ECB central-government debt-security series. Monthly gross issuance is summed to annual frequency.
NFC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Non-financial corporations (ECB sector 1100), debt securities.	NFC is constructed from the ECB non-financial-corporation issuer-sector series. Monthly gross issuance is summed to annual frequency.
FC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Banks (ECB sector 1220) and other financial institutions (ECB sector 1235).	FC is a harmonized aggregate constructed for this dataset rather than a directly reported ECB series. It combines debt-security issuance by banks (sector 1220, instrument F33000) with long-term debt-security issuance by other financial institutions (sector 1235, instrument F33200).
TC	Gross issues	1990–2021	European Central Bank, Securities Issues Statistics, ECB Data Portal	Constructed NFC and FC aggregates.	TC is constructed as the sum of the harmonized ECB-based NFC and FC gross-issuance series.

Notes. The Dutch historical construction relies on unusually detailed issuer classifications, rather than imposing a single modern institutional classification retrospectively, the construction maps the source categories into the closest consistent GOV, FC, NFC and TC concepts. For 1914–1940, the data are compiled from successive editions of *Jaarcijfers voor Nederland*. FC consists of bank and credit-institution bonds and mortgage-bank *pandbrieven*. NFC combines the identifiable non-financial issuer categories, including industrial, commercial, extractive, transport and colonial cultivation enterprises. A residual “miscellaneous bonds” category is retained in TC but not assigned to either FC or NFC. Consequently, pre-war TC can exceed the sum of FC and NFC. From 1919 through the mid-1930s, government bond statistics jointly report the Netherlands and Netherlands Indies. No annual gross-issuance series is currently available for 1941–1951, coded as NA. For 1952–1980, the exact set of categories changes repeatedly. The NFC series therefore sums the non-financial private issuer categories available in each source vintage. In the early post-war tables these include combinations of trade, industry, utilities, mining and petroleum, shipping, railways, cultivation activities, and religious/charitable institutions. The latter are retained because the historical category combines private non-commercial and health-related institutions that cannot be separated consistently. From 1970 the source instead identifies health care and related institutions more directly.

For financial issuers, Bank voor Nederlandsche Gemeenten, and later Nederlandse Waterschapsbank, can either appear inside the broader banking/credit/insurance category or as separately reported issuers. They are classified with FC because they operate as financial intermediaries. They are added separately only when they are not already contained in the reported financial aggregate. Real-estate funds (*Vastgoedfondsen*) are classified with FC where separately reported. Polders and water boards are excluded from NFC and, because the baseline GOV concept is restricted to the central/state government, are not added to GOV. A further reporting change occurs in 1981. The source focuses on broader issuer group reporting. FC is then constructed from ordinary and subordinated bonds and *pandbrieven* of financial institutions together with bonds of banks for lower government, while NFC consists of ordinary and subordinated bonds of the “other private sector.” TC is constructed as their sum. From 1990 onward, the final dataset switches deliberately to the harmonized ECB Securities Issues Statistics. This creates a pronounced level break relative to the historical CBS series because the modern debt-securities statistics use a substantially broader and differently organized instrument and issuer universe. The overlap is therefore not used to level-adjust or splice the historical series. The ECB construction is preferred from 1990 for consistency with the modern series used for the other euro-area countries. NFC corresponds to sector 1100; FC combines sectors 1220 and 1235; GOV corresponds to central government sector 1311; and TC is the sum of NFC and FC. Monthly gross issuance is aggregated to annual frequency by summing the twelve monthly observations.

6.5.14 Norway

Table 18: Source construction for Norway: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1930–1952	Statistics Norway, <i>Historical Statistics 1994</i> , Table 24.25	Central government.	GOV uses the source-reported central-government bearer-bond issues in Norwegian kroner. The table reports foreign-currency issuance only as an aggregate without a consistent issuer decomposition, so no foreign-currency amount is allocated to GOV in years in which the issuer is not identified. In 1952 the source notes that the central-government category includes NOK 48 million issued by state enterprises; this amount cannot be separated consistently and is left within the reported source category.
TC proxy	Gross issues	1930–1952	Statistics Norway, <i>Historical Statistics 1994</i> , Table 24.25	Local government including municipal enterprises; loan associations; state banks where separately reported.	Before 1953 the historical source does not permit a clean NFC/FC decomposition. A broad source-based corporate-sector proxy is therefore retained. It combines loan associations, the joint category “local government including municipal enterprises,” and, from 1946, separately reported state banks. The residual “Others” category is excluded because it cannot be allocated reliably; before 1946 it also contains state banks. The pre-1953 TC series should consequently not be interpreted as a precise institutional-sector NFC+FC aggregate.
GOV	Gross issues	1953–1992	Statistics Norway, <i>Historical Statistics 1994</i> , Table 24.26	Central government.	GOV follows the central-government issuer category. Issues denominated in Norwegian kroner and, where separately attributed to central government, foreign-currency issues are combined. No allocation of unclassified foreign-currency issuance is imposed.

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Table 18: Source construction for Norway: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
NFC	Gross issues	1953–1982	Statistics Norway, <i>Historical Statistics 1994</i> , Table 24.26	Private non-financial enterprises; state enterprises.	NFC is constructed as the sum of private non-financial enterprises and state enterprises. This treatment follows Statistics Norway's institutional-sector classification, under which market-producing public enterprises owned by central government are part of the non-financial-corporation sector rather than general government. Foreign-currency issues are added when the source identifies the issuing sector.
NFC	Gross issues	1983–1992	Statistics Norway, <i>Historical Statistics 1994</i> , Table 24.26	Private non-financial enterprises; state enterprises; municipal enterprises.	From 1983, municipal enterprises are separately reported and are added to NFC together with private non-financial enterprises and state enterprises. Statistics Norway's institutional-sector classification places public enterprises owned by both central and local government in the NFC sector. During 1972–1978 municipal-enterprise issues are included within the broader municipalities-and-counties category and cannot be separated; they are therefore not imputed to NFC for those years.
FC	Gross issues	1953–1992	Statistics Norway, <i>Historical Statistics 1994</i> , Table 24.26	State banks; commercial banks; savings banks; loan associations; financial companies; life- and non-life-insurance companies.	FC is constructed by summing the separately reported financial issuer categories whenever available. State banks are classified with FC despite public ownership because they are financial intermediaries. The same functional treatment is applied to commercial and savings banks, loan associations, financial companies, and insurance companies. Foreign-currency issuance is included whenever an issuer-sector breakdown is available and is not otherwise imputed.
TC	Gross issues	1953–1992	Statistics Norway, <i>Historical Statistics 1994</i> , Table 24.26	Harmonized NFC and FC components.	TC is constructed as NFC+FC. Central and local government are excluded. Because the historical source does not always allocate total foreign-currency issuance across issuer sectors, TC includes foreign-currency issuance only where the corresponding NFC or FC issuer can be identified.

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Table 18: Source construction for Norway: gross bond issuance – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1993–1998	Statistics Norway, <i>Statistical Yearbook</i> , various editions	Central government including social security.	GOV follows the corresponding central-government gross bond-issuance category in the Statistical Yearbook tables.
NFC	Gross issues	1993–1998	Statistics Norway, <i>Statistical Yearbook</i> , various editions	State enterprises etc.; municipal enterprises; other Norwegian sectors.	NFC is constructed as the sum of state enterprises, municipal enterprises, and the residual “other Norwegian sectors” category. The treatment of public enterprises as NFCs is consistent with Statistics Norway’s institutional-sector classification.
FC	Gross issues	1993–1998	Statistics Norway, <i>Statistical Yearbook</i> , various editions	State lending institutions; commercial banks including Postal Bank; savings banks; other credit institutions.	FC is constructed as the sum of the four separately reported financial-intermediary categories.
TC	Gross issues	1993–1998	Statistics Norway, <i>Statistical Yearbook</i> , various editions	Harmonized NFC and FC components.	TC is constructed as NFC+FC. Local and central government bond issuance is excluded.
GOV	Gross issues	1999–2024	Statistics Norway (SSB), modern securities statistics, successive StatBank series	Central government.	The historical government series is continued using the harmonized modern SSB issuer-sector data assembled in the country source file.
NFC	Gross issues	1999–2024	Statistics Norway (SSB), modern securities statistics, successive StatBank series	Public and private non-financial corporations.	NFC follows the modern SSB non-financial-corporation classification. The construction includes public enterprises owned by central and local government together with private non-financial corporations, consistent with SSB’s institutional-sector definition.
FC	Gross issues	1999–2024	Statistics Norway (SSB), modern securities statistics, successive StatBank series	Financial corporations.	FC follows the harmonized modern SSB financial-corporation universe, including the relevant banking, credit-intermediation, insurance and other financial issuer categories represented in the successive source tables.
TC	Gross issues	1999–2024	Statistics Norway (SSB), modern securities statistics, successive StatBank series	Harmonized NFC and FC components.	TC is constructed as NFC+FC.

Notes. The Norwegian historical data are unusually detailed by issuer sector but undergo several changes in classification and instrument coverage. For 1930–1952, Table 24.25 reports central government, a combined local-government-and-municipal-enterprise

category, loan associations, state banks, and a residual “Others” category. Before 1946 state banks are included within “Others.” These categories do not permit a defensible historical NFC/FC decomposition, so only a broad source-based TC proxy is retained for this period. In particular, the joint local-government/municipal-enterprise category cannot be split retrospectively, while “Others” is left unallocated rather than assigned mechanically to the corporate sector.

From 1953 onward, Table 24.26 provides substantially finer issuer information and allows separate NFC and FC series to be constructed. The historical NFC series combines private non-financial enterprises and state enterprises and, from 1983, separately reported municipal enterprises. This classification follows Statistics Norway’s institutional-sector treatment: publicly owned enterprises engaged in market production of non-financial goods and services belong to the NFC sector, whereas public financial intermediaries such as state lending institutions belong to FC. Municipal enterprises cannot be separately identified during 1972–1978 because the source includes them within municipalities and counties.

FC combines state banks, commercial banks, savings banks, loan associations, financial companies, and life- and non-life-insurance companies whenever separately reported. TC is then constructed directly as the sum of NFC and FC.

The source separately reports local and foreign-currency issuance, but sector classification here appears only later. The harmonized sector series therefore add foreign-currency issues only where the issuing sector is explicitly identified; unallocated foreign-currency issuance is not distributed proportionally across sectors.

A source transition occurs after 1992. For 1993–1998, sectoral bond issuance is reconstructed from successive Statistics Norway *Statistical Yearbook* tables. The NFC aggregate combines state enterprises, municipal enterprises, and other Norwegian sectors; FC combines state lending institutions, commercial and postal banks, savings banks, and other credit institutions (see sector classification in *SSB (1991) Bank and Credit Statistics 1990–91*). From 1999 onward, the final series use harmonized modern Statistics Norway securities statistics assembled from successive StatBank series. The modern classification continues the same institutional principle, distinguishing non-financial corporations, including publicly owned market producers, from financial corporations and general government.

6.5.15 Portugal

Table 19: Source construction for Portugal.

Series	Measure	Period	Source	Original categories	Construction and notes
TC	Gross issues	1936–1989	Instituto Nacional de Estatística (2001), <i>Portuguese Historical Statistics</i> , Table 5J.5, pp. 434–436	Private bond issues	Total-corporate gross bond issuance follows the reported private-bond-issues series. The historical source does not provide an FC/NFC decomposition. From the underlying source, <i>Estatísticas Monetárias e Financeiras</i> , is it clear that this concerns corporate issues.
TC	Gross issues	1990–2021	ECB Data Portal, Securities Issues Statistics	Total corporations	Total-corporate gross bond issuance follows the ECB total-corporations series.
FC	Gross issues	1990–2021	ECB Data Portal, Securities Issues Statistics	Financial corporations	Financial-corporation gross bond issuance follows the ECB financial-corporations series.
NFC	Gross issues	1990–2021	ECB Data Portal, Securities Issues Statistics	Non-financial corporations	Non-financial-corporation gross bond issuance follows the ECB non-financial-corporations series.
GOV	Gross issues	1969–1989	Instituto Nacional de Estatística (2001), <i>Portuguese Historical Statistics</i> , Table 5J.5, pp. 434–436	Public bonds issues	The reported “public bonds issues” series is used as government gross bond issuance, the category is interpreted as public-debt bond issuance, consistent with the terminology of the underlying Portuguese public-debt statistics.
GOV	Gross issues	1990–2021	ECB Data Portal, Securities Issues Statistics	Government	Government gross bond issuance follows the ECB government series. As for corporate issuance, the ECB series is preferred over the overlapping INE observations from 1990 onward.

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Series	Measure	Period	Source	Original categories	Construction and notes
TC	Net issues	1990–2021	ECB Data Portal, Securities Issues Statistics	Total corporations	Total-corporate net bond issuance follows the ECB total-corporations series.
FC	Net issues	1990–2021	ECB Data Portal, Securities Issues Statistics	Financial corporations	Financial-corporation net bond issuance follows the ECB financial-corporations series.
NFC	Net issues	1990–2021	ECB Data Portal, Securities Issues Statistics	Non-financial corporations	Non-financial-corporation net bond issuance follows the ECB non-financial-corporations series.
GOV	Net issues	1990–2021	ECB Data Portal, Securities Issues Statistics	Government	Government net bond issuance follows the ECB government series.
TC	Outstanding amount	1990–2021	ECB Data Portal, Securities Issues Statistics	Total corporations	Total-corporate bonds outstanding follow the ECB total-corporations series.
FC	Outstanding amount	1990–2021	ECB Data Portal, Securities Issues Statistics	Financial corporations	Financial-corporation bonds outstanding follow the ECB financial-corporations series.

Notes. The historical Portuguese issuance data are taken from Table 5J.5, “Issue and transaction of securities,” of *Portuguese Historical Statistics*, compiled by the Instituto Nacional de Estatística. Its underlying source is *Estatísticas Monetárias e Financeiras*. The private-bond series is used as the historical total-corporate series because of information in the underlying source. No sectoral split between financial and non-financial corporations is available. From 1990 onward, the data comes from the harmonized ECB series.

6.5.16 Sweden

Table 20: Source construction for Sweden.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1835–2021	Waldenström (2022)	Government gross issues in local currency; government gross issues in foreign currency.	Annual government gross issuance equals the sum of local-currency and foreign-currency government bond issues.
GOV	Outstanding amount	1835–2021	Waldenström (2022)	Government bonds outstanding in local currency; government bonds outstanding in foreign currency.	Government outstanding amount equals the sum of local-currency and foreign-currency government bonds in circulation.
TC	Gross issues	1835–2021	Waldenström (2022)	Financial corporations; non-financial corporations; railways; industry; other corporations; finance corporations in foreign currency; non-financial corporations in foreign currency.	Total corporate gross issuance is constructed as the sum of all corporate issuer categories, including railways. A version excluding railways is also constructed for robustness.
TC	Outstanding amount	1835–2021	Waldenström (2022)	Financial corporations; non-financial corporations; railways; industry; other corporations; banks; finance corporations in foreign currency; non-financial corporations in foreign currency.	Total corporate outstanding amount is constructed as the sum of all corporate bonds in circulation, including railways. A version excluding railways is also constructed for robustness.
NFC	Gross issues	1835–2021	Waldenström (2022)	Non-financial corporations; railways; industry; other corporations; non-financial corporations in foreign currency.	Non-financial corporate gross issuance is constructed as the sum of non-financial corporate categories, including railways. Railways are retained separately to allow alternative classifications.
NFC	Outstanding amount	1835–2021	Waldenström (2022)	Non-financial corporations; railways; industry; other corporations; non-financial corporations in foreign currency.	Non-financial corporate outstanding amount is constructed as the sum of non-financial corporate bonds in circulation, including railways.
FC	Gross issues	1835–2021	Waldenström (2022)	Financial corporations; finance corporations in foreign currency.	Financial-corporation gross issuance is constructed as the sum of domestic financial-corporation issues and foreign-currency finance-corporation issues.

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Table 20: Source construction for Sweden – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
FC	Outstanding amount	1835–2021	Waldenström (2022)	Financial corporations; banks; finance corporations in foreign currency.	Financial-corporation outstanding amount is constructed as the sum of financial-corporation bonds, bank bonds, and foreign-currency finance-corporation bonds in circulation.
Railways	Gross issues	1835–2021	Waldenström (2022)	Railway gross issues in local currency.	Railway gross issuance is retained as a separate series. In the baseline harmonized Swedish NFC and TC series, railway bonds are included in the corporate sector.
Railways	Outstanding amount	1835–2021	Waldenström (2022)	Railway bonds outstanding in local currency.	Railway bonds outstanding are retained as a separate series and included in the baseline Swedish NFC and TC outstanding-amount aggregates.

Notes. The Swedish series are based on [Waldenström \(2022a\)](#) who reconstructs the Swedish bond market from 1835 to 2021 using historical primary-market and outstanding-amount data. The main harmonized Swedish gross-issuance series include both local-currency and foreign-currency bond issues when these are reported separately in the source. Railways are treated as non-financial corporate issuers. To assess sensitivity to this classification, I also construct total-corporate and non-financial-corporate aggregates excluding railways. Outstanding amounts are constructed analogously to gross issues, using the corresponding bonds-in-circulation categories. The Swedish country file retains the exact source-column references used for each constructed series.

6.5.17 United Kingdom

Table 21: Source construction for the United Kingdom: gross corporate bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
TC	Gross issues	1919–1949	Midland Bank Monthly Review	Aggregate corporate debt issues.	Total-corporate gross bond issuance follows the historical aggregate debt-issues series. For 1940–1945, the source reports only a cumulative total for the full period rather than annual observations. This value is allocated equally across the six calendar years. These observations are flagged in the underlying dataset because annual variation is mechanically imposed rather than directly observed.
TC	Gross issues	1950–1959	UK Macroeconomic Dataset; Ryland Thomas compilation	Aggregate corporate debt issues.	Total-corporate gross bond issuance is taken directly from the reported aggregate debt-issues series.
TC	Gross issues	1960–1983	UK Macroeconomic Dataset; Ryland Thomas compilation	Convertible debt; other debt.	Total-corporate gross bond issuance equals the sum of convertible debt and other debt.
TC	Gross issues	2003–2024	Bank of England Capital Issuance Statistics, Bankstats Table E3.1	Monetary financial institutions; other financial corporations; private non-financial corporations.	Quarterly gross bond issuance is summed to annual totals. Total-corporate issuance equals financial-corporation plus non-financial-corporation bond issuance. The BoE “Other sectors” category is excluded because it covers public corporations and non-profit institutions serving households.
FC	Gross issues	2003–2024	Bank of England Capital Issuance Statistics, Bankstats Table E3.1	Monetary financial institutions; other financial corporations.	Financial-corporation gross bond issuance equals the sum of monetary financial institutions and other financial corporations. Quarterly gross issues are summed within each calendar year.
NFC	Gross issues	2003–2024	Bank of England Capital Issuance Statistics, Bankstats Table E3.1	Private non-financial corporations.	Non-financial-corporation gross bond issuance follows the private non-financial-corporation bond-issues series. Quarterly gross issues are summed within each calendar year.

Notes. The Bank of England capital-issuance statistics cover non-government primary-market issuance by UK-resident entities. The baseline modern series uses the bond-issuance category only. Commercial paper is retained separately in the country file and can be combined with bonds to construct a broader

debt-securities measure, but it is not included in the baseline bond-issuance series. The historical data do not provide a consistent FC/NFC split before 2003. No bond-issuance series is currently available for 1984–2002, coded as missing without interpolation.

6.5.18 Thailand

Table 22: Source construction for Thailand: gross bond issuance.

Series	Measure	Period	Source	Original categories	Construction and notes
GOV	Gross issues	1979–1991	Bank of Thailand Annual Reports	Government bonds; Treasury bills.	Annual government gross issuance equals the sum of government bond and Treasury bill issuance reported in the annual reports.
GOV	Gross issues	1992–2023	BoT FM_CM_002	Government bonds; Treasury bills.	Monthly flows are summed to annual totals. The source switch from annual reports to the modern BoT statistical portal occurs around 1992.
FC	Gross issues	1998–2004	BoT FM_CM_003	Banking, finance, insurance and leasing.	Monthly flows are summed to annual totals. This category is assigned to financial corporations.
FC	Gross issues	2005–2023	BoT FM_CM_004	Financial intermediation.	Monthly flows are summed to annual totals. The 2005 source switch introduces a classification break relative to the pre-2005 financial-sector category.
NFC	Gross issues	1998–2004	BoT FM_CM_003	Non-financial sectors excluding financial sector and others.	Monthly flows are summed to annual totals. The category “Others” is left unallocated and is not included in the NFC aggregate.
NFC	Gross issues	2005–2023	BoT FM_CM_004	All non-financial business categories.	Monthly flows are summed to annual totals. The NFC aggregate excludes the category Financial Intermediation.
TC	Gross issues	1986–1991	Bank of Thailand Annual Reports	State-owned enterprises; other non-government, non-SOE sectors.	Total corporate gross issuance is constructed as the sum of state-owned enterprise bond issuance and other corporate-sector issuance.
TC	Gross issues	1992–2023	BoT FM_CM_002	State enterprise bonds; private debt securities.	Monthly flows are summed to annual totals. Total corporate issuance is constructed as the sum of state enterprise bond issuance and private debt securities.

Notes. Early data for Thailand was available in the Bank of Thailand Annual Reports and the more recent data comes from the Bank of Thailand statistical data portal. Monthly gross issuance is aggregated to annual frequency by summing monthly flows within each calendar year. The main source break occurs in 1992 for government and total corporate issuance, when the construction switches from annual reports to the modern Bank of Thailand statistical portal. For financial and non-financial corporations, the main classification break occurs in 2005, when the source changes from BoT FM_CM_003 to BoT FM_CM_004. Ambiguous “Others” categories are left unallocated when they cannot be assigned cleanly to financial or non-financial corporations.

6.5.19 United States

Table 23: Source construction for the United States.

Series	Measure	Period	Source	Original categories	Construction and notes
NFC	Gross issues	1900–1943	Hickman (1953), Appendix A, Table A-1	Total of Railroads; public utilities; industrial corporations.	Non-financial-corporate gross bond issuance follows Hickman’s “Offered during year” column for the aggregate “All Industries Combined” of railroads, public utilities, and industrial corporations. The measure records par amounts of bond offerings and includes both cash and noncash offerings.
NFC	Gross issues	1970–1994	Federal Reserve Bulletin, annual new-security-issues tables	Manufacturing; commercial and miscellaneous; transportation; public utility; communication.	Non-financial-corporate gross issuance is constructed as the sum of the reported non-financial industry groups.
NFC	Gross issues	1995–2023	Federal Reserve Bulletin; Board of Governors, <i>New Security Issues, U.S. Corporations</i>	Bonds: non-financial corporations.	Non-financial-corporation gross bond issuance follows the directly reported non-financial-corporate bond-issues series.
TC	Gross issues	1944–1969	Board of Governors, <i>Banking and Monetary Statistics, 1941–1970</i> , Table 12.32	Corporations: bonds and notes, new issues.	Total-corporate gross bond issuance follows the reported new-issues series for corporate bonds and notes.
TC	Gross issues	1970–2023	Federal Reserve Bulletin; Board of Governors, <i>New Security Issues, U.S. Corporations</i>	Corporate bonds, total.	Total-corporate gross bond issuance follows the annual total-bonds category.
FC	Gross issues	1970–1994	Federal Reserve Bulletin, annual new-security-issues tables	Real estate and financial.	Financial-corporation gross issuance follows the reported “Real estate and financial” industry group. This category includes real-estate issuers and is therefore broader than a pure financial-corporation measure.

Continued on next page

Table 23: Source construction for the United States – continued.

Series	Measure	Period	Source	Original categories	Construction and notes
FC	Gross issues	1995–2023	Federal Reserve website; Board of Governors, Data section, New Security Issues Table 1.46., U.S. Corporations	Bonds: financial corporations.	Financial-corporation gross bond issuance follows the directly reported financial-corporate bond-issues series. From 1995 onwards real estate is not part of the financial category anymore due to a change in reporting.
NFC	Outstanding amount	1899–1950	Hickman (1953), Appendix A, Table A-1	Railroads; public utilities; industrial corporations.	Hickman’s “All Industries Combined” corporate-bond aggregate equals the sum of railroads, public utilities, and industrial corporations. These issuer groups are classified as non-financial corporations. Hickman reports beginning-of-year outstanding amounts; these are shifted back one calendar year in the compiled dataset to obtain end-of-year stocks.
NFC	Outstanding amount	1951–2022	Board of Governors Financial Accounts of the United States	Non-financial corporate business: corporate bonds, liability level.	The postwar continuation follows the Financial Accounts series for corporate-bond liabilities of non-financial corporate business. The historical Hickman series is narrower in industry coverage but conceptually consistent in excluding financial-corporate issuers.
GOV	Gross issues	1934–1973	<i>Statistical Abstract of the United States</i> , selected annual tables	U.S. Government public debt issues or new issue volume.	Federal-government gross issuance is transcribed from historical <i>Statistical Abstract</i> tables. Available observations cover 1934–1935, 1939–1941, 1943, 1945, and 1947–1973. Missing years are retained as missing.
GOV	Gross issues	1990–2023	U.S. Treasury Fiscal Data	U.S. Treasury securities, new issue volume.	Federal-government gross issuance follows the Treasury-security issuance series retained in the country file. The interval 1974–1989 remains missing without interpolation or splicing.
GOV	Outstanding amount	1900–2023	U.S. Treasury, Historical Debt Outstanding	Federal debt outstanding.	Government outstanding amounts follow the Treasury historical debt series. These observations are reported at fiscal-year end and are therefore not fully identical to a calendar-year-end stock measure.

Notes. The United States series combine historical reconstructions of corporate bond financing, Board of Governors capital-market statistics, Federal Reserve Bulletin tables, the Federal Reserve Financial Accounts, and U.S. Treasury data. The final compiled dataset distinguishes between a long historical non-financial-corporate bond series, a later broad total-corporate series, and sectoral financial-corporation/non-financial-corporation series from 1970 onward.

The historical Hickman data cover railroads, public utilities, and industrial corporations. These issuer groups are classified as non-financial corporations. They are therefore used to construct the early NFC series and are not treated as a complete total-corporate aggregate.

The main historical sectoral distinction is between the NFC series available from 1900 and the broader TC series available from 1944. The pre-1944 Hickman aggregate should therefore not be interpreted as complete total-corporate issuance, because it does not include financial-corporate issuers. NFC gross issuance has an internal gap between 1944 and 1969; FC issuance begins in 1970. The 1970–1994 FC category combines financial and real-estate issuers, whereas the source reports financial corporations directly from 1995 onward.

7 Appendix B: Additional Results

This appendix presents additional results that complement the main text in various ways. The aim is descriptive: to visualize data structure, coverage, and distributional patterns that motivate the specifications used in the paper. Details are described in the respective figure notes.

7.1 Corporate bond issuance in a fixed long-run country cohort

Figure 11 assesses whether the long-run evolution of corporate bond issuance reflects changing country composition in the underlying sample. It restricts attention to countries with total-corporate issuance coverage in the historical, postwar, and modern eras. The fixed-cohort comparison confirms the broad pattern documented in the main text: corporate primary-market activity was economically meaningful before World War II, declined during the postwar decades, and revived after 1980. While the level and composition of issuance differ substantially across countries—most notably in the modern period—the postwar trough is visible within the same set of long-run bond-market economies.

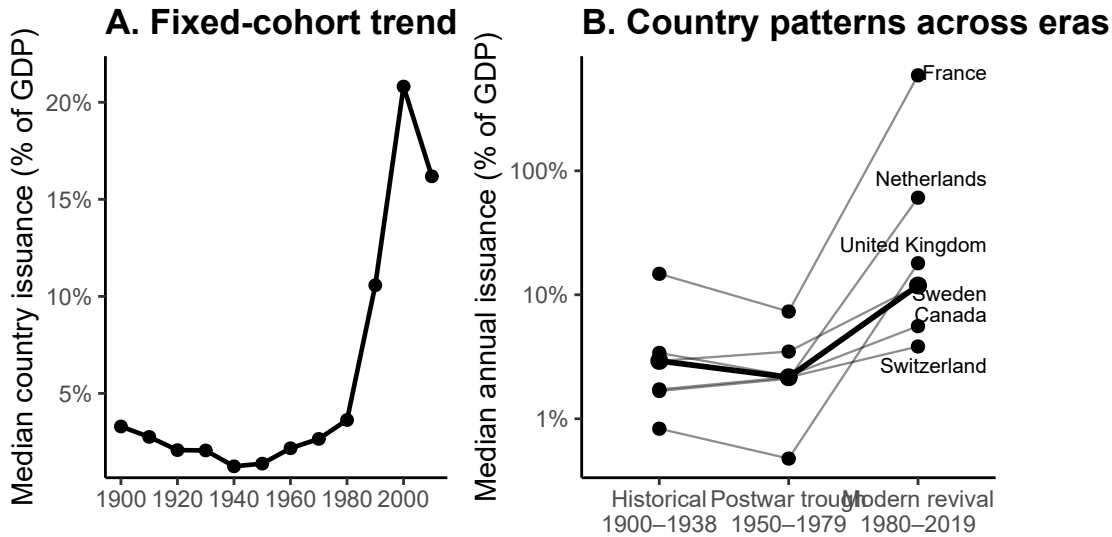


Figure 11: Corporate bond issuance in a fixed long-run country cohort. The figure restricts the sample to countries with total-corporate bond-issuance coverage in the historical, postwar, and modern periods. Panel A reports the median across countries of country-decade median gross bond issuance relative to nominal GDP. Panel B reports country-specific median annual issuance relative to GDP in three broad eras; the vertical axis is logarithmic. The fixed-cohort comparison shows that the postwar decline and subsequent revival in corporate primary-market activity are not mechanically generated by changes in country coverage.

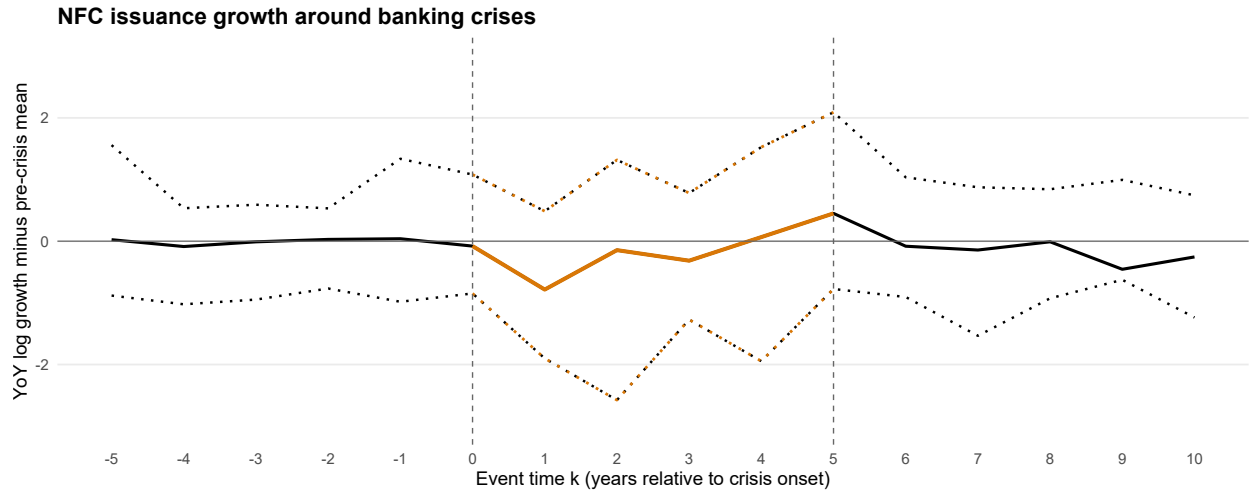


Figure 12: Corporate bond issuance growth before, during and after banking crises. The figure plots the mean year-over-year growth rate of NFC bond issuance before, during and after banking crises, in log differences. For each crisis episode, the plotted series is demeaned by subtracting the average issuance growth observed in the pre-crisis window of that same country-episode, defined as years $t_0 - K_{\text{pre}}$ to $t_0 - 1$ (here $K_{\text{pre}} = 5$, i.e. a five year pre-crisis window). The solid line reports the cross-episode mean, and the shaded area reports the 5th to 95th percentile range across episodes. The vertical dashed line marks crisis onset (t_0), and the dotted line marks the end of the crisis window (t_5). Positive values indicate issuance growth above the episode-specific pre-crisis average; negative values indicate issuance growth below the pre-crisis average. Issuance growth is stable prior to crises but declines sharply in the years following crisis onset, indicating a substantial disruption in corporate bond market activity during banking crises.

7.2 Corporate bond issuance growth around banking crises vs non-crises

Figure 12 provides an alternative visualization of issuance dynamics around banking crises. Unlike the cumulative growth statistic shown in Figure 7 in the main text, the figure plots year-over-year NFC issuance growth demeaned by the pre-crisis average within each crisis episode. The figure illustrates that average issuance growth is stable prior to crises but weakens sharply following crisis onset, motivating the conditional analysis below.

7.3 From descriptive crisis patterns to the conditional issuance response

The baseline local projections estimate a sizable decline in non-financial corporate bond issuance following banking crises. Because these estimates summarize an average conditional response across a relatively small number of historical crisis episodes, a natural question is how closely this result maps into the underlying country-level observations. In particular, a negative average response does not imply that issuance must decline in every individual banking crisis. This subsection therefore provides a deliberately descriptive link between the crisis-level data and the regression estimates.

Panel A of Figure 13 starts from the simplest possible statistic: the fraction of observations for which cumulative NFC issuance rises relative to year $t - 1$. Around one half of banking-crisis observations display positive cumulative changes in gross issuance, especially at short horizons. Taken in isolation, this could suggest substantial heterogeneity in

the response of bond markets to banking distress. However, positive issuance growth is also common in normal times. In the exact estimation sample used for the baseline local projections, the fraction of non-crisis observations with positive cumulative gross issuance rises from around 60% at short horizons to around 70% at longer horizons. For issuance relative to GDP, the corresponding non-crisis fraction is lower, but remains above the crisis fraction at medium horizons. Hence, the sign of the raw change alone does not provide the relevant benchmark for evaluating the crisis response.

This distinction follows directly from the estimand in the baseline local projections. The coefficient on the banking-crisis indicator does not ask whether issuance is literally lower than in year $t - 1$. Rather, it measures whether issuance evolves differently following a banking crisis than would normally be expected conditional on country fixed effects, lagged issuance, and lagged macroeconomic conditions. An episode can therefore display positive cumulative issuance growth and at the same time contribute to a negative estimated crisis effect if issuance would otherwise have risen more strongly.

Panel B makes this comparison explicit. For every crisis observation, I calculate the difference between the observed long-difference outcome and the fitted outcome from the corresponding baseline local projection after setting the crisis indicator to zero, while leaving all other regressors unchanged. This provides a model-implied non-crisis benchmark for the same country-year observation. Across horizons, roughly 60–70% of banking crises lie below this fitted non-crisis path. For NFC issuance relative to GDP, the share reaches slightly above 70% around the three-year horizon, where the baseline contraction is also most pronounced. Thus, while positive raw issuance changes are far from uncommon during crises, issuance is nevertheless unusually weak relative to normal dynamics in a clear majority of episodes.

Panel C shows the full distribution of these crisis-specific deviations rather than only their signs. There is substantial heterogeneity across historical banking crises, including a meaningful set of observations with issuance above the fitted non-crisis path. At the same time, the distributions are shifted toward negative values, particularly over the medium run. The baseline local-projection coefficients, shown by the diamonds, summarize these crisis-level deviations and lie within rather than outside the underlying distribution. The negative average response is therefore not equivalent to a claim that every banking crisis produces a decline in bond issuance, nor does it rely on treating particular prominent crises as representative of the full historical sample.

Taken together, these descriptive exercises clarify the interpretation of the main results. Banking crises need not be associated with an absolute decline in NFC bond issuance in every country and every episode. Instead, the systematic result is that issuance is weaker than its normal conditional path following banking crises. This distinction is particularly relevant when interpreting prominent episodes in which bond markets appear to substitute for impaired bank credit. Such cases are present in the historical sample, but they

coexist with a broader distribution in which below-normal issuance is the more common response. The local-projection estimates provide a disciplined way of summarizing this cross-episode heterogeneity without assigning disproportionate weight to individual crisis experiences.

7.4 Issuance dynamics in banking crises and non-financial recessions

A natural question is whether the issuance patterns documented in the main text are specific to systemic banking crises or instead reflect more general downturn dynamics. To address this, Figure 14 compares the event-study path of non-financial corporate (NFC) bond issuance around banking-crisis onsets to the corresponding path around non-financial recession onsets.

The recession comparison is constructed using a simple dating rule based on annual real GDP growth. A recession onset is defined as the first year of negative real GDP growth following a year with non-negative growth.⁶ To isolate non-financial recessions, I exclude all recession onsets that occur within a ± 2 -year window around a systemic banking-crisis onset. Thus, the recession sample excludes downturns that are contemporaneous with, or very close to, systemic banking crises. The event-study specification mirrors the baseline design in Equation 1. In both cases, the dependent variable is log NFC bond issuance relative to GDP, normalized to zero in the year prior to the event ($t - 1$).

Figure 14 shows that NFC bond issuance weakens in both cases, but the decline around systemic banking crises is substantially larger and more persistent than around non-financial recessions. This suggests that the contraction in corporate bond issuance documented in the main text is not merely a generic cyclical feature of downturns, but is particularly pronounced in episodes associated with financial-sector distress.

7.5 Changing relative compositions around banking crises

The baseline results show that banking crises are associated with falling non-financial corporate issuance and rising government issuance. A natural complementary question is whether crises also change the relative composition of bond market activity. To examine this, Figure 15 plots sectoral issuance shares around banking crises, where the denominator is total bond market issuance defined as the sum of total corporate and government bond gross issuance. For each sector, the left column shows the average level share around crises, while the right column shows the change in that share relative to its pre-crisis value in year $t - 1$.

⁶Formally, a recession onset in country i and year t is defined as an observation with $g_{i,t} < 0$ and $g_{i,t-1} \geq 0$, where $g_{i,t}$ denotes annual real GDP growth computed from the log difference in real GDP. This is a pragmatic approximation rather than a full business-cycle chronology.

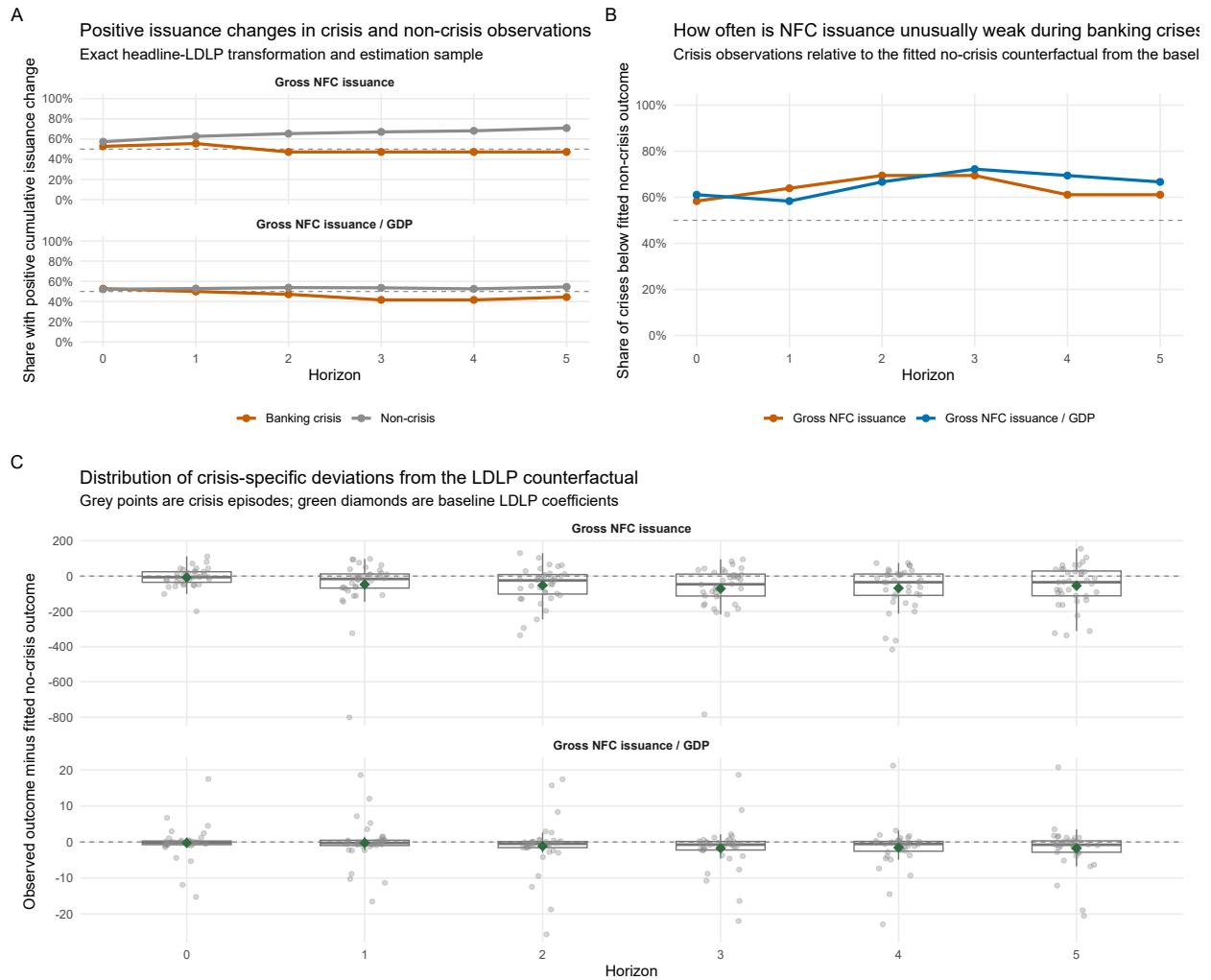


Figure 13: NFC bond issuance across banking-crisis episodes: raw and conditional patterns. Panel A reports the share of observations with positive cumulative changes in non-financial corporate bond issuance at each horizon, separately for banking-crisis and non-crisis observations. The outcome transformation and estimation sample are identical to those used in the baseline long-difference local projections. Panel B reports the share of banking-crisis observations for which the realized outcome lies below the fitted non-crisis outcome. The latter is obtained from the corresponding baseline local projection after setting the banking-crisis indicator to zero while holding country fixed effects, lagged issuance, and lagged macroeconomic controls at their observed values. Panel C plots the distribution of these crisis-specific deviations from the fitted non-crisis outcome. Grey points represent individual banking-crisis episodes, boxes summarize the cross-episode distribution, and diamonds report the corresponding baseline local-projection coefficient. The upper panels use gross NFC issuance and the lower panels issuance relative to GDP. The figure is descriptive: its purpose is to relate the average conditional responses estimated in the main text to heterogeneity in the underlying crisis observations.

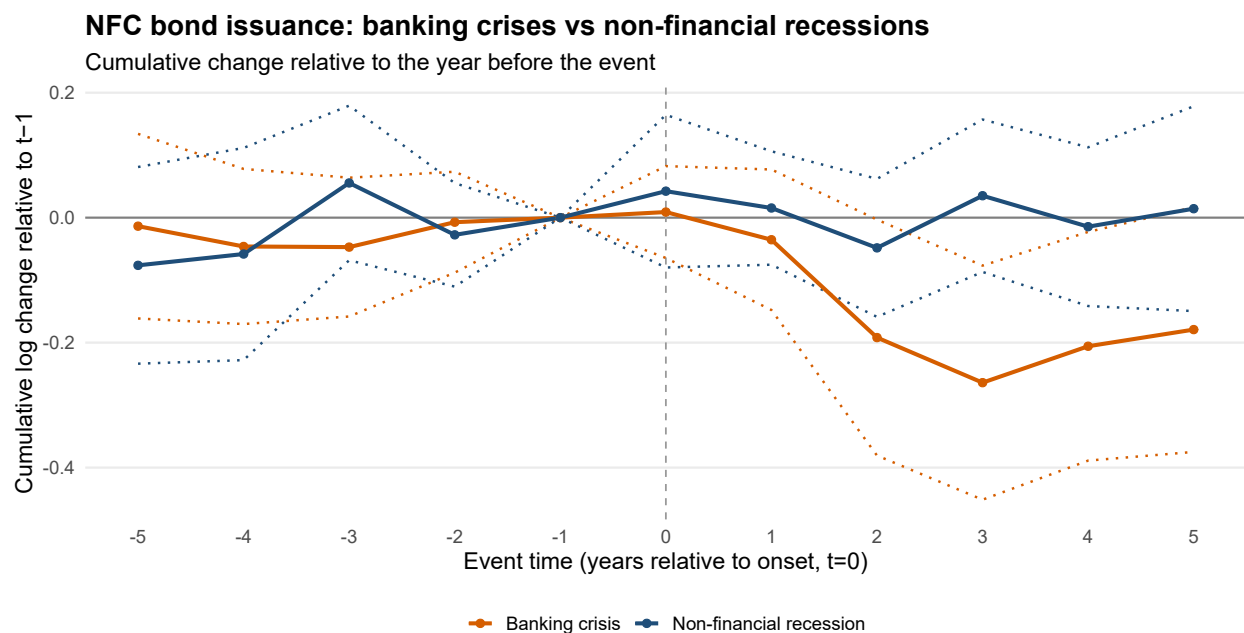


Figure 14: NFC bond issuance in banking crises and non-financial recessions. The figure compares event-study estimates of non-financial corporate bond issuance around systemic banking-crisis onsets and around non-financial recession onsets. The dependent variable is log NFC bond issuance relative to GDP, normalized to zero in the year prior to the event ($t - 1$), so the plotted coefficients represent cumulative deviations from the pre-event baseline. Event time $t = 0$ denotes the onset year. Non-financial recession onsets are defined as the first year of negative real GDP growth following a non-negative year, excluding all cases that occur within a ± 2 -year window around a systemic banking-crisis onset. Estimates are obtained from horizon-specific country fixed-effects regressions. Dotted lines indicate 90% confidence intervals based on Driscoll–Kraay standard errors with horizon-dependent bandwidths.

Two observations emerge. First, the strongest and clearest composition shift is toward the public sector. The government share of total bond market issuance rises after banking crises, with the increase becoming visible after onset and remaining positive over the following years. This mirrors the decline in the total corporate share. Second, within the corporate segment, compositional shifts between non-financial and financial issuers are comparatively modest and noisier. The NFC and FC share paths do not display changes as large or as persistent as those observed for the government sector. Hence, the main compositional reallocation in banking crises appears to be between public and corporate issuers rather than within the corporate sector itself.

These figures are descriptive and should be interpreted as showing how primary bond market activity is redistributed across issuing sectors during crises. They complement the sector-level issuance dynamics in the main text by illustrating that the rise in government issuance is not only large in levels, but also sizable relative to total bond market activity.

Sectoral shares in the total bond market around banking crises
Denominator: total corporate plus government bond issuance

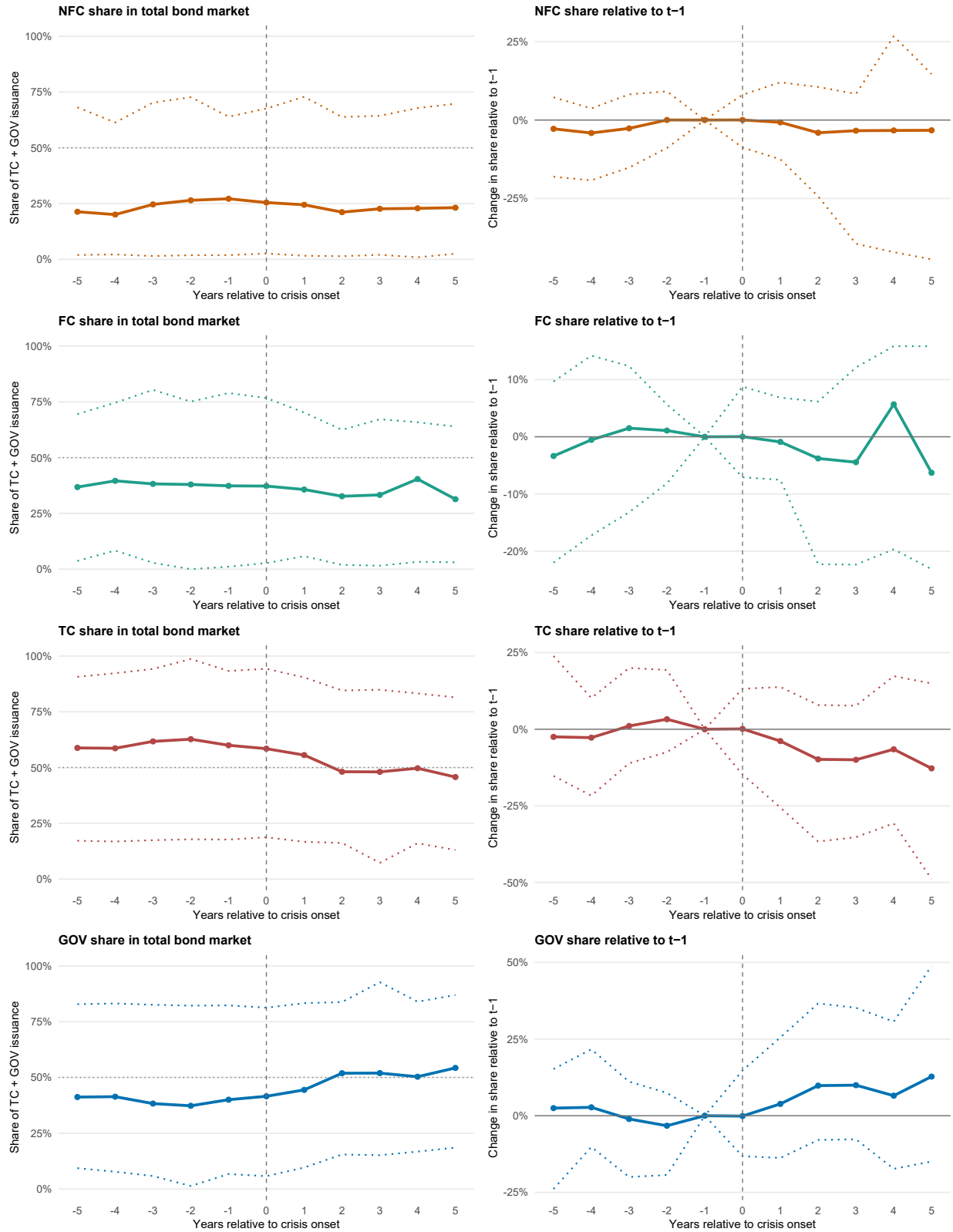


Figure 15: Sectoral shares in the total bond market around banking crises. The figure shows the evolution of issuance shares for non-financial corporations (NFC), financial corporations (FC), total corporations (TC), and government (GOV) around banking-crisis onsets. The denominator is total bond market issuance, defined as the sum of total corporate and government bond gross issuance. For each sector, the left column reports the average share level around crises and the right column reports the change in the share relative to its pre-crisis value in year $t-1$. Event time $t = 0$ denotes the crisis-onset year. Solid lines show cross-episode means and dotted lines indicate the 10th and 90th percentiles across crisis episodes.

Same market, different measures

US nonfinancial corporate bonds, index 2007 = 100

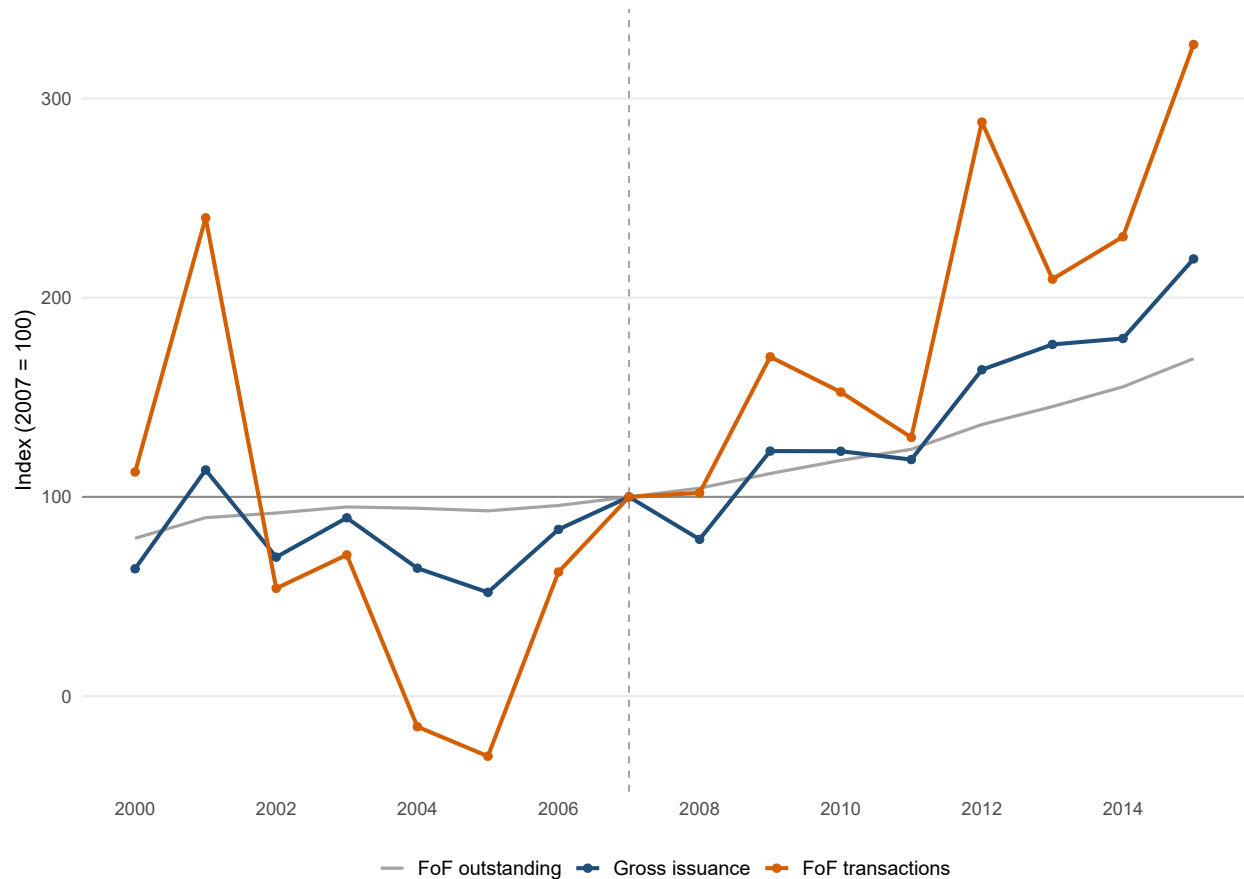


Figure 16: Same market, different measures. The figure compares three measures for U.S. nonfinancial corporate bonds: my hand-collected series on gross bond issuance, the Flow of Funds stock of outstanding corporate bond liabilities, and the Flow of Funds transactions series. The outstanding stock evolves smoothly by construction, while transactions are much more muted than gross issuance and can even turn negative. This reflects the fact that Flow of Funds transactions capture net changes in outstanding positions rather than actual primary-market issuance activity.

7.6 Comparison with Adrian et al. (2013): gross issuance versus Flow of Funds measures

A central benchmark for the spare-tire hypothesis is the U.S. Global Financial Crisis. Adrian et al. (2013) document substitution from bank lending toward bond financing using U.S. Flow of Funds evidence and micro-level issuance data. The comparison in this subsection clarifies how my primary-market gross issuance measure relates to the Flow of Funds objects used in that literature. This distinction matters because gross issuance, Flow of Funds transactions, and outstanding liabilities measure different margins of bond-market activity: new primary issuance, net changes in positions, and end-of-period stocks.

Using gross issuance rather than net transactions matters quantitatively. Flow of Funds transactions understate the scale of bond market activity and therefore compress the apparent response of bond finance during stress episodes. This distinction is particularly

Gross issues show more muted and delayed substitution into bonds

US GFC, index 2007 = 100

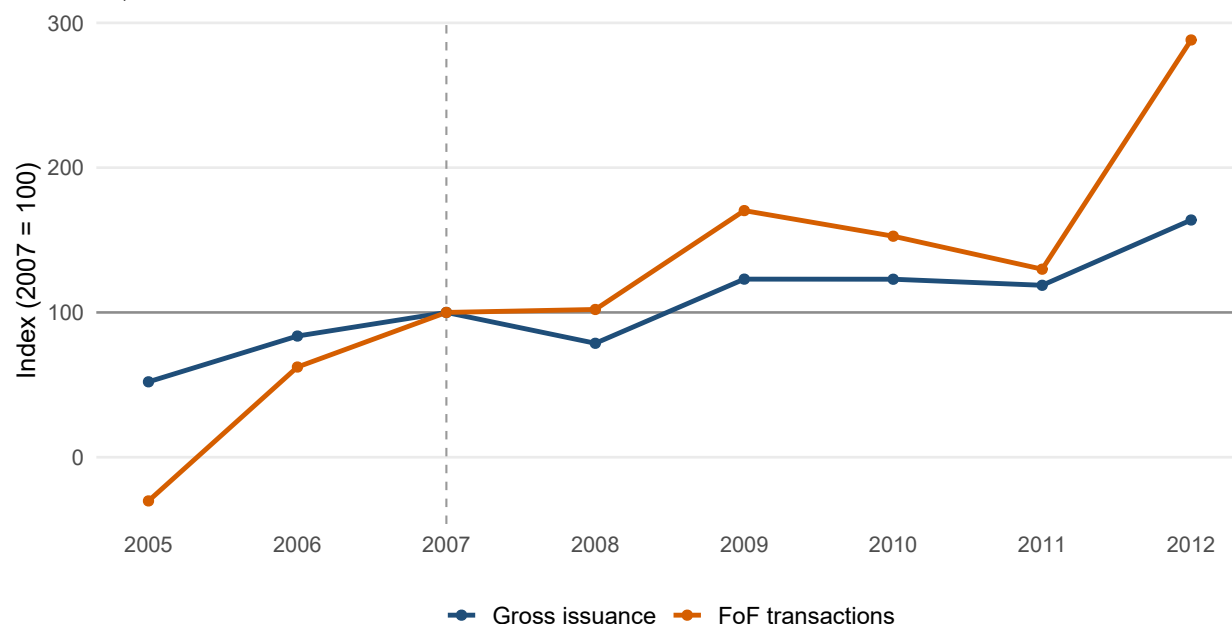


Figure 17: Gross issues show more muted and delayed substitution into bonds. The figure zooms in on the U.S. Global Financial Crisis and compares gross bond issuance with the Flow of Funds transactions series, both normalized to 2007 = 100. Both measures point to increased bond financing after the crisis onset, but gross issuance suggests a more muted and delayed adjustment than the standard Flow of Funds series. In particular, issuance declines in 2008 and rises only thereafter, indicating that substitution into bond markets was not immediate even in the benchmark U.S. case.

important in my setting, where the object of interest is gross primary issuance rather than the net evolution of outstanding credit. Figures 18, 17 show that these distinctions are quantitatively important even in the benchmark U.S. case.

The comparison does not contradict the evidence in [Adrian et al. \(2013\)](#). Rather, it shows that the timing and magnitude of the spare-tire response depend on the financing object being measured. Flow of Funds transactions capture net changes in outstanding positions, while gross issuance captures primary-market activity. In the U.S. GFC, both measures indicate a rebound in bond financing after the crisis onset, but gross issuance suggests that the adjustment was more delayed and less immediate than a net-transactions measure alone might imply.

US GFC versus other banking crises

Outcome: NFC bond gross issuance relative to t-1

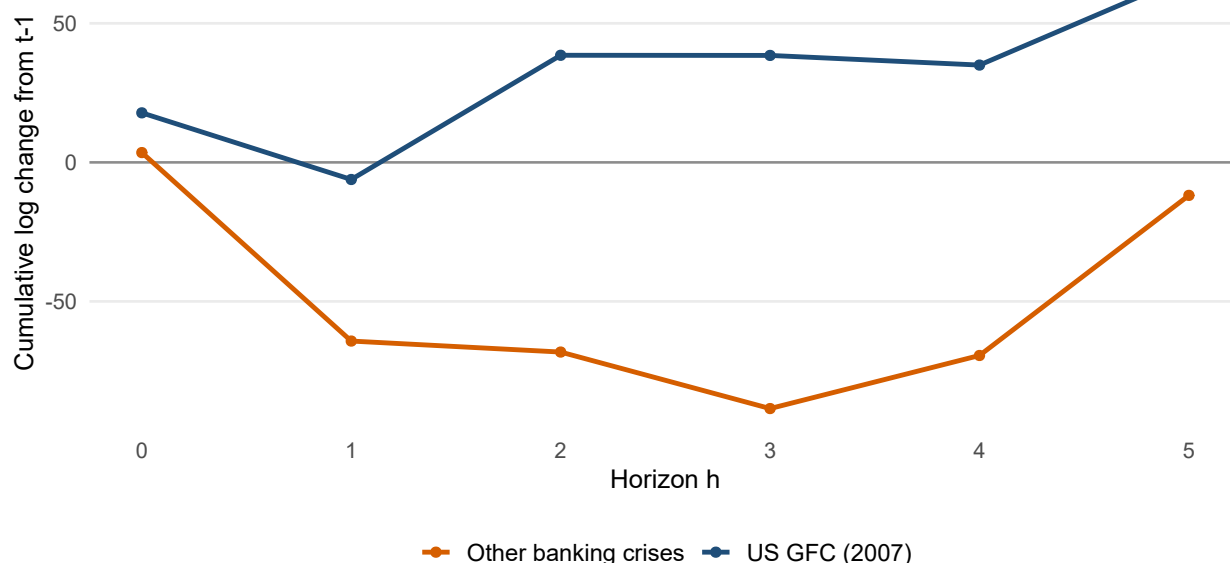


Figure 18: The U.S. GFC versus other banking crises. The figure compares the cumulative long-difference path of U.S. nonfinancial corporate bond issuance after 2007 with the average path observed in other banking crises in the cross-country historical sample. The U.S. episode displays a substantially more positive issuance response than the typical banking crisis, consistent with the interpretation of the GFC as an exceptional case rather than the norm.

8 Appendix C: Robustness checks

This section presents robustness checks to the baseline results presented in the main text for the event study and the local projections.

8.1 Event study robustness

Alternative to 4 which uses log bond issuance in raw currency units as dependent variable. Otherwise the results shown follow the main specification as described in Equation 1.

8.2 Issuance local projections robustness

This appendix reports robustness checks for the long-difference local projection estimates in Section 4.2. I vary the treatment of outliers, the timing of winsorization, the dependent-variable definition, and the sample split used to assess historical coverage. Across these specifications, the qualitative results remain unchanged: non-financial corporate issuance contracts after banking crises, total corporate issuance declines, government issuance rises, and financial-sector issuance displays a more mixed response.

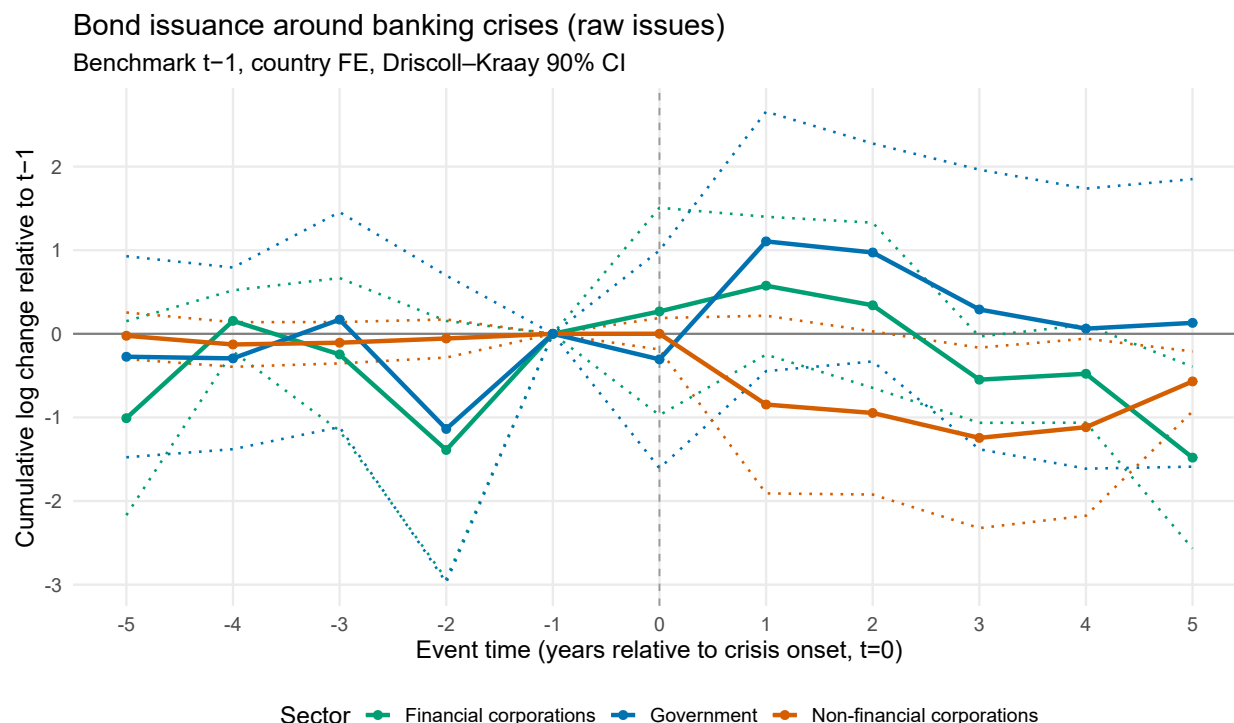


Figure 19: Event study of bond issuance around banking crises using raw issuance levels. The dependent variable is the cumulative change in log bond issuance relative to the year before crisis onset. All other details follow Figure 4 and the specification as explained in the main text.

8.2.1 Sensitivity to outlier treatment

Bond issuance data contain extreme observations, especially around financial stress episodes and in periods of market development. The baseline specification therefore winsorizes the issuance series symmetrically at the 2% level before taking logs. To assess whether the main results are driven by this choice, Figure 21 compares the baseline specification to specifications without winsorization and with stronger 5% winsorization.

The estimated dynamics are stable across these choices. In particular, the post-crisis contraction in non-financial corporate issuance and the expansion in government issuance remain visible even without winsorization and under stronger trimming. The results are therefore not driven by a small number of extreme issuance observations.

8.2.2 Winsorizing the transformed outcome

The baseline specification winsorizes gross issuance before the log transformation. As an alternative, I leave gross issuance unchanged, construct the long-difference outcome $100 \times (y_{i,t+h} - y_{i,t-1})$, and winsorize this transformed outcome directly. This check asks whether the results are driven by the treatment of extreme cumulative log changes rather than extreme issuance levels.

Figure 22 shows that the results are essentially unchanged. The NFC response remains negative at all horizons, financial-sector issuance displays a temporary increase followed

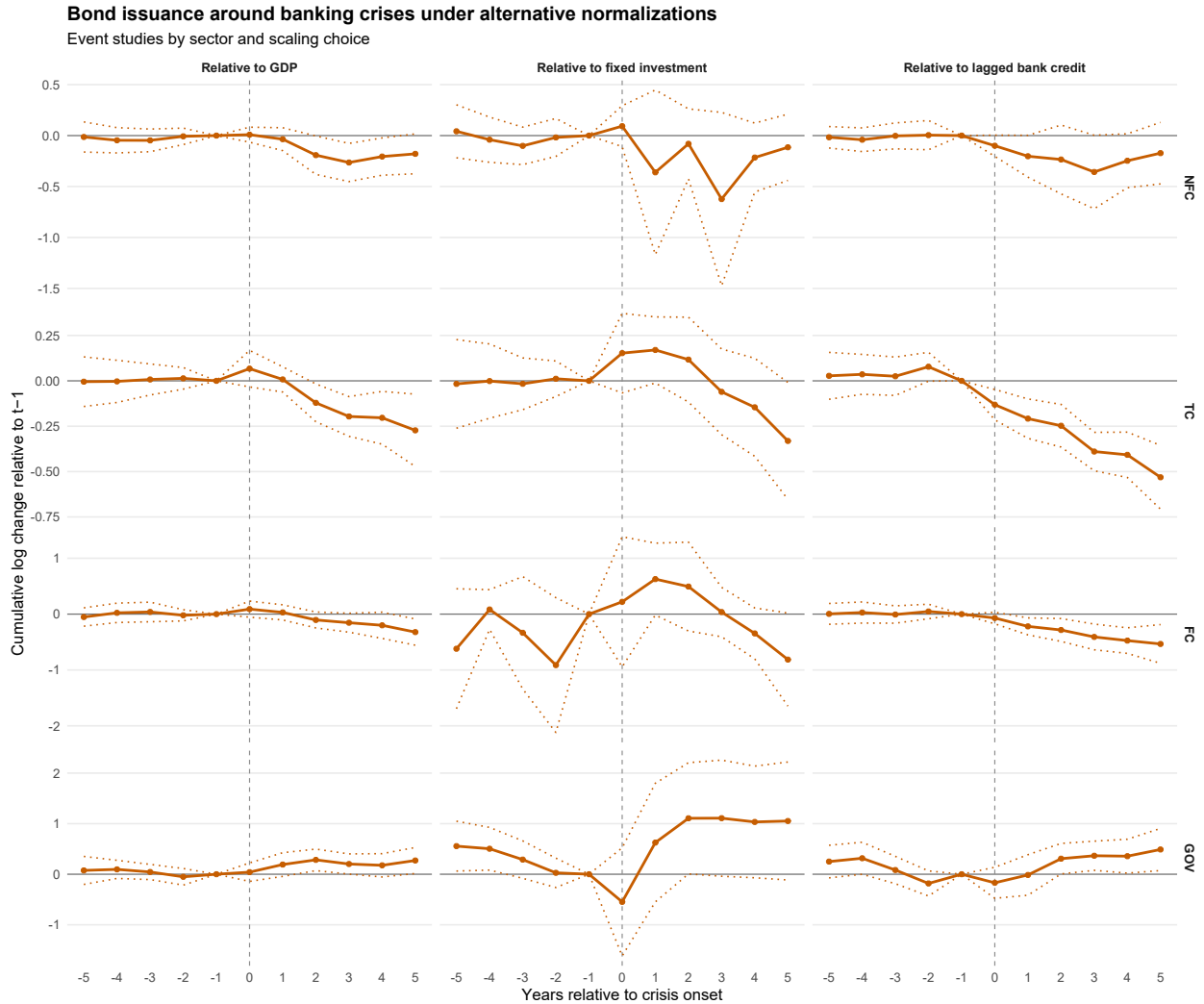
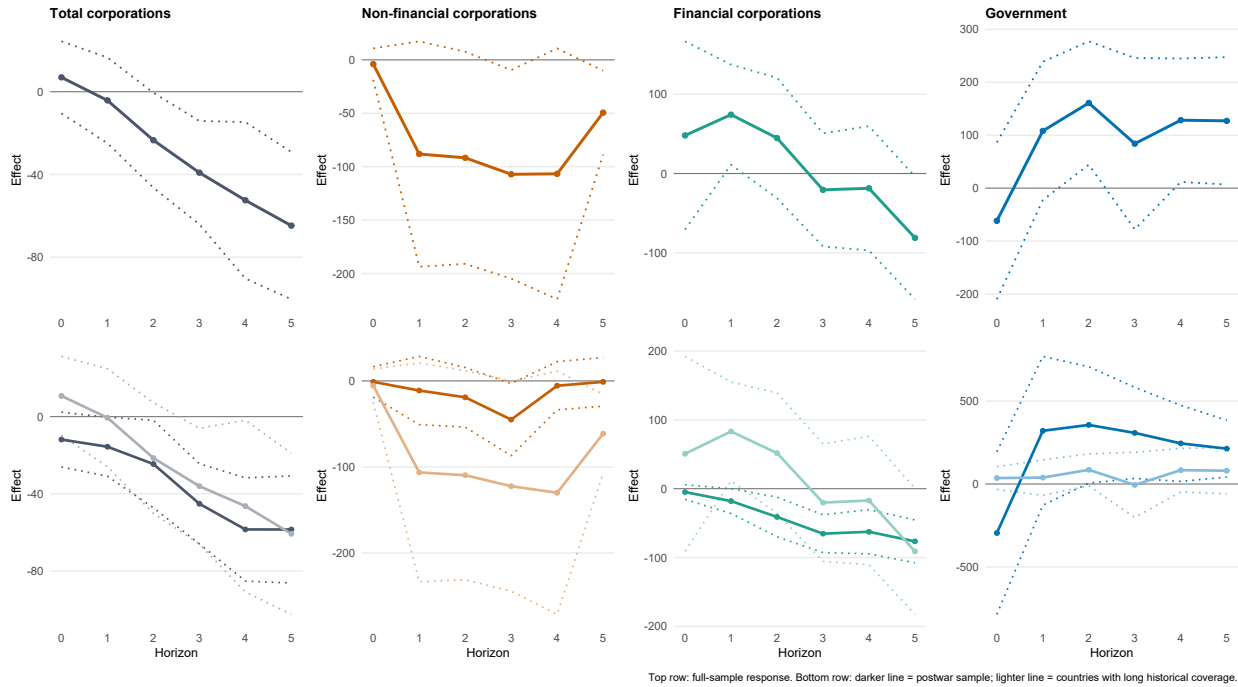


Figure 20: Bond issuance around banking crises under alternative normalizations. The figure reports event-study estimates of bond issuance around banking-crisis onsets for four issuer sectors: non-financial corporations (NFC), total corporations (TC), financial corporations (FC), and government (GOV). Within each sector, issuance is alternatively scaled by GDP, fixed investment, and lagged total corporate bank credit. All series are log-transformed and normalized relative to the year before crisis onset, so that the plotted coefficients represent cumulative log deviations from the pre-crisis benchmark year $t - 1$. Specification follows the main text. Event time $t = 0$ denotes the crisis-onset year. Each horizon is estimated separately using country fixed effects and Driscoll–Kraay standard errors with horizon-dependent bandwidths; dotted lines indicate 90% confidence intervals. Scaling issuance by fixed investment provides a demand-oriented normalization, i.e. showing whether bond issuance weakens relative to capital-spending. Normalization by lagged bank credit instead relates bond issuance to the pre-crisis size of the domestic bank-intermediated corporate credit base.

Bond issuance responses to banking crises: log issuance
Long-difference local projections; DK 90% bands, lag = 2; winsorization = 0



Bond issuance responses to banking crises: log issuance
Long-difference local projections; DK 90% bands, lag = 2; winsorization = 0.05

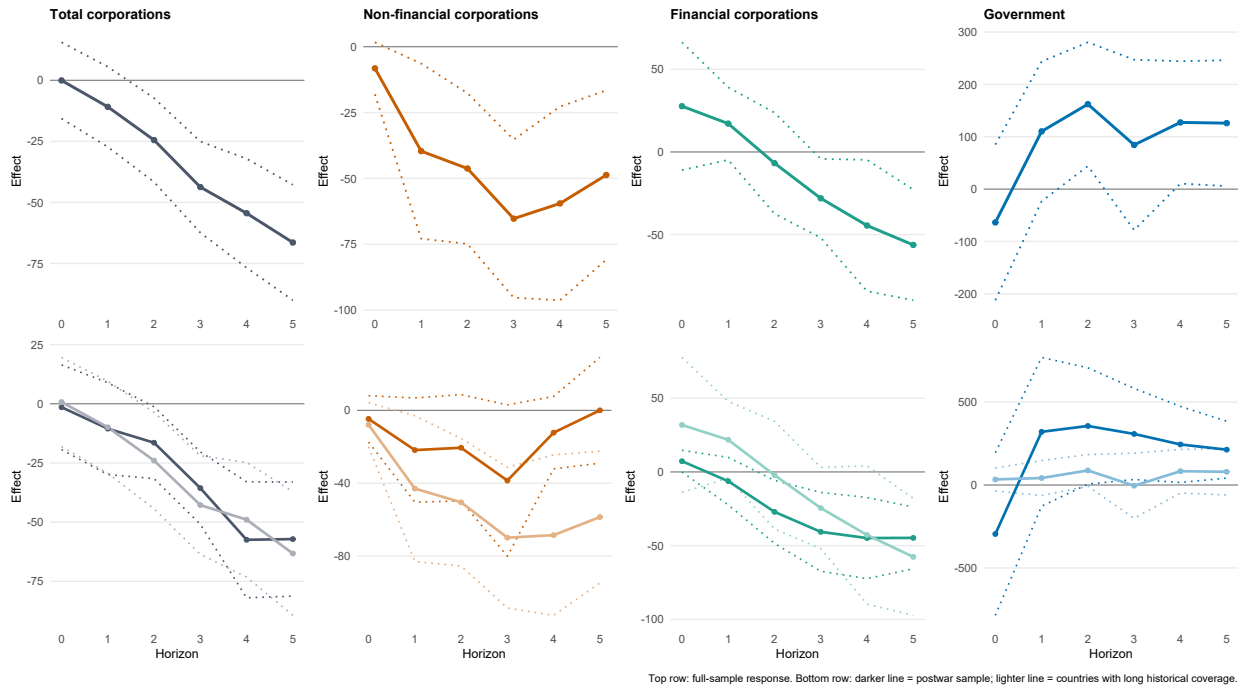


Figure 21: Sensitivity to outlier treatment in long-difference local projections. The top figure reports estimates without winsorization; the bottom figure reports estimates using 5% winsorization of the issuance series before log transformation. The dependent variable is $100 \times (y_{i,t+h} - y_{i,t-1})$, where $y_{i,t}$ denotes the log of gross bond issuance. Each figure reports total corporations, non-financial corporations, financial corporations, and government issuers. Within each figure, the top row shows the full-sample response and the bottom row allows responses to differ between countries with long historical coverage (darker) and countries observed only in the postwar sample (lighter). All specifications include country fixed effects, two lags of the dependent variable, and two lags of macroeconomic controls. Dotted lines denote 90% confidence intervals based on Driscoll and Kraay (1998) standard errors.

by a decline, and government issuance rises after crisis onset. This confirms that the baseline results are not an artifact of winsorizing the issuance level before taking logs.

8.2.3 Dependent-variable definition

The baseline local projections use the log of raw gross issuance. A natural concern is that issuance dynamics may partly reflect changes in the scale of the economy during crises. I therefore re-estimate the long-difference local projections using log issuance relative to GDP.

Figure 23 shows that the qualitative patterns are unchanged. Non-financial corporate and total corporate issuance decline relative to GDP after banking crises, while government issuance increases. The magnitudes differ because the dependent variable is now scaled by GDP before taking logs, but the sectoral ranking and dynamic pattern remain similar to the baseline raw-issuance specification.

8.2.4 Pre-crisis corporate credit growth

A potential concern is that the estimated decline in bond issuance after banking crises reflects the credit expansion that typically precedes financial crises rather than the crisis itself. I therefore augment the baseline specification with the cumulative change in corporate bank credit relative to GDP between $t - 4$ and $t - 1$. Data comes from Müller and Verner (2023). This captures pre-crisis corporate credit conditions while remaining predetermined with respect to crisis onset.

Because historical corporate credit data are less widely available than bond issuance data, I compare the augmented specification to the baseline re-estimated on exactly the same credit-available sample. Figure 24 reports the results. Controlling for the pre-crisis corporate credit expansion leaves the main response patterns largely unchanged. For non-financial corporations, the decline in raw issuance is somewhat attenuated at medium horizons but remains pronounced. When issuance is scaled by GDP, the controlled and matched-sample baseline responses are virtually identical. The responses of financial corporations and government issuance are likewise qualitatively unchanged.

The post-crisis contraction in non-financial corporate bond issuance therefore does not appear to be driven by the corporate credit boom preceding the crisis.

8.2.5 Historical coverage heterogeneity

A separate concern is that the estimated crisis response may reflect differences in sample composition rather than stable issuance dynamics. Countries with long historical coverage are often those with more developed early bond markets, while countries entering the sample only in the postwar period may differ in financial structure, market depth, and

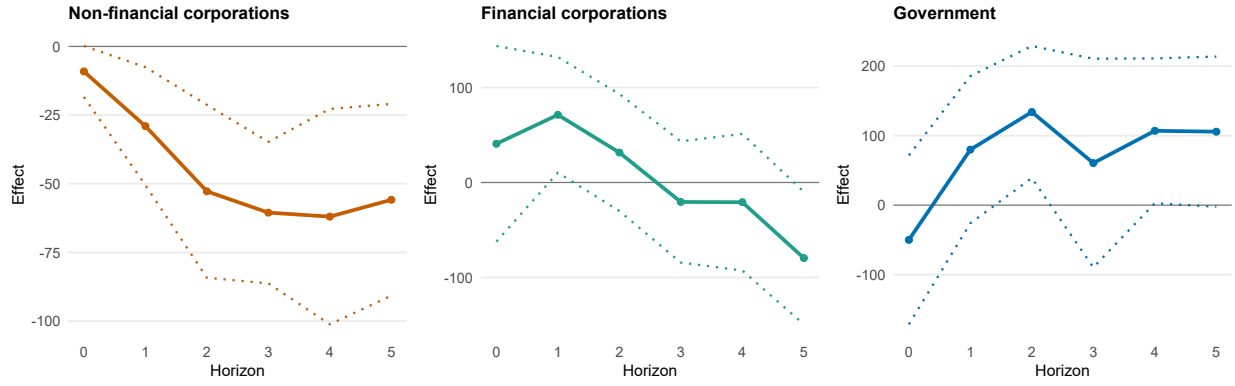


Figure 22: Robustness to winsorizing the transformed long-difference outcome. Gross issuance is not winsorized before logs. Instead, the dependent variable $100 \times (y_{i,t+h} - y_{i,t-1})$ is constructed first and then winsorized symmetrically at the 2% level. The figure reports estimates for non-financial corporations, financial corporations, and government issuers. All specifications include country fixed effects, two lags of the dependent variable, and two lags of macroeconomic controls. Dotted lines denote 90% confidence intervals based on Driscoll and Kraay (1998) standard errors.

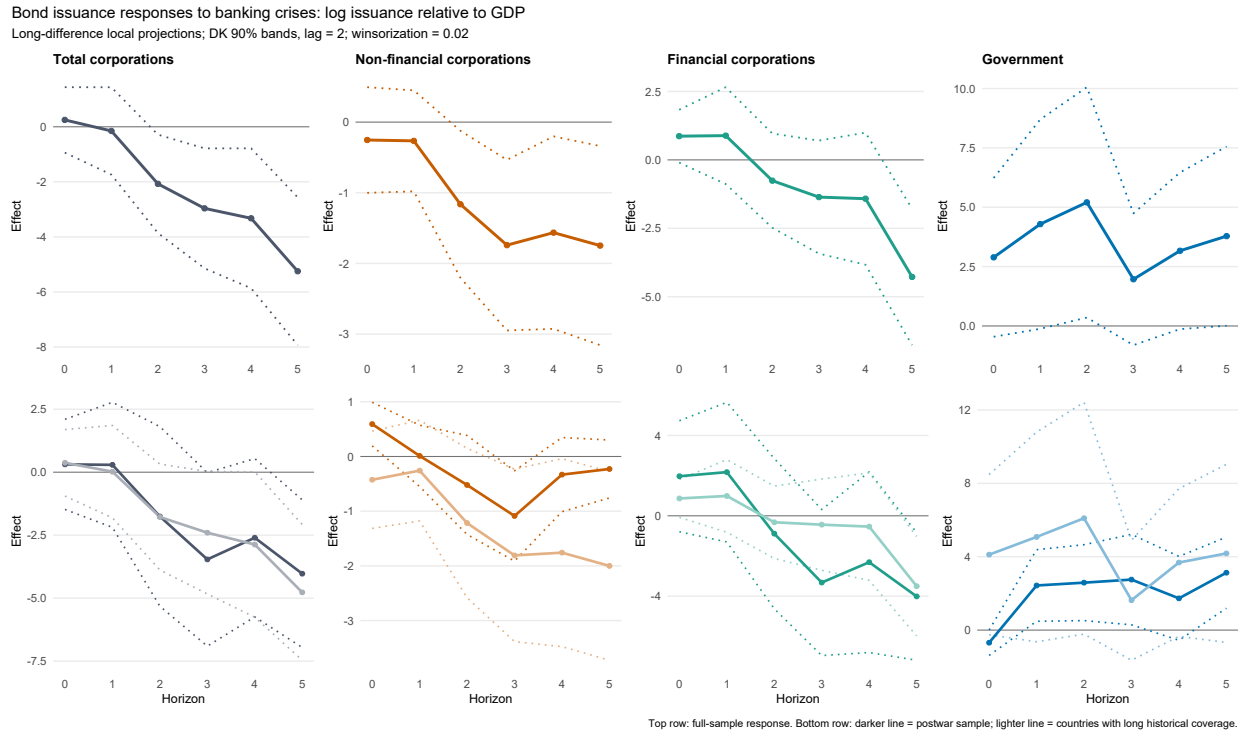


Figure 23: Outcome-definition robustness: issuance relative to GDP. The figure reports long-difference local projection estimates using $y_{i,t} = \log(1 + \text{Issues}_{i,t}/\text{GDP}_{i,t})$. The dependent variable is $100 \times (y_{i,t+h} - y_{i,t-1})$. The top row shows the full-sample response. The bottom row allows responses to differ between countries with long historical coverage and countries observed only in the postwar sample. All specifications include country fixed effects, two lags of the dependent variable, and two lags of macroeconomic controls. Issuance series are winsorized symmetrically at the 2% level before log transformation. Dotted lines denote 90% confidence intervals based on Driscoll and Kraay (1998) standard errors.

Bond issuance responses controlling for pre-crisis corporate credit growth

Change in corporate credit-to-GDP from $t-4$ to $t-1$; baseline re-estimated on identical sample; Driscoll–Kraay 90% confidence bands

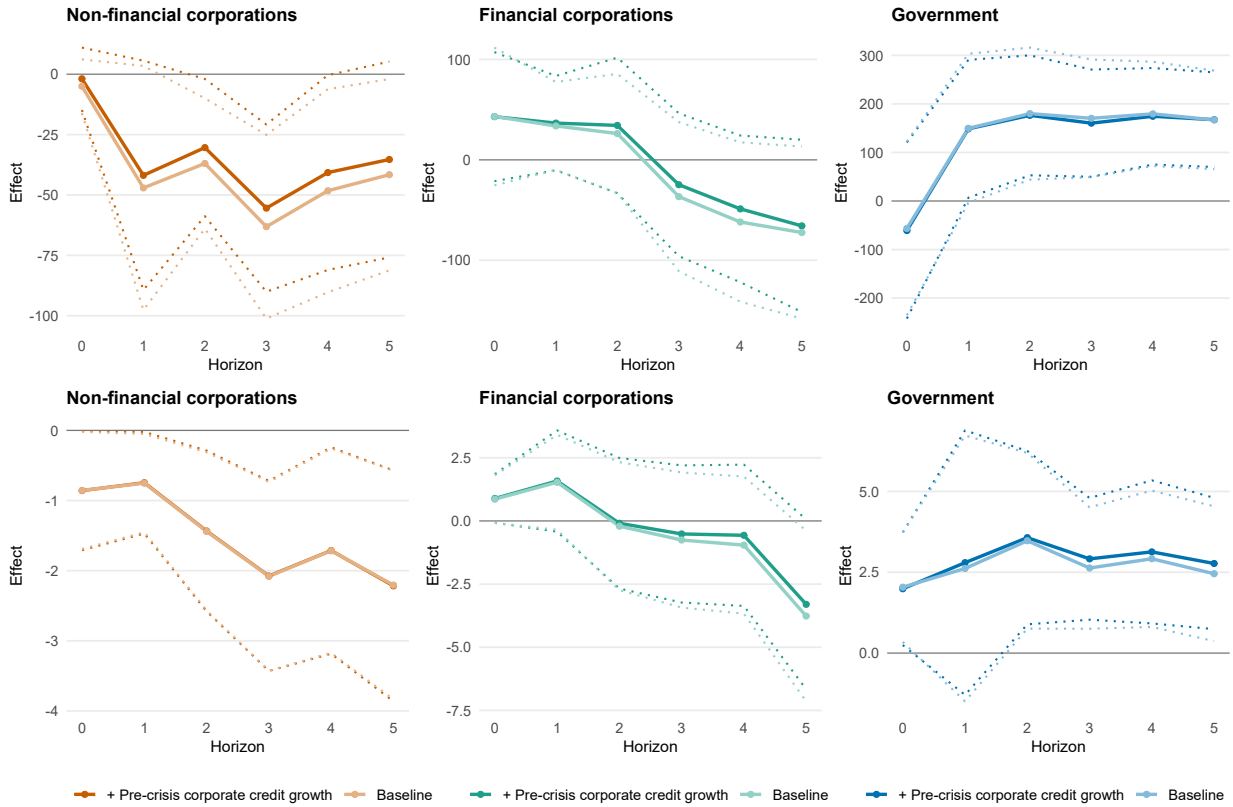


Figure 24: Bond issuance responses controlling for pre-crisis corporate credit growth.

The figure reports long-difference local projection estimates with and without a control for the cumulative change in corporate bank credit relative to GDP between $t-4$ and $t-1$. Both specifications are estimated on the identical sample for which the pre-crisis credit measure is available. Panel A reports cumulative changes in log raw issuance and Panel B reports log issuance relative to GDP. Dark lines denote the specification including the pre-crisis corporate credit-growth control and lighter lines the matched-sample baseline. All remaining elements of the specification follow the baseline, including country fixed effects, two lags of the dependent variable and macroeconomic controls, 2% winsorization of issuance, and Driscoll–Kraay standard errors. Dotted lines denote 90% confidence intervals.

data availability. To assess this, I allow the crisis response to differ between countries with pre-1945 issuance observations and countries observed only in the postwar sample.

This exercise is distinct from comparing pre- and post-1945 crises. The split used here is based on country-level data coverage, not on the date of the crisis episode. It therefore asks whether the baseline response is driven by the subset of countries for which long-run historical data are available.

The bottom rows of Figures 21 and 23 report these coverage-specific responses. The qualitative conclusions remain similar across samples. In particular, NFC issuance does not exhibit a systematic post-crisis expansion in either group, while government issuance rises after crises. This suggests that the main results are not mechanically driven by the historical coverage structure of the dataset.

8.2.6 Lag length

The baseline specification includes two lags of the dependent variable and macroeconomic controls. To assess sensitivity to the chosen lag structure, this subsection reports results using a richer and hence more conservative lag specification, as suggested in [Montiel Olea and Plagborg-Møller \(2021\)](#) to obtain lag-augmented local projections that are robust to highly persistent data for impulse responses at long horizons. Using four lags does not materially affect the estimated responses as shown in Figure 25.

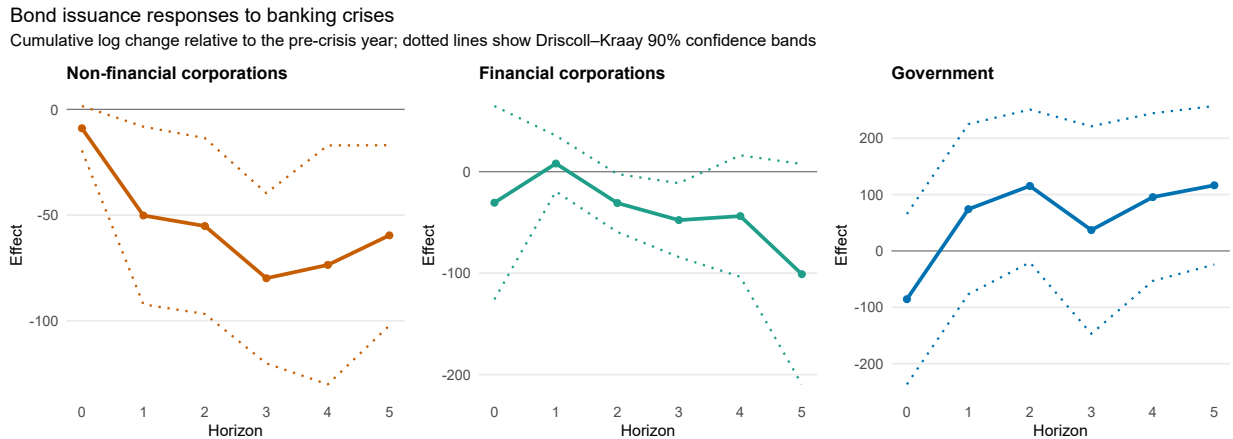


Figure 25: Lag-length robustness. The figure reports long-difference local projection estimates using four lags of the dependent variable and macroeconomic controls. The dependent variable is the log of raw bond issuance. All specifications include country fixed effects and dotted lines denote 90% confidence intervals based on [Driscoll and Kraay \(1998\)](#) standard errors.

8.2.7 Changing sample composition across horizons

Re-estimating each horizon on the common sample available through horizon five yields the same qualitative response profile, indicating that the impulse-response profile is not driven by changing sample composition across horizons.

8.2.8 Pre- versus post-1945 crisis episodes

This split differs from the historical-coverage split used above: here, crises are classified by the calendar date of the crisis onset, whereas the coverage split classifies countries by whether their issuance data extend before World War II.

8.2.9 Bond issuance responses before and after 1980

A potential concern with the long-run analysis is the pronounced increase in the size of bond markets since the 1980s. In particular, issuance relative to GDP exhibits a marked upward trend over the sample period, raising the possibility that the estimated crisis responses primarily reflect the substantially deeper bond markets of the recent period. I therefore allow the response to banking crises to differ between crisis episodes occurring before and after 1980.

Rather than estimating the two periods separately, I re-estimate the baseline long-difference local projections on the full sample and interact the banking-crisis indicator with an indicator for crisis years from 1980 onward. I also allow the coefficients on all lagged controls and lagged dependent variables to differ across the two periods. Specifically, for each horizon h , I estimate

$$\begin{aligned}\Delta_h y_{i,t+h} = & \alpha_i + \beta_h \text{Crisis}_{i,t} + \delta_h (\text{Crisis}_{i,t} \times \text{Post1980}_t) + \lambda_h \text{Post1980}_t \\ & + \Gamma'_h X_{i,t} + \Theta'_h (X_{i,t} \times \text{Post1980}_t) + \varepsilon_{i,t+h},\end{aligned}\tag{5}$$

where the pre-1980 crisis response is given by β_h and the post-1980 response by $\beta_h + \delta_h$. The remaining specification follows the baseline, including country fixed effects, two lags of the macroeconomic controls and dependent variable, 2% winsorization, and Driscoll–Kraay standard errors.

Figure 27 presents the results. Panel A uses the baseline log issuance outcome. For non-financial corporations, the central result is present in both periods: bond issuance falls sharply following banking crises before as well as after 1980. The estimated trajectories are quantitatively similar, and formal tests of the interaction terms provide no evidence of systematic differences between the pre- and post-1980 responses. The responses of financial-corporate and government issuance are considerably noisier and likewise show no systematic evidence of a break around 1980.

The GDP-scaled specification in Panel B reveals more pronounced heterogeneity. For non-financial corporations, issuance relative to GDP changes little following pre-1980 crises, whereas post-1980 crises are followed by a persistent decline. The difference between the two periods becomes statistically significant at several horizons. A similar divergence emerges for financial corporations at longer horizons, while government issuance exhibits no systematic pre/post-1980 difference.

Bond issuance responses before and after 1945

Crisis episodes split by onset date; cumulative change relative to $t-1$; Driscoll–Kraay 90% confidence bands

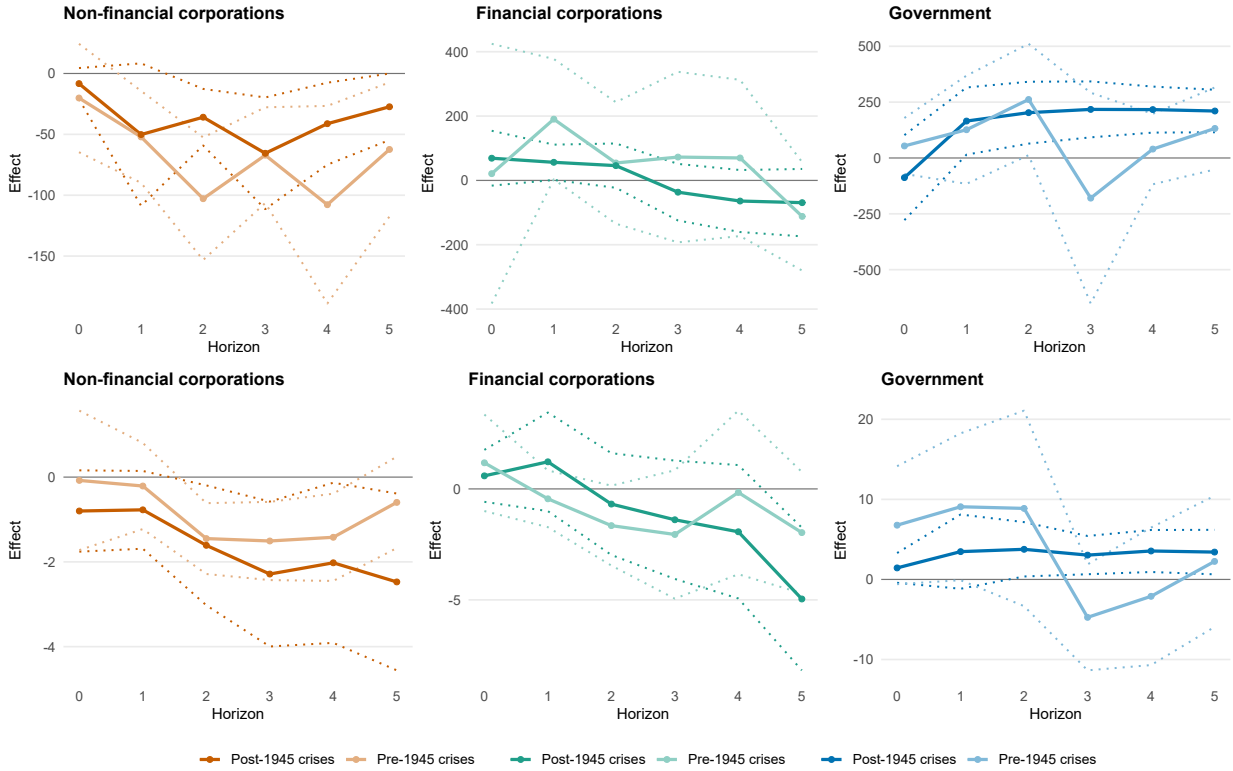


Figure 26: Pre- versus post-1945 crisis episodes. The figure reports long-difference local projection estimates of the cumulative response of bond issuance to banking crises, allowing the response to differ between crisis episodes with onset dates before 1945 and crisis episodes with onset dates in 1945 or later. Panel A uses the log of raw gross issuance as the dependent variable. Panel B uses log issuance relative to GDP. The dependent variable is $100 \times (y_{i,t+h} - y_{i,t-1})$. All specifications include country fixed effects, two lags of the dependent variable, and two lags of macroeconomic controls: real GDP growth, inflation, the short-term interest rate, and the current account balance. Issuance series are winsorized symmetrically at the 2% level before log transformation. Dotted lines denote 90% confidence intervals based on [Driscoll and Kraay \(1998\)](#) standard errors. Vertical scales differ across panels to highlight within-sector dynamics.

Bond issuance responses before and after 1980

Crisis episodes split by onset date; cumulative change relative to $t-1$; Driscoll-Kraay 90% confidence bands

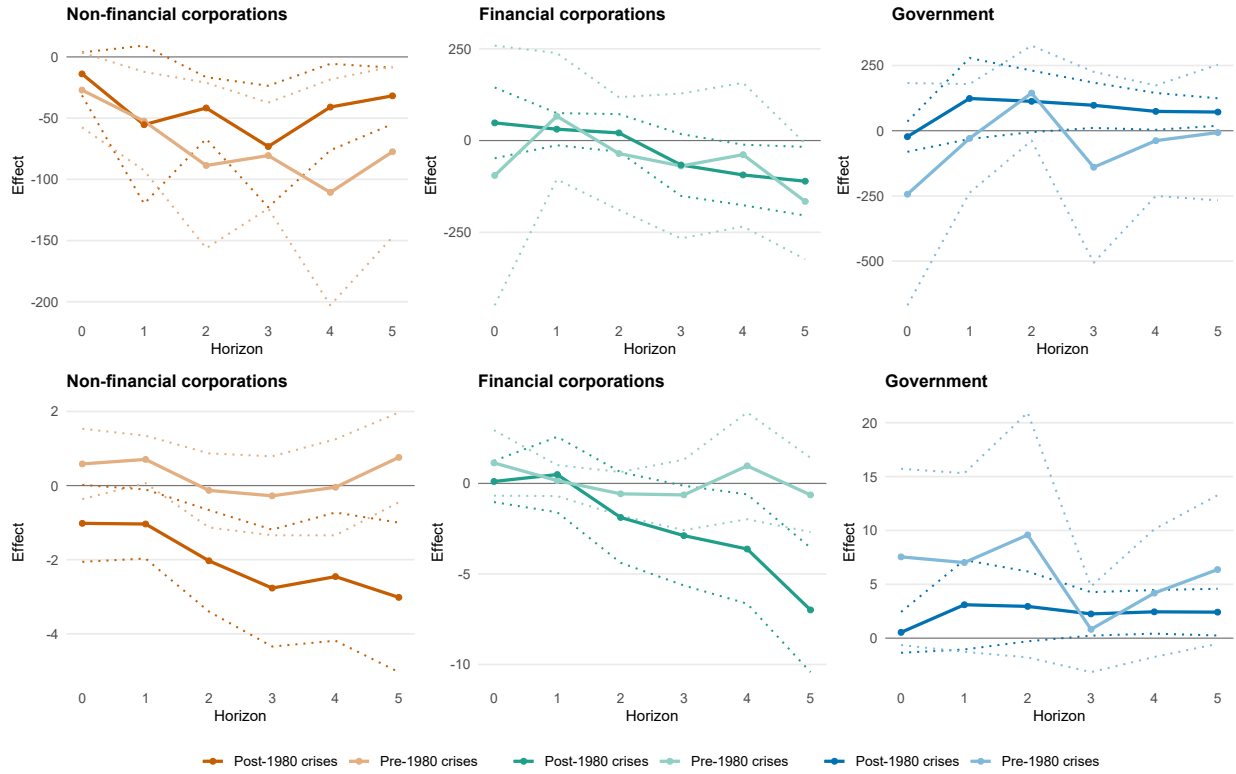


Figure 27: Bond issuance responses before and after 1980

Notes: The figure reports long-difference local-projection estimates of bond issuance responses to banking crises, allowing crisis responses and all baseline controls to differ between crisis episodes beginning before and after 1980. Panel A reports cumulative changes in log raw issuance and Panel B reports changes in log issuance relative to GDP. Dark lines denote post-1980 crisis episodes and light lines denote pre-1980 episodes. Dotted lines report 90% Driscoll-Kraay confidence intervals. The specification includes country fixed effects, two lags of the macroeconomic controls and dependent variable, and 2% winsorization.

These results help distinguish two implications of the secular deepening of bond markets. First, the underlying contraction in non-financial corporate bond issuance following banking crises is not specific to the modern, high-issuance period: the response of raw issuance is already clearly visible before 1980. Second, the contraction becomes substantially more important relative to aggregate economic activity once bond markets deepen. The stronger post-1980 response of issuance relative to GDP is therefore consistent with the growing macroeconomic importance of bond-market financing rather than with the baseline issuance response being mechanically generated by the post-1980 expansion of bond markets.

8.2.10 Leave-One-Out analysis - countries

A potential concern with the baseline estimates is that the results may be driven by a small number of influential countries or crisis episodes. To assess the stability of the estimated effects, I conduct a systematic leave-one-out (LOO) robustness analysis. Starting from the baseline full-sample specification, I iteratively re-estimate the model while excluding one country at a time. For each exclusion, I recover the full impulse response function (IRF) for the issuance path following banking crises. The LOO analysis evaluates both the dispersion of the estimated response across countries and the sensitivity of the baseline estimate to any single-country exclusion.

Figure 28 presents a leave-one-out (LOO) of crisis-period issuance coefficients across horizons. The solid black line reports the full-sample impulse response, while grey dashed lines show the IRFs obtained from all leave-one-out estimations. To enhance readability, the figure highlights the eight most influential exclusions, defined as the countries whose omission produces the largest maximum absolute deviation from the full-sample IRF across horizons. Even for these most influential cases, the IRFs closely track the full-sample response at all horizons. While the magnitude of the responses varies modestly, the qualitative pattern—an initial contraction followed by partial recovery—remains unchanged. The estimated responses are highly stable across LOO iterations: excluding any individual country does not materially affect the sign, timing, or overall shape of the impulse responses. This indicates that the baseline results are not driven by a small subset of influential countries.

8.2.11 Leave-One-Out analysis - crises

Similarly, Figure 29 repeats the same exercise for crisis rather than country exclusions, again confirming the stability of the baseline results. Specification exactly as for the country LOO.

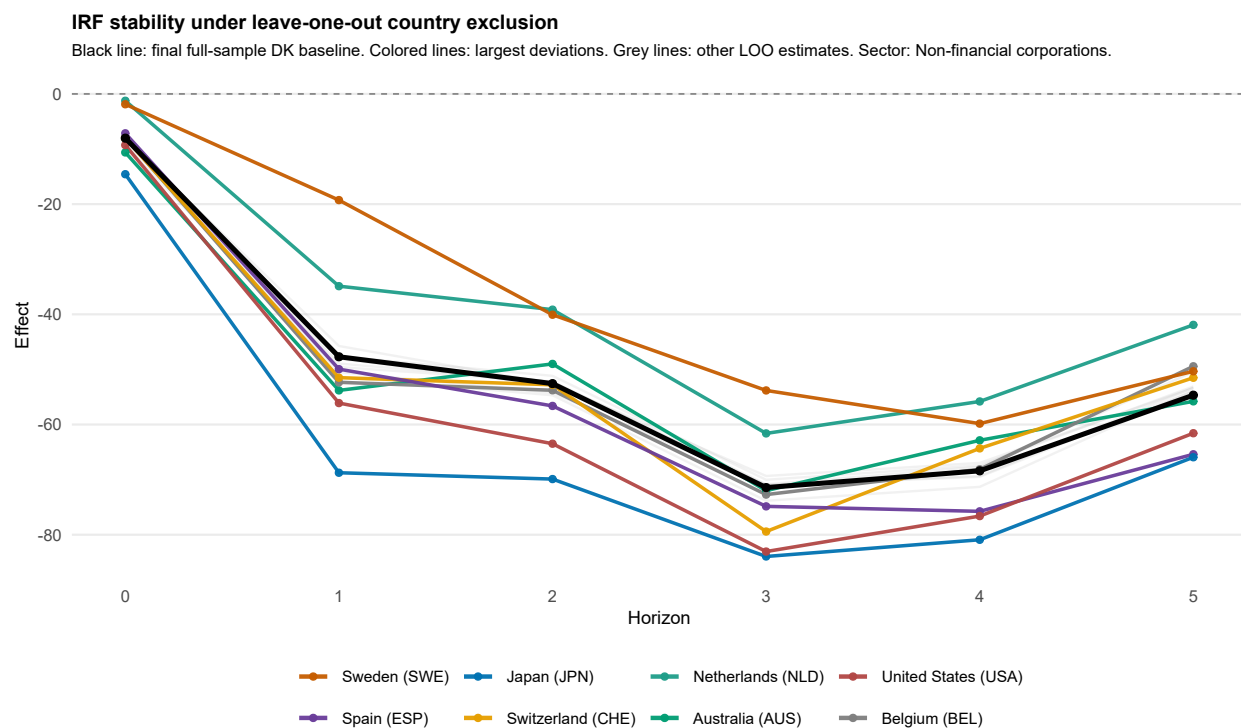


Figure 28: IRF stability under leave-one-out country exclusions. The figure overlays impulse response functions (IRFs) from the baseline LDLP specification estimated on the full sample (solid black line) and on samples excluding individual countries. Response variable is the log of non-financial corporations bonds issues. Grey dashed lines show IRFs from all leave-one-out estimations. Colored dashed lines highlight the eight most influential exclusions, defined as the countries whose exclusion yields the largest maximum absolute deviation from the full-sample IRF across horizons. Influence is measured as the maximum absolute difference between the leave-one-out and full-sample IRF coefficients across horizons, i.e. $\max_h |\hat{\beta}_h^{(-i)} - \hat{\beta}_h|$.

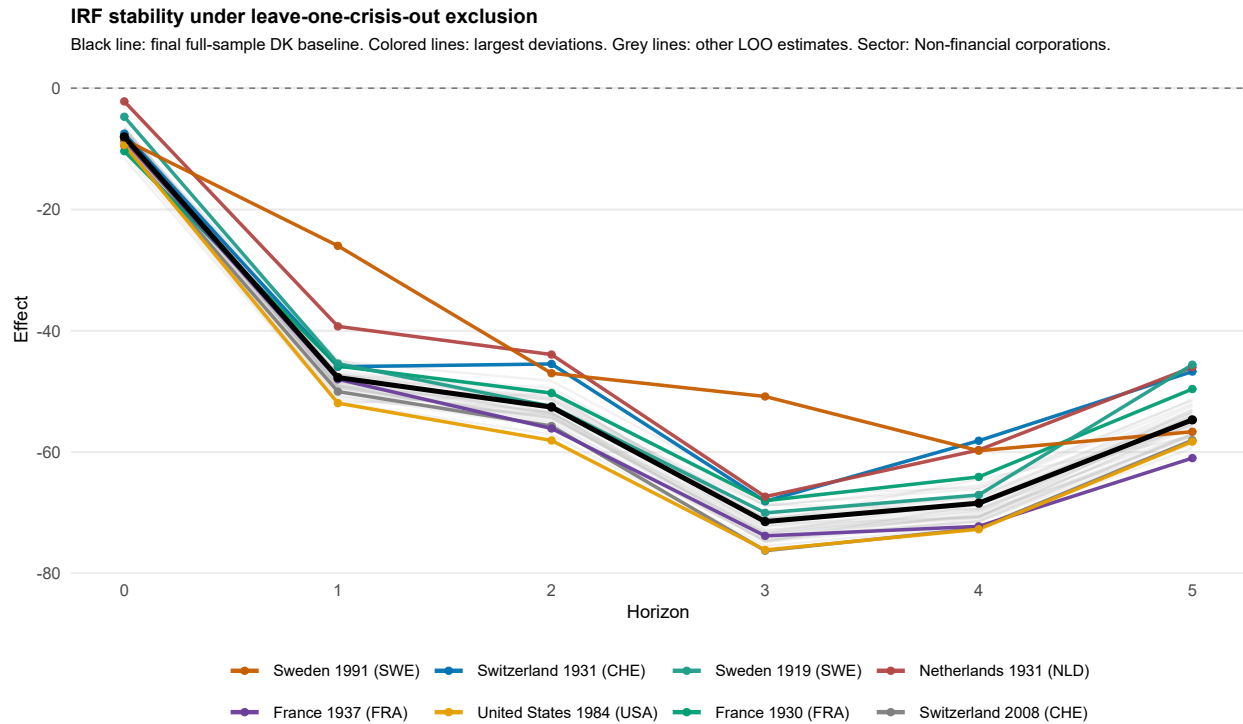


Figure 29: IRF stability under leave-one-out crisis exclusions. The figure overlays impulse response functions (IRFs) from the baseline LDLP specification estimated on the full sample (solid black line) and on samples excluding individual crisis. Response variable is the log of non-financial corporations bonds issues. Grey dashed lines show IRFs from all leave-one-out estimations. Colored dashed lines highlight the eight most influential exclusions, defined as the crisis whose exclusion yields the largest maximum absolute deviation from the full-sample IRF across horizons. Influence is measured as the maximum absolute difference between the leave-one-out and full-sample IRF coefficients across horizons, i.e. $\max_h |\hat{\beta}_h^{(-i)} - \hat{\beta}_h|$.

Bond issuance responses to banking crises
Country and year fixed effects

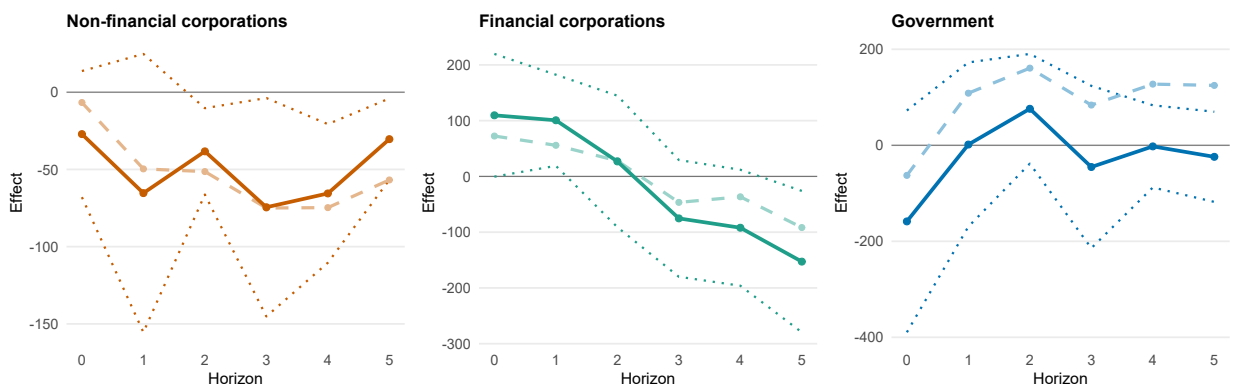


Figure 30: Bond issuance responses to banking crises: calendar-year fixed effects

Notes: The solid lines report long-difference local-projection estimates including country and calendar-year fixed effects; dotted lines denote 90% confidence intervals based on Driscoll-Kraay standard errors with five lags. The lighter dashed lines report the baseline country-fixed-effects specification re-estimated on the identical estimation sample. All other specification choices are unchanged from the baseline.

8.2.12 Year fixed effects

Banking crises are often clustered in periods of global financial and macroeconomic stress. A potential concern is therefore that the baseline estimates partly capture common shocks to bond issuance in crisis years rather than country-specific changes associated with banking crises. To address this concern, I augment the baseline long-difference local projection with calendar-year fixed effects:

$$\Delta_h y_{i,t} = \beta_h \text{Crisis}_{i,t} + \sum_{j=1}^2 \Gamma'_{h,j} X_{i,t-j} + \sum_{j=1}^2 \rho_{h,j} y_{i,t-j} + \alpha_i + \lambda_t + \varepsilon_{i,t+h}, \quad (6)$$

where λ_t denotes calendar-year fixed effects. All other elements of the baseline specification are unchanged, including the controls, lag structure, winsorization, and Driscoll–Kraay standard errors with five lags. The inclusion of year fixed effects absorbs shocks common to all countries in a given year, so that β_h is identified from cross-country differences within the same calendar year.

Figure 30 reports the resulting responses. Because introducing year fixed effects can alter the estimation sample, the figure also reports the baseline country-fixed-effects specification re-estimated on exactly the same observations retained by the country-and-year-fixed-effects model. This makes it possible to distinguish changes due to the additional fixed effects from changes in sample composition.

The main result for non-financial corporate issuance is robust. The medium-run contraction remains quantitatively close to the matched-sample baseline, particularly at horizons three and four, and remains statistically significant at the 90% level from horizons two through five. The response attenuates somewhat at the longest horizon, but does not reverse. The matched-sample country-fixed-effects estimates are themselves very close to the original baseline, indicating that changes in sample composition are not driving the result.

The responses of financial corporations and the government are more sensitive to common time shocks. Financial-corporation issuance continues to increase initially before contracting at longer horizons, while the positive medium-run government issuance response largely disappears. Overall, absorbing common calendar-year variation leaves the central finding—a persistent post-crisis contraction in non-financial corporate bond issuance—intact.

8.2.13 Alternative banking-crisis chronology

A potential concern is that the estimated issuance response depends on the classification or precise dating of banking crises. The baseline analysis uses the banking-crisis chronology of [Baron et al. \(2021\)](#). Historical crisis chronologies can differ both in whether an episode is classified as a systemic banking crisis and in the precise year assigned to crisis onset.

I therefore re-estimate the headline long-difference local projection for non-financial corporate bond issuance using the crisis chronology of [Jordà et al. \(2017\)](#), specifically the JST Dataset version R6. Because the JST chronology covers a narrower set of countries than the baseline sample, I separate changes in sample composition from changes in crisis dating. I first re-estimate the baseline BVX specification using only country-year observations covered by JST and then replace the BVX crisis indicator with the JST indicator on exactly the same sample. All other features of the baseline specification are unchanged.

Figure 31 shows that restricting the BVX specification to the JST-covered sample has virtually no effect on the estimated issuance response. More importantly, replacing the BVX dates with the JST chronology yields the same pronounced and persistent contraction in NFC bond issuance. The JST estimates are somewhat more negative at intermediate horizons and less precisely estimated, but remain statistically below zero from horizons two through five. The estimated decline therefore does not depend on the particular banking-crisis chronology used in the baseline analysis.

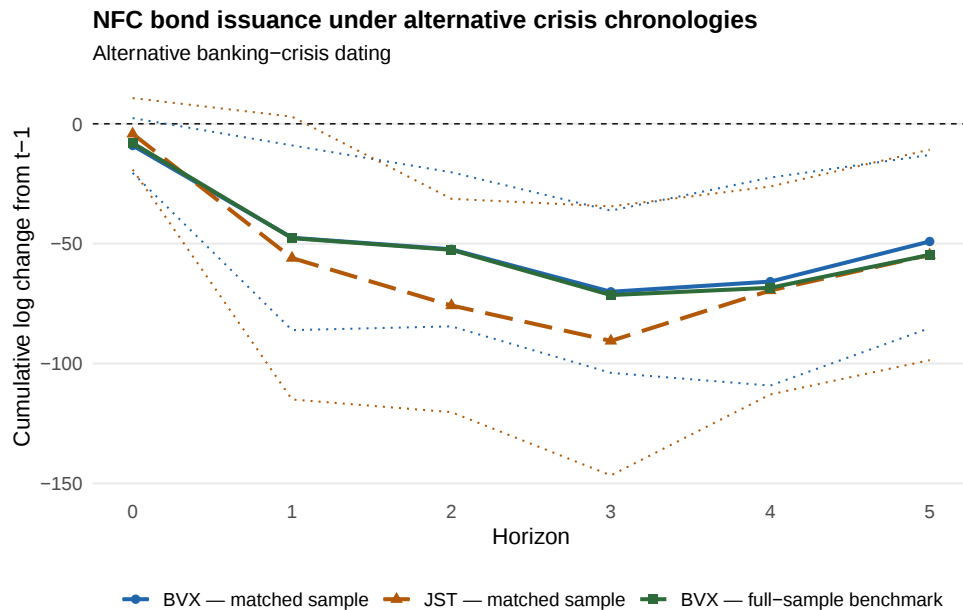


Figure 31: NFC bond issuance under alternative banking-crisis chronologies. The figure reports long-difference local projection estimates of the cumulative response of non-financial corporate bond issuance following banking-crisis onset. The solid line uses the [Baron et al. \(2021\)](#) crisis chronology and the dashed line uses the [Jordà–Schularick–Taylor](#) chronology, estimated on the common JST-covered sample. The dotted grey line reports the original full-sample BVX benchmark. The dependent variable is $100 \times (y_{i,t+h} - y_{i,t-1})$, where y denotes log gross NFC bond issuance. All specifications retain the baseline country fixed effects, lag structure, macroeconomic controls, and outlier treatment. Error bars denote 90% confidence intervals based on [Driscoll and Kraay \(1998\)](#) standard errors.

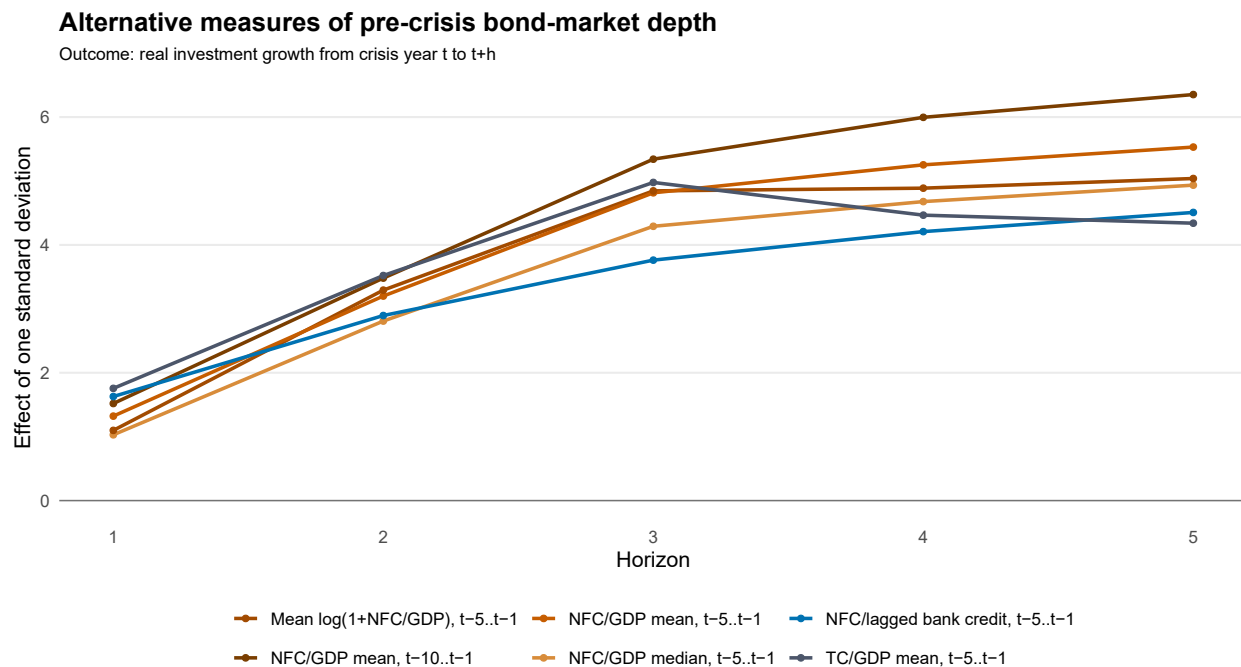


Figure 32: Alternative measures of pre-crisis bond-market depth. The figure reports crisis-event regressions of real investment recovery on alternative measures of pre-crisis bond-market depth. The dependent variable is $100 \times (\log I_{i,t_0+h} - \log I_{i,t_0})$, where I denotes real investment. Each depth measure is standardized across crisis episodes. All specifications control for the pre-crisis corporate credit boom and the crisis-year real GDP shock. Standard errors are clustered by country.

8.3 Real effects robustness

This appendix reports robustness checks for the real-effects exercise in Section 4.5. The baseline specification relates post-crisis recovery to pre-crisis non-financial corporate bond-market depth, defined as the average NFC bond issuance-to-GDP ratio over the five years before crisis onset. Outcomes are measured from the crisis year t_0 to $t_0 + h$, so the estimates capture subsequent recovery conditional on the crisis having begun.

Figure 32 shows that the positive association between bond-market depth and investment recovery is not specific to the baseline depth measure. The pattern is similar when depth is measured using the median rather than the mean NFC issuance-to-GDP ratio, a longer ten-year pre-crisis window, a log transformation, issuance relative to lagged corporate bank credit, or total corporate rather than NFC issuance. The magnitude varies across definitions, but the medium-run investment slope remains positive.

Figure 33 shows that the investment result is not driven by the inclusion of the severity controls. The estimated slope remains positive when the crisis-year GDP shock is omitted, when the pre-crisis credit boom is omitted, and when both controls are excluded. This reduces the concern that the baseline result mechanically reflects either stronger credit expansions before crises or differences in the size of the initial output collapse.

Figure 34 and Table 24 report a full-panel interaction specification similar to [Krishnamurthy and Muir \(2025\)](#). For each horizon $h = 1, \dots, 5$, I estimate the full-panel interac-

Robustness to credit-boom and crisis-year shock controls

Outcome: real investment growth from crisis year t to t+h

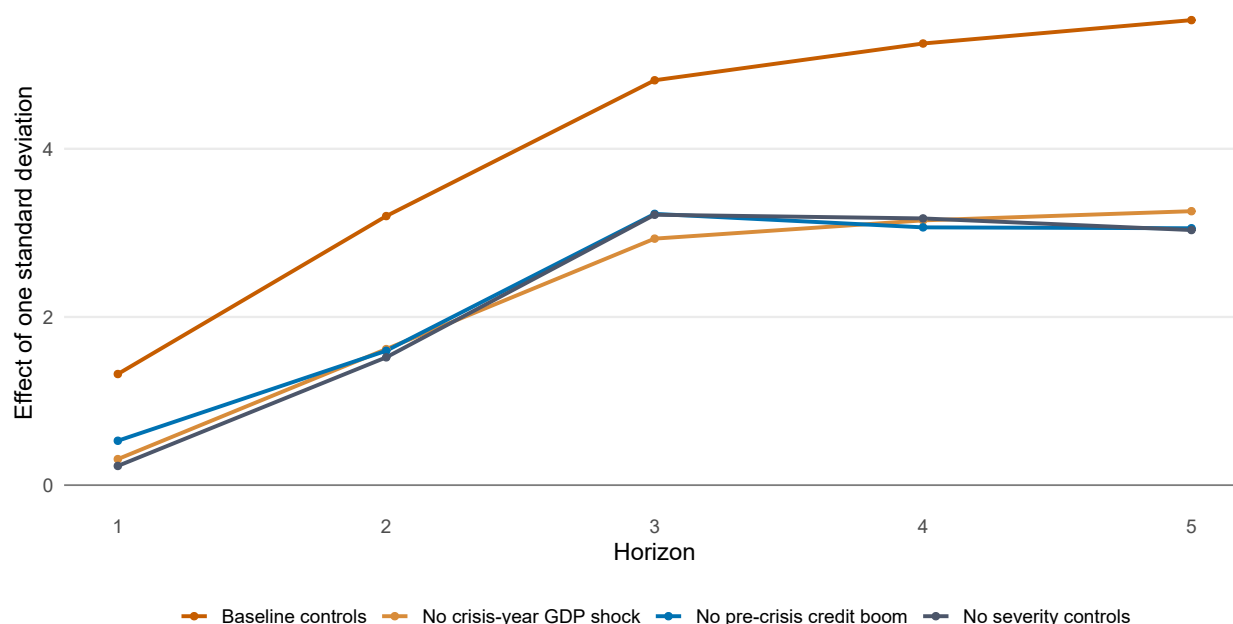


Figure 33: Robustness to credit-boom and crisis-year shock controls. The figure reports crisis-event regressions of real investment recovery on pre-crisis NFC bond-market depth under alternative control sets. The baseline controls for the pre-crisis corporate credit boom and the crisis-year GDP shock. The remaining specifications remove the crisis-year GDP shock, remove the pre-crisis credit boom, or remove both controls. Standard errors are clustered by country.

Table 24: Full-panel interaction: bond-market depth in crisis and non-crisis years

Outcome	Horizon	Observations	Countries	Crisis obs.	NFC depth × crisis onset	NFC depth × non-crisis years
Real GDP	1	741	16	29	0.14 (0.17)	0.07 (0.11)
Real GDP	2	740	16	29	0.22 (0.19)	0.17 (0.20)
Real GDP	3	739	16	29	0.31 (0.25)	0.20 (0.29)
Real GDP	4	738	16	29	0.44 (0.35)	0.19 (0.38)
Real GDP	5	737	16	29	0.63 (0.42)	-0.01 (0.40)
Real investment	1	677	16	27	0.29 (0.79)	0.14 (0.34)
Real investment	2	676	16	27	0.73 (0.90)	0.64 (0.63)
Real investment	3	675	16	27	1.05 (1.11)	1.01 (0.82)
Real investment	4	674	16	27	1.51 (1.46)	1.20 (0.92)
Real investment	5	673	16	27	1.81 (1.57)	1.24 (0.95)

Notes: The table reports a full-panel interaction specification in the spirit of [Krishnamurthy and Muir \(2025\)](#). The dependent variable is $100 \times (\log y_{i,t+h} - \log y_{i,t})$, where y is real GDP or real investment. The table reports the coefficient on pre-crisis NFC bond-market depth interacted with crisis-onset years and clean non-crisis years. NFC depth is the standardized five-year rolling average of NFC bond issuance relative to GDP. Regressions include country fixed effects, year fixed effects, two lags of real GDP growth, the crisis-onset indicator, and the pre-crisis credit boom interacted with the crisis-onset indicator. Standard errors are computed using [Driscoll and Kraay \(1998\)](#) standard errors with eight lags. Parentheses report standard errors. Sample is reduced as the depth measure requires data to be available well before crisis onsets which is often not the case historically.

tion specification

$$100 \times (\log y_{i,t+h} - \log y_{i,t}) = \beta_h^C (\text{Depth}_{i,t} \times \text{Crisis}_{i,t}) + \beta_h^N (\text{Depth}_{i,t} \times \text{NonCrisis}_{i,t}) + \gamma_h (\text{CreditBoom}_{i,t} \times \text{Crisis}_{i,t}) \quad (7)$$

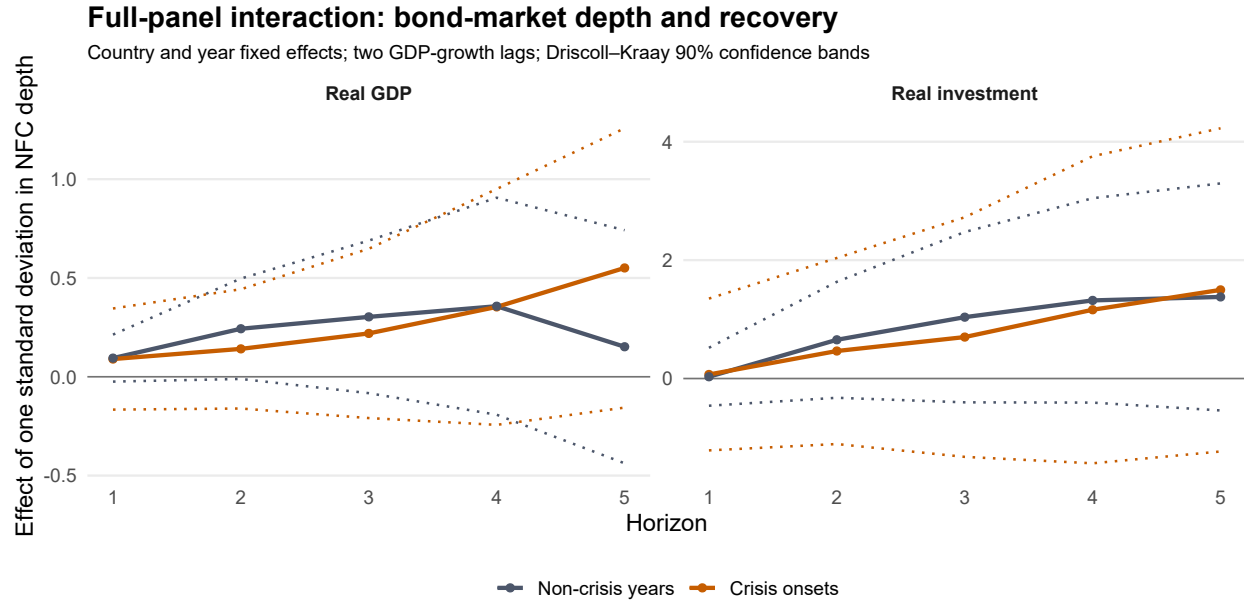


Figure 34: Full-panel interaction: bond-market depth in crisis and non-crisis years. The figure reports coefficient paths from a full-panel interaction specification. The dependent variable is $100 \times (\log y_{i,t+h} - \log y_{i,t})$, where y is real GDP or real investment. The figure plots the implied slope of real outcomes with respect to five-year lagged NFC bond-market depth separately for crisis-onset years and non-crisis years. Regressions include country fixed effects, year fixed effects, two lags of real GDP growth, the crisis-onset indicator, and the pre-crisis credit boom interacted with the crisis-onset indicator. Dotted lines denote 90% confidence intervals based on Driscoll and Kraay (1998) standard errors with eight lags following Krishnamurthy and Muir (2025).

Here $y_{i,t}$ denotes either real GDP or real investment. $\text{Depth}_{i,t}$ is the standardized five-year rolling average of NFC bond gross issuance relative to GDP, measured over $t - 5$ to $t - 1$. hence it is the pre-period bond-market depth in this full-panel specification, not always “pre-crisis depth,” because for non-crisis years it is just lagged depth. $\text{Crisis}_{i,t}$ is an indicator for a systemic banking-crisis onset. $\text{NonCrisis}_{i,t}$ is an indicator for clean non-crisis years, defined as years with no crisis onset in the current year or over the subsequent five-year horizon. $\text{CreditBoom}_{i,t}$ is the change in corporate credit-to-GDP from $t - 4$ to $t - 1$. The specification includes country fixed effects α_i , year fixed effects λ_t , and two lags of real GDP growth. Standard errors are computed using Driscoll and Kraay (1998) standard errors with eight lags.

The coefficients of interest are β_h^C and β_h^N . β_h^C measures the association between pre-crisis NFC bond-market depth and subsequent real outcomes in banking-crisis onset years, while β_h^N measures the corresponding association in clean non-crisis years. A crisis-specific spare-tire mechanism would imply $\beta_h^C > \beta_h^N$, especially for investment. The coefficients on NFC bond-market depth are positive for investment in both crisis-onset and non-crisis years, especially at medium horizons. However, the crisis and non-crisis slopes are not sharply separated, and the difference between them is imprecise. The full-panel evidence therefore supports a cautious interpretation: pre-crisis bond-market depth is as-

Table 25: Sample coverage for the real-effects crisis-event regressions

Statistic	Count
Crisis episodes	59
Real GDP outcome available	59
Real investment outcome available	57
Pre-crisis NFC depth available	38
Credit boom available	39
Crisis-year GDP shock available	58
Baseline GDP sample	28
Baseline investment sample	26

Notes: The table reports sample coverage for the main crisis-event real-effects specification at horizon $h = 5$. The baseline sample requires the outcome, pre-crisis NFC bond-market depth, the pre-crisis corporate credit boom, and the crisis-year real GDP shock to be observed.

sociated with stronger investment growth, including after banking crises, but the data do not cleanly establish that this association is unique to crisis periods.

This full-panel exercise is useful because it maps the real-effects result back to the theory. If bond markets acted as a crisis-specific spare tire, the coefficient on NFC depth should be substantially larger in crisis-onset years than in clean non-crisis years. The estimates do not show such a sharp separation. Investment slopes are positive in both states and their difference imprecise. Thus, the real-effects evidence is consistent with bond-market depth being associated with stronger investment performance, but it does not provide strong support for a distinct crisis-state substitution mechanism.

9 Appendix D: Credit-market repricing and NFC issuance

This appendix describes the credit-spread data, their treatment and overlap with the bond-issuance panel, and the full set of price–quantity results underlying Section 4.4. The exercise is designed as interpretation evidence. It asks whether the severity of risky debt-market repricing is systematically related to the severity of the subsequent NFC primary-issuance contraction. It does not claim to recover a structural bond-supply shock.

9.1 Credit-spread data and construction

The credit-spread series come from the replication data of ?. Their historical measure, available for 1869–1929, is constructed from bond prices and yields in the *Investor’s Monthly Manual* as a within-country risky-minus-safe spread, averaged over the final quarter of each year. The underlying bond cross-section is broad and includes railroads, banks, sovereign or quasi-sovereign issuers, and other corporations; it should therefore be interpreted as a price measure for the risky bond market rather than as an NFC-specific borrowing rate. Modern observations combine the U.S. Moody’s Baa–Aaa spread with corporate spread series from central banks and commercial providers. Table 26 summarizes the main source regimes and their treatment.

I use the authors’ mean-normalized country spread, spreadnorm , and their supplied annual change, chgspreaddnorm . I do not reconstruct the change mechanically from adjacent observations because the supplied variable deliberately suppresses comparisons across source breaks and gaps. The spread panel is merged to the issuance data by ISO3 code and calendar year, while crisis onsets continue to follow ?, as in the main analysis. No spread observations are interpolated. The strict price sample requires the supplied normalized spread change at crisis onset and excludes Sweden from 1987 onward because that segment measures bank-loan rather than bond-market pricing. Hence, the Swedish crises of 1991 and 2008 do not enter the strict sample; the earlier Swedish bond observations remain eligible. The baseline uses the same-year change from $t - 1$ to t , with maximum repricing over $t, t + 1$ and $t, t + 1, t + 2$ reported as timing robustness checks.

9.2 Overlap and exact crisis sample

The full NFC baseline contains 36 crisis origins with the controls and outcomes required by the exact LDLP at the reported horizons. Restricting the panel to countries that ever have a strict KM bond spread leaves the baseline response essentially unchanged, but requiring a spread change at the crisis origin selects a much milder set of episodes. The constant-origin price sample used for the main heterogeneity analysis contains 18 crisis onsets from nine countries. The full fixed-effects estimation panel contains 12 countries because non-crisis observations from additional spread-covered countries enter the control and fixed-effects

Table 26: Summary of KM spread sources and treatment in the issuance merge

Period and source	Spread concept	Treatment
1869–1929: <i>Investor's Monthly Manual</i>	Within-country high-yield minus low-yield bond spread; broad risky bond market rather than NFC-only	Included when the author-supplied normalized change is observed
United States, 1928 onward: Moody's	Baa minus Aaa corporate bond spread	Included
Japan and South Korea: central banks	Corporate credit-spread series; Korea uses three-year AA- corporate bonds	Included
Modern Europe and other countries	Corporate-minus-government or comparable bond-market spread	Included where classified as a bond spread
Sweden, 1987 onward	Bank-loan spread to non-financial firms, with short average maturity	Excluded from strict bond sample
World-war years	Government benchmarks distorted by wartime borrowing	Retained as missing

The table summarizes the data appendix and replication variables of ?. Their final replication file does not provide a source flag for every country-year. I therefore retain the author-supplied normalized variables as the source of record and impose only restrictions that can be identified unambiguously.

structure.

The exact 18-event sample is shown in Table 27. The same-year measure places the U.S. 2007 onset in the low-repricing group because the large U.S. spread increase materialized mainly in 2008. This is why the onset-window timing checks are important and are reported below.

Table 27: Exact constant-origin crisis sample by same-year spread-repricing tercile

Low repricing	Middle repricing	High repricing
Japan 1990 (−0.85)	United States 1990 (0.33)	Japan 1997 (0.98)
Sweden 1878 (−0.31)	Japan 1927 (0.46)	Spain 2008 (1.31)
Japan 1923 (−0.18)	Japan 2001 (0.52)	Germany 2008 (1.77)
Sweden 1907 (−0.16)	Japan 1922 (0.76)	France 2008 (2.18)
United States 1984 (0.05)	Switzerland 2008 (0.84)	United Kingdom 2008 (2.98)
United States 2007 (0.07)	Spain 2010 (0.85)	South Korea 1997 (3.77)

Parentheses report the author-supplied normalized spread change from $t - 1$ to the BVX crisis-onset year. The group cutoffs are defined on this exact 18-event constant-origin sample. The modern Swedish bank-loan segment is excluded; only the historical Swedish bond observations enter.

9.3 Empirical specifications

Nested-sample baseline. The first exercise re-estimates the exact baseline NFC LDLP on nested samples. It retains the two-percent winsorization of issuance levels, the log transformation, two lags of the dependent variable, two lags of real GDP growth, inflation, the short-term interest rate, and the current account balance, country fixed effects, and Driscoll–Kraay standard errors. The samples are: (i) the full NFC baseline; (ii) countries ever covered by strict KM spreads; (iii) crisis origins with an observed strict spread change; and (iv) crisis origins without one. The crisis coefficient in the third and fourth samples is restricted to the relevant origins while ordinary country-year observations remain in the estimation panel.

Continuous spread interaction. Equation (3) is estimated separately at horizons $h = 0, \dots, 5$. The spread interaction is centered at the mean spread change among observed crisis origins. The reported “effect of one standard deviation” rescales θ_h by the cross-crisis standard deviation of the normalized spread change. Conditional effects at selected spread percentiles use the full covariance between the crisis coefficient and the interaction coefficient.

Tercile specification. As a transparent non-parametric presentation, the exact 18-event sample is divided into low, middle, and high same-year spread-repricing terciles. The three crisis indicators are entered jointly in the baseline LDLP. Formal Wald tests use the

full Driscoll–Kraay covariance matrix, with the high-minus-low contrast pre-specified as the central comparison.

Demand-oriented outcomes. To assess whether the spread gradient merely reflects lower financing demand, I replace raw issuance with

$$100 \Delta_h \log \left(1 + \frac{\text{NFC issuance}}{D} \right),$$

where D is nominal GDP, fixed investment, broader investment, or lagged corporate bank credit. Investment variables from the Global Macro Database are converted into the same legacy local-currency units as the issuance series using the country-year conversion factor implied by nominal GDP. Lagged corporate credit is measured prior to the outcome horizon to avoid a contemporaneous mechanical relationship.

9.4 Sample composition and external validity

Figure 35 separates country composition from crisis-origin composition. Panel A shows that restricting the baseline to countries that ever appear in the strict KM sample leaves the NFC response nearly unchanged. Panel B shows that the subset of crisis origins with an observed strict spread change has a much milder issuance response than the complementary no-spread set. Table 28 reports the corresponding coefficients, and Table 29 formally tests their difference.

At $h = 3$, the spread-observed crisis coefficient is approximately -20 , compared with about -123 among crisis origins without an observed spread change. The jointly estimated difference is roughly 104 log points ($p = 0.056$), and the gap remains large at $h = 5$ ($p = 0.025$). Historical spread coverage therefore does not span the crisis block generating the strongest full-sample contraction. This limits external validity: the price data can characterize heterogeneity within observed crises, but cannot establish that spread repricing explains the full-sample average issuance decline.

9.5 Spread repricing and NFC issuance

Figure 36 reports the continuous conditional crisis effect over the observed spread distribution. The spread gradient is weak at short horizons but becomes economically and statistically important at medium horizons. At $h = 3$, the raw gradient is -32.0 normalized log points per unit of spread change; a one-standard-deviation larger spread increase implies an additional 38.1 log-point contraction. The corresponding $h = 5$ estimate is an additional 32.3 log-point contraction. Table 30 reports the coefficients.

Conditional effects clarify the economic content. At the 25th percentile of same-year repricing, the estimated $h = 3$ response is slightly positive and imprecise. At the median

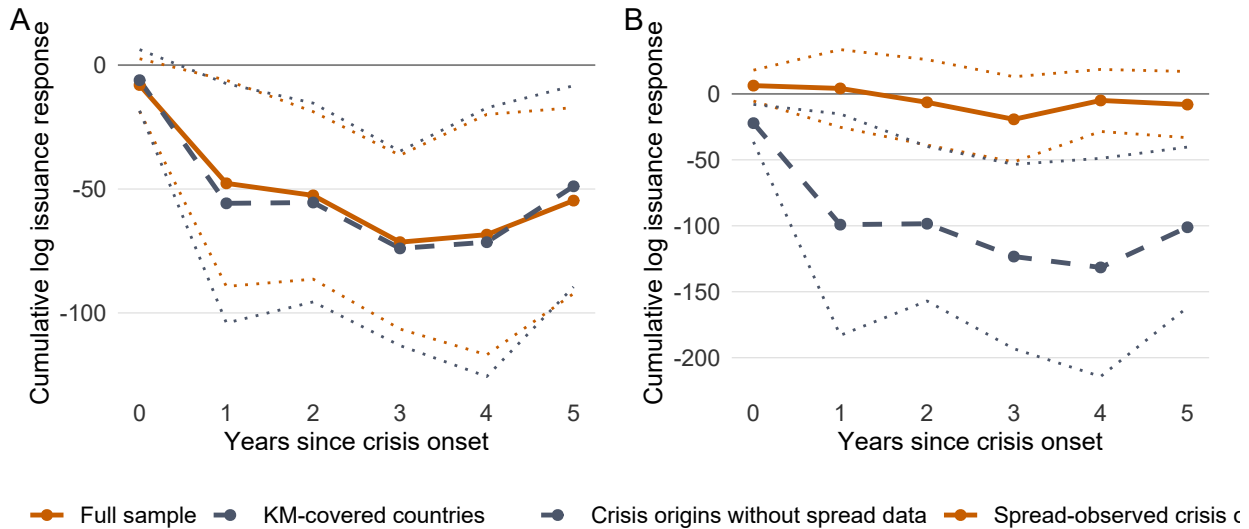


Figure 35: NFC issuance responses across spread-data samples. Panel A compares the full-sample baseline with the same specification estimated in countries ever covered by the strict KM bond-spread series. Panel B jointly estimates separate crisis effects for onsets with and without an observed strict spread change. All specifications use the baseline LDLP controls, country fixed effects, two-percent winsorization, and Driscoll–Kraay 90% confidence intervals.

Table 28: NFC issuance responses across nested spread-data samples

Sample	$h = 1$	$h = 3$	$h = 5$	Crisis onsets
Full NFC baseline	-47.7* (25.3)	-71.4*** (21.3)	-54.7** (22.8)	36
Countries ever covered by strict KM spreads	-55.8* (29.4)	-74.0*** (23.8)	-48.9** (24.7)	31
Only crisis onsets with strict spread changes	3.9 (17.8)	-20.0 (19.5)	-5.9 (15.2)	18
Only crisis onsets without strict spread changes	-99.7* (51.0)	-123.4*** (42.3)	-101.0*** (37.2)	18

Entries report LDLP coefficients with Driscoll–Kraay standard errors in parentheses. The dependent variable is the cumulative log change in NFC gross bond issuance relative to $t - 1$. All specifications use the exact baseline controls and country fixed effects. ***, **, and * denote significance at the 1, 5, and 10 percent levels.

Table 29: Formal tests of the difference between spread-observed and no-spread crisis effects

Horizon	Difference	Std. error	90% CI	<i>p</i> -value
$h = 1$	103.3	60.5	[3.7, 202.9]	0.088
$h = 3$	104.0	54.4	[14.6, 193.5]	0.056
$h = 5$	93.0	41.5	[24.7, 161.3]	0.025

The difference is the jointly estimated spread-observed crisis coefficient minus the coefficient for crisis origins without an observed strict spread change. Positive values indicate a less negative issuance response in the spread-observed sample. Inference uses the full Driscoll–Kraay covariance matrix.

it is modestly negative. At the 75th percentile it reaches about -30.5 log points, and at the 90th percentile it reaches about -68.8 log points. The latter corresponds to an issuance decline of roughly one half relative to the pre-crisis year. These estimates, reported in Table 31, explain why raw crisis plots contain several large issuance increases: low-repricing crises do not display the same quantity contraction as high-repricing crises.

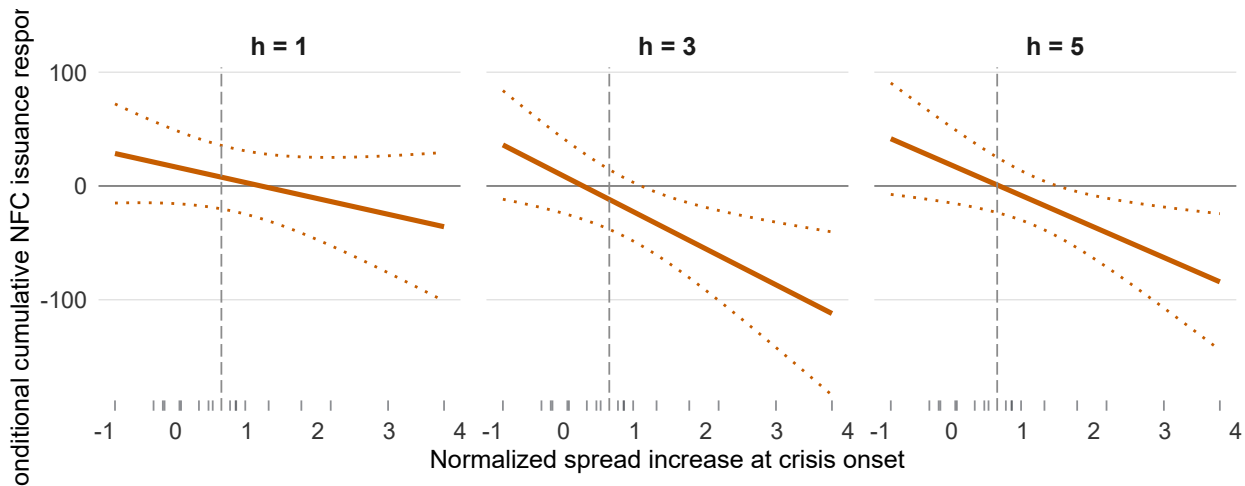


Figure 36: Conditional NFC crisis effects across the spread-repricing distribution. Each horizon is estimated using the exact baseline LDLP augmented with a centered interaction between the crisis indicator and the author-supplied KM spread change. Solid lines are point estimates; dotted lines are Driscoll–Kraay 90% confidence intervals. Rug marks show observed crisis spread changes, and the vertical dashed line marks their median.

Figure 37 provides the same evidence in grouped form. The low-repricing path remains positive through $h = 5$, the middle group remains close to zero, and the high-repricing group falls sharply. At $h = 3$, the high-minus-low difference is -115.6 log points ($p = 0.006$); at $h = 5$ it is -90.2 log points ($p = 0.008$). The middle group is not individually distinguishable from either tail at every horizon, so the grouped evidence should be interpreted primarily as a sharp high-versus-low contrast rather than as a precisely estimated linear ordering across all terciles.

Table 30: NFC issuance responses and the size of crisis spread repricing

Horizon	Crisis effect at mean spread	Spread gradient	Effect of one SD larger spread	Crisis onset
$h = 1$	4.8 (16.8)	-13.9 (12.2)	-16.5 (14.5)	18
$h = 3$	-18.6 (15.6)	-32.0** (14.1)	-38.1** (16.8)	18
$h = 5$	-4.9 (13.6)	-27.2** (13.2)	-32.3** (15.6)	18

The spread interaction is centered at the mean spread change among observed crisis onsets. The third column reports the effect of a one-unit increase in the normalized KM spread; the fourth rescales this coefficient by the crisis-sample standard deviation. Standard errors are in parentheses.

Table 31: Conditional NFC issuance effects at selected spread-repricing percentiles

Horizon	Spread percentile	Spread change	Conditional effect	90% CI
$h = 3$	25th percentile	0.06	6.9 (19.5)	[-25.1, 38.9]
$h = 3$	Median	0.64	-11.8 (16.0)	[-38.1, 14.5]
$h = 3$	75th percentile	1.22	-30.5* (16.4)	[-57.4, -3.6]
$h = 3$	90th percentile	2.42	-68.8** (26.7)	[-112.7, -24.9]
$h = 5$	25th percentile	0.06	16.7 (19.7)	[-15.6, 49.1]
$h = 5$	Median	0.64	0.9 (14.8)	[-23.4, 25.2]
$h = 5$	75th percentile	1.22	-15.0 (12.9)	[-36.3, 6.3]
$h = 5$	90th percentile	2.42	-47.5** (20.8)	[-81.7, -13.3]

Conditional effects are linear combinations of the crisis coefficient and the centered crisis-spread interaction. Standard errors use the full Driscoll–Kraay covariance between the two coefficients.

Table 32: NFC issuance responses by crisis spread-repricing tercile

Spread-repricing group	$h = 1$	$h = 3$	$h = 5$
Low spread repricing	29.4 (26.2)	31.3 (23.7)	45.4 (27.7)
Middle spread repricing	-7.8 (29.8)	-1.7 (33.7)	-15.1 (29.0)
High spread repricing	-7.5 (24.8)	-84.3*** (31.2)	-44.8*** (15.6)
High minus low	-36.9 (36.2)	-115.6*** (42.2)	-90.2*** (34.3)

The low, middle, and high groups contain six crisis onsets each and are estimated jointly. The final row reports the high-minus-low Wald contrast using the full Driscoll–Kraay covariance matrix. Standard errors are in parentheses.

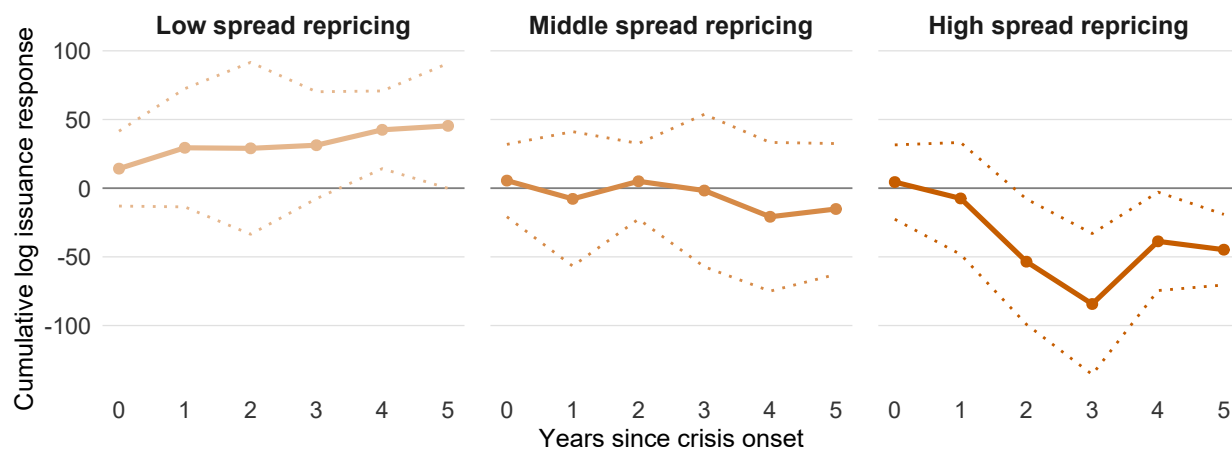


Figure 37: NFC issuance responses by crisis spread-repricing tercile. Crisis origins are divided into terciles using the normalized same-year KM spread change among the exact 18-event constant-origin sample. Each panel contains six crisis onsets. The three coefficients are estimated jointly at every horizon using the baseline controls and country fixed effects. Solid lines are point estimates; dotted lines are Driscoll–Kraay 90% confidence intervals.

9.6 Issuance relative to GDP, investment, and lagged credit

Figure 38 shows the conditional $h = 3$ effects for three scaled outcomes. The negative spread gradient survives when issuance is divided by GDP, fixed investment, or lagged corporate credit. Table 33 reports the full horizon results and also includes broader investment as an alternative denominator.

At $h = 3$, a one-standard-deviation larger spread increase predicts an additional decline of 1.62 units in the transformed NFC issuance-to-GDP outcome and an additional decline of 6.06 units relative to fixed investment. The broader investment definition produces a similar coefficient of -5.61 . Relative to lagged corporate credit, the corresponding estimate is -11.15 , although this specification has only 13 observed crisis origins. These estimates do not make GDP, investment, or credit exogenous measures of financing demand. They show instead that the issuance contraction is disproportionate to several relevant scales of corporate financing activity.

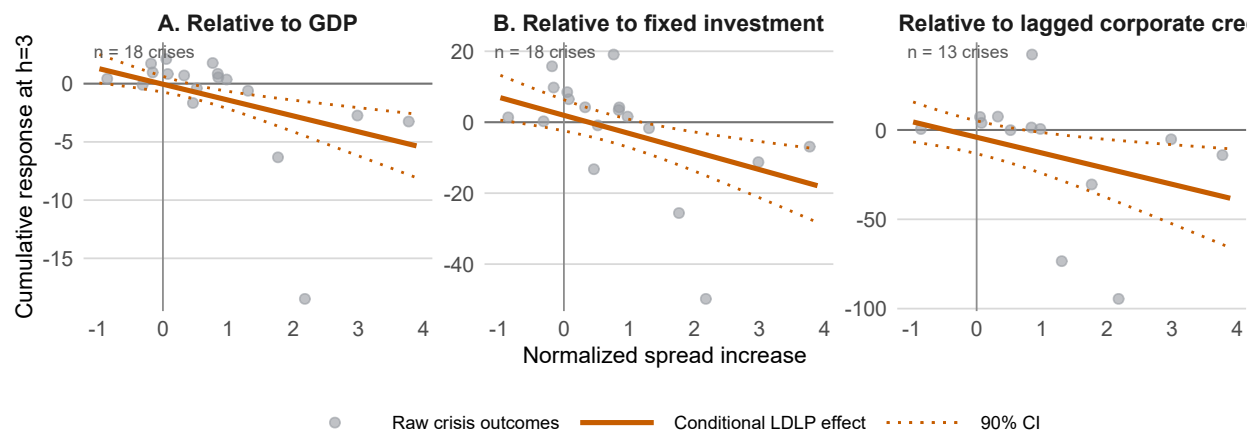


Figure 38: Crisis repricing and NFC issuance relative to GDP, fixed investment, and lagged corporate credit at $h = 3$. Grey dots show the raw crisis-level cumulative changes for the observed price sample. Solid orange lines show conditional effects from the exact baseline LDLP augmented with the centered crisis-spread interaction; dotted lines denote Driscoll–Kraay 90% confidence intervals. Outcomes are $100 \times \Delta \log(1 + \text{NFC issuance/denominator})$ relative to $t - 1$. Fixed investment uses the legacy-currency-adjusted GMD fixed-investment series. The raw dots document the underlying observations but are not adjusted for fixed effects or baseline controls.

Table 33: Spread repricing and NFC issuance relative to GDP, investment, and lagged credit

Denominator	Horizon	Crisis effect at mean spread	Effect of one SD larger spread	Crisis onsets	Countries
GDP	$h = 1$	-0.42 (0.56)	-0.77 (0.59)	18	12
GDP	$h = 3$	-1.21*** (0.42)	-1.62*** (0.55)	18	12
GDP	$h = 5$	-0.75* (0.43)	-1.37*** (0.48)	18	12
Fixed investment	$h = 1$	1.39 (2.48)	-2.40 (1.67)	18	12
Fixed investment	$h = 3$	-2.41 (2.37)	-6.06*** (2.17)	18	12
Fixed investment	$h = 5$	0.53 (2.99)	-5.79** (2.51)	18	12
Broad investment	$h = 1$	0.76 (1.88)	-0.82 (1.44)	18	12
Broad investment	$h = 3$	-2.70 (1.71)	-5.61*** (2.05)	18	12
Broad investment	$h = 5$	-0.80 (1.75)	-4.41*** (1.67)	18	12
Lagged corporate credit	$h = 1$	-15.00** (6.92)	-4.56 (4.83)	13	12
Lagged corporate credit	$h = 3$	-14.06* (7.31)	-11.15** (5.16)	13	12
Lagged corporate credit	$h = 5$	0.61 (5.60)	-8.33* (4.43)	13	12

Outcomes are cumulative changes in $100 \log(1 + \text{NFC issuance}/\text{denominator})$ relative to $t-1$. The reported gradient is the additional response associated with a one-standard-deviation larger crisis spread increase. Driscoll–Kraay standard errors are in parentheses.

9.7 Timing, influence, and cross-crisis robustness

Annual timing. The same-year baseline is transparent and uses the author-supplied change without researcher-selected timing. Annual crisis chronologies are nevertheless coarse. The U.S. 2007 onset is the clearest example: the supplied $t - 1$ to t change is small, while the large repricing occurs in 2008. Replacing the same-year measure with the maximum spread over $t, t + 1$ relative to $t - 1$ strengthens rather than weakens the relationship. In simple crisis-level regressions, the $h = 3$ slope is -43.4 for the supplied same-year change, -46.2 for the $t/t + 1$ maximum, and -54.1 for the $t/t + 1/t + 2$ maximum. The corresponding rank correlations are also strongly negative. I retain the supplied same-year change as the formal baseline because it minimizes discretion, while treating the onset-window measures as important robustness checks.

Table 34: Robustness to alternative timing of crisis spread repricing at $h = 3$

Spread measure	Slope	Std. error	Spearman ρ	Crisis origins
Supplied $t - 1$ to t change	-43.4^{***}	12.1	-0.67	18
Maximum over $t, t + 1$ relative to $t - 1$	-46.2^{***}	10.7	-0.68	17
Maximum over $t, t + 1, t + 2$ relative to $t - 1$	-54.1^{***}	9.6	-0.76	17

Entries are crisis-level associations between spread repricing and the cumulative NFC issuance response at $h = 3$. Standard errors are clustered by country. The timing exercise is a robustness check for annual crisis-date uncertainty; the controlled LDLP uses the supplied same-year change as its baseline.

Influence and synchronized episodes. Individual country, crisis, and event-family leave-outs preserve a negative spread gradient. The result also remains negative when crises are collapsed to one observation per country or one observation per country-event family. Excluding all 2007–2011 crises or the European GFC/euro cluster reduces the magnitude but does not reverse the sign. This indicates that the relationship is not generated by one observation, although the large European GFC repricing materially strengthens the full-sample estimate. Because some block exclusions leave only four or five countries, conventional clustered inference should be interpreted cautiously; wild-cluster or CR2 inference should be added before final publication.

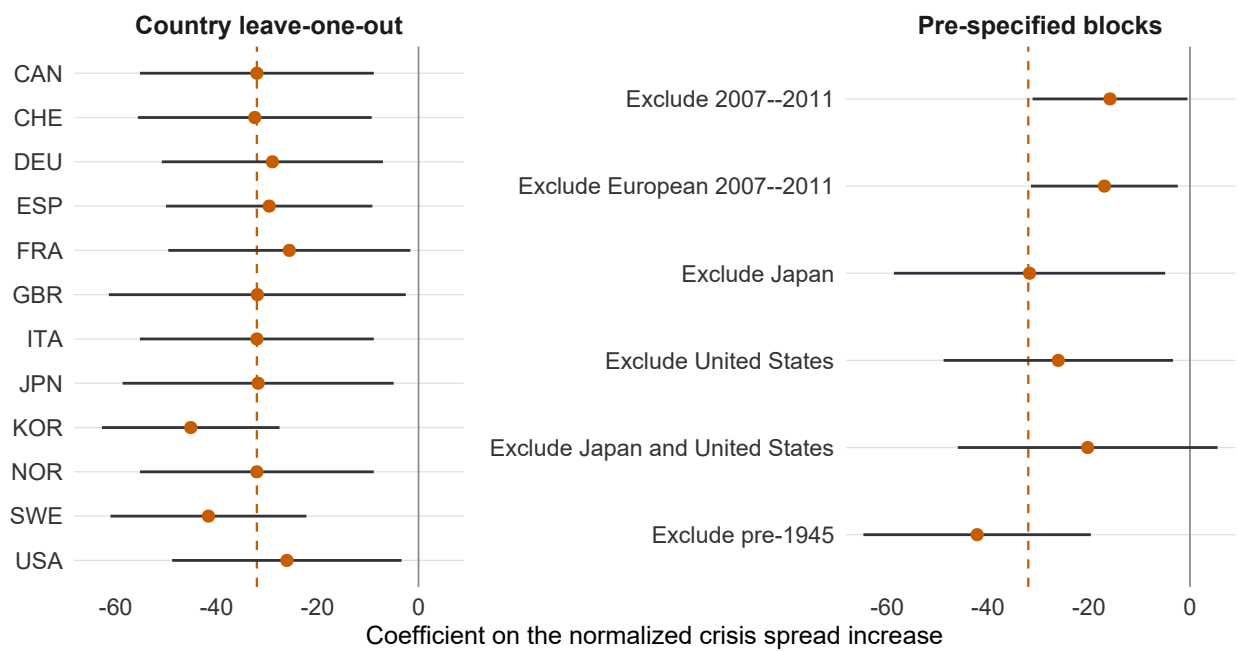


Figure 39: Influence of pre-specified block and country exclusions on the controlled $h = 3$ spread gradient. The dashed vertical line marks the full strict-sample estimate. Intervals use the same LDLP and Driscoll–Kraay inference as the baseline price specification.

Table 35: Cross-crisis robustness of the spread–NFC issuance relationship at $h = 3$

Specification	OLS slope	Spearman ρ	Rank p	Huber slope	Theil–Sen slope	Units	Countries
Full strict sample	-43.4*** (12.1)	-0.67	0.002	-43.3	-48.0	18	9
Exclude all 2007–2011 crises	-30.0** (8.6)	-0.52	0.102	-29.6	-27.5	11	4
Exclude European 2007–2011 crises	-29.8** (8.3)	-0.54	0.071	-29.3	-28.2	12	4
Exclude Japan and United States	-28.4** (10.3)	-0.57	0.112	-28.5	-28.9	9	7
Exclude pre-1945 crises	-48.3** (13.8)	-0.80	< 0.001	-48.0	-54.4	13	8
Earliest onset per event family only	-41.1** (12.3)	-0.65	0.007	-41.0	-44.9	16	9
Country means	-35.5** (13.7)					9	9
Country-event-family means	-40.5*** (11.5)					16	9

The baseline event-level OLS slopes use country-clustered standard errors. Country means are estimated with one observation per country; event-family means average overlapping crisis onsets within country. Robust and rank estimates are shown where meaningful. The structural LDLP evidence is reported separately in Tables 30 and 32.

Observable crisis-sample composition. Spread-observed and no-spread crisis origins have similar prewar shares and bank-equity losses, but the observed spread sample has stronger initial GDP growth and substantially lower pre-crisis NFC issuance growth. The latter difference is particularly visible in ranks. These comparisons help explain why the spread-covered crises display a milder unconditional issuance response; they are descriptive diagnostics of historical data selection rather than balance tests for a treatment design.

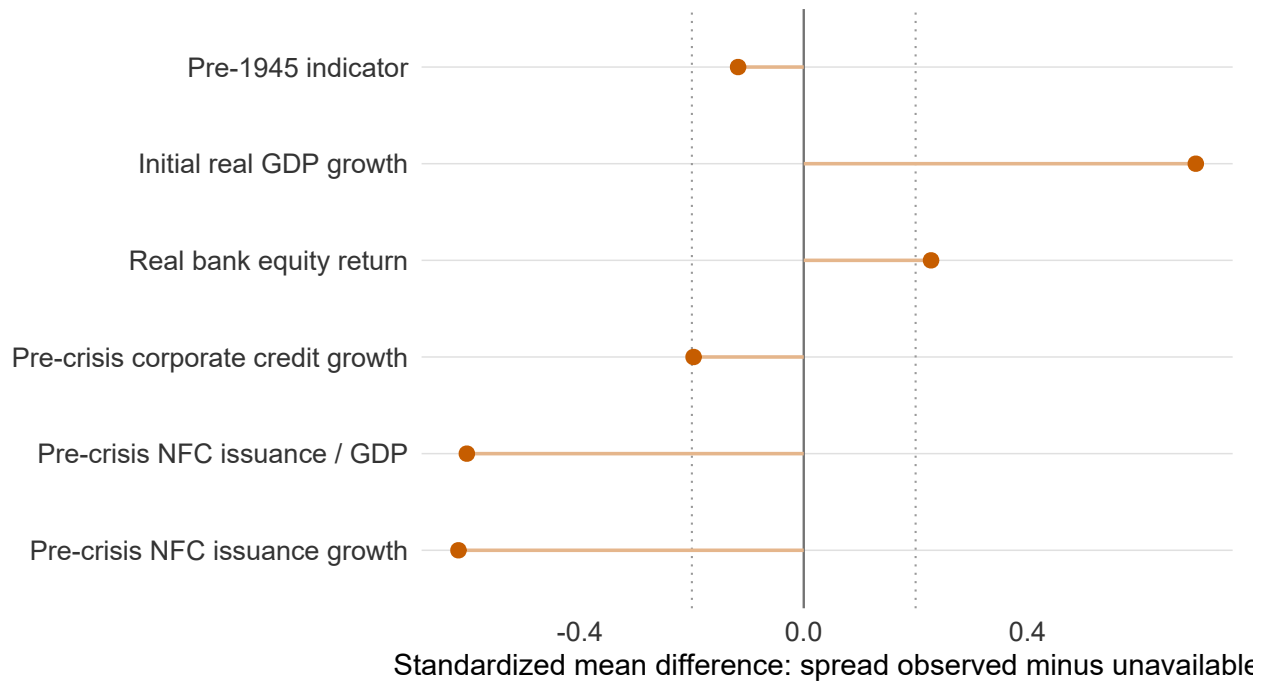


Figure 40: Observable composition of crisis origins with and without strict spread data. Points show standardized mean differences; the underlying group means and rank tests are reported in Table 36.

Table 36: Observable differences between crisis origins with and without spread data

Observable	Spread observed	Spread unavailable	Difference	Std. difference	Welch p	Rank p
Pre-1945 indicator	0.3 [18]	0.3 [18]	-0.1	-0.12	0.727	0.736
Initial real GDP growth	1.9 [18]	-0.2 [18]	2.1	0.70	0.043	0.189
Real bank equity return	-35.3 [17]	-40.2 [18]	4.9	0.23	0.503	0.564
Pre-crisis corporate credit growth	24.3 [13]	29.6 [14]	-5.3	-0.20	0.610	0.790
Pre-crisis NFC issuance / GDP	4.3 [17]	17.7 [18]	-13.4	-0.60	0.083	0.830
Pre-crisis NFC issuance growth	14.4 [16]	56.0 [18]	-41.6	-0.62	0.088	0.022

Samples are restricted to crisis origins entering the exact baseline NFC LDLP at $h = 3$. Brackets report the number of non-missing observations. Standardized differences use the pooled within-group standard deviation. These comparisons diagnose historical spread-data selection; they are not causal tests.

9.8 Sectoral comparison on a common crisis sample

A final exercise asks whether the price–quantity gradient differs across issuing sectors. To avoid comparing coefficients estimated on different event sets, the sample is restricted to 11 crises in five countries for which NFC, total-corporate, financial-corporate, and government issuance are all observed. The resulting pattern is suggestive: larger corporate spread increases predict a much larger contraction in NFC issuance, a smaller decline in total-corporate issuance, little clear change in financial-corporate issuance, and an increase in government issuance. This mirrors the sectoral reallocation documented in the full issuance sample. The comparison is nevertheless based on very few country clusters and should be treated as descriptive supporting evidence rather than a definitive sectoral test.

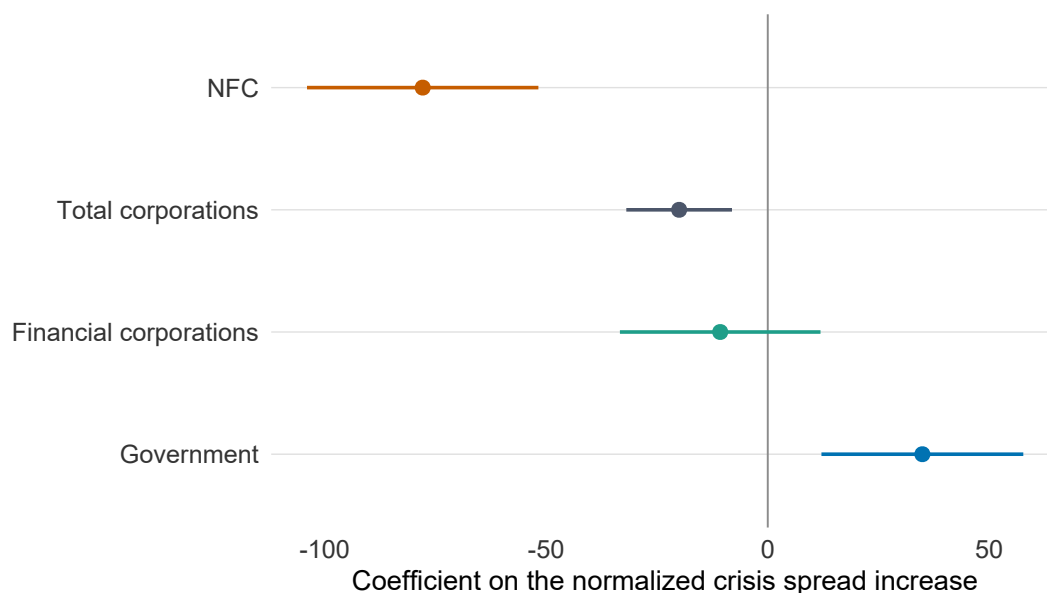


Figure 41: Sectoral price–quantity gradients on an identical crisis sample. The figure reports crisis-level $h = 3$ slopes for NFC, total-corporate, financial-corporate, and government issuance using the same 11 crisis origins.

9.9 Interpretation and limitations

The price evidence sharpens but does not overturn the paper’s quantity-first interpretation. The full issuance sample shows a persistent average NFC contraction after banking crises. Historical spread coverage selects a smaller and more issuance-resilient subset, so the average response in that subset is not itself representative of the full crisis sample. Within observed price episodes, however, the degree of credit-market repricing is highly informative: large spread increases are followed by substantially weaker medium-run NFC issuance, including relative to GDP, investment, and lagged corporate credit.

Table 37: Sectoral price–quantity gradients on an identical crisis sample

Sector	Spread gradient	90% CI	Crisis onsets	Countries
NFC	-77.9*** (12.2)	[-104.0, -51.8]	11	5
Total corporations	-20.0** (5.6)	[-31.9, -8.1]	11	5
Financial corporations	-10.7 (10.6)	[-33.4, 11.9]	11	5
Government	34.9** (10.7)	[12.1, 57.7]	11	5

All outcomes and the strict KM spread are observed for the same 11 crisis onsets. Coefficients come from crisis-level regressions with country-clustered standard errors. The small common sample means the sectoral comparison is suggestive rather than definitive.

Four limitations bound the conclusion. First, the spread is a country-level risky debt-market price, not the average primary-market yield paid by the NFC issuers in the issuance dataset. Second, the historical spread is broad and the modern source varies across countries. Third, the spread and issuance responses are jointly endogenous to crisis severity, expected defaults, liquidity, risk premia, investor risk-bearing capacity, and issuer composition. Fourth, price coverage is missing for many of the crises that generate the strongest full-sample issuance decline, particularly several Great Depression and modern European episodes. The estimates therefore do not identify an exogenous shift in bond supply and do not show that spread repricing explains the full-sample average contraction.

Subject to these limitations, the evidence is difficult to reconcile with a simple financing-demand account in which issuance falls only because firms proportionally reduce investment. The contraction is largest when risky debt prices deteriorate most and remains visible relative to several financing scales. The most defensible conclusion is therefore that weaker financing demand, deteriorating borrower quality, and tighter market conditions interact during systemic banking crises. Bond markets can remain usable for selected firms and may even support higher issuance in low-repricing crises, but they do not provide a broad aggregate spare tire when the crisis is accompanied by substantial credit-market repricing.