Bad News Bankers: Evidence from Pre-1914 Sovereign Debt Markets on Monitor Reputation and Contagion*

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Abstract

Financial institutions facilitate access to financing not only by directly providing funding, but also by acting as a monitor of issuers. Accordingly, issuer defaults potentially damage not only the reputation of the issuer but also the reputation of its monitor. Contagion may then spread to other securities sharing the defaulter's monitor. This paper tests whether monitor reputation can be an important source of contagion. To identify the causal effect of sharing a monitor during a default, I exploit features of early sovereign bond markets, where underwriters acted as monitors of sovereigns. Using new bond-level data on defaults and prices, I find significant contagion: there is and additional 45% pass-through of the defaulting bonds' price declines to non-defaulting bonds sharing the defaulter's underwriter. Testing predictions from alternative explanations, such as contagion spread via financial losses, the evidence favors monitor reputation as the mechanism. These findings highlight the importance of underwriters in early international capital markets and demonstrate that shared monitors can be a powerful source of contagion.

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1 Introduction

Financial crises are often international in nature and characterized by sudden and sharp spillovers of financial distress (Kaminsky, Reinhart and Vegh, 2003). Rapid asset price comovement can quickly send distress rippling across regions and asset classes. A better understanding of threats to financial stability requires knowing the channels that facilitate such contagion.[1] However, empirically quantifying individual channels of contagion is difficult because unobserved global, regional, and market-level shocks also contribute to asset price comovement.

This paper uses new data and features of early sovereign bond markets to isolate and quantify a channel of contagion arising through the reputation of financial institutions tasked with monitoring borrowers. Pre-1914, the merchant banks underwriting sovereign bonds could take costly—but difficult to verify—monitoring actions that could improve investors' returns. Their primary ex ante actions included screening and due diligence in the underwriting phase. Underwriters could also take ex post monitoring actions such as providing debt management and macroeconomic policy advising, exerting influence to encourage meeting scheduled payments, and negotiating during defaults. When default occurred, this sent investors a signal not only about the sovereign but also about the underwriter's willingness/ability to exert effort to monitor. Such damage to the underwriter's reputation could spread financial distress *across countries* if investors revise beliefs about the likelihood of default on the underwriter's other bonds.

In modern settings, similar channels could arise for institutions with monitoring responsibilities such as credit rating agencies, venture capital firms, lead lenders in syndicates, and corporate debt and equity underwriters. However, many modern monitors engage in both lending and monitoring, making it difficult to separate the influence of financial versus reputational losses. Prior research on contagion emphasizes the role of financial losses among common lenders in facilitating contagion (Kaminsky, Reinhart and Vegh, 2003). However, little is known about whether financial intermediaries' *reputation* for monitoring can facilitate quantitatively significant contagion. This historical setting offers a unique opportunity to isolate contagion stemming from shared monitors.

I find that sharing an underwriter led to significant contagion during sovereign defaults. Using an event study, I estimate the causal effect of sharing a defaulting bond's underwriter on the price of a non-defaulting bond. In defaults, comovement between defaulting and non-defaulting bonds during default is five times higher when sharing an underwriter. On average, an additional 45% of a defaulting bond's price decline is passed on to bonds sharing its underwriter. Guided by a model of underwriter reputation formation, I present additional evidence suggesting that reputation for monitoring is the mechanism underlying this contagion. Together, these results indicate that monitor reputation can be an important channel of contagion. Most financial regulation aimed at limiting financial contagion focuses on contagion spread via *financial* losses (e.g., macroprudential policy). These findings suggest that there may be scope to further improve financial stability if policy can limit contagion via *reputation* losses, highlighting an important avenue for future research.

[1] In this paper "contagion" specifically refers to asset price comovement.

The empirical analysis employs newly-digitized bond-level data. I manually record over 200 sovereign defaults occurring between 1869-1914, including the bonds involved and often the month of default. My sources are the annual reports produced by the *Corporation of Foreign Bondholders* (CFB), a group of British investors that formed in 1868 to collectively bargain with sovereigns during defaults. I also record bond characteristics, which I then use to manually link bonds to monthly price data digitized from the *Investors Monthly Manual* (IMM).[2] To my knowledge, this paper is the first, along with contemporaneous work in Meyer, Reinhart and Trebesch (2022), to link monthly price data to precise information on the timing of defaults. The dataset constructed here focuses on a smaller time period than Meyer, Reinhart and Trebesch (2022) but it employs a broader definition of default, capturing more events from this era.[3] It also records additional characteristics of bonds and defaults, such as the underwriter or presence of collateral. The linked data set contains 21,542 monthly observations from 1,027 bonds, in 105 defaults, across 75 countries and six continents.

To identify the causal effect of a shared underwriter, the research design exploits *within-country* variation in bond exposure to underwriters. For example, if Argentina defaults on a bond issued by Barings, comparing the price changes of Peruvian bonds issued by Barings to Peruvian bonds issued by a different underwriter is used to help quantify contagion. In the pre-1914 era, it was common for countries to have bonds trading at the same time that were issued through several out of fifty or more potential underwriters. By using country-year fixed effects, the research design compares bonds at the same point in time, subject to the same country-level risks, but with different underwriters. This approach to identification disentangles the effect of sharing a defaulter's underwriter from changes in country-level factors (similarly to Khwaja and Mian, 2008). Contagion is identified from the spread that opens up between non-defaulting bonds within the *same* country in response to another bond's default.

A distinct identification concern centers on the interpretation of the effect of sharing a defaulting bond's underwriter. The empirical strategy identifies the causal effect of sharing an underwriter during a default. But does this estimated effect impact bond prices *only* through underwriter reputation—or is there another underwriter-specific channel at play? For example, do defaults cause financial losses to the underwriter that impact their ability or willingness to monitor and exert influence? The estimated effect can be fully attributed to underwriter reputation under the assumption of an exclusion restriction: sharing a defaulter's bank impacts non-defaulters' bond prices *only* through damage to the underwriter's reputation.

To shed light on the plausibility of this exclusion restriction, I draw on two forms of evidence. First, I marshal historical evidence in Section 2 that provides context to assess the plausibility of reputation and alternative channels. Second, I empirically test the predictions of a model of repu-

[2] The IMM data were digitized by William Goetzmann and K. Geert Rouwenhoorst. The data are hosted by the Yale School of Management at https://som.yale.edu/imm-issues.

[3] Here, default is defined as either missed payments (coupon or principal) or changes to bond contract terms that negatively affected the net present value of the bond's expected cash flows. The latter category includes, for example, modifications to sinking funds and the rehypothecation of collateral. This broader definition helps capture small defaults that are often omitted from other historical records.

tation formation. Overall, I find evidence consistent with reputation being the primary mechanism behind the contagion I document.

The model is a dynamic game with one underwriter (a long-run player), a sequence of investors (short-term players), and a sovereign (a passive player). Each period, a new investor chooses whether or not to purchase a bond issued through the underwriter. If issued, the sovereign encounters a crisis with some probability. The underwriter chooses to either pay a cost to fight the crisis, which prevents default with some probability, or can do nothing and allow the crisis to turn into default. Investors observe the history of defaults but do not directly observe if a crisis occurred nor if the underwriter fought the crisis.

The model captures the moral hazard and adverse selection problems characterizing the relationship between an underwriter and investors. Underwriters have either a low or high cost of fighting a crisis, known to the underwriter but unknown to the investors. A high cost of effort creates moral hazard, discouraging the underwriter from fighting. Investors have a common prior over the likelihood that the underwriter is the low-cost type. Investors face adverse selection when choosing whether or not to purchase a bond from an underwriter, hoping to avoid a high-cost underwriter.

When default occurs, investors are not entirely sure if this happened due to a lack of fighting or an unsuccessful attempt to fight, but it sends a negative signal about the underwriter. After a default, investors revise downwards their belief that the underwriter is low-cost. Similarly, when repayment occurs, investors are not entirely sure if this happened due to a lack of a crisis or if the underwriter successfully fought a crisis. But a lack of default improves reputation, leading to a stronger belief that the underwriter is low-cost. In terms of pricing, default erodes an underwriter's reputation, leading to lower bond prices as investors expect future default to occur with a higher probability. If reputation becomes sufficiently low, investors will stop purchasing bonds through the underwriter.

I empirically examine several predictions of the model. First, if the likelihood of success when fighting a default is lower, default has a smaller impact on the price of the underwriter's other bonds. Intuitively, default is a weaker signal about the underwriter's type when preventing a default is harder. To explore this, I estimate how contagion varies with the size of the default, measured as the share of the underwriter's outstanding bonds involved in the default (weighted by principal). The idea is that a larger default is one that would have been harder to prevent. Consistent with reputation, I estimate that the impact on prices of sharing a defaulting bond's bank is *smaller* when the default is larger.

This finding is at odds with an alternative explanation centered on real wealth effects. For example, contagion could also arise if bond markets are segmented by issuer (e.g., investors purchase bonds through only one underwriter). In this scenario, missed coupon payments on one bond could motivate the investor to sell off other bonds, depressing the price of non-defaulting bonds from the same issuer. A larger default would lead to more contagion, in contrast to the empirical finding described above. Additionally, local projections estimates reveal that sharing a defaulter's underwriter has a persistent impact on bond prices, at odds with temporary selling pressure.

Second, the model predicts that additional signals about the occurrence of a crisis or the cost of preventing default lead to a stronger revision of investor beliefs. In practice, selective default could serve as such a signal. In this era, it was not uncommon for a country to default on a subset of its bonds (this occurs for 36% of the sample's observations). Default sends a more negative signal when another underwriter's bond for the same country escapes default. Conversely, avoiding default can send a positive (or less negative) signal about the underwriter that avoided default.

Consistent with this, empirically I find that sharing a defaulting bond's underwriter has a *larger* impact on prices when the default is selective. I also find that, within selective defaults, sharing the underwriter of a *non-defaulting* bond whose sovereign defaulted (on other bonds) is on average associated with higher bond prices.

Third, I explore how initial reputation affects contagion. In the model, the relationship between initial reputation and the price change following default is non-monotonic (U-shaped, specifically). At extremely high or low levels of reputation, investors already have strong beliefs, and default leads to a smaller price decrease. In intermediate ranges, default has a more negative impact on bonds sharing the defaulter's underwriter. This result suggests the possibility of a paradox: maintaining a good reputation by avoiding default can reduce contagion, but a sound reputation can make contagion more severe when default occurs because it is more surprising.

In the data, I proxy for initial reputation using the number of defaults in the past year involving a bond issued by the underwriter. I find that the effect of sharing a defaulter's underwriter is larger when banks have *more* recent defaults. This suggests that in the sample period, on average banks were in the higher reputation region, where better reputation reduces contagion following defaults.

Related Literature. The central contribution of this paper is both positing and quantifying financial intermediary reputation for monitoring as a channel of contagion. This work builds on a banking and corporate finance literature documenting the role of financial intermediary monitoring in shaping financial market outcomes. Monitoring by underwriters, credit rating agencies, and lenders can mitigate information asymmetries between investors and securities issuers, expanding access to financing (Frydman and Hilt, 2017; Sufi, 2009; Petersen and Rajan, 1994, 2002). In many settings, both modern and historical, investors and borrowers value the association of a security with a reputable monitor. This is evidenced by, for example, higher prices for securities, intermediation fees, and market shares (Beatty and Ritter, 1986; Carter and Manaster, 1990; Megginson and Weiss, 1991; Nanda and Yun, 1997; Carter et al., 1998; Dunbar, 2000; Fang, 2005; Lewellen, 2006; Ivashina, 2009; Drucker and Puri, 2009; Chemmanur et al., 2011; Kang et al., 2018). These studies find an important role for reputation in a variety of markets, ranging from influential VCs funding start-ups, lead lenders in syndicates, to corporate debt and equity underwriters. Even job seekers are more likely to click on job ads for start-ups when funding by a reputable VC is made salient (Bernstein et al., 2022). Additionally, after borrowers default on corporate loans, intermediaries appear to respond to perceived failures in monitoring/screening and write stricter covenants (Murfin, 2012).

Despite these benefits of a reputation for monitoring, prior empirical and theoretical work highlights that moral hazard can deter monitoring (e.g., Chemmanur and Fulghieri, 1994; Baghai and Becker, 2020). Intermediaries trade-off short-run profits from misleading investors or shirking on costly due diligence against the long-run benefits of building reputation. When returns to monitoring are lower—for example, due to low market power or complexity/opaqueness of securities—intermediaries are less likely to monitor (Becker and Milbourn, 2011; Griffin et al., 2014). The risk of moral hazard can make monitor reputation a potent vector of contagion.

This paper also adds to the financial contagion literature, contributing a new focus on an *intagible* asset (reputation for monitoring). Prior work emphasizes the role of financial capital and intermediary balance sheets in contagion (e.g., Kaminsky and Reinhart, 2000; Kaminsky et al., 2003; Mitchener and Richardson, 2013). Financial losses borne by intermediaries can trigger contagion in a variety of ways. These include reducing lending capacity, weakening intermediaries' bargaining position, heightening their risk aversion, or a "wake-up call" that increases investor incentives to acquire information (Gorton and Metrick, 2012; Mitchener and Richardson, 2013; Mitchener and Trebesch, 2023; Arellano et al., 2017; Broner et al., 2006; Bottero et al., 2020; Cole et al., 2022). Due to its intangible nature, reputation capital is harder to measure than financial capital. Therefore, macroprudential policies such as financial capital requirements may not be effective at reducing the contagion risk associated with reputation. Knowing whether reputation for monitoring can be a powerful source of contagion is important for understanding risks to financial stability and motivates further study into how regulation can best counter this form of contagion.

To the best of my knowledge, there are two other prior works theorizing that monitor reputation may be a channel of contagion. Morrison and White (2013) formulates a model where a bank regulator's reputation for monitoring is damaged by bank failures, which may prompt runs on other banks. Abreu et al. (2007) hypothesizes that "information spillovers" related to shared underwriters could lead to contagion in the setting that I study, and does a case study of two default episodes. I build on both of these works by highlighting how the economics of monitor reputation could arise in a variety settings where financial intermediaries can monitor, by estimating the *causal* effect of sharing a defaulter's monitor across many default episodes, and by presenting evidence in support of reputation (rather than wealth effects) driving contagion.

Lastly, this paper adds to the literature on financial intermediaries in early international capital markets by providing new evidence on the importance of sovereign bond underwriters in this era. Pre-1914, underwriters played an important role in facilitating the first mortgage-backed securities boom and bust (de Jong, Kooijmans and Koudijs, 2022), negotiating with defaulting sovereigns (Flandreau and Flores, 2012; Esteves, 2013), and (sometimes successfully) lobbying the British government to impose supersanctions on defaulting states (Flandreau, 2005; Mitchener and Weidenmier, 2010). Flandreau and Flores (2009) and Flandreau et al. (2010) argue that sovereign bond underwriter reputation played a crucial role in overcoming information asymmetries in this era, as evidenced by investors' higher willingness to pay for bonds underwritten by reputable banks. My work contributes new evidence on the importance of this reputation as a channel of contagion. Better understanding the origins of financial distress in this era is important, as the impacts of financial distress can be long-lasting and even reshape long-run economics outcomes (e.g., Xu, 2022; Olmstead-Rumsey, 2019). Finally, this paper also assembles a new bond-level dataset on sovereign defaults linked to monthly price data. The data contain many new defaults and additional bond characteristics such as underwriter, loan purpose, and collateral.[4]

Outline. The next section describes relevant features of the historical setting. Section 3 describes the newly-digitized data. After this, Section 4 presents the empirical strategy and the main results documenting the causal effect of sharing a defaulter's underwriter. To investigate the plausibility of reputation being the mechanism behind the documented contagion, Section 5 empirically tests theoretical predictions from both a model of underwriter reputation and alternative mechanisms, such as underwriter or investor wealth losses. Section 6 concludes.

2 Historical Background: Pre-1914 Sovereign Bond Markets

London was the global hub for international finance during 1869–1914, a period often referred to as the first era of global financial integration (Fishlow, 1985; Mauro et al., 2002). Not until the 1990s did financial integration again reach the levels achieved during this time (Obstfeld and Taylor, 1998). Relative to the British economy, British foreign investment was large, averaging 5.4% of GDP over 1865-1914 and peaking at 10% by the eve of WWI (Fishlow, 1985; Chabot and Kurz, 2010). Over this period, foreign government bonds grew to be an important component of British asset holdings, rising from 6% to 21% of publicly listed securities on the London Stock Exchange (Tomz and Wright, 2013).

2.1 Important Differences between Early and Modern Sovereign Bond Markets

Asymmetric information was a key friction limiting the extent of lending from external investors to sovereigns. Despite significant improvements in communications technology, investors faced difficulties in gathering timely and accurate information about sovereigns.[5] Compounding the natural information barriers created by geographic distance, governments would occasionally delay or misreport fiscal and trade statistics. [6] Even with the available data, interpreting it was challenging as there could be significant uncertainty about how a sovereign will behave. When it

[4]Many of these defaults are new relative to existing datasets, such as Reinhart and Rogoff (2008) and Meyer et al. (2022).

[5]By the 1840s, the London Stock Exchange was linked to regional exchanges by telegraph. The transatlantic cable was operating by 1866, cutting the time it took to send a message between New York and London from three weeks to one day (this fell to one minute by 1914). By 1878, the transoceanic telegraph connected Buenos Aires to Europe. The dates for these technologies are reported in Bordo et al. (1998).

[6]Mexico postponed releasing public accounts for several years (Weller, 2015a). A popular source of fiscal and trade statistics, the *Stateman's Yearbook*, was often substantially revised, with revisions tending to be more negative (Flandreau et al., 2023).

came to interpreting data, investors had a limited set of experts on which to rely. Notably, credit rating agencies only came into existence around the turn of the century and did not begin systematically rating sovereign borrowers until after 1914 (Flandreau et al., 2023). Instead, underwriters played a key role in collecting, communicating, and certifying information.

Sovereign bond contracts in this era differed in several important ways compared to their modern counterparts. First, sovereign bonds were often secured by collateral. Common forms of collateral were customs or tax revenue, and occasionally natural resources. Bonds that were intended to finance a specific project often pledged the revenues associated with the project as collateral (this was regularly the case with railroads). Some forms of collateral were indeed highly pledgeable, as it would be directly controlled by the underwriters through, for example, correspondent banking services. Flandreau et al. (2023) argues that such control also facilitated information production about the government's ability to service its debt and may have prevented debt dilution. By requiring a new revenue source be pledged for a new bond, bondholders could reduce the risk of insufficient funds being available to service the loans.

A second difference is that sovereign bonds often had a sinking fund. Over the life of the bond, sovereigns would make payments into an account from which they could not withdraw. The funds were intended to repurchase bonds and repay the principal of the loan. By effectively amortizing the loan, sinking funds could reduce incentives to default on coupon and principal payments, increasing investor willingness to lend.

Lastly, legal protections for bondholders in the event of default were limited pre-1914. Bondholders' lawsuits were rare and generally unsuccessful (Mauro and Yafeh, 2003). Pari passu clauses, stipulating equal treatment of bondholders, only began to appear around the early 20$^{\text{th}}$ century, and were still rare pre-1914. Perhaps as a result, selective default was not uncommon in this era; 52% of the defaults I study were selective in that some but not all of a sovereign's bonds entered default at the same time. Collective action clauses requiring that a supermajority of bondholders agree to a proposed restructuring, were generally not explicitly included in sovereign bond contracts. Instead, bondholder organizations attempted, though not always successfully, to organize bondholders to abide by majority rule (Mauro and Yafeh, 2003).

2.2 Underwriters as Monitors

Merchant banks were the primary institution in Britain underwriting sovereign bonds pre-1914. Most merchant banks were private partnerships among less than half a dozen people who invested their own capital (Ziegler, 1988). Merchant banks typically got their start intermediating trade and providing trade credit financing in the 18th century (Chapman, 2013). In the early 1800s, a number of the largest and most prestigious merchant banks began to specialize in underwriting sovereign bonds (Ziegler, 1988). Early success in avoiding default in the "first Latin American debt crisis" in the 1820s would propel Rothschilds and Barings to be market leaders for most of the 19th century.

Their trade-related origins gave merchant banks connections and familiarity with foreign countries that provided them an information advantage relative to many investors. Underwriters were especially well-suited to conduct ex ante monitoring (screening) and ex post monitoring. Screening could entail avoiding high-risk borrowers, setting appropriate interest rates that compensate investors for risk, or selecting collateral and sinking fund terms that optimally incentivize repayment. In terms of ex post monitoring, underwriters could benefit bondholders by influencing sovereigns to avoid default, issuing new "funding loans" to make repaying easier, negotiating favorable terms in a default/restructuring, and lobbying the British government to intervene in the event of a severe default. Superior information and influence over both foreign and domestic government officials could enable an underwriter to successfully monitor sovereigns.

In order to assess sovereign risk, many underwriters maintained networks of permanent agents abroad. For example, Nicholas Bower, an agent of Barings based in Argentina, would regularly telegraph reports to Barings. Bower's reports described significant events, conversations with Argentine politicians, and statistics on "trade, prices, immigration, financial position, banks, natural resources, [and] tradable assets" (Flores, 2011). Bower provided statistics to Barings that were identical to those published by the Argentine government *three months later*. Another way underwriters gathered advance or hidden information was from providing correspondent banking services or even controlling the financial accounts associated with a bond's collateral.[7]

Underwriters had several tools at their disposal to influence sovereign borrowers. The same agents they relied on for information would also lobby politicians to prioritize repaying debts.[8] Underwriters would also speak out against political developments that could pose a threat to repayment. For example, Nathan Rothschild publicly criticized the Paraguayan War in a letter to the Brazilian Congress, lamenting the war's financial cost (Weller, 2015b). Short-term lending occasionally happened (or was speculated to have happened) between underwriters and sovereigns to avoid missed payments (Flandreau and Flores, 2012).[9]

Underwriters were often closely involved in debt restructuring and post-default negotiations (Flandreau and Flores, 2012). When facing severe or persistent risks to repayment, underwriters would sometimes arrange for a "funding loan" that would effectively allow sovereigns to roll over their debt. Similarly to modern multilateral institutions like the IMF, underwriters would sometimes attach conditions to funding loans. Conditions ranged from fiscal and monetary reforms to requirements of seeking underwriter approval before issuing subsequent new loans.[10]

[7] For example, Gibbs & Sons asserted control over Peru's Guano Islands in response to a default (Flores, 2020; Oosterlinck, 2013).

[8] For example, Barings' US agent Thomas Ward launched a media campaign to encourage Pennsylvania to resume debt payments. Describing the campaign, Ziegler (1988) writes "Politicians were persuaded that self-interest demanded a rapid resumption of payments; the press was fed with letters and articles arguing that the economic development of the State would be crippled unless access to foreign funds was restored; appeals were made to pride and a sense of propriety; the clergy was enlisted to preach that credit-worthiness was next to godliness...[Ward] did not hesitate to use occasional small but well-placed bribes or promises of favours to come." Ward's campaign succeeded and Pennsylvania soon resumed payments after its initial default.

[9] The occurrence of such lending is not well documented. Indeed, underwriters would likely prefer if news of a nearly-missed payment did not spread in order to avoid a speculation-fueled price drop.

[10] In a famous case, Rothschilds' 1898 restructuring of Brazil's debt required that Brazil burn paper notes in order to reduce the supply of local currency. Rothschilds blamed loose monetary policy for Brazil's low exchange rate and inability to service its debt. Due to non-compliance with prior loan conditions, Rothschilds coordinated with a British bank located in Brazil to certify that Brazil did indeed burn paper money (Weller, 2015b).

In extreme cases, underwriters would lobby the British government, sometimes successfully to intervene diplomatically or militarily to protect bondholders' interests.[11] The British government was generally reluctant to take such actions on behalf of bondholders, more often doing so when it aligned with their other geopolitical goals (Mitchener and Weidenmier, 2010; Tomz and Wright, 2013).[12]

For successful monitoring, underwriters were rewarded with market power and profits. Underwriters associated with fewer past sovereign defaults benefited from higher market share, milder price run-ups after issuance, lower yields, and larger issuance fees (Flandreau and Flores, 2009; Flandreau et al., 2010). The low price run-ups and yields also made reputable underwriters appealing to sovereigns, likely contributing to their ability to command larger issuance fees. Investors and sovereigns appeared to have a high willingness to pay for an association with a reputable underwriter. In fact, contemporaries indicated that the reputation of the underwriter may have been *more* important to investors than the reputation of the sovereign in influencing their willingness to invest.[13]

Because monitoring is difficult for investors to directly observe and costly to underwriters, there is scope for underwriter moral hazard to arise. Reputation for monitoring paid off in the long-term. But in the short-term, underwriters could profit from slacking or misleading investors. Ex ante, underwriters could slack on screening efforts or fail to set contract terms that compensate investors for a bond's risk.[14] Ex post, an underwriter could slack on information gathering and processing (e.g., by limiting investment in its network of agents abroad). After default and during restructuring, underwriters could also exert low effort in obtaining investor-friendly outcomes. Underwriters could also mislead investors by understating risks and overstating their abilities to monitor and influence borrowers. Because investors could not perfectly observe monitoring, the occurrence of sovereign default sent investors a negative signal about the underwriter's ability and willingness to monitor, damaging their reputation.

Investors had good to reason to be skeptical of underwriters. Egregious cases of fraud, such as the issuance of bonds for the *fictitious* nation of Poyais fueled investor fears of opportunistic underwriters (Dawson, 1990; Flandreau and Flores, 2009). Fraud also manifested in the form of

[11] The *Banker's Magazine* (volume 15, Part 2, 1861) describes such a case where "At the close of November, 1859, Messrs. Baring, Rothschild, Huth, A. Gibbs & Sons, had signed an address to Lord John Russell, begging that the British government would throw its protection over British interests in Mexico, and put a stop to those outrages which continue, unfortunately, to the present day."

[12] In a a famous case, Britain blockaded Venezuela's ports (Mitchener and Weidenmier, 2010).

[13] Two examples of such accounts are below: "And thus it is that the credit of a foreigner, namely that of the House of Rothschild, not that of the Kingdom of Naples, was responsible for the rise of Neapolitan securities. Hence, the value of public securities does not reflect the prosperity of a country...Naples itself had very little to do in all that beyond punctually paying coupons." Source: Austrian Ambassador Ficquelmont in February 1822 (quoted in Gille, 1965); "It was especially regrettable that Barings had lent its name to the proceedings. Although all the firm's partners had repeatedly stated that they had no formal connection with the Mexican government and had agreed to pay out dividends as they would [for?] any other commercial agency, the general public had received a different impression. Many bondholders would never had retained their position in the loan but for the character which Messrs. Barings gave it by undertaking the agency." Source: *The Times*, Sep. 18, 1827 (quoted in Dawson, 1990).

[14] For example, underwriters could set coupons too low, originate too large a loan that is unlikely to be repaid, or not select sinking fund and collateral terms that optimally incentivize repayments.

foreign officials raising funds in London for which they did not secure the approval of their respective governments (Flandreau and Flores, 2009). In 1875, the British government convened an investigation into the practices of underwriters. However, no regulations or supervisory agency were created in response (Fishlow, 1985).

2.3 Underwriter Specialization, Financial Risk, and Sovereign Bond Investors

Below I summarize additional background information that is relevant to understanding the identification challenges that the empirical strategy aims to overcome.

Underwriter Specialization. Underwriters tended to specialize geographically. Especially for long-lived merchant banks, such specialization naturally arose from the expertise they had cultivated while intermediating trade and trade credit between Britain and particular countries. This feature is part of the motivation for the research design, which compares bonds within the same country-year that *differ* in their underwriter. This comparison differences out country-specific time trends that could influence bond prices. I do not find evidence of underwriter specialization in other aspects of the bonds. This includes loan purpose and collateral type. This suggests that it is unlikely that bonds with a common underwriter tend to comove more with each other simply because their other contract characteristics are similar. Section 4 discusses this more thoroughly in the context of identification.

Pairing Between Underwriters and Sovereigns. Underwriter-sovereign pairings were highly persistent.[15] Sovereigns had an incentive to retain reputable underwriters. Because underwriters had an information advantage relative to investors, changing underwriters could send a negative signal to investors if they infer that the underwriter has learned negative information about the sovereign. Consistent with this inference, borrowers that switched more often paid higher yields on average (Flandreau and Flores, 2012). Prestigious houses typically ended up initiating an underwriting relationship for riskier countries after the country's earlier loans had defaulted. Having a reputable underwriter involved in the restructuring and issuance of new loans could help entice reluctant investors back to the sovereign.[16]

To maintain their reputation, underwriters have an incentive to issue for sovereigns that rarely default. But post-crisis, sovereigns were in a weakened bargaining position which could enable underwriters to command substantial fees. Ultimately, underwriters competed with each other to issue bonds. Prior to issuance, underwriters would submit bids outlining proposed bond terms and fees to a sovereign (Flandreau and Flores, 2009). This competition contributed to the within-

[15] For a newly issued bond, 25% of the time the underwriter was the sovereign's most recent previous underwriter. In 72% of new issues, the underwriter had worked with the sovereign at some point in the past.

[16] This quote from the *Daily News* in 1889 (in Flores, 2014) highlights how Baring's involvement in the wake of an Argentine default (in the lead up to the Baring Crisis) initially increased investor optimism about Argentina: "As the matter is understood to be in the hands of Messrs Baring Bros and Co. a successful result may be hoped for. The mere fact that an important syndicate is willing to negotiate is good for Argentine credit. Had matters been as bad as pessimists have been inclined to make out late, eminent firms would not have been disposed to trust the Argentine Republic more money."

sovereign variation in underwriters. At one extreme was Mexico, who never selected a "patron bank" and constantly pit underwriters against each other (Weller, 2015a). The pairing of underwriters and sovereigns was unlikely random. However, the empirical strategy will not require such an assumption.

Underwriters' Financial Risks. Default damages an underwriter's reputation capital for monitoring, but to what extent could it also damage an underwriter's *financial* capital? This is relevant for understanding whether the mechanism underlying the contagion documented in this paper is plausibly operating through reputation for monitoring versus the financial health of the underwriter. Because underwriters were generally private institutions, there is limited balance sheet data available to directly verify the extent to which underwriters held sovereign bonds.

Prior historical work, informed by contemporary accounts and the available balance sheet data indicates that underwriters' direct financial exposure was rare and small (Chapman, 2013; Flores, 2014). Merchant banks were primarily intermediaries, rather than investors in sovereigns bonds. Describing the role of merchant banks, Chapman (2013) writes "merchant banks did not possess sufficient capital or deposits to finance development loans but, more importantly, the most eminent of them enjoyed a reputation which enabled them to act as catalysts for the generation of capital...the actual capital of most of the merchant banks was...quite modest, but it has been shown that their real power lay in their reputation and connections."

Underwriters could act as simply an "agent" for the government and avoid taking placement risk. However, underwriters also could engage in "full underwriting" and take placement risk. That is, underwriters would purchase the bonds at origination with the goal of selling them to investors (Flandreau et al., 2010). If the newly issued bonds were under-subscribed (i.e., not fully taken up), some could remain on the underwriter's balance sheet past the initial issuance. British underwriters were known to be less willing to engage in full underwriting compared to their smaller counterparts in France and Germany (Flores, 2010). One of the most famous cases of a failed placement was the Baring Crisis, which left Barings holding deeply discounted Argentine bonds and culminated in a bailout of the bank (Mitchener and Weidenmier, 2008). However, this experience was atypical, as Barings rarely took placement risk (Flores, 2010). When bonds initially remained unsold, underwriters attempted to sell them over time.[17]

To the extent that underwriters retained financial exposure, outside of the Baring Crisis, it was not reported to pose a major risk to underwriters' finances. For example, Rothschilds' never had more than 6% of its assets exposed to Brazil, its largest borrower, even during the zenith of Brazil's default crises (Weller, 2015b) spanning 1889–1898. In an analysis of Rothschilds' and Brazil's underwriting relationship, Weller (2015b) argues that during Brazil's crisis, reputational risks far outweighed the direct financial risks facing Rothschilds: "An eventual default on the Brazilian debt would not have caused [Rothschilds'] bankruptcy. However, reputation was the core of the underwriting business, so a default would have had significant effect on the house's

[17] For example, Paribas refused to issue new loans for Argentine until they had fully placed their last Argentine issue (Flores, 2011).

book in the long term."

To sum up, underwriters' direct financial exposure to sovereigns was not known to be significant. The primary mechanism behind the contagion arising from shared underwriters is more plausibly damage to reputation capital, as opposed to financial capital. To further evaluate this interpretation, Section 5 tests opposing predictions from both financial wealth and reputation-based theories of contagion.

Sovereign Bond Investors. The typical British investor in foreign sovereign bonds was a wealthy individual, rather than a financial institution (Flandreau, 2013). Data on investors' bond holdings is limited. However, contemporary accounts suggest that British investors diversified their holdings of sovereign bonds and, even in large defaults, losses were generally spread across a large set of investors.[18] This suggests that *investor* wealth effects are unlikely the mechanism behind the contagion through shared underwriters that I study. The tests in Section 5 also address alternative explanations centered on investor wealth effects (in addition to underwriter wealth effects).

3 Data

One contribution of this paper is building a new bond-level dataset on sovereign defaults during 1869–1914. Using historical documents, I manually recorded bonds' characteristics (including underwriter identity) and information about their defaults. The data include many defaults that are not part of existing datasets (e.g., Reinhart and Rogoff, 2008). In other cases, I am able to record more precise timing of defaults than in other data (i.e., the day or month of default as opposed to only the year). I then manually matched these bonds to monthly price data based on bond characteristics. This section describes the data sources and discusses summary statistics.

3.1 Data Sources: CFB and IMM

CFB Data: Defaults and Bond Characteristics The primary source for the default data are a series of annual reports published by the Council of the Corporation of Foreign Bondholders (CFB). The CFB is a bondholders' organization that formed in London in 1873 to collectively bargain with sovereigns (Mauro and Yafeh, 2003). Every year, from 1873 to 1988, the CFB published an annual report recording developments among sovereign borrowers (as well as historical developments). The reports contain detailed descriptions of past and ongoing defaults, renegotiations, and bond issuance. Reports since the early 20th century regularly contain tables on sovereigns' financial accounts, exchange rates, trade data. The CFB reports contain detailed descriptions of bond characteristics. From the CFB, I extract data on bonds' underwriter(s), borrowing reason, issue price,

[18] Clarke (1879) argues that investors learned to diversify from defaults in Mexico, Central America, Colombia, Argentina, and Greece in the first half of the 19th century: "Many families attracted by the high interest imperilled [sic] the greater part of their fortunes. Since then, although individuals have committed the same error of putting too many eggs into one basket, the main body of investors in England, Holland, and France, appear to have adopted the practice of distributing their risks." In contemporaneous defaults, Clarke (1879) describes the losses imposed by defaults as being spread across many investors. Regarding large defaults by Turkey, Peru, and Egypt, Clarke (1879) quotes *The Economist* (December 22, 1877): "This loss was undoubtedly distributed over the holdings of a vast number of persons, and probably has affected only a portion of the income of most them."

principal (amount and currency), coupon rate, collateral, sinking fund, and issue year.

The reports also provide detailed information on sovereign defaults. One important difference in how I identity defaults, compared to prior work (e.g., Reinhart and Rogoff, 2008; Meyer et al., 2022), is that I use a broader definition. I classify any event that results in an NPV-negative deviation from the original bond contract as a default. These include missed payments (coupon or principal; the usual classification of default) as well as "conversions" (i.e, modifications of contract terms such as a reduced coupon or extension or rehypothecating collateral). Broadening this definition is valuable, as all are significant events affecting investor's returns. For a majority of defaults I record, the reports describe the type of default (e.g., a missed coupon versus restructuring). The CFB reports also note the specific bonds involved in defaults. This is useful because sovereigns selectively defaulting on a subset of bonds was common—50% of the defaults that I study are selective.

In total, I document 240 defaults. Table C.1 details sample restrictions made to arrive at the final analysis sample. For example, I require that the month of default is reported and that the defaulting bond is identified in the IMM data during the month of default. In the analysis sample (obtained after applying all filters) there are 102 defaults between 1869–1914.

IMM Data: Prices and Bond Characteristics I obtain monthly bond price data from the *Investor's Monthly Manual* (IMM), published by *The Economist*.[19] The data span 1869 to 1929, though this paper makes use of data only until 1914 due to the outbreak of World War I.[20] Throughout, I use bond prices on the last day of trading for each month.[21] Most IMM bonds have a text description that details characteristics such as coupon, issue year, and purpose. The data also report principal and the names of paying agents (these were either underwriters or institutions that could perform the same ex post monitoring actions as underwriters). To link the CFB bond characteristic and default data to the IMM data, I manually match bonds based on shared bond characteristics (primarily issuer, issue year, and coupon).

3.2 Summary Statistics: Defaults

Figure 1 displays the number of defaults by year. Surges in defaults tended to coincide with international financial crises such as the Panics of 1873 and 1890, which catalyzed a recessions and financial crises around the world. Figure 2 details defaults by country. The analysis sample contains defaults from 19 different countries, with Turkey/Ottoman Empire contributing the most defaults. In terms of the type of default, a 63% are cases of missed payments (i.e., missed coupon or principal payments, including sinking fund payments). The other 37% are conversions, which are restructurings/modifications of contract terms (e.g., reducing coupon rates). Because nearly every bond (99.2%) in this sample was issued in British Pounds, there was virtually no scope for

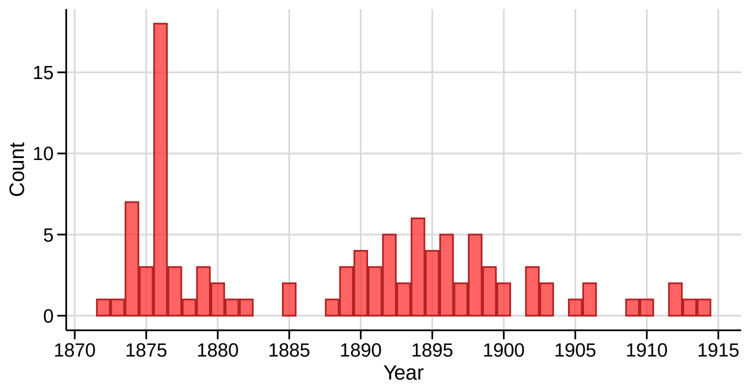
[19] The price data were digitized by William Goetzmann and K. Geert Rouwenhoorst and are hosted by the Yale School of Management's International Center for Finance.

[20] Not only did World War I significantly disrupt international capital markets, but the economic devastation of the war led the US to supersede Britain as the global financial hub.

[21] If missing, I use next month's price on the first day of trading.

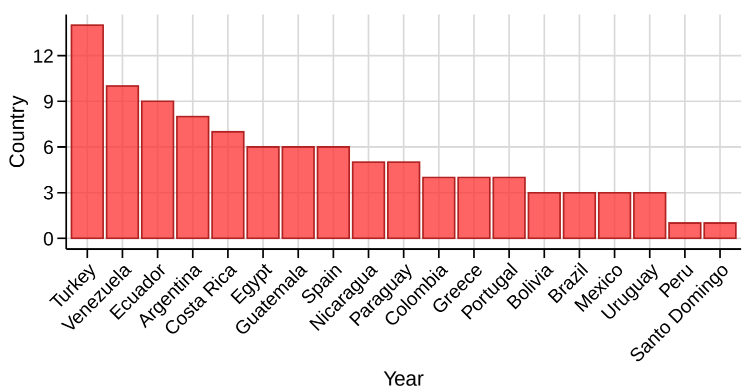
"de facto" default via currency in this era.

Figure 1: Defaults by Year



Note: This figure plots the number of defaults by year by for the subset of defaults used in the analysis sample (totaling 102 defaults).

Figure 2: Defaults by Country



Note: This figure plots the number of defaults by country by for the subset of defaults used in the analysis sample (totaling 102 defaults from 19 countries).

3.3 Summary Statistics: Bond Characteristics and Prices

The IMM data contain 1024 bonds in total. The analysis sample, with all information needed for the regression analysis, contains 799 bonds and 21,921 observations of non-defaulting bonds during defaults. Appendix Table C.3 reports the number of bonds by country (totaling 72 countries), Appendix Table C.4 the number of bonds by underwriter, and Appendix Table C.7 the number of defaulting bonds by underwriter.

Appendix Figure C.1 reports a breakdown of loan purposes. The most common official intended use of funds borrowed was to manage existing debt (e.g., to support coupon payments or pay down existing debt). and for the development of railways. Other common purposes were general public goods (e.g., development of public infrastructure such as roads), industrial or financial development (e.g., subsidizing a specific industry), and national defense.

Often, when bonds had collateral, it was related to the purpose of the loan. A common combination was to see loans issued for railway development to be secured on revenues generated by operating the railway. The most common forms of collateral were specific taxes (e.g., a tobacco tax), physical assets (e.g., railways), customs duties, and financial securities. Appendix Figure C.2 describes the prevalence of different forms of collateral. 14% of bonds in the sample reported having some form of collateral.

Table 1 reports additional summary statistics describing the characteristics of bonds at origin. The median bond is issued with a principal of 2.2 million GBP, however the distribution of principal is quite skewed—the mean is 17 million GBP. The median coupon is 5%. Most bonds have one underwriter, but it is not uncommon to have 2-4 underwriters.

Table 1: Bond Characteristic Summary Statistics

Variable	Mean	SD	25th %	50th %	75th %	N
Issue Price	90	23	85	93	98	495
Principal (mil. GBP)	17	105	0.84	2.2	6.2	730
Coupon (%)	4.5	1.7	3.9	5	6	764
Known Collateral (%)	14	35	0	0	0	771
Known Sinking Fund (%)	86	35	100	100	100	771
# Underwriters	1.4	0.66	1	1	2	770
Issue Year	1883	17	1871	1881	1896	737

Note: This table reports bond-level summary statistics. The bonds are the subset used in the main analysis.

Table 2 describes monthly bond prices changes in and out of defaults. The average change (without conditioning on the occurrence of a default) is approximately 0 percentage points. In a default, the price of the defaulting bond(s) on average falls 2.86%. Non-defaulting bonds fall on average 0.78% when they share the underwriting bank of the defaulter. Non-defaulting bonds with different underwriters on average fall 0.11% during a default. At the beginning of the month of the default, bonds that enter default are already trading at a much lower price (41.9/100) versus 78.5 and 89.8 for non-defaulting bonds (that share and do not share the defaulter's underwriter, respectively).

Table 2: Bond Price Summary Statistics

Sample	Variable	Mean	SD	25th %	50th %	75th %	N
All periods	$100 \times \Delta \ln(P_{it})$	-0.001	3.75	-0.651	0	0.913	123760
	Start of Month Price	90.1	33.6	84.5	99	104	124761
Def. Bonds	$100 \times \Delta \ln(P^D_{ie})$	-2.86	9.41	-7.71	-1.83	1.95	212
	Start of Month Price	41.9	27.6	22	34.2	53.8	212
Non-Def. Bonds (Bank = 1)	$100 \times \Delta \ln(P_{ie})$	-0.78	5.62	-1.78	0	0.966	1220
	Start of Month Price	78.5	33.8	55	93	103	1220
Non-Def. Bonds (Bank = 0)	$100 \times \Delta \ln(P_{ie})$	-0.108	3.81	-0.957	0	0.922	20701
	Start of Month Price	89.8	36.4	83	100	106	20701

Note: This table reports summary statistics of bond prices for various subsamples. "All periods" uses the bond-time panel for the subset of bonds used in the main analysis. The remaining samples are the analysis sample (bond-event panel). "Def. Bonds" are the defaulting bonds during defaults. "Non-Def. Bonds (Bank = 1)" are non-defaulting bonds that share the defaulter's underwriter (during a default). "Non-Def. Bonds (Bank = 0)" are non-defaulting bonds that do not share the defaulter's underwriter (during a default).

4 Empirical Results: Estimating Contagion from Shared Underwriters

This section uses the linked CFB and IMM data to estimate the causal effect of sharing a defaulter's underwriting bank during a default on non-defaulting bonds' prices. To guide the interpretation of the empirical analysis, I first describe predictions from a model that features reputation-based contagion. I then introduce the econometric specification and discuss the identifying assumptions. I then present and discuss the estimation results. After this, I evaluate two balance tests that attempt to falsify the identifying assumptions and discuss additional evidence on robustness.

This section focuses on estimating the causal effect of sharing a defaulter's bank. However, whether this effect works exclusively (or primarily) through underwriter reputation as opposed to alternative mechanisms is a separate question. Section 5 addresses this possible "exclusion restriction" issue by testing predictions of reputation-based contagion and alternative possible mechanisms.

4.1 Hypothesis

To clarify the hypothesized reputation-based channel of contagion, I develop a stylized model. In this section, I describe the model and its predictions. The full model is detailed in Appendix A. The model is a dynamic game, featuring a sovereign borrower, a sequence of investors, and underwriter.

Timing and Actions. Each period unfolds as follows. First, an investor chooses whether to lend to the sovereign. Next, the sovereign and underwriter learn whether the sovereign faces a "crisis," which may result in default. The underwriter chooses whether to "fight" the crisis or to "allow" it to proceed. With some positive probability, fighting prevents the crisis from turning into a default and the sovereign repays the loan. But fighting may also fail, resulting in a default. If allowing the crisis to proceed, the sovereign defaults with probability one. If no crisis occurs, the sovereign repays with probability one.

Payoffs. The underwriter receives a finder's fee (a fraction of the investor's payment) for underwriting the bond *only* if the investors chooses to purchase the bond at the beginning of the stage. There is a direct cost to the underwriter of fighting. "Fighting" is an ex post monitoring action; in reality this would best correspond to exerting influence over the sovereign. The cost could correspond to "relationship" capital with the sovereign.

If an investor buys the bond, they pay the cost of the bond (its principal). If default occurs, the investor receives nothing (ending with a negative net payoff). If default is avoided, the investor receives the principal plus interest (ending with a positive net payoff). The sovereign is a "passive" player in that they do not solve an explicit optimization problem. Hence, I do not focus on their payoffs.

Information Asymmetries. The underwriter observes when a crisis occurs, their cost of fighting, and whether default occurs. It also knows the history of these events from previous stages. Investors, on the other hand, only observe the history of defaults. They do not directly observe the occurrence of a crisis, the underwriter's actions, nor the underwriter's cost of fighting.

Investors start with a prior over whether the underwriter has a high or low cost of fighting. Investors use Bayesian updating to revise their beliefs about the sovereign's cost type (high or low) based on the public history of defaults. When a default occurs, investors revise their beliefs downwards about the likelihood that that underwriter is the low-cost type (who is more likely to fight). The belief that the underwriter is the low-cost type corresponds to the underwriter's reputation. Therefore, a higher belief corresponds to a "high" reputation.

Importantly, neither a default nor a lack of default perfectly reveals the underwriter's type. A default could happen if a low-cost underwriter's fighting is unsuccessful or if a high-cost underwriter opted to not fight. Similarly, a lack of default could happen if a high-cost underwriter successfully fought or if a low-cost underwriter did not need to fight because no crisis occurred.

Equilibrium Behavior. At each stage, the investor only lends if their belief that the underwriter is the low cost type is sufficiently high. For simplicity, I assume that the possible costs of fighting are such that the high-cost underwriter never fights and the low-cost underwriter always fights.

If the game were a one shot interaction, the underwriter would never fight. But in this dynamic game, there is a reputation cost to not fighting. Default damages the underwriter's reputation. If reputation becomes sufficiently low, investors will stop purchasing bonds through the underwriter. The underwriter will no longer receive the finder's fee in future interactions.

Prices and Contagion. The game described above corresponds to a primary market for bonds. Now consider a secondary market, populated by investors with the same information as those participating in the primary market. In the secondary market, the price of a bond is determined by the expected value of the bond's future payoffs. The secondary market price of a bond is higher if investors believe that the underwriter is the low-cost type, as future default risk is lower. Suppose that the dynamic game described above plays out independently across different sovereigns and underwriters. News about default on one sovereign's bond (the "defaulter") is a negative signal about its underwriter's type. The underwriter's reputation falls, which then lowers the secondary market prices of other bonds it has underwritten. It is in this sense that contagion can spread through a shared monitor (the underwriter).

Ex Ante and Ex Post Actions. As described in Section 2, early sovereign bond underwriters could take both ex ante and ex post actions to prevent default. The model features an ex post action. It is straightforward to modify the model to feature a costly ex ante action. For example, one could model due diligence as the underwriter paying a cost to learn about the sovereign's risk of a crisis (which can change across stages). The underwriter could use this information to decide whether to underwrite the bond. If investors are uncertain about the underwriter's cost of due diligence (higher versus low), they would learn about it from the public history of defaults.

Modifying the model to feature ex ante actions would lead to similar predictions in terms of default spreading contagion in secondary markets. However, *other* predictions of ex ante versus ex post actions about the size of contagion may differ. I explore this in Section 5, where I find evidence suggesting that both ex ante and ex post underwriter actions mattered in early sovereign bond markets.

4.2 Identification and Econometric Specification

Primary Identification Challenge. Estimating the causal effect of sharing a defaulter's underwriting bank on non-defaulting bonds' prices is challenging. The primary reason is that there are likely unobserved events that drive comovement in bond prices across countries. Examples include fluctuations in commodities prices, military conflicts, or financial crises. Such events could independently affect bond prices across countries or trigger contagion between economically integrated countries. This is a fundamental challenge to isolating any specific channel of contagion.

If countries' exposure to such events is correlated with the identity of their underwriter, this could make it difficult to empirically separate contagion through the shared underwriter from contagion through shared economic exposure. This could happen if, for example, low-reputation underwriters tend to underwrite for high-risk countries (and vice versa for high-reputation underwriters).[22] One could find higher comovement between bonds sharing an underwriter simply because the borrowers tend to load similarly on unobserved risk factors.

Another scenario that could pose similar threats to identification would be if underwriters specialized regionally. If proximate regions are more economically integrated, then we could find more comovement between bonds sharing an underwriter not because of reputation-based contagion, but because of their shared economic exposure. Indeed, early underwriters tended to

[22] Flandreau and Flores (2009) documents that low-risk countries tended use more reputable underwriters.

specialize regionally. And underwriting relationships were highly persistent: 25% of new issues had the same underwriter as the sovereign's most recent prior issue. 72% had worked with the same underwriter in the past.

Identifying Assumptions and Econometric Specification To overcome this first challenge, my identification strategy exploits *within-country* variation in exposure to a defaulter's underwriter. Specifically, I compare bonds issued for the same country, during the same year, but with *different* underwriters. Specifically, I estimate the equation below.

$$\begin{aligned}\Delta \ln P_{ie} = \beta_1 \Delta \ln P_e^D + \beta_2 \text{Bank}_{ie} + \beta_3 \left(\text{Bank}_{ie} \times \Delta \ln P_e^D\right) + \gamma_{ie} \left(\text{Country}_i \times \text{Year}_e\right) \\ + \xi_{ie} \left(\text{Country}_i \times \text{Def. Country}_e\right) + \iota_i \text{Bond}_i + \varepsilon_{iet}\end{aligned} \tag{1}$$

The outcome variable is the log change in a non-defaulting bond i's price over the month of a default event e. The data are structured as a bond-event panel. The explanatory variables are: the change in the defaulting bond's price ($\Delta \ln P_e^D$) during default e, an indicator for sharing the defaulting bond's underwriter ($1[\text{Bank}]_{ie}$), and the interaction of these two variables.

The first coefficient, β_1 describes the average amount of comovement between non-defaulting bonds and the defaulting bond during a default. We would expect that this coefficient is positive but small, as defaults are more common in global economic downturns (see Figure 1) so it is likely that bonds in general would tend to be decreasing in value.

The second coefficient, β_2, measures how much more a non-defaulting bond falls in price when it shares the defaulter's underwriter (relative to a non-defaulting bond that does not share the defaulter's underwriter). The third coefficient, β_3, measures the average change in a non-defaulting bond's price when it shares the defaulter's underwriter *during* a default. Throughout, I demean the defaulting bond's price so that the coefficient on the shared underwriter indicator (β_2) measures the average change in the price of a non-defaulting bond when it shares the defaulter's underwriter.

We would expect to find a negative β_2 if there is contagion through the shared underwriter. This would indicate greater contagion to the non-defaulting bond when it shares the defaulter's underwriter. We would also expect a positive β_3 if there is contagion through the shared underwriter. This coefficient describes how much more strongly a non-defaulting bond comoves with the defaulting bond when shares the defaulter's underwriter during a default. The model in Appendix A predicts that, all else equal, when the underwriter's reputation falls by more (i.e., a bigger revision in beliefs), the price of the non-defaulting bond falls more.

The estimating equation includes three sets of fixed effects. Most importantly, country-year fixed effects account for time-varying country-level shocks or spillovers. If such shocks or spillovers are correlated with the underwriter's identity, they could bias the estimates of β_2 and β_3 in the absence of these fixed effects (i.e., the primary threat to identification described above). The equation also includes non-defaulting-defaulting country fixed effects. These help account for how much bonds from the defaulting and non-defaulter tend to comove during a default. Lastly, bond fixed effects control for time-invariant bond-specific characteristics that could affect bond prices. Including a bond fixed effect implicitly controls for the bond's underwriter(s).

The key identifying assumption is that sharing a defaulter's underwriter ($1[\text{Bank}]_{ie}$) is uncorrelated with unobserved factors that vary within a country-year and affect non-defaulters' bond prices. Violating this assumption would require that there are omitted factors varying within-country that are correlated with the underwriter's identity. Moreover, because the bond fixed effect implicitly controls for the underwriter, this also accounts for any time-invariant unobserved factors that are correlated with the underwriter's identity. This includes, for example, whether an underwriter on average specializes regionally or in low-risk countries. Therefore, confounders would need to vary within country and across time with the underwriter's identity. I test for such scenarios in Section 4.4.

Identification therefore does not require random matching between sovereigns and underwriters. It also does not require that the default was unanticipated. Typically, a bond's price deteriorates over several months leading up to default, suggesting that its occurrence is not a complete surprise to investors. When the default is announced, uncertainty about the timing and severity of the default is resolved. If defaults are almost perfectly anticipated, there would be little information content in the default announcement. This could reduce contagion during the default (i.e., the causal effect), which could limit the power of the empirical analysis to detect contagion, but it would not bias the estimates.

Lastly, throughout I two-way cluster standard errors by time (year-month) and bond. Sharing a defaulter's bank varies within bonds over events. Clustering by bond allows for correlation within bonds across events/time. Clustering by time allows for correlation across bonds during the same point in time. It is important to cluster by time as opposed to event (the former is less restrictive) because the same bond can be a non-defaulting bond across events that overlap, which happens for a small subsample of defaults.

4.3 Estimation Results

Estimating Equation (1) using OLS, I find economically and statistically significant contagion through shared underwriters during defaults. Table 3 displays the estimation results. Column 7 contains the most saturated regression, corresponding to Equation (1). The estimate of β_2 implies that sharing a defaulter's underwriter (during a default) leads to a 1.28% decrease in a non-defaulting bond's price on average. In the average default, the defaulting bond's price falls 2.86% (Table 2). Therefore, on average there is 45% pass-through of the defaulting bond's price changes to non-defaulting bonds underwritten by the same bank.

When a non-defaulting bond does *not* share the defaulter's underwriting bank, it tends to fall in price 4bp for every 100bp decrease in the defaulting bond's price. This small but positive comovement is consistent with default occurring when other factors tend to depress bond prices, such as during economic downturns. Comparing this 4% versus 45% indicates that sharing a defaulter's bank leads to 11 times greater comovement.

Lastly, there is a large and positive coefficient on the interaction term. This coefficient describes how much the contagion scales with the size of the changes in the defaulting bond's price. The estimate implies that the price of a non-defaulting bond falls 0.25% more for every 100bp decrease in the defaulting bond's price when they share the defaulter's underwriter. This is consistent with more severe reputation damage, which would lead to a larger decline in the defaulting bond's price, resulting in larger effects of contagion.

Table 3: Estimated Contagion from Sharing a Defaulter's Underwriter

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\Delta \ln(P_{ie}^{D})$	0.030**	0.047***	0.040***	0.041***	0.042***	0.042***	0.042***
	(0.014)	(0.012)	(0.013)	(0.014)	(0.014)	(0.014)	(0.014)
1[Bank$_{ie}$]	-0.962***	-0.813**	-0.947***	-0.976**	-1.149**	-1.267***	-1.284***
	(0.354)	(0.343)	(0.355)	(0.449)	(0.443)	(0.436)	(0.441)
1[Bank$_{ie}$] $\times \Delta \ln(P_{ie}^{D})$	0.224***	0.223***	0.238***	0.244***	0.251***	0.253***	0.252***
	(0.065)	(0.066)	(0.065)	(0.070)	(0.077)	(0.078)	(0.078)
Obs.	21921	21921	21921	21921	21921	21921	21921
R2	0.030	0.056	0.080	0.207	0.369	0.374	0.386
Country FE	✓	✓	✓				
Year FE		✓	✓	✓			
Def. Country FE			✓				
Country × Def. Country FE				✓	✓	✓	✓
Country × Year FE					✓	✓	✓
Bank FE						✓	
Bond FE							✓

Note: The outcome variable is the change in a non-defaulting bond's price ($\Delta \ln P_{ie}$). The explanatory variables are: the change in the defaulting bond's price ($\Delta \ln P_e^D$), an indicator for sharing the defaulting bond's underwriter (1[Bank]$_{ie}$), and the interaction of these two variables. Price changes are measured as the difference in log prices between the current month and the previous month. The coefficient on the shared underwriter indicator is scaled by 100 so that its units correspond to log points. The defaulting bond's price change is demeaned prior to regression. Standard errors are two-way clustered by time (year-month) and bond. Statistical significance: 0.1*, 0.05**, 0.01***.

The different columns in Table 3 illustrate the impact of including various fixed effects. Overall, the coefficients are fairly stable across the different specification. Column 5 adds the crucial country-year fixed effects, decreasing the coefficient on the shared bank indicator from -0.98 to -1.15. Adding a bank fixed effects leads to a similar-sized further decrease to -1.27. The relatively small change between columns 6 and 7 suggests that there is little scope for heterogeneity related to banks to act as possible confounders. And recall that, after including this fixed effect, confounders would need to be time-varying as well. Column 7 add the bond fixed effect, leading to the estimate of -1.28.

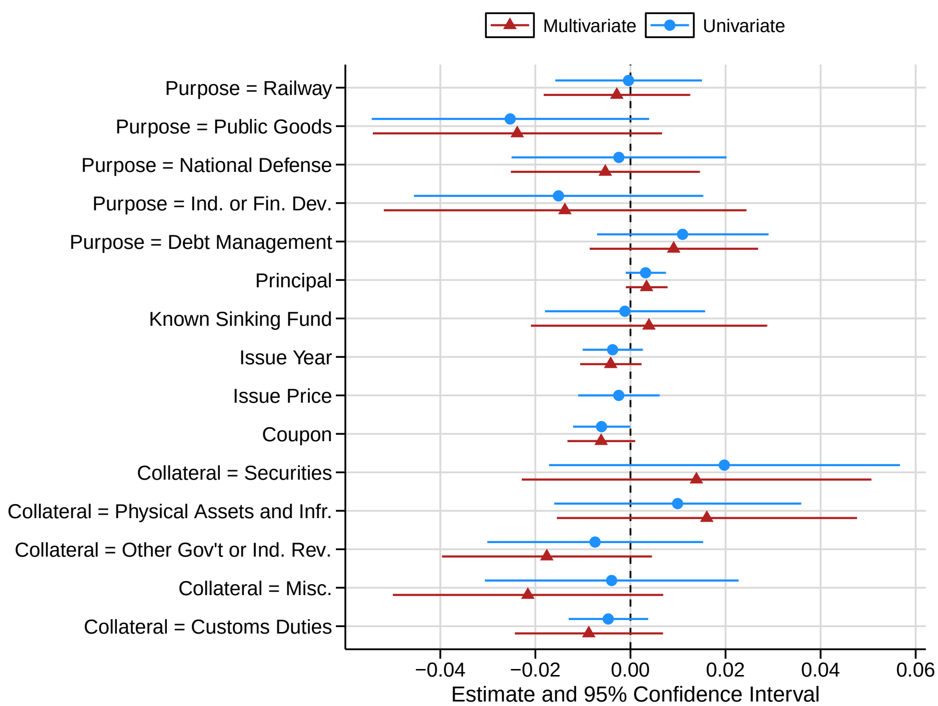
4.4 Balance Tests and Robustness

I next test for failures of the identifying assumption and provide additional robustness evidence. There are two scenarios that pose potential threats to identification that are not ruled out by the country-year (or other) fixed effects.

The first scenario arises if there are differences in bond characteristics that vary within a country-year and are correlated with the underwriter's identity. This could happen if underwriters specialize in, for example, the purpose and/or collateral of the loan, such as railways. If railway loans tend to be riskier, these bonds could both default more often and be more likely to experience negative returns. If so, the empirical analysis could conflate this phenomenon with reputation-based contagion.

To test for this first scenario, I estimate a balance test. This test regresses the shared bank indicator on bond characteristics in the bond-event panel. Figure 3 displays the results of this test. The estimated correlations are small and statistically insignificant, indicating that there are not systematic differences in the characteristics of bonds that tend to share a defaulter's underwriter.

Figure 3: Balance Test 1—Do Bond Characteristics Predict Sharing the Defaulter's Bank?

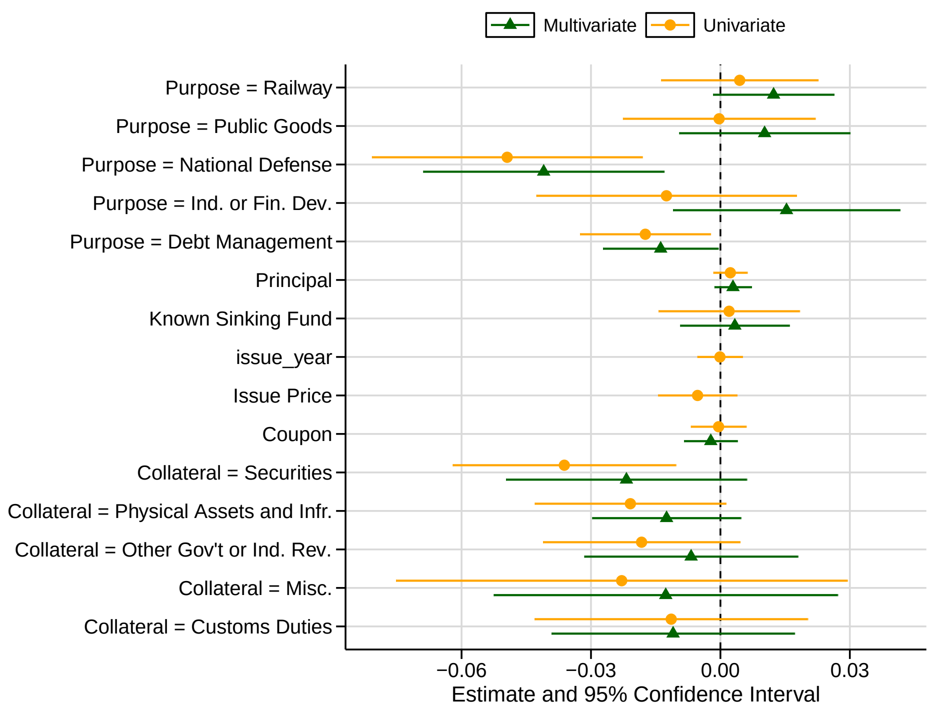


Note: This figure plots regression estimates and 95% confidence intervals. The outcome variable in each regression is the shared bank indicator and the explanatory variables are the characteristics of non-defaulting bonds. Each regression includes the same clustering and fixed effects and at the rightmost column in the main analysis (Table 3). Triangles denote estimates from a multivariate regression (i.e., all regressors are included in one regression) and circle denote estimates from a univariate regression (i.e., estimated separately for each regressor). For ease of interpretation, all continuous variables are demeaned and divided by their standard deviation.

The second scenario arises if there are systematic *similarities* in bonds that share an underwriter. This could also happen if there is specialization in bond characteristics within underwriters. Non-defaulting and defaulting bonds could comove more strongly not because of reputation-based contagion, but because they have similar coupon rates, collateral types, or other characteristics. To the extent that specialization in a time invariant characteristic, this is absorbed by the bond fixed effect. However, if the underwriter's specialization changes over time, this could bias the estimated effect of sharing a defaulter's bank.

I use a second balance test to test for evidence of this scenario. This test regresses the shared bank indicator on measures of *similarity* in bond characteristics between the non-defaulting and defaulting bond(s).[23] Figure 4 reports the estimation results.

Figure 4: Balance Test 2—Does Similarity to the Defaulting Bond Predict a Shared Bank?



Note: This figure plots regression estimates and 95% confidence intervals. The outcome variable in each regression is the shared bank indicator and the explanatory variables are the *differences* in the characteristics of non-defaulting bonds relative to the defaulting bond. Each regression includes the same clustering and fixed effects and at the rightmost column in the main analysis (Table 3). Triangles denote estimates from a multivariate regression (i.e., all regressors are included in one regression) and circle denote estimates from a univariate regression (i.e., estimated separately for each regressor). For ease of interpretation, all continuous variables are demeaned and divided by their standard deviation.

Generally the correlations are small and statistically insignificant. However, two characteristics show up in at least one specification as statistically significant: whether the purpose of the loan was national defense and whether the bond was secured on financial securities. The point es-

[23] In the case of multiple defaulting bonds, I take the average of their continuous characteristics and the max of indicator variables.

timates are negative and economically small (predicting a 3-5% lower chance of sharing a bank). The negative coefficient suggests, if anything, diversification rather than specialization in these characteristics.

The second balance test raises possible concerns related to selection on two bond characteristics. To gauge whether these characteristics could be related to confounders, I re-estimate the main regression on a subsample that excludes bonds with these characteristics. Table 4 displays the results. Column 2 omits national defense loans and column 3 omits loans secured on financial securities. The estimates remain similar, indicating that the estimated contagion is not driven by these two bond characteristics.

Table 4: Robustness to Dropping Special Cases

	(1)	(2)	(3)	(4)	(5)
$\Delta \ln(P^D_{ie})$	0.042***	0.041***	0.040***	0.034**	0.054**
	(0.014)	(0.014)	(0.013)	(0.015)	(0.022)
$1[\text{Bank}_{ie}]$	-1.284***	-1.119***	-1.235***	-1.282***	-1.842***
	(0.441)	(0.398)	(0.424)	(0.448)	(0.518)
$1[\text{Bank}_{ie}] \times \Delta \ln(P^D_{ie})$	0.252***	0.238***	0.262***	0.243***	0.314***
	(0.078)	(0.070)	(0.081)	(0.081)	(0.087)
Obs.	21921	21394	21209	21456	12820
R2	0.386	0.392	0.397	0.388	0.397
Country × Def. Country FE	✓	✓	✓	✓	✓
Country × Year FE	✓	✓	✓	✓	✓
Bond FE	✓	✓	✓	✓	✓
Excluded Cases	None	Purp. = Nat'l Def.	Col. = Fin. Sec.	Baring Crisis	Colonial

Note: The first column reproduces the baseline specification (the rightmost column of Table 3). The other columns estimate the same regression using a subset of the sample that exclude one of three special cases. Column 2 omits loans originated for the purpose of expenditures related to national defense. Column 3 omits bonds secured on financial securities. Column 4 drops all bonds during the year of the Baring Crisis (1890). The outcome variable is the change in a non-defaulting bond's price ($\Delta \ln P_{ie}$). The explanatory variables are: the change in the defaulting bond's price ($\Delta \ln P^D_e$), an indicator for sharing the defaulting bond's underwriter ($1[\text{Bank}]_{ie}$), and the interaction of these two variables. Price changes are measured as the difference in log prices between the current month and the previous month. The coefficient on the shared underwriter indicator is scaled by 100 so that its units correspond to log points. The defaulting bond's price change is demeaned prior to regression. Standard errors are two-way clustered by time (year-month) and bond. Statistical significance: 0.1*, 0.05**, 0.01***.

The next columns investigate robustness to two additional features. Column 4 omits all bonds during the year of the Baring Crisis (1890). This crisis began in July 1890 with an Argentine default and Barings' failed placement of Argentinean bonds. Stuck with nearly worthless bonds on its balance sheet, Barings ultimately received a bailout in November 1890. During this episode, financial losses at Barings did contribute to contagion back in Europe and possibly Latin America as well(Mitchener and Weidenmier, 2008). The Baring Crisis is a rare known case of a sovereign default having a meaningful financial impact on an underwriter. Therefore, since reputation was plausibly not the dominant channel of contagion in this episode, it is important to verify that the results are similar when excluding the Baring Crisis. This is indeed the case, as the point estimate remains similar (-1.284 versus -1.282).

Lastly, I exclude bonds issued by British colonies. These bonds were typically underwritten by a distinct set of banks (or the British government itself). They were generally regarded as implicitly guaranteed by the British government. Omitting these bonds is essentially excluding a subset of extremely low-risk assets. Restricting attention to the class of non-colonial bonds suggests even greater contagion within this sub-population.

5 Evidence on Mechanisms: The Role of Reputation

This section provides evidence on the role of underwriter reputation for monitoring in driving contagion. In Section 5.1, I first test predictions implied by reputation-based contagion versus an alternative mechanism: financial loss-based contagion. The alternative mechanism posits that contagion occurs due to default imposing financial losses on either the underwriter or investors. My findings most closely align with the reputation mechanism, rather than the financial loss mechanism. Results from these tests also suggest that investors were learning about both ex ante and ex post monitoring actions.

Section 5.2 then explores whether investors are plausibly *learning* about higher future default risk associated with with defaulter's underwriter. I first show that sharing a defaulter's underwriter does not predict higher default risk in the short-term (1-2 years), but it does predict higher default risk in the medium-term (3-10 years). This is consistent with default being a truly informative signal about the future default risk of and underwriter's other bonds, which can rationalize the price contagion at the time of default. I then provide evidence that the contagion I document is almost entirely underwriter-specific, as opposed to investors generally learning about the class of "high-risk" underwriters. This is consistent with investors learning about the underwriter's type as opposed a set of risk factors that vary systematically with underwriter risk. Importantly, these patterns are at odds within a possible threat to identification: that unobserved shocks are driving both non-defaulting bond prices (for those sharing a bank) and *which* bonds enter default.

Lastly, Section 5.3 examines financial stability implications of reputation-based contagion. In theory, it is ambiguous whether contagion will be stronger or milder when it involves a *higher* reputation monitor. That is, does having reputable monitors dampen or amplify contagion? In the context of early sovereign bond markets, I find evidence that reputation dampened contagion, consistent with reputation being stability-enhancing.

5.1 Mechanism: Reputation versus Financial Losses

An alternative explanation for contagion through shared underwriters centers on financial losses, rather than reputation for monitoring. If underwriters tended to hold some of the bonds that they issued, default could damage their wealth. If such losses prompted underwriters to sell other assets, including other bonds, this could depress the price of these bonds.

Another variant of financial loss-based contagion could arise via losses to investor wealth.

In particular, if there are segmented investors markets, a similar scenario could play out. For example, suppose investors in Argentinean Barings bonds tend to old other bonds issued through Barings. If investors tend to sell their other bonds after a default, then default on the Argentinean Barings bond could lead to contagion to other Barings bonds.

Section 2 discusses institutional details that suggest such scenarios are less plausible than reputation-based contagion. In particular, it suggests that underwriters had limited direct financial exposure and that investors were generally diversified. However, to the best of my knowledge, there is not sufficient data to systematically measure underwriter financial exposure nor investor concentration by underwriter in this era. Because underwriters were generally structured as private partnerships and many investors were private individuals, there is little available data on their financial holdings. Given the lack of data to directly test these scenarios, I instead provide additional evidence on these competing explanations by empirically testing predictions that differ.

Persistence. I first examine the persistence of the price impact of sharing a defaulter's underwriting bank. If contagion stemmed from a wealth effect due to temporary selling pressure, we would expect the price impact to be short-lived. In contrast, a persistent impact would be consistent with learning new information with persistent relevance (e.g., about the underwriter's monitoring ability/willingness). This observation is motivated by Coval and Stafford (2007), which compares the price impact of "forced" versus "voluntary" mutual fund sales of assets. They find tha forced sales have a temporary effect (dissipating within 1-2 years) while voluntary sales, which are plausibly driven by new information, have a persistent effect over this horizon.

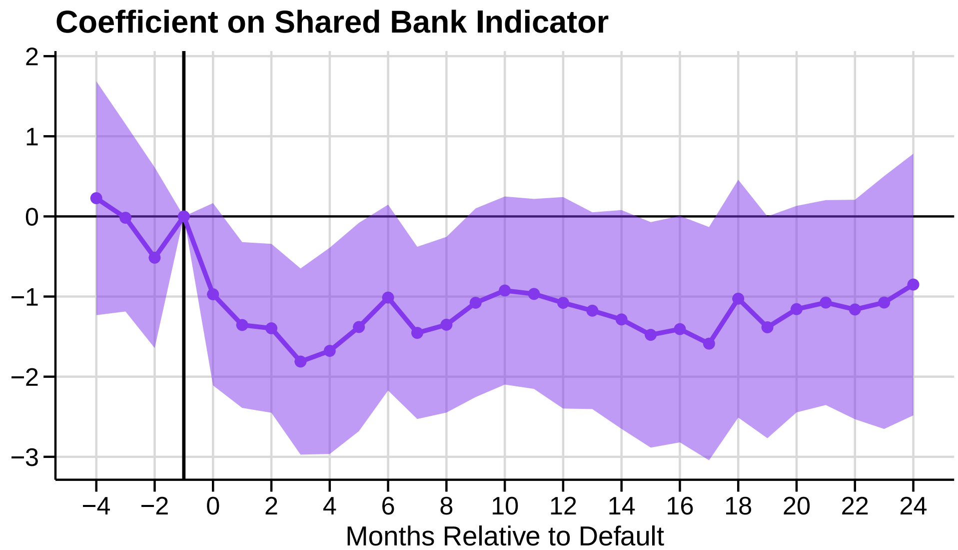
To gauge persistence, I estimate a local projections (Jordà, 2005) variant of Equation (1) over the 4 months before and 24 months following a default. I define the outcome variable to be the cumulative log price change relative to the month before the default.[24] Figure 5 displays the results for the shared bank indicator, which summarizes the average cumulative price change for bonds sharing a defaulter's bank.

In the four months prior to default, there are not significant differences in prices. However, after default, bonds sharing the defaulter's bank fall 1-1.5% in the three months following default and remain about 1% lower through a total of 24 months. This persistence suggests investors are learning new information rather than facing temporary selling pressure.

Excluding Young Bonds. A possible scenario in which an underwriter may have had at-risk bonds on their balance sheet is a failed placement. If default occurred when the bank had not yet fully placed the bonds, contagion could potentially spread via a wealth effect. Table 4 excludes the most well-known case of a failed placement during a default: the Baring Crisis. But limited information is available about other possible cases, making it difficult to explicitly exclude other cases. Given this limitation, I instead re-run the regression but omit defaults with bonds that are

[24] That is, $\ln(P_{ie,h}) / \ln(P_{ie,-1})$ where $P_{ie,h}$ is the price at horizon h (month) and $P_{ie,-1}$ is the price in the month before default.

Figure 5: Persistence of Average Price Effects of Sharing a Defaulter's Bank



Note: This figure plots regression coefficients (and their 95% confidence intervals) for local projections estimates of the impact of sharing a defaulter's banks over -4 to +24 months relative to default. The specification has the same clustering and fixed effects and at the rightmost column in the main analysis (Table 3). The outcome variable is the log price change relative to period -1, therefore the graph describes the cumulative price change.

at the greatest risk of not yet being fully placed: recently originated bonds.

Table 5 reports the results. Column 1 reproduces the baseline estimates. Column 2 restricts to the subset of bonds for which the defaulting bond's age is known (but does not yet impose restrictions on the *value* of the defaulting bond's age). The subgroup for which the necessary data is available exhibits higher average contagion: a 1.66% price decrease versus 1.28%.

Column 3 retains defaults where the defaulting bond's age is at least one year. The estimate is little changed (-1.68 versus -1.66). Restricting to bonds at least two years old (column 4) also yields a similar estimate (-1.69). These results suggest that contagion via shared underwriters is not driven by defaults involving bonds that had the highest risk of not yet being fully placed. Additionally, the small changes in sample size across columns 2-4 suggest that defaults on "young" bonds were relatively rare.

Variation with Wealth Involved. I next examine how contagion varies with the amount of wealth involved in the default. If contagion is driven by financial losses, we would expect contagion to be larger when more wealth is affected. The wealth effect would be larger and hence spur more contagion.

In contrast, if contagion is driven by reputation, it is possible to instead find milder contagion when the wealth involved is greater. In the model discussed in Section 4.1, contagion is milder when default is more difficult to prevent (specifically, when the probability of "fighting" is less likely to succeed). Proposition 1 in Appendix B formalizes this result. If defaults involving more

Table 5: Excluding Recently Originated Defaulting Bonds

	(1)	(2)	(3)	(4)
$\Delta \ln(P^D_{ie})$	0.042***	0.040**	0.040**	0.036**
	(0.014)	(0.016)	(0.016)	(0.017)
$1[\text{Bank}_{ie}]$	-1.284***	-1.663***	-1.675***	-1.688***
	(0.441)	(0.591)	(0.590)	(0.626)
$1[\text{Bank}_{ie}] \times \Delta \ln(P^D_{ie})$	0.252***	0.305***	0.305***	0.295***
	(0.078)	(0.093)	(0.093)	(0.098)
Obs.	21921	21097	20865	19818
R2	0.386	0.399	0.399	0.407
Country × Def. Country FE	✓	✓	✓	✓
Country × Year FE	✓	✓	✓	✓
Bond FE	✓	✓	✓	✓
Def. Bond Age	Baseline	Non-Missing	$\geq$ 1 year	$\geq$ 2 years

Note: The first column reproduces the baseline specification (the rightmost column of Table 3). The other columns estimate the same regression using a subset of the sample. Column 2 is the subset for which the defaulting bond's age is known. Columns 3 and 4 exclude bonds less than one and two years old (respectively). In the case of multiple defaulting bonds, I take the minimum of all bonds' ages. The outcome variable is the change in a non-defaulting bond's price ($\Delta \ln P_{ie}$). The explanatory variables are: the change in the defaulting bond's price ($\Delta \ln P^D_e$), an indicator for sharing the defaulting bond's underwriter ($1[\text{Bank}]_{ie}$), and the interaction of these two variables. Price changes are measured as the difference in log prices between the current month and the previous month. The coefficient on the shared underwriter indicator is scaled by 100 so that its units correspond to log points. The defaulting bond's price change is demeaned prior to regression. Standard errors are two-way clustered by time (year-month) and bond. Statistical significance: 0.1*, 0.05**, 0.01***.

wealth are harder to prevent, reputation is damaged less in such defaults and there can be less contagion.

Table 6 tests this prediction by splitting the sample into two groups based on the total principal of the bonds involved in default: above and below the median. The average effect of sharing a defaulter's bank is a statistically significant 1.89% price decrease in defaults involving below-median wealth. The average decrease is 0.82% for in cases with above-median wealth. I caution that this last coefficient, while not statistically different from zero is estimated with less precision.

Because the smaller sample size may limit the power of this test, I also estimate a higher-power (but more restrictive) variant that uses interactions instead of splitting the sample in Appendix Table C.2.[25] Those results find an economically significant difference in contagion: a one standard deviation increase in defaulting bond's principal is associated with 0.48 percentage points more contagion. However, this coefficient is also not precisely estimated.

Cautiously interpreting these results, the evidence is more consistent with reputation rather than financial loss-based contagion. When more wealth is involved, contagion appears to be either

[25]It is more restrictive in the sense that the pooled regression constraints the fixed effects to take on the same value for both subgroups.

Table 6: Heterogeneity by Defaulting Bond Total Principal

	(1)	(2)	(3)
$\Delta \ln(P_{ie}^{D})$	0.042***	0.021	0.084***
	(0.014)	(0.020)	(0.023)
$1[\text{Bank}_{ie}]$	-1.284***	-1.893**	-0.820
	(0.441)	(0.747)	(0.587)
$1[\text{Bank}_{ie}] \times \Delta \ln(P_{ie}^{D})$	0.252***	0.226***	0.228**
	(0.078)	(0.080)	(0.109)
Obs.	21921	10730	10931
R2	0.386	0.558	0.405
Country x Def. Country FE	✓	✓	✓
Country x Year FE	✓	✓	✓
Bond FE	✓	✓	✓
Def. Bond Principal	All (Baseline)	Below Median	Above Median

Note: The first column reproduces the baseline specification (the rightmost column of Table 3). The other columns estimate the same regression using a subset of the sample. Columns 2 and 3 use subsets where the sum of the defaulting bond's principal above or below median (respectively). The outcome variable is the change in a non-defaulting bond's price ($\Delta \ln P_{ie}$). The explanatory variables are: the change in the defaulting bond's price ($\Delta \ln P_{e}^{D}$), an indicator for sharing the defaulting bond's underwriter ($1[\text{Bank}]_{ie}$), and the interaction of these two variables. Price changes are measured as the difference in log prices between the current month and the previous month. The coefficient on the shared underwriter indicator is scaled by 100 so that its units correspond to log points. The defaulting bond's price change is demeaned prior to regression. Standard errors are two-way clustered by time (year-month) and bond. Statistical significance: 0.1*, 0.05**, 0.01***.

milder or similar.

Variation with Selective Default. Selective default presents another opportunity to test a prediction of reputation-based contagion. 52% of the defaults I study are selective in that the sovereign defaults on a subset of its outstanding bonds, with some bonds escaping default. Selective default could signal that the default was *easier* to prevent, as some bonds were able to avoid default. If so, under Proposition 1, contagion would be more *severe* in selective defaults.

Regarding the alternative mechanism, financial losses, the prediction is less clear. To the extent that selective default involves a smaller amount of wealth, selective defaults would tend have weaker contagion under this mechanism.

To test this, I augment the baseline regression to include an interaction between an indicator for selective default and the shared bank indicator. Table 7 presents the results. The coefficient on the uninteracted shared bank indicator is -0.31 and statistically insignificant. It is somewhat imprecisely estimated but rules out an average affect greater than -1.31 at the 95% confidence level. The interacted coefficient is both economically and statistically significant. It indicates that, for a default with an average decrease in the defaulting bond's price, contagion is 1.77 percentage points more severe in selective defaults. This stronger level of contagion is consistent with the

Table 7: Heterogeneity by Selective Default Indicator

	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta \ln(P^D_{ie})$	0.030**	0.048***	0.039***	0.041***	0.042***	0.042***
	(0.014)	(0.011)	(0.013)	(0.014)	(0.015)	(0.015)
1[Bank$_{ie}$]	-0.067	0.094	-0.094	-0.066	-0.228	-0.310
	(0.352)	(0.357)	(0.376)	(0.538)	(0.519)	(0.509)
1[Sel. Def.$_e$]	-0.096	0.410	0.218	0.311	0.326	0.345
	(0.242)	(0.260)	(0.335)	(0.336)	(0.316)	(0.310)
1[Bank$_{ie}$] $\times \Delta \ln(P^D_{ie})$	0.247***	0.241***	0.256***	0.262***	0.267***	0.267***
	(0.064)	(0.066)	(0.064)	(0.070)	(0.078)	(0.079)
1[Bank$_{ie}$] $\times$ 1[Sel. Def.$_e$]	-1.777***	-1.792***	-1.652***	-1.721**	-1.731**	-1.770***
	(0.576)	(0.551)	(0.542)	(0.677)	(0.682)	(0.668)
Obs.	21921	21921	21921	21921	21921	21921
R2	0.033	0.059	0.082	0.209	0.371	0.387
Country FE	✓	✓	✓			
Year FE		✓	✓	✓		
Def. Country FE			✓			
Country $\times$ Def. Country FE				✓	✓	✓
Country $\times$ Year FE					✓	✓
Bond FE						✓

Note: This table adds two regressors: an indicator for whether the default was selective (i.e., not all of the defaulting state's bonds entered default) and its interaction with the shared bank indicator. The outcome variable is the change in a non-defaulting bond's price ($\Delta \ln P_{ie}$). The explanatory variables are: the change in the defaulting bond's price ($\Delta \ln P^D_e$), an indicator for sharing the defaulting bond's underwriter (1[Bank]$_{ie}$), and the interaction of these two variables. Price changes are measured as the difference in log prices between the current month and the previous month. The coefficient on the shared underwriter indicator is scaled by 100 so that its units correspond to log points. The defaulting bond's price change is demeaned prior to regression. Standard errors are two-way clustered by time (year-month) and bond. Statistical significance: 0.1*, 0.05**, 0.01***.

reputation mechanism.

Avoiding Selective Default. Selective default could also send a signal about the underwriter(s) that *avoided* the default. That is, the underwriters who had outstanding bonds for the same country but whose bonds were not among those entering default. First, default on the other bonds could send a positive signal about the "good" underwriter's ability to exert ex post influence over a sovereign to avoid default. In the language of the model, the occurrence of default indicates that a "crisis" arose (the sovereign wanted to default), and a lack of default demonstrates that the underwriter successfully "fought" the crisis. Second, default could send a negative signal about the underwriter's ex ante screening and due diligence, as the sovereign did default on some of its bonds.

I test this by focusing on the subset of selective defaults and adding an indicator for being a "good" bank that avoid default (and its interaction with the log change in the defaulting bond's price). Table 8 displays the results. The average contagion when sharing the defaulter's bank is a 2.64% price decrease, versus a (statistically insignificant) 0.39% price decreasing when sharing a good bank. The 95% confidence interval for the good bank rules out an increase larger than 0.17% (and a decrease smaller than -0.95%) for bonds underwritten by a good bank. Similarly, comovement with the defaulting bond is weakest for those underwritten by banks not at all associated with the defaulting sovereign (4% pass through of the defaulting bond's price change), moderate for those associated via a good bank (4% + 10% = 14%), and strongest for those associated with the defaulting bond's bank (4% + 35$ = 39%).

Table 8: Effect of a Bank Avoiding Default in a Selective Default

	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta \ln(P_{ie}^{D})$	0.013	0.030***	0.037**	0.043***	0.042**	0.041***
	(0.017)	(0.010)	(0.014)	(0.015)	(0.015)	(0.015)
1[Bank$_{ie}$]	-1.926***	-1.770***	-1.852***	-2.252***	-2.436***	-2.638***
	(0.480)	(0.485)	(0.494)	(0.638)	(0.683)	(0.657)
1[Good Bank$_{ie}$]	-0.503	-0.123	-0.331	-0.211	-0.288	-0.389
	(0.305)	(0.320)	(0.284)	(0.320)	(0.234)	(0.287)
1[Bank$_{ie}$] $\times \Delta \ln(P_{ie}^{D})$	0.330***	0.325***	0.351***	0.369***	0.354***	0.353***
	(0.084)	(0.087)	(0.080)	(0.091)	(0.097)	(0.101)
1[Good Bank$_{ie}$] $\times \Delta \ln(P_{ie}^{D})$	0.131***	0.117***	0.110***	0.097**	0.099**	0.102**
	(0.038)	(0.037)	(0.035)	(0.039)	(0.038)	(0.040)
Obs.	10603	10603	10603	10603	10603	10603
R2	0.063	0.086	0.104	0.260	0.424	0.446
Country FE	✓	✓	✓			
Year FE		✓	✓	✓		
Def. Country FE			✓			
Country × Def. Country FE				✓	✓	✓
Country × Year FE					✓	✓
Bond FE						✓

Note: This table uses the subsample of selective defaults and adds two regressors: an indicator for whether a non-defaulting bond's bank avoided default (a "good" bank) and its interaction with the defaulting bond's price change. The outcome variable is the change in a non-defaulting bond's price ($\Delta \ln P_{ie}$). The explanatory variables are: the change in the defaulting bond's price ($\Delta \ln P_{e}^{D}$), an indicator for sharing the defaulting bond's underwriter (1[Bank]$_{ie}$), and the interaction of these two variables. Price changes are measured as the difference in log prices between the current month and the previous month. The coefficient on the shared underwriter indicator is scaled by 100 so that its units correspond to log points. The defaulting bond's price change is demeaned prior to regression. Standard errors are two-way clustered by time (year-month) and bond. Statistical significance: 0.1*, 0.05**, 0.01***.

These findings indicate that the bonds of good banks are on average penalized by default, but much less so compared to bonds sharing the defaulter's bank. If ex ante screening and due diligence (with respect to country choice) did not matter in the eyes of investors, we would expect no contagion or positive price impacts for the bonds of good banks. The presence of these negative effects suggests these ex ante actions are an important part of what investors are learning about. However, because contagion is significantly milder compared to bonds sharing the defaulter's bank, it suggests that ex post actions (e.g., exerting influence) are also important. That is, investors are not only learning about ex ante actions.

These results are not necessarily at odds with financial loss-based contagion. For example, the default likely signals a higher risk of the same sovereign defaulting on its other bonds in the near future. The good bank's bonds for this sovereign would likely fall in price. This could depress the prices of other sovereigns' bonds sharing that underwriter if there is (1) segmentation in ownership by underwriter and (2) a wealth effect from this (possibly unrealized) wealth shock. However, because the bonds associated with the good bank did not experience a cash flow shock like an unpaid coupon, it is less plausible that contagion to these bonds is driven by financial losses (as opposed to learning about the underwriter's monitoring).

Variation with Bond Age *Similarity*. Another piece of evidence that can be rationalized by learning about ex ante underwriter monitoring actions relates to the similarity of bonds in terms of age. Suppose that underwriter screening effort varies over time. This could happen if underwriters improve their monitoring abilities with experience or if incentives to monitor (e.g., reputation concerns) vary over time. Contagion between defaulting and non-defaulting bonds that share an underwriter could be larger when the bonds were underwritten closer in time to each other. This is because the default of one bond would be more informative about other bonds underwritten closer in time to the defaulter.

I test this in Table 9 using a subgroup analysis. Conditioning on the subsample for which the time since issuance (bond age) is known for both the defaulting and non-defaulting bonds, the average contagion is a 1.78% when sharing the defaulter's bank (column 2). Columns 3-7 restrict to bonds underwritten at least 1, 3, 5, 7, and 9 years apart (respectively). The estimated contagion generally shrinks as the bonds are underwritten further apart in time. It declines from 1.78% in the full sample (with available bond age data) to 1.37% when the bonds are underwritten at least 9 years apart.

Such heterogeneity is not obviously predicted by a finanical loss-based mechanism. However, these results can be rationalized by learning about ex ante underwriter monitoring actions.

Variation with Default Type. I next examine how contagion varies with the type of default: missed payments versus conversions. Missed payment defaults occur when the sovereign fails to make a scheduled payment on its bonds (either coupon, principal/sinking fund payments). Conversions are modifications bond contract terms (e.g., lowering coupon rates).

Table 10 augments the baseline specification to include an indicator for a default being a missed payment default (and its interaction with the shared bank indicator). The results suggest contagion is similar across the two types of defaults. Average contagion is a 1.21% price decrease when sharing the defaulter's bank in a conversion. However, while similar in magnitude to the

Table 9: Heterogeneity by *Difference* in Bond Age

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\Delta\ln(P_{ie}^D)$	0.042***	0.041**	0.041**	0.051***	0.057***	0.061***	0.061**
	(0.014)	(0.018)	(0.018)	(0.019)	(0.019)	(0.021)	(0.026)
$1[\text{Bank}_{ie}]$	-1.284***	-1.778***	-1.835***	-1.908**	-1.679**	-1.541*	-1.372*
	(0.441)	(0.613)	(0.619)	(0.753)	(0.742)	(0.821)	(0.758)
$1[\text{Bank}_{ie}] \times \Delta\ln(P_{ie}^D)$	0.252***	0.322***	0.318***	0.308***	0.269**	0.277**	0.201*
	(0.078)	(0.097)	(0.097)	(0.115)	(0.113)	(0.122)	(0.109)
Obs.	21921	19819	18958	15784	13447	11429	9573
R2	0.386	0.402	0.403	0.409	0.421	0.439	0.459
Country × Def. Country FE	✓	✓	✓	✓	✓	✓	✓
Country × Year FE	✓	✓	✓	✓	✓	✓	✓
Bond FE	✓	✓	✓	✓	✓	✓	✓
Bond Age Diff.	Baseline	Non-Missing	≥ 1	≥ 3	≥ 5	≥ 7	≥ 9

Note: The first column reproduces the baseline specification (the rightmost column of Table 3). The other columns estimate the same regression using a subset of the sample. Column 2 reports estimates for the subsample for which both the non-defaulting and defaulting bonds' ages are known. Columns 3-7 restrict the sample to bonds with increasingly large differences in their ages. The outcome variable is the change in a non-defaulting bond's price ($\Delta\ln P_{ie}$). The explanatory variables are: the change in the defaulting bond's price ($\Delta\ln P_e^D$), an indicator for sharing the defaulting bond's underwriter ($1[\text{Bank}]_{ie}$), and the interaction of these two variables. Price changes are measured as the difference in log prices between the current month and the previous month. The coefficient on the shared underwriter indicator is scaled by 100 so that its units correspond to log points. The defaulting bond's price change is demeaned prior to regression. Standard errors are two-way clustered by time (year-month) and bond. Statistical significance: 0.1*, 0.05**, 0.01***.

original estimate of -1.28%, this estimate is somewhat imprecise (perhaps not surprisingly, as conversions comprise around 30% of defaults). The coefficient on the missed payment interaction is -0.12% (and also not precisely estimated). The point estimate suggests that contagion in missed payments defaults is either similar or, if anything, milder.

To the extent that missed payment defaults entail a larger cash flow shock than conversions, a financial loss mechanism could lead to more contagion in missed payment defaults. Relatedly, missed payments are also cases where conceivably emergency lending from the underwriter could have prevented default. If these kinds of transfers were a primary action a bank could take to prevent default, which entails a financial cost, we would expect contagion to be higher in missed payment defaults. The similarity between these types of defaults is at odds with these two scenarios. Reputation, however, does not have obvious predictions about different default types.

Variation with Number of Defaulter's Banks. Lastly, I examine how contagion varies with the *number* of underwriters per defaulting bond. While a majority of bonds have one underwriter, it is not uncommon for bonds to be underwritten by a syndicate of (typically) 2–4 banks. The signal sent about a given underwriter of a defaulting bond can be weaker when more banks are involved

Table 10: Heterogeneity by Default Type

	(1)	(2)
$\Delta \ln(P_{ie}^D)$	0.042***	0.041***
	(0.014)	(0.015)
$1[\text{Bank}_{ie}]$	-1.284***	-1.209
	(0.441)	(0.732)
$1[\text{Bank}_{ie}] \times \Delta \ln(P_{ie}^D)$	0.252***	0.251***
	(0.078)	(0.084)
$1[\text{Missed Payment}_e]$		-0.013
		(0.317)
$1[\text{Bank}_{ie}] \times 1[\text{Missed Payment}_e]$		-0.120
		(0.838)
Obs.	21921	21921
R2	0.386	0.386
Country x Def. Country FE	✓	✓
Country x Year FE	✓	✓
Bond FE	✓	✓

Note: This table adds two regressors: a categorical variable that indicate the type of default (conversion or missed payment) and its interaction with the shared bank indicator. The omitted category is conversion. The outcome variable is the change in a non-defaulting bond's price ($\Delta \ln P_{ie}$). The explanatory variables are: the change in the defaulting bond's price ($\Delta \ln P_e^D$), an indicator for sharing the defaulting bond's underwriter ($1[\text{Bank}]_{ie}$), and the interaction of these two variables. Price changes are measured as the difference in log prices between the current month and the previous month. The coefficient on the shared underwriter indicator is scaled by 100 so that its units correspond to log points. The defaulting bond's price change is demeaned prior to regression. Standard errors are two-way clustered by time (year-month) and bond. Statistical significance: 0.1*, 0.05**, 0.01***.

if the presence of multiple banks makes it harder to attribute responsibility to one particular bank. Therefore, defaults with multiple underwriters per bond may send a less informative signal and lead to less contagion.

I investigate this in a subgroup analysis in Table 11. Columns 2-4 restrict to subsamples where the defaulting bond(s) has no more than 3, 2, and 1 underwriters (respectively). Overall, the fewer underwriters are involved, the larger is the estimated contagion. This is consistent with fewer underwriters making it easier to attribute responsibility to a particular bank, leading to more contagion.

In terms of financial loss-based contagion, if having more banks involved corresponds to a wealth effect that is distributed over more bondholders, one would expect the same. Therefore, this pattern could be rationalized by either monitor reputation or financial loss-based contagion.

Table 11: Heterogeneity by Defaulting Bond's Number of Underwriters

	(1)	(2)	(3)	(4)
$\Delta \ln(P^D_{ie})$	0.042***	0.039**	0.018	-0.050*
	(0.014)	(0.019)	(0.013)	(0.026)
$1[\text{Bank}_{ie}]$	-1.284***	-1.407**	-1.800***	-1.958***
	(0.441)	(0.632)	(0.647)	(0.627)
$1[\text{Bank}_{ie}] \times \Delta \ln(P^D_{ie})$	0.252***	0.286***	0.397***	0.212**
	(0.078)	(0.097)	(0.103)	(0.093)
Obs.	21921	19582	16150	8819
R2	0.386	0.415	0.482	0.629
Country $\times$ Def. Country FE	✓	✓	✓	✓
Country $\times$ Year FE	✓	✓	✓	✓
Bond FE	✓	✓	✓	✓
# Def. Underwriters	Baseline	<= 3	<= 2	<= 1

Note: The first column reproduces the baseline specification (the rightmost column of Table 3). The other columns estimate the same regression using a subset of the sample. Columns 2-4 restrict te sample to bonds in defaulters where the defaulting bond(s) had fewer and fewer underwriters (from a max of 3 to a max of 1). The outcome variable is the change in a non-defaulting bond's price ($\Delta \ln P_{ie}$). The explanatory variables are: the change in the defaulting bond's price ($\Delta \ln P^D_e$), an indicator for sharing the defaulting bond's underwriter ($1[\text{Bank}]_{ie}$), and the interaction of these two variables. Price changes are measured as the difference in log prices between the current month and the previous month. The coefficient on the shared underwriter indicator is scaled by 100 so that its units correspond to log points. The defaulting bond's price change is demeaned prior to regression. Standard errors are two-way clustered by time (year-month) and bond. Statistical significance: 0.1*, 0.05**, 0.01***.

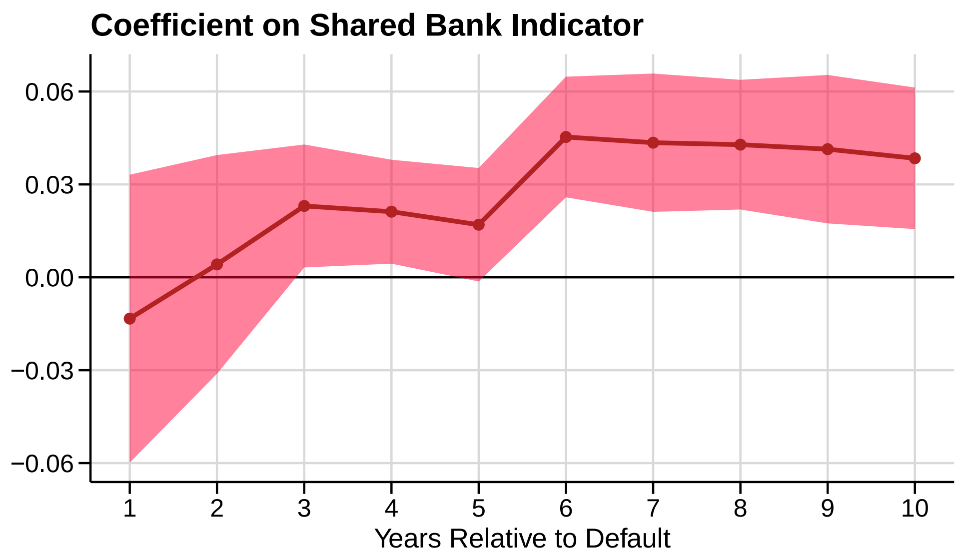
5.2 Evidence on Learning

This section investigates what investors are plausibly learning from default about non-defaulting bonds.

Default in the Long-Run. Is default on one bond a signal that other bonds sharing its underwriter are relatively more likely to default in the future? If so, this would be consistent with default truly being an informative signal that rational investors would incorporate into prices. To test this, I use local projections estimation. The specification mirrors Equation (1), with the covariates interacted with a years-since-default indicator. The outcome variable is an indicator for whether a default has occurred by a given time horizon. The regression estimates the difference in the chances that a non-defaulting bond enters default in the future as a function of whether it shares the (original) defaulter's bank.

Figure 6 plots the coefficients on the shared bank indicator for different time horizons (years since default). Within the first two years of the original default, there is not an economically or statistically significant difference in the likelihood of bonds sharing the defaulter's bank entering default. However, in the long-run default is more likely. Within 10 years, there is a 4-5% higher rate of default among bonds that shared a prior defaulter's bank. Sharing a defaulter's bank is a highly predictive signal about default in the long-run.

Figure 6: Difference in Default Rates when Sharing a Defaulter's Bank



Note: This figure plots regression coefficients (and their 95% confidence intervals) for local projections estimates regressing default on sharing a defaulter's bank. Specifically, the coefficients describe how the the probability of a non-defaulting bond entering default in the future varies with whether the non-defaulting bond shared the defaulter's bank in a default occurring at time 0. The specification has the same clustering and fixed effects and at the rightmost column in the main analysis (Table 3). The outcome variable is the probability of default on or before the time specified on the x-axis; it reflects the cumulative probability of default.

These patterns are also at odds with a potential threat to identification: unobserved shocks driving both non-defaulting bond prices (for those with a shared bank) and the choice of which bond to default on. For example, sovereigns selectively defaulting may prefer to default on lower reputation underwriters, as these relationships are less valuable. This could make both the prices and default risk of low-reputation underwriters load more strongly on the global financial cycle, which could be conflated with the estimated price contagion.

However, higher risk of default does not materialize in the year of default (nor the year after) for bonds that share the defaulter's bank. This evidence against there being an acute unobserved shock causally increasing default risk among bonds sharing the defaulter's bank. Rather, this evidence is more consistent with contagion due to investors learning about future default risk.

Learning about Specific Banks or the Class of "Risky" Banks. Is default a signal specifically about the underwriter involved or about similar underwriters more broadly? To test this, I modify the baseline regression to include an indicator for whether the *non-defaulting* bond's underwriter(s) were associated with a default in the past two years (excluding the current default). I also interact this indicator with the defaulting bond's price change. This enables a "horse race" that compares whether sharing a bank or simply being a "risky" bank drives contagion.

Table 12 gives the estimation results. The coefficient on the uninteracted recent default indicator is positive, indicating that these bonds tend on net to rise 0.54% in price during defaults. This positive effect could arise if global financial conditions are an important driver of default and avoiding default is an especially positive signal for bonds underwritten by banks with a worse track record. The interacted coefficient is positive and small, indicating that bonds associated with a recent default experience 8% (=3% + 5%) pass through of the defaulting bond's price decrease. The coefficient on the shared bank interaction remains similar (25% versus 24%).

Table 12: Heterogeneity by *Non-Defaulting* Bond's Banks' Recent Default Record

	(1)	(2)
$\Delta \ln(P^D_{ie})$	0.042***	0.025*
	(0.014)	(0.013)
$1[\text{Bank}_{ie}]$	-1.284***	-1.223***
	(0.441)	(0.440)
$1[\text{Bank}_{ie}] \times \Delta \ln(P^D_{ie})$	0.252***	0.235***
	(0.078)	(0.079)
$1[\text{Recent Bank Def.}_{ie}]$		0.544**
		(0.266)
$1[\text{Recent Bank Def.}_{ie}] \times \Delta \ln(P^D_{ie})$		0.049**
		(0.023)
Obs.	21921	21921
R2	0.386	0.388
Country x Def. Country FE	✓	✓
Country x Year FE	✓	✓
Bond FE	✓	✓

Note: This table adds two regressors: an indicator for whether any of a non-defaulting bond's bank(s) were associated with a default in the past two years years (excluding the current default, if applicable) and its interaction with the defaulting bond's price change. The outcome variable is the change in a non-defaulting bond's price ($\Delta \ln P_{ie}$). The explanatory variables are: the change in the defaulting bond's price ($\Delta \ln P^D_e$), an indicator for sharing the defaulting bond's underwriter ($1[\text{Bank}]_{ie}$), and the interaction of these two variables. Price changes are measured as the difference in log prices between the current month and the previous month. The coefficient on the shared underwriter indicator is scaled by 100 so that its units correspond to log points. The defaulting bond's price change is demeaned prior to regression. Standard errors are two-way clustered by time (year-month) and bond. Statistical significance: 0.1*, 0.05**, 0.01***.

These results suggest that investors may also learn from default about the risk of bonds with "worse" underwriters. However, it also suggests that that this is not the mechanism behind the contagion between bonds with shared a underwriter. Rather, contagion within an underwriter's bonds is driven by learning about that underwriter specifically.

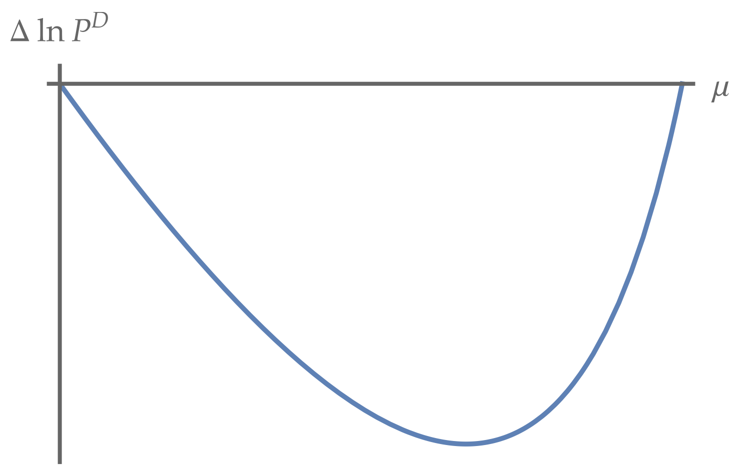
These patterns are also at odds with the threat to identification described above. If "low reputation" underwriters' bonds are more sensitive to the global financial cycle, and this was being conflated with contagion, we would expect the coefficient on the interaction of the shared bank indicator and defaulting bond price change to significantly decrease after adding the interaction with the recent default indicator.

5.3 Do Reputable Monitors Reduce Contagion?

The main results show that monitor reputation can be a quantitatively significant source of contagion. Given the importance of this channel of contagion, it is important to understand what mitigates this form of contagion. To shed light on this, I examine how the size of contagion varies with the reputation of the defaulter's underwriter(s).

The model discussed in Section 4.1 implies a non-monotonic relationship between initial reputation and the size of contagion if investors update their beliefs using Bayes' rule. Specifically, there is a U-shaped relationship between the price change following default and initial reputation. Figure 7 illustrates this relationship. This result is formalized in Proposition 2 in Appendix B.

Figure 7: Effect of Initial Reputation on Price Response



Note: The figure depicts an example of the U-shaped relationship between the price response ($\Delta \ln P^D$) and initial reputation (μ). The example is generated using $\alpha = 0.75$ and $\delta = 0.15$ (definitions for these parameters is given in Appendix A).

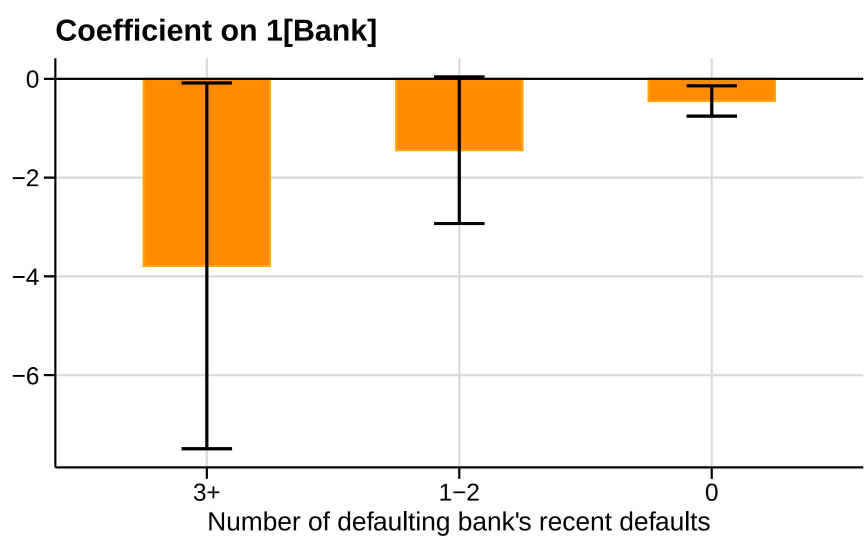
At lower levels of reputation, a higher reputation leads to *more* contagion. The most severe contagion occurs for an intermediate value of reputation. At higher levels of reputation, contagion decreases with reputation. Intuitively, this is because there is the least learning when investors already have strong priors. If investors are confident that the underwriter is a bad (or good) monitor, news about default does not cause a large revision in beliefs. In contrast, when investors are more uncertain about the underwriter's type, default leads to larger revisions in beliefs.

This suggests that a paradox can arise if monitor reputation tend to be in the leftmost region. Reputable banks may be more able (and motivated) to prevent a default. However, when default occurs, contagion can be more severe because it is more *surprising*. Trust in our financial institutions can make us more vulnerable to contagion when they fail. In this scenario, more potent contagion would be a cost to policies that incentivize reputation building.

Alternatively, if monitor reputation tends to primarily be in the rightmost region, monitor reputation can enhance financial stability. In this region, as monitors become more reputable, contagion decreases. Investors are sufficiently confident in monitors that default does little to change their beliefs and contagion is limited. In this scenario, policies that incentivize reputation building would be more desirable, as they have the added benefit of reducing the size of contagion.

Motivated by these implications, I explore how the size of contagion varies with the non-defaulting bonds' underwriter's initial reputation. I proxy for initial reputation using the number of defaults over the past two years associated with that underwriter.[26] I then conduct a subgroup analysis, splitting the sample based on whether the defaulter's underwriter had many or few recent defaults (low and high reputation, respectively). Figure 8 displays the estimated coefficient on the shared bank indicator. The largest contagion effects occur when the

Figure 8: Heterogeneity by Defaulting Bank's Recent Defaults



Note: This figure plots regression coefficients (and their 95% confidence intervals) regressions run on subsamples of the main analysis sample. The sample is partitioned based on the defaulting bank's recent number of defaults (number of other defaults in the past two years). The number of recent defaults is a proxy for the reputation of the bank. The graph can be read from left to right as describing how the effect of sharing a defaulter's bank changes as reputation improves. The specification has the same clustering and fixed effects and at the rightmost column in the main analysis (Table 3). The outcome variable is the log price change relative to period -1, therefore the graph describes the cumulative price change.

I find that contagion decreases and underwriter reputation improves. This is consistent with early sovereign bond underwriters having sufficient reputation be on the rightmost side of Figure 7. Contagion is on average 4% when the defaulter's underwriter had three or more recent

[26] I exclude the current default. In the case of multiple underwriters, I take the maximum number of defaults associated with its underwriters.

defaults. It is around 1% when the defaulter's underwriter had 1–2 recent defaults. It is smallest, around 0.5%, when the defaulter's underwriter had no recent defaults. This suggests that monitor reputation was stability enhancing, rather than destabilizing, in this setting. One reason we may not tend to find monitors on the leftmost side of the Figure 7 is such low reputation monitors may not be able to underwrite bonds in equilibrium, as investors may be unwilling to purchase their bonds.

These findings relate to those of de Jong, Kooijmans and Koudijs (2022) who show in another historical setting that reputation concerns can make underwriters more disciplined, reducing misrepresentation of financial risks and issuing less fragile securities. As such, their findings suggest another channel through which reputation can enhance financial stability.

An important direction for future research is to both theoretically and empirically investigate how to best mitigate financial stability risks associated with monitor reputation. The dominant policy framework for limiting financial contagion, macroprudential policy, focuses on curtailing contagion related to financial losses. However, intangible assets like monitor reputation, can also also be an important source of contagion. It would valuable to explore whether the same macroprudential tools mitigate reputation-based contagion. And are there other tools that are more effective at mitigating contagion from monitor reputation? One possible avenue would be policies that incentivize reputation building. Empirically and theoretically studying policies that affect incentives to build reputation (or other alternatives to standard macroprudential tools) could shed important new light on how to improve financial stability.

6 Conclusion

This paper finds evidence that financial intermediaries can be an important source of non-fundamental contagion. In pre-1914 sovereign debt markets, British sovereign bond issuers were in unique position to influence the performance of their bonds. By monitoring, advising, and exerting influence over the sovereign, banks were able reduce the likelihood that sovereigns would default.

Aware of this, news of default on one bond signaled to investors that the bank was less willing and able to perform these tasks. Others bonds issued by the same bank appeared riskier to investors and their prices fell in response. Even absent real economic linkages between the defaulting bond and the non-defaulting bonds of the same issuer, sovereign distress was able to spread to different countries.

New data from the CFB Reports paired with monthly bond price data from the IMM suggest that this channel existed in pre-1914 sovereign bond markets. Identification is achieved by exploiting variation in association with the defaulting bond's bank within countries. The effect of having a bank in common with a defaulting bond leads to significantly more bond price comovement. In the average default, sharing the defaulting bond's underwriter leads to 6 times more pass-through of the defaulting bond's price change. This difference is quantitatively significant. The average monthly price change of a defaulting bond (upon entering default) is a 5% decrease in price. On average 30% of this price decrease is passed on to non-defaulting bonds sharing the defaulter's underwriter. In contrast, only 5% of the defaulting bond's price decrease is pass on to non-defaulting bonds with a different underwriter. This suggests that underwriter reputation for monitoring can be an important source of contagion outside of borrower fundamentals.

This era gives use a chance to examine how powerful reputation and non-fundamental contagion can be in transmitting sovereign financial stress. In a modern setting, many policymaking agencies are in a position where their actions can reveal information about their willingness to prevent economic crises. When this willingness in one context is related to the agency's willingness to do so in other contexts, actions can be a powerful signal to investors. The significant ability of Britain's merchant banks to transmit financial weakness in pre-1914 sovereign debt markets suggests it is worthwhile for future research to investigate when a similar reputation channel could exist and to quantify its importance. A better understanding of these channels could help policymakers and investment banks in assessing the risks of contagion associated with the information revealed by their actions.

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Bad News Bankers: Evidence from Pre-1914 Sovereign Debt Markets on Monitor Reputation and Contagion Online Appendix

Sasha Indarte

Contents

A Model of Monitor Reputation

This section presents a stylized dynamic game between a bank and investors with incomplete and imperfect information. The bank underwrites a bond issued by a risky sovereign that investors choose whether to purchase. The model predicts that asset price contagion can arise through damage to the bank's reputation for monitoring a sovereign borrower. The game is presented below, then comparative statics on reputation formation are discussed.

Setting. A bank encounters a sequence of potential investors. Each period t, the bank brings to market a new sovereign bond issue and connects with a potential investor. At the beginning of the stage, the investor chooses whether to buy the bond. If not buying, no further actions occur. If buying, the investor faces a risk of not being repaid (in the event the sovereign defaults).

The bond costs $Q > 0$. If the bond is issued, the bank receives a payment λQ where $\lambda \in (0, 1)$. If the sovereign does not default, the investor receives $R > Q$ at the end of the period. For simplicity, I assume that Q, λ, and R are exogenous.

Default. Default can occur if the sovereign encounters an economic crisis, which happens with probability $\delta \in (0, 1)$. After issuing a bond, the bank privately observes the state of the sovereign's economy, which is summarized by $\kappa_t \in \{\kappa_C, \kappa_{NC}\}$ (crisis and no crisis, respectively). Conditional on this information, the bank chooses to either fight ($a_t = F$) or allow the crisis to proceed ($a_t = A$).[27] A crisis causes a default with probability one if the bank does not fight. But if the bank fights, it prevents the crisis from turning into a default with probability $\alpha \in (0, 1)$. Fighting entails a cost $\phi \geq 0$, while allowing the crisis to proceed is costless.

The bank has one of two types—a "good" type with a low cost of fighting ($\phi^G \geq 0$) or a "bad" type with a high cost of fighting ($\phi^B > \phi^G$). The bank's type is private information.

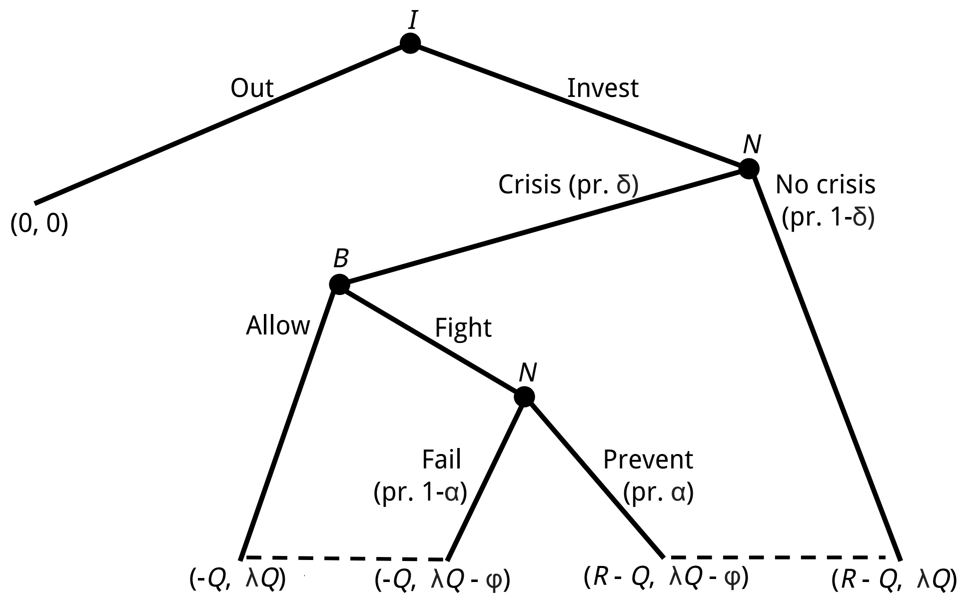
Stage Payoffs. The bank's payoffs in each stage depend on whether the investor buys the bond and whether the bank fights a crisis. The bank receives zero if the investor does not buy the bond. If the bank issues the bond and does not fight a crisis, it receives λQ. If it issues the bond and does fight a crisis, it receives $\lambda Q - \phi$. The payoff to an investor depends on whether the investor buys the bond and whether default occurs. If not buying the bond, the investor's payoff is zero. If buying the bond, the investors receives on net $R - Q$ if the sovereign does not default and $-Q$ if the sovereign defaults. Figure A.1 shows the stage game.

Public Information. Let $s_t \in \{D, H\}$ denote whether or not the sovereign defaults or honors its debt (respectively) in period t. Investors observe the entire history of defaults and can infer that a crisis occurred in t if $s_t = D$. But when $s_t = H$, it could be either that the bank prevented a default or that there was no crisis. The public outcome s_t does not reveal the action $a \in \{F, A\}$ chosen by the bank. Let $s^t = \{s_t, s^{t-1}\}$ denote the public history. When default occurs the investor does not know whether the investor (unsuccessfully) fought the crisis or if the bank allowed it to proceed. Similarly, if repayment occurs, the investor does not know if the bank fought a crisis or if there was no crisis.

Player Objectives. The bank is a dynamic player and seeks to maximize the expected NPV of stage payoffs (discounted with a discount factor $\beta \in (0, 1)$). Each investor is a short-run player that seeks to maximize the expected payoff from a one-shot encounter with the bank.

[27] The bank takes no action in when $\kappa_t = \kappa_{NC}$.

Figure A.1: Stage Game



Note: Above, I, N, and B identify actions taken by the investor, nature, and the banker (respectively). The dashed lines indicate the investor's information sets. Nothing is learned if the investor chooses not to participate.

Equilibrium Behavior. Suppose that the following are true:

$$(1 - \delta + \delta\alpha)R - Q > 0 \quad (2)$$

$$(1 - \delta)R - Q < 0. \quad (3)$$

The first equation is the investor's expected payoff if the bank fights a crisis. The second equation is the investor's expected payoff if the bank does not fight a crisis. These inequalities imply that the investor would invest if they believe with probability one that the bank would fight a crisis and they would not invest if they knew with probability one that the bank would not fight.

The bank will fight a crisis if the expected payoff from fighting is greater than the expected payoff from not fighting. The payoff is only positive if the investor will still be willing to invest in the future. The possibility of future bond issuances is what gives the bank an incentive to fight.

Evolution of Beliefs Let $\mu(s^{t-1})$ denote the common belief among investors that the bank will fight, given history s^{t-1}. Investment will cease if

$$\mu < \frac{Q/R - (1-\delta)}{\alpha\delta} \equiv \mu^*,$$

that is, if investors are sufficiently skeptical that the bank will fight.[28]

In any sequential equilibrium, in order for investor beliefs to be consistent they must obey Bayes' rule on path. This means that beliefs are updated in the following manner upon observing

[28]Note that (2) and (3) imply $\mu^* \in (0, 1)$.

either a default or repayment:

$$\mu_{t+1}(D,\mu_t) = \frac{(1-\alpha)\mu_t}{(1-\alpha)\mu_t + (1-\mu_t)}$$
$$\mu_{t+1}(H,\mu_t) = \frac{(1-\delta+\delta\alpha)\mu_t}{1-\delta+\alpha\delta\mu_t}$$

Notice that $\mu_{t+1}(H,\mu_t) > \mu_t > \mu_{t+1}(D,\mu_t)$, meaning that avoiding default improves the bank's reputation. Absent uncertainty about the bank's payoffs, there still exists a reputational motive due to the imperfect observations of the bank's actions. The bank has an incentive to keep $\mu_t > \mu^*$ in order to avoid the risk of permanently losing the trust of investors.

Now, for simplicity, suppose that investors believe the bank may be one of two types. The bank may be either a "good" or "bad" type. A good bank always chooses to fight while an bad bank always allows the crisis to proceed.[29] Since the ultimate interest of this paper is the behavior of secondary market bond prices, I focus on how investors update their beliefs in response to default. To simplify doing so I abstract away from making explicit assumptions about the structure of the bank's payoffs and refrain from deriving their best responses for any particular structure.[30]

Using the consistency property of any sequential equilibrium with these beliefs, we can derive several comparative statics to see how the structure of the game influences reputation formation. First, note that $\mu_{t+1}(D,\mu_t) = \frac{(1-\alpha)\mu_t}{(1-\alpha)\mu_t+(1-\mu_t)}$ does not depend on δ. Default has the same effect on reputation regardless of the likelihood of a crisis. This may seem surprising, but this follows from assuming that the likelihood of a crisis is unrelated to the bank's type. Conditional on witnessing default, only the investor's prior beliefs and the effectiveness of fighting in preventing default (α) are useful for updating beliefs.

Taking derivatives of $\mu_{t+1}(D,\mu_t)$ we can also see

$$\frac{\partial\mu_{t+1}(D,\mu_t)}{\partial\mu_t} = \frac{1-\alpha}{(1-\alpha\mu_t)^2} > 0$$
$$\frac{\partial\mu_{t+1}(D,\mu_t)}{\partial\alpha} = \frac{-(1-\mu_t)\mu_t}{(1-\alpha\mu_t)^2} < 0.$$

Reputation is less harmed by default when investors already have a strong prior that the bank was the good type. Once a bank has secured a good reputation, default does less damage to reputation. Default also harms reputation less when α is lower. Intuitively, when it is harder to prevent a crisis, a bank is punished less when a default occurs.

Next, consider $\mu_{t+1}(H,\mu_t) = \frac{(1-\delta+\delta\alpha)\mu_t}{1-\delta+\alpha\delta\mu_t}$. In contrast, the likelihood of a crisis, δ, is relevant here. Intuitively this is because the ability of the bank to prevent a crisis, α, and thus the probabilistic benefit of investing with the good type is proportional to δ. Derivatives of the posterior are

[29] Note this game admits sequential equilibria with mixed strategies. We could instead assume good banks play F with a probability on average greater than μ^* and opportunistic banks play it on average with a probability less than μ^*. What is relevant for this analysis is that there is adverse selection—investors stop investing once confident enough that the bank is opportunistic.

[30] Note that characterizing a sequential equilibrium in these types of dynamic games featuring reputation is in general an unresolved problem in a discrete-time setting. This is however feasible in continuous-time environments as shown in Faingold and Sannikov (2011). For ease of exposition, I consider a sequential equilibrium that is analogous to what one could derive in a continuous time game as my main focus is on describing a channel of contagion between bonds.

given below:

$$\begin{aligned}
\frac{\partial \mu_{t+1}(H,\mu_t)}{\partial \mu_t} &= \frac{(1-\delta)[1-\delta(1-\alpha)]}{[1-\mu_t(1-\alpha\delta)]^2} > 0\\
\frac{\partial \mu_{t+1}(H,\mu_t)}{\partial \alpha} &= \frac{\mu_t\delta(1-\delta)(1-\mu_t)}{[1-\delta(1-\alpha\mu_t)]^2} > 0\\
\frac{\partial \mu_{t+1}(H,\mu_t)}{\partial \delta} &= \frac{\alpha(1-\mu_t)\mu_t}{[1-\delta(1-\alpha\mu_t)]^2} > 0
\end{aligned}$$

As before, a higher initial reputation μ_t leads to a higher updated reputation. In contrast, now an improved ability to thwart default (higher α) leads to greater reputational benefits when debt is honored, which may appear counterintuitive. The reason for this relationship is that when α is low, the investor finds it less likely that default was avoided due to a bank choosing to fight. Knowing we avoided default is a less powerful signal when it more rarely means that a good bank prevented a crisis. Thus, a lower α corresponds to a smaller reputational gain. Another important difference is that the probability of a debt crisis does affect the reputational gain to avoiding default. When a crisis is more likely (higher δ), the bank gains more in terms of reputation when default is avoided.

Asset Price Implications. The data analyzed in this paper (discussed in detail in the following section) are secondary market prices for bonds. The price Q in the previous model corresponds to a primary market or IPO price and λQ is a proportional finders fee garnered by the bank for intermediating the transaction. We can extrapolate from the above results on belief formation to consider how prices in a secondary market for bonds are affected by another bond's default.

For ease of exposition, consider a perpetuity (infinite maturity) bond $i \in I(b)$ where $b \in B$ is a bank and $I(b)$ is the set of bonds issued by bank b. Denote the price at time t as $p_{i,t}$ and coupon payments as $c_{i,t}$. Modifying our earlier notation, let $\mu_t(b)$ denote the investors' belief that bank b would attempt to prevent default should a crisis arise. When the bond defaults, the sovereign fails to make a coupon payment ($c_{i,t} = 0$), otherwise $c_{i,t} = c_i$. With no arbitrage we can write the secondary market price of the bond as below

$$\begin{aligned}
p_{i,t}[\mu_t(b)] &= \mathbb{E}_{\mu_{t(b)}}[c_{i,t} + \beta p_{i,t+1}]\\
&= \mathbb{E}_{\mu_t(b)}\left[\frac{c_{i,t}}{1-\beta}\right]\\
&= \frac{c_i[(1-\delta)+\delta\alpha\mu_t(b)]}{1-\beta}.
\end{aligned}$$

The second equality follows from a no-bubble condition $\lim_{j\to\infty}\mathbb{E}_{\mu_t(b)}\beta^j p_{t+j} = 0$ and the law of iterated expectations.

Let $\Delta \ln p_{i,t} = p_{i,t+1}[\mu_{t+1}(b)] - p_{i,t}[\mu_t(b)]$. Next, we can characterize how a *change* in beliefs about the likelihood of the bank fighting a crisis affects the bond's price:

$$\Delta \ln p_{i,t} = \ln\left[\frac{(1-\delta)+\delta\alpha\mu_{t+1}(b)}{(1-\delta)+\delta\alpha\mu_t(b)}\right].$$

Using the above expression, we can also see how heterogeneity in the chances of crises, the bank's ability to prevent a crisis from turning into default, and can affect pass-through. A given change in beliefs $(\mu_{t+1}(b) - \mu_t(b))$ has a smaller effect on prices when $\mu_t(b)$ is larger. When investors are more optimistic that the bank is good, the price does not fall as much after a downward revision of beliefs. Additionally, when the ability of the bank to thwart default, α, is greater, reputation changes have a stronger effect on bond prices. Lastly, a greater risk of a crisis δ increases the impact of reputation.

Contagion between bonds $i, j \in I(b)$ occurs when i defaults and investors become more skeptical about the willingness of bank b to prevent default. Because bank b faces the same incentives to prevent the default of either i or j, the default of i is informative about the likelihood of j defaulting. Therefore, the price drop of i is partially passed onto bond j as well.

B Comparative Statics and Proofs

This section presents proofs for the theoretical results discussed in the paper. The following results are proved for the model of Appendix A (or extensions of this model, formulated here).

B.1 Effect of Fighting Ability α on Price Response

Proposition 1 (Fighting Ability Comparative Static)**.** *Denote the price change following default by*

$$\Delta \ln P^D \equiv \ln \left[\frac{(1-\delta) + \delta\alpha\mu'}{(1-\delta) + \delta\alpha\mu} \right]$$

where $\mu' = \frac{(1-\alpha)\mu}{(1-\alpha)\mu + (1-\mu)}$. *If* $\alpha, \delta \in (0,1)$ *and* $\mu \in [0,1]$, *then*

$$\frac{\partial \Delta \ln P^D}{\partial \alpha} < 0.$$

Proof. The derivative is

$$\frac{\partial \Delta \ln P^D}{\partial \alpha} = -\frac{\alpha\delta\mu(1-\mu)[2(1-\alpha\mu)(1-\delta) + \alpha\mu]}{(1-\delta)[(1-\delta)(1-\alpha\mu) + \delta\alpha(1-\alpha)\mu]}$$

Given $\alpha, \delta \in (0,1)$ and $\mu \in [0,1]$ the denominator is positive as

$$\begin{aligned} (1-\delta)(1-\alpha\mu) &> 0, \\ \delta\alpha(1-\alpha)\mu &> 0. \end{aligned}$$

Note also $2(1-\alpha\mu)(1-\delta)$ is positive, as are the additional terms in the fraction. □

B.2 Effect of Initial Reputation μ on Price Response

The proposition below characterizes the effect of initial reputation (μ) on the price change induced by default. The relationship is generally U-shaped. At low levels of reputation, a better reputation means a bigger price decrease following default. The effect size bottoms out at some $\mu^\star \in (0,1)$; for higher levels of reputation, the price change begins to shrink as reputation improves (μ rises).

Proposition 2 (Initial Reputation Comparative Static)**.** *Denote the price change following default by*

$$\Delta \ln P^D \equiv \ln \left[\frac{(1-\delta) + \delta\alpha\mu'}{(1-\delta) + \delta\alpha\mu} \right]$$

where $\mu' = \frac{(1-\alpha)\mu}{(1-\alpha)\mu+(1-\mu)}$. *If* $\alpha, \delta \in (0,1)$, *then there exists a unique* $\mu^\star \in (0,1)$ *such that*

$$\frac{\partial \Delta \ln P^D}{\partial \mu} < 0 \quad \textit{for all } \mu \in [0, \mu^\star)$$
$$\frac{\partial \Delta \ln P^D}{\partial \mu} = 0 \quad \textit{for } \mu = \mu^\star$$
$$\frac{\partial \Delta \ln P^D}{\partial \mu} > 0 \quad \textit{for all } \mu \in (\mu^\star, 1].$$

The proof below proceeds in multiple steps in order to consider several cases.

Proof. First, note that the derivative of the price change with respect to initial reputation μ is:

$$\frac{\partial \Delta \ln P^D}{\partial \mu} = \alpha \left[\frac{1}{1-\alpha\mu} - \frac{\delta}{1-\delta+\alpha\delta\mu} - \frac{1-(2-\alpha)\delta}{(1-\delta)(1-\alpha\mu)+\delta\alpha(1-\alpha)\mu} \right].$$

For $\alpha, \delta \in (0,1)$ and $\mu \in [0,1]$, all three denominator terms above are strictly positive. Therefore the derivative $\frac{\partial \Delta \ln P^D}{\partial \mu}$ defined everywhere on these intervals. Because the $\Delta \ln P^D$ is differentiable everywhere on $\mu \in [0,1]$ it is continuous in μ on that interval.

At the beginning of the interval ($\mu = 0$) the derivative is decreasing in μ while at the end of the interval ($\mu = 1$) it is increasing in μ. That is,

$$\left.\frac{\partial \Delta \ln P^D}{\partial \mu}\right|_{\mu=0} = -\frac{\alpha^2\delta}{1-\delta} < 0$$
$$\left.\frac{\partial \Delta \ln P^D}{\partial \mu}\right|_{\mu=1} = \frac{\alpha^2\delta}{(1-\alpha)[1-(1-\alpha)\delta]} > 0.$$

Given the above and the continuity of $\Delta \ln P^D$, if there is a unique μ that solves $\frac{\partial \Delta \ln P^D}{\partial \mu} = 0$ then the derivative $\frac{\partial \Delta \ln P^D}{\partial \mu}$ is strictly decreasing for $\mu \in [0, \mu^\star)$ and strictly increasing for $\mu \in (\mu^\star, 1]$. To see that there is such a unique $\mu^\star$, we must consider the two cases below.

Case 1: $\alpha \neq 2 - 1/\delta$**.** In this case, there are two solutions to $\frac{\partial \Delta \ln P^D}{\partial \mu} = 0$:

$$\mu^- \equiv \frac{1-\delta-\sqrt{(1-\alpha)(1-\delta)(1-\delta+\alpha\delta)}}{\alpha[1-\delta(2-\alpha)]}$$
$$\mu^+ \equiv \frac{1-\delta+\sqrt{(1-\alpha)(1-\delta)(1-\delta+\alpha\delta)}}{\alpha[1-\delta(2-\alpha)]}$$

However, for $\alpha, \delta \in (0,1)$, only μ^- lies on the interval $[0,1]$ while μ^+ lies strictly outside of this interval. Thus in this case there is a unique $\mu^\star \in [0,1]$ such that $\frac{\partial \Delta \ln P^D}{\partial \mu} = 0$ for $\mu = \mu^\star$.

Case 2: $\alpha = 2 - 1/\delta$**.** In this case, the derivative is:

$$\frac{\partial \Delta \ln P^D}{\partial \mu} = -\frac{(1-2\delta)^2(1-2\mu)}{(1-\delta-\mu+2\delta\mu)(\delta+\mu-2\delta\mu)}. \tag{4}$$

Both denominator terms are nonzero. To see that the first is, assume for the sake of contradiction that $1-\delta-\mu+2\delta\mu=0$, which rearranges to yield $\delta=\frac{1-\mu}{1-2\mu}$. But since $\mu\in[0,1]$, this would imply $\delta\geq 1$, contradicting $\delta<1$. The second term, $\delta+\mu-2\delta\mu$ is nonzero for $\delta\in(0,1)$ and $\mu\in[0,1]$.

For $\delta\neq\frac{1}{2}$, the unique solution to Equation (4) is $\mu=\frac{1}{2}$. We do not need to consider the case $\delta=\frac{1}{2}$ because this case is ruled out by the assumption $\alpha=2-1/\delta$. To see this, note that $\alpha<1$ and $\alpha=2-1/\delta$ imply $\frac{1}{2}>\delta$. Therefore in Case 2 there is a unique $\mu^{\star}=\frac{1}{2}$ such that $\frac{\partial\Delta\ln P^D}{\partial\mu}=0$. $\square$

C Additional Tables and Figures

C.1 Effect of Filters on Default Counts

Table C.1: Impact of Sample Restrictions on Number of Defaults

# Defaults	Filter
240	None
224	Keep if default year is during 1869–1914
187	Drop if month of default is unknown
166	Collapse defaults in the same country-month to a single event
118	Drop if defaulting bond(s) not present in IMM in month of default
102	Drop if defaulter's bank or price change is missing, or if filtered out of regression due to outlier removal.

Note: This table describes how sample restrictions affect the number of defaults used in the main analysis.

C.2 Additional Regressions

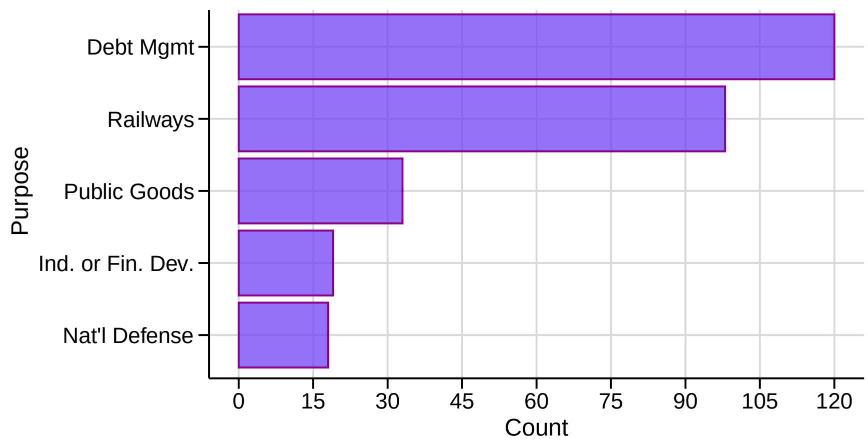
Table C.2: Heterogeneity by Defaulting Bond Total Principal (Interactions)

	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta \ln(P^D_{ie})$	0.029*	0.046***	0.038***	0.040***	0.041***	0.040***
	(0.015)	(0.012)	(0.013)	(0.014)	(0.014)	(0.014)
$1[\text{Bank}_{ie}]$	-1.100***	-0.997***	-1.169***	-1.142**	-1.317***	-1.451***
	(0.379)	(0.362)	(0.363)	(0.471)	(0.465)	(0.482)
$\ln(\text{Principal}_e)$	-0.225**	-0.110	-0.371**	-0.378**	-0.366**	-0.371**
	(0.106)	(0.133)	(0.161)	(0.165)	(0.142)	(0.143)
$1[\text{Bank}_{ie}] \times \Delta \ln(P^D_{ie})$	0.234***	0.234***	0.251***	0.253***	0.260***	0.262***
	(0.067)	(0.067)	(0.064)	(0.070)	(0.079)	(0.080)
$1[\text{Bank}_{ie}] \times \ln(\text{Principal}_e)$	0.479	0.408	0.534	0.430	0.465	0.482
	(0.327)	(0.339)	(0.365)	(0.381)	(0.366)	(0.377)
Obs.	21661	21661	21661	21661	21661	21661
R2	0.033	0.056	0.083	0.212	0.377	0.393
Country FE	✓	✓	✓			
Year FE		✓	✓	✓		
Def. Country FE			✓			
Country x Def. Country FE				✓	✓	✓
Country x Year FE					✓	✓
Bond FE						✓

Note: This table adds two regressors: the logged sum of of the defaulting bond's principal and its interaction with the shared bank indicator. I exclude defaulting bonds with principal in currency other than the Great British Pound (a small subset of bonds). The logged principal is demeaned and divided by itself standard deviation prior to regression, so its associated coefficients can be interpreted as effect of a one standard deviation change in this measure. The outcome variable is the change in a non-defaulting bond's price ($\Delta \ln P_{ie}$). The explanatory variables are: the change in the defaulting bond's price ($\Delta \ln P^D_e$), an indicator for sharing the defaulting bond's underwriter ($1[\text{Bank}]_{ie}$), and the interaction of these two variables. Price changes are measured as the difference in log prices between the current month and the previous month. The coefficient on the shared underwriter indicator is scaled by 100 so that its units correspond to log points. The defaulting bond's price change is demeaned prior to regression. Standard errors are two-way clustered by time (year-month) and bond. Statistical significance: 0.1*, 0.05**, 0.01***.

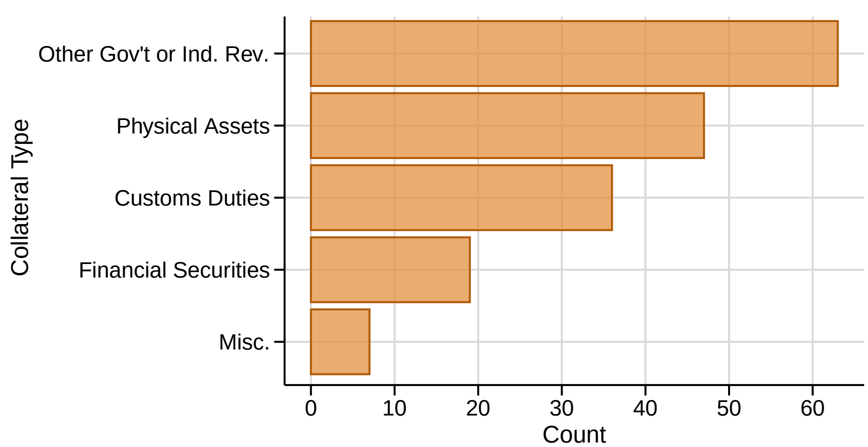
C.3 Bond Characteristics

Figure C.1: Stated Loan Purpose



Note: This figure displays the number of bonds issued for one of five stated purposes. Bonds with multiple stated purposes are counted multiple times. 30.03% of bonds in the analysis sample have a known stated purpose. "Debt Mgmt" is primarily borrowing in order to repay or restructure existing debt. "Railways" is investment in railways. "Public goods" is infrastructure investment, such as development of roads and public utilities infrastructure. "Ind. or Fin. Dev." is investment in domestic industries (financial and non-financial). "Nat'l Defense" is investment in military resources and/or operations.

Figure C.2: Types of Collateral



Note: This figure displays the number of bonds collateralized by one of five types of collateral. Bonds with multiple stated collateral sources are counted multiple times. 14.07% of bonds in the analysis sample have a known collateral type. "Other Gov't or Ind. Rev." is revenue from taxes (often levied on specific industries) or other sources of government revenue. Physical assets include primarily railways, land, and ports.

Table C.3: Number of Bonds by Country

Country	# Bonds	Country	# Bonds
Australia	106	Romania	5
Canada	89	Cuba	4
Argentina	57	New Granada	4
Turkey	49	Peru	4
Britain	39	Trinidad	4
Russia	34	Belgium	3
Brazil	31	British Guiana	3
Chile	24	Honduras	3
Egypt	23	Nigeria	3
New Zealand	23	Sierra Leone	3
South Africa	23	Straits Settlements	3
China	22	Austria	2
Greece	14	Ecuador	2
Mexico	14	El Salvador	2
Japan	13	Germany	2
Natal	13	Ghana	2
India	11	Hong Kong	2
France	10	Ireland	2
Sweden	10	Nicaragua	2
United States	10	Siam	2
Italy	9	St Lucia	2
Mauritius	9	Antigua	1
Spain	9	Barbados	1
Ceylon	8	Bolivia	1
Uruguay	8	Fiji	1
Hungary	7	Finland	1
Norway	7	Grenada	1
Portugal	7	Hawaii	1
Venezuela	7	Liberia	1
Costa Rica	6	Montenegro	1
Denmark	6	Morocco	1
Guatemala	6	Orange Free State	1
Jamaica	6	Persia	1
Bulgaria	5	Santo Domingo	1
Colombia	5	Serbia	1
Paraguay	5	Switzerland	1

Note: This table reports the number of bonds (used in the analysis sample) for each state. There are 72 different states in total.

Table C.4: Number of Bonds by Underwriter (1/3)

Underwriter	# Bonds (full sample)	# Bonds (analysis subsample)
Crown Agents	121	103
Barings	116	102
Bank Of England	96	78
Rothschilds	76	70
London & Westminster	61	60
Glyn Mills & Co AKA Glyn Mills Currie & Co	56	51
Imperial Ottoman Bank	53	48
London & County	53	53
Bank Of Montreal	42	42
Hambros	40	35
Bank Of Ireland	29	26
London Joint Stock Bank	26	23
HSBC	21	21
Murrieta & Co	20	19
Schroders	20	14
Bank Of Adelaide	16	16
Stern Bros	16	15
National Bank Of Australia	15	13
River Plate Trust, Loan And Agency Co.	15	15
JS Morgan AKA JP Morgan	14	12
Thomson & Bonar	14	10
Dent & Palmer AKA Palmer, M'killop, & Dent	13	11
Bank Of New South Wales	12	12
Bank Of South Australia	11	6
Raphael	11	8
Yokohama Specie Bank	11	11
Fruhling & Goschen	10	8
Imperial Treasury Paris	10	9
Spanish Government	10	6
Union Bank Of Australia	10	5
Robarts And Lubbock	9	9
Bischoffsheim & Goldschmidt	8	8
Morton, Rose & Co	8	8
Knowles & Foster	7	6
Lloyds Bank	7	7
Oriental Bank Of New South Wales	7	7
Canadian Bank Of Commerce	6	5
Comptoir National D'escompte	6	5
Louis Cohen And Sons	6	6
Oriental Bank	6	6
Portuguese Financial Agency	6	5
Consolidated Bank	5	5
Deutsche Bank	5	4

Note: This table reports the number of bonds by underwriter. The first count ("full sample") is the full linked IMM-CFB sample. The second count are the bonds used in the main analysis. The difference in counts is due to bonds missing needed to be used the main analysis' regression.

Table C.5: Number of Bonds by Underwriter (2/3)

Underwriter	# Bonds (full sample)	# Bonds (analysis subsample)
Erlanger & Co	5	5
Gibbs	5	3
Queensland National Bank	5	5
Speyer	5	5
City Bank	4	4
Devaux	4	4
London & County Bank	4	3
National Provincial Bank	4	3
Parr's	4	4
Russian Bank	4	4
Bank Of Bc	3	3
Chartered Bank	3	3
Coutts	3	3
Isaac & Samuel	3	2
Matheson & Co.	3	3
Maua, Macgregor & Co.	3	0
Minor C. Keith	3	3
Robinson Fleming	3	3
Anglo Italian Bank	2	1
Bank Of Japan	2	2
Council Of Foreign Bondholders	2	2
General Credit Company Of London	2	2
General Credit And Finance	2	2
Gerstenberg	2	1
Holderness, Nott & Co.	2	1
Hope & Co	2	1
Huth	2	2
Imperial Bank Of Canada	2	2
London & Brazilian Bank	2	2
Martin & Co.	2	2
Mccalmonts	2	2
Messrs Palmer And Goldsmid	2	2
Mires	2	1
Morgan, Grenfell & Co	2	2
Newgass	2	2
Oppenheim	2	2
Seligman	2	2
Societe Generale	2	2
Vienna House Of Eskeles	2	2
Banque De Constantinople	2	2
Credit Mobilier	2	2
Agra & Masterman	1	0
Anglo Egyptian Bank	1	1

Note: This table reports the number of bonds by underwriter. The first count ("full sample") is the full linked IMM-CFB sample. The second count are the bonds used in the main analysis. The difference in counts is due to bonds missing needed to be used the main analysis' regression.

Table C.6: Number of Bonds by Underwriter (3/3)

Underwriter	# Bonds (full sample)	# Bonds (analysis subsample)
Anglo South American Bank	1	1
Bank Of Castile	1	1
Bank Of New Zealand	1	0
Bank Of Spain	1	1
Bank Of Turkey	1	1
Banque Commerciale Et Industrielle	1	1
Boulton	1	1
Brit. Lin. Co. Bank	1	1
Capital & Counties	1	1
Chalmers, Guthrie & Co.	1	1
Clydesdale	1	1
Credit Lyonnais	1	1
Credit Mobilier	1	1
Dresdner Bank	1	1
Ethelburga Syndicate	1	1
Fisk	1	1
Frances George Horne	1	0
Franco-Egyptian Bank	1	1
Gordon Barton	1	1
Haslewood	1	0
Heinemann And Co.	1	1
Heywood, Kennard & Co.	1	0
Hme & Col As	1	1
Hullett	1	0
Ionian Bank	1	1
J. B. Medici	1	1
Lawson & Co.	1	1
London & South-Western Bank	1	1
London Agents	1	1
London Bank Of Mexico & South America	1	1
London Bank Of Mexico And South America	1	1
Lumb, Wanklyn & Co.	1	1
Messrs. Philippson And Horwitz	1	1
Messrs. Schneider And Co.	1	1
Midland Bank Ltd.	1	1
Natal Bank	1	1
National Bank Of Greece	1	1
National Bank Of Scotland	1	1
Ricardo & Co.	1	1
Standard Bank Of South Africa	1	1
Teixeira De Mattos	1	1
Union Bank Of Canada	1	1
Victoria Cham	1	1
Banque Austro Ottomane	1	1

Note: This table reports the number of bonds by underwriter. The first count ("full sample") is the full linked IMM-CFB sample. The second count are the bonds used in the main analysis. The difference in counts is due to bonds missing needed to be used the main analysis' regression.

Table C.7: Number of Defaulting Bonds by Underwriter (1/2)

Underwriter	# Bond-defaults	# Bond ever in default
Barings	47	21
Imperial Ottoman Bank	29	20
River Plate Trust, Loan And Agency Co.	28	12
Murrieta & Co	26	13
Rothschilds	20	15
Robarts And Lubbock	14	4
Hambros	13	6
Morton, Rose & Co	12	5
Glyn Mills & Co AKA Glyn Mills Currie & Co	11	7
Bischoffsheim & Goldschmidt	11	6
Thomson & Bonar	10	5
Dent & Palmer AKA Palmer, M'killop, & Dent	10	6
Knowles & Foster	10	3
JS Morgan AKA JP Morgan	8	5
Stern Bros	7	4
Louis Cohen And Sons	6	5
Council Of Foreign Bondholders	6	2
London & County	5	4
General Credit Company Of London	5	2
Schroders	4	4
Fruhling & Goschen	4	3
Portuguese Financial Agency	4	1
Deutsche Bank	4	1
London & County Bank	4	3
Minor C. Keith	4	2
Robinson Fleming	4	2
Bank Of England	3	2
City Bank	3	1
General Credit And Finance	3	1
Societe Generale	3	2
Heinemann And Co.	3	1
Lumb, Wanklyn & Co.	3	1
Midland Bank Ltd.	3	1
Raphael	2	1
Comptoir National D'escompte	2	2
Erlanger & Co	2	1
Gibbs	2	2
Devaux	2	1
Messrs Palmer And Goldsmid	2	1
Oppenheim	2	1
Vienna House Of Eskeles	2	1
Anglo Egyptian Bank	2	1

Note: This table reports the number of defaulting bonds associated with each underwriter. The first count are the number of bond-defaults (i.e., the number of times any bond ever defaults) and the second is the number of bonds that ever default. All bonds are from the analysis sample.

Table C.8: Number of Defaulting Bonds by Underwriter (2/2)

Underwriter	# Bond-defaults	# Bond ever in default
Anglo South American Bank	2	1
Banque Commerciale Et Industrielle	2	1
Credit Mobilier	2	1
Ethelburga Syndicate	2	1
J. B. Medici	2	1
Messrs. Philippson And Horwitz	2	1
Banque Austro Ottomane	2	1
Spanish Government	1	1
Speyer	1	1
Mires	1	1
Morgan, Grenfell & Co	1	1
Seligman	1	1
Banque De Constantinople	1	1
Credit Mobilier	1	1
Bank Of Turkey	1	1
Capital & Counties	1	1
Dresdner Bank	1	1
Fisk	1	1
Lawson & Co.	1	1
Ricardo & Co.	1	1
Teixeira De Mattos	1	1

Note: This table reports the number of defaulting bonds associated with each underwriter. The first count are the number of bond-defaults (i.e., the number of times any bond ever defaults) and the second is the number of bonds that ever default. All bonds are from the analysis sample.