Contagion via Financial Intermediaries in Pre-1914 Sovereign Debt Markets

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Abstract

This paper uses new data on the timing of sovereign defaults during 1869-1914 to quantify an informational channel of contagion via shared financial intermediaries. Concerns over reputation incentivized Britain's merchant banks to monitor, advise, and occasionally bail out sovereigns. Default signaled to investors that a merchant bank was not as willing or able to write and support quality issues, suggesting that its other bonds may underperform in the future. In support of this channel, I find that during a debt crisis, a 5% fall in the defaulting bond's price leads to a 2.19% fall in prices of bonds sharing the defaulter's bank. This is substantial compared to the 0.24% price drop among bonds with different banks. Information revelation about financial intermediaries can be a powerful source of contagion unrelated to a borrower's fundamentals. In modern financial markets, third parties such as credit rating agencies, the IMF, or the ECB could similarly spread contagion if news about their actions reveals information about their willingness to monitor risky borrowers or intervene in crises.

JEL: F34, F42, G14, G15, G24, N20

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1 Introduction

Two salient features of recent economic crises are their global nature and connection to financial markets. The Great Recession catalyzed economic and financial crises in economies around the world. Soon after, several European economies plunged into debt crises. Rapid asset price comovement across countries is a robustly documented phenomenon (for a discussion of many such papers, see Kaminsky, Reinhart and Vegh, 2003), however less is known about what determines the strength of this comovement.

In this paper, I use a new dataset on the monthly timing of defaults during 1869-1914 to give evidence of a role for financial intermediaries to spread sovereign distress. Specifically, I study the extent to which sharing a financial intermediary with a defaulting bond affects the performance of non-defaulting bonds. At first glance, it appears puzzling that intermediaries could be a vector of contagion when they rarely held the debt of sovereigns on their own balance sheets and hence suffered no real economic losses from default.

Contagion arose from informational frictions and the (costly) ability of banks to influence the performance of their bonds. Banks had three primary actions at their disposal. First, they accessed information on sovereigns unavailable to investors through long-standing relationships with foreign officials and commercial leaders. Second, banks provided macroeconomic policy counsel to sovereigns. Third, when liquidity problems emerged, banks provided short-term financing to keep debt payments proceeding as planned. A country's bankers were often the first external party to learn of threats to debt service and were known to prevent news of these threats from reaching markets by keeping debt service uninterrupted (Flandreau and Flores, 2012). As sovereign debt is especially prone to self-fulfilling default, even small threats to liquidity have the potential to evolve into a full-blown debt crisis and default.

Investors faced imperfect information as they did not clearly observe to what extent a bank was taking these actions. This created a potential moral hazard problem. When a country defaulted, it was not perfectly clear to investors if its banker could have acted to prevent it but chose not to do so. Information was also incomplete as investors were uncertain about the costs and benefits to the bank. This meant investors were not sure how strongly incentivized the banks were to undertake these actions. Since the emergence of Britain's sovereign debt markets in 1820, cases of fraud, market rigging, and opportunistic banks made investors fearful of adverse selection.

The main contribution of this paper is evidence of significant pass-through of sovereign financial stress through changes to the reputation of a common financial intermediary. A 5% point drop in the defaulting bond's price during a default leads to a 0.24% decline in the price of bonds that do not share the defaulting bond's bank. But when another country's bond shares the bank of the defaulting bond, its price falls 2.19% during the default.[1] Even when the defaulting state's bond price change is zero, the occurrance of default alone is enough to cause a 1.11% decline in the price of bonds issued by the same bank as the defaulting bond.

An advantage of examining the role of intermediaries in 1869-1914 is that they were just that – intermediaries but not usually holders of the assets they underwrote. Merchant banks during the 19$^{\text{th}}$ and early 20$^{\text{th}}$ century truly specialized in intermediation, specifically underwriting and distributing dividends and amortizing payments to investors. In modern data, it is challenging to credibly separate the effects of the performance of securities underwritten by a particular merchant bank and the performance of its assets which may be closely linked to the underwritten securities. Pre-1914 international capital markets provide a setting where it is easier to identify the effect of underwriter reputation on bond performance.

Contagion Contagion generally refers to the rapid transmission of economic/financial distress from one location to another. Asset price contagion spreads economic crises by making borrowing more expensive or destroying the wealth of investors holding the affected assets. This paper focuses specifically on contagion among sovereign bond prices, which are an important determinant of sovereign debt sustainability.

The Eurozone Debt Crisis shifted the focus of sovereign debt research to international contagion and, in particular, the role of financial intermediaries who hold sovereign debt as well as the organizations in position to bailout sovereigns (e.g., Park, 2014; Farhi and Tirole, 2016, respectively). The role of financial intermediaries in spreading financial turmoil in early global sovereign debt markets is more akin to the role played by third parties such as the ECB during the Eurozone Debt Crisis.[2] When third parties have the authority to bail out multiple borrowers, their handling of one debt crisis is a signal to investors about the actions they would take should another borrower encounter a debt crisis. A special feature of sovereign debt markets is the limited ability to enforce contracts with sovereigns. This means willingness, rather than ability to pay, plays a central role in determining default. Ultimately this makes sovereigns especially sensitive to their borrowing costs and

[1] The mean and median bond price changes among defaulting bonds during their respective defaults are -5.4% and -3.39%, respectively.

[2] This is different from the type of contagion in which banks were involved during the recent Eurozone Debt Crisis. In this modern crisis, banks with exposure to each other and Southern European economies' debt cut lending after realizing asset losses through these exposures. For excellent analyses of the role of counterparty risk and the transmission of sovereign stress to bank balance sheets, see Elliott, Golub and Jackson (2014) and Bocola (2015), respectively.

hence prone to self-fulfilling defaults when borrowing suddenly becomes more expensive (Lorenzoni and Werning, 2013).

Research into the mechanisms through which contagion operates have primarily focused on financial crises. Kaminsky, Reinhart and Vegh (2003) describes and discusses empirical evidence of four types of financial contagion. The first type is through real wealth effects. When investors are made poorer, they simply have fewer resources to lend out to other parties. Additionally, losses in net worth can cause capital constraints to bind and force a financial institution to sell off other assets.

The second type is portfolio rebalancing. Rebalancing arises when an investor's optimal portfolio decision rules force them to sell off risky assets after other assets become riskier or fall in value. A common way of generating this channel in models is through imposing decreasing average risk aversion (DARA) preferences on investors (e.g., Lizarazo, 2009).

A third form is sometimes referred to as the "wake-up hypothesis". The general idea in the context of sovereign debt is that an asset price movement in one country signals something relevant to another's country's determinants of solvency. Most often research focuses on when this signal is related to imperfectly observed fundamentals of the other country. This paper considers a form of the "wake-up hypothesis" where default signals the failure of banks to act to prevent default rather than something about the real fundamentals of another economy.

The last form of contagion is through real economic linkages (i.e., trade). When one country experiences a sovereign debt crisis, it may lower real output in their major trading partners as demand for their exports and supply of their imports decrease. However, Kaminsky and Reinhart (2000) shows that a common lender better predicts asset price contagion than trade linkages in modern data. This suggests the first three forms of contagion are relatively more important.

Researchers have primarily investigated the contagion of sovereign debt crises through analyses of dynamic stochastic general equilibrium models.[3] These papers give evidence showing that particular channels are consistent with observed events. On the reduced-form empirical side, Abreu, Pinho de Mello and Sodré (2007) analyze two specific defaults – Greece in 1893 and Brazil in 1898 – and find that bonds in non-defaulting economies that shared the defaulting bond's underwriter experienced a decrease in price of about 3-4%.[4] The authors' detailed analysis of these two episodes suggests sharing a defaulting

[3] In addition to the papers already mentioned, see also Arellano and Bai (2014) and Cole, Neuhann and Ordoñez (2014) for novel takes on possible channels of contagion of sovereign financial distress.

[4] During Brazil's default the authors examine bonds from Chile, Hungary, and Russia. In Greece's default, the authors use data on Italian, Swedish, and Norwegian Bonds.

bond's bank could be an important channel for spreading sovereign stress but it does not quantify the extent to which the severity of one country's crisis is passed onto others. This paper builds on these findings in two ways. First, I examine 100 different default episodes across four continents. Second, I quantify the pass-through of asset price changes during defaults. This improves our understanding of contagion by relating the severity of the debt crisis (which is reflected in the defaulting bond's price) to the shock transmitted to non-defaulting bonds with the bad luck of sharing the defaulting bond's bank.

Roadmap This paper is organized as follows. Section 2 describes Britain's international capital markets during 1869-1914 and the incentives faced by sovereign debt underwriters. Next, the problem of writing debt contracts in this environment is discussed formally in the context of a dynamic game in section 3. The novel dataset used in this paper and the empirical strategy is described in section 4. Section 5 presents the main results and robustness analyses. Section 6 concludes.

2 Pre-1914 Sovereign Debt Markets

This paper focuses on 1869-1914, an era when London was central hub of international finance. Displacing Amsterdam from this role in the early 19th century where a foreign exchange market had begun to flourish, international sovereign lending grew rapidly in popularity in London during the 1820s (Chabot and Kurz, 2010; Chapman, 2013).[5]

Soon after, debt crises in Latin America and Southern Europe in the late 1820s temporarily took the wind out of investors' sails. Following the failure of a number of sovereign debt underwriters, from 1826-1829 every state in Latin America and Southern Europe, that borrowed in London, defaulted (except Brazil and Naples). In 1853, foreign and colonial securities constituted 6% of all securities traded on the London Stock Exchange. Interest in this market eventually returned and by 1873 the share of foreign securities rose to 21%. This level persisted until the beginning of World War I (Tomz and Wright, 2013). From 1873-1913, foreign investment as a percentage of British GDP averaged 5%, peaking at 10% on the eve of World War I (Fishlow, 1985).

Gathering accurate and timely information relevant to the performance of sovereign bonds was a challenge for investors throughout the 19th and early 20th century. Governments postponed releasing public accounts and other economic information for years when they feared the news would discourage investors (e.g., Mexico; Weller, 2015). There

[5] In 1820 only one non-British sovereign bond traded in London, but by 1826 there were 23 different non-British government bonds (Flandreau and Flores, 2009).

was also the threat that governments would not use funds for their stated productive purpose.[6] Governments sometimes also misled investors. For example, in their 1858 and 1862 loans, Turkey pledged the same customs revenue as collateral for these separate loans. This move was not detected by investors until years after the fact (Abreu, Pinho de Mello and Sodré, 2007).

Another risk faced by investors was a dishonest underwriter. In the most notorious case, Scottish fraudster Gregor MacGregor raised funds for the non-existent country of "Poyais", which he fabricated in the early 1820s (Flandreau and Flores, 2009; Oosterlinck, 2013). Fraud also manifested itself in the form of foreign officials raising funds in London for which they did not secure the approval of their respective governments (Flandreau and Flores, 2009). In addition to these failures of due diligence in creating these fraudulent bonds, underwriters also behaved opportunistically on occasion. In 1875, the British government concluded an investigation into the practices of underwriters and found substantial evidence of market rigging and exorbitant commission fees. However, no regulatory or monitoring agency was created in response (Fishlow, 1985).

2.1 Sovereign Debt Underwriters

Faced with these sources of uncertainty, the banks underwriting and managing payments of sovereign bonds became central actors in this market. The performance of a bond signaled the effort exerted by the underwriter in drafting a quality security and their willingness to forgo opportunistic behavior. Banks issuing these bonds were also known to use their own capital for short-term financing to prevent liquidity problems from turning into a debt crisis or even to temporarily buy back bonds to keep prices from falling far.

That banks played a pivotal role in the success of their bond issues was a fact not neglected by investors. A bank with a history of well-performing bonds could establish a reputation for taking the unobserved actions that improve a bond's performance. A reputation was an asset to the banks that helped secure greater returns for their role and a sizable market share (Flandreau and Flores, 2009).

Two types of financial institutions acted as intermediaries between investors and sovereign borrowers.[7] Early in the 19th century merchant banks dominated this market. Merchant banks were large, private investment institutions that specialized in foreign bonds and railway issues in particular (both government and commercial). These insti-

[6] For example, the Greek government confiscated two thirds of the Piraneus-Larissa Railway loan (Abreu, Pinho de Mello and Sodré, 2007).

[7] The details presented here are drawn from Fishlow (1985); Flandreau and Flores (2009); Chapman (2013)

tutions were typically set up by a wealthy individual or group of wealthy individuals. Rothschild's went on to dominate the market during the 19th century after being the only underwriter to have no bonds default during the debt crisis of the late 1820s, replacing the incumbent, Baring's.[8] In the latter half of the century, joint stock banks also became major underwriters of sovereign debt. Joint stock banks officially resided overseas and typically focused on financing trade between Britain and specific regions. These banks were most common in Asia and colonial states (e.g., The Hongkong and Shanghai Banking Corporation). Throughout the paper, references to "merchant banks" or simply "banks" refer to both types of financial institutions.

Joint stock banks channeled funds to different states within particular regions (e.g., southeast Asia) while merchant banks loaned to states around the world. Another important feature of sovereign debt markets was that they were characterized by monopolistic competition (Fishlow, 1985; Flandreau and Flores, 2009, 2012). Typically 200-300 sovereign bonds, underwritten by several dozens of banks traded on the London Stock Exchange during 1869-1914. While small issuers did exist, underwriters with considerable market share were most common (Flandreau and Flores, 2009). This matters because a sizable market share makes the costs of losing one's reputation higher.

How did a sovereign bond come into existence? A country would typically inform a number of underwriters that it was interested in raising funds (though occasionally banks approached sovereigns with whom they had a previous lending relationship). A handful of underwriters competed for the contract based on its characteristics such as amount raised, maturity, coupon, and the actions to be taken in the event the entire amount can not be placed upon the IPO.[9] The next step was distribution, i.e., finding investors for the IPO. Sometimes underwriters would hire another bank to act as a window for distribution. This stage required facilities and clerks in London. The next role was that of the paying agent who carried out the delivery of coupon and principal payments to investors. Most often, the underwriter would take on all of these roles. The actors to which investors paid the most attention were the underwriters and the paying agents. Both had opportunities to influence the success of a bond as described further on in this section.[10]

Who bought the bonds? Primarily bonds were bought by wealthy European individuals. Other financial institutions not involved in the marketing of bond also traded the bonds. Most often the merchant banks acted solely as an intermediary. They usually only held the bonds on their own balance sheet after repurchasing them to stabilize prices with

[8] Baring's remained a prolific lender until Argentina's default in the early 1890s forced them into bankruptcy.

[9] Occasionally underwriters formed a syndicate in this stage to offer a more competitive contract.

[10] The details of this process are drawn from (Flandreau and Flores, 2009).

the intent of ultimately returning them to the market.

Influencing a Bond's Success Banks had a variety of ways to influence the performance of the bonds they issued. Importantly, many of these actions were imperfectly observable to the investors trading the bonds. In a series of papers, Marc Flandreau and Juan Flores provide many of the following details on the actions available to banks discussed below.

In the underwriting process, banks could exert costly effort to learn more about the sovereign's ability to repay. In this stage, diligent underwriters researched the borrowers' economic situation. Banks typically maintained offices abroad, this gave them a significant informational advantage compared to investors. With representatives on the ground abroad, it was easier to *verify* the research one could do from London. Bank employees often also established long-term relationships with foreign officials and major commercial enterprises to gather additional information.

Even after gathering information, underwriters had the chance to be opportunistic and could overprice their bonds relative to its expected return. Merchant banks could compensate investors fearful of this behavior through a higher IPO discount (the difference between the IPO and first quoted price). Reputable banks could offer a smaller IPO discount because a history of quality bond issues reassured investors that the bank did not find the short-term gains to opportunism greater than the long-run benefits of smaller IPO discounts. Empirically, prestigious underwriters in the 19$^{\text{th}}$ century did in fact have lower IPO discounts on average (Flandreau and Flores, 2009).[11] But if investors learned that the bank downplayed the risks after a default, the reputation of the bank would suffer.

Underwriters and paying agents often provided consulting services. Specifically, banks advised sovereigns on macroeconomic policy and offered debt management counseling. This allowed the bank to promote economic stability and influence the sovereign to prioritize repayment. This extensive information gathering and advising role was costly to the bank, but well-worth the effort if it helped its securities perform better and instill confidence in investors.

Another important role for banks was to prevent relatively small repayment problems from turning into debt crises and default. Even minor threats to repayment could potentially result in crises if investors suspected the sovereign was unwilling (not simply unable) to service its debt. The limited commitment problem in sovereign borrowing makes it especially prone to self-fulfilling debt crises. Banks used their own capital to support their bonds during tough economic times. Typically this occurred through short-term lending

[11] The authors measure the prestige of underwriters based on the size of their capital, the number and size of their bond issues, and narrative evidence from contemporaneous investor publications.

to prevent debt from falling into arrears or conditionality lending in particular (Fishlow, 1985).[12] When serving as a paying agent, a bank was the first to know when potential threats to repayment emerged. Occasionally, banks successfully prevented information about a threat to repayment from reaching the market by providing short-term finance to allow for continued debt service (Flandreau and Flores, 2012). Investors would prefer this to be kept secret if short-term financing could sufficiently remedy the sovereign's financial problems and prevent a self-fulfilling crisis from emerging.

Investors did not perfectly observe if banks were gathering information, advising, occasionally providing short-term finance, or if the bank was sufficiently incentivized to avoid opportunistic pricing. Well-performing securities were evidence of a bank willing and able to take these actions and meant banks could build a reputation over time for writing quality bonds and supporting them when threats to repayment arose. Faced with incomplete and imperfect information, investors were willing to pay a premium for a sound bond. In their research, Marc Flandreau and Juan Flores argue that banks were well aware of the importance of reputation and exerted effort in order to capture higher rents in Britain's monopolistically competitive debt issuance market.

2.2 The Corporation of Foreign Bondholders

Another important actor in early sovereign debt markets was the Corporation of Foreign Bondholders (CFB). The CFB was founded in 1868 and incorporated in 1873 (CFB Reports) to collectively bargain with sovereigns on the behalf of investors during defaults. Prior to their founding, individual investors had little power to negotiate with a defaulting state. Occasionally ad hoc committees were formed to negotiate, but much greater success was achieved by the permanent CFB (Mauro and Yafeh, 2003; Esteves, 2013).

CFB members were individual investors, representatives of financial institutions investing in sovereign debt, and representatives of the banks underwriting and managing the payments of these bonds (Eichengreen, 1995). Upon a default, members would form a committee that traveled to the defaulting country. The committee met the country's head of state or relevant ministers to negotiate a debt restructuring (Mauro and Yafeh, 2003). After returning to London with a proposed deal, a majority vote was required in a general meeting to approve the deal (CFB reports).

The greatest advantage of a large and permanent bondholders' organization was that it had the credible threat to embargo capital flows to defaulting states. With many influential members, not only was the CFB able to forcibly de-list a nation's securities in London,

[12] Conditionality lending attaches policy stipulations to the financing agreement.

they could often coordinate to de-list them in other major exchanges (Mauro and Yafeh, 2003). London was the most prestigious exchange at this time and de-listing sent a strong, negative signal to potential future investors (Fishlow, 1985). The threat wielded by the CFB was a powerful one.

3 A Model of Financial Intermediary Reputation

This section presents a simple dynamic game between a bank and investors with incomplete and imperfect information. The model predicts asset price contagion arises in the presence of reputation, a prediction supported by the empirical results in section 5. The game is presented below, then comparative statics on reputation formation are discussed. Lastly, I connect reputation to asset prices.

The key informational frictions affecting the interaction between this era's banks and sovereign lenders were imperfect and incomplete information. Information was imperfect in that investors did not perfectly observe if the bank took the actions at its disposal to improve the expected payoff of its bonds. Debt crises were possible following random events such as political regime change, commodity price declines, and wars. When investors observe a default, it is not obvious if it would have been preventable had the bank exerted effort. This creates a potential moral hazard problem when these actions are costly for the bank to take.

Information was also incomplete in that investors were unsure of how strongly incentivized banks were to strive for a reputation of issuing well-performing bonds. Investors were concerned that a bank may be opportunistic. This could arise from a bank facing higher costs of information gathering or using its capital stock for short-term finance, but then attempts to convince investors that these costs are low and thus they're willing to pay them. Additionally, a bank may be present-biased and feign otherwise in order to amass short-term gains before its reputation is tarnished.

Setting Consider the problem of a single bank who encounters a sequence of potential investors each period t. Every period the bank brings to market a new sovereign bond issue and connects with a potential investor. There is a risk that each bond's sovereign will experience an economic crisis 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 $\theta_t \in \{\theta_C, \theta_{NC}\}$ (crisis and no crisis, respectively).[13] Conditional on this information, the

[13] The analysis is similar if we instead model the bank as exerting effort in general to lower the probability of default.

bank chooses to either fight ($a = F$) or allow the crisis to proceed ($a = A$).[14] A crisis is certain to turn into default if the bank does not fight it, but if the bank makes the costly choice to intervene it prevents the crisis from turning into default with probability $\alpha \in (0,1)$. The bank receives a payment $\lambda Q > 0$, where $\lambda \in (0,1)$, each time an investor purchases a bond and incurs a cost $\phi \geq 0$ for each fight. The goal of the bank is to maximize the expected net present value of stage payoffs (with discount factor $\beta \in (0,1)$).

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 simply 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.

Investors are unable to lend directly to the sovereign and can purchase bonds from the bank at price Q. If an investor does not purchase a bond, her payoff is 0. When the sovereign honors its debt the investor receives $R - Q > 0$, when the bond defaults her payoff is $-Q < 0$. Investors are "short-run" players, meaning that each is only concerned with maximizing her expected payoff from a one-shot encounter with the bank. Suppose that

$$(1 - \delta + \delta\alpha)R - Q > 0 \tag{1}$$

$$(1 - \delta)R - Q < 0 \tag{2}$$

so that, for price Q and repayment R, the investor strictly prefers (not) to invest when the bank will (not) fight. This is an important strategic feature of this problem. The bank is able to intervene to prevent a crisis in a way that an investor cannot. The services of the bank are only valuable to the investor if the bank uses this ability. 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.[15] The stage game is shown below in figure 1.

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

[14] The bank takes no action in when $\theta_t = \theta_{NC}$.

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

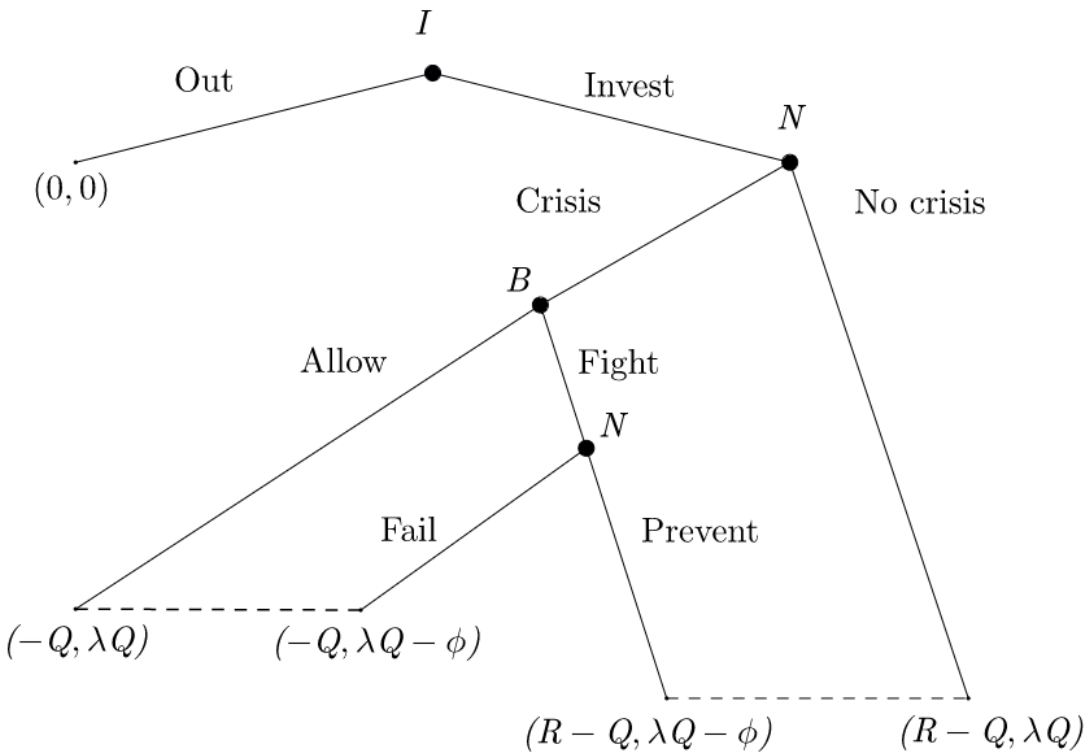

Figure 1: Stage Game

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.

upon observing 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, theres 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 suppose that investors believe the bank may be one of two types. The bank may be either a "good" or "opportunistic" type. A good bank always chooses to fight while an opportunistic bank always allows the crisis to proceed.[16] 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.[17]

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 is 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

[16] 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.

[17] 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.

of the posterior are 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 see how a *change* in beliefs about the likelihood of the bank fighting a crisis affects the bond's price:

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

where the last inequality comes from $\ln(1+x) \approx x$ for x small. This approximation should be extremely precise for many possible values of the variables. The above expression motivates the log-log specification of the regression analysis. 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 $(\mu_{t+1}(b) - \mu_t(b))0$ has a smaller effect on prices when $\mu_t(b)$ is larger. When investors are more optimistic that the bank is not opportunistic, 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 the determinants of b's incentives to prevent the default of i are the same as those to prevent the default of j, the default of i is informative about the likelihood of j defaulting too. Therefore, the asset price drop of i is passed on to bond j as well.

Allowing δ to rise for the defaulting bond after default occurs would give rise to partial pass-through. This is because the fall in the defaulting bond's price would be due not only to the damage to its bank's reputation, but also due to the higher risk of a future crisis. Additionally, if countries simply faced different likelihoods of experiencing a crisis, we could also have incomplete pass-through. The main analysis of section 5 quantifies the degree to which defaulting bond price changes are transmitted to non-defaulting bonds.

4 Data and Identification

One contribution of this paper is building a new dataset describing sovereign default events at the bond level constructed from CFB publications. I match this manually-entered information on sovereign defaults to bond price data digitized by the Yale School of

Management's International Center for Finance. Below I describe in detail the variables of interest, their exact sources, and how the panel data used in the main empirical analysis is assembled.

4.1 Default Data

In addition to bargaining with sovereigns on the behalf of investors, the CFB also kept meticulous annual records of sovereign defaults, renegotiations, sovereign financial accounts, exchange rates, and trade data.[18] Each year since their incorporation in 1873, the CFB published an *Annual Report of the Council of the Corporation of Foreign Bondholders*.[19] The appendix of each report contains descriptions of default and describes the individual bonds involved in a default.

From the CFB reports, I first built a bond-level dataset that includes the underwriter(s) of each bond. It is worth noting that thorough records of underwriters are difficult to come by in other historical investor publications. To the best of my knowledge, this dataset contains the most complete record of sovereign bond underwriters for the pre-1914 era. These data also contain the bond's interest rate, principal size, issue year, and issue date.[20] Importantly, the data also record the timing and nature of many defaults over the course of these bonds' existence.

From each bond's default history, I construct an event-level dataset. In total these data contain 241 defaults for 26 countries in Africa, Asia, Europe, and Latin America. Ultimately, there is sufficient data across all sources to include 100 distinct default events in the main analysis. I define events at the level of the sovereign (therefore two countries defaulting simultaneously are treated as separate events). It is not uncommon for a sovereign to default on multiple bonds simultaneously; 190 bonds are associated with the 100 events in the subset used for the regression analysis.

Below, figure 2 displays the number of bonds that *enter* default each year. One reason for the surge of defaults in the 1870s is the Panic of 1873. Economic instability in North America and Europe emerged in the years following the American Civil War (1861-1865) and the Franco-Prussian War (1870-71) (Fishlow, 1985). Years of inflation, bank runs, and dwindling capital flows culminated in economic depressions from 1873 to 1879 across both continents.

[18] The CFB maintained a library for their members where they could access this information in addition to relevant news articles from around the world, economic commentary, and political analyses.

[19] Publication continued through 1988.

[20] Ideally one would compute yield-to-maturity for each bond, however information on the maturity of bonds is too limited to do this for many bonds.

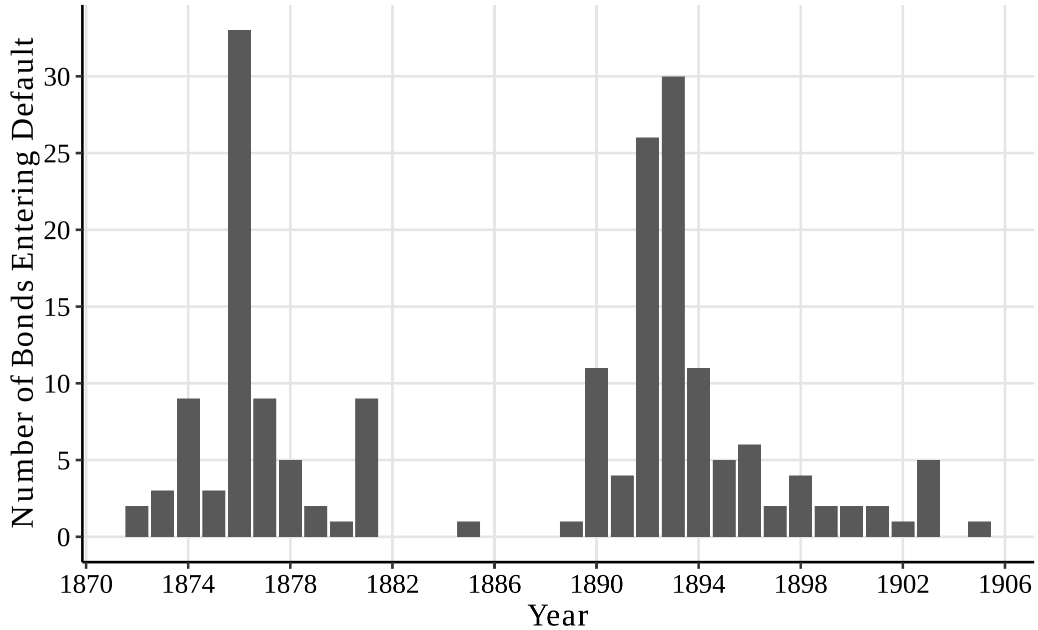

Figure 2: Bonds Entering Default

Note: The data here include the events for which there is sufficient data to use in the regression analysis.

Many of the defaults in the 1890s are from Argentine bonds. A new government came to power in a fraudulent election and significantly increased Argentina's public borrowing. Argentina was in a precarious position both economically and politically. In 1890, a coup in Buenos Aires ultimately forced Argentina's President to resign in August. In the same year, decreases in the prices of Argentina's main agricultural exports led to a shortage of foreign currency to service the large debt accrued over the past decade (Ford, 1956).[21] Argentina entered a severe recession, with real GDP falling by 11% from 1889 to 1890. In November, Argentina defaulted on its sovereign debt; with this default Argentine bonds comprised 60% of the world's defaulted debt at that time (Mitchener and Weidenmier, 2008).

The infamous Baring Crisis ensued as exposure to Argentine securities, bought in attempts to stabilize bond prices, ultimately rendered the second largest British sovereign debt underwriter of the time, Baring's, insolvent.[22] The Bank of England prevented the crisis from bankrupting other merchant banks by guaranteeing Baring's liabilities.[23] While

[21] Debt service requirements (on the external debt alone) totaled 50% of export earnings that year (Fishlow, 1985).

[22] The Bank of England oversaw the restructuring of Baring's into a joint stock banking company. The restructured Baring's reentered the sovereign debt market as an underwriter within years (Abreu, Pinho de Mello and Sodré, 2007).

[23] Baring's did not underwrite the Argentine bonds, they only acted as a paying agent – a point which they emphasized to investors (Flandreau and Flores, 2012).

a potential financial crisis was curtailed in England, foreign capital flows receded. Other developing countries now found it increasingly difficult to secure new bond issues that they could afford and to rollover existing debt. Other nations defaulted in the years following the Baring Crisis. Contagion was worse for borrowers who previously issued through Barings. These borrowers sharing Argentina's banker experienced comparatively larger decreases in their bond prices following the Baring crisis (Abreu, Pinho de Mello and Sodré, 2007).

The default episodes considered in this paper focus on a wide variety of *de jure* defaults. The CFB reports do not discuss *de facto* forms of defaults; therefore these events are excluded in the analysis. But since the bonds considered here are almost exclusively denoted in British pounds, the most common form of *de facto* default (inflation) is not relevant.

This paper adopts a broader definition of *de jure* default than is standard in the sovereign debt literature (Oosterlinck, 2013). At a minimum, most academics define default episodes by the cessation or incompleteness of interest or principal payments. I broaden this definition to include events with two characteristics. First, these events must be unfavorable modifications or failures to honor the legal terms of a debt contract that adversely impact the bond's expected net present value. Second, they are also events that an underwriter or paying agent could conceivably influence so that the reputation mechanism would be operative.

The frequency of the main forms of default examined in this paper is displayed in figure 3. Most common are coupon defaults, which are the failure to pay the (often quarterly or semi-annual) interest payments on a bond. Next most common are conversions which are used to lower interest rates and often reduce the principal of the outstanding debt. Partial payments refer to incomplete coupon payments. Interest reductions are modifications to originally agreed upon interest rate. Sinking fund suspensions are the partial or complete suspension of payments to a bond's sinking fund.[24] Lastly, I include collateral modifications. In pre-1914 sovereign debt markets, it was common practice for sovereigns to pledge collateral, such as import duties, that would be turned over to investors in the event of default. On occasion sovereigns *ex post* reduced the size of the underlying collateral or bondholders seniority claim.[25] Most often, sinking fund suspensions and collateral modifications are ignored in the sovereign default literature.

[24] Sinking fund clauses required borrowers to regularly set aside a specified fraction of the bond's principal in order to ensure that sufficient cash will be available upon maturity to repay the original issue. In the miscellaneous category I include modifications to bond's sinking fund terms such as the repurchase rate (which is effectively a principal reduction).

[25] Sinking funds and collateral are rarely features of modern sovereign bond contracts. However, they are still common features of corporate debt.

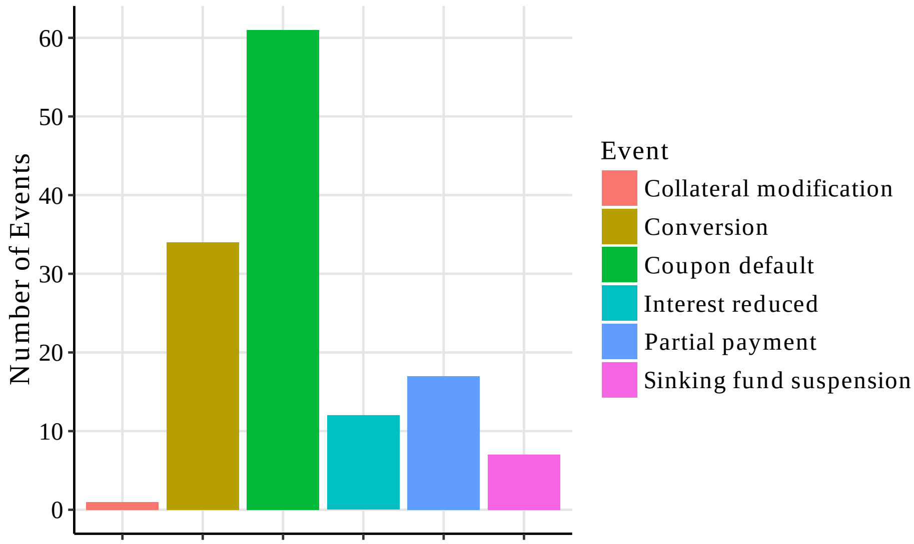

Figure 3: Types of Default

Note: There are an additional 90+ events which I classify as simply ”defaults” which are omitted from this graph but still included in the main empirical analysis. These general ”defaults” include events where multiple forms of default occurred (e.g., a sinking fund suspension and coupon reduction) or more idiosyncratic modifications of the initial debt contract (e.g., taxing and previously untaxed bond or modifying the currency in which payments are made). About 10-15 of these events were simply referred to as ”defaults” in the CFB reports and provided no further information. The data are at the bond-level, therefore multiple bonds are present for a number of individual events. The events depicted here are those used in the regression analysis.

Underwriters and paying agents had a significant influence on these events. First, since underwriters ultimately wrote the legal terms of each bond contract, any unfavorable modifications or failures to meet these terms would suggest the underwriters exerted insufficient effort to write a bond that whose terms would be sustainable. Additionally, underwriters offered economic policy advice to borrowers and did in fact try to protect the relevant sources of collateral and prevent taxation of coupon payments (Flandreau, 2003; Flandreau and Flores, 2012). Paying agents were responsible for ensuring payments were made on time and in their entirety. Since these defaults fundamentally stem from current or anticipated unwillingness to honor a debt contract, tools like short-term lending and conditionality lending provided by banks would be useful for reducing the likelihood of default.

4.2 Bond Data

I obtain monthly bond price data from the *Investor's Monthly Manual* (IMM), published by *The Economist*. The data span 1869 to 1929, though this paper makes use of data only until 1914 due to the outbreak of World War I.[26] Throughout, the prices this paper uses from the IMM data are the prices of the bonds upon closing on the last day of trading each month.[27] Another variable used throughout is the paying agent reported by the IMM. Lastly, issue prices, principal size, outstanding debt and a number of other bond characteristics is available.

After merging the data and dropping observations for which price or banker data is unavailable, the main sample contains price data for many countries and bonds for a variety of defaults. This subsample of the default data contains bonds from countries in Latin America and Europe primarily, though Asian and and African bonds are also present. There are 190 different bonds that are part of 100 distinct defaults from 19 countries (see table 5). There are 234 bonds that have an underwriter or paying agent in common with the defaulting bond(s) during a default.[28] The subsample that shares a defaulter's bank in at least one default comes from 37 different countries in Africa, Asia, Europe, North America, South America, and Oceania. (see table 6). In total 649 non-defaulting bonds from 68 different countries are in the main sample.[29]

Below are summary statistics for the bonds used in the main analysis. In table 1, unsurprisingly we can see a large difference between the behavior of defaulting bond prices (third row) and non-defaulting bonds without a shared bank. On average defaulting bonds fall in price by 5.4% during their default compared to an average decline of 0.26% for bonds unconnected to the defaulting bond. Similarly, the median change for all other bonds is 0 during a default while defaulting bonds typically decline in price by 3.29%.

More interestingly, bonds sharing the banker of the defaulting bond on average fall much more than those with unrelated bankers (rows 2 versus 1). On average, a bond connected to the defaulting bond by a common intermediary declines -1.85% in price. This is significantly larger than the -0.26% decrease of unrelated bonds. At the 25^{th} percentile,

[26]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 chief global lender.

[27]The IMM reports the monthly high, low, initial, and latest prices. Coverage is more complete for the latest price compared to the price at the beginning of the month so I opt to measure the change in the price as the difference between the end of month prices.

[28] Many underwriters also served as the paying agent for their bonds, so these banks are one and the same for the most part. Both underwriters and paying agents are in a position to take similar costly actions to ensure the success of bond issues. Therefore it is reasonable that the effects of a default on a shared intermediary's reputation – whether its the underwriter or paying agent – would be similar.

[29]This is out of 1009 bonds for which some information is published in the IMM in the months of the defaults.

Table 1: Bond Price Changes During Default Episodes

Var.	Mean	25^{th} %	50^{th} %	75^{th} %	Std. Dev.	Obs.	Def.	Share bank
$\Delta \ln P_{i,e}$	-0.26	-1.02	0.000	0.95	8.90	21,536	N	N
$\Delta \ln P_{i,e}$	-1.85	-2.90	0.000	0.91	16.52	852	N	Y
$\Delta \ln P_{i,e}$	-5.40	-13.55	-3.29	2.37	13.44	190	Y	NA
$\Delta \ln P_{i,e}$	-0.94	-0.91	0.000	0.91	7.52	2,105	N	Unknown

Note: This table reports summary statistics for the changes in log bond prices over the month surrounding a default for different subsamples of the main sample. The first row is for non-defaulting bonds i that do not share a banker with the defaulting bond of event e. The second row are non-defaulting bonds with a banker in common with the defaulting bond. The third row gives the price changes for the defaulting bonds during their respective defaults. The fourth row is for non-defaulting bonds with unknown bankers.

we can also see that the decrease is about three times as large.

The last row contains statistics for bonds for which it was unclear whether or not a bank was connected to the defaulting bond. It is encouraging to see that these bonds appear to behave somewhere in between those with a shared bank and those without. This is consistent with these observations' bank information being close to missing at random.

Table 2 reports the same summary statistics but for the change in the bond prices over the month *preceeding* the default of event e. The ability to statistically identify contagion would be questionable if the prices of bonds connected to the soon-to-default bond (the treatment group) behaved differently than the unconnected bonds (the control group). Two worrying patterns would be if it appeared that the treatment group tended to fall in price more on average or comoved more closely with the defaulting bonds regardless of the default status of the soon-to-default bond. Fortunately, we do not see such patterns in the table below.

At the various quantiles, the treatment group (row 2) most closely resembles the control group (row 1). Additionally, the variance of these two groups is now very similar whereas during defaults the standard deviation for the treatment group is double that of the control group. Overall the means for rows 1-3 are very similar. The mean differs for row 4, but this is due to a few relatively observations. At the quantiles, the group in row 4 is very close to rows 1 and 2. We also see that prior to the default events, the soon-to-default bonds had greater variance and, at the 25^{th} percentile even fell significantly. This is not surprising as the build up to default often took months or years in this era.

If we look over a wider a window before and after defaults, we can see from another perspective that bond prices tend to behave similarly before a default but diverge signifi-

Table 2: Bond Price Changes Before Default Episodes

Var.	Mean	25^{th} %	50^{th} %	75^{th} %	Std. Dev.	Obs.	Def.	Share bank
$\Delta \ln L(P_{i,e})$	-0.10	-0.95	0.000	0.95	8.99	21,276	N	N
$\Delta \ln L(P_{i,e})$	0.40	-1.08	0.000	1.16	7.20	837	N	Y
$\Delta \ln L(P_{i,e})$	0.30	-5.13	0.000	6.45	11.43	189	Y	NA
$\Delta \ln L(P_{i,e})$	1.48	-0.69	0.000	0.89	32.94	1,981	N	Unknown

Note: This table reports summary statistics for the changes in log bond prices over the month *preceding* a default for different subsamples of the main sample. Above, $L(\cdot)$ denotes the monthly lag operator. The first row is for non-defaulting bonds i that do not share a banker with the defaulting bond of event e. The second row are non-defaulting bonds with a banker in common with the defaulting bond. The third row gives the price changes for the defaulting bonds prior to their respective defaults. The fourth row is for non-defaulting bonds with unknown bankers.

cantly in price after a default. Figure 4 plots the average bond price at various leads and lags of the date at which default occurs. The plot displays the average for both banks that share and do not share the defaulting bond's bank. In the month of the default (time $t = 0$) we see a negative divergence between the average prices of the two groups. The divergence between the two groups is persistent; the gulf continues to widen even five months after the default.

4.3 Controls

Correlates of War Data One of the less common, but still important, causes of default during 1869-1914 was war. This is especially true for North and South America during this time. A war could potentially call into question the solvency of all nations involved. Therefore a regression of one warring nation's bond prices on those of another involved in the conflict could lead spurious correlation and makes causal inference incredible. To avoid this, I use the Correlates of War 1816-2007 database (Sarkees and Wayman, 2010) to exclude observations where the defaulting state is at war with the sovereign of the other bonds trading during the default.[30]

[30] It ends up being not necessary to drop any additional observations from the subsample with complete information. Only once in this sample is a defaulting country (Turkey/The Ottoman Empire) at war with another country (Serbia) in the non-defaulting bonds sample. However, there were no Serbian bonds trading during the Serbian-Turkish war of 1876).

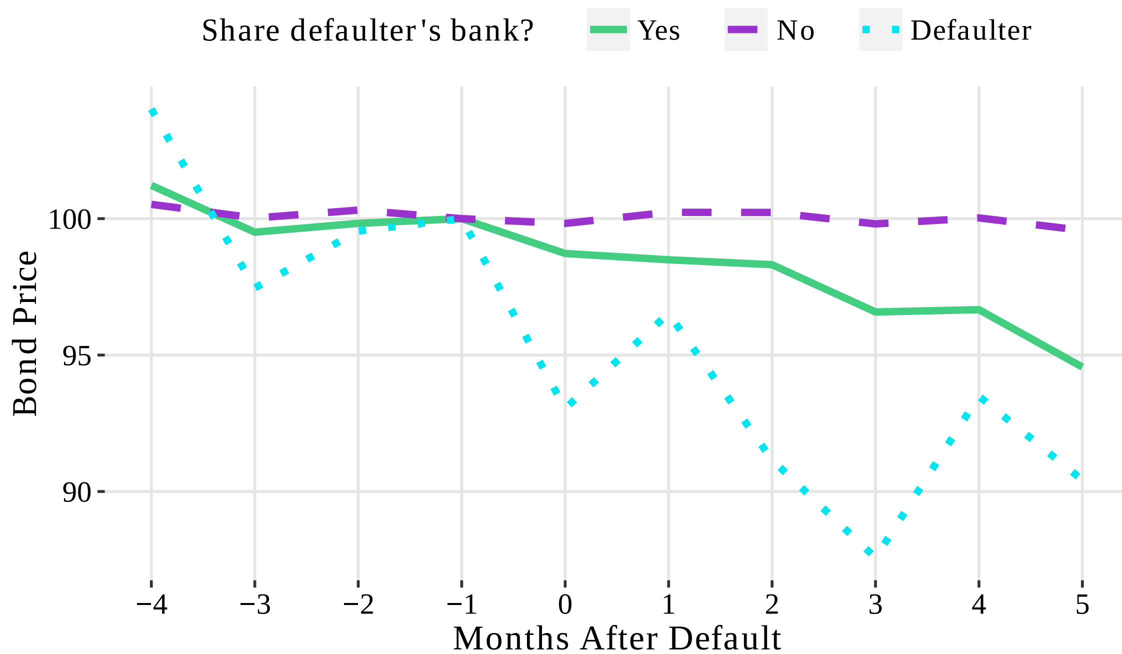

Figure 4: Average Bond Prices Near Defaults

Note: This graph plots the average price of all bonds trading in the months before and after a default. The solid green line is the average price of bonds that do share the defaulter's bank. The dashed purple line is the average for bonds that do not share the bank of the bond that defaults at time 0 above. The dotted turquoise line is the average price of defaulting bonds. The averages for both groups are normalized to 100 at time $t = -1$. The prices are those at the end of the month on the last day of trading; i.e., at $t = 0$ it is the average end of month price in the month during which default occurs.

Trade Statistics Also for identification concerns, one would ideally have controls for determinants of sovereign financial distress. Fortunately for the empirical analysis, one of the most common causes of default, political regime change, is unlikely to directly cause a debt crisis in another country. But other common causes such as commodity price declines are more problematic. Through directed-pair fixed effects (explained in detail in section 5), it is possible to control for time invariant country-characteristics that affect how sovereign stress in the defaulting country is passed on to bonds in the other country.

For example, both Mexico and Australia were major silver exporters. If large drops in the price of silver causes Mexico to default, a fixed effect for being an "Australian bonds when Mexico defaults", absorbs the variation in Australian bond prices due to this commodity price shock. This approach is not ideal though as few countries default only for the exact same reason. This concern is directly addressed by the robustness check in section 5.2 by including both country and event fixed effects. This controls for country-specific factors such as exposure to different commodities prices as well as the relevant economic causes of the event. However, characteristics like commodity price exposure vary over time with the discovery of new natural resources, so this approach is still imperfect.

I plan to use commodity export and import data from Mitchell (1982) and novel data for these variables constructed from the CFB Reports to address this concern in a future version of this paper. With this data, I plan to construct a bilateral index for each country pair that reflects the similarly of their economy's exposure to commodity price changes. This is reflected is the size of exports relative to GDP as well as the share of individual commodities in exports.

4.4 Empirical Approach

To understand the role of common banks in transmitting sovereign financial distress, I investigate if sharing an underwriter leads to greater price comovement between defaulting bonds and non-defaulting bonds. To do so, I merge the monthly bond price data and default event data into a panel indexed by bond i and event e. The key to identification is that within countries, even during the same defaults, there is variation across a country's bonds in whether or not they share the bank of the defaulting bond. Identification comes from exploiting this variation across bonds and time within countries.

The outcome of interest is $\Delta \ln P_{i,e}$, the log change in the price of a non-defaulting bond i over the month surrounding event e. To quantify contagion, I regress this asset price change on the logged, monthly change in the price of the defaulting bond ($\Delta \ln P_e$) of event e.[31] I estimate the effect of bank reputation on contagion by including a binary indicator $BANK_{i,e}$ that equals one when bond i has the same paying agent as the defaulting bond of event e (and zero otherwise).[32] Interacting this indicator variable with the asset price change of the defaulting bond makes it possible to estimate how sharing an underwriter affects the transmission of asset price changes. The baseline specification is

$$\begin{aligned}\Delta \ln P_{i,e} = \beta_1 \Delta \ln P_e + \beta_2 BANK_{i,e} + \beta_3 (\Delta \ln P_e \times BANK_{i,e}) \\ + \gamma L(\Delta \ln P_{i,e}) + Country_i + \varepsilon_{i,e}\end{aligned} \tag{3}$$

where $L(\Delta \ln P_{i,e})$ is the previous month's price change (a control) and $Country_i$ is a fixed

[31] When multiple bonds are part of the same default, $\Delta \ln P_e$ is the weighted averaged of the different bonds' price changes (weighted by principal). I.e., $\Delta \ln P_e = \sum_{d \in \mathcal{D}(e)} \frac{P_d(\Delta \ln P_{d,e})}{\sum_{d \in \mathcal{D}(e)} P_d}$ where $\mathcal{D}(e)$ is the set of defaulting bonds in event e and P_d is the principal of bond $d \in \mathcal{D}$.

[32] Since the underwriter is almost always a paying agent, there is little loss from only using the IMM data's paying agents to match. Since underwriter data is most complete for the defaulting bonds, I match non-defaulting bonds based on their paying agents to underwriters or paying agents of the defaulting bond(s).

effect for the non-defaulting bond's country.

The expected sign of β_1 is not entirely obvious. It is reasonable to have $\beta_1 > 0$ if asset price decreases during default negatively impact the financial wealth of lenders, leading them to sell off assets in general. This could also arise if financial distress spreads through real economic linkages between economies such as trade. But if investors react to the default by first selling the defaulting bond and other bonds from the same bank then purchasing bonds issued by a different bank, we could have $\beta_1 < 0$.

We can expect $\beta_2 \leq 0$ as there may be a baseline penalty for default occurring when connected to the defaulting bond through a common bank. It is also reasonable that $\beta_2 = 0$ if there is no contagion when the bond price of the defaulting country is unchanged, meaning investors' expectations of the value of the bond did not change.

The main coefficient of interest is β_3. If bank reputation contributes to asset price contagion then we would expect $\beta_3 > 0$. This implies the effect of the change in the bond price of event e is larger ($\beta_1 + \beta_3 BANK_{i,e}$) when sharing a bank.

To identify β_1, variation in $\Delta \ln P_e$ must be independent of the determinants of $\Delta \ln P_{i,e}$. In this era, default was extremely idiosyncratic. The primary causes of default were political regime changes, commodity price drops, regional economic downturns, and war (CFB Reports).[33] The political defaults were generally unrelated to the determinants of default in other countries and almost always arose from a new government coming to power. Using the COW data I address war by dropping observations when the countries of the defaulting bond and non-defaulting bond are at war. But defaults related to commodity prices and regional downturns are more problematic as they could potentially cause changes in $P_{i,e}$ that would be observationally equivalent to contagion.

Typically political turmoil, economic downturns, or commodity price changes take more than a month – sometimes years – to affect whether or not a sovereign defaults in this era. Most often, an economic breaking point is reached or a new government repudiates old debt, and a default is suddenly announced. I emphasize this because, in this era, default was rarely brought about rapidly within a month. The price at the end of the previous month should have already incorporated information about the determinants of a sovereign's willingness to default. The price at the end of the month in which the default occurs reflects revised expectations of the net present value of the bond.

In this paper, the surprise reflected in $\Delta \ln P_e$ is not only information that affects anticipated cash flows in different states of the world (and their respective probabilities) but

[33] For example, in Greece's 1893 default, a a funding loan was negotiated to service Greece's debt but a new government was elected that promptly rejected the loan (Fishlow, 1985). A decline in coffee prices (over five years, but especially in the last two years) was the primary culprit in Brazil's 1898 default. This also coincided within years of the end of a rubber boom in Brazil as well (Fishlow, 1985).

part of the surprise is that the default occurred. When the occurrence of default is perfectly anticipated, but not its severity, the interpretation of $\Delta \ln P_e$ resembles that of the asset price changes in the high-frequency identification literature (e.g. Swanson and Williams, 2014). When default itself can be a surprise, observations such as $\Delta \ln P_e > 0$ could arise when investors are positively surprised by the severity of the default.[34]

To identify β_1, I assume that whatever new developments led the sovereign to default and affected how severe it was are unrelated to latent determinants of $\Delta \ln P_{i,e}$. The advantage of using monthly data is that this assumption is unlikely violated by reverse causality. That is, it is unlikely a decrease in bond i's price caused a price decrease in the defaulting bond of event e's price.[35]

This assumption is not ideal. One would preferably have daily data and higher frequency dating of the defaults themselves. The inclusion of a number of fixed effects addresses many remaining bias concerns (see the discussion of the results for the specific role of the different fixed effects). Additionally, the robustness exercise of section 5.2 gives support for this assumption.

External Validity The choice of countries documented by the CFB may introduce some selection bias, however, it is unlikely a concern for external validity in pre-1914 sovereign debt markets. The appendix of the CFB reports is largely devoted to countries in default at the time of publication or with a history of many defaults. A number of more minor defaults such as conversions, which even consistently economically stable countries such as Norway have done, are omitted.[36] However, a small number of large defaults in more economically volatile economies (e.g., Brazil in 1898 and Russia in 1885) are absent from the CFB reports. While the record of defaults used in this paper is not complete, it does contain defaults that differ dramatically in their degree of severity and country of origin (see tables 1 and 5, respectively). Therefore selection should not be a problem in the sense that there is insufficient variation.

Another potential limitation on external validity comes from selection of defaults in which the CFB was involved in negotiations. Most sovereign default negotiations for British bondholders were carried out by the CFB or through ad hoc committees formed

[34]Observations of $\Delta \ln P_e = 0$ could also mean that investors were negatively surprised by the occurrence of the default but positively surprised by its severity.

[35]This would likely be a significant problem with annual data.

[36] In the late 19$^{\text{th}}$ century, several times Norway paid off outstanding bonds ahead of their scheduled maturity through issuance of lower interest rate bonds. Current bondholders were offered the option to exchange their bonds directly for these new lower paying bonds, effectively converting their initial bonds. This particular example is from *Fenn on the Funds: A Handbook of Public Debts* (1898), another source I hope could be digitized to contribute additional default-event and underwriter-bond data.

by investors (Esteves, 2013). In a minority of cases the banks oversaw the negotiations. The role of banks was primarily to *prevent* default from occurring in the first place. This suggests negotiation has limited relevance to bank reputation. Additionally, as rapid asset price contagion is of interest, rather than long-run contagion following years of negotiation, negotiation is less relevant to contagion.

How might we expect the response of bank-negotiated bonds to be different? Since recovery rates were lower for bank-negotiated bonds (Esteves, 2013), for a given default and change in the beliefs about the sovereign's willingness to prevent default, the expected net present value of the defaulting bond would be lower.[37] Importantly, the revision in beliefs determines the decline in the price of bonds sharing the defaulting bond's bank. This means we should expect that a given change in a bond's price stemming from sharing the bank of a defaulting bond will be associated with a relatively larger decrease in the price of the defaulting bond for bank-negotiated bonds compared to CFB-negotiated bonds. This suggests pass-through is likely slightly smaller for this group of bonds.

However, investors may also update their beliefs so that they find it more likely that the bank would handle negotiations for their bonds in the future and thus lower their expected recovery rates in the event of default. In this case, we should also expect the prices of the non-defaulting bonds sharing the defaulting bond's banker to fall by more than in the scenario where the CFB handles negotiations. It is ultimately ambiguous whether or not this subsample would have more or less contagion. This depends on how much these events alter beliefs and the relative differences in te destruction of value from default versus ineffective negotiation. However, given that a majority of bonds were not negotiated by banks, the empirical analysis of this paper directly speaks to a majority of pre-1914 sovereign bonds.

A modern area of finance to which these findings are related is the literature on investment bank reputation and IPOs. Lewellen (2006) investigates a pattern of behavior where larger, more reputable underwriters are more likely to intervene to stabilize prices after an IPO. The author posits that this is done to protect a good reputation as it signals to future investors that the investment bank would intervene to support the price of a new issue.

[37] Esteves (2013) and Mauro and Yafeh (2003) suggest that the inferior recovery rates of bank-led negotiations were due to differences in the incentives of banks compared to investors. It was in the interest of the banks to resume lending as soon as possible, thus encouraging quicker negotiations even if it meant a worse recovery rate. At the time, this incentive problem was well known; for example, *The Economist* (November 20, 1897, p. 1624) wrote "it is notorious that in all the negotiations for the re-arrangements of the debts of foreign States a powerful influence is exercised upon bondholders by the issuing houses, who find it practically impossible to do fresh business with the debtors while the default lasts, and who are, therefore, naturally anxious that some sort of settlement should be arrived at, more especially as settlements of the kind yield substantial pickings in the way of commissions, are frequently followed by new loans."

However, investment banks have a stronger incentive to do so on days when the market performs well as a weak IPO performance is less likely attributable to market-wide events beyond the control of the underwriter. In line with this hypothesis, she finds underwriters stabilize more extensively when equity market returns are higher. Other work finds that overpriced IPOs lead underwriters to lose market share (Beatty and Ritter, 1986; Dunbar, 2000) and market value (Nanda and Yun, 1997).

This role for reputation among investment banks closely resembles that of pre-1914 merchant banks studied in this paper. It is not obvious how to quantitatively map the findings of this paper to this modern setting. However, the results discussed in the following section suggest that reputation of underwriters can significantly influence how financial markets react to large price movements.

5 Results

This section first presents and discusses the regression results. A robustness exercise lends further support to this paper's hypothesis that merchant bank reputation played an important role in transmitting sovereign financial stress.

5.1 Main Results

Throughout a number of specifications I find that sharing a bank with a defaulting bond leads to a considerable decrease in sovereign bond prices during a default. Point estimates and standard errors are given in table 3. All coefficients have a sign consistent with the expected signs discussed in the previous section. Overall, estimation is very precise (only twice do we see coefficients of interest drop from the 5% to 10% level of statistical significance).

The point estimates for β_1, the coefficient on the defaulting bond's price $\Delta \ln P_e$, suggest that on average contagion did occur even for borrowers not connected to the defaulting state via a shared intermediary. The range of estimate imply that a 5% decrease in defaulting country's bond price (slightly smaller than the average drop of -5.4%) during its crisis lowers the price of these non-connected bonds by 0.12 to 0.24%.[38]

Absent a decrease in the defaulting country's bond price, other bonds issued by the same bank may still experience a non-trivial price decrease. The coefficient on the binary indicator $BANK_{i,e}$ tells us that even when $\Delta \ln P_e = 0$, sharing the defaulter's bank leads to

[38]The ranges given here are for the highest and lowest implied effects from the different specifications of table 3.

a 0.92 to 1.44% decrease. Note that this coefficient is not as precisely estimated in column 5. It is not unreasonable that sharing a banker would have zero effect when the defaulting country's bond price does not change.

The key coefficient of interest is that of the interaction term $\Delta \ln P_e \times BANK_{i,e}$. When a bond shares the defaulting bond's bank, asset price contagion is substantially larger. Using column 6's estimates, the coefficient on $\Delta \ln P_e$ increases from 0.047 to 0.215. These unlucky bonds are more than four times as sensitive to the defaulting bond's asset price changes compared those not issued by the same bank. With a shared bank, a 5% fall in the defaulting bond's price alone ($[\beta_1 + \beta_3] \times 5$) now leads to a 1.08% drop in bond prices. Adding this to the pure effect of sharing a defaulting country's bank (β_2), the 5% decline induces a 2.19% fall in the connected country's bond price. This suggests pass-through of a 5% bond price drop from a defaulting country to a non-defaulting country whose bonds were issued by the same bank is as at least 20% (excluding β_2) and as high as 40% (including β_2).

Table 3: Asset Price Contagion Regressions (dependent variable: $\Delta \ln P_{i,e}$)

	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta \ln P_e$	0.024*	0.035**	0.045***	0.045***	0.047***	0.047***
	(0.013)	(0.014)	(0.014)	(0.014)	(0.015)	(0.015)
$BANK_{i,e}$	-1.44***	-1.35***	-1.04**	-1.14**	-0.92*	-1.11**
	(0.52)	(0.45)	(0.44)	(0.46)	(0.49)	(0.52)
$\Delta \ln P_e \times BANK_{i,e}$	0.18**	0.18**	0.21***	0.21***	0.17**	0.17**
	(0.08)	(0.07)	(0.07)	(0.07)	(0.08)	(0.08)
$\Delta \ln L(P_{i,e})$	-0.14***	-0.14***	-0.15***	-0.15***	-0.16***	-0.16***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Country FE	✓	✓	✓	✓	✓	✓
Year FE		✓	✓	✓	✓	✓
Defaulting country FE			✓	✓	✓	✓
Bankers				✓		✓
Directed Pair FE					✓	✓
Observations	19,952	19,952	19,952	19,952	19,952	19,952
R^2	0.035	0.054	0.065	0.069	0.179	0.183

Note: Prior to the regression, all logged and differenced prices are multiplied by 100, thus their units are in log (approximately percentage) points. Here $L(\cdot)$ denotes the monthly lag operator. Standard errors are clustered at the event level. Statistical significance: 0.1*, 0.05**, 0.01***.

A year fixed effect (columns 2-6) helps addresses concerns that unobserved, time-varying factors may be simultaneously affecting all bond prices. For example, global financial crises, such as the panic of 1873 which affected both the US and Europe, would likely encourage British investors to liquidate assets as other sources of income disappeared. But since these events typically arise at a less than annual frequency, events like economic crises would be absorbed within the year fixed effect.

Columns 3-6 add a fixed effect for the defaulting country. This accounts for unobserved characteristics of the defaulting country. We can expect this to be useful if, for example, decreases in the price of coffee over a certain size tend to lead Costa Rica to default. To the extent that these thresholds are time invariant, we can potentially control for some unobserved determinants of default.

Many countries had persistent relationships with banks, but there is still significant variation in the client countries of banks. While the identity of bank does predict a bond's performance (Flandreau and Flores, 2009), what is necessary for identification here is the fact that two bonds share an issuer is not also a result of latent determinants of bond prices during the default of one of the bonds. For example, one might be concerned that a particular bank prefers to write riskier bonds. Riskier bonds could perform worse when any bond defaults; and riskier bonds themselves are more likely to make up those defaulting. To the extent that risk is country-specific, this is addressed by including a country fixed effect. Additionally, I further address this by adding binary indicators for association with a bank to the baseline specification in columns 4 and 6.[39] Given that bank choice often precedes default by years, even decades, it is unlikely that we need to worry about time-varying, unobserved bank or country characteristics for identifying β_2 and β_3.

The columns 5 and 6 of table 3 add a directed pair fixed effect. A directed pair reflects the countries of bond i and the bond defaulting in event e and it records which was the defaulting state. That is, it is directed in the sense that Argentina $\rightarrow$ Uruguay is distinct from Uruguay $\rightarrow$ Argentina. In the presence of this fixed effect, we estimate how sharing a bank affects pass-through of sovereign financial stress *within* a country pair.

5.2 Robustness

Unobserved Event-Specific Factors It is possible that unobserved, event-specific shocks such as commodity price drops could be spuriously driving my main results. To address this concern, one would ideally include an *event* fixed effect in the main regression, but this would be collinear with the asset price of the defaulting state. To this end, I re-estimate the main results but omit the price of the defaulting state (ΔP_e) from the regressors and

[39] Note that these are not bank fixed effects as they are not mutually exclusive – it was not uncommon for bonds to have multiple underwriters and paying agents.

now add an event fixed effect. Overall the results (table 4) are little changed.

The year and defaulting country fixed effects are dropped as these are nested within the event fixed effect. Throughout all the specifications, the interaction term is statistically significant at the 5% level. The point estimate is not only similar across specifications, but also similar to those from the main regressions. The coefficient on the indicator for sharing a bank is also similar across specifications and is slightly smaller compared to those of table 3. Overall this suggests there may be slight bias due to event-specific unobservables in the main analysis, but it is very small.

Table 4: Comparing Contagion Within Events (dependent variable: $\Delta \ln P_{i,e}$)

	(1)	(2)	(3)	(4)	(5)
$BANK_{i,e}$	-1.01**	-1.00**	-1.11**	-0.83*	-1.02*
	(0.44)	(0.43)	(0.45)	(0.49)	(0.52)
$\Delta \ln P_e \times BANK_{i,e}$	0.23***	0.22***	0.22***	0.18**	0.18**
	(0.07)	(0.07)	(0.07)	(0.08)	(0.08)
$\Delta \ln L(P_{i,e})$	-0.15***	-0.15***	-0.15***	-0.16***	-0.16***
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)
Event FE	✓	✓	✓	✓	✓
Country FE		✓	✓	✓	✓
Bankers			✓		✓
Directed pair FE				✓	✓
Observations	19,952	19,952	19,952	19,952	19,952
R^2	0.079	0.089	0.093	0.203	0.207

Note: Prior to the regression, all logged and differenced prices are multiplied by 100, thus their units are in log (approximately percentage) points. Here $L(\cdot)$ denotes the monthly lag operator. Standard errors are clustered at the event level. Statistical significance: 0.1*, 0.05**, 0.01***.

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 learning about and advising the sovereign, standing ready to provide short-term capital should a liquidity shortage occur, and ignoring short-term opportunistic gains in favor of building a reputation, 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. Without a shared bank, a 5% drop in the price of a defaulting bond only leads to a 0.24% decline in bond prices. Only 4.7% of the fall is transmitted to other bonds. But when bonds share the bank of the defaulting bond, the same 5% drop now leads to 2.19% fall in non-defaulting bonds' prices. This is a 43.7% pass-through of the asset price loss.

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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Appendix

Table 5: Defaulting Bonds by Country

Country	Bonds	Country	Bonds	Country	Bonds	Country	Bonds
Argentina	57	Venezuela	14	Bolivia	4	Nicaragua	2
Turkey	27	Ecuador	11	Colombia	4	Peru	2
Costa Rica	15	Guatemala	5	Paraguay	4	Mexico	1
Egypt	14	Spain	5	Portugal	3	San Domingo	1
Greece	14	Uruguay	5	Honduras	2		

Note: This table breaks down the number of defaulting bonds in the main sample by sovereign. Each time a default occurs for a bond, it contributes to the total number of observed defaults counted here. San Domingo refers to the current capital of the Dominican Republic (Santo Domingo).

Table 6: Number of Bonds Connected by Banker to a Defaulting Bond

Country	Bonds	Country	Bonds	Country	Bonds	Country	Bonds
Argentina	37	India	6	Chile	3	Spain	2
Canada	27	Sweden	6	Honduras	3	China	1
Russia	21	Venezuela	6	Belgium	2	Cuba	1
Turkey	18	Italy	5	Bulgaria	2	Japan	1
Egypt	13	Costa Rica	4	Denmark	2	Morocco	1
Britain	11	Hungary	4	Ecuador	2	Portugal	1
Brazil	8	Norway	4	Germany	2	South Africa	1
Greece	8	Paraguay	4	Mexico	2		
Australia	7	Romania	4	New Zealand	2		
United States	7	Uruguay	4	Peru	2		

Note: This table breaks down by country the number of bonds associated via a shared bank with a defaulting bond. These data are from the sample used in the regression analysis. Each time a bond defaults, it contributes to the total number of observed defaults counted here. Throughout the sample I label bonds issued for Australian states as having the same country as Australia became a country in 1901.

Table 7: Number of Bonds Trading During Defaults

Country	Bonds	Country	Bonds	Country	Bonds	Country	Bonds
Australia	88	France	10	Paraguay	4	Barbados	1
Canada	62	Mauritius	10	Peru	4	Bolivia	1
Argentina	46	United States	10	Romania	4	Fiji	1
Turkey	38	Sweden	9	Trinidad	4	Ghana	1
Russia	33	Italy	8	Belgium	3	Grenada	1
Britain	32	Spain	8	British Guiana	3	Hawaii	1
Brazil	22	Ceylon	7	Bulgaria	3	Liberia	1
South Africa	20	Hungary	7	Colombia	3	Morocco	1
Egypt	19	Venezuela	7	Honduras	3	Nicaragua	1
New Zealand	17	Jamaica	6	Cuba	2	Nigeria	1
Chile	16	Norway	6	Ecuador	2	North Germany	1
China	15	Portugal	6	Germany	2	Orange Free State	1
Mexico	13	Uruguay	6	Hong Kong	2	San Domingo	1
Natal	13	Costa Rica	5	Ireland	2	Serbia	1
Greece	11	Denmark	5	Sierra Leone	2	Siam	1
India	11	Guatemala	5	St. Lucia	2	Straits Settlements	1
Japan	11	New Granada	4	Antigua	1	Switzerland	1

Note: This table breaks down the number of bonds associated via a shared bank with a defaulting bond. Each time a bond defaults, it contributes to the total number of observed defaults counted here. British Guiana, Ceylon, and the Straits Settlements are now primarily Guyana, Sri Lanka, and Singapore (respectively). Natal and Orange Free State are presently part of South Africa. New Granada is the predecessor state to Colombia and Panama and also included parts of Ecuador and Venezuela.

Table 8: Bond Principal Size (Millions of Contemporaneous £)

Variable	Mean	25^{th} %	50^{th} %	75^{th} %	Std. Dev.	Obs.	Defaulting	Shared banker
$\text{Principal}_{i,e}$	£10.91	£0.78	£2.28	£6.44	£58.64	19,686	N	N
$\text{Principal}_{i,e}$	£10.48	£1.50	£3.82	£8.00	£47.60	781	N	Y
$\text{Principal}_{i,e}$	£6.56	£1.19	£2.40	£5.40	£12.83	189	Y	NA
$\text{Principal}_{i,e}$	£155.44	£0.80	£6.52	£84.50	£523.13	922	N	Unknown

Note: This table reports summary statistics for the principal (”original issue” in the IMM data) of the bonds in the panel for different subsamples of the main sample. The first row is for non-defaulting bonds i that do not share a banker with the defaulting bond of event e. The second row are non-defaulting bonds with a banker in common with the defaulting bond. The third row gives the principal size for the defaulting bonds prior to their respective defaults. The fourth row is for non-defaulting bonds with unknown bankers. Most of the large bonds with unknown bankers are American bonds.

Internet Appendix (Not for Publication)

A Bank Affiliations of Bonds

Table 9: Number of Bonds by Underwriter/Paying Agent (1 of 4)

Bank	No. of Non-Defaulting	No. of Defaulting	$\frac{100\times\text{Def. Bonds}}{\text{Non-Def. Bonds}}$
Crown Agents	3,068	0	0.00%
Barings	2,948	24	0.81%
Rothschilds	2,019	4	0.20%
Bank of England	1,856	2	0.11%
London & Westminster	1,209	0	0.00%
Hambros	971	14	1.44%
Glyn, Mills, Currie & Co.	847	4	0.47%
Imperial Ottoman	813	20	2.46%
Bank of Montreal	729	0	0.00%
National Bank of Australia	669	0	0.00%
London Joint Stock Bank	644	0	0.00%
London & County	395	6	1.52%
Murrieta	392	14	3.57%
Bank of New South Wales	381	0	0.00%
Raphael	367	2	0.54%
Schroders	341	2	0.59%
Imperial Treasury Paris	337	0	0.00%
Thomson & Bonar	327	3	0.92%
Oriental Bank of New South Wales	315	0	0.00%
Stern	312	6	1.92%
J. S. Morgan	306	4	1.31%
Fruhling & Goschen	293	5	1.71%

Note: This table breaks down the number of bonds associated with the various underwriters and paying agents in the sample. For each bank, the second column gives the number of bonds in the sample of those that were trading during a default but not counted as defaulting. The third gives the number of bonds for each bank that default in the sample considered in the main analysis. The third column reports the ratio of default bonds to non-defaulting bonds.

Table 10: Number of Bonds by Underwriter/Paying Agent (2 of 4)

Bank	No. of Non-Defaulting	No. of Defaulting	$\frac{100\times\text{Def. Bonds}}{\text{Non-Def. Bonds}}$
River Plate Trust Loan & Agency	293	12	4.10%
Union Bank of Australia	272	0	0.00%
Consolidated Bank	260	0	0.00%
Dent & Palmer	249	6	2.41%
Bank of Ireland	242	0	0.00%
Morton, Rose & Co.	240	13	5.42%
Robarts & Lubbock	218	15	6.88%
HSBC	205	0	0.00%
Bischoffsheim & Goldschmidt	155	6	3.87%
Gibbs	138	0	0.00%
Deutsche Bank	135	3	2.22%
Robinson Fleming	127	2	1.57%
Portuguese Financial Agency	120	3	2.50%
City Bank	108	2	1.85%
Cohen	98	3	3.06%
Devaux	95	0	0.00%
Spanish Financial Agency	94	0	0.00%
Coutts	92	0	0.00%
Comptoir d'Escompte	83	3	3.61%
McCalmonts	70	0	0.00%
Bank of British Columbia	60	0	0.00%
Lawson & Co.	60	1	1.67%
London Buenos Ayres & River Plate Bank	60	0	0.00%
Yokohama Specie Bank	57	0	0.00%
Imperial Bank of Canada	55	0	0.00%
Credit Lyonnais	54	0	0.00%
Anglo Italian Bank	53	0	0.00%

Note: This table breaks down the number of bonds associated with the various underwriters and paying agents in the sample. For each bank, the second column gives the number of bonds in the sample of those that were trading during a default but not counted as defaulting. The third gives the number of bonds for each bank that default in the sample considered in the main analysis. The third column reports the ratio of default bonds to non-defaulting bonds.

Table 11: Number of Bonds by Underwriter/Paying Agent (3 of 4)

Bank	No. of Non-Defaulting	No. of Defaulting	$\frac{100\times\text{Def. Bonds}}{\text{Non-Def. Bonds}}$
Clydesdale	53	0	0.00%
Anglo Egyptian Bank	51	3	5.88%
Corporation of Foreign Bondholders	51	4	7.84%
Queensland National Bank	51	0	0.00%
General Credit and Finance	50	2	4.00%
Knowles & Foster	50	5	10.00%
Lumb Wanklyn	50	4	8.00%
Matheson & Co.	49	0	0.00%
National Provincial Bank	48	0	0.00%
Seligman	46	0	0.00%
Parr's	40	0	0.00%
Martin & Co.	38	0	0.00%
Hme & Col As	33	0	0.00%
Standard Bank of South Africa	33	0	0.00%
National Bank of Scotland	32	0	0.00%
Brit. Lin. Co. Bank	31	0	0.00%
Lloyds	28	0	0.00%
Newgass	26	0	0.00%
Bank of South Australia	25	0	0.00%
Russian Bank	25	0	0.00%
Bank of Adelaide	22	0	0.00%
Chartered Bank	22	0	0.00%
Gordon Barton	22	0	0.00%
Bank of Japan	16	0	0.00%
Ionian Bank	5	0	0.00%
Speyer	4	0	0.00%
Bank of Spain	2	0	0.00%

Note: This table breaks down the number of bonds associated with the various underwriters and paying agents in the sample. For each bank, the second column gives the number of bonds in the sample of those that were trading during a default but not counted as defaulting. The third gives the number of bonds for each bank that default in the sample considered in the main analysis. The third column reports the ratio of default bonds to non-defaulting bonds.

Table 12: Number of Bonds by Underwriter/Paying Agent (4 of 4)

Bank	No. of Non-Defaulting	No. of Defaulting	$\frac{100\times\text{Def. Bonds}}{\text{Non-Def. Bonds}}$
Canadian Bank of Commerce	2	0	0.00%
Huth	2	0	0.00%
London & Brazilian Bank	2	0	0.00%
Midland Bank	2	0	0.00%
Natal Bank	2	0	0.00%
Victoria Cham	2	0	0.00%
Capital & Counties	1	0	0.00%
Erlanger	1	0	0.00%
Franco-Egyptian Bank	1	0	0.00%
Isaac & Samuel	1	0	0.00%
Total	24,151	197	

Note: This table breaks down the number of bonds associated with the various underwriters and paying agents in the sample. For each bank, the second column gives the number of bonds in the sample of those that were trading during a default but not counted as defaulting. The third gives the number of bonds for each bank that default in the sample considered in the main analysis. The third column reports the ratio of default bonds to non-defaulting bonds.