Holding Bankers Liable:

Personal Guarantees and Risk-taking in Security Underwriting*

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Abstract

Does additional liability for bank executives improve risk management? We address this question using uniquely detailed data on the underwriting activities of one of the largest Dutch banks in the early 20th century. Its executives faced additional liability as they partially guaranteed their banks' security underwriting. If the issuance was successful, they received the underwriting fee; if it failed, they had to personally purchase securities at a loss. Exploiting exogenous discontinuities in the size of these guarantees, we find that issuance quality was higher for bigger guarantees. Investor subscription rates were higher and issuing firms had stronger balance sheets. Results indicate that additional liability directly tied to executives' decisions can help reduce bank risk-taking.

Keywords: Limited liability, Executive compensation, Bank risk taking, Financial history

JEL Codes: G21, M12, N24

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Banks are risky and bank failures often have large negative externalities. Due to high leverage and opaque balance sheets, banks are sensitive to agency problems and this can result in excessive risk-taking. Bank executives (henceforth 'bankers'), in particular, face asymmetric payoffs through bonuses and stock-based compensation: they arguably have more exposure to their bank's profits than to its losses. The recent banking turmoil in 2023 at Silicon Valley Bank and Credit Suisse shows that bank risk-taking remains an important concern that has both financial and real implications. To reduce the riskiness of the financial sector, some argue that bankers should be held liable when their bank gets into trouble (Acharya, Mehran and Sundaram, 2016; Goodhart and Lastra, 2020). However, empirical evidence on the effect of additional liability on risk-taking is scarce.

There is evidence from financial history suggesting that bankers with additional liability indeed took less risk (Esty, 1998; Mitchener and Richardson, 2013; Calomiris and Carlson, 2016; Koudijs et al., 2021; Aldunate et al., 2021). In these settings, liability is defined with respect to the banks' losses in case of failure. This is a rather crude way to set incentives. Typically, individual bankers can only affect a limited part of total risk-taking and bank failure may be beyond their direct control. Further, there might be a collective action problem. Depending on the circumstances, this might either make additional liability ineffective, or lead bankers to ban risk-taking from their bank altogether.

A more targeted approach would be to define liability with respect to *specific* losses that can be attributed to bankers' *individual* decisions. Although promising in theory, this may not be effective in practice. Using the opacity of their bank's balance sheet, bankers might be able to hide losses in an attempt to escape this type of liability. Further, if bankers are concerned about their reputation or career, they might avoid risks that can be tied to them personally anyway, instead shifting risk into a gray zone where nobody can be held personally accountable.

In this paper, we ask whether tying bankers' liability directly to their individual decisions can reduce bank risk-taking. Using a newly constructed and unique dataset, we address this in a setting where bankers had additional liability for some of the most material decisions they had to make: whether to let their bank underwrite a specific security issuance or not. We analyze the security underwriting of one of the largest Dutch banks at the time, the *Nederlandsche Handel-Maatschappij* (NHM), between 1919 and 1930. The bank kept uniquely detailed minutes of its activities; secret at the time but accessible to current-day researchers. Bankers had to guarantee part of the underwriting of any security that the bank was a lead underwriter for. At the time, this was a risky activity with 50% of issues in our sample undersubscribed (40% of issues had a subscription rate of 90% or lower). The bank had to purchase any unsold securities at a loss (see also Boissevain, 1891; Wertheim, 1891). Bankers received the underwriting fee over all

securities they had guaranteed and that were successfully sold to investors. However, if securities remained unsold, the bankers had to purchase these securities personally in proportion to their guarantees. This made the payoff between bank and bankers fully symmetric and exposed bankers to potentially large personal losses.

To examine the effects of this executive compensation scheme on bank risk-taking, we use exogenous discontinuities in the exact bankers' guarantees. These guarantees were set at large round numbers for a given banker. The size of the personal guarantee increased discontinuously, e.g. from 20,000 guilders ($f.$) to $f.$ 40,000 in nominal value (securities were typically issued at par), when the total bank guarantee exceeded a (large) round number, e.g. $f.$ 1,500,000 in nominal value. This generated a step function between the size of the bank and the bankers' guarantee. The exact cutoffs of the step function were pre-determined. We compare the risk characteristics of issues below or above these cutoffs, where we expect issues right above the cut-off to be less risky.

Bank risk is typically hard to measure due to the opacity of bank balance sheets. The great advantage of security underwriting is that outcomes are easy to observe. Further, firm level characteristics are available for public firms while there is fiscal information on the (local) governments for which the bank also underwrote bonds. Our key risk measure is the fraction of the issuance that investors subscribed to. On average, undersubscription *ex post* is indicative of high underwriting risks *ex ante*. We verify this measure by showing that undersubscription is associated with weaker firm balance sheets and worse (local) government finances.

It is not obvious that additional liability directly tied to a banker's personal decision will change behavior. First, personal reputation or career concerns might already limit risk taking. A bank's reputation, especially in security underwriting, is key for future business and can easily be ruined if the bank's decisions are seen to hurt their clients' interests (Fang, 2005; Kymmell, 1998; De Jong et al., 2022; Indarte, 2021). The same could hold for individual bankers if particular outcomes can be directly linked to their personal decisions. Even nowadays, executives claim to be more motivated by reputation than by pay (Edmans et al., 2023). At the same time, the evidence for adverse career consequences from misconduct in finance is limited (Griffin, Kruger & Maturana 2019; Egan, Matvos & Seru 2019). Second, bankers' individual risk aversion might already limit risk taking. For example, the security issues in our setting were seen as risky, with only 50% in our sample being fully subscribed. Even the most experienced bankers could never be confident about the outcome (Boissevain, 1891). Risk-averse bankers may have already tried to avoid risky issues to minimize uncertainty around their bonus payments. Finally, reputational concerns or risk aversion might be dominated by private benefits. For example, bankers could have interlocking directorates or personal relationships with

the executives of the issuing firms that they want to maintain by underwriting the firm's securities.

We implement our analysis with an intent-to-treat two stage least squares (2SLS) design. We focus on issues where the NHM was one of the lead underwriters. We instrument for actual banker guarantees with the predetermined step function. The first stage is strong with an F-statistic higher than 50. Using bin fixed effects, we compare issues above or below a discontinuity. Results are robust to including a host of controls, including whether a banker was also on the board of the issuing firm.

We find that bankers' underwriting guarantees substantially improve the quality of the securities that are selected by the bank for underwriting. This effect is statistically and economically significant. The average banker guarantee was equivalent to approximately $f.$ 20,000 in par value, with a range spanning from $f.$ 2,000 to $f.$ 100,000 and an average increase at a discontinuity of $f.$ 6,000. In comparison, base salaries ranged from $f.$ 10,000 to $f.$ 35,000. A increase in the banker's guarantee from the median to the 75^{th} percentile (a change of $f.$ 12,000) is associated with a 38 percentage point higher subscription rate. Compared to the median subscription rate of 100%, this is a large effect. Restricting our analysis to firms only, we find that bankers' underwriting guarantees push the bank towards underwriting securities for older firms and firms with lower leverage, although these effects are not statistically significant.

These results are likely driven by the selection of security issues, not effort in the underwriting process: bankers had little influence over investor appetite, which determined whether an issuance would be fully subscribed or not. It is also unlikely that our results are driven by signaling: banker guarantees were unobserved by the public and unverifiable ex post. The reason we are able to observe information about the the size (and existence) of guarantees is because the bank's historical secret minutes have been made publicly available for current day researchers.

Related Literature

This paper makes several contributions to the literature. First of all, we contribute to the literature on the effect of additional liability on bank risk-taking. Esty (1998), Grossman (2001), Mitchener and Richardson (2013), Calomiris and Carlson (2016) and Aldunate et al. (2021) find that additional liability for US banks before the Great Depression reduced risk-taking. For the UK, Grossman and Imai (2013) find that contingent liability in the form of uncalled capital led to less bank risk-taking, while Turner (2014) shows that banks with unlimited liability were less likely to fail. Colvin (2018) examines the choice of liability arrangement in Dutch banks catering to small and medium sized businesses in the 1920s and finds that this mattered little for bank failure. Most closely related is Koudijs et al. (2021) who focus on the personal liability of bank executives. Bankers in

New England in the nineteenth century that married under a regime that protected their wife's wealth were more likely to take on more risk and consequently lost more capital and deposits during the Long Depression (1873-1878). We contribute to this literature by analyzing a form of banker' liability directly tied to individual decision making. Bankers might not be able to influence all bank risk management directly. For instance, they might only have indirect control over deposit taking and the performance of the bank's entire loan portfolio, which are important determinants of a bank's overall profitability. In contrast, security underwriting is directly under their control. Not only does this allow us to directly link additional liability to actual decision making, it is also a test of whether targeted additional liability is effective.

Second, our paper is related to literature on executive compensation in banking. Modern-day bankers' "skin-in-the-game" is in the form of equity compensation, which predominantly affects the upside of risk-taking due to the high leverage of banks (Bolton, Mehran and Shapiro, 2015). Empirically, higher equity stakes for bankers appear to increase bank risk (Fahlenbrach and Stulz, 2011; Berger, Imbierowicz and Rauch, 2016). At the same time, inside debt, e.g. future pensions, appears to reduce risk-taking for both firms (Wei and Yermack, 2011) and banks (Van Bekkum, 2016). We contribute to this literature by looking at the direct effects on risk taking of exposing bankers to downside risk.

Finally, our paper fits into the broader literature of managerial incentives and executive compensation. Edmans, Gabaix and Jenter (2017) provide an overview of theoretical and empirical work on executive compensation and argue that the causal effect of executive pay is difficult to identify empirically, due to the endogeneity of compensation contracts. We contribute to this literature by exploiting a predetermined arbitrary rule in compensation contracts that bankers followed when underwriting security issues.

The rest of the paper is structured as follows. Section 1 discusses the relevant historical background. Section 2 describes our newly constructed dataset. Section 3 details our empirical approach, while Section 4 presents our empirical results. Section 5 concludes.

1 Historical background

1.1 General background

During the late 19^{th} and early 20^{th} century, the financial sector in the Netherlands consolidated and large banks adopted a universal banking model. The "Big Five" banks,

including the NHM, dominated the banking industry (De Jong and Roell, 2005), even though many specialized smaller banks still co-existed.[1]

The Netherlands remained neutral during the First World War and domestic businesses benefited substantially from exporting to foreign markets, where supply chains were disrupted (Van der Werf, 2014). Firms required ever more capital and the universal banks were quick to provide the funds by either extending private credit or facilitating public issuance of securities. As in neighboring countries, issuing securities via underwriters was a standard practice for firms to attract large amounts of funding through the placement of securities (Boissevain, 1891). A wide range of securities from private firms and public entities, both domestic and foreign, were issued and traded on the Amsterdam Stock Exchange. Different types of financial institutions were active in the security issuance business: brokers, private banking houses, general commercial banks and universal banks. The security market was free from any financial regulation or government intervention (Brouwer, 1969; Geljon, 2005).

After the First World War, the securities markets experienced a short boom in 1919-1920 before collapsing into a global post-war slump (Colvin, De Jong and Fliers 2015). Many banks failed due to the unprecedented credit boom from 1915-1920 and the consequent debt-deflationary period in the early 1920s, leaving their debtors unable to repay their debts (Jonker, 1991; Colvin, De Jong and Fliers 2015; Jonker and Van Zanden, 1995). The resulting banking crisis between 1921-1924 led to the write-off of nearly 10% of the Big Five banks' assets (De Jong and Roell, 2005).[2] The crisis affected especially younger, smaller, less diversified and more leveraged banks, but even one of the Big Five universal banks, Rotterdamsche Bankvereeniging, was on the brink of collapse and had to be bailed out.[3]

Firm and bank directors were essential in determining the direction of firms. Many bankers had several board positions, resulting in interlocked directorates. The NHM was

[1]The other large banks are Amsterdamsche Bank, Incasso-Bank, Rotterdamsche Bankvereeniging, and Twentsche Bank. Twentsche Bank merged with NHM in 1964 to become Algemene Bank Nederland, while Amsterdamshe Bank and Rotterdamsche Bankvereeniging merged as AMRO in the same year. These two merged banks united in 1991 to form ABN AMRO. For an overview of the Dutch banking system in the early twentieth century, see Colvin, De Jong and Fliers (2015).

[2]The exact start and end dates of the 1920s banking crisis are subject to debate. Some use only 1921 and 1922 as crisis years (Van Zanden, 1997; Benanke and James, 1991). Gelderblom et al. (2023) mentions 1922 as starting year, while De Jong and Röell (2005) and Jonker (1991) see 1920 as the starting point, even though Jonker (1991) identifies 1922-1924 as the height of the crisis. Colvin (2018) defines 1920-1926 as crisis years. The bailout of one of the Big Five banks occurs in 1924 (Colvin, 2014) and Colvin, de Jong and Fliers (2015) show that recovery began in 1924 for stock prices of banks that did not experience distress, and in 1926 for distressed banks. We define the banking crisis to span the years 1921-1924. This decision is based on the number of security issues during those years: in October 1920 the number of issues starts declining (Van der Werf, 2014) and only in 1925 recovery sets in.

[3]See Colvin (2014) for a description of the crisis and the near-collapse of the Rotterdamsche Bankvereeniging.

one of the largest and most prestigious of its time, and interlocked directorates occurred regularly at the executive level.[4] In the extreme case, interlocked directorates could lead to conflicts of interest affecting bank performance negatively (Colvin, 2014). The banks that survived the banking crisis of 1921-1924 reduced their management ties afterwards (Jonker and Van Zanden, 1995).

The economy and the stock market recovered in 1925, and a stock market boom followed. Industrial firms expanded their foreign operations, while Dutch banks increasingly underwrote foreign securities for both public and private issuers (Van der Werf, 2014). This upward trend persisted until 1930, when the Netherlands began to feel the impact of the Great Depression.

1.2 The Nederlandsche Handel-Maatschappij and Underwriting in the Dutch 1920s

The bank that we focus on in our analysis is the 'Nederlandsche Handel-Maatschappij' (Dutch Trading Society, NHM, the bank). The bank was one of the largest and the most prestigious bank in the Netherlands in the early twentieth century. The bank was founded in 1824 as a limited liability colonial bank, engaging in financial and trading activities in the Dutch East Indies. Since its establishment the bank was renowned for its solid reputation (Wijtvliet, 1993).[5] Since the 1880s, the NHM shifted from a trading business towards universal banking activities, including securities underwriting.

The underwriting business was considered risky, and the bank's change of course to engage in investment banking in the 1880s was subject to intense discussion between the bankers and the supervisory board (De Graaf, 2012). In 1884, the bank adjusted its articles of association to allow for securities trading on its own account, which was a necessary legal requirement for the bank to be active in security underwriting. The bank created a provision balance sheet item as a buffer for potential losses from underwriting in 1888 and used this reserve already in 1889 (De Graaf, 2012).

We study the security issuance activities of the NHM from 1919 until 1930. The 1920s were a particularly booming period for security issuance in the Netherlands. Universal banks were especially active, party due to their large enough size to absorb potential

[4]De Jong, Fliers and Westerhuis (2021) identify a list of "exceptional big linkers", which includes the president of our bank. Colvin, De Jong and Fliers(2015) find that banks failing during the Dutch banking crisis of the 1920s had on average smaller boards and fewer interlocked directorates.

[5]The bank fulfilled a unique position in the Dutch society, as it had a special relationship with the government and the royal family and was not only a trading company, but also a commercial and investment bank. The colonial activities were very profitable, especially in the nineteenth century, and remained a substantial share of the bank's business in the first half of the twentieth century. See De Graaf (2012) for an elaborate overview of the bank's colonial business.

losses from underwriting (Van Der Werf, 1990). The NHM was one of the largest players in the underwriting business. Before the First World War, the bank was responsible for more than half of the total syndicates and securities in the Netherlands (Kymmell, 1998). Three other large universal banks played an important role in the securities markets in this period as well (Amsterdamsche Bank, Rotterdamsche Bankvereeniging and Twentsche Bank). Other smaller commercial banks and prestigious merchant banks ('bankiershuizen') such as Hope & Co. and Van Eeghen & Co. were active as well, often joining forces with a universal bank.

Security issues were fixed price offerings that the public could subscribe to. Securities were mostly issued around par (see Figure A1). Underpricing was limited, unrelated to the volume of the security issuance, but correlated mainly with stock market sentiment (Legierse, 2023). In the event of oversubscription, the securities would be divided pro rata among the subscribed investors. The demand for newly issued securities in the 1920s stemmed from different groups of investors, depending on the type of issuer. Institutional investors mainly invested their money in Dutch and Dutch East Indies government bonds (Legierse, 2023). The upper class elite of private capital owners dominated the share purchases of industrial firms (Westerhuis and de Jong, 2015). Since the standard nominal value of a security was $f.$ 1,000, few small private investors had pockets deep enough to participate.[6]

We focus on the most common type of underwriting whereby the underwriter would agree to guarantee the placement of securities for a specific price (full commitment). In this way, any placement risk was shifted from the firm to the bank. The underwriter then tried to sell the securities on the predetermined issuance date. If there was not enough investor demand in the market, the underwriter was obliged to buy the securities at the pre-specified price and tried to sell them in the future. When an issuance was successful, the underwriter received a commission premium, which was often a few percentage points of the total issuance amount (on average 3% in our sample). Underwriting was considered successful when subscription on the issuance day was close to the full amount of securities offered. We consider every issuance above 90% subscription as successful. When the issuance failed, the underwriter was exposed to substantial losses, up to the total underwriting guarantee. The bank could potentially sell the securities for a good price at a later stage, but ex ante this was uncertain and selling later on often resulted in losses (Geljon, 2005; Kymmell, 1998). In many cases, unsold underwritten securities remained on the bank's balance sheet of the bank.[7] For instance, a substantial amount of

[6] A thousands guilders in the 1920s is equivalent of € 15,000- € 20,000 nowadays, depending on the year in which the security was issued. Source: Central Bureau for Statistics, https://www.cbs.nl/nl-nl/visualisaties/prijzen-toen-en-nu

[7] End of year reports from the executive board to the supervisory board included lists of unsold securities still held by the bank. NL-HaNA, NHM, 54: yearly report 1930.

Chinese government bonds ($f.$ 3,9 million) issued in 1922 were still on the balance sheet of the NHM in 1934 (De Graaf, 2012).

Financial intermediaries often set up a syndicate ("consortium") to share the underwriting risk. Wertheim (1891) defines a syndicate as a temporary collaboration between banks or other financial intermediaries to sell securities to the public. At the end of the syndicate agreement, remaining unsold securities had to be divided among the participants in the syndicate, proportional to their initial underwriting guarantee.

The NHM had several underwriting partners with whom it regularly formed syndicates, depending on the type of issuance that was offered. Amsterdam municipal bonds were underwritten together with Hope & Co. and the Amsterdamsche Bank, while for foreign issues the bank often collaborated with the German Mendelssohn & Co. Each member of the syndicate could subsequently offer a sub-participation to other 'friendly relations', such as banks, firms or their executives.[8]

Underwriting offers can be divided into two categories: offers where a bank was one of the the lead underwriters, and offers where the bank was a syndicate participant.

If the bank was a lead underwriter, it received an underwriting offer from a public or private issuing entity that wanted to raise a certain quantity in the market. The bank—together with any other lead underwriters—would negotiate the and issuance price and quantity. Since most securities are issued at par and the pricing of securities is uncorrelated with the success of the issuance, negotiations were most likely coming down to the issuance amount. If the amount requested by the firm was deemed too large for the bank to underwrite on its own, it could invite other banks to participate. The bank's guarantee was substantially higher when it was the lead underwriter (see Figure 1). Also, after a failed issuance, its reputational damage would be larger. The prospectus, offered to the public, only included the names of the lead underwriters, not of the participants (Wertheim, 1891).

If the bank was a participant, it could only accept or reject the offer from a lead underwriter who would have first negotiated the terms with the issuer. It was unable to check the issuer's books before issuance. Accepting participations offered by friendly relations was necessary to "prevent isolation on the stock market and consequently be excluded from doing business."[9] Figure A2 shows that on average, issues where the bank was a participant rather than a lead underwriter were slightly less successful.

[8]NL-HaNA, NHM, 72, 1907 p. 47-48.

[9]NL-HaNA, NHM, 36: 12-11-1907 - 14-11-1907, authors' translation.

1.3 Personal guarantees in underwriting

The NHM had five to six executives ("bankers"): the president, three or four four directors and a secretary. Three bankers, president Van Aalst, director Bierens de Haan and secretary Abbing, remain in the same role throughout our period of analysis. The composition and number of director changes over time: 3 in 1924 and 1930 and 4 in the years 1919-1923 and 1925-1929. All bankers were selected based on their expertise and experience (De Graaf, 2012). The president had the decisive vote in meetings. The bankers received a fixed base salary depending on their position. The president received a$f.$ 20,000 base salary in 1919; the directors were paid 80% and the secretary 40% of the president's salary.[10] These base salaries were low compared to other banks (De Graaf, 2012). They were increased once in 1925, by 75%, when the economy recovered from the banking crisis.

Additionally, the banks received a bonus ('tantième'), which was a percentage of the bank's profit ranging between 1-2.5% based on the same ratios as the fixed base salary. Figure 2 shows the evolution of the base salaries and tantièmes over the years of our sample. At its peak in 1919, the tantièmes were almost 14 times higher than the base salary. However, the tantièmes fluctuated significantly over time. During the banking crisis of 1921-1924 the bankers' bonuses declined substantially to amounts that were comparable to their base salary.

Finally, the bankers received income from personal guarantees in the bank's security underwriting, which was common in the 1920s (Boissevain, 1891; Van der Werf, 2014; De Graaf, 2012). This did expose bankers to downside risk: according to Boissevain (1891), even the most experienced and skilled banker could not be certain of the success of a security issuance.

Personal guarantees increased both bankers' upside potential and downside risk. Bankers would receive the underwriting fees as percentage over the amount of the issuance they had guaranteed. If the issuance failed, they had to personally purchase the underwritten securities in proportion to their guarantees. The potential downside losses could easily outweigh the upside underwriting fees and could be quite substantial compared to the fixed annual income a banker received. In 1918, the bank secretary, Frederik Hendrik Abbing, received a base salary of $f.$ 8,000 and had to buy securities of failed issuance summing to a total of $f.$ 5,500.[11] When he was forced to resign in 1930, he complained

[10]The secretary received an additional yearly fixed amount to increase his share to 50% of the president's salary, but his original base salary was determined at 40%.

[11]He also received substantial 'tantièmes' of f. 74,494.77 , i.e. a share of the banks' profit, but this was only known (and received) after the accounting year. The total income of bank managers was uncertain (NL-HaNa, NHM, 2.20.01: 4129).

about his low salary and the substantial losses he had suffered.[12] The median (average) personal guarantee per issuance during our period of analysis was $f.$ 17,500 (26,000) for the president, $f.$ 14,000 (20,000) for each director and $f.$ 10,000 (14,000) for the secretary. One average underwriting guarantee was thus comparable to the entire annual salary.

The details about the bankers' personal guarantees were kept secret from the public. We only observe the size of the bankers' guarantees because the bank's secret minutes have been made available to the public. We hypothesize that the system was a compromise between the supervisory board (non-executive directors) and the bankers to ensure aligned incentives between the bank and the bankers without direct monitoring of the supervisory board.[13] According to the supervisory board, underwriting could be divided into three groups: syndicates to obtain profit for the banking business, syndicates to support the national cause and syndicate offers that should be accepted out of courtesy.[14] Both the second and the third category gave the bankers a lot of discretion on which security issues the bank should underwrite. Especially the latter category, underwriting out of courtesy, could lead to underwriting securities that were not necessarily of good quality, but would increase the bankers' private benefits. Even for the first category of obtaining profit, underwriting was risky and without personal guarantees, the bankers might have an incentive to take too much risk to boost their end of year tantièmes.

The supervisory board was well aware of the incentive problem for the bankers. Already before the bank started underwriting in the 1880s, the chair of supervisory board discussed the relevance of well-designed executive pay:

"To view tantièmes in the bank's profit as an incentive for better management, is a folly. The members of the executive board of the NHM are always persons that do not require such an incentive, however even for an institution as ours, with such substantial capital, there still exists the possibility, that such an incentive could work counterproductive, and could lead to large, even risky speculations, in which the managers would share the profits, but not the losses."[15]

In 1884, the board discussed whether "they could not restrict the managers by first requiring approval of the supervisory board for important matters".[16] The supervisors

[12]NL-HaNA, NHM, 2.20.01, 4129; 37: 23-11-1931.

[13]The supervisory board represented the bank shareholders and had to consist of at least ten members chosen from the electoral committee of the local Chamber of Commerce. The supervisory board members received a small attendance fee and a small share of the annual bonus (2.5% to be divided amongst all members, usually around 15 directors). They met as often as was seen fit to audit the bankers. They had the power to accept or reject the balance sheet (including the amount of dividend to be paid out) and the yearly reports of the directors. In this way the supervisory board could monitor the directors and act accordingly.

[14]NL-HaNA, NHM, 36: 14-11-1907

[15]NL-HaNA, NHM, 33: 21-11-1879, authors' translation.

[16]NL-HaNA, NHM, 534: 18-04-1884, authors' translation.

frequently tried to gather information on the ongoing and future underwriting business, but the bankers argued that they would "inform the board not on ongoing, but only on past matters".[17] The supervisory board was lacking a tool to exert more control over the bankers, especially when the bank engaged in risky activities such as underwriting.

Personal guarantees in security issuance were a solution to the lack of monitoring: it minimized the 'risky speculations' and thus reduced the need for the supervisory board to stay informed on all underwriting matters. Since 1910, the bankers were required to share the risk of the bank by underwriting part of the issuance based on the banks' guarantee. The secret minutes of the bankers' meetings provide some evidence on why this was required: in 1911, banker participation in 4% bonds of a colonial company was required because "it was not deemed desirable that the NHM would participate for more than$f.$ 100,000 in the syndicate."[18] Similarly, the bankers participated in an IPO of a newly established company in 1911 since "the exposure for the bank would have been too high otherwise".[19] That is, they had to follow a predetermined, discontinuous rule (step function) based on the bank's guarantee. The higher the bank guarantee, the higher the personal guarantee. The rule had certain cutoffs, and when the bank's guarantee would surpass a round number (e.g. $f.$ 2 million) the bankers' guarantee would jump up (e.g. from $f.$ 40.000 to $f.$ 50.000 for the president).[20]

Bankers' guarantees were assigned to all executives, regardless of their attendance at the meeting deciding on a specific security issuance.[22] President Cornelis Johannes Karel Van Aalst appears to have played a central role in these decisions. He was an authoritative figure both within the NHM and Dutch banking circles (De Graaf, 2012).[23]

Following Van Aalst's appointment in 1913, the number of syndicates jointly guaranteed by the bank the bankers increased rapidly. He remained in office until 1934, during which the supervisory board remained largely silent on the practice. Only after his resignation did the personal guarantees begin to raise concerns.

[17]NL-HaNA, NHM, 34: 9-11-1886 - 11-11-1886; 15-11-1887 - 17-11-1887.

[18]NL-HaNA, NHM, 2.20.01, 437: 30-01-1911, authors' translation.

[19]NL-HaNA, NHM, 437: 10-02-1911, authors' translation

[20]The supervisory board was likely not aware of the exact amounts and securities that the bankers guaranteed. The bankers provided biannual reports for the supervisory board in which they mentioned ongoing syndicates, but the details of the bank's underwriting were kept to a minimum. To whom the bank extended participations was unknown to the supervisory board, since the reports referred to these as 'friendly relations', 'sub-participants', or 'third parties'.[21] These friendly relations could also include the personal guarantees of the bankers. Still, it appears that the supervisory board implicitly approved this underwriting practice, as some of its members sporadically participated (De Graaf, 2012).

[22]The secret minutes list attendees, yet bankers' guarantees were allocated even to absentees

[23]According to banker Ernst Heldring, who would become president of the bank in 1939, Van Aalst had great power within the bank and the Netherlands, and only surrounded himself by followers and rather dependent businessmen. See Ernst Heldring (1970), *Herinneringen en dagboek*, e.g. p. 480, 530, 556, 623.

The system of personal guarantees appears to break down after the onset of the Great Depression. By 1931, only 6 of 24 underwriting instances were personally guaranteed by bankers (down from 30 of 49 in 1930), of which 4 were safe local government bonds (De Graaf, 2012).[24] This paper excludes the period after 1930 due to the lower number of underwriting opportunities and the choice of bankers to underwrite only relatively safe securities.[25]

Personal underwriting was not observable to other investors. The prospectus of each security issuance contained only information on the banks that were involved as underwriters (without revealing the exact exposure each bank had). However, it is possible that bankers among each other discussed their personal guarantees. Other 'insiders' could view personal guarantees as a signal for either quality of the security, or effort that the bankers would exert in order to maximize the probability of success of the issuance. In that way, personal guarantees could encourage market participants to invest, increasing the likelihood of issuance success. However, even if bankers revealed their exposure to others *ex ante*, the signal was not verifiable *ex post*. The guarantees and subscription rate to a security issuance is only known via the bank's secret minutes that have been made available to researchers nowadays. We therefore assume that the bankers could not influence the outcome of the security issuance by signaling their exact guarantees to investors.

2 Data description

2.1 Sources

We hand-collect data from the archival records of the NHM. The bank is the only large Dutch banks with nearly complete detailed records still available at the Dutch National Archives. Decisions regarding bank and personal guarantees of the NHM bankers are documented in detail in minutes of confidential board meetings ("secret minutes"), annual reports and security books. We hand-collect and enter this data on all underwriting

[24]The number of underwritten securities continued to drop to 13 in 1932 and 4 in 1933, with bankers exclusively using personal guarantees for government securities.

[25]In 1934, amid reorganization, the supervisory board formally requested an end to personal guarantees. Concerns resurfaced in 1936, as some bankers could no longer cover unsold securities. The supervisory board therefore proposed that the bankers should only engage in underwriting using escrow accounts: "managers should only be allowed to participate in syndicates if they would form a 'consortium' between themselves that should include paid-in capital, yearly balance sheets and profit and loss statements and which could pay out dividends to the managers, only after securing sufficient reserves". Some of the board members preferred to abolish personal underwriting altogether (De Graaf, 2012). The last recorded personal guarantees date from 1936. NL-HaNA, NHM, 37: 29-05-1934; 27-11-1936, authors' translation.

decisions from 1919-1930. We have information on the bank's position in the security issuance, underwriting fee, security characteristics, company characteristics, currency of the issuance, other syndicate members, sub-participants, (supervisory) board positions of the bankers at the respective firm, the success of the security and info on previous lending relations with the issuing firm. We analyze the data in their original currency, to keep the round numbers of both the bank and bankers' guarantees intact. We only scale Austrian Kronas (multiplied by 0.001) and British Pounds (multiplied by 10) to resemble their guilders value and avoid outliers. We rely on De Graaf (2012) and issuance prospectuses for interlocked directorates of the bank managers and for information on previous interactions with issuers.

Second, we retrieve additional data on underlying fundamentals of issuers from Van Oss' yearbooks and prospectuses over the same period 1919-1930. We hand-collect company balance sheet data and (local) government financial information of the year before the issuance. For firms we hand-collect total debt, equity, assets, capital, age of the firm, profitability, reserves and dividend ratio of the previous year. We try to resemble as much as possible the information that investors had available at the time of issuance by using only balance sheets and prospectuses of before the issuance. If information of the previous year is not available due to the issuance taking place early in the year, we use information of two years before the issuance. If Van Oss' yearbook reports the financial info of the holding company, we use the balance sheet of the underlying firm instead (if available). Note that we do not need to convert the firm balance sheet items to guilders, as we only use financial ratios and scale variables by total assets. For public institutions, we collect debt per capita and deficit (surplus) per capita. We use the currency of the reported information, and apply the exchange rate from prospectuses, or, if not available, the yearly guide to stock market prices ("Gids bij de Prijscourant") to convert the debt and deficit numbers into guilders.

2.2 Predetermined rule for personal guarantees

Bankers followed a rule for their personal guarantees in security underwriting, based on the bank's guarantee. The archival documents do not contain any information on how exactly this rule was agreed upon, yet the data shows a clear pattern. Figure A4 plots the observations of our main sample, where the bank is one of the lead underwriters. The personal guarantees are always a round number based on a fixed rule. We infer this function from the data by making use of the compensation ratios between the president, the directors and the secretary. The base salaries were divided according to a fixed ratio: the directors received 80% of the president's base salary, and the secretary received 50%. The directors also received 80% of the tantièmes that were paid out to the presi-

dent, and the secretary received 40%. Similarly, the directors often underwrote 80% of the president's guarantee, while the secretary underwrote 60%.[26] Figure A3 shows the observations where the bankers have exactly the fixed ratio.

Personal guarantees were a discontinuous fraction of the bank's guarantee. We infer the exact steps of the rule using several restrictions.[27] First, the steps cannot overlap: there exists discontinuities at specific bank guarantees. Second, the steps should be monotonic: bank and bank manager guarantees should increase for each step. Third, steps can only increase in size. That is, higher steps can cover a wider range of the bank's guarantee, but not a narrower range. Fourth, board connections should not determine the rule. Previous literature has pointed at the importance of interlocked directorates for bank performance. Board connections can lead to deviations from the rule as bankers might have more private information and/or private benefits. While we control for this in our regression analysis, the observations cannot be relied upon to determine the steps of the rule. Fifth, each step should contain at least two observations. Sixth, below $f.$ 150,000 the bankers do not underwrite, simply because the exposure for the bank is too small for personal guarantees.

Using the assumptions above gives two underwriting rules, as shown in Figure 3. After the banking crisis of 1921-1924, the bankers shifted to a different rule in October 1925. Compliance with the 1925-1930 (second) rule is higher compared to the 1919-1925 (first) rule. Moreover, the second rule has more gradual steps for bank guarantees below $f.$ 2 million. Several factors can explain this difference. First, the period 1919-1925 contains more domestic securities, while underwriting foreign securities dominated between 1925-1930. For foreign securities information on the quality of the issuance might have been limited, since the bankers were less likely to know the firms from previous interactions or interlocked directorates (which were all domestic management ties). The rule might have been adapted for this uncertainty by including smaller steps. Second, after the banking crisis many banks cut their management ties with non financial firms (Jonker and Van Zanden, 1995). Fewer interlocked directorates potentially affected the information the bankers were able to obtain before underwriting. The bankers could have demanded an adaptation of the rule to account for the now higher uncertainty. Third, the bankers' own income had substantially declined during the crisis period, with tantièmes in some years even approaching the low base salary. In 1925, an increase in the bankers' base

[26]The ratio between the directors and the president is constant across compensation and risk sharing. The secretary however differs in all three. In our sample, in 65% of the observations the secretary underwrites 60% of the president's guarantee, which is higher than the 40% of the president's salary that the secretary receives. For identification of the rule we only rely on the secretary for dubious cases.

[27]See Appendix Figure A3 for the observations that served as our starting point for determining the rule: mostly USD and Dutch guilder observations from 1926-1928. We use the fixed ratios 100-80-60% as starting points. From there, we expand the bins by using the restrictions mentioned here.

salary was approved by the supervisory board. Possibly the bankers were no longer able to underwrite the higher guarantees required by the first rule.

Bankers did not always adhere to the rule exactly. Deviations from the rule occur more often with domestic securities, especially when the bank has engaged in underwriting for the issuer before or when one of the bank managers has a interlocked directorate at the respective firm. Since we are interested in the effect of additional bankers' guarantees on bank risk-taking following an exogenous rule, we instrument the actual bankers' guarantee with the guarantee predicted by the rule. Figure A4 shows the deviations from the fixed 100-80-60% ratio that is used to determine the rule.

We exploit the discontinuities in the rule to examine when the bankers decide to underwrite relatively more. Demand for underwriting services is plausibly different at each discontinuity, as issuers differ both in funding capacity (based on fundamentals) and funding needs (growth opportunities). Similarly, the bank might face different financial and reputational risk when underwriting a larger vs. smaller issuance. The size of the issuance was an important factor for success. A larger issuance was considered substantially more risky than a smaller one (De Graaf, 2012). To compare observations that are arguably similar in funding demand and supply, we only compare observations in bins around each discontinuity. Each bin starts in the middle of a step of the rule, and ends in the middle of the next step. See Figure 4 for a visual example for some of the bins. For period 1 (1919-1925), the step function consists of 8 bins. For period 2 (1925-1930), the step function has 12 bins. We create 1 bin for both periods with only observations below $f.$ 50,000.[28] Using these bins, we can compare observations were the bank and the issuers had a similar position, keeping issuance size largely constant.

2.3 Summary statistics

The bank is active in underwriting 558 security issues from 1919-1930. We exclude observations where the exact bank guarantee or the success of the issuance is missing. We also exclude issues where the bank guarantee exceeds 5 million, since we cannot retrieve the rule used for bankers' guarantees due to their sparse and dispersed distribution. 317 of the 558 issues are participations, i.e. cases where the bank is not the lead underwriter but a member of the syndicate (62) or a sub-participant (255). Our main analysis contains the remaining 241 security issues where the bank is one of the leaders of the syndicate. Using all the bankers in our sample as individual observations provides us with 1407 observations. In our sample, 211 securities (1238 observations) feature personal guarantees of the bankers.

[28] Excluding this 'zero bin', which contains 23 observations, does not affect the results.

Table 1 displays the characteristics of the security issues by year. During 1922-1924, the banking crisis years, the underwriting business was practically absent. 1922 is the least active year with only 3 security issues. In the years after the banking crisis, the number of issues guaranteed by the bank increased to a peak of 43 in 1928. The other columns in the table show the yearly percentage of guaranteed issues that were stocks, foreign issuers, issued in Dutch guilders, (local) government issues and the percentage that was successful. From 1919-1920, in the post WWI years, the Amsterdam stock exchange saw a boom of domestic stocks being issued. This is reflected in the table, where more than 60% of the securities are stocks, all issued in Dutch guilders. Moreover, 100% (89%) of the securities are from domestic issuers in 1919 (1920). In the other years of our sample, the vast majority of the observations are bond issues. Especially after 1924, the share of foreign security issues dominates, even though still a substantial number is issued in the Dutch domestic currency, guilders. Foreign firms and governments often issued securities in multiple markets, where cross-border syndicates were set up and securities were listed on several exchanges (especially for very large issues). The securities listed on the Amsterdam Stock Exchange were in those cases sometimes issued in guilders. The successful issues vary over time, with a majority of securities fully subscribed in all years but 1922 (1 out of the 3 guaranteed by the bank), 1928 and 1929. The increasing number of relatively low quality issues (i.e. not fully subscribed) in 1928 and 1929 is some indication of the overheated stock market.

Table 2 shows the summary statistics for our sample. The average actual and predicted guarantees for bankers are both around 20,000 in the currency of issuance. The observations are mostly in guilders (58%) and dollars (28%). Predicted personal guarantees, determined by the rule, are slightly higher than the actual guarantees—mainly because in some cases, a guarantee was predicted but the banker did not participate. The bank guaranteed 34% in the average syndicate. In only 15% of the observations was the bank the only underwriter. The success of the issuance is defined as the number of securities that have been subscribed over the total number of securities available. 51% of the issues are fully subscribed or oversubscribed (60% have a subscription rate above 90%). The median issuance is fully subscribed, while the average is 26 times oversubscribed. The subscription rate of the issues is thus strongly skewed to the right, with some issues being more than 100 times oversubscribed. The bank and bankers always received the underwriting fee, irrespective of the success of the issuance. However, when the issuance failed, the bank and the bankers were liable pro rata up to their complete underwriting guarantee, depending on the severity of the failure. The log transformation of the subscription rate, where zero is full subscription, better reflects the upside and downside of underwriting (see Figure 5).

Only 3% of our sample are IPOs. All other issues are SEOs or bond issues. Other characteristics show that 17% of the observations in the sample have a lending relationship with the bank, and 15% have an interlocked directorate. Note that these two dummies are not collinear: the interlocked directorate applies only for half of the observations where the bank has a lending relationship with the issuer firm.

The other variables in Table 2 stem from firm balance sheets and public entities prospectuses, which were not available for the entire regression sample. Issuance/size is the total security issuance divided by the total assets of the firm in the year before the issuance. On average, firms issue 17% of their size in additional capital or debt. Some firms issue new capital or debt that is more than half their size (in the 99th percentile a firm's size would even double after the issuance). Reserves are on average 10% of assets in the previous year, while profit is 5% of total assets. The average firm in our sample is 25 years, and has twice as much debt as equity on its balance sheet in the year before the issuance. Debt makes up nearly half of total assets. Few (local) governments provide information on outstanding debt and budget surplus or deficit in the year before issuance. Outstanding debt is on average $f.$ 221.54 per capita, while budget deficits are $f.$ 0.37 per capita.

Next, we compare observations where the bank guarantee is just above or below a discontinuity in the rule. That is, we compare means around each threshold, using bin fixed effects. The balancing Table 3 collapses all observations to one dummy indicating whether the bank guarantee is above or below a discontinuity in a given bin. By design, the bank guarantee is naturally higher above the discontinuity, and this difference is statistically significant. The average actual personal guarantee is $f.$ 6,000 higher above a discontinuity, while the predicted personal guarantee is $f.$ 7,000 higher. This difference is due to the deviations from the rule and seem to suggest that if the bankers deviate, it is mostly above a discontinuity. Moreover, the dependent variable, log(subscription), is significantly higher for the observations above the discontinuity. The successful issuance dummy shows that 45% of issues were fully subscribed below the discontinuity, compared to 55% above the discontinuity. The success rate was thus 10 percentage points higher above the discontinuity.

All the other control variables do not significantly differ around the discontinuities. Above the discontinuity the underwritten securities are slightly more often bonds and issued in guilders. The number of bankers in our sample varies between 5 and 6 depending on the year. Below the discontinuities the number of bankers participating in underwriting is slightly below 5, due to issues where the bankers did not participate at all. This difference is not significant.

3 Empirical approach

We examine the relation between personal guarantees and the quality of the issuance, proxied by the investors' subscription rate. We are interested in analyzing whether the step function leads to higher personal guarantees for issues that have higher subscription rates ex post. Arguably bankers might self-select into issues that are of higher quality. That is, they might increase their relative exposure above and beyond the step function to issues that are ex post extremely well subscribed. Figure 6 shows suggestive evidence for this. Issues that were not fully subscribed (i.e. the logarithm of investors' subscription rate is below zero) had more personal guarantees below the step function. Similarly, issues that are more than fully saw more personal guarantees above the step function.

To address this concern, we use a two-stage least squares (2SLS) design, instrumenting the actual personal guarantee with the predicted guarantee implied by the step function. One could think of the IV interpretation as an approximate local average treatment effect (LATE). This approach isolates the exogenous variation in personal guarantees driven by the step function, allowing us to estimate its effect on the quality of the issuance.

The first stage of the 2SLS design estimates the relationship between the actual personal guarantee and the instrument, the predicted personal guarantee, as follows:

$$D_i = \beta Z_{i,d} + \Gamma' X_i + \eta_t + \zeta_b + \kappa_d + \tau_g + \epsilon_i \tag{1}$$

In the second stage, we regress the quality of the security issuance i on the instrumented personal guarantee:

$$Y_i = \beta \hat{D}_{i,d} + \Gamma' X_i + \eta_t + \zeta_b + \kappa_d + \tau_g + \tilde{\epsilon}_i \tag{2}$$

For our main regression analysis, the outcome variable Y_i is measured as the logarithm of the subscription rate. We use the logarithm of the subscription rate to ensure an approximate normal distribution of the dependent variable and to give more weight to under-subscription compared to over-subscription (see Figure 5). Our variable of interest is the instrumented banker guarantee $\hat{D}_{i,d}$ in thousands of the currency of issuance. Similarly, the instrument $Z_{i,d}$ is the predicted banker guarantee in thousands of the issuance currency. X_i is a set of controls: dummies for 1) stocks or bonds issuance, 2) public or private issuer 3) foreign or domestic 4) interlocked directorate 5) IPO and 6) bank lending relationship. We also control for the share of the bank guarantee in the syndicate. We include fixed effects for year t, banker d, industry g and importantly, bin b. The within-bin comparison of bankers' guarantees prevents bank guarantee size driving the

results. Using bin fixed effects, we compare issues above and below a discontinuity. With year fixed effects we compare issues within each year to avoid that the post-war boom and banking crisis period affect our results. We include industry fixed effects to control for unobserved heterogeneity in security issues by industry, such as industry-specific risks and capital needs. Since the personal guarantees varied by banker for the same issuance, we cluster standard errors by issuance and include individual banker fixed effects.

We run the same 2SLS estimation as in equation 1 and 2 for the president (van Aalst), director (Bierens de Haan) and secretary (Abbing) separately. These three bankers remained in their function throughout our period of analysis. We include the same control variables as before but use robust standard errors instead of clustered standard errors and exclude the banker fixed effects.

For our firm sample regressions, the dependent variable Y_i is either the logarithm of the subscription rate, the logarithm of the age of the company at the moment of issuance, the leverage ratio of total debt over total assets, the reserves over total assets or the profit over total assets, all in the year before the issuance. All the control variables remain the same as for our main specification, except that the public issuer dummy drops out, since the analysis only covers firms.

4 Results

In this section, we examine the relation between bankers' additional liability in underwriting and the quality of the security issuance. We are not claiming that personal guarantees affected the outcome of the security issuance, as these guarantees were not observable by the public. Instead, we analyze what type of securities bankers selected for their bank once they faced additional liability. We proxy for the quality of the issuer with the investor subscription rate to the issuance, with the idea that high quality securities are more subscribed to than lower quality securities.

4.1 Issuance subscription

Table 4 shows that bankers underwrite more for issues that ex post are more successful. Column 1 to 4 include all observations where the bank is one of the lead underwriters. Column 5 includes only observations where the bank is the first lead of the syndicate. The top panel displays the OLS results. Personal guarantees are associated with higher subscription rates and therefore higher quality issues. Column 1 shows that an additional 1,000 (guilders, dollars, etc.) of personal guarantee, within each bin and year, is

associated with a 2.7% higher subscription rate. The results are almost identical when we include industry fixed effects (column 2) and the coefficients increase slightly when we add director fixed effects (column 3). When including all fixed effects and controlling for the characteristics of the issuance, which is our most conservative estimation (column 4), the coefficient increases to 3.2%. However, the OLS results might be driven by cases where the bankers underwrite to their discretion and deviate from the step function for higher quality issues. We therefore instrument the actual banker guarantees with the predicted guarantees according to the step function.

The reduced form results in panel 2 indicate that the step function is associated with higher quality issuance, i.e. the higher predicted personal guarantees, the higher the subscription rate of the issuance. The coefficients of column 1 - 4 remain significant but are slightly lower than the OLS results, ranging between 1.5% and 2.2%. The significance of the coefficients in the reduced form provides a first indication that the intent-to-treat is relevant for the actual treatment.

The results of the first stage, displayed in the last panel, confirm the relevance and strength of the instrument. The instrument is highly significant and stable in all four columns with a coefficient of around 0.8. Moreover, the F-statistic is sufficiently large, as it is above 50 in all four columns.

The second stage results can be interpreted as an approximate local average treatment effect (LATE). The effect of the compliers (second stage IV), i.e. the bankers that follow the rule, is slightly lower than the OLS estimates but is stronger than the reduced form estimates. An additional $f.$ 1,000 in instrumented personal guarantees is associated with a higher subscription rate of 2.7% in our most stringent estimation (column 4). This implies that when the bankers followed the rule, they increased their own and their bank's exposure only for higher quality issues.

The effect of additional banker underwriting is statistically and economically significant. The median subscription rate is 100%. The average banker guarantee was approximately $f.$ 20,000, with a standard deviation of $f.$ 21,000 (or any other currency of issuance). Within each bin, the jump at the discontinuity was at least $f.$ 1,500 in the first bin, and at most 50,000 for the last bin. An additional $f.$ 1,000 in personal guarantees is thus comparable to the lowest possible discontinuity in predicted guarantees.[29] The average jump at a discontinuity is $f.$ 6,000. In our most stringent estimation 4, an increase from the median personal guarantee to the 75^{th} percentile (around $f.$ 12,000) is associated with

[29]Most securities were issued at par (Figure A1)

a 38 percentage point higher subscription rate. Compared to the median subscription rate of 100%, this effect is substantial.[30]

Large, prestigious banks with a long-standing reputation - like the bank of our analysis - might especially avoid all activities that could affect their reputation. A bank's reputation is especially at stake in underwriting due to the visibility of a bank's involvement in a security issuance. Issuer prospectuses include a list of all the names of the lead underwriting banks. The first name on the list signals the leader of the syndicate to the outside world.[31] In column 5 we test whether the effects are stronger if the bank is the first lead of the syndicate. The bank is the first lead in 70% of our observations. The OLS results are similar to the full sample, but the coefficients of the reduced form and IV estimates (both significant at 1%) are much larger compared to both the OLS results and the full sample results. When the bank is the first lead, an additional $f.$ 1,000 of personal guarantees leads to bankers selecting securities that have an approximate 5% higher subscription rate, almost twice the size as for our full sample. The personal guarantees are thus especially effective when the bank's reputation is most at stake.

We prefer to include all bankers in our estimations to ensure that we have enough power. The downside of this approach is that we repeat the same dependent variable values 5 to 6 times for each banker. We cluster our standard errors on the issuance level to address this concern, but we can also analyze the bankers' guarantees individually. We do so in Table 5 for the president (Van Aalst), one director (Bierens de Haan), and the secretary (Abbing). Only these three bankers are present throughout the sample. Table 5 shows that the results are similar to the full sample analysis and for the OLS even increase in magnitude for the director and the secretary. The OLS coefficient for the president remains comparable to the baseline regression. The reduced-form estimates in panel 2 show that the instrument is borderline significant for all individual directors, potentially due to a lack of power from only 239 observations. As before, the first stage is highly significant, but the F-statistic is much lower. The coefficients of the second stage results are higher compared to the OLS for the individual directors. Less precise estimates due to low power are often stronger for IV regression. The results for IV estimation are significant only on 10% level. We therefore prefer to focus on all bankers for the IV estimation as it yields a substantially higher first-stage F-statistic, indicating a stronger instrument and greater statistical power.

[30]From p50 to p75: +12,000 banker's guarantee implies 12 x 0.027 = 0.208 log(subscription) = 0.324 $\approx$ 38 p.p. higher subscription rate

[31]NL-HaNA, NHM, 5956.

4.2 Ex ante riskiness

Quality of the issuance might be unrelated to fundamentals. To test this, we compare the distribution of ex ante risk measures for successful and unsuccessful issues. Similar to Legierse (2023), we argue that older firms are safer, since there is more information available that investors can use to determine the value of the firm. Firms that are more leveraged are riskier, while firms with higher reserves (weighted by total assets) have more buffers and can be considered less risky. The relation between riskiness and profitability of the firm might be ambiguous due to several factors, such as growth opportunities, sensitivity to manipulation by firm executives and external factors such as a banking crisis. We use firm balance sheet information of the year before the issuance to compare the security's issuance quality with firm financial quality. This information is published in books and prospectuses that were publicly available for investors. Focusing only on firms shrinks our sample to 835 observations. Figure 7 shows the kernel densities for 4 balance sheet variables: debt over total assets, firm age (log at the moment of issuance), reserves over total assets and profit over total assets. Firms with successful issues have on average less leverage, more reserves and higher profits. They are relatively older than firms with unsuccessful issues.

We analyze other risk measures for public institutions, for which we have 308 observations. The most available measures for our sample are debt and deficit of the year before. Figure 8 shows the distribution of public debt and budget deficit (surplus) by success of the issuance. Both public debt and budget deficit (surplus) are divided by the population of the respective institution. Public debt per capita is slightly higher for unsuccessful issues. Similarly, budget deficit (surplus) is lower (higher) for issues that are ex post successful. The differences however appear to be minimal, which might be due to the smaller sample size.

Table 6 repeats the mean comparison exercise from Table 3, but only for the firms for which we have all the financial information. It shows the mean of firm balance sheet variables above and below the discontinuities, clustered by issuance and with bin fixed effects. Again, the bank and personal guarantees (both actual and predicted) are significantly higher above the discontinuity. Interestingly, the actual personal guarantee both above and below the discontinuity is comparable to the baseline sample, but the predicted personal guarantee is much lower below the discontinuity. This implies that the firm sample consists of relatively smaller issues, especially below the discontinuities. In practice, the bankers appear to have guaranteed more than the step function would predict below discontinuities. On average, firms below the discontinuity successfully issue securities 39% of the time, compared to 57% above the discontinuity. This difference is nearly twice as large compared to our full sample. Observations above the discontinuity

consist for 58% of foreign firms, compared to 49% below. This difference is statistically significant and we control for it with a foreign dummy in the regression analysis. All balance sheet items are not significantly different around the discontinuities, though the mean above the discontinuities is slightly higher for firm reserves. Leverage is lower for firms above the discontinuity, especially for debt over equity.

We examine the relation between personal guarantees and firm-level risk characteristics in Table 7. Due to the smaller sample, we likely do not have enough power for statistical significance. We use our main specification in column 1 to test whether the results hold for the firm sample only. The coefficients of the OLS, RF and IV are all larger compared to the main specification. The first stage F-statistic is sufficiently large and higher compared to the same specification for our main sample. Bankers have increase bank and thus personal guarantees for higher-quality issues, and this result is mainly driven by firms. Column 2 shows that the logarithm of firm age is positively associated with the personal guarantee, but the effects are small and not statistically significant. Column 3 shows that personal guarantees are negatively associated with firms leverage. This suggests that within each bin, bankers reduce their and their bank's exposure to firms that are highly levered, though this effect is not significant. The instrumented banker guarantee is positively associated with reserves (column 4) and profits (column 5), yet the coefficients are small: an additional 1,000 in personal guarantees is associated with firms with 0.170 (0.042) percentage points higher reserves (profits) over total assets.

4.3 Robustness

Since we cannot be certain that the step function found in the data was the true rule that the bankers followed, we test whether the step function is outperforming any arbitrary rule. That is, we test formally whether randomly drawn observations would follow the same pattern as observed in our data. Absent a systematic rule, our step function would not result in significantly lower MSEs than many random counterfactual datasets. To test this, we create 10,000 counterfactual banker guarantees for the median banker, without imposing any rule. The counterfactual banker guarantees are derived randomly from the error term of the bank guarantee. We take into account the non-normal distribution of the errors from a linear regression of banker guarantees on bank guarantees and impose this distribution on our counterfactual datasets. We obtain 10,000 counterfactual datasets for which we cluster the bank and banker guarantees based on the number of bins used in our dataset, i.e. 8 for 1919-1925 and 12 for 1925-1930. These clusters in our counterfactual datasets form the counterfactual step functions. We cluster using 3 approached: 1) without any restrictions, 2) with imposing monotonicity of the rule and 3) with monotonicity of the rule and increasing bin size. We compute the mean squared er-

ror (MSE) of each counterfactual dataset and compare these with our own MSEs of both step functions. Figure 9 shows that our step functions for both periods are not random. For the first(second) period, it outperforms the counterfactual step function 97% (95%) of the time.[32] See appendix A2 for more details on the computation of counterfactual step function.

5 Conclusion

This paper analyzes the effect of bankers' personal guarantees on bank risk-taking in security underwriting. We exploit a setting at a Dutch universal bank in the 1920s where bankers had additional personal guarantees in their bank's underwriting activities. Underwriting was risky at the time, with 50% of issues not being fully subscribed to. Bankers chose whether and how much the bank should underwrite a security issuance and thus directly influenced the bank risk in underwriting. The bankers faced additional liability as they had to personally guarantee part of the issuance, pre-determined by the bank guarantee. Personal guarantees were based on a step function with cutoffs around certain round numbers. We show that both bankers and the bank itself increased their guarantees for higher quality issues, indicated by higher investor subscription rates. The subscription rate is a measure of ex post quality and is correlated with with ex ante riskiness measures, such as firm leverage, reserves and firm age. Moreover, the bankers have higher personal guarantees for higher quality issues, especially in syndicates where the bank is the first lead, indicating that the system worked better when the reputation of the bank was most at stake. Our findings seem to suggest that additional liability, directly tied to bankers decisions, can improve bank risk-taking.

[32]Since imposing monotonicity and increasing bins constraints lowers the chance of obtaining an actual step function, we allow 2 attempts for approach 1), 20 attempts for 2) and 200 attempts for 3). If within these attempts a counterfactual step function cannot be found, we consider the MSE of that dataset to be higher than our own step function.

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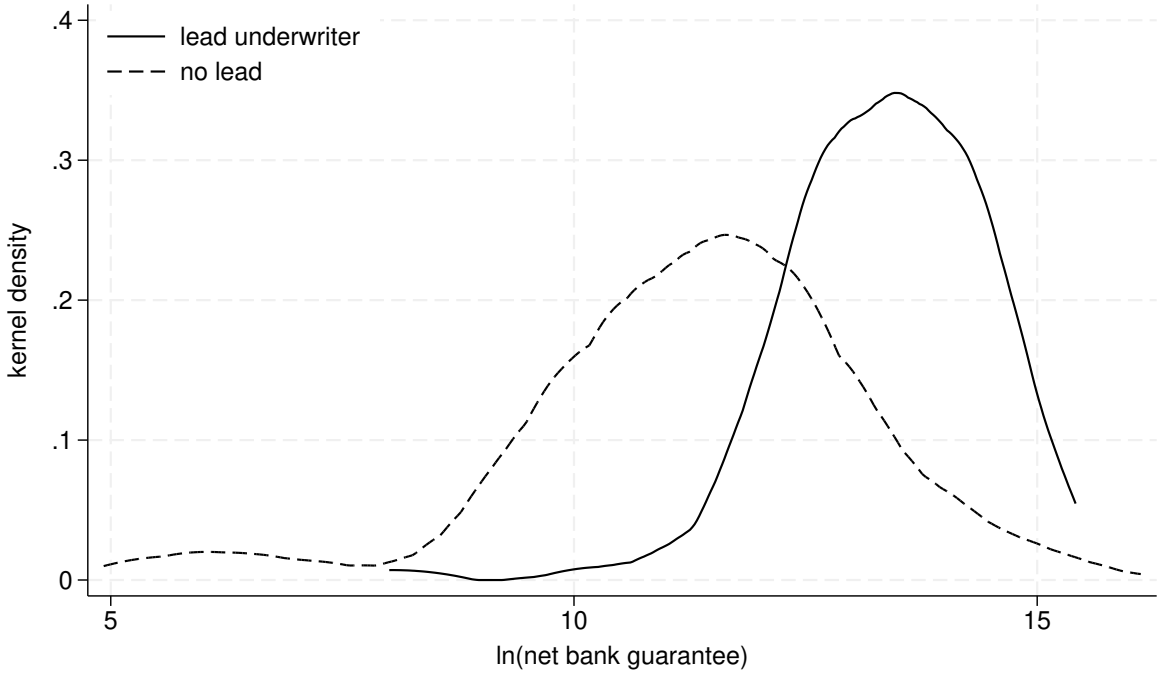
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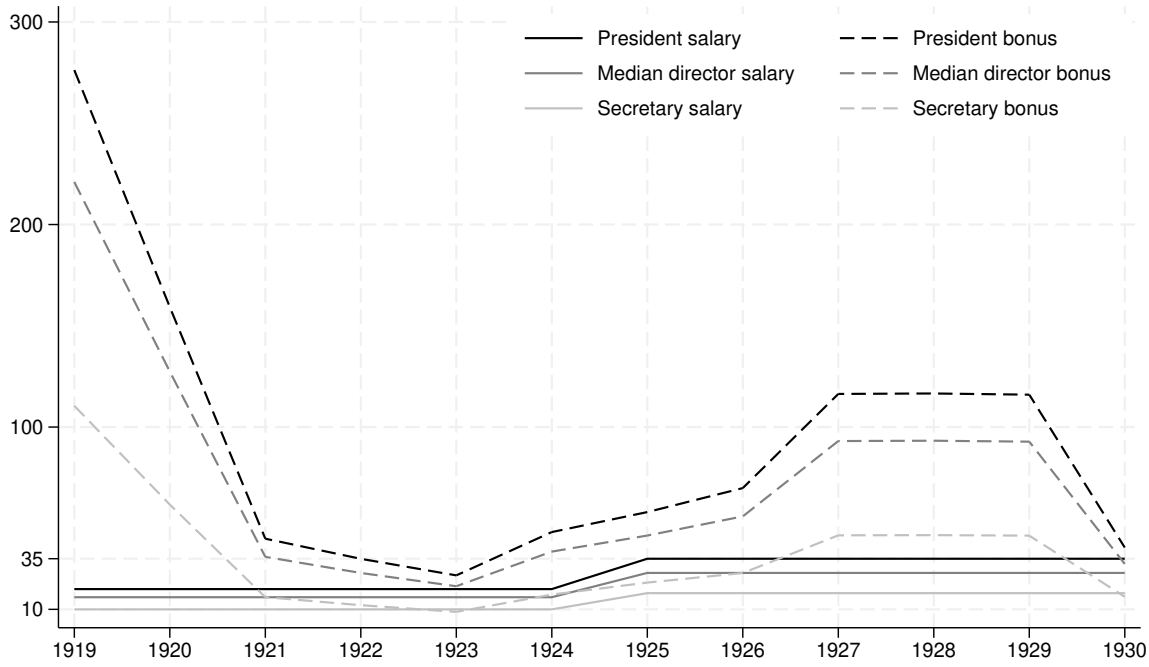
Figures

Figure 1: Distribution of bank's guarantee, by lead underwriter



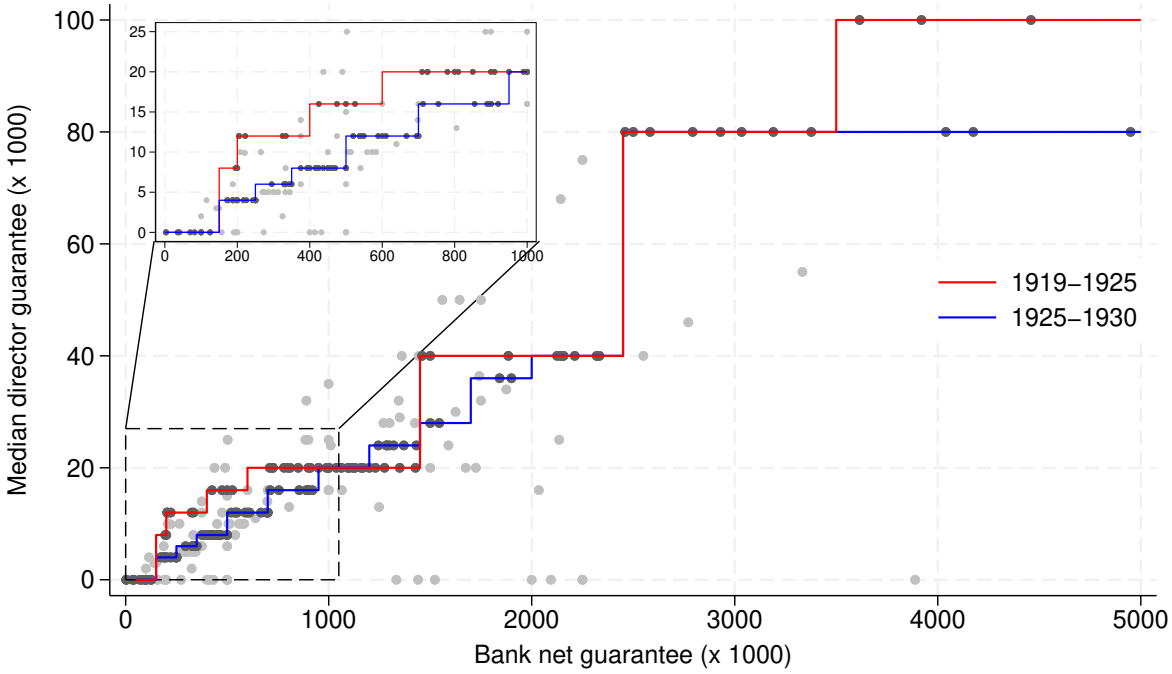
Note: This figure shows the kernel density of the natural logarithm of bank's guarantee in security issues. The solid line reflects the observations where the bank is one of the lead underwriters, while the dashed line represents the observations for which the bank is a participant in the syndicate. The densities include all observations below 5 million net bank's guarantee in the currency of issuance.

Figure 2: Banker compensation 1919-1930



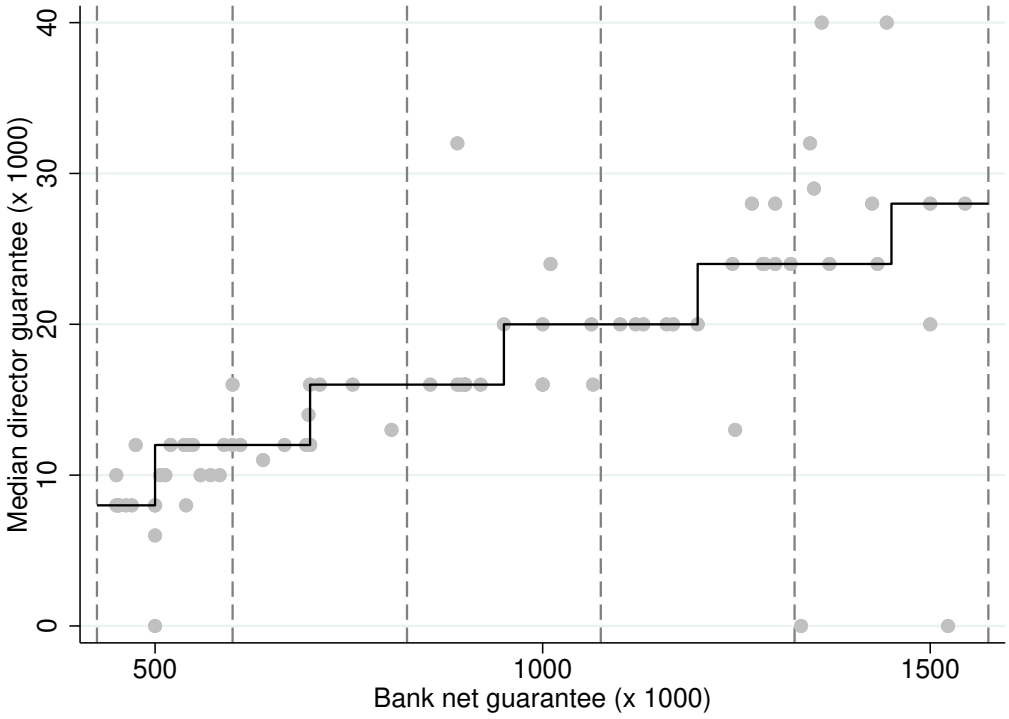
Note: This figure displays the annual salaries (solid lines) and tantièmes (dashed lines) for the president (black), median director (mid grey) and secretary (light grey). The base salaries range from $f.10.000$ to $f.35.000$ guilders in our sample period. The annual salary for the president is $f.20.000$ from 1919-1924, $f.35.000$ thereafter. For the directors, $f.16.000$ from 1919-1924, $f.$ 28.000 thereafter. For the secretary: $f.10.000$ from 1919-1924, $f.18.000$ thereafter. Directors enter and exit throughout the years, leading to pro rata salaries. The figure shows the 'median' director to display the compensation over a full year of a bank director. Amounts in thousands of guilders.

Figure 3: Bank and bankers' guarantee



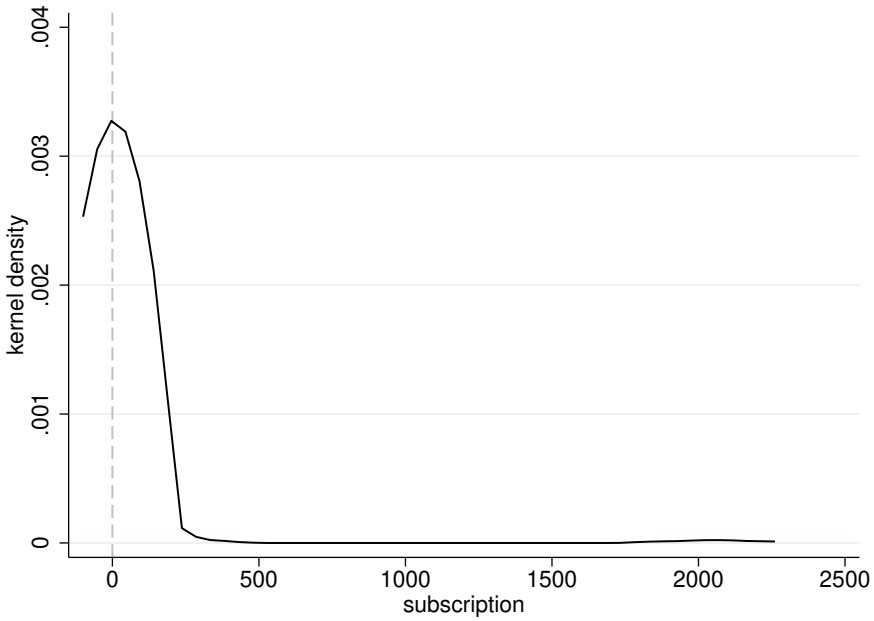
Note: This figure shows the predicted guarantee of the median director. The red line reflects the 1919-1925 step function, the blue line is the 1926-1930 step function. Throughout our period of analysis the directors of the bank alternate and consist of either 3 or 4 persons (excluding president and secretary). The median director is based on 1) the one director that is present in the sample throughout the period (Jacob Bierens de Haan) and 2) is corrected for deviations by one of the bank directors. That is, if this bank director underwrote a different amount than other directors, we use the median value of the directors. Bank and banker guarantees are in thousands of currency of issuance. Includes only observations where the bank is one of the lead underwriters. Bank guarantee is displayed in levels.

Figure 4: Within bin comparison

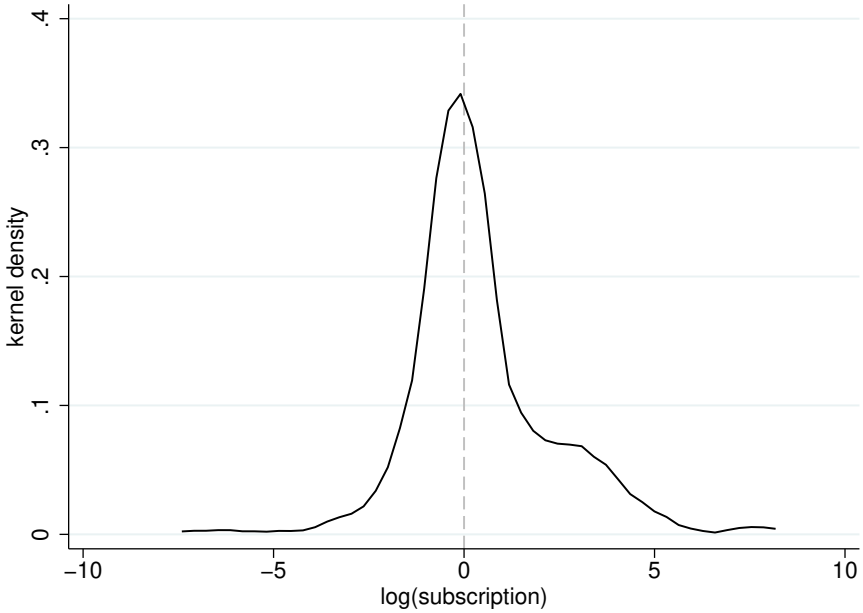


Note: This figure provides an example of some of the bins used in our regression analyses. We use bin fixed effects to compare observations within a bin, where the bank's guarantee is relatively similar while the banker's guarantee jumps around the discontinuity. The banker's guarantee displayed here is the median director's guarantee. The figure zooms in into 5 bins in the bank's guarantee range of 450.000 - 1.575.000. Each bin is defined from one middle point of a step until the next middle point. Vertical grey dashed lines reflect bin borders. The solid black line is the step function for 1926-1930. Bank and banker guarantee are thousands of the currency of issuance. Includes only observations where the bank is one of the lead underwriters.

Figure 5: Distribution of subscription rate of issuance



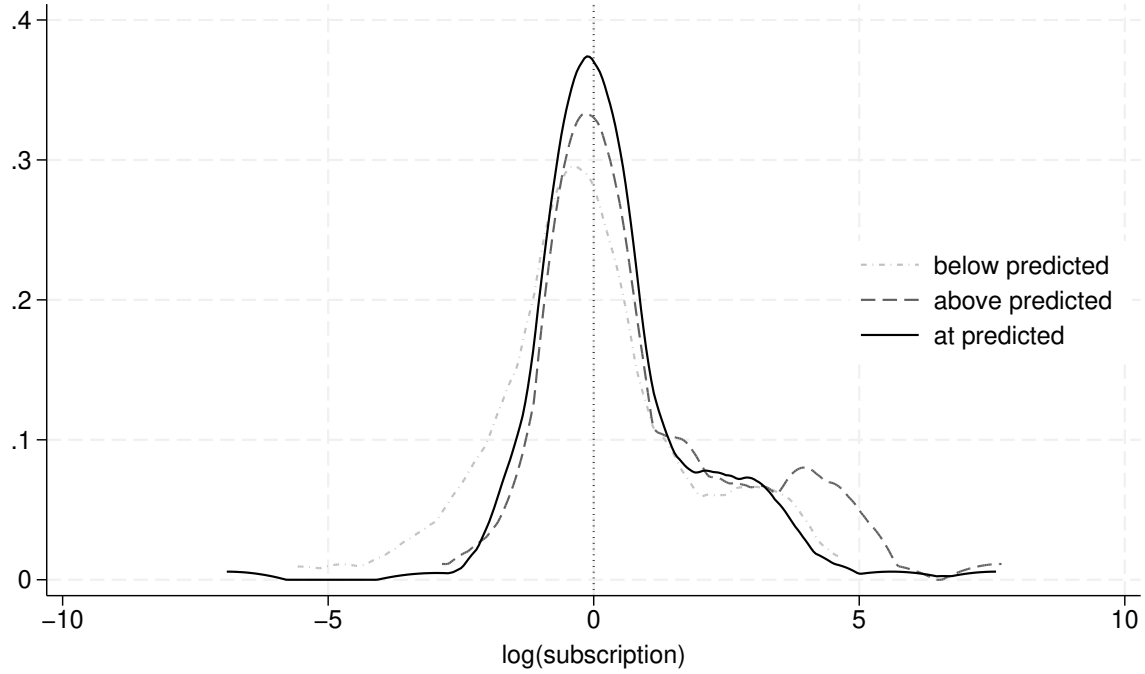
(a) Times subscribed to issuance



(b) Log(subscription rate) of issuance

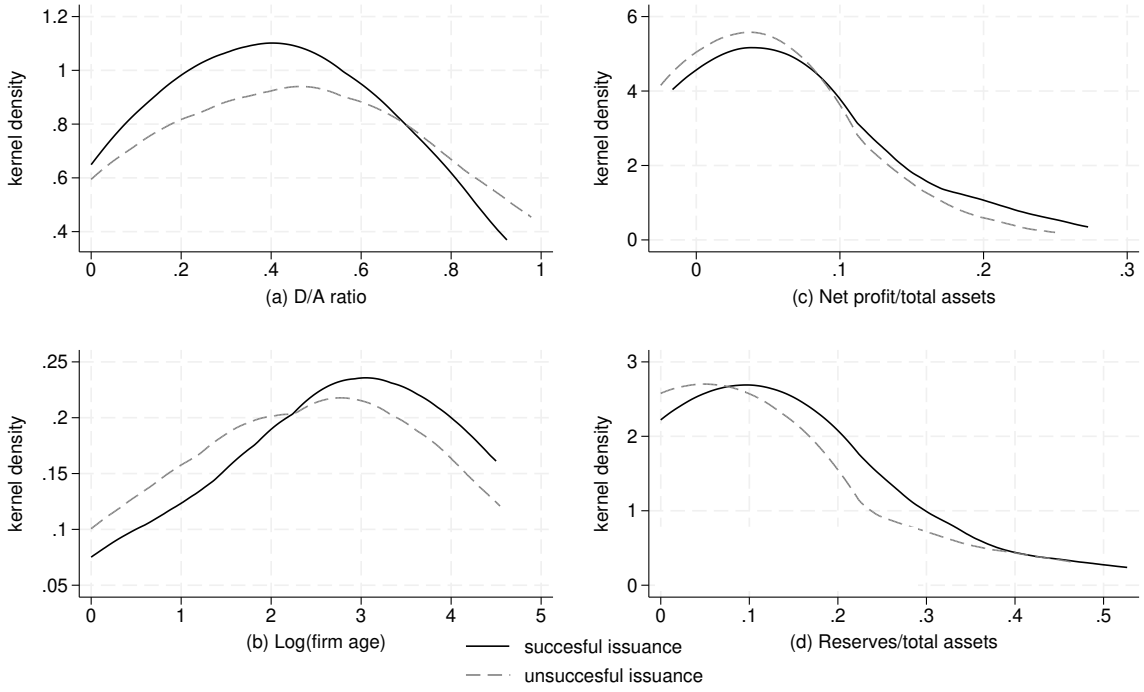
Note: The panels in this figure display the kernel density of our main dependent variable, the subscription rate. Panel (a) shows the actual subscription rate as ratio of the total securities outstanding at the security issuance. In this case, 1 means that the issue is fully subscribed. Panel (b) shows the log transformation of the subscription rate, where 0 means that the issue is fully subscribed. Both panels include all observations where the bank is one of the lead underwriters and the bank's guarantee does not exceed 5 million in the currency of issuance.

Figure 6: Banker guarantees and subscription to the issuance



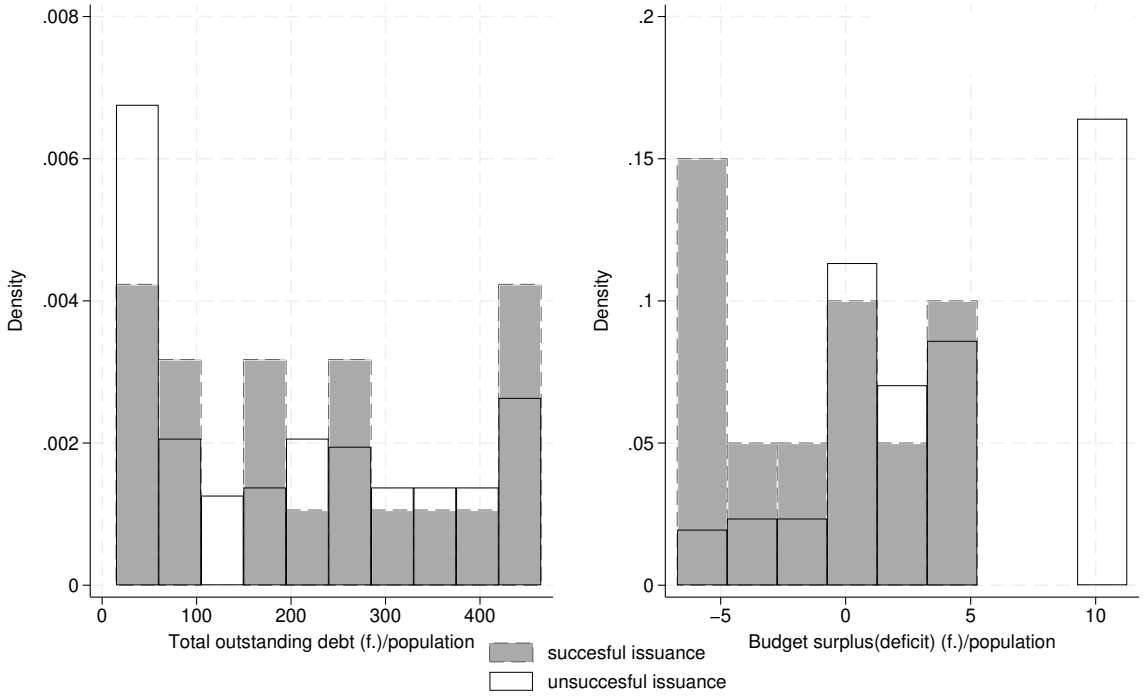
Note: This figure shows the kernel density of success of the issuance as log(subscription) for different sorts of bankers' guarantees. The solid line represents the issues where the bankers underwrite exactly the predicted amount. The dashed (dotted) line shows issues where the bankers' guarantees are higher (lower) than predicted. All mass right of the zero line is oversubscribed; all mass left of the zero is undersubscribed. Includes only observations where the bank is one of the lead underwriters and the bank's guarantee does not exceed 5 million in the currency of issuance.

Figure 7: Ex ante firm risk measures



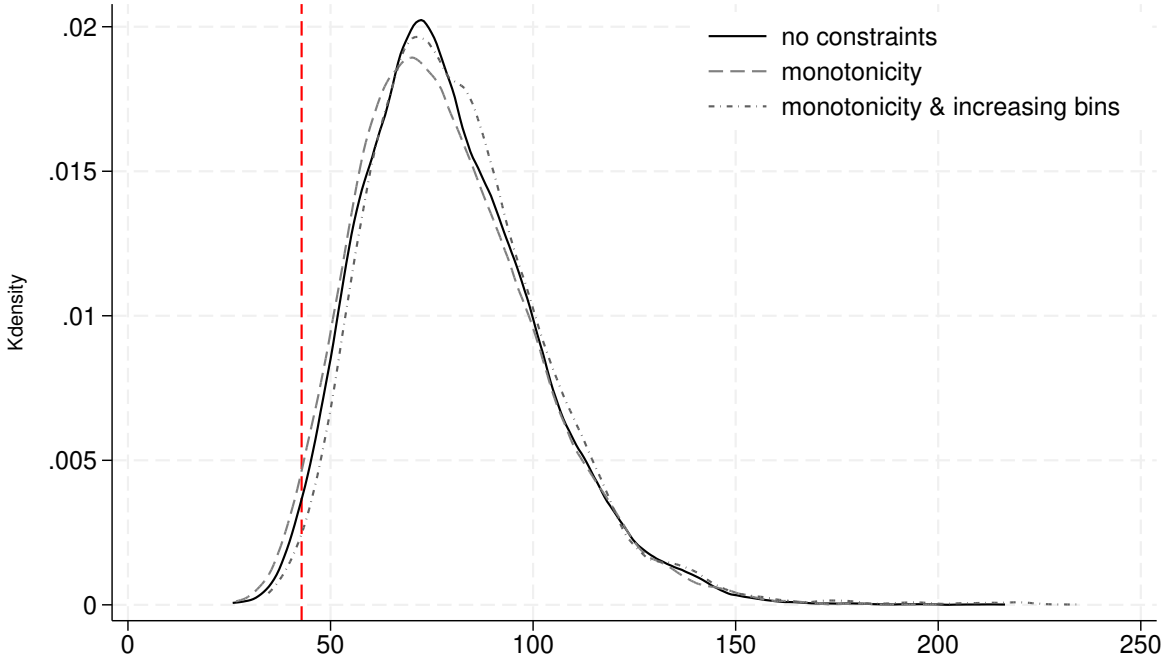
Note: The panels of this figure show the kernel density of balance sheet variables for issuing firms, split in security issues that were successful (solid line) versus issues that were not fully subscribed (dashed line). We consider every issuance above 90% subscription as successful. Panel (a) shows total debt over total assets of the issuing firm at the year before issuance. Panel (b) shows the logarithm of the age of the firm at the time of issuance (where all firms from 0-12 months are coded as age 1). Panel (c) displays the total reserves over total assets of the firm in the year before the security issuance. Panel (d) displays the profits (or losses) of the firm over total assets in the year before the issuance. All data are (balance sheet) information in the prospectus published before the security issuance, or if missing from 'Van Oss' Effectenboek' firm financial information book in the year of the issuance. All panels include only observations where the bank is one of the lead underwriters and the bank's guarantee does not exceed 5 million in the currency of issuance.

Figure 8: Ex ante public institutions risk measures

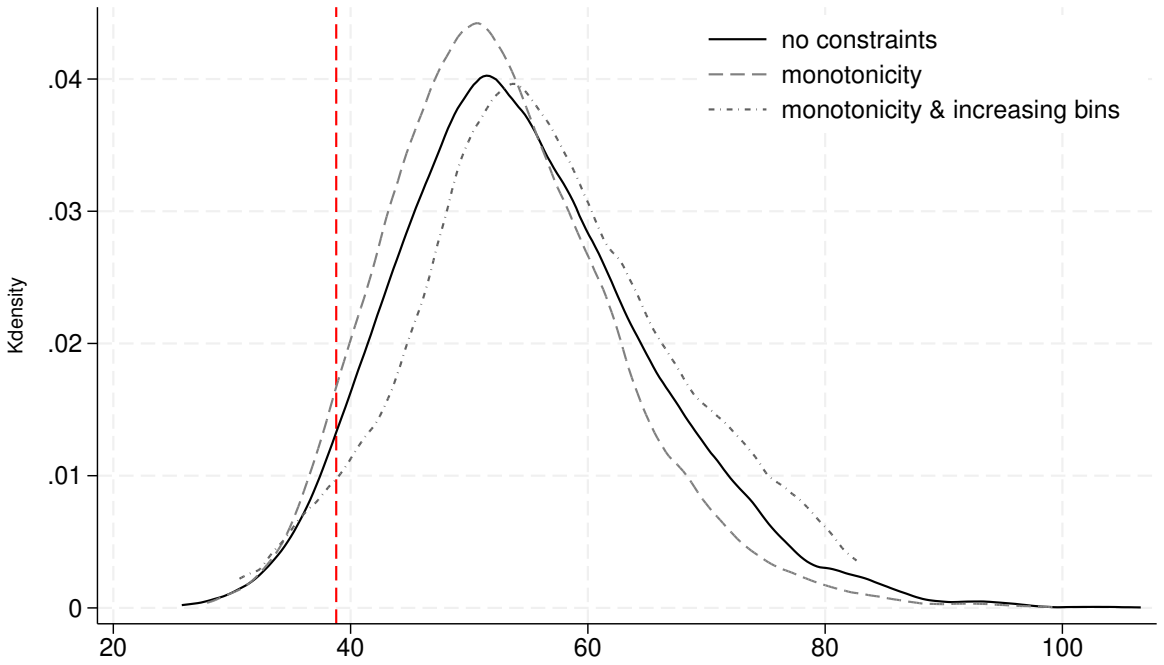


Note: The panels of this figure show the histograms of issuing (local) government's debt and deficit, split in security issues that were successful (solid black) versus issues that were not fully subscribed (dashed grey). We consider every issuance above 90% subscription as successful. Panel (a) shows total debt over the population of the respective government in the year before the issuance. Panel (b) displays the public surplus (deficit) of the (local) government in the year before the issuance, weighted by the population. Both variables are winsorized at 10% for visibility. All data are based on information in the prospectus published before the security issuance, or if missing from 'Van Oss' Effectenboek' in the year of the issuance. All panels include only observations where the bank is one of the lead underwriters and the bank's guarantee does not exceed 5 million in the currency of issuance.

Figure 9: Mean squared error distribution of counterfactual step functions



(a) Step function 1: 1919-1925



(b) Step function 2: 1925 - 1930

Note: The panels of this figure show the kernel density of mean squared errors of counterfactual step functions for period 1 (Panel (a)) and period 2 (Panel (b)). The vertical dotted line reflects the mean squared error of the step functions inferred from our data and used for the analysis. The solid line reflects the MSE distribution of counterfactual step functions without any imposed restrictions (N = 10,000 for both periods), the dashed line for step functions includes a monotonicity restriction (N = 9,987 for period 1 and N = 9,705 for period 2), and the dash-dot line includes both monotonicity restriction and requires non-decreasing bin size of the step function (N = 6,981 for period 1 and N = 508 for period 2).

Tables

Table 1: Overview of yearly security issuances guaranteed by the bank

Year	N	Stocks (%)	Foreign (%)	Guilders (%)	Government (%)	Successful (%)
1919	17	64.71	0.00	100.00	35.29	70.59
1920	18	61.11	11.11	100.00	22.22	61.11
1921	12	16.67	8.33	91.67	8.33	66.67
1922	3	33.33	33.33	100.00	33.33	33.33
1923	6	16.67	16.67	100.00	33.33	66.67
1924	6	16.67	50.00	66.67	83.33	83.33
1925	17	0.00	58.82	58.82	64.71	82.35
1926	27	14.81	70.37	48.15	37.04	74.07
1927	38	7.89	84.21	36.84	52.63	57.89
1928	43	25.58	72.09	41.86	30.23	46.51
1929	21	28.57	80.95	33.33	33.33	38.10
1930	33	6.06	78.79	60.61	18.18	54.55

Note: This table provides an overview of the security issues guaranteed in our main regression sample. The second column is number of unique bank guarantees. The other columns display the percentage of the security issues that were in stocks, from foreign issuers, in the domestic currency (guilders), (local)government and the percentage of issues that has been successful. It includes only the observations for which the bank is the one of the lead underwriters and where the total bank guarantee does not exceed 5 million in the currency of issuance.

Table 2: Summary Statistics

	Mean	SD	P1	P50	P99	N
Bank guarantee (x1000)	987.84	911.98	35.00	695.00	4175.00	1407
Actual banker guarantee (x1000)	20.06	21.77	0.00	13.00	100.00	1407
Predicted banker guarantee (x1000)	20.50	21.31	0.00	15.00	100.00	1407
Share of bank in syndicate (%)	0.34	0.25	0.08	0.25	1.00	241
Log(subscription)	0.43	1.85	-4.03	0.00	5.61	241
Times subscribed	25.42	188.30	0.02	1.00	273.42	241
Successful issuance dummy	0.60	0.49	0	1	1	241
Fully subscribed	0.51	0.50	0	1	1	241
Public sector dummy	0.36	0.48	0	0	1	241
Foreign dummy	0.59	0.49	0	1	1	241
Guilders dummy	0.59	0.49	0	1	1	241
Interlocked directorate dummy	0.15	0.36	0	0	1	241
Equity dummy	0.22	0.42	0	0	1	241
IPO dummy	0.03	0.17	0	0	1	241
Main bank dummy	0.17	0.37	0	0	1	241
First lead	0.70	0.46	0	1	1	241
Issuance/size	0.17	0.59	0.00	0.05	0.98	210
Age of firm at issuance	24.71	25.13	1.00	17.00	94.00	152
Reserves/total assets	0.10	0.12	0.00	0.05	0.50	167
Profit/total assets	0.05	0.06	-0.02	0.03	0.27	167
Leverage (D/A)	0.47	0.45	0.00	0.41	2.71	167
Leverage (D/E)	2.05	4.91	0.00	0.67	23.54	142
Public budget surplus (f)/population	-0.53	13.45	-42.93	0.77	15.61	35
Outstanding public debt (f)/population	228.02	198.51	5.14	196.04	683.87	54

Note: This table reports summary statistics for the main regresssion sample where the bank is one of the lead underwriters and the total bank guarantee does not exceed 5 million in the currency of issuance. The first three variables are reported on the banker-issuance level. All other variables are reported at the issuance level. Bank guarantee is the net guarantee of the bank, after extending amounts to syndicate members or sub-participants (excluding the bank's bankers). Share (%) of bank in the syndicate is the bank's guarantee divided by the total syndicate guarantee. Log(subscription) is the logarithm of the number of securities subscribed by market participants over the total of issued securities. If the issuance was fully subscribed, the log(subscription) is zero. Times oversubscribed is the number of times an issuance has been subscribed to. Successful issuance dummy is equal to 1 if the subscription rate was above 90%. Full subscription is a dummy that equals one if the subscription rate is 100% or higher. Dummies equal 1 (0) if public (private) sector security, foreign (domestic), issued in domestic (foreign) currency, one of the bankers has an interlocked directorate, dummy for stocks (bonds), dummy for IPOs, dummy if the bank is the main lender of the firm and a dummy if the bank is the first lead of the syndicate. Firm level variables have fewer observations, since the sample is also made up of (local) governments. Issuance/size is the total security issuance amount of the firm over its total assets measured in the year before. Reserves, profit and leverage are all weighted by total assets in the year before issuance. Leverage (D/E) is total debt weighted by total equity. The last two rows shows summary statistics for issuing (local) governments. Both outstanding debt and budget surplus(deficit) are in guilders and are weighted by the population in the year before the issuance.

Table 3: Balancing table

Variable	(1) Below discontinuity Mean/(SE)	(2) Above discontinuity Mean/(SE)	(1)-(2) Pairwise t-test Mean difference
Bank guarantee (x1000)	926.058	1047.125	-121.067***
	(87.766)	(78.871)	
Actual banker guarantee (x1000)	16.997	23.009	-6.012***
	(1.816)	(1.962)	
Predicted banker guarantee (x1000)	16.842	24.089	-7.247***
	(1.702)	(2.010)	
Log(subscription)	0.163	0.700	-0.538*
	(0.139)	(0.189)	
Fully subscribed	0.451	0.556	-0.104
	(0.046)	(0.045)	
Share of bank in syndicate	0.348	0.341	0.007
	(0.023)	(0.023)	
Public sector dummy	0.360	0.361	-0.001
	(0.045)	(0.044)	
Foreign dummy	0.585	0.597	-0.013
	(0.046)	(0.045)	
Guilders dummy	0.556	0.607	-0.051
	(0.046)	(0.044)	
Interlocked directorate dummy	0.132	0.166	-0.034
	(0.031)	(0.034)	
Equity dummy	0.248	0.198	0.050
	(0.040)	(0.036)	
IPO dummy	0.017	0.042	-0.024
	(0.012)	(0.018)	
Main bank dummy	0.170	0.164	0.005
	(0.035)	(0.034)	
First lead	0.679	0.726	-0.046
	(0.043)	(0.040)	
Number of bankers	4.865	5.440	-0.575
	(0.206)	(0.141)	
Observations	689	718	1407
Clusters	118	123	241

Note: This balancing table shows the means of the observations of our main regression sample below and above the discontinuities, collapsed to one level. Column 1 (2) reports the mean and standard deviation of observations below (above) each discontinuity. The pairwise t-test, displayed in the last column, includes bin fixed effects. Observations are clustered by issuance. Log(subscription) is the logarithm of number of securities subscribed to over the total outstanding in the issuance. Bank guarantee is the net guarantee of the bank, after extending amounts to syndicate members or sub-participants (excluding the bank's bankers). Log(subscription) is the logarithm of the number of securities subscribed by market participants over the total of issued securities. If the issuance was fully subscribed, the log(subscription) is zero. Full subscription dummy is equal to 1 if the subscription rate was equal to or above 100%. Share (%) of bank in the syndicate is the bank's guarantee divided by the total syndicate guarantee. Dummies equal 1 (0) if public (private) sector security, foreign (domestic), issued in domestic (foreign) currency, one of the bankers has an interlocked directorate, dummy for stocks (bonds), dummy for IPOs, dummy if the bank is the main lender of the firm and a dummy if the bank is the first lead of the syndicate. The number of bankers reflects the number of bankers personally underwriting in each issuance. This number varies over time due to the different number of bankers in the sample. It is included here to show that the number of bankers in the firm varied between 5 and 6. The table only includes observations for which the bank is one of the lead underwriters and where the total bank guarantee does not exceed 5 million in the currency of issuance.

Table 4: Bankers' guarantees and success of issuance, with fixed effects

	(1)	(2)	(3)	(4)	(5)
		(Co)-lead in syndicate			First lead
			OLS		
Actual banker guarantee (x1000)	0.027***	0.027***	0.029***	0.032***	0.032***
	(0.007)	(0.007)	(0.008)	(0.008)	(0.009)
R^2	0.188	0.261	0.264	0.286	0.301
			RF		
Predicted banker guarantee (x1000)	0.015*	0.015**	0.019**	0.022**	0.037***
	(0.007)	(0.007)	(0.009)	(0.010)	(0.013)
R^2	0.158	0.235	0.236	0.256	0.284
			IV 2nd stage		
Actual banker guarantee (x1000)	0.017**	0.017**	0.023**	0.027**	0.049***
	(0.008)	(0.008)	(0.011)	(0.012)	(0.016)
R^2	0.033	0.033	0.040	0.070	0.084
			IV 1st stage		
			Actual banker guarantee		
Predicted banker guarantee (x1000)	0.882***	0.890***	0.835***	0.814***	0.754***
	(0.096)	(0.089)	(0.112)	(0.110)	(0.130)
R^2	0.262	0.279	0.211	0.249	0.264
IV F-stat	83.66	100.58	56.12	54.45	33.83
Observations	1407	1407	1407	1407	989
Clusters	241	241	241	241	169
Bin FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Industry FE	N	Y	Y	Y	Y
Director FE	N	N	Y	Y	Y
Controls	N	N	N	Y	Y

Note: This table presents estimates of actual and predicted banker guarantees for log(subscription to the issuance) as a measure of quality of the securities underwritten by the bank. We only include the observations for which the bank is one of the lead underwriters and where the total bank guarantee does not exceed 5 million in the currency of issuance. Log(subscription) is the logarithm of the subscription to the security issuance, which are the securities sold at issuance over the total securities offered. The explanatory variables are the actual or predicted banker guarantee (in thousands of issued currency). The rows present the results for OLS, reduced form, and IV regression including the first stage. All specifications have bin and year fixed effects. Column (2) includes industry fixed effects, column (3) director fixed effects. Column (4) includes all controls and fixed effects, while (5) is the same specification as (4) but contains only observations where the bank is the first lead of the syndicate, i.e. appears first on the prospectus. Controls included in (4) and (5) are: bank share in syndicate, stocks, foreign, interlocked directorate, a main bank dummy and an IPO dummy. Standard errors (in parentheses) are clustered at the issuance-level. ***, ** and * indicate significance at 1, 5 and 10% level, respectively.

Table 5: Subscription to issuance for each type of director guarantee

VARIABLES	(1) Log(subscription) President	(2) Log(subscription) Director	(3) Log(subscription) Secretary
		OLS	
Actual banker guarantee (x1000)	0.026***	0.040***	0.057***
	(0.009)	(0.011)	(0.015)
R^2	0.237	0.250	0.254
		RF	
Predicted banker guarantee (x1000)	0.033*	0.041*	0.055*
	(0.017)	(0.021)	(0.028)
R^2	0.211	0.211	0.211
		IV 2nd stage	
Actual banker guarantee (x1000)	0.044*	0.052*	0.072*
	(0.025)	(0.028)	(0.039)
R^2	0.050	0.082	0.087
		IV 1st stage Actual banker guarantee	
Predicted banker guarantee (x1000)	0.753***	0.795***	0.769***
	(0.211)	(0.200)	(0.203)
R^2 FS	0.167	0.183	0.174
IV F-stat	12.68	15.87	14.31
Observations	239	239	239
Bin FE	Y	Y	Y
Year FE	Y	Y	Y
Industry FE	Y	Y	Y
Controls	Y	Y	Y

Note: This table presents estimates of president, director and secretary underwriting that are part of the bank's executive board throughout the period of analysis. The dependent variable is the logarithm of the subscription to the security issuance. We only include the observations for which the bank is one of the lead underwriters and where the total bank guarantee does not exceed 5 million in the currency of issuance. The rows present the results for OLS, RF, and IV regression including the first stage. All columns include the following set of controls: bank share in syndicate, dummy for public, stocks, foreign, interlocked directorate, a main bank dummy and an IPO dummy. All columns include bin, year and industry fixed effects. Robust standard errors are in parentheses. ***, ** and * indicate significance at 1, 5 and 10% level, respectively.

Table 6: Firm balancing table

Variable	(1) Below discontinuity Mean/(SE)	(2) Above discontinuity Mean/(SE)	(1)-(2) Pairwise t-test Mean difference
Bank issuance guarantee (x1000)	759.210	1025.287	-266.077***
	(88.906)	(99.932)	
Actual banker guarantee (x1000)	16.211	24.669	-8.458***
	(2.062)	(2.560)	
Predicted banker guarantee (x1000)	14.197	23.693	-9.496***
	(1.868)	(2.564)	
Log(subscription)	0.120	0.749	-0.629
	(0.208)	(0.253)	
Fully subscribed	0.388	0.565	-0.177**
	(0.058)	(0.059)	
Log(age company at issuance)	2.547	2.505	0.043
	(0.167)	(0.161)	
Leverage (D/A)	0.444	0.411	0.033
	(0.031)	(0.033)	
Leverage (D/E)	2.714	1.465	1.249
	(0.802)	(0.293)	
Reserves/total assets	0.098	0.126	-0.028
	(0.013)	(0.016)	
Profit/total assets	0.054	0.052	0.002
	(0.007)	(0.008)	
Share of bank in syndicate	0.391	0.362	0.029
	(0.035)	(0.034)	
Foreign dummy	0.490	0.584	-0.094**
	(0.060)	(0.058)	
Guilders dummy	0.663	0.612	0.050
	(0.057)	(0.058)	
Interlocked directorate dummy	0.221	0.267	-0.046
	(0.049)	(0.053)	
Equity dummy	0.400	0.322	0.079
	(0.059)	(0.055)	
IPO dummy	0.029	0.057	-0.028
	(0.020)	(0.028)	
Main bank dummy	0.284	0.265	0.019
	(0.054)	(0.052)	
First lead	0.721	0.726	-0.005
	(0.054)	(0.053)	
Observations	412	423	835
Clusters	71	73	144

Note: The balancing table covers the firm underwriting sample. Column 1 (2) reports mean and standard deviation of observations below (above) each discontinuity. The pairwise t-test includes bin fixed effects. Observations are clustered by issue. All variables used in our main sample have the same definition as in previous tables. Issuance/size is the total security issuance amount of the firm over its total assets in the year before. Reserves, Profit and leverage are all weighted by total assets in the year before issuance. Leverage (D/E) is total debt weighted by total equity. Due to missing values, leverage ratio debt/equity has 406 (70 clusters) observations below the discontinuity and 405 (70 clusters) above, while all other variables have 412 below and 423 above. The table includes only observations where the bank is one of the lead underwriters and where the total bank guarantee does not exceed 5 million in the currency of issuance.

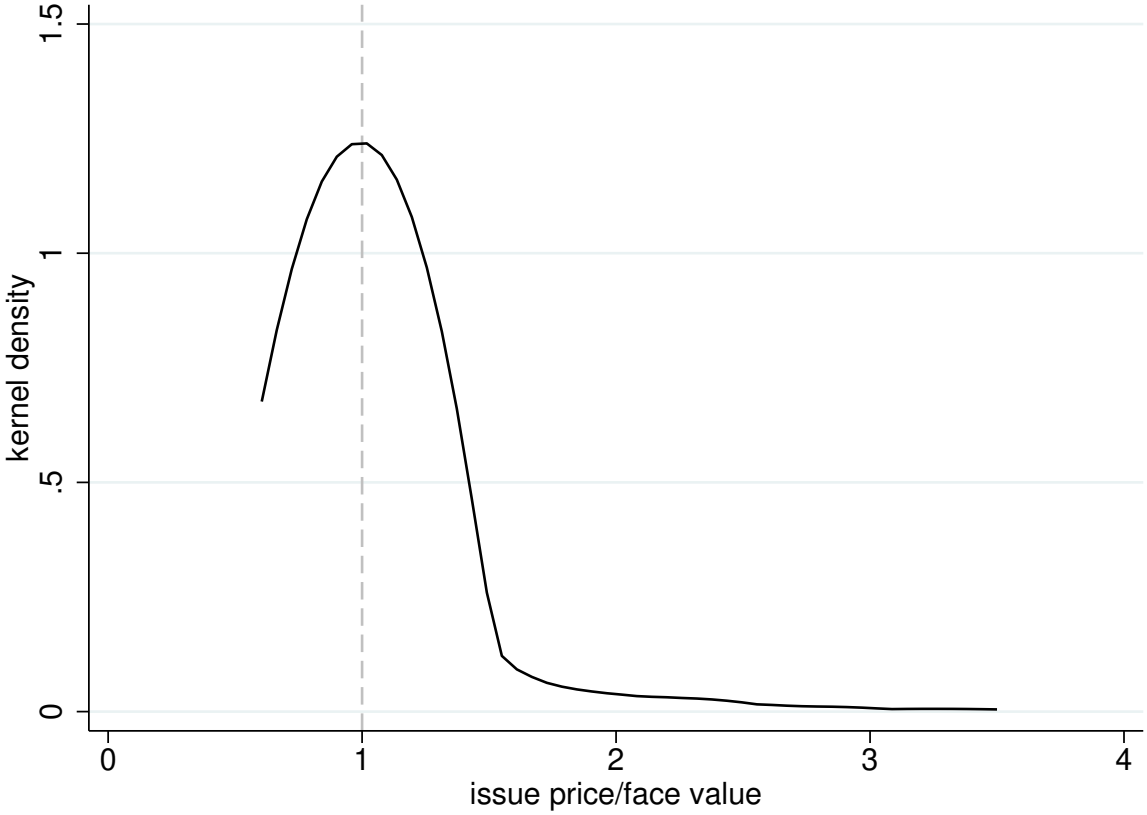
Table 7: Bankers' guarantees and firm risk

VARIABLES	(1) Log(subscription)	(2) Log(age)	(3) Leverage	(4) Reserves	(5) Profit
			OLS		
Actual banker guarantee (x1000)	0.045***	0.005	-0.152	0.105	-0.027
	(0.016)	(0.007)	(0.150)	(0.092)	(0.029)
R^2	0.397	0.451	0.473	0.453	0.571
			RF		
Predicted banker guarantee (x1000)	0.032**	0.006	-0.121	0.141	0.035
	(0.014)	(0.009)	(0.194)	(0.135)	(0.039)
R^2	0.369	0.451	0.472	0.451	0.571
			IV 2nd stage		
Actual banker guarantee (x1000)	0.039**	0.007	-0.147	0.170	0.042
	(0.018)	(0.011)	(0.230)	(0.160)	(0.047)
R^2	0.062	0.245	0.258	0.098	0.075
			IV 1st stage		
Predicted banker guarantee (x1000)			0.825***		
			(0.096)		
R^2			0.306		
IV F-stat			74.45		
Observations	835	835	835	835	835
Clusters	144	144	144	144	144
Bin FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Director FE	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y

Note: This table presents estimates of actual and predicted banker underwriting for (1) subscription to the issuance, firm (2) age, (3) leverage, (4) reserves and (5) profit. We only include the observations for which the bank is the lead underwriter and where the total bank guarantee does not exceed 5 million in the currency of issuance. Log(subscription) is the logarithm of the subscription to the security issuance, which are the securities sold on the stock market over the total securities offered. Log(age) is the logarithm of the age of the firm at the time of issuance (where all firms from 0-12 months are coded as age 1). The dependent variable in column (3)-(5) is multiplied by 100 for presentational purposes and to interpret the coefficients as percentage point changes. Leverage is the ratio total debt over total assets, both in the year before the security issuance. Reserves are scaled by total assets, both in the year before issuance. Profit are scaled by total assets and reflect the profit (or loss) reported by the firm over total assets in the year before the issuance. All specifications include the same set of controls (bank share in syndicate, stocks, foreign, interlocked directorate, a main bank dummy and an IPO dummy). All columns have fixed effects: bin, year, industry and director. Standard errors (in parentheses) are clustered by issuance. ***, ** and * indicate significance at 1, 5 and 10% level, respectively.

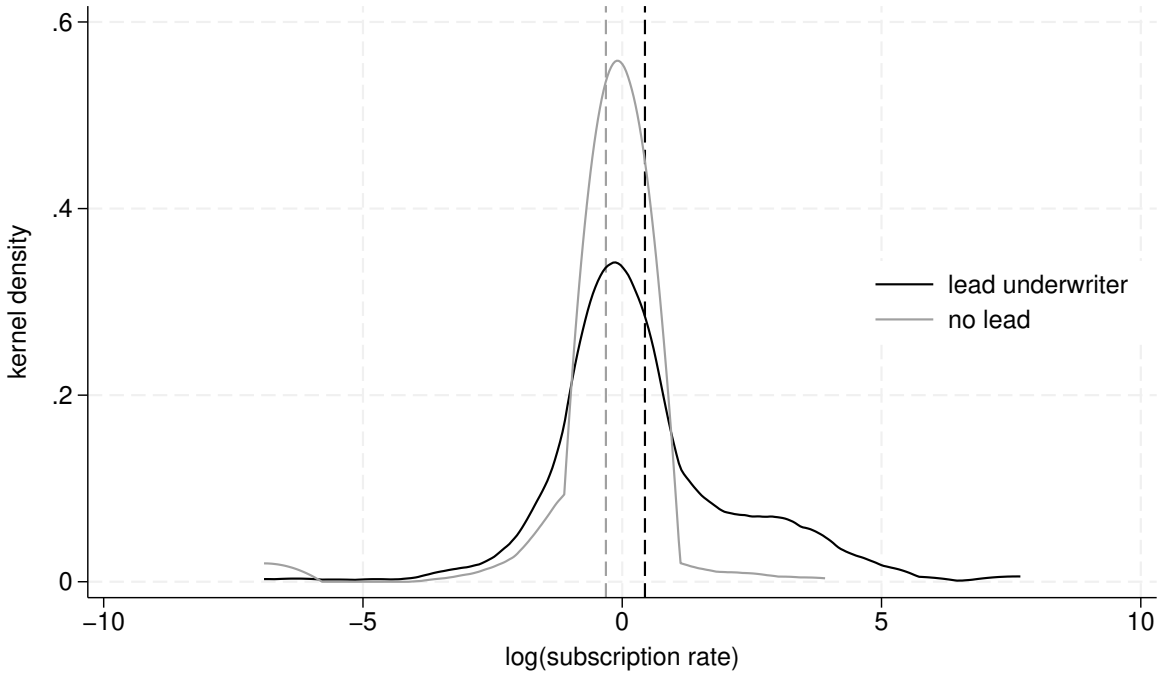
Appendix A1

Figure A1: Issue price as a ratio of face value



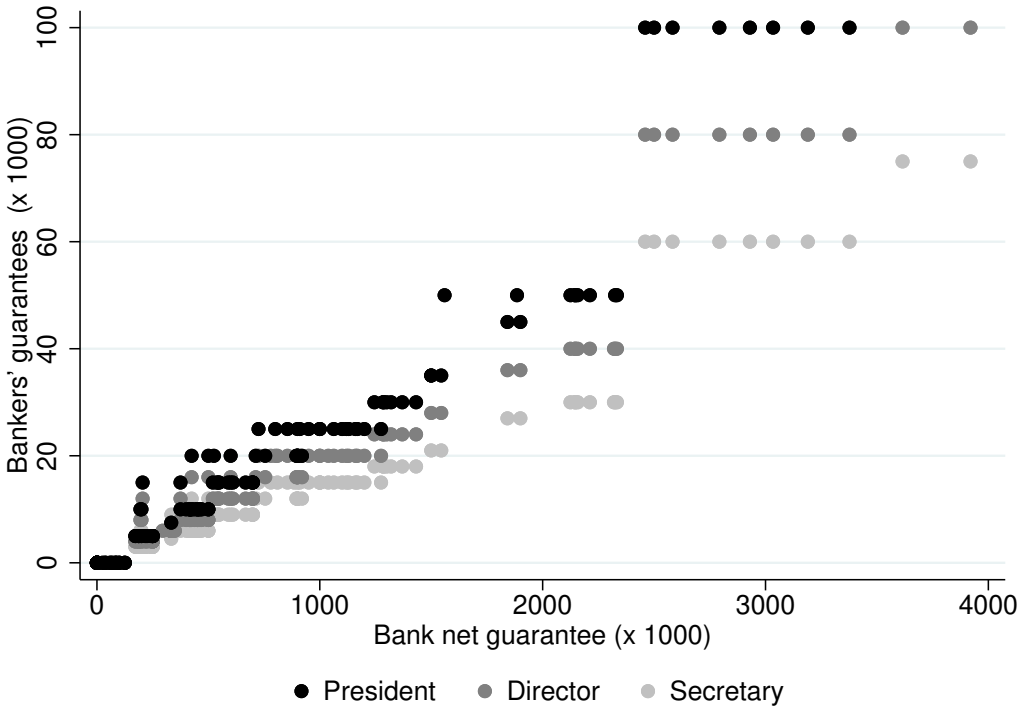
Note: This figure shows the kernel density of the issue price of the security issuance over the face value. This is the ratio of the price at which the securities are bought by the bank over the price at which the securities are sold to the market. Most issue prices are around par. Includes all observations where the bank is one of the lead underwriters and the bank's guarantee does not exceed 5 million in the currency of issuance.

Figure A2: Success of the issuance for participating or leading a syndicate



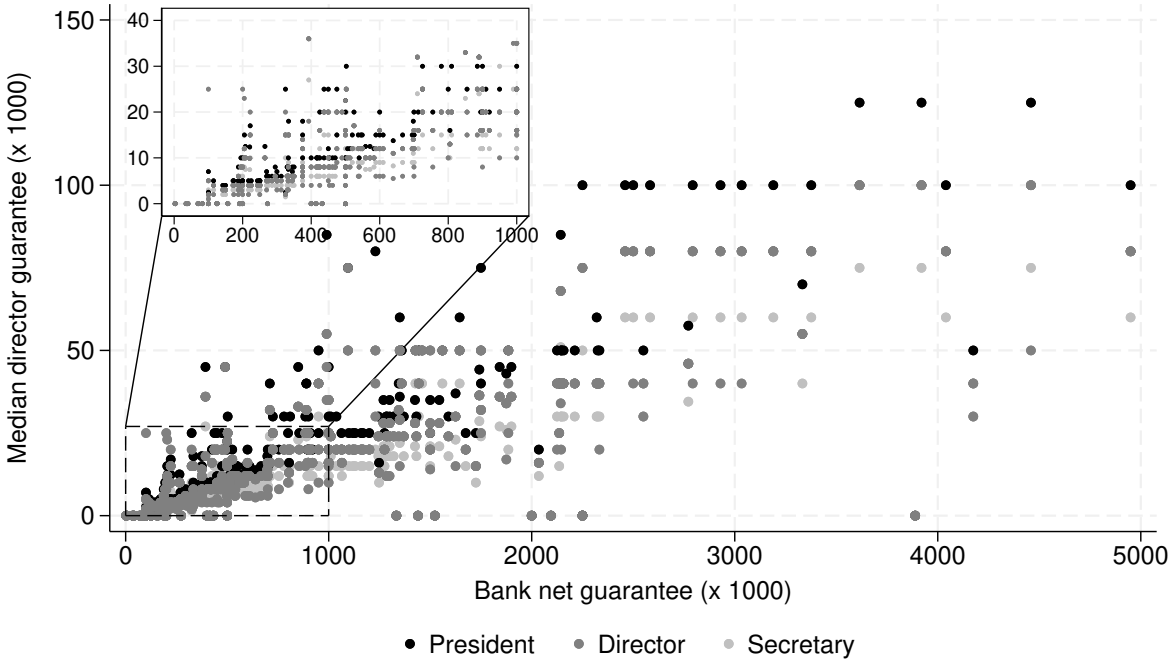
Note: This figure shows the distribution (kernel density) of the success of the security issues by leading or participating in a syndicate. Log(subscription) is the logarithm of the subscription to the security issuance, which are the securities sold on the stock market over the total securities offered. The black (dashed) line reflects the observations (mean) of bank lead underwriting issues, while the grey (dashed) line reflects observations (mean) of bank participations in other syndicates. Includes all observations where the bank is one of the lead underwriters and the bank's guarantee does not exceed 5 million in the currency of issuance.

Figure A3: Bank and bankers' guarantees at step function



Note: This figure shows the observations in our sample where the bankers follow exactly the step function. The figure shows guarantees for the president (black), median director (mid grey) and secretary (light grey). The bankers' guarantees are shown in thousand guilders. Bank guarantees are in thousands of guilders where bankers follow the step functions with ratio 60-80-100. Includes all observations where the bank is one of the lead underwriters and the bank's guarantee does not exceed 4 million in the currency of issuance.

Figure A4: Bank and bankers' guarantees



Note: This figure shows all the observations used in our regression sample. It shows guarantees for the president (black), median director (mid grey) and secretary (light grey). The bank and banker guarantees are in thousands of guilders. Includes all observations where the bank is one of the lead underwriters and the bank's guarantee does not exceed 5 million in the currency of issuance.

Appendix A2

We simulate counterfactuals for both periods separately, as we find two different rules in our dataset. To maximize comparison across different rules, we impose the same restrictions on the counterfactuals as on our own data, as explained in section 3.2 of the paper: 1) no overlap between steps, 2) monotonic jumps at the discontinuities, 3) steps can only increase in size, 4) board connection should not be taken into consideration. Restriction 1-3 are explicitly coded, while restriction 4 is met when using the median banker. Additionally, we exclude the zero banker guarantees from the clustering if the bank guarantee is above f. 150,000. Figure A5 shows the discontinuity of the banker guarantee below and above the bank guarantee of f. 150,000. Restriction 5 and 6 are not explicitly imposed in our counterfactual datasets but will hold most of the time. We use only the median banker.

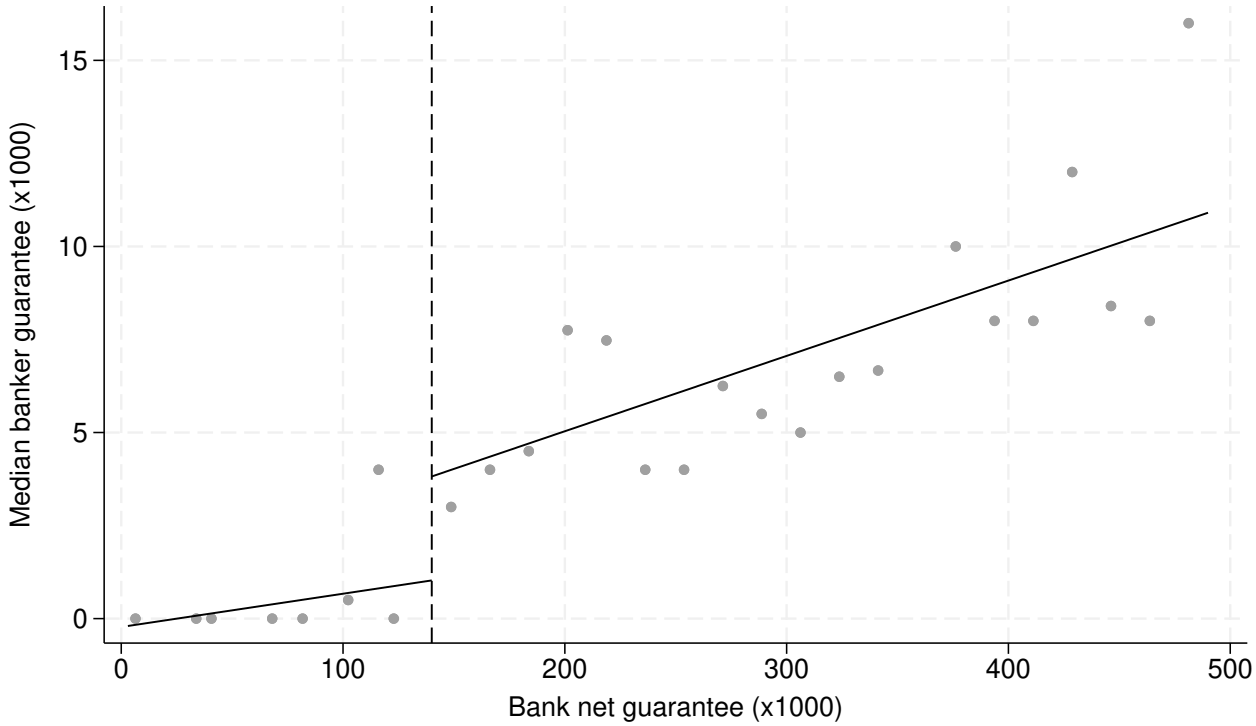
Using our own data, we simulate 10,000 counterfactual banker guarantees. We estimate a first simple OLS regression of banker guarantees on bank guarantees for each period separately and store the intercept, slope and error terms. Since our errors are het-

eroskedastic, we impose the same distribution of our error terms on the counterfactuals: we estimate a second regressions with the squared residuals of the first regression on the bank guarantee and store the residuals. We then randomly draw 10,000 counterfactual banker guarantees using the estimated intercept and slope from the first regression together with the randomly drawn error term (which has mean 0 and standard deviation based on the stored residuals of our second regression). Since our original data has no negative banker guarantees, we replace the negative counterfactual with zero. We round the banker counterfactuals to the nearest actual banker guarantee, to closely imitate our own data. Finally, we set the value of the banker guarantee to zero when the bank guarantee is above f. 150,000.

We cluster the banker and bank guarantee using the number of clusters of our own data: 8 for 1919-1925 and 13 for 1925-1930. To incorporate restriction 1-3 from our own step function, we find the optimal step function to the counterfactual datasets using 3 methods: a) no restrictions), b) monotonicity (restriction 2) and c) both monotonicity and progressive bins (restriction 2 and 3). We address the first restriction, no overlap, later. We first apply clustering multiple times for each of the 10,000 counterfactuals, to maximize the chances of having a counterfactual step function. We increase the number of clustering attempts if we impose another restriction: a) gets 2 attempts per counterfactual, b) gets 20 attempts, c) gets 200 attempts. If after these attempts of clustering, step function conditioned on our restrictions cannot be found, we set this counterfactual to missing and assume it has performed worse (i.e. a higher MSE) than our own step function. If multiple clustering variables remain after imposing restriction b) and c), we choose the counterfactual step function with the lowest MSE. For method a), without any restrictions, N = 10,000 for both periods. For b) the monotonicity restriction leaves N = 9,987 for period 1 and N = 9,705 for period 2. For c), both monotonicity and progressive bin size results in N = 6,981 for period 1 and N = 508 for period 2.

We address the possible overlap (restriction 1) for the remaining unique counterfactual step function as follows: If clusters have overlap, we reassign the overlapping observations to one of the two cluster based on the lowest mean squared error. We then compute the MSE of the counterfactual step function with the counterfactual banker guarantee. Using no constraints, our step function of the first(second) period outperforms random counterfactual datasets 98% (95%) of the time (p = 0.0144 (0.0486)). When using the monotonicity constraint our step function of the first (second) period outperforms 97% (95%) of the time (p = 0.028 (0.0558)). Finally when including both the monotonicity and the increasing bins constraint, our step function of the first (second) period outperforms the counterfactual datasets 99% of the time (p = 0.006; p = 0.0018).

Figure A5: Bank and bankers' guarantees discontinuity



Note: This figure shows the RD plot of the bank net guarantee with a cutoff at f. 150,000. The RD plot has 8 bins below the cutoff and 20 above. Bank and banker guarantees are in thousands of currency of issuance. Includes only observations where the bank is one of the lead underwriters.