Underwriter Competition and Bargaining Power in the Corporate Bond Market

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Abstract

We study the impact of underwriter competition on corporate bond contracts. We develop a new measure of underwriter power and a novel empirical approach, based on the underwriter's comparative ability to place bonds. When an issuer has few "outside options" to take his bond to the market, the underwriter enjoys a stronger bargaining power over the issuer. The key feature of our approach is that underwriter power varies within a given underwriter at a given point in time across different issuers, allowing us to separate the effects of power from those of reputation and certification with a fixed effects strategy. Using our measure, we document that powerful underwriters are able to extract rents at the expense of bond issuers, in the form of higher fees, issuance yield spreads, and under-pricing. Issuers facing underwriters with the highest bargaining power have a $1.5 million higher issuance cost, or about 16% relative to the average issue. A number of checks rule out alternative explanations based on certification, loyalty, and omitted issuer and/or issue characteristics. Our findings suggest that lack of underwriter competition results in material costs for corporate bond issuers.

Keywords: Competition, Bargaining power, Corporate bonds, Underwriting

JEL Classifications: G24, G32

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Abstract

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The bond market is a major source of corporate financing. It has tripled in size since 2001, reaching nearly $50 trillion in outstanding value as of 2013 (Tendulkar and Hancock (2014)). At the same time, the bond underwriting industry has become increasingly more concentrated, with a handful of very large banks capturing the bulk of deals: in 2013, the top ten underwriters in the U.S. had a combined market share of about 80%, up from 55% in 2000 and 30% in 1990. Industry practitioners and the financial press have raised the concern that this may give disproportionate bargaining power to a few large underwriters to the detriment of corporate bond issuers.[1] In this paper, we address this concern and ask whether, and to what extent, lack of competition allows underwriters to extract rents from bond issuers.

The main challenge presented by this question is that the underwriter's bargaining power is unobservable and often overlaps with her reputation. For instance, at first glance market share could seem a reasonable measure of the underwriter's competitive position and bargaining power. However, it could also stand for the certification value of the underwriter's reputation as a signal of bond quality; and indeed, the literature has used it as a proxy for both (Booth and Smith (1986), Burch, Nanda, and Warther (2005), Livingston and Miller (2000)). Similar considerations apply to alternative proxies such as past performance (Nanda and Yun (1997), Dunbar (2000)) or industry specialization (Dunbar (2000)). Disentangling the impact of the "bargaining power" and "certification" channels, therefore, requires a measure of the underwriter's competitive position that is distinct from reputation.

We develop one such measure, and attempt to separate the two effects, with a novel empirical approach that departs from conventional market share-based arguments. We gauge

[1] "The biggest winners were Barclays PLC, J.P. Morgan Chase & Co., Bank of America Corp., and Morgan Stanley, which each earned about $41 million for their lead roles placing the debt with investors ("Verizon Sells a Record $49 Billion Worth of Bonds", *The Wall Street Journal*, September 11, 2013).

bargaining power on the basis of how difficult it is to find or replace an underwriter for a given issue. We define our main proxy in detail below; but the intuition behind it is straightforward. Consider, for instance, two bond issues in our data by Oracle, a computer technology firm, and by AT&T Inc., a telecommunications firm, both taken to the market by J.P. Morgan in 2012. On the first one, our proxy indicates that *only* J.P. Morgan can be expected to take the issue to the market, suggesting strong bargaining power for J.P. Morgan. On the AT&T issue, our proxy indicates 10 potential replacements to J.P. Morgan, with Bank of America, Barclays, and UBS among the alternatives. Competition among potential underwriters – the fact that a number of other investment banks could take the issue to the market – weakens J.P. Morgan's bargaining power. Put differently, the underwriter's bargaining power is inversely related to the number of outside options available to the bond issuer.

The features of our measure help us separate bargaining power from certification, because a given underwriter may have different bargaining power when dealing with different issuers. In our example, J.P. Morgan has a strong bargaining position vis-à-vis Oracle, but a weaker one vis-à-vis AT&T. Building on this intuition, we take advantage of the nature of competition in the market for underwriting corporate bonds in our empirical setup. Unlike traditional proxies for certification such as market share, our bargaining power measure varies *within underwriter, across different issues, at a given point in time*. We exploit this feature to identify the effect of bargaining power net of underwriter reputation, via a fixed effects strategy. Whether J.P. Morgan is underwriting an issue by Oracle or AT&T, her reputation and certification ability remain the same. In contrast, our proxy allows J.P. Morgan's bargaining power to differ across the two issues. Comparing different issues that share the same underwriter at the same point in time therefore absorbs the impact of reputation and identifies the bargaining power effect.

Our main testable hypothesis is that, in line with the concerns voiced by practitioners and the press, powerful underwriters are able to extract rents from issuers. If the underwriter has a unique ability to place the bond, she will be able to set the contract terms in her favor. We find evidence strongly consistent with this argument.

We run our tests on a comprehensive dataset combining bond characteristics and underwriting information from the Mergent Fixed Income Securities (FISD) and SDC Platinum Global New Issues (SDC) databases. Our data cover 9,356 corporate bonds issued by 1,696 individual publicly listed U.S. firms, and span a 45-year period from 1970 to 2015.

Our main findings are as follows. Consistent with our hypothesis, underwriters with high bargaining power are able to extract larger rents from the issuers, in the form of higher fees, higher issuance yield spreads, and higher underpricing (first-trading day return). Moving from the bottom to the top decile of our bargaining power proxy, we observe on average an 8 basis points (bps) increase in fees, 18 bps higher yield spreads, and 13 bps larger underpricing. In comparison, the fees, yield spread, and underpricing on the average issue in our sample are 88 bps, 184 bps, and 13 bps respectively. In dollar terms, bond issuers pay additional issuing costs of $0.46m in fees and about $1m in terms of issuance yield spreads and underpricing, or a 16% increase relative to the about $9 million cost borne by the average issuer. These effects indicate that the costs associated with underwriter power are material.

These findings are sustained in an extensive set of robustness checks. We consider alternative measures of bargaining power, based on the Banzhaf (1964) and Shapley and Shubik (1964) indexes of power in a coalition, and alternative filters on the set of potential “replacement” underwriters on a given bond issue. Our findings are also robust to a broad set of control variables, alternative clustering of the standard errors, and a number of filters on the sample of bonds in our data.

Our fixed effects strategy considerably raises the bar for any alternative explanation based on certification. Such an explanation requires that the same underwriter, at a given point in time, have different certification ability on different issues. This could still be a possibility e.g. if underwriters may have more or less expertise in certain bond market segments. We perform two further checks against this possibility. First, we study how the market price of an issuer's bonds outstanding reacts to a new bond issue, taken to the market by a powerful underwriter. Under the certification hypothesis, having a reputable underwriter conveys positive information to all of the issuer's creditors (Booth and Smith (1986)), suggesting an increase in the price of bonds outstanding, or at least no decrease. In contrast, under the bargaining power hypothesis, the issuer bears a cost that can harm the position of existing bondholders, so that the price of bonds outstanding should decrease. Our evidence is consistent with the latter prediction, indicating a larger drop in the price of bonds outstanding around issues taken to the market by a powerful underwriter. Second, we compare the effects of underwriter power on fees, yields, and underpricing for issuers or issues that are more transparent or more opaque, based on analyst coverage, probability of default, time since first tapping the bond market, age, or issue complexity (measured with proxies based on textual analysis of the bond prospectus). In contrast to the certification hypothesis, we do not detect any differences between transparent and opaque issuers.

A second alternative explanation is "loyalty" between issuers and underwriters, referring to the fact that issuers tend to stick to the same underwriters because they derive some benefits (observable or otherwise) from their continued relationship. Four sets of results rule out this explanation. First, we exploit time-variation within issuer-underwriter pairs in our underwriter power measure, and include issuer × underwriter fixed effects in our estimates. We are thus able to absorb the impact of any unobservable, non-time-varying factor affecting the matching between issuers and underwriters – such as loyalty. We find very close estimates to our baseline, inconsistent with loyalty being a main driver of the effects that we document. Second, we restrict the attention to cases where the issuer employs a given underwriter for the first time, where by construction loyalty cannot play a major role, and find again very close effects. Third, we obtain very close estimates when we compare cases in which the issuer and the underwriter have a long relationship (where loyalty considerations should be more important) or a short one. Fourth, we test whether a past relationship with the underwriter on bond, equity, or M&A transactions absorbs the effects of our underwriter power measure. We find that is not the case, suggesting that loyalty is not driving our results.

A third alternative explanation is that unobservable characteristics of the issuer or the bond issue, rather than the level of competition faced by the underwriter, are behind our findings. To address this possibility, we exploit issues that are taken to the market by a syndicate with multiple lead underwriters. In those issues, different lead underwriters are apportioned fees depending on their bargaining power. As a result, the fees vary across underwriters *within a given bond issue*, allowing us to absorb the potential effect of any issuer and/or bond characteristic with individual bond issue fixed effects. When we relate apportioned fees to underwriter power in this setting, we find again estimates that are very close to our baseline, indicating that omitted issuer and/or issue characteristics do not explain our results.

Finally, we ask whether bond issuers attempt to attenuate the costs associated with powerful underwriters, and how those underwriters are able to preserve their rents in equilibrium. First, bond issuers can strategically structure their issues so as to avoid having to hire a powerful underwriter. For instance, the issue can be broken down into a number of smaller bonds, or a combination of bonds with different maturities. Consistent with this argument, when we compare such “broken down” issues to similar issues involving only one bond, we find that they are systematically taken to the market by less powerful underwriters.

Second, we provide evidence of one channel through which underwriter rents are preserved. We show that powerful underwriters have a superior network of connections to large institutional investors, which enables them to place bond issues more rapidly. The cost of establishing such a network constitutes a barrier to entry: As in classic oligopoly models, the presence of a fixed cost of entry implies that the market can only sustain a small number of players in equilibrium.

Our paper makes three main contributions to the literature. First, it provides evidence of the economic impact of underwriter power. The bond underwriting literature has so far focused on the certification effects associated with top underwriters. The certification view implies that working with a top underwriter is beneficial to the issuers: increased certification effort may be associated with higher underwriting fees, but these are more than offset by the lower yields that a reputable underwriter can obtain on the market (Fang (2005)). We document a “dark side” of corporate bond underwriting, where top underwriters are able to leverage their market power to extract rents at the expense of bond issuers. The costs associated with a dearth of outside underwriting options can have important regulatory implications, particularly in light of the banking industry’s consolidation in the aftermath of the 2008 financial crisis.

Second, our work contributes to the literature on underwriter selection. Thus far, this strand of literature has highlighted driving factors such the underwriter’s prestige and expertise (Ritter and Welch (2002), Liu and Ritter (2011), Logue, Rogalski, Seward, and Foster-Johnson (2002)), reputation and certification ability (Livingston and Miller (2000), Fang (2005)), and loyalty (Yasuda (2005), Burch, Nanda, and Warther (2005)). Our results point to competition among potential underwriters – or rather, lack thereof – as an additional factor. Moreover, they suggest that, when issuers have limited outside options, underwriters can extract substantial oligopolistic rents at their expense.

Third, we develop a novel approach to measuring underwriter power. The prior literature has considered proxies, such as market share, which do not enable a separation of reputation from bargaining power effects (Megginson and Weiss (1991), Beatty and Welch (1996), Gande, Puri, and Saunders (1999), Livingston and Miller (2000), Burch, Nanda, and Warther (2005), Fang (2005), Yasuda (2005) and Ljungqvist, Marston, and Wilhelm (2006)). Because our proxy is issue-specific, we are able to isolate power effects while controlling for reputation with underwriter × date fixed effects. Moreover, alternative measures of bargaining power such as the Banzhaf (1964) or Shapley and Shubik (1954) indexes used e.g. in the shareholder voting literature are complex (see Felsenthal and Machover (1998) for a review). Our results indicate that, at least in the context of corporate bond underwriting, a simple count-based index as the one we propose can be as effective as those measures. The simplicity, generality, and flexibility of our approach suggest that it could be applied to a number of other settings, such as, but not limited to, other security public offerings (e.g. IPOs).

The remainder of this paper is organized as follows. Section 1 describes the data, our bargaining power proxy, and the identification strategy. Section 2 presents our baseline results and robustness checks. In section 3 we rule out alternative explanations based on certification, loyalty, and omitted issuer or issue characteristics. Section 4 discusses how issuers attempt to attenuate the costs associated with powerful underwriters, and how those underwriters are able to preserve their rents. Section 5 concludes.

1. Data, variables of interest, and empirical strategy

1.1 Data

We merge data from a number of sources. We obtain corporate bond characteristics and underwriting information from the Mergent Fixed Income Securities Database (FISD) and the SDC Platinum Global New Issues Database (SDC). We exclude bonds issued by financials (SIC codes 6000-6999), regulated utilities (SIC codes 4900-4949), non-U.S. firms, issues in foreign currency, and puttable issues. We restrict our sample to newly issued straight corporate bonds, and drop convertibles and medium-term notes. We focus on non-distressed public bond issuers with non-negative book equity from the CRSP-Compustat Merged (CCM) database, and retain bonds with non-missing offering amounts and maturities, known underwriter names, available information on fees or offering yields, and for which ratings are provided by at least one of the main rating agencies (Moody's, Standard and Poor's, and Fitch). These filters are in line with the literature (e.g. Billett, King, and Mauer (2007), Fang (2005), Yasuda (2005)). After applying these filters, our sample comprises 9,356 bonds issued by 1,696 firms, over the period 1970 to 2015.[2]

We also analyze corporate bond returns on the secondary market. To do so, we collect bond trades data from the Trade Reporting and Compliance Engine (TRACE) and the National Association of Insurance Commissioners (NAIC) databases. We remove cancelled, corrected, and commission trades, as well as non-institutional trades from TRACE following Bessembinder et al. (2009). We combine trades from the NAIC and TRACE datasets and then calculate daily bond

[2] Appendix B describes in detail the construction of this part of our data set.

returns by applying Bessembinder et al.'s (2009) "trade-weighted price, trade ≥ 100k" approach, i.e. we restrict the data to trades larger than \$100,000, and weigh intraday transactions by trading volume. We compute bond returns between two trading days as: [3]

$$R_t = \frac{P_t - P_{t-1} + AI_t}{P_{t-1}} \quad (1)$$

where P_t is the bond price on a day t, AI_t is the interest accrued between the two subsequent trading days $t-1$ and t.[4] We drop 1,038 price reversals as returns with absolute value larger than 20%, as in Bessembinder et al. (2009).[5] The final sample includes 1,268,635 daily return observations for 6,290 bonds traded from 10 January 1994 until 15 July 2016.

Table 1.A illustrates the main features of the bonds in our sample. The average issue size is \$357 million, and the maturity is about 13 years. Around one-quarter (26%) of the bonds in our sample are below investment grade, similar to Fang (2005) and Bessembinder et al. (2009).

Table 1.B shows that the average bond issuer in our sample has market capitalization of nearly \$8 billion, profitability (ROA) of 5%, leverage (total debt divided by total assets) of 35%, market-to-book ratio of 1.52, and cash holdings over debt of 40%. The table also compares the issuer characteristics in our sample with other companies in CRSP-Compustat. The average bond issuer is larger, more profitable, and slightly more leveraged, and has lower market-to-book ratio and more cash. These findings in line with those of Faulkender and Petersen (2006) and Billett, King, and Mauer (2007).

[3] When calculating returns we exclude weekends and holidays in the recommended holiday schedule for financial markets from http://www.sifma.org/services/holiday-schedule/.
[4] We calculate accrued interest starting from the date of accruing interest (*dated_date* FISD variable) or, when missing, from the bond issue date, and until the date of the last interest payment (*last_interest_date* FISD variable) or, when missing, until the bond's maturity.
[5] In unreported checks, we find that retaining those outliers does not affect our results.

Table 1.C describes underwriter characteristics. Bond underwriting syndicates are set up and coordinated by lead underwriters, so we focus on the leads for most of the analysis.[6] If a given underwriter is acquired by or merges with another bank, we re-assign all future bond issues to the surviving entity.[7] There are 134 individual lead underwriters in our sample. About one-half of the bonds are co-led by multiple banks, and the average number of lead underwriters on a given bond is 2.3. The average underwriter market share, measured one year before the issue, is about 12%.[8]

[Insert Table 1 about here]

1.2 Measuring underwriter bargaining power

To study how underwriter power affects bond issues, we develop a novel measure of market power, building on insight from the industrial organization and banking literatures (Shaked and Sutton (1982), Degryse (1996), Degryse and Ongena (2005)). The intuition behind our measure is that an underwriter will enjoy greater power over a given issuer, if the issuer has few alternatives to the underwriter to take the bond to the market. In terms of the example in the introduction, J.P. Morgan will have stronger power over Oracle, if no underwriter other than J.P. Morgan can take Oracle's bond issue to the market. Thus our measure, which we call $Power$, reflects how difficult it is to find a replacement for the underwriter on a given issue.

The extent to which the underwriter is "difficult to replace" depends on her ability to place the issue on the market. Placement ability is mainly driven by the amount of the issue allocated to

[6] Existing studies typically assume that the lead underwriters are solely responsible for underwriting the securities (e.g. Carter and Manaster (1990), Gande, Puri, and Saunders (1999), Fang (2005), Hoberg (2007), Ljungqvist, Marston, and Wilhelm (2006), Yasuda (2005)).
[7] We aggregate subsidiaries under their parent banks, and account for the history of mergers and acquisitions following the list of the principal M&As between underwriters provided in Ljungqvist, Marston, and Wilhelm (2006) for 1988-2002, integrated with data from the SDC M&A database, bank websites, and press releases. The full list of M&As of banks underwriting bonds in our sample is described in Appendix C, Figure C.1.
[8] When computing market shares, we credit each lead underwriter with the full issue size. If we split the issue size in equal parts among all lead underwriters, the resulting average market share is about 13%.

the underwriter and by the underwriter's activity in a given bond market segment and industry. In the first place, a bank's balance sheet should be large enough to underwrite the issue, as the corporate bond market is characterized by a prevalence of "commitment" underwriting, where the underwriter purchases the bond from the issuer at a discount while guaranteeing the full proceeds (Levinson (2014, p. 78)).[9] Secondly, although a small number of very large banks provide universal services and rank relatively high in league tables across different market segments, most underwriters tend to lead in a smaller range of segments.[10] Similar considerations apply, for instance, in equity IPOs, where issue size and industry are primary drivers of the underwriter choice (Ritter and Welch (2002)).

Building on these observations, we develop our measure as a function of a given underwriter's expected placement ability for a given bond issue, conditional on the issue's size as well as rating, maturity, and issuer industry. We focus on those characteristics because they can delineate bond market segments, by determining an issue's risk profile and transparency to the underwriter and the market (Datta, Iskandar-Datta, and Patel (1997), Fang (2005), Helwege and Turner (1999), Yasuda (2005)). We partition the bond market into six groups according to rating (AAA, AA, A, BBB, BB, and B and lower), calculate the bonds' years to maturity, and classify issuers into the Fama-French 10 industries. Consistent with the idea that underwriters' activity tends to relate to rating and industry, we find that for the average underwriter in our sample, the top (top three) rating group(s) accounts for 68% (94%) of her business, and the top (top three) industry (industries) accounts for 60% (85%) of her business.

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[9] SDC reports the offering technique for 79% bonds in our sample. "Commitment" underwriting accounts for 100% of those bonds. The alternative regime is "best effort" underwriting, in which the underwriter only pledges to make the best effort to sell the issue to investors.

[10] For example, in 2013 Deutsche Bank and Credit Suisse do not even feature among the top-ten investment grade bond underwriters, but hold at the same time the 3rd and the 4th positions in the high yield segment (Wiegmann, (2013)).

We then obtain our underwriter power measure, by comparing the portion of the bond that the lead underwriter actually takes to the market with the amount that other banks could be expected to place. We proceed as follows. Given a bond underwritten by underwriter u at calendar quarter t, we consider the set of bonds taken to the market by each underwriter other than u, denoted by $-u$, over the preceding five-year period,[11] and estimate:

$$B_{-ub} = \alpha + \sum_k \beta_k Rat(k)_b + \gamma Mat_b + \sum_i \delta_i Ind(i)_b + \tau Mkt\ size_t + \nu N_b + \varepsilon_b \qquad (2)$$

where B_{-ub} denotes the natural logarithm of the underwriting allocation of bond b to underwriter $-u$, $Rat(k)$ are indicator variables for the six credit rating categories, Mat is the natural logarithm of years to maturity, $Ind(i)$ are indicators for the 10 Fama-French industries, $Mkt\ size$ denotes the natural logarithm of the total volume of bond issuance on the market over past 5 years, and N_b is the number of lead underwriters on bond b.[12] We obtain predicted coefficients $\hat{\alpha}_{-u}$, $\hat{\beta}_{-uk}$, $\hat{\gamma}_{-u}$, $\hat{\delta}_{-ui}$, $\hat{\tau}_{-u}$, and $\hat{\nu}_{-u}$ and derive underwriter $-u$'s predicted placement ability on bond b as: $\hat{B}_{-ub} = \hat{\alpha}_{-u} + \sum_k \hat{\beta}_{-uk} Rat(k)_b + \hat{\gamma}_{-u} Mat_b + \sum_i \hat{\delta}_{-ui} Ind(i)_b + \hat{\tau}_{-u} Mkt\ size_t + \hat{\nu}_{-u} N_b$. $\hat{B}_{-ub}$ reflects the amount that an underwriter other than u could place on the market, for a bond having characteristics such as those of bond b. We then define underwriter u's bargaining power on bond b as a function of the number of underwriters that could "replace" u as:

$$Power_{ub} = -\ln\left(1 + \sum_{-u} \mathbb{I}\{\hat{B}_{-ub} \geq B_{ub}\}\right) \qquad (3)$$

Intuitively, the larger the number of underwriters that could place a bond similar to b replacing underwriter u, the lower the power of u.[13]

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[11] Robustness checks, described below, reveal that our findings are not sensitive to the length of this time window.

[12] Whenever the underwriting allocation is not available, we divide the bond issue size by the number of its lead underwriters, and assign the resulting value to each of them.

[13] When a given bond issue has multiple lead underwriters, we compute the number of potential replacement underwriters as the weighted average of the number of replacements associated with each lead, with weights are proportional to the underwriting allocation.

Table 1.D summarizes our measure of underwriter power. In the typical bond issue, the underwriter has $Power$ equal to –2.23, corresponding to about 8 replacements, or about 21% of all active lead underwriters. That is consistent with the notion that only a relatively small number of banks are able to place a given issue. It is also line with the organizational structure of the bond market, where about ten "bulge-bracket" banks and a smaller number of second-tier underwriters should be able to take the typical issue to the market. Figure 1 illustrates the variation in the average number of replacements to the largest underwriters, ranked by the total underwritten amount over the sample period, broken down by segments based on bond size, rating, and time to maturity (upper panel), or issuer industry (lower panel). Darker cells indicate fewer possible replacements for the actual underwriter, i.e. stronger bargaining power. Overall, even among this set of large banks, there is not a single underwriter with high $Power$ across all segments, suggesting that the variation in $Power$ across underwriters and segments is material.

[Insert Figure 1 about here]

1.3 Rent extraction measures

Throughout the analysis, we focus on three main measures of rent extraction by the underwriters. The first one is bond issuance fees, representing the immediate monetary benefit that the underwriter can obtain from the issuer. Underwriters charge fees as compensation for marketing and distributing the issue, as well as for taking on underwriting risk. A stronger bargaining position should enable the underwriter to extract larger fees from the bond issuer. From Table 1.A, the typical fees charged by the underwriter are 0.88% of the par issued amount, close to the values reported by Fang (2005). For the vast majority, the bonds are offered via a negotiated sale, so that the fees are negotiated between the issuer and the underwriter, and are equal to the spread between the price the issuer receives and the price at which the underwriter sells the issue to the market.[14]

The second measure is bond issuance yield spreads, computed as the difference between the bond's issuance yield and the yield on Treasury bonds of similar maturity. Unlike fees, which result from a direct negotiation between issuer and underwriter, yields depend on the demand for the new issues generated by the underwriter via marketing to prospective investors and book-building. The pricing process and the allocation of bonds to investors, however, are not transparent to the issuers, and the absence of efficient rules regulating this process makes it difficult for the regulators to punish malpractices.[15] This creates scope for moral hazard, and two sources of agency costs. First, because the underwriter's selling effort is not verifiable, the underwriter might choose to place the issue at a lower price to exert less effort (Baron (1982)). Second, the underwriter may underprice bonds in order to cater to a clientele of investors, such as large bond funds that, in return, can generate business for the underwriter. An example of such quid-pro-quo behavior is underwriters earning trade commission revenues in exchange for underpriced bonds (e.g. Reuter (2006), Goldstein, Irvine, and Puckett (2011)). Since it should be easier for a powerful underwriter to make the issuer agree to a lower price, we expect stronger bargaining power to be associated with a higher yield spread. From Table 1.A, the issuance yield spread on the average bond is 1.84% (again similar to Fang (2005)).

The final measure is bond underpricing, i.e. the change in bond price relative to the offering price during the first day of trading. While the issuance yield spread measures *ex-ante* underpricing

[14] Negotiated sales take place for over 90% of the issues in our sample. The alternative is a competitive sale, when the selling price to the market is defined by competitive bids by brokers.

[15] "The behind-closed-doors process by which new corporate bonds are priced and then doled out to investors means that opportunities for questionable – though not necessarily illegal – behaviour exist, these bankers say." ("How firm a foundation?" *Financial Times*, March 8, 2015). Further, regulators are "…unlikely to find wrongdoing because there were no clear cut rules around how banks should dole out bond issuances among investors". ("SEC probes Goldman and Citi bond allocations." *Financial Times*, February 28, 2014).

(Gande, Puri, and Saunders (1999), Livingston and Miller (2000), Fang (2005)), first-day returns measure *ex-post* underpricing on the secondary market. By a logic similar to the case of issuance yield spreads, we expect stronger bargaining power to be associated with a stronger underpricing. We compute bond underpricing following Cai, Helwege, and Warga (2007), as the first-day bond return net of the value-weighted return on a matching portfolio of bonds with similar rating and maturity based on the "Rating & Maturity" approach of Bessembinder et al. (2009). We are able to compute underpricing for 5,396 bonds in our sample.[16] For 96.6% of these bonds, we observe first day prices. When we do not observe first day prices, we follow Cai, Helwege, and Warga (2007) and use the earliest available price within one week of trading. From Table 1.A, bond underpricing is on average 13 bps.[17]

1.4 Empirical strategy

We exploit the features of $Power$ to address the identification challenge discussed in the introduction, and distinguish underwriter market power from reputation and certification effects. The fact that $Power$ varies over time and across different issues for a given underwriter is key, because it provides us with a way to separate power from reputation with fixed effects. Going back to the example from the introduction, our approach compares bond issues by Oracle and AT&T that take place at the same time, and are both taken to the market by J.P. Morgan. Because J.P. Morgan's reputation does not vary across the two issues, by comparing them we can isolate bargaining power effects.

[16] When studying the secondary bond market Bessembinder et al. (2009) exclude putable and zero-coupon bonds. In our sample there are 76 such observations and their exclusion does not affect the results.

[17] Cai, Helwege, and Warga (2007) find somewhat larger underpricing, 37 bps on average. The difference can be related to the fact that they use as benchmarks the Lehman Brothers Corporate Indices. Those indices include all publicly traded US corporate debentures and secured notes meeting several maturity, liquidity, and quality guidelines; in particular, they include securities with calls, puts, and sinking fund provisions. In contrast, our matching portfolios constructed with under the Bessembinder et al. (2009) approach only include bonds meeting the filters on the NAIC and TRACE data described in Section 1.1.

Based on this reasoning, in our baseline tests we estimate:

$$y_{iut} = \alpha_{ut} + \beta Power_{iut} + \gamma' x_{iut} + \varepsilon_{iut} \quad (4)$$

y_{iut} denotes the fees, yield spreads, or underpricing on bond i, issued at time t and underwritten by underwriter u. $Power_{iut}$ is the bargaining power of underwriter u over the issuer associated with bond i. x_{iut} is a set of bond and bond issuer controls. Importantly, we include underwriter × calendar quarter fixed effects (α_{ut} term above) to absorb the impact of reputation (and, indeed, any time-varying underwriter characteristics). To define the fixed effects, we focus on lead underwriters; i.e. in terms of our example, the fixed effects group together all issues on which J.P. Morgan is the lead underwriter at a given date. Whenever there are multiple lead underwriters (in 4,725 cases, or about 50% of the deals in our sample), we define fixed effects that account for their composition; i.e. issues where the lead underwriters are J.P. Morgan and Goldman are grouped separately from issues where the leads are J.P. Morgan and Morgan Stanley. In a further set of tests discussed in Section 3.3, we treat members of an underwriting syndicate individually.

2. Results

Our main testable hypothesis is that lack of competition strengthens underwriter bargaining power. Under that hypothesis, powerful underwriters can extract rents from issuers, by placing their bonds on the market at higher fees and lower prices (higher yield spreads and underpricing).

A simple univariate sort supports this prediction. Table 1.E presents the average fees, offering yield spreads, and underpricing by terciles of $Power$. The difference between the top and bottom terciles is 11 bps for fees, 36 bps for yield spreads, and 6 bps for underpricing, consistent with the notion that issues placed by more powerful underwriters are typically more costly for issuers. Relative to the average fee (88 bps), yield spread (184 bps), and underpricing (13 bps), these effects also appear to be economically non-negligible.

An alternative interpretation of the univariate sorts is that weaker issuers turn to more powerful underwriters for certification, because they would otherwise not be able to place their bonds on the market. Our identification strategy, as discussed, attempts to disentangle these two alternatives; we now turn to those tests.

2.1 Baseline tests

Our first set of tests looks at the relationship between underwriter power and issuance fees. Table 2.A reports the estimates of regressions of $Fees$ on $Power$, with the specification described by equation (4), where $Fees$ denotes the fees associated with a given bond issue as a percentage of bond size. Each observation is a bond issue by a given issuer, taken to the market by a given underwriter, during a given calendar quarter. The control variables include a number of bond and issuer characteristics used in Burch, Nanda, and Warther (2005), Fang (2005), and Yasuda (2005): bond rating indicators and log-years to maturity, issuer size (natural logarithm of market equity), leverage, profitability (ROA), market-to-book ratio, and cash holdings-to-debt ratio, as well as issuer industry with Fama-French 10-industry and calendar quarter indicators. All issuer characteristics are measured at the end of the year preceding the bond issue date. In all specifications, we two-way cluster the standard errors by lead underwriter-calendar quarter combination and issuer.

Specification (1) reports a statistically significant coefficient on $Power$ of 0.055, which is also economically meaningful. An increase in $Power$ from the bottom to the top decile is associated with 9 bps higher fees, or a 10% increase relative to the average fees of 88 bps.[18] Specification (2) includes lead underwriter fixed effects and issuer fixed effects. Specification (3) includes lead underwriter × calendar quarter fixed effects to disentangle the bargaining power and reputation effects. The coefficient on $Power$ in this specification is very close to the estimate of specification (1) and equal to 0.051.

To assess the dollar value of the additional cost to issuers when they hire powerful underwriters, we regress log-dollar fees ($\ln(Fees \times Bond\ size)$) on the full set of control variables and fixed effects of specification (3), except for $Power$. We then exponentiate the residuals, and compare the average values for the subsamples of issues underwritten by the most and the least powerful banks. The difference captures the dollar amount that the issuers lose in fees when hiring powerful banks. The average value for issues in the top decile of $Power$ is $1.36m, while in the bottom decile it is $0.89m, resulting in a difference of $0.47m, or 18% of the $2.59m that issuers typically pay in fees. The impact of underwriter bargaining power on issuance costs appears, therefore, substantial.

In Table 2.B we run a similar analysis on bond yield spreads at issuance (i.e., ex ante underpricing), regressing the bond's offering yield spread on $Power$. In all specifications, the coefficient on $Power$ is positive and statistically significant. It is also economically meaningful: Based on the estimates of specification (1), an increase in $Power$ from the bottom to the top decile is associated with a 35 bps higher offering yield spread, or a 19% increase relative to the average offering yield spread of 1.84%. Considering the other specifications, the effect of an inter-decile increase in $Power$ on bond yield spreads ranges between 18 and 35 bps. In dollar terms, with the

[18] The economic effects are computed as follows. The bottom-decile average level of $Power$ is –3.00; the top-decile is –1.39. Therefore $0.055 \times (-1.39 + 3.00) \times 100 = 8.85$bps. The effects discussed in the remainder of the paper are computed in the same way.

same approach as for the fees, we find that the cost associated with an inter-decile increase in $Power$ amounts to \$1.02m, or 15% of the about \$6.85m dollar yield spread on the typical bond. Combining this effect with that of fees calculated above, we obtain about \$1.5m, or an implied 16% (= (0.47 + 1.02) / (2.59 + 6.85)) increase total issuing costs. Overall, these findings are in line with our prediction that powerful underwriters can extract rents from bond issuers, and suggest that the implied extra cost for the issuers is non-trivial.

In Table 2.C we repeat the analysis for (ex-post) underpricing. Similar to the impact on yield spreads, we find that $Power$ has a positive and significant association with underpricing, with the economic effects ranging between a 10 to 19 bps increase when going from a bottom-decile to a top-decile underwriter in terms of $Power$. In dollar terms, the effect on underpricing is close to the effect on yield spreads and amounts to \$1m, implying again a combined increase in total issuance costs of about \$1.5m.

[Insert Table 2 about here]

2.2 Robustness

We conduct a series of robustness checks, summarized in Table 3. For brevity, that table only reports the estimates of the coefficients on $Power$ and the associated *t*-statistics; but all regressions include the same sets of controls and fixed effects as in Table 2.A, specification (3).

In a first set of checks, we use two alternative indexes from the literature on bargaining power in coalitions (Felsenthal and Machover (1998)). Our baseline $Power$ measure treats all alternative underwriter "coalitions" as equally relevant outside options for the issuer. That ignores the fact that a given underwriter might be pivotal to the forming of a given coalition, thus narrowing the range of alternatives effectively available to the issuer. The indexes of Banzhaf (1964) and Shapley and Shubik (1954) account for this. We thus develop measures of bargaining power based on those indexes, described in detail in Appendix A, and replicate our main tests using those measures instead of our baseline $Power$. The results are reported in Table 3.A. The estimates and economic effects are similar to the ones discussed in the previous section,[19] suggesting that a simple count-based index as $Power$ such as the one used in our baseline estimates can provide an adequate measure of underwriter power.

In a second set of checks, we examine three variations in the estimation of the baseline $Power$ measure (Table 3.B). First, we control in the placement ability equation (2) for the underwriter's placement history in a given bond segment and industry (natural logarithm of the total number of issues and natural logarithm of the total amount placed over the past 5 years). The resulting estimates are very close to those of Table 2. Second, we show that our results are not sensitive to the length of the estimation window used to define "replacement" underwriters (by expanding it to 10 years), nor to restricting potential replacements to underwriters active in a given rating, industry, or maturity group over the previous 5 years. The parameter estimates of $Power$ and their statistical significance are similar to the baseline. Third, in equation (3) we defined $Power$ as $-\ln\left(1 + \sum_{-u} \mathbb{I}\left\{\hat{B}_{-ub} \geq B_{ub}\right\}\right)$, where B_{ub} is the allocation of bond issue b to underwriter u. We show that we obtain similar inference when we set an additional bandwidth of 5% around the bond size B_{ub} to determine potential replacements. The results are again close to our baseline.

In a third set of checks, we consider alternative ways of clustering the standard errors (Table 3.C). We find that our estimates are robust to clustering by issuer, underwriter, issuer ×

[19] The economic effects are computed as follows. The bottom-decile average Banzhaf (1954) power index is 2.66; the top-decile is 7.23. Therefore, moving from a bottom- to a top-decile underwriter is associated with an increase in fees by $0.011 \times (7.23 - 2.66) \times 100 = 5$ bps, with an increase in yield spreads by 16 bps, and in underpricing by 21 bps. Similarly, the bottom-decile average Shapley and Shubik (1964) power index is 1.46; the top-decile is 11.29. Therefore, moving from a bottom- to a top-decile underwriter is associated with an increase in fees by $0.014 \times (11.29 - 1.46) \times 100 = 14$ bps, with an increase in yield spreads by 29 bps, and in underpricing by 25 bps.

underwriter pair, or by calendar quarter. We also find that our results are robust to restricting the sample to cases in which only one bond of a given issuer is taken to the market, or to averaging fees, yield spreads, and underpricing across all bonds comprised in one issue (Table 3.D).[20] Finally, they are robust to controlling for a number of additional issuer and bond characteristics: fees, yield spreads, and underpricing faced by the issuer on previous issues, the bond's size, as well as syndicated loans obtained by the issuer within ten years prior to the bond's issuance date (Table 3.E, 3.F, and 3.G).

[Insert Table 3 about here]

3. Alternative explanations

The results discussed above are consistent with the effects associated with underwriter power. Our fixed effects strategy, moreover, considerably raises the bar for alternative explanations. If we assume for a moment that *Power* reflects some underlying economic variable, e.g. underwriter reputation or certification, which matches issuers and underwriters, such a variable must vary *within underwriter, at a given point in time*. This restricts the potential alternative drivers for our results to a narrow set, and further requires that any "matching" variable changes precisely around new bond issues. To check for this possibility, and disentangle the effect of underwriter power from alternative explanations based on assortative matching, we turn to three additional sets of tests.

3.1 Certification

In a first set of tests, we address the possibility that our earlier findings are explained by underwriter certification and reputation. First, we examine the returns on bonds outstanding around

[20] Around 22% of the bonds in our sample are taken to the market as part of an issue comprising multiple bonds. We come back to these bonds and examine them in greater detail in Section 4.

the issue dates of new bonds of the same issuers. Since certification reduces the amount of adverse information about the issue or the issuer, the market should view the issuance of new bonds taken to the market by a reputable underwriter as good news (Booth and Smith (1986)). Thus, if certification rather than underwriter power drives our results, we expect a more favorable market reaction around issue dates of new bonds underwritten by banks with high $Power$. The prices of the issuer's bonds outstanding should therefore increase (or at least not decrease). If, instead, the underwriter power mechanism dominates, the market reaction should be opposite, since worse contracts are imposed on the issuers. We should therefore observe a drop in the price of the issuer's bonds outstanding.

We compute cumulative abnormal returns (CARs) on bonds outstanding around issue dates of new bonds of the same issuers, and regress them on our bargaining power proxy. We calculate abnormal returns (ARs) following the matching portfolio approach of Bessembinder et al. (2009). We apply their "Rating & Maturity" approach, and partition the universe of bonds with available return data on a given day into 17 matching portfolios.[21] We compute two sets of matching portfolio returns, value- as well as equal-weighted.

Figure 2 illustrates the returns on bonds outstanding around new bond issues, for issues taken to the market by more versus less powerful underwriters (above/below median $Power$). The main conclusion from this test is already visible in the graph: when the underwriter of the new issue has higher $Power$, the price of existing bonds on the secondary market drops by around 40 bps, about twice as much as when the underwriter has low $Power$.

We replicate this test in a regression framework, estimating:

[21] First, bonds are partitioned into six rating groups (AAA, AA, A, BBB, BB and B and below). The bonds in each rating group are then further partitioned by years to maturity. The cutoffs for A-rated bonds is 0 and 7 years to maturity, for other investment-grade bonds they are 0, 5 and 10 years to maturity, and for non-investment grade bonds they are 0, 6 and 9. The cutoffs are designed to ensure approximately equal-sized groups.

$$CAR_{iut} = \alpha + \beta Power_{iut} + \gamma' x_{iut} + \varepsilon_{iut} \quad (7)$$

where CAR is the cumulative abnormal return on outstanding bonds. The sample includes all bonds whose issuers have a new issue in our sample period, with available price information in the union of the TRACE and NAIC databases. The set of controls mirror those of Table 2, and include bond rating and maturity, issuer size, profitability and leverage, market-to-book and cash to debt, as well as lead underwriter × calendar quarter fixed effects and issuer fixed effects. Additionally, we control for the residual maturity of the outstanding bonds and their Amihud (2002) illiquidity ratio. As before, we two-way cluster the standard errors by lead underwriter-calendar quarter combinations and issuer.

The results are reported in Table 4. Across all specifications, we find a strong negative relationship between $Power$ and issue announcement returns. In economic terms, an increase in $Power$ from the bottom to the top decile is associated with a drop in the three-day CAR[-1,+1] by 79 bps (specification (1)). In specifications (2) and (4), we compute abnormal returns over a longer window, from 10 days prior to 10 days after the new bond issue, to account for potential thin trading and stale prices of corporate bond, allowing for more observations and greater statistical power. Here too, higher underwriter $Power$ is associated with a more negative market reaction to the new bond issue. The implied impact of $Power$ appears to be more similar, and equal to 91-99 bps. Economically, these effects appear substantial, in comparison to the mean yield spread in our data of 184 bps. These findings suggest that our baseline estimates of Table 2 are unlikely attributable to issuers seeking underwriters with greater certification ability; they are more consistent with underwriter power effects.

[Insert Figure 2 and Table 4 about here]

As an additional check, we isolate bond issuers and issues that can ex ante benefit more from underwriter reputation and certification ability, and ask if we observe stronger effects of $Power$ on those issuers. We identify several proxies for certification needs: (i) analyst coverage (log-number of analysts following the issuer, net of the industry median), (ii) default risk (based on the Merton model, estimated with the procedure of Bharath and Shumway (2008)), (iii) tapping the bond market for the first time, (iii) young issuer age (less than ten years of stock price history), and (v) issue complexity (proxied by the prospectus file size and Fog index, following Loughran and MacDonald (2014)).

We estimate regression specifications analogous to those reported in Table 2, augmented by interacting indicators for high certification needs with $Power$. The results are reported in Table 5. Across all specifications, the impact of $Power$ does not appear stronger, statistically or economically, for issues with higher certification needs. The baseline effect of $Power$, on the other hand, appears in line with our baseline estimates.

In sum, the evidence presented in this section suggests that $Power$ is unlikely to capture the effects of certification and underwriter reputation.

[Insert Table 5 about here]

3.2 Loyalty

In a second set of tests, we focus on loyalty. This is an alternative version of the underwriter-issuer matching argument, suggesting that the issuer's choice of a given underwriter is due to the value of a continued relationship (Burch, Nanda, and Warther (2005), Ljungqvist, Marston, and Wilhelm (2006)). Given our results so far, it is not obvious why issuers should stick with a given underwriter if that entails bearing higher issuance costs and, based on the findings of the previous section, no material certification benefit. It is possible, however, that some unobservable long-term benefit accrues to loyal issuers, motivating them to rely on the same underwriter. For example, issuers may value the scope of other investment banking services provided by investment banks, such as equity underwriting or M&A advisory (Fang (2005)). To check for this possibility, we perform four tests.

First, we augment our baseline regression specification (3) to include issuer × underwriter fixed effects. Such fixed effects absorb the impact of any unobservable, non-time-varying factor that affects the relationship between issuers and their underwriters – such as loyalty. The estimates are reported in Table 6.A. They are, across all specifications, very similar to the corresponding ones of Table 2, suggesting that (non-time-varying) loyalty does not contaminate our results.

Second, we restrict the attention to cases in which the issuer employs a given underwriter for the first time. Since the relationship between issuer and underwriter is new in those cases, the effect of $Power$ should not be driven by loyalty; under the loyalty hypothesis, therefore, we should observe smaller (or no) effects. In Table 6.B, we show that is not the case; in fact, the effect of $Power$ in first-time encounters between issuers and underwriters is statistically indistinguishable, and economically very close, to other issues.

Third, we perform in Table 6.C a similar test and compare issues for which the issuer and underwriter have a long relationship, where loyalty considerations are arguably more relevant, or a short one. We find, again, very close effects in the two groups of issues.

[Insert Table 6 about here]

Fourth, we model loyalty and directly control for its impact on our tests. To do so, we resort to a two-stage procedure based on Heckman's (1979) selection model. In the first stage, we estimate a probit regression for the probability that a given issuer hire a given underwriter. To estimate it, we create an indicator variable equal to one if an investment bank is the lead underwriter in a given bond issue, and zero for all banks that are not hired to lead this particular issue, but have been active underwriters over the previous five years.[22] Underwriter choice is modeled as a function of having worked with a given underwriter in the previous five years on (a) a bond issue, (b) an equity issue (SEO), or (c) an M&A transaction, as the literature indicates these to be the main drivers of loyalty (Fang (2005), Ljungqvist, Marston, and Wilhelm (2006)). The estimates are reported in Table 7.A. Consistent with the evidence on loyalty from the literature, all three variables are highly statistically significant, and have a strong positive impact on underwriter choice. In Panel B, we show the second stage of the selection model where we estimate the impact of $Power$ on fees, yield spreads, and underpricing while controlling for unobserved loyalty effects (beyond the past underwriter or advisory relationships affecting selection) as captured by the inverse Mills ratio. We find that these effects have much bearing on the relation between power and fees/issue terms. Taken together, the results of these tests reject the hypothesis that $Power$ captures the effect of loyalty, and are more consistent with the predicted effects of underwriter bargaining power.

[Insert Table 7 about here]

3.3 Unobserved issuer and/or issue characteristics

In a third set of tests, we address the possibility that $Power$ is picking up the effect of some unobserved, omitted characteristic of the bond issuer or the issue itself, unrelated to the certification and loyalty channels discussed in the previous sections. To control for it, we explicitly account for the structure of underwriting syndicates, and exploit within-syndicate variation in

[22] In additional tests, omitted for brevity, we repeat this procedure under alternative definitions of active underwriters. We consider underwriters that in the five years prior to a given bond's issue quarter placed (a) any bond, (b) bonds in the same rating group, (c) bonds in the same maturity group (below/above 10 years), or (d) bonds in the same industry. In each case, we obtain results similar to the ones reported.

underwriter power and in the allocation of underwriting fees. We retrieve the fees allocated to individual underwriters within a syndicate from Capital IQ, and regress them on underwriter $Power$, including *individual bond issue fixed effects*. As in our baseline estimates, more powerful underwriters should command higher fees – here, a larger fees allocation. At the same time, the fixed effects absorb the effect of any variable that does not vary within a given bond issue; by construction, that includes any omitted issuer and/or bond characteristics.

The results are reported in Table 8. Consistent with our previous results, we find a strong positive association between $Power$ and fees allocation. This indicates that our baseline results are not picking up the effects of some omitted issuer or issue characteristic.

[Insert Table 8 about here]

4. Discussion

In the last part of our analysis, we ask two questions about the interactions between bond issuers and underwriters and about market entry. First, do bond issuers attempt to attenuate the costs associated with powerful underwriters? Second, how are such underwriters able to preserve their oligopolistic rents in equilibrium? In either case, we do not claim to provide an exhaustive answer; rather, we describe one economically relevant channel.

4.1 Do issuers attenuate the costs associated with powerful underwriters?

Around 22% of all bond issues in our sample period involve multiple bonds grouped together under one prospectus. Breaking up an issue into separate bonds with different characteristics can be a way to circumvent a powerful underwriter. The variation in bond characteristics within one prospectus can be non-trivial: We observe on average a $35 million difference in size between the largest and smallest bond on a given prospectus, and a 9-year maturity difference between the longest- and shortest-maturity bond (the difference in terms of rating is smaller, about one notch).[23]

We compare such bonds to cases where the prospectus contains only one bond as follows. First, we define an equivalent "aggregate" bond by summing up the bond sizes and weighted average maturities and rating within one prospectus. Second, we seek a matching bond for it, among all bonds issued by firms within the same Fama-French 10 industry and of similar rating (both investment grade/both speculative grade) within a $\pm$5-year window.

We then compare underwriter power between the "aggregate" bond and the matching bond, by regressing the difference in $Power$ between them on a constant term, controlling for an investment grade indicator, the log-absolute value of the difference in maturities, and the log-absolute value of the difference in bond sizes. The results are reported in Table 9. Columns (1)-(4) apply increasingly tighter filters for the similarity between the "aggregate" and the matching bonds in terms of issue size ($\pm$20%, $\pm$10%) and maturity ($\pm$20%, $\pm$10%). Across all specifications, the intercept is negative and statistically significant, indicating that the matching bond is systematically taken to the market by an underwriter with greater $Power$. The size of the coefficient estimate indicates that, controlling for rating, maturity, and bond size, the matching bond issuer has about one half as many potential replacement underwriters. This is consistent with the notion that issuers structure their bonds in such a way as to avoid powerful underwriters, when they can.

[Insert Table 9 about here]

4.2 How are underwriter rents sustained in equilibrium?

[23] For a given issuer, it is possible to issue a bond with a lower rating than the issuer's own rating. It is generally not possible to issue a bond with a higher rating.

In light of the results of the previous section, how are powerful underwriters able to sustain their rents, and why are those rents not competed away in equilibrium? We document one channel, related to institutional features of the corporate bond sector and the cost of entry into the underwriting market. The vast majority of corporate bond issues are “firm commitment” or “bought deal”: the underwriter purchases from the issuer the entire value of the bond, which it then sells to investors. To attenuate inventory risk, underwriters establish a network of connections with institutional investors that allows them to place an issue more rapidly on the market. Establishing such a network represents a fixed cost of market entry. As in classic oligopoly models, then, the presence of the fixed entry cost implies that only a reduced number of underwriters can be active in the market.

To take this idea to the data, we look at the speed with which underwriters place a bond. We examine trades in the NAIC database between the underwriter of a given bond and insurance companies reporting to NAIC, and focus on the fraction of the issue that is sold by the underwriter within the first day of trade and within the first week. The results are reported in Table 10. In all specifications, the coefficient on $Power$ is positive and statistically significant, revealing that powerful underwriters are able to place their bonds to investors more rapidly. Going from the bottom to the top $Power$ decile, the fraction of the bond placed within the first day (first week) increases by 2-11% (2-10%). This is consistent with the notion that powerful underwriters have a superior network of investor connections, representing a barrier to entry that helps them preserve their oligopolistic rents.

[Insert Table 10 about here]

5. Conclusion

We study the impact of underwriter competition in the corporate bond market. We rely on a novel underwriter power proxy, which measures the extent to which a given underwriter can be replaced by its competitors to place a bond issue. Because our measure varies *within underwriter, at a given point in time* across different bond issuers, we are able to separate the impact of bargaining power from the underwriter's reputation and certification ability using underwriter × date fixed effects. Our findings are consistent with the view that powerful underwriters are able to extract rents from issuers, in the form of higher underwriting fees, yield spreads, and underpricing. Opting for a powerful underwriter costs an issuer about $1.5 million more, which represents a 16% increase relative to the $9 million cost borne by the average issuer.

The finding that underwriters can exploit their power by setting issue terms is robust to a host of alternative measures of bargaining power (e.g. Banzhaf and Shapley-Shubik indexes, and alternative filters on the set of potential replacement underwriters on a given bond issue), a broad set of control variables, alternative clustering of the standard errors, and a number of filters on the sample of bonds in our data.

Our fixed effects strategy considerably raises the bar for any alternative explanation based on *certification*, but we perform further checks on this possibility comprising an analysis of the price reaction of bonds outstanding to the new bond issue and an analysis of issues with varying degrees of transparency (based on analyst coverage, probability of default, time since first tapping the bond market, age, or issue complexity). The results of these tests imply that the power measure does indeed capture the relative power of an underwriter and not his certification ability. We also test whether our results could be explained by *loyalty* between issuers and underwriters, referring to the fact that issuers can stick to the same underwriters when they derive some benefits from a continued relationship. We are able to rule out loyalty as an explanation by including issuer ×

underwriter fixed effects that absorb the impact of any unobservable, non-time-varying factor affecting the matching between issuers and underwriters, by studying the cases where the issuer employs a given underwriter for the first time versus the ones where they have a long-standing relation, and by controlling for past relationships with the underwriter on bond, equity, or M&A transactions. None of the results of these tests suggest that loyalty explains our base line results. Another alternative explanation is that *unobservable characteristics of the issuer or bond issue* are behind our findings. To address this possibility, we focus on the issues taken to the market by a syndicate of underwriters, each of which receives different apportioned fees. We include individual bond issue fixed effects that absorb the potential effect of any issuer and/or bond characteristic. We show that omitted issuer and/or issue characteristics do not explain our results.

Finally, we ask whether bond issuers attempt to attenuate the costs associated with powerful underwriters, and how those underwriters are able to preserve their rents in equilibrium. First, some bond issuers break down a large bond issue into a number of smaller bonds or a combination of bonds with different maturities so as to avoid having to hire a powerful underwriter. Second, while powerful underwriters are more expensive, they do a superior network of connections to large institutional investors, which enables them to place bond issues more rapidly. The cost of establishing such a network constitutes a barrier to entry: As in classic oligopoly models, the presence of a fixed cost of entry implies that the market can only sustain a small number of players in equilibrium.

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Table 1. Descriptive statistics

The table reports descriptive statistics for the main variables used in the analysis. The sample includes non-convertible U.S. dollar-denominated corporate bonds issued by U.S. firms over 1970-2015, excluding exchange offers, medium-term notes, and bonds issued by financials and regulated utilities. Bond characteristics and underwriting data are retrieved the from Fixed Income Securities Database (FISD) and SDC Platinum Global New Issues (SDC) databases. Issuer characteristics come from CRSP-Compustat Merged (CCM) Fundamentals Annual. Panel A summarizes bond characteristics. Panel B presents issuer characteristics (all measured at the end of the fiscal year prior to the bond issue date), and compares them with the characteristics of the average firm in the CCM database. Panel C presents lead underwriter characteristics. Panel D describes the underwriter power proxy and the implied number of potential replacements for an issue's underwriter. Panel E computes the means of fees, bond issuance yield spreads, and underpricing by terciles of underwriter power. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively. All dollar values are expressed in constant January 1, 2010 U.S. dollars. All the variables are winsorized at the 1st and 99th percentiles, and defined in detail in the Appendix A.

A: Bond characteristics	Mean	Median	St. Dev.	Min	Max	Obs.
Fees (%)	0.88	0.65	0.72	0.00	3.50	7,971
Yield spread (%)	1.84	1.38	1.80	-6.66	7.31	9,024
Underpricing (%)	0.13	0.08	0.85	-3.29	3.62	5,396
Bond size ($mln)	357	203	413	1	2,205	9,356
Maturity (years)	12.87	10.02	9.05	2.00	40.04	9,356
Bonds in rating group (%)	AAA	AA	A	BBB	BB	B and below
N = 9,356	1.08	8.68	30.17	33.86	11.49	14.72

B: Issuer characteristics and comparison with CCM firms	Our sample (1)		Average CCM (2)			
	Mean	Obs	Mean	Obs	(2)-(1)	*t*-stat
Market capitalization ($mln)	7,638	4,911	811	159,789	6,827	20.79***
ROA	0.05	4,907	0.01	145,484	0.04	22.06***
Leverage	0.35	4,901	0.22	161,150	0.13	31.16***
Market-to-book	1.52	4,911	1.89	159,785	-0.37	-15.77***
Cash/debt	0.40	4,897	11.27	159,785	-10.88	-39.44***
Cash ($mln)	411.00	4,911	59.89	159,785	350.97	18.17***

C: Underwriter characteristics	Mean	Median	St. Dev.	Min	Max	Obs.
Co-lead (0/1)	0.50	1.00	0.50	0.00	1.00	9,356
Number of lead underwriters	2.29	2.00	1.76	1.00	9.00	9,356
Market share	12.15	12.63	5.64	0.00	25.41	9,355
Segment market share	13.75	13.14	9.72	0.00	56.36	9,355
Industry market share	13.56	13.16	9.78	0.00	55.12	9,355

D: Underwriter power	Mean	Median	St. Dev.	Min	Max	Obs.
Power	-2.23	-2.30	0.66	-3.53	0.00	9,350
Number of replacements	10.22	9.00	6.19	0.00	33.00	9,350

E: Sorts (by underwriter power tercile)	Low	Mid	High	High-Low	*t*-stat
Fees (%)	0.83	0.87	0.93	0.11	4.02***
Yield spread (%)	1.67	1.77	2.04	0.36	5.57***
Underpricing (%)	0.10	0.12	0.16	0.06	1.79*

Table 2. Fees, yield spreads, underpricing and underwriter power

The table presents the estimates of: $\boldsymbol{y_{iut} = \alpha_{ut} + \beta Power_{iut} + \gamma' x_{iut} + \varepsilon_{iut}}$ The dependent variable $\boldsymbol{y_{iut}}$ denotes the fees (panel A), issuance yield spread (panel B), or underpricing (panel C) on a bond issued by firm $\boldsymbol{i}$ at time $\boldsymbol{t}$, taken to the market by underwriter $\boldsymbol{u}$. $\boldsymbol{Power}$ denotes the underwriter power proxy. $\boldsymbol{x}$ is a set of bond- and firm-level control variables, including rating, calendar quarter, Fama-French 10 industry fixed effects, as well as, in different specifications, issuer, underwriter, and underwriter × date fixed effects. All the variables are winsorized at the 1st and 99th percentiles, and defined in detail in the Appendix A. *t*-statistics, reported in parentheses, are two-way clustered by lead underwriter-calendar quarter combination and by issuer, and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

A: Fees

	(1)	(2)	(3)
Power	0.055***	0.049***	0.051***
	(4.85)	(3.17)	(3.43)
log(Maturity)	0.177***	0.181***	0.185***
	(19.78)	(19.98)	(22.12)
log(Market capitalization)	-0.112***	-0.146***	-0.160***
	(-10.30)	(-5.84)	(-4.46)
ROA	0.085	-0.075	-0.340
	(0.60)	(-0.38)	(-1.38)
Leverage	0.136**	0.121	-0.079
	(1.98)	(0.80)	(-0.48)
Market-to-book	0.052***	0.050***	0.088***
	(5.03)	(2.76)	(2.72)
Cash/Total debt	0.004	0.002	0.011
	(0.51)	(0.22)	(0.73)
N	7,354	6,382	5,205
R^2	0.72	0.82	0.86
Rating f.e.	Yes	Yes	Yes
Calendar quarter f.e.	Yes	Yes	
Fama-French industry 10 f.e.	Yes		
Issuer f.e.		Yes	Yes
Underwriter f.e.		Yes	
Underwriter × calendar quarter f.e.			Yes

Table 2. Fees, yield spreads, underpricing and underwriter power – continued

B: Yield spread

	(1)	(2)	(3)
Power	0.218***	0.132***	0.109***
	(7.83)	(3.62)	(2.68)
log(Maturity)	0.240***	0.245***	0.271***
	(10.79)	(11.69)	(13.95)
log(Market capitalization)	-0.297***	-0.443***	-0.398***
	(-12.40)	(-7.38)	(-4.69)
ROA	-1.993***	-1.923***	-1.877***
	(-4.99)	(-3.63)	(-2.70)
Leverage	0.170	0.399	-0.382
	(0.97)	(1.08)	(-0.95)
Market-to-book	-0.020	0.010	0.028
	(-0.74)	(0.21)	(0.37)
Cash/Total debt	0.036**	-0.022	-0.150**
	(2.00)	(-0.53)	(-2.20)
N	8,249	7,088	5,631
R^2	0.57	0.76	0.83
Rating f.e.	Yes	Yes	Yes
Calendar quarter f.e.	Yes	Yes	
Fama-French industry 10 f.e.	Yes		
Issuer f.e.		Yes	Yes
Underwriter f.e.		Yes	
Underwriter × calendar quarter f.e.			Yes

Table 2. Fees, yield spreads, underpricing and underwriter power – continued

C: Underpricing

	(1)	(2)	(3)
Power	0.061**	0.116***	0.083***
	(2.33)	(3.61)	(2.92)
log(Maturity)	0.055***	0.047*	0.051*
	(2.90)	(1.84)	(1.86)
log(Market capitalization)	-0.031*	-0.024	-0.009
	(-1.95)	(-0.31)	(-0.05)
ROA	0.374	-0.045	-3.329**
	(1.20)	(-0.07)	(-2.12)
Leverage	-0.047	-0.137	-2.020*
	(-0.37)	(-0.37)	(-1.77)
Market-to-book	0.001	-0.024	0.147
	(0.06)	(-0.38)	(0.94)
Cash/Total debt	-0.017	-0.029	-0.168
	(-1.23)	(-0.77)	(-1.62)
N	4,873	4,025	2,957
R^2	0.08	0.45	0.68
Rating f.e.	Yes	Yes	Yes
Calendar quarter f.e.	Yes	Yes	
Fama-French industry 10 f.e.	Yes		
Issuer f.e.		Yes	Yes
Underwriter f.e.		Yes	
Underwriter × calendar quarter f.e.			Yes

Table 3. Robustness

This table reports robustness checks. In all panels, regression specifications similar to the ones reported in Table 2 are estimated, with fees (column (1)), yield spreads (column (2)), and underpricing (column (3)) as the dependent variable, and including all control variables and rating, issuer, and underwriter × date fixed effects as in column (3) of Table 2. For brevity, only the coefficients on the key variables of interest are reported. Panel A considers alternative proxies for underwriter power, based on the Banzhaf (1954) and Shapley and Shubik (1964) measures of the extent to which a given underwriter is pivotal in a coalition. Panel B considers variations to the construction of the underwriter power proxy defined in Section 1.2 (controlling for the underwriter's placement history in equation (2), using 10 years of past issues to estimate equation (2), restricting the set of comparable underwriters to those active in same rating, maturity, or industry group, and applying a 5% bandwidth to determine the number of potential replacements in equation (3)). Panel C reproduces the estimates of Table 2 with alternative clusters of the standard errors, around issuer, underwriter, issuer × underwriter, or calendar quarter. Panel D removes from the analysis issues that involve multiple bonds, or replaces them by an average of the characteristics of the underlying bonds. Panel E reports regressions that control for fees, yield spreads, or underpricing of past issues. Panel F controls for bond size. Panel G controls for the presence of syndicated loans associated with the bond issuer. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

	Fees (1)	**Yield spread** (2)	**Underpricing** (3)
A: Alternative underwriter power proxies			
Banzhaf (1954) index	0.011*	0.036*	0.045***
	(1.71)	(1.82)	(2.61)
Shapley and Shubik (1964) index	0.014***	0.029**	0.026**
	(3.86)	(2.29)	(2.00)
B: Variations in the construction of Power (coefficients on Power)			
Controlling for underwriter placement history	0.049***	0.115**	0.109***
	(2.77)	(2.32)	(3.52)
Construction based on 10 years of past issues	0.053***	0.096**	0.075**
	(3.60)	(2.35)	(2.44)
Potential replacements within rating group	0.046***	0.075*	0.054*
	(3.52)	(1.94)	(1.93)
Potential replacements within maturity group	0.055***	0.115***	0.059*
	(3.73)	(2.89)	(1.95)
Potential replacements within industry	0.037***	0.077**	0.042*
	(3.03)	(2.19)	(1.76)
5% bandwidth	0.051***	0.109***	0.083***
	(3.43)	(2.68)	(2.92)
C: Alternative standard error clusters			
Power	0.051	0.109	0.083
t-statistics based on st. errors clustered around…			
Issuer	(3.22)	(2.50)	(2.43)
Underwriter	(3.08)	(2.77)	(2.28)
Issuer × underwriter	(3.33)	(2.67)	(1.99)
Calendar quarter	(3.68)	(2.75)	(2.14)

Table 3. Robustness – continued

	Fees (1)	Yield spread (2)	Underpricing (3)
D: Treatment of issues that involve multiple bonds (coefficients on Power)			
One bond per issue	0.083***	0.190***	0.333*
	(3.54)	(2.93)	(1.67)
Average bond per issue	0.097***	0.172**	0.083
	(4.09)	(2.15)	(0.69)
E: Control for past fees, yield spreads, underpricing			
Power	0.042***	0.118***	0.104***
	(2.62)	(2.63)	(3.52)
Past Fees	-0.040		
	(-0.73)		
Past Yield spread		0.001	
		(0.05)	
Past Underpricing			0.067
			(0.80)
F: Control for bond size			
Power	0.048**	0.110**	0.142**
	(2.14)	(2.08)	(2.00)
Bond size	0.003	-0.001	-0.081
	(0.12)	(-0.03)	(-0.97)
G: Control for syndicated loans to the bond issuer			
Power	0.051***	0.108***	0.083***
	(3.44)	(2.65)	(2.94)
Syndicated loans	-0.075	0.181	0.183
	(-0.98)	(1.42)	(0.55)

Table 4. Certification: Underwriter power and returns on bonds outstanding around new issues

The table presents the estimates of a regression of the cumulative abnormal returns (CARs) on bonds outstanding around the new bond issue dates on underwriter bargaining power (*Power*). Bond abnormal returns (ARs) are cumulated over 3-day [-1,1], and 21-day [-10,10] windows, and are computed relative to value-weighted (columns (1)-(2)) or equal-weighted (columns (3)-(4)) matching portfolios following Bessembinder et al. (2009). All regressions include the issuer and issue controls from Table 2, as well as controls for the bonds outstanding (log-residual maturity and Amihud (2002) illiquidity ratio). *t*-statistics, reported in parentheses, are two-way clustered by lead underwriter-calendar quarter combination and by issuer. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

	Value-Weighted Matching Portfolio		**Equal-Weighted Matching Portfolio**	
	CAR [-1, 1]	CAR [-10, 10]	CAR [-1, 1]	CAR [-10, 10]
	(1)	(2)	(3)	(4)
Power	-0.493***	-0.566***	-0.536***	-0.619***
	(-6.53)	(-19.90)	(-7.04)	(-20.27)
N	4,587	6,865	4,587	6,865
R^2	0.39	0.30	0.39	0.30
Outstanding bonds' controls	Yes	Yes	Yes	Yes
Issuer and issue controls	Yes	Yes	Yes	Yes
Rating f.e.	Yes	Yes	Yes	Yes
Issuer f.e.	Yes	Yes	Yes	Yes
Underwriter × cal. quarter f.e.	Yes	Yes	Yes	Yes

Table 5. Certification: Underwriter power and certification needs

The table presents the estimates of regressions of fees, bond issuance yield spreads, and underpricing on underwriter power (*Power*), interacted with proxies for certification needs. Panel A looks at analyst coverage (natural logarithm of the number of I/B/E/S analysts covering the firm net of Fama-French industry 10 × date average, odd-numbered columns) and default probability (implied by the Merton model, estimated using the Bharath and Shumway (2008) approach, even-numbered columns). Panel B looks at an indicator for the first time the issuer taps the corporate bond market (odd-numbered columns) and an indicator for less than ten years of stock trading history (even-numbered columns). Panel C looks at issue complexity, proxied by the log-prospectus file size (odd-numbered columns) and the Fog index (even-numbered columns), following Loughran and McDonald (2014). The set of controls and fixed effects is the same as in Table 2, specification (3). *t*-statistics, reported in parentheses, are two-way clustered by lead underwriter-calendar quarter combination and by issuer. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

A. Analyst coverage and default probability

	Fees		**Yield spreads**		**Underpricing**	
	(1)	(2)	(3)	(4)	(5)	(6)
Power	0.049***	0.049***	0.107**	0.115***	0.092***	0.095***
	(3.11)	(3.34)	(2.56)	(2.79)	(3.02)	(3.24)
Power × Analyst coverage	0.006		0.015		-0.042	
	(0.53)		(0.51)		(-1.45)	
Analyst coverage	-0.010		0.053		-0.100	
	(-0.37)		(0.72)		(-0.75)	
Power × Default probability		0.076		-0.332		-0.375
		(0.22)		(-1.19)		(-0.61)
Default probability		1.022		1.146***		-2.038**
		(1.43)		(2.70)		(-1.99)
Bond and issuer controls	Yes	Yes	Yes	Yes	Yes	Yes
N	5,205	5,205	5,631	5,631	2,957	2,957
R^2	0.87	0.87	0.83	0.83	0.68	0.68
Rating f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Issuer f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Underwriter × cal. quarter f.e.	Yes	Yes	Yes	Yes	Yes	Yes

Table 5. Certification: Issuer characteristics and underwriter power – continued

B. First time on the bond market and young issuers

	Fees		Yield spreads		Underpricing	
	(1)	(2)	(3)	(4)	(5)	(6)
Power	0.052***	0.049***	0.115***	0.123***	0.071**	0.079***
	(3.49)	(3.22)	(2.63)	(2.74)	(2.42)	(2.60)
Power × 1st time on bond mkt	-0.028		-0.077		0.128	
	(-0.56)		(-0.80)		(1.09)	
1st time on bond mkt	0.024		0.040		0.278	
	(0.21)		(0.18)		(0.77)	
Power × Young issuer		0.017		-0.121		0.041
		(0.22)		(-1.17)		(0.31)
Young issuer		-0.022		-0.514		0.059
		(-0.12)		(-1.60)		(0.11)
Bond and issuer controls	Yes	Yes	Yes	Yes	Yes	Yes
N	5,205	5,205	5,631	5,631	2,957	2,957
R^2	0.87	0.86	0.83	0.83	0.68	0.68
Rating f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Issuer f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Underwriter × cal. quarter f.e.	Yes	Yes	Yes	Yes	Yes	Yes

Table 5. Certification: Issuer characteristics and underwriter power – continued

C. Issue complexity

	Fees		Yield spreads		Underpricing	
	(1)	(2)	(3)	(4)	(5)	(6)
Power	0.051***	0.052***	0.110***	0.111***	0.083***	0.080***
	(3.41)	(3.46)	(2.72)	(2.73)	(2.91)	(2.84)
Power × log(File size)	-0.007		0.017		-0.045	
	(-0.44)		(0.66)		(-1.31)	
log(File size)	0.012		0.016		-0.010	
	(0.29)		(0.26)		(-0.10)	
Power × Fog index		-0.002		0.000		0.007
		(-0.89)		(0.01)		(1.04)
Fog index		-0.005		0.019		0.033
		(-0.80)		(1.62)		(1.27)
Bond and issuer controls	Yes	Yes	Yes	Yes	Yes	Yes
N	5,205	5,205	5,631	5,631	2,957	2,957
R^2	0.87	0.86	0.83	0.83	0.68	0.68
Rating f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Issuer f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Underwriter × cal. quarter f.e.	Yes	Yes	Yes	Yes	Yes	Yes

Table 6. Loyalty: Underwriter × issuer fixed effects, new underwriters, and length of relationship

Panel A presents the estimates of regressions analogous to those of Table 2, column (3), augmented by underwriter × issuer fixed effects. Panel B presents similar estimates, where $\boldsymbol{Power}$ is interacted with $\boldsymbol{New\ Underwriter}$, an indicator equal to 1 if the issuer hires a given underwriter for the first time on a given bond issue, as well as with (1–$\boldsymbol{New\ Underwriter}$). Similarly in Panel C, $\boldsymbol{Power}$ is interacted with $\boldsymbol{Long\ relationship}$, an indicator equal to 1 if the issuer has employed the same underwriter on a previous bond or equity issue or an M&A during the previous ten years, as well as with (1–$\boldsymbol{Long\ relationship}$). In all panels, the dependent variable is fees in column (1), issuance yield spread in column (2), and underpricing in column (3). All regressions include the full set of control variables and fixed effects used in Table 2. *t*-statistics, reported in parentheses, are two-way clustered by lead underwriter-calendar quarter combination and by issuer. In panels B and C, the rows labeled F-stat and p-value report the F test statistic for the null hypothesis that the coefficients on the interactions between $\boldsymbol{New\ Underwriter}$ or (1 –$\boldsymbol{New\ Underwriter}$) ($\boldsymbol{Long\ relationship}$ or (1 – $\boldsymbol{Long\ relationship}$)) and $\boldsymbol{Power}$ are equal and the corresponding p-value. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

	Fees (1)	**Yield spread** (2)	**Underpricing** (3)
A: Underwriter × issuer fixed effects			
Power	0.045***	0.125***	0.096***
	(3.18)	(3.02)	(3.33)
Bond and issuer controls	Yes	Yes	Yes
Rating and Underwriter × cal. quarter f.e.	Yes	Yes	Yes
N	4,480	4,657	2,483
R^2	0.90	0.87	0.70
Underwriter × issuer f.e.	Yes	Yes	Yes
B: New and old underwriters			
Power × New underwriter [A]	0.046***	0.121***	0.067**
	(3.06)	(2.77)	(2.05)
Power × (1 – New underwriter) [B]	0.055***	0.098**	0.104***
	(3.52)	(2.37)	(2.74)
N	5,205	5,631	2,957
R^2	0.86	0.83	0.68
Controls and fixed effects as in Table 2	Yes	Yes	Yes
F-stat [A] = [B]	0.98	0.94	0.78
p-value	0.32	0.33	0.38
C: Previous relationship with the underwriter			
Power × Long relationship [A]	0.048***	0.094*	0.092*
	(3.06)	(1.85)	(1.68)
Power × (1 – Long relationship) [B]	0.052***	0.116***	0.078**
	(3.38)	(2.98)	(2.29)
N	5,205	5,631	2,957
R^2	0.86	0.83	0.68
Controls and fixed effects as in Table 2	Yes	Yes	Yes
F-stat [A] = [B]	0.14	0.63	0.04
p-value	0.71	0.43	0.84

Table 7. Loyalty: Past issuer-underwriter relationship

The table reports the estimates of a two-stage model for underwriter selection in the spirit of Heckman (1979). Panel A reports the (first-stage) estimates of a probit model for the probability that a given underwriter takes to the market a given issue, as a function of the full set of control variables used in the previous regressions, as well as indicators for whether the issuer and underwriter have worked together on a bond issue, equity issue, or an M&A in the previous five years (information on previous equity issue and M&As is retrieved from the SDC Platinum database). From the estimates of panel A, inverse Mills ratios are obtained, which are then included in the second-stage estimates reported in panel B. Panel B reports specifications analogous to the ones in Table 2, column (3), where the dependent variables are fees (column (1)), issuance yield spreads (column (2)), and underpricing (column (3)). *t*-statistics, reported in parentheses, are two-way clustered by lead underwriter-calendar quarter combination and by issuer. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

	(1)	(2)	(3)
A: First-stage: Underwriter selection			
Past bond underwriter	4.059***	4.007***	3.948***
	(25.49)	(24.42)	(24.76)
Past equity underwriter	1.323***	1.437***	1.126***
	(4.92)	(5.75)	(4.29)
Past M&A advisor	1.851***	2.072***	1.539***
	(5.32)	(5.55)	(4.65)
Bond and issuer controls; industry and cal. quarter indicators	Yes	Yes	Yes
N	317,618	318,513	245,267
B: Second-stage	*Fees*	*Yield spreads*	*Underpricing*
Power	0.049***	0.112***	0.082***
	(3.39)	(2.77)	(2.91)
Inverse Mills' ratio	0.021*	-0.041	0.054
	(1.75)	(-1.28)	(0.53)
Bond and issuer controls	Yes	Yes	Yes
N	5,205	5,631	2,957
R^2	0.87	0.83	0.68
Issuer f.e.	Yes	Yes	Yes
Underwriter × Calendar quarter f.e.	Yes	Yes	Yes

Table 8. Omitted issuer or issue characteristics: Individual bond fixed effects

The table reports the estimates of regressions analogous to those of Table 2.A, but where the dependent variable is the percentage fees apportioned to a given underwriter. Therefore, one observation corresponds to one underwriter in one bond. The apportioned fees are regressed on underwriter power and, in column (1), the same set of controls and fixed effects as in column (3) of Table 2.A. In column (2), we include individual bond fixed effects, which absorb all bond- and issuer-level controls, as well as any potentially omitted variable on the bond or issuer level. Data on the apportionment of fees to each underwriter on a given issue is retrieved from Capital IQ. *t*-statistics, reported in parentheses, are two-way clustered by lead underwriter-calendar quarter combination and by issuer. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

	(1)	(2)
Power	0.056***	0.113***
	(7.54)	(10.74)
Bond and issuer controls	Yes	–
N	4,741	4,741
R^2	0.80	0.84
Issuer f.e.	Yes	
Underwriter × Calendar quarter f.e.	Yes	Yes
Individual bond f.e.		Yes

Table 9. Strategic structuring of bond issues

The table focuses on the 1,493 issues in the sample which include multiple bonds, and tests whether these issues are strategically "broken down" to circumvent powerful underwriters. The characteristics of the bonds comprised within a given issue are aggregated, and the resulting "aggregate" bond is matched to other issues involving only one bond, by an issuer belonging to the same industry and credit quality (investment grade/speculative grade), and of similar size and maturity. The "broken down" and matching issues are then compared, by estimating a regression of the difference in underwriter power between "broken down" issue and the average of the matching issues on an intercept and controls for the log-difference in their maturities and issue sizes, including industry and rating indicators. The intercept's estimate measures the reduction in underwriter power achieved by "broken down" issues. The different columns restrict the set of potential matches to progressively tighter bands in terms of size (±20%, ±10%) and maturity (±20%, ±10%). *t*-statistics, reported in parentheses, are two-way clustered by lead underwriter-calendar quarter combination and by issuer. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

Size difference from match	**±20%**	**±20%**	**±10%**	**±10%**
Maturity difference from match	**±20%**	**±10%**	**±20%**	**±10%**
	(1)	(2)	(3)	(4)
Intercept	-0.968***	-1.052***	-0.877***	-1.066***
	(-6.16)	(-6.37)	(-4.42)	(-4.87)
Controls for industry, rating, difference in maturity and issue size	Yes	Yes	Yes	Yes
N	611	454	394	267
R^2	0.07	0.08	0.07	0.07

Table 10. Underwriter power and speed of bond placement

The table reports the estimates of a regression of the fraction of a given bond sold by the underwriter on the offering date (columns (1)-(2)) and within one week (columns (3)-(4)) on underwriter power. Whenever a bond is underwritten by multiple underwriters, the regression includes separate observations for each underwriter. Columns (1) and (3) include the full set of controls and fixed effects used in Table 2; columns (2) and (4) include individual bond fixed effects, which absorb those controls. Bond placement data are based on the trades between underwriters and insurance companies reported in the NAIC database. *t*-statistics, reported in parentheses, are two-way clustered by lead underwriter-calendar quarter combination and by issuer. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

	% of the bond sold on the offering date		**% of the bond sold within a week**	
	(1)	(2)	(3)	(4)
Power	0.010***	0.059***	0.009***	0.062***
	(4.41)	(9.85)	(4.38)	(9.83)
Bond and issuer controls	Yes	–	Yes	–
N	10,963	9,954	10,963	9,954
R^2	0.30	0.39	0.34	0.40
Rating f.e.	Yes		Yes	
Issuer f.e.	Yes		Yes	
Underwriter × Cal. quarter f.e.	Yes	Yes	Yes	Yes
Individual bond f.e.		Yes		Yes

Figure 1. Underwriter power by segments and industries

The graph depicts the median number of potential replacements for several bond underwriters, by bond size (above/below the median), rating, maturity (shorter/longer than 10 years), and Fama-French 10 industry groups. Replacements are defined as the number of underwriters that could replace a lead underwriter on a given bond, based on equation (3). Darker areas correspond to fewer replacements, implying higher underwriter power.

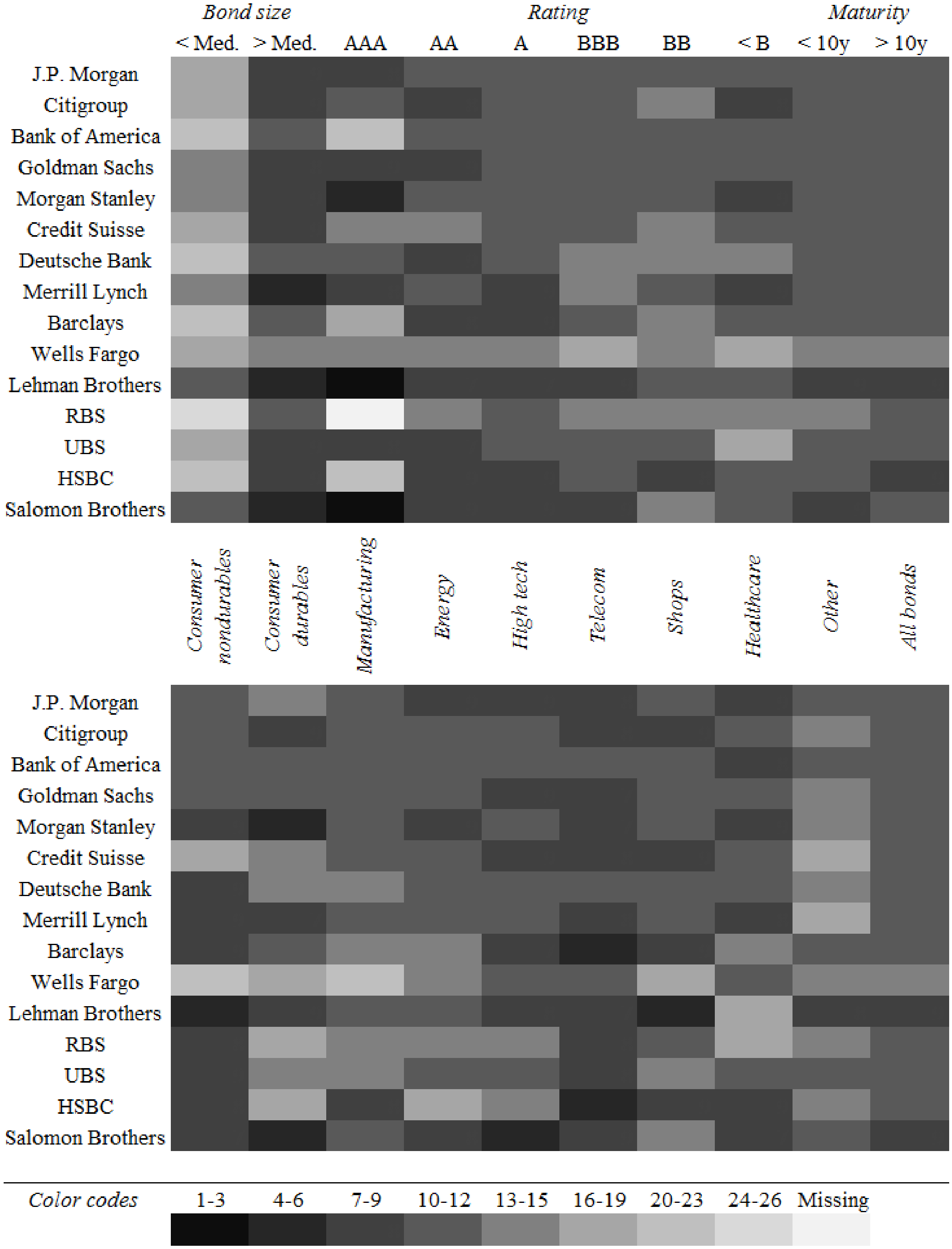
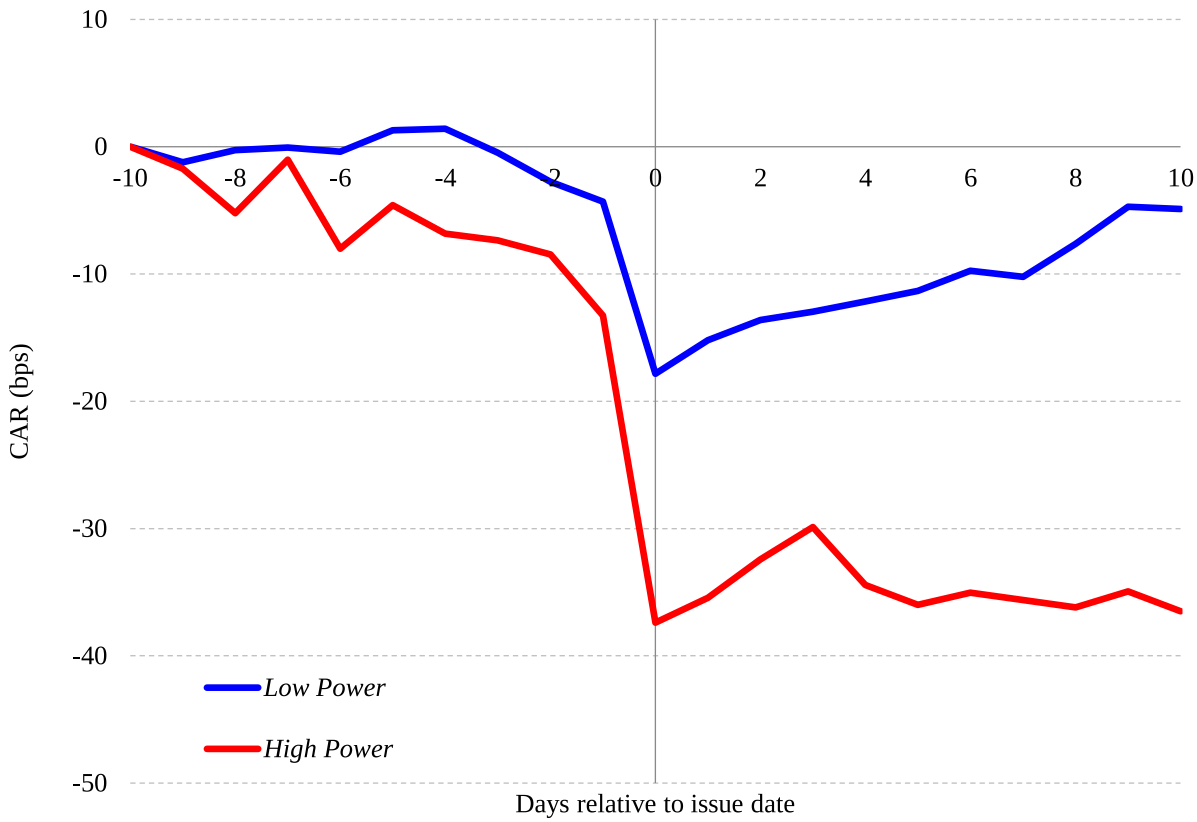


Figure 2: Returns on bonds outstanding and underwriter power

The graph presents cumulative abnormal returns (CARs) on bonds outstanding around the dates of new bond issues, separating new issues taken to the market by underwriters with *High Power* (top tercile) and *Low Power* (bottom tercile). Abnormal returns (ARs) are computed relative to matching portfolios based on rating and maturity groups following Bessembinder et al. (2009). The ARs are then value-weighted on each day and cumulated.



Appendix A

Table A.1 Variable definitions

The sample includes all non-convertible, U.S. dollar-denominated corporate bonds issued by U.S. firms from 1970 until 2015, excluding exchange offers, medium-term notes, and bonds issued by financials and regulated utilities. Bond characteristics and underwriting data are retrieved from the Fixed Income Securities Database (FISD) and SDC Platinum Global New Issues (SDC). Issuer characteristics come from the CRSP-Compustat Merged (CCM) Fundamentals Annual database, and are computed at the end of the fiscal year prior to the bond issue date. All dollar quantities are expressed in constant 2010 U.S. dollars, deflated using the Producer Price Index.

Variable	Description
Bond characteristics	
Fees	The sum of managing fees, underwriting fees, and selling concessions expressed as a percentage of par. It is equal to FISD *Gross_spread* divided by FISD *Principal_amt*. If *Gross_spread* is missing, it is equal to SDC *GPCT*. We also replace FISD values by the SDC fee values when SDC reports positive fee values whereas FISD does not report fees. In the test repoted in Table 8, we break down the fees into the amount apportioned to each underwriter in a syndicate, retrieved from Capital IQ.
Yield spread	Bond yield at the issuance date, minus the yield on a Treasury bond of similar maturity. The issuance yield is retrieved as FISD's *Offering_yield* if available, otherwise as SDC's *Y*.
Underpricing	First-trading day return on a bond (if available; otherwise return based on the earliest trade available during the first week of trading), net of the return on the bond's matching portfolio constructed with the Bessembinder et al. (2009) procedure. Data on secondary-market bond returns are obtained from the union of the NAIC and TRACE databases.
Bond size	Bond part value, equal to FISD *Offering_amt* if available; otherwise SDC *AMT*.
Rating group	Six bond rating groups AAA, AA, A, BBB, BB, B and below, based on the FISD *Rating* closest to the bond issue date and, if missing, based on SDC rating variables *QMOODY*, *QSP*, and *QFITCH*. We compute averages across Moody's, Standard and Poor's and Fitch ratings, round values to a notch, and then allocate them to a group such that e.g. AA includes AA+/AA- bonds, A includes A+/A- bonds, etc.
Maturity	Difference between principal due date minus issuance date, divided by 365. Principal due date is equal to FISD *Maturity*, and, if missing, to SDC *FINALMATURITY_YYYY*. Issue date is equal to FISD *Offering_date* and, if missing, to SDC *D*.
Issuer characteristics	
Market capitalization	Share price (Compustat data item *rpcc_f*) times the number of shares outstanding (*csho*).
ROA	Net income (Compustat data item *ni*) divided by lagged total assets (*at*).
Leverage	Sum of long term debt (Compustat data item *dltt*) and debt in current liabilities (*dlc*) divided by total assets (*at*).
Analyst coverage	Natural logarithm of the number of I/B/E/S estimates in the quarter prior to the bond issue date, net of the industry-quarter median.
Default probability	Probability of default implied by the Merton model, estimated via the Bharath and Shumway (2008) procedure.
First time on the market	Indicator variable equal to one if on a given year the firm issues a bond for the first time, and zero otherwise.
Young issuer	Indicator variable equal to one if a given issuer has less than ten years of stock price history, and zero otherwise.

Prospectus file size	Size of the bond issue prospectus, measured in Mb (Loughran and McDonald (2014)).
Fog index	0.4 × (Average number of words per sentence + Percentage of complex words) in the bond issue prospectus (Loughran and McDonald (2014)).
Underwriter characteristics	
$Power$	Underwriter power measure, equal to the negative of the natural logarithm of one plus the number of potential replacement for the underwriter taking to the market a given bond. The construction of this variable is explained in detail in Section 1.2 of the paper.
Banzhaf (1954) index	For a given underwriter u, it is defined as the number of coalitions that would not be able to place a bond b without u, divided by the number of all coalitions that could place bond b. The index is expressed in percentage points. Any underwriters active in the past five years can form a coalition, i.e. jointly underwrite a bond, and if the amount they could jointly underwrite exceeds the bond size, the coalition could place the bond b. The actual underwriters of bond b are assumed to contribute an amount equal to the bond size divided by the number of lead underwriters on the bond. Other underwriters contribute the amount predicted by the underwriter placement ability model (equation (2)), where the bond size is divided by the number of lead underwriters on the bond.
Shapley and Shubik (1964) index	This measure is similar to the Banzhaf (1954) index, with the difference that the order in which underwriters enter a coalition matters. For a given underwriter u, the Shapley and Shubik (1964) index equals the number of coalitions that become able to place the bond b after u joins the coalition, divided by the number of all such "sequential" coalitions. The index is expressed in percentage points.

Appendix B. Sample construction

We obtain corporate bond characteristics and underwriting data from the Mergent Fixed Income Securities (FISD) and SDC Platinum Global New Issues (SDC) databases. The coverage of these datasets presents slight differences, and in general FISD provides information on a broader range of bonds. The intersection of FISD and SDC covers 78.5% (7,347 bonds) of the bonds in our sample, while 19.3% (1,806 bonds) comes only from FISD, and 2.2% (203 bonds) comes only from SDC. In contrast to the SDC database, FISD comprises only bond data and provides a broader range of bond characteristics (such as detailed information on covenant protection, rating updates, details of interest payments, etc.). SDC comprises equity, bond, and M&A data, and as well as some additional information on underwriters such as the underwriter's parent bank and underwriting allocations. The two databases are also complementary in their coverage of the list of underwriters on a given bond. For these reasons, combining the two datasets yields a more comprehensive coverage.

First, we merge the datasets by either 8-digit CUSIP or ISIN and security issue date.[24] For a small number of issues, SDC does not report an 8-digit CUSIP. In those cases, we merge by issuer 6-digit CUSIP and security characteristics, requiring the bonds to be uniquely identified by issuer CUSIP, bond issue date, bond size, and maturity. This allows us to retrieve information available in SDC but not in FISD.

We restrict the attention to bonds issued by companies in the CRSP/Compustat merged (CCM) database. To merge CCM with our sample of bond issues, we match bonds to issuers on the basis of their historical issuer 6-digit CUSIP and date. In some cases, we can match an issuer before and after a given issue date t, but not at t. When that happens, we use the issuer's PERMCO

[24] CUSIP and ISIN codes can be re-assigned; we thus match by security identifier and issuance date.

identifier from CRSP, which does not change over time, to fill in the link information on date t. In such cases, the FISD issuer name (*prospectus_issuer_name*), the SDC issuer name (*issuer*), the FISD issuer identifier (*issuer_id*), or the SDC issuer identifier (*SDC ID*) do not vary between the earlier and later dates.

Following the literature, we exclude the bond issues by financials (SIC 6000-6999), utilities (SIC 4900-4949), non-U.S. firms, firms with negative book value of equity at the end of the last fiscal year before the bond issue date. We apply these filters, and also require availability of information on issuer country and SIC code of the issuer. Finally, we exclude all issues in foreign currency, equity-linked (including convertibles) and equity-like bonds, medium-term notes, and exchange offers. Exchange offers are an exchange of one security for another and 97% have missing information on underwriting fees and offering yields or report zero fees. Medium-term notes allow issuers to receive short-term financing and to avoid registration with the Securities and Exchange Commission. The typical medium-term note in our sample is about 8 times smaller in size than the typical bond. We also drop bonds issued before 1970 since the information on them is very sparse. These filters restrict our sample to 9,356 newly issued straight corporate U.S. dollar-denominated bonds, issued by 1,696 U.S. firms over 45 years.

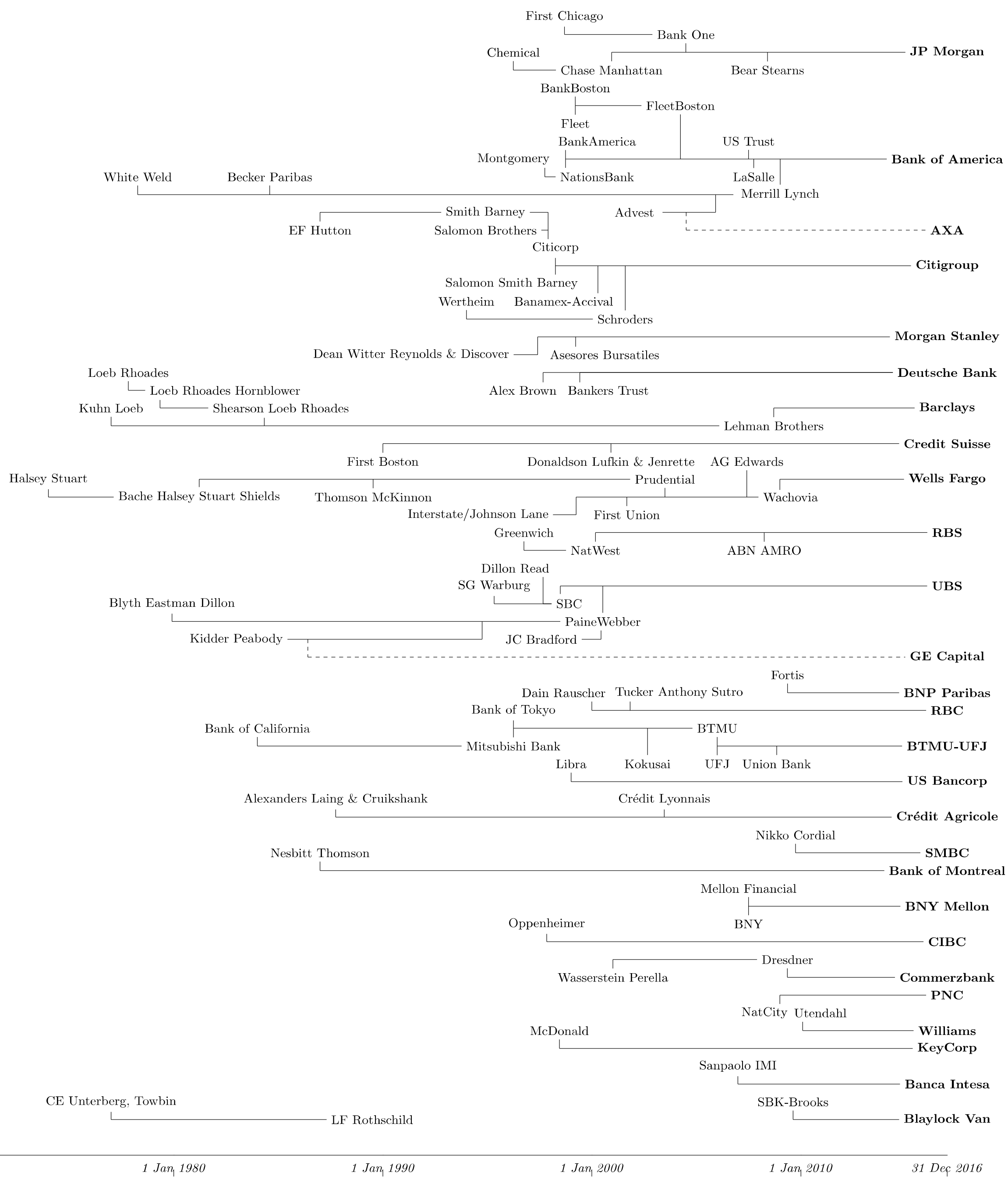


Figure C.1 Mergers and acquisitions among bond underwriters over 1970-2015

This figure describes mergers and acquisitions among the banks underwriting bonds in our sample, over the 1970-2015 period. The horizontal axis plots the timeline. The vertical lines originate from the target banks and touch the horizontal lines of the surviving banks at the date of the merger. Bold font highlights the banks still active as of 2015, at the end of our sample. In contrast, e.g. LF Rothschild filed for bankruptcy on June 30, 1989, and as a result the horizontal line for this bank stops. If after the acquisition the target bank is sold to another acquirer, we draw a connection to the former acquirer with a dashed line and a connection to the subsequent acquirer with a solid line. Banks for which we do not observe any M&A activity during our sample period, e.g. Goldman Sachs, are not presented on the graph.

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