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Underwriter Reputation and the Quality of Certification: Evidence from High-Yield Bonds[☆]

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Abstract

This paper provides primary evidence of whether certification via reputable underwriters is beneficial to investors in the corporate bond market. We focus on the high-yield bond market, in which certification of issuer quality is most valuable to investors owing to low liquidity and issuing firms' high opacity and default risk. We find bonds underwritten by the most reputable underwriters to be associated with significantly higher downgrade and default risk. Investors seem to be aware of this relation, as we further find the private information conveyed via the issuer-reputable underwriter match to have a significantly positive effect on at-issue yield spreads. Our results are consistent with the market-power hypothesis, and contradict the traditional certification hypothesis and underlying reputation mechanism.

JEL classification: G11, G14, G24

Keywords: borrowing costs, certification, downgrade and default risk, reputation, underwriting standards

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1. Introduction

Significant cases of debt underwriting fraud over the past decade have called into question both traditional theory (e.g., Booth and Smith 1986, Allen 1990) and empirical results that support the certification hypothesis for the corporate bond market (Livingston and Miller 2000, Fang 2005).[1] To determine whether the most reputable underwriters are necessarily associated with the highest-quality underwriting standards, we study certification in the U.S. corporate bond market between 2000 and 2008. Specifically, we examine whether bonds underwritten by reputable (i.e., high-market-share) lead underwriters are associated with significantly higher or lower downgrade and default risk. We further explore whether investors behave rationally in pricing the risk associated with reputable underwriters when bonds are issued. We thus, in contrast to most studies that deal with underwriters, test the certification hypothesis from the investor's point of view by asking whether certification benefits investors in the bond market.

The corporate, particularly high-yield, bond market is an optimal test ground for our study for the following reasons. Our analysis is the first to use data post enactment, in late 1999, of the Gramm-Leach-Bliley Act (GLBA) that repealed the Glass-Steagall Act. The GLBA led to intensified competition among underwriters and a sharp decrease in investment banking fees, especially in the high-yield bond market in which commercial bank entry was strongest (Gande et

[1] In a *New York Times* (August 25, 2002) article titled "Underwriting Fraud," Citigroup, J.P. Morgan Chase, and Merrill Lynch are blamed for misusing their reputations for their own and clients' benefit to the detriment of investors. The article mentions Citigroup's involvement in a 2002 lawsuit brought by pension funds that had invested 12 billion dollars in WorldCom bonds and later claimed the bank had not adequately reviewed the state of WorldCom's business due to conflicts of interest. *"[T]here is no denying,"* the article stated, *"that prestigious banks helped bankroll huge frauds that hurt millions of investors."* Relatedly, Gopalan et al. (2011) report that J.P. Morgan syndicated a loan to Enron as its lead arranger just before the firm's bankruptcy filing.

al. 1999, Geyfman and Yeager 2009, Shivdasani and Song 2011). Second, compared to investment-grade bonds, high-yield bonds are particularly information-sensitive, low-liquidity securities not sold exclusively on the basis of credit ratings (Datta et al. 1997, Fridson and Garman 1998).[2] Certification of issuer quality via underwriters is hence particularly valuable to both issuing firms and investors in this segment (Puri 1999, Duarte-Silva 2010). Third, the vast majority of high-yield bond investors, predominantly insurance companies and mutual and pension funds (Standard & Poor's 2007), are heavily regulated, engage only rarely in activism, and have rather long investment horizons. Thus, the effects of underwriter reputation on bond downgrade and default risk is highly important to these investors. Finally, issuing firms in the high-yield segment, often private or smaller public firms, are generally less visible than investment-grade issuers. Thus, with less reputational exposure, reputable underwriters may have less incentive to conduct business properly (Rhee and Valdez 2009).[3]

In contrast to existing literature that relies exclusively on pre-GLBA data, we find that the most reputable underwriters increase rather than reduce issuing firms' informational costs. This is in line with our main finding that bonds underwritten by these banks are associated with significantly higher downgrade and default risk. In particular, we report that bonds underwritten by one of the Top 3 lead underwriters in the U.S. corporate bond market are significantly more likely both to be downgraded in the short and medium term and to default. Calculating marginal effects, we estimate the probability of a bond being downgraded within six or 24 months of issue at 3% and 15%, respectively, larger if the lead underwriter is one of the Top 3. The probability

[2] However, credit ratings are available and reduce the heterogeneity in the data. This allows for cleaner inferences on underwriter reputation (Fang 2005).

[3] The observation by Ljungqvist et al. (2006) that incentives to preserve reputation can be less constraining for banks that specialize in underwriting debt as compared to equity implies a greater willingness to test investor credulity.

that the first rating action within the first three years of issue will be a downgrade is about 18% higher for bonds underwritten by a Top 3 underwriter. The marginal effect for bond default is about 2%. In line with the higher default probabilities we document, bonds underwritten by Top 3 lead underwriters experience significantly more downgrades (but not upgrades) both within the first three years of issue and in general. These results account for endogeneity, and do not hinge on the definition of underwriter reputation or use of binary or continuous variables measuring reputation. Moreover, the results do not change when we include additional controls, use additional rating performance variables, or examine subsamples of bonds by time to maturity.

In line with the increased downgrade and default risk associated with Top 3 lead underwriters, we find investor evaluation of the underwriting standards of the Top 3 to have a significantly positive effect on at-issue yield spreads. This finding is consistent with market efficiency, and suggests that the issuer-reputable underwriter matching conveys price-relevant information to bond investors. In other words, investors seem to be aware of this relation and demand a risk premium through a higher yield spread. The most reputable underwriters thus increase rather than reduce issuers' informational costs and, hence, do not seem to fulfill a certification function. Following Puri (1996), Fang (2005), and McCahery and Schwienbacher (2010), we use the inverse Mills ratio for the choice of a Top 3 lead underwriter in the second-stage regressions (Heckman 1979) to measure the pricing effect of underwriter evaluation standards (i.e., ability to certify issuer quality). Our results suggest that investors generally should, and do, not believe that at-stake reputation capital incentivizes the most reputable underwriters to report client quality honestly.

Our findings, in providing primary evidence from the bond market in favor of the *market-power* over the *certification* hypothesis, support recent results by Chemmanur and Krishnan (2012) and McCahery and Schwienbacher (2010). The former find reputable underwriters to be associated with equity IPOs priced further from intrinsic values, the latter, reputable lead arrangers in the

loan market to be associated with higher loan spreads. In general, our findings suggest that the reputation mechanism does not work for the most reputable underwriters in the high-yield segment of the bond market. Our results also corroborate Gopalan et al.'s (2011) conclusion for the syndicated loan market—the structure of which is comparable to that of the high-yield bond market, and in which the same banks are dominant—that the largest lead arrangers do not suffer a loss of reputation when borrowers experience large-scale bankruptcies. As bonds underwritten by dominant banks are associated with significantly higher downgrade and default risk, and these banks stay on top of the league table throughout our sample period, our results seem to document a similar pattern for the high-yield bond market.

The foregoing results can be further interpreted as empirical evidence of the phenomenon of "reputation milking," as described in Chemmanur and Fulghieri (1994). The authors document incentives for the most reputable underwriters to "milk" their reputations to avoid the costs of strict evaluation (i.e., underwriting) standards.[4] Additional results support this interpretation. In particular, we find that bonds underwritten by one of the Top 10 underwriters do not exhibit significantly higher downgrade or default risk, and that bonds underwritten by one of the Top 4 - Top 10 underwriters, being significantly less likely to be downgraded or to default, seem to evidence a negative effect on issuing firms' informational costs. Another interpretation, in line with Bouvard and Levy (2009) and Mathis et al. (2009), is that reputable underwriters reduce their evaluation standards to attract future clients. Our interpretation is further supported by evidence that suggests that reputable underwriters actively manage their evaluation standards (i.e., product quality) in response to client-specific reputational exposure. When we restrict our sample to bonds issued by firms listed on the New York Stock Exchange (NYSE) or American

[4] Chemmanur and Fulghieri (1994) posit, theoretically, the existence of a U-shaped relation between underwriter reputation and the quality of evaluation standards (i.e., certification quality).

Stock Exchange (AMEX), we find the Top 3 lead underwriters to be associated neither with significantly higher downgrade or default risk nor with significantly higher informational costs, at bond issue. This finding is consistent with Rhee and Valdez (2009), and corroborates empirical results for the M&A market reported in Golubov et al. (2012).

Relaxing underwriting standards is thus one potential response of underwriters to increased competition for clients and league table positions in the wake of the repeal of the Glass-Steagall Act.[5] Our findings support this conclusion, and suggest that certification may not be the most important role played by large, reputable underwriters in instances of issuers for which risks associated with placing bonds are higher and financing opportunities fewer, as is generally the case in the high-yield bond market.[6] Reducing screening incentives or, more generally, product quality in response to increased competition and lower fees is consistent with the models of Strausz (2005) and Shapiro (1983) and empirical evidence provided by Shivdasani and Song (2011). The latter show intensified competition in the wake of deregulation of the Glass-Steagall Act in 1996 to have adversely affected screening incentives of underwriters in the corporate bond market between 1996 and 2000.

[5] Regarding league table competition, Golubov et al. (2012) observe that the investment banking industry seems to be fixated on these rankings as they pursue future business, as documented in Rau (2000) and Bao and Edmans (2011) for the M&A market. Anecdotal evidence associates competition for league table rankings with lower underwriting standards, *The Wall Street Journal* online observing, in an article that reports that the industry's most-respected banks are rabid about staying in these rankings: *"If you want to understand the Street at its absurd best, watch men in Rolexes grub for credit for deals they barely worked on for clients who probably won't pay them"* (see "Gaming the Game: How the Street Plays the League Tables," April 10, 2007).

[6] That issuing firms' transactional (as well as opportunity) costs may play an at least equally important role is suggested by our first-stage regressions on lead underwriter choice (see Table 5), which find bond issue volume and high-yield market sentiment to significantly drive the choice of a Top 3 lead underwriter.

Fang's (2005) finding that more stringent criteria of prestigious banks acting as bond underwriters reduce firms' informational costs, which was generally consistent with earlier empirical work that supports the traditional certification hypothesis, is contradicted by our study. We attribute this discrepancy in results primarily to the fact that Fang (2005) and contemporaneous studies examined bond issues in the pre-GLBA period (the 1990s and earlier) when incentives were less adverse owing to considerably less competition for investment banking services. The GLBA has seemingly led reputable underwriters to reduce screening incentives. The discrepancy between our and Fang's (2005) results may also reflect her examination of bond issues by larger, more visible stock-listed firms. Incentives to conduct business properly being, as noted earlier, less adverse when underwriters face greater reputational exposure, it is not surprising that her results are more supportive of the certification hypothesis. Finally, in contrast to most previous studies of underwriter certification, we control for a larger number of potential certification devices and bond features that have been shown to affect bond prices including seniority levels and clawback provisions. Ours being the first paper to account for the coexistence of certification devices (e.g., credit ratings and split ratings, listing standards, and underwriter syndicates) and important bond features that have been neglected in earlier work, we are thus able to address the potential omitted variable bias in prior studies and draw cleaner inferences about the certification role of underwriters.

The remainder of the paper is organized as follows. In section 2, we discuss the related literature and derive testable hypotheses. An overview of the variables (including control variables) employed in our study and the motivation for the choice of measures for bond rating performance and underwriter reputation are provided in section 3. Data and methodology are discussed in section 4, the multivariate analyses of bond performance and pricing in sections 5 and 6, respectively. Our conclusions follow.

2. Literature and Hypotheses

The traditional *certification hypothesis* suggests that in repeat business reputable underwriters can, because they put their reputations at stake when acting as certifiers, credibly certify issuer quality to less informed investors (see, for example, Booth and Smith 1986, Titman and Trueman 1986, and Allen 1990). Certification via reputable underwriters thus reduces issuing firms' informational costs. The certification mechanism works because reputable banks set stricter evaluation standards, that is, they incur higher costs to become insiders of the firms they certify (Chemmanur and Fulghieri 1994). But because information production and stricter evaluation standards are costly, moral hazard problems can occur. Chemmanur and Fulghieri's (1994) model documents that underwriters with a very high reputation - i.e. those underwriters that incurred high costs in the past to build up this reputation - can have incentives to abuse their reputation, a phenomenon that the authors describe as "reputation milking". Specifically, high-reputation underwriters reduce the cost of becoming insiders by lowering underwriting standards below the level their reputations would suggest to outside investors. As a result, high-reputation underwriters can be associated with a high probability of incorrect evaluations.[7] Chemmanur and Krishnan (2012) further suggest the potential for collusion between issuers and large, reputable underwriters that are able to attract, through their market power, greater numbers of professional and retail investors. In this case, the main role of the underwriter shifts from certifying issuer quality to obtaining the highest possible valuation (i.e., maximum price) for a security issue, which the authors term the *market-power hypothesis*, and for which they provide empirical evidence using data on equity IPOs. The authors show IPOs backed by high-reputation underwriters to be priced higher and further from intrinsic values. Their results are in line with

[7] Mathis et al. (2009) support, theoretically, the idea that certifiers with sufficiently good reputations "milk" those reputations, and demonstrate the reputable rating agencies have incentives to inflate their ratings.

those of other recent studies of the equity market that challenge the certification hypothesis (e.g., Cooney et al. 2001, Logue et al. 2002).

With respect to corporate bonds, Fang (2005) provides empirical support for the certification hypothesis for the 1991-2000 sample period. Controlling for endogenous matching between bond issuers and lead underwriters, she finds that reputable lead underwriters reduce issuing firms' informational costs and earn economic rents on reputation. Livingston and Miller (2000) and Datta et al. (1997) find reputable underwriters to have a significantly negative effect on bond yields, but their studies do not account for self-selection. Results for the syndicated loan market are less conclusive. Ross's (2010) finding for the 2000-2003 period that the most dominant lead arrangers have a high reputation for screening borrowers is inconsistent with Gopalan et al.'s (2011) results for the 1990-2006 period. The latter authors' finding that the most dominant lead arrangers do not suffer reputational losses (i.e., limited future syndication activity) when borrowers experience large-scale bankruptcies supports the market-power hypothesis and is corroborated by McCahery and Schwienbacher (2010), who find reputable lead arrangers to be associated with significantly higher loan spreads between 1987 and 2005.

We explain below why results on underwriter certification may differ between the pre- and post-GLBA periods, particularly for the corporate bond market, in which competition increased strongly and was accompanied by sharp declines in underwriting fees (see, for example, Geyfman and Yeager 2009, Shivdasani and Song 2011). These observations are particularly important inasmuch as Strausz (2005) shows honest certification to require high prices and monopolistic market structures, in the absence of which, he argues, certifiers will be incentivized to accept bribes to certify product or issuer quality. This is in line with Shapiro's (1983) reasoning that it does not pay to build a reputation for quality for products that need to be sold at a price level that precludes earning reputation rents. Bouvard and Levy's (2011) model is consistent with Mathis et

al.'s (2009) in documenting incentives for reputable certifiers to lower their evaluation standards to attract future clients. Both models predict that competition reduces certifiers' incentives to maintain high-cost evaluation standards to protect their reputations.[8]

In sum, while evidence for the corporate bond market for the pre-GLBA period supports the certification hypothesis, results of recent studies of the equity and syndicated loan markets are more consistent with the market-power hypothesis. It is thus an empirical question whether certification in the bond market works in the post-GLBA period with the significant increase in competition for investment banking services and consolidation that has produced larger, potentially more dominant banks since the 1990s (see, for example, Ljungqvist et al. 2006). The present study empirically tests whether the certification hypothesis can be supported for bond underwriters in the post-GLBA period, in which case we would expect reputable underwriters to be associated with superior bond rating performance and the firms they certify with lower informational costs that reflect better underwriting standards and screening incentives. We thus hypothesize as follows.

H1: *Bonds underwritten by reputable underwriters are associated with significantly lower downgrade and default risk.*

H2: *Reputable underwriters reduce issuing firms' informational costs, that is, they certify quality.*

[8] In line with these theories, empirical studies have documented aggressive fee schedules (Song 2004) and analyst recommendations (Ljungqvist et al. 2006, Michaely and Womack 1999) to win underwriting mandates interpretable as liquidations of reputation capital. With respect to the effect of competition on the quality of certification services, Becker and Milbourn (2011) recently showed that, with increased competition resulting from the strengthening of Fitch as the third large rating agency, the quality of credit ratings by incumbents Moody's and Standard & Poor's deteriorated significantly.

3. Variables Employed

In our analysis of the corporate bond market we take on the investors' point of view, which is in contrast to most of the existing literature (most papers such as Fang (2005) put a focus on the issuing firm). Therefore, in a first step, we investigate which factors influence the rating performance of high-yield bonds, whose investors are particularly affected by information and default costs. This way, we attempt to answer the question of whether reputable/powerful lead underwriters and their certification standards are informative to investors and whether the latter benefit from certification in the short and long run. We then consider the determinants of firms' borrowing costs at issuance in a second step to analyze whether underwriters certify issuer quality and reduce issuers' informational costs. In the analyses we control for multiple certification mechanisms to avoid a potential omitted variable bias. Definitions of and motivations for the variables we employ are provided below. Rating performance measures are presented in section 3.1. We provide an overview of the largest underwriters in the U.S. bond market and derive our measures for underwriter reputation and power in section 3.2. Control variables are described in section 3.3.

3.1. Measures of Bond Performance and Borrowing Costs

With regard to short- and long-term bond performance, we screen the credit rating history of each bond in our final sample via Capital IQ and construct binary variables related to the bonds' rating actions.[9] The first, second, and third variable (denoted *downgrade first 6/15/24 months*) are set to one if the bond's credit rating was downgraded within the first six, 15, or 24 months,

[9] We define rating actions as upgrades or downgrades of credit ratings; watch-list actions and so forth are not considered. Klein and Zur (2011) recently used variables for credit-rating actions to measure the impact of hedge funds on bond performance.

respectively, of bond issue.[10] This set of variables is used to measure short-term performance. To measure medium- to long-term performance, we use a dummy set to one if a bond's first rating action within the first three years of issue is a downgrade (as opposed to an upgrade) (*1. rating action downgrade 3 yrs*), and a binary variable set to one if a bond's first rating action, independent of length of time since issue, is a downgrade (*1. rating action downgrade*). For purposes of robustness, we also consider the first four years and first five years after bond issue.

The use of these variables is motivated by the literature on credit ratings. Lando and Skødeberg (2002) and Güttler and Wahrenburg (2007), among others, show credit ratings to exhibit a positive serial correlation when the initial rating change is a downgrade. We further find, when we scan our sample, a strong tendency towards subsequent rating changes in the direction of the initial change.[11] As a last measure, we use an indicator variable (*default*) set to one if a bond defaulted (the necessary rating history information ends in 2010). The use of default-related variables to measure bond and firm performance is well established in the literature (see, for example, Altman 1989, Puri 1994, and Gopalan et al. 2011). We use a continuous rating-performance measure as an alternative to the aforementioned binary variables. For the first three years after bond issue, and for the complete observation period (ending in 2010), we create for the respective periods two variables defined as the number of downgrades minus the number of upgrades (denoted *downgrade-to-upgrade ratio (3 yrs)*).

[10] In line with practitioners' statements, we use these periods because reputable underwriters usually (try to) ensure that the bonds they promote do not experience a downgrade within at least six and for as much as 12 months after bond issue. For robustness purposes, we consider downgrades within the period of three years of bond issue (*downgrade first 3 yrs*) and create a binary variable set to one if a bond's rating is upgraded within 15 months (*upgrade first 15 months*).

[11] We provide evidence for the serial correlation of rating downgrades in our sample in specification 6 of Table 6.

With respect to the suitability of using rating-related variables to measure bond performance, the existing literature shows rating downgrades, as opposed to upgrades, to have a significant negative effect on bond prices (Wansley et al. 1992, Hand et al. 1992, Hite and Warga 1997). Most studies report these effects to be particularly strong for bonds and issuers in the high-yield bond segment. In this regard, Jorion et al. (2005) found that the exemption of rating agencies from regulation FD (Reg FD) in 2000 afforded credit analysts at rating agencies access to confidential information no longer available to other investors.[12] They show that the information content of credit ratings and price effect of downgrades increased significantly subsequent to the introduction of Reg FD.

The structure of the investor base in the high-yield market, together with well documented price reactions to rating downgrades, provide the rationale for using bond-rating variables. According to Standard & Poor's (2007), the largest groups of investors are mutual funds (35%), pension funds (25%), and insurance companies (16%); CBOs/CDOs, hedge funds, and retail investors comprise the balance. Not only are most of these groups long-term investors, but the three largest investor groups are also strictly regulated with respect to investment in bonds. For example, regulators demand that capital requirements for investments made by insurance companies be based on a rating scoring system.[13] Hence, rating downgrades either incur immediate costs due to enhanced capital requirements or increase the probability of future costs in the event a notch-wise

[12] Regulation Fair Disclosure, enacted in 2000 by the Securities and Exchange Commission (SEC) to eliminate selective disclosure to privileged parties, requires that non-public information disclosed by U.S. public companies to selected groups be simultaneously disclosed to the public. Disclosure of non-public information to rating agencies was excluded from this rule until enactment of the Dodd-Frank Act (specifically, Section 939B) in 2010.

[13] For capital requirements, a credit rating of BB, assigned a value of 3, of B, assigned a value of 4, and of CCC, assigned a value of 5, are associated with specific amounts of capital backing. For an overview of the use of credit ratings in regulation, see Kisgen (2006).

downgrade does not directly engender a change in rating class (e.g., from BB to B). Additionally, mark-to-market accounting can lead to costs associated with necessary write-downs. Finally, as noted in Kisgen (2006), liquidity concerns are most significant in the speculative-grade bond segment. Accordingly, Alexander et al. (2000) find that credit ratings affect bond liquidity in the high-yield segment. As lower credit ratings are generally associated with less liquidity, rating downgrades can increase the investors' liquidity risk. In this context, Bao et al. (2011) document that liquidity significantly affects bond yield spreads. In sum, rating-downgrade variables are highly important to investors, are not affected by bond liquidity (whereas prices are), and incorporate inside information for the sample period.

To measure firms' borrowing costs, we use each bond's initial *benchmark spread*, being the at-issue yield spread in basis points over a U.S. Treasury security with similar maturity on the same day (similar to Guedhami and Pittman 2008, and Livingston and Miller 2000).

3.2. League Tables and Measures of Underwriter Reputation

Before defining our measures of underwriter reputation (or, put differently, market power), we present in Table 1 an overview of the largest underwriters in the U.S. bond market between 2000 and 2008 (our sample period). The source of the data is Bloomberg.

[Insert Table 1 about here]

Table 1 provides summary statistics for the ten largest (top 10) underwriters in the U.S. corporate bond market and identifies their respective league table positions in both the high-yield and overall (including all, not only corporate, bond issues) bond markets. Although there is some variation in the league table positions among the top 10 underwriters, the same ten banks appear in each of the reported rankings.[14] The two largest underwriters by market share, and the only

[14] The market share held by the top 10 underwriters in the corporate bond market between 2000 and 2008 amounts to nearly 90%. This is only slightly less than the market shares for the top 10 bond underwriters reported in Fang (2005)

banks with double-digit market shares, J.P. Morgan Chase and Citi, hold the top two positions in all three reported league tables. These underwriters have almost twice the market share held by the underwriters in positions 3 and 4 in the corporate bond market. This market structure is similar to that of the syndicated loan market, which is dominated by three lead arrangers, J.P. Morgan Chase, Citi, and Bank of America (see Ross 2010). The same three banks hold the top three positions in the high-yield bond underwriting market.

With regard to measures of underwriter reputation, following the literature (e.g., Ross 2010, Fang 2005), we measure a lead underwriter's reputation via its position in the league table for U.S. bond underwriters. We use primarily the league table for all U.S. corporate bonds issued between 2000 and 2008 (as shown in Table 1). A lead underwriter is classified as reputable (or powerful) if it is ranked among the top 3 in the league table (variable denoted *Top 3*).[15] This classification is applied in Ross (2010) and McCahery and Schwienbacher (2010) who use a "Big 3" variable to measure lead arranger reputation in the syndicated loan market. Due to the structure of the corporate bond underwriting market described above, we follow the authors and also employ a *Top 3* variable as our primary measure. For purposes of robustness, we use as well several alternative classifications. First, in line with Schenone (2004), we use a lead underwriter's annual

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and Livingston and Miller (2000) for the 1990s. Due to considerable market consolidation and entry by European banks such as Deutsche Bank and UBS around and subsequent to the repeal of the Glass-Steagall Act in 1999 (see, for example, Ljungqvist et al. 2006), the league table presented here differs from those presented in Fang (2005) and Livingston and Miller (2000). Reflecting increased competition, the underwriter fees documented in Table 1, which average 0.68%, are lower than those reported in Fang (2005) for the ten largest underwriters in the 1990s, which average 1.06%.

[15] The use of a binary variable to measure reputation is necessary to adapt a variable for possible self-selection bias. Besides, using a continuous variable for reputation, because it is required to measure reputation with precision and have a constant effect on the dependent variables (see Fang 2005), is not preferable econometrically.

market share of U.S. corporate bond underwriting (i.e., a continuous variable). Second, to account for the dominance of the two largest bond underwriters, we employ, in unreported regressions, an indicator variable *Top 2*. Following Fang (2005) and Livingston and Miller (2000), respectively, we use, in additional unreported regressions, *Top 8* and *Top 10* indicator variables. To distinguish Top 3 from underwriters in the group of the top 10 banks with lesser reputations, we use the dummy variable *Top 4 - Top 10*. Third, we use the variable *Top 3 annual* set to one if a lead underwriter holds one of the top 3 positions in the annual league table for all U.S. corporate bonds in the year of bond issue. Finally, again in unreported regressions, we use Top 3 indicator variables based on league tables for the sample period for U.S. high-yield bonds (*Top 3 HY*) and all U.S. bond issues, not only corporate bonds (*Top 3 all*). We follow Fang (2005) in defining the reputation of underwriter syndicates with several reputable lead underwriters as the maximum of their lead underwriters' reputations. Our rationale for using annual underwriter market shares of the year of the bond issue (in robustness tests) is that we want to capture the effects of lead underwriters' efforts to generate business to maintain or enhance their league table positions on the performance of the issued bonds. The use of league tables for the sample period may instead reflect underwriters' high reputations and dominance in the bond market. Both league table competition and high reputation/dominance can have adverse effects on underwriters' certification standards and screening efforts, as pointed out in section 2.

3.3. Control Variables

Our set of control variables, and motivation for our choice of measures for other certification devices in the bond market, are described below.

Credit ratings: We examine the effects of two credit-rating variables on the pricing and performance of corporate bonds. We use Standard & Poor's (S&P) issue-specific credit rating on notch level (*rating*) (e.g., Guedhami and Pittman 2008) and an indicator variable *split rating*

(Santos 2006, Livingston et al. 2008, Livingston and Zhou 2010) that takes a value of one if a bond's initial issue-specific S&P and Moody's credit ratings differ. For robustness, we follow Fang (2005) in using issue-specific credit ratings by Moody's instead of S&P.

Number of underwriters: Cook et al. (2006) document underwriting syndicates to be important for the marketing of securities, as underwriters engage in promotional efforts that can elevate investor sentiment. Such marketing activity can be particularly important for high-yield bonds, as placement issues incur relatively high risk for issuing firms and lead underwriters. Syndicate members may produce information about, as well as market, an issue. Corwin and Schultz (2005) show offer prices in equity IPOs to be more likely to be revised in response to information when syndicates have more underwriters, and Shivdasani and Song (2011) find, in the corporate bond market, that underwriters' reputation-based incentives to screen issuer quality are weakened by free-riding problems among the banks in underwriter syndicates. The foregoing evidence suggests that syndicate size may affect both bond rating performance (via screening incentives) and initial pricing (via information production and marketing). Hence, as in Puri (1996), we control, in all regressions, for a bond's number of underwriters (*number underwriters*). For robustness, we use (in unreported regressions) the number of lead underwriters.

NYSE/AMEX listing: According to Affleck-Graves et al. (1993), the minimum listing requirements (e.g., timeliness of disclosure) for firms listed on the NYSE or AMEX are substantially higher than for other listed firms. Moreover, several provisions of the corporate governance standard exceed SEC requirements.[16] Being listed on the NYSE or AMEX thus certifies that a firm meets the exchanges' quantitative and qualitative listing standards. Baker et al. (1999) further find that NYSE listings are associated with increased firm visibility. We thus assume both ex-ante and ex-post uncertainty and, hence, the borrowing costs of these firms to be

[16] For instance, the number of outside directors or representation of independent directors on the audit committee.

lower when they act as issuers in bond markets. Empirical evidence provided by Datta et al. (1997) suggests that being listed on the NYSE or AMEX reduces borrowing costs in initial public offerings of corporate bonds. We further expect, as a result of reduced uncertainty, rating agencies' initial ratings of bonds issued by firms listed on the NYSE or AMEX to be more appropriate and the probability of subsequent corrections consequently lower.

Other controls: In addition to the aforementioned variables, we use several variables that have been shown to impact initial yield spreads of high-yield corporate bonds and that we expect to have an impact on bond performance. We control for callable bonds (using the variable *callable*) (Livingston and Miller 2000), *first-time issuer* status (Gande et al. 1999), the BofA/Merrill Lynch *high-yield (HY) index* spread over 10-year Treasuries (Fridson and Garman 1998), bond *maturity* (Helwege and Turner 1999), *subordinated* bonds[17] (John et al. 2010), *treasury spread*, defined as the yield differential of 10-year to 3-month U.S. Treasuries on the date of bond issue (Fridson and Garman 1998), and *zero or step-up* coupon bonds (Fenn 2000). We also control for the following, to date little researched, variables: equity *clawback* provisions (Goyal et al. 1998, Daniels et al. 2009), leveraged buyouts *(LBOs),*[18] and SEC *Rule 144A* issues (Fenn 2000,

[17] Guedhami and Pittman (2008) and John et al. (2010) argue that evidence that subordinated bonds exhibit lower initial yield spreads relative to senior bonds with similar credit ratings reflects Moody's and Standard & Poor's rating policy of generally notching down subordinated bonds by two (S&P) or even three (Moody's) notches relative to senior bonds. Market disagreement regarding this practice can result in a correction being reflected in the initial yield spread.

[18] Saunders and Steffen (2011) document loan deals with private equity firm participation to be associated with significantly higher costs. We control for LBOs using two indicator variables. We assign the value of one to the variable *LBO-5+5* if the issuing firm became the target of an LBO five years prior to or after the bond issue, and to the indicator variable *LBO-7* if the issuing firm became the target of an LBO up to seven years before the bond issue date. We obtain data on LBOs from the Capital IQ database.

Livingston and Zhou 2002). We control in all regressions for economic and industry effects using indicator variables for years and industries (first-digit SIC codes). Although credit ratings should largely capture accounting information, for purposes of robustness we control in some regressions for issuing firm size (logarithm of total assets), leverage, and EBITDA margin. These regressions contain fewer observations because, owing to the inclusion of private firms, we are unable to obtain accounting data for all issuing firms in our sample. In unreported regressions, we further control for *public* issuers (Livingston and Miller 2000) and whether a bond issuer employs a *Big 4 auditor* (Deloitte Touche Tohmatsu, Ernst & Young, KPMG, and PWC) in the year of bond issue (similar to Guedhami and Pittman 2008).[19] We use the *NYSE/AMEX* dummy instead of the variable *public* to account for exchange-listed bond issuers, and, due to their high correlation (0.71), do not use the two variables together in our main regressions.

Table 2 lists and defines all variables used in our analyses. Pair-wise correlations of the main variables are shown in Table 3.

[Insert Tables 2 and 3 about here]

4. Data and Methodology

4.1 Sample Construction and Summary Statistics

Data on original U.S. high-yield corporate bonds issued between January 1, 2000 and September 15, 2008 (the Chapter 11 filing date of Lehman Brothers) with an available credit rating history

[19] Although some studies document that reputable auditors lower firms' cost of debt (Mansi et al. 2004, Pittman and Fortin 2004), the variable Big 4 auditor is, for the following reasons, used only in additional robustness checks. First, information about the auditors employed is available for fewer than 590 bond issues, which would significantly limit the number of observations in our regressions. Second, the variable Big 4 auditor has a sample mean of 0.94, that is, virtually all bond issuers employ a reputable auditor. Third, it was recently shown by Guedhami and Pittman (2008) that Big 4 auditors do not affect yield spreads or credit ratings of Rule 144A bonds.

are collected from the Capital IQ (CIQ) database that provides rating histories for most bonds. In line with prior research, we exclude convertible debt as well as bonds issued by financial institutions. We check the data using Bloomberg to ensure that bonds are non-convertible, original speculative-grade issues. We end up with a sample of 635 high-yield bond issues for which initial bond prices and credit ratings are provided. Information about these bonds and the respective issuers, such as first-time issuer status and initial split, is largely manually acquired from the debt histories available in CIQ. Excluding all bonds for which we are unable to gather full information leaves us with a final sample of 607 high-yield corporate bonds. The number of issuing firms being 374, on average, each firm in our sample issues 1.6 bonds. As our sample contains private issuers, full accounting and auditor data is not available for all observations.

Summary statistics including bond features and bonds' initial credit ratings and rating performance measures as well as issuer and underwriter characteristics are provided in Table 4, which also provides an overview of descriptive statistics for the overall sample (column 1) and arithmetic means for the groups of bonds that are (column 2) (are not, (column 3)) underwritten by one of the Top 3 lead underwriters in the U.S. corporate bond market (variable *Top 3*). Results of a t-test for differences in means between the two subsamples are reported in the last column.

[Insert Table 4 about here]

The mean issue volume for the bonds in our full sample is 289 million USD and mean time to maturity 93 months (about 7.7 years). Fifty-nine percent (28%) of the bonds in our sample have an at-issue B (BB) credit rating and 62% (45%) are issued by public (NYSE/AMEX-listed) firms. These numbers are comparable to the numbers reported in the existing empirical literature using high-yield bond data. Alexander et al. (2000) report an average volume of 396 million USD and average time to maturity of 7.3 years for high-yield bonds traded on NASDAQ's FISP system, Fenn (2000) an average volume of 196.5 million USD and average time to maturity of 9.8 years

using data from the Securities Data Company (SDC). Fenn (2000) further reports 63% of the bonds in his sample to have a B rating and approximately 70% of the issuers to be public firms. This comparison of the most important bond characteristics suggests that our sample is representative of the population of U.S. high-yield bonds.

The results of the differences in means tests reported in Table 4 reveal significant disparities between bonds underwritten by Top 3 lead underwriters and those underwritten by underwriters with lesser reputations. Bonds underwritten by Top 3 lead underwriters are considerably larger (327mn vs. 256mn USD), less frequently first-time issues (17% vs. 27%), and have slightly higher credit ratings. These differences are consistent with the differences between bonds underwritten by reputable underwriters and underwriters with lesser reputations reported in Fang (2005). Except for callability and clawback provisions, bonds in the two subsamples do not differ significantly with respect to bond features. The well-recognized issue of selection in the underwriting process is nevertheless apparent in our data. We address this issue in the next section and throughout our econometric analyses.

Before turning to the multivariate analyses, we discuss the effect of lead underwriters' reputation/market power on the rating performance of the bonds in our sample. The univariate results in Table 4 suggest significantly higher probabilities of downgrades in the short run, and that upgrades are not more likely, for bonds underwritten by Top 3 lead underwriters. In line with these findings, bonds underwritten by more reputable underwriters experience significantly more downgrades than upgrades within the first three years of bond issue (see the variable *downgrade-to-upgrade ratio 3 yrs*). It is hence not surprising that these bonds are also more likely to be downgraded and to default in the medium to long term (see the variables *1. rating action downgrade (3/4 yrs)* and *default*).

4.2 Issuer-Underwriter Matching

The foregoing results on subsample differences indicate that matching between a bond issuer and lead underwriter is not a random process. In fact, Top 3 lead underwriters, on average, underwrite bonds that differ significantly from those underwritten by underwriters with lesser reputations. This may cause endogeneity problems in econometric analyses investigating the role of reputable lead underwriters in the form of omitted variable bias due to self-selection. We address the well-recognized issue of endogenous matching using a Heckman (1979) two-stage approach in the manner of Ross (2010), Schenone (2004), and Puri (1996).[20] We estimate in the first stage of the Heckman approach selection equations for bonds' most reputable lead underwriters following the different definitions of underwriter reputation as defined in section 3.2. Specifically, the dependent variables in the five selection equations are *Top 3, Top 4 - Top 10, Top 3 annual, Top 3 all,* and *Top 3 HY*. We then construct from these regressions inverse Mills ratios that are added as control variables in the second-stage (OLS and probit) regressions reported in sections 5 and 6. As suggested by Heckman (1979), this procedure solves the omitted variable (or self-selection) bias caused by endogenous matching.

We generally follow the literature regarding the independent variables for the underwriter selection equations (e.g., Fang 2005, Puri 1996) and control for: credit rating class (BB, B); bond features guaranteed, redeemable, Rule 144A, and unsecured; whether the issuer is a public firm or a first-time issuer; and whether the issuer was the target of an LBO within seven years prior to bond issue. We control for high-yield bond market sentiment using the variable *HY index*. We thus use in the first-stage regression a number of variables that differ significantly for reputable

[20] This approach is used in such other recent studies as Fernando et al. (2012), Golubov et al. (2012), and McCahery and Schwienbacher (2010). Fang (2005) is the only study on certification in security markets (to the best of our knowledge) that uses a switching regression model, i.e. a generalization of the Heckman approach.

underwriters and underwriters with lesser reputations, as indicated by the results in Table 4. Furthermore, as suggested by Li and Prabhala (2007), the first-stage regressions include variables that are not in the second-stage equations. We use bond issue volume as our main instrument for underwriter selection, as issuing firms in the high-yield bond market, because they face higher financial and refinancing risk and fewer financing opportunities, are likely to choose larger, more reputable underwriters when they plan to issue bonds with larger volumes. As noted in Yasuda (2005), underwriters provide two direct services, (1) insurance for unsold securities, and (2) assistance with the marketing, pricing, and selling of securities. Large underwriters, owing to their more extensive investor networks, more reputable co-managers, and the larger number of market participants they can attract (Chemmanur and Krishnan 2012), are better able to provide these services and guarantee successful placement.[21] The probability of choosing a large, reputable underwriter will consequently increase primarily with bond volume.[22] Each selection equation is estimated using probit regressions with issuer-clustered standard errors and contains year and industry controls. The regression results are reported in Table 5.

[Insert Table 5 about here]

The results in Table 5 generally corroborate the univariate findings reported in Table 4 and our reasoning regarding the relation between issue volume and Top 3 underwriter choice. In

[21] Empirical evidence provided by Chemmanur and Krishnan (2012) suggests that underwriters with large market shares can attract more (professional and retail) investors and make retail investors more optimistic about firms' future prospects. Fernando et al. (2012) report that a variable used for issue size in their first-stage regressions on reputable underwriter choice for equity issues has a large impact significant at the 1% level.

[22] The significant positive correlation of 0.2 between the variables *volume* and *Top 3* corroborates our reasoning (see Table 3). In the event the variable *volume* measures effects not fully controlled for in the second-stage regressions, it might not be a valid exclusion restriction. However, as recently noted in Golubov et al. (2012), exclusion restrictions are not critical in the Heckman selection procedure (see also Li and Prabhala 2007).

particular, Top 3 underwriters tend to underwrite larger bonds that are more likely to be issued by public firms and less likely by first-time issuers. Top 3 underwriters are also more likely to be chosen when the high-yield market sentiment is less favorable, that is, when firms' financing costs are potentially higher. All of these results are consistent with economic intuition. Furthermore, a comparison of regression specifications (1) and (2) suggests different selection criteria for Top 4 - Top 10 relative to Top 3 underwriters and emphasizes the latter's special role. Top 4 - Top 10 underwriters evidently tend not to underwrite large bond volumes in the high-yield segment in which placement risk is particularly high. The likelihood of choosing a Top 4 - Top 10 underwriter is significantly higher, moreover, when the high-yield market sentiment is positive, as indicated by the negative regression coefficient of the variable *HY index*.

5. Empirical Findings: Bond Performance and Lead Underwriter Reputation

In this section, we attempt to answer the question of whether certification via reputable lead underwriters is beneficial or detrimental to bond investors. Specifically, we run multivariate analyses that test reputable/powerful (Top 3) lead underwriters' association with poor rating performance for high-yield corporate bonds indicated by the univariate results presented in Table 4. In other words, we test our first hypothesis (H1) and provide empirical evidence for either the *certification* or *market-power hypothesis*, as presented in section 2.

We test this hypothesis by investigating via probit regressions the effect of reputable lead underwriters on bond rating performance. We examine short-term bond performance using the three variables *downgrade first 6/15/24 months* as dependent variables in section 5.1, medium- to long-term bond performance using the three variables *1. rating action downgrade 3yr*s, *1. rating action downgrade*, and *default* in section 5.2. Besides running basic probit regressions using the continuous variable *market share annual* to measure lead underwriter reputation, we run probit regressions in which we use the binary variable *Top 3* and control for the Mills ratio (variable

Mills Top 3) that results from the first-stage regressions described in section 4.2 and shown in Table 5. Additionally, in the spirit of Heckman (1979), we run "Heckprob" models that use a maximum-likelihood (ML) estimation approach to simultaneously estimate first- and second-stage regressions. The Heckprob approach calculates a Wald (Chi-square) test for independent equations that indicates whether the first- and second-stage regressions can be estimated independently. We report the resulting Wald test statistics in the regression tables. The Wald test of independent equations is insignificant (except for specification (5) in Table 6, for which the Wald test returns a p-value of 9.7%), which suggests that the error terms are not considerably correlated and the two binary regressions can be run independently.

Finally, in section 5.3, we run OLS and two-stage Heckman regressions on the dependent variables *downgrade-to-upgrade ratio 3 yrs* and *downgrade-to-upgrade ratio*, defined as the number of downgrades minus the number of upgrades within the first three years of bond issue, and over the lifetime of the bond, respectively.

In the following sections, we estimate regressions in the form of equation (1) using either probit (sections 5.1 and 5.2) or OLS (section 5.3) regressions with the dependent variables (y_i) described above.

$$y_i = c_0 + c_1\ \textbf{Top 3}_i + c_2\ \textbf{Number Underwriters}_i + c_3\ \textbf{NYSE/AMEX}_i + c_4\ \textbf{Rating}_i + c_5\ \textbf{Split Rating}_i + \textbf{Controls} + e_i \quad (1)$$

5.1. Short-term Bond Performance

The regression results for short-term bond performance presented in Table 6 suggest that reputable lead underwriters are associated with significantly poorer bond performance, corroborating the univariate results reported in Table 4. To facilitate interpretation of our results, we also report *marginal effects*. The probability that a bond experiences a rating downgrade is about 3% higher within the first six months of bond issue if it is underwritten by a Top 3 lead

underwriter (specifications 1 and 2). This effect, significant at least at the 10% level, holds as well for the downgrade probability within the first 15 months, which is about 7% higher for bonds underwritten by Top 3 lead underwriters (specification 4). Within the first 24 months (specifications 5 and 6), we find Top 3 lead underwriters to be associated with a 15% higher downgrade probability, significant at the 1% level. When we measure reputation by the lead underwriter's annual market share (specifications 3 and 7), that is, using a continuous variable, the results remain significant at least at the 5% level.

[Insert Table 6 about here]

We find with regard to our control variables that both credit-rating variables, *rating* (which measures default risk) and *split rating* (which measures ambiguity in the rating process), have a significantly positive effect on the probability of a bond rating downgrade within six and up to 24 months after issue. This result is in line with Livingston et al. (2008), who report that bonds with initial split ratings exhibit a significantly higher probability of future rating revisions. Our finding of a significantly lower downgrade probability, particularly in the first six months, for bonds with longer *maturity* corroborates Helwege and Turner's (1999) finding that high-quality issuers in the low-grade bond segment issue longer-maturity debt.

5.2. Medium- to Long-term Bond Performance

Regression results for medium- to long-term bond performance are presented in Table 7.

[Insert Table 7 about here]

Again, we look first at the effects of reputable lead underwriters. As can be seen in Table 7, the variable *Top 3* has a positive impact on the probability of a bond's first rating action being a downgrade, both within the first three years of issue (specifications 1 and 2) and in general (specification 4). The corresponding coefficients of the Top 3 variable are significant at the 1% level in all of these regressions. *Marginal effects* amount to approximately 18% for the three-

year, and 15.5% for the general probability of experiencing a rating downgrade as the first rating action. Specifications (5) and (6) further suggest that bonds underwritten by Top 3 lead underwriters are also more likely to default. The corresponding regression coefficients are significant at the 1% and 5% level, respectively. *Marginal effects* for default probability are about 2%. Results remain significant at the 5% level when we use the variable annual market share instead of the Top 3 dummy (specifications 3 and 7).

With respect to control variables, we provide empirical support for the serial correlation of rating downgrades noted in section 3.1. When we use the variable *1. rating action downgrade 3 yrs* as an explanatory variable in specification (6), the corresponding coefficient is positive and significant at the 1% level. Similar results are obtained in unreported regressions in which we use other rating downgrade variables. Regarding the credit rating variables *rating* and *split rating*, we again document that both have a significantly positive impact on the downgrade probability measures. However, in line with the literature and economic intuition, we find the variable *rating* (which increases with better credit ratings) to have a significantly negative effect on default probabilities in specifications (5)-(7). LBOs within five years prior to or after bond issue have a significantly positive effect on downgrade probability, as indicated by the variable *LBO-5+5* (specifications 1-4). Finally, we find bonds issued by firms listed on the NYSE or AMEX to be less likely to experience rating downgrades and defaults. When we add, in unreported regressions, the variable *public*, this effect remains significant at the 5% level, while the public dummy is not significant. Results are similar when we use *default* as the dependent variable.

5.3. Downgrade-to-Upgrade Ratios

Table 8 presents the regression results for the downgrade-to-upgrade ratio. A positive ratio indicates that a bond had more downgrades than upgrades over a given period. Okashima and

Fridson (2000) show the ratio of downgrades to upgrades to have high explanatory power in the high-yield corporate bond market for changes in default rate two to three quarters later.[23]

[Insert Table 8 about here]

The results in Table 8 provide strong support for our univariate findings in Table 4, and corroborate the foregoing results on downgrade and default probabilities. In particular, we find that bonds underwritten by Top 3 lead underwriters experience considerably more downgrades in the first three years after issue. The regression coefficient of the *Top 3* variable is significant at the 1% level in specifications (1) and (3), and remains significant at the 5% level when we control for issuing firms' accounting data in specification (4). Even when we consider, in specification (7), the downgrade-to-upgrade ratio over the entire lifetime of a bond, in which we examine only bonds issued between 2000 and 2003 (i.e., with a rating history of at least seven years), the coefficient of the *Top 3* variable remains significant at the 10% level.

Two additional findings merit mention. As specification (5) shows, the significant increase in the number of downgrades is driven by the Top 3 dummy. When we use the dummy *Top 4 - Top 10* (for underwriters with lesser reputations/dominance in the top 10 of the sample-period league table for corporate bonds), we find the corresponding regression coefficient to be negative and significant at the 1% level (controlling for endogeneity). In unreported regressions, we further find the indicator variable *Top 10* to be insignificant when used to explain the downgrade-to-upgrade ratio. This suggests that the poor rating performance is a specific phenomenon of bonds underwritten by the most reputable or most dominant bond underwriters. The findings for Top 3 and Top 4 - Top 10 underwriters together provide empirical evidence for the U-shape between underwriter reputation and evaluation standards posited, theoretically, in Chemmanur and

[23] In unreported regressions, our variable *downgrade-to-upgrade ratio 3 yrs* is positive and significant at the 1% level when we include it in the default regressions shown in Table 7.

Fulghieri (1994). Second, when we examine, in specification 6, only bonds issued by firms listed on the NYSE or AMEX (i.e., by larger, more visible issuers), we find that the regression coefficient of the *Top 3* variable loses statistical significance. This finding is in line with the reasoning that banks have stronger incentives to conduct business properly when reputational exposure is greater (Rhee and Valdez 2009), and corroborates Golubov et al.'s (2012) findings for the M&A market. In the context of our study, this suggests that reputable underwriters adjust the quality of their underwriting standards in response to client-specific reputational exposure, a conclusion supported by the results of additional unreported regressions. The regression coefficient of the variable *Top 3* loses magnitude and statistical significance in all short-term and medium- to long-term regressions described in sections 5.1 and 5.2 when we restrict the sample to firms listed on the NYSE or AMEX.

The control variables we employ reveal a picture similar to that presented in Table 7. The credit rating variables *rating* and *split rating* both have a significantly positive impact on the downgrade-to-upgrade ratio. That the latter result is again in line with Livingston et al. (2008) suggests that split ratings necessitate more future rating revisions. The variable *LBO-5+5* is positive throughout all reported regressions, but significant only in specifications (5)-(7). Finally, corroborating the results reported in Table 7, we find bonds issued by firms listed on the NYSE or AMEX to have considerably lower downgrade-to-upgrade ratios. The corresponding regression coefficients of the listing dummy variable are not only largely negative in magnitude, but also significant at the 1% level in all specifications. When added, in unreported regressions, the variable *public* has a positive and insignificant regression coefficient, whereas the effect of the NYSE/AMEX listing remains significant at the 1% level. Results are qualitatively similar when we use the general downgrade-to-upgrade ratio as the dependent variable.

5.4. Robustness

Even though we control for endogeneity in the regressions shown in Tables 6, 7, and 8, which also show satisfying values for R-squared and significant F- and Wald-statistics, we run a large number of additional tests to ensure that our results are robust and have good explanatory power. We present first the results of robustness tests in which we include additional control variables. We then elaborate on the use of alternative measures of bond performance and subsample analyses. Lastly, we examine the effects of different measures and levels of underwriter reputation. For brevity, regression results are not shown.

Additional controls: Owing to the comparatively high correlation between the variables *callable* and *clawback* (0.58) and *callable* and *rating* (-0.56), we estimate all specifications without the variable *callable*. The results in Tables 6, 7, and 8 remain unchanged. The same holds when we control for initial bond price via the variable *benchmark spread*, which should capture the sum of all information relevant to investors. As expected, we find benchmark spread to be significantly positive in all regressions. Motivated by Fang (2005), who uses Moody's (which may differ from S&P) ratings, we use Moody's instead of S&P issue-specific credit ratings. We then substitute the number of all bond underwriters for the *number of lead underwriters* (Shivdasani and Song 2011), that is, only underwriters actively chosen by the bond issuer. Results remain qualitatively unchanged. Lennox (1999) having shown that large auditors provide more accurate signals of financial distress, and may hence affect initially assigned credit ratings and potentially improve rating performance, we run regressions including the variable *Big 4 auditor*. Results do not change considerably, but the Big 4 variable, although insignificant in almost all regressions, has a negative impact significant at the 10% level on *downgrade first 24 months* and *downgrade-to-upgrade ratio 3 yrs*.

Finally, for the 571 bond issues for which we have information about covenants, we control for the number of covenants attached to a bond. We do this because reputable lead underwriters might negotiate better terms for their clients in the form of fewer covenants, which may lead to poor rating performance due to less monitoring. Running Poisson regressions, we find that Top 3 lead underwriters do not significantly affect the number of covenants attached to a bond. This result is in line with McCahery and Schwienbacher's (2010) finding for the syndicated loan market. The results on rating performance do not change significantly when we include the number of bond covenants. Only when we use the variable *downgrade first 15 months* as the dependent variable is the variable *Top 3* no longer significant (only at the 12% level). The number of covenants is insignificant in virtually all regressions.

Alternative measures of bond performance and subsample analyses: When we use the four variables *1. rating action downgrade 4 yrs/5yrs* and *downgrade 3 yrs/5 yrs* as dependent variables in equation (1), the regression coefficient of the variable *Top 3* is positive and significant at the 1% level in all specifications. When we use the variable *upgrade first 15 months* as the dependent variable, the coefficient of the Top 3 dummy is insignificant. Acknowledging a potential for bias against Top 3 lead underwriters in recession years because the largest underwriters are most likely to place a bond during such periods, and bonds might experience more downgrades by virtue of being issued in times of economic hardship, we exclude from the sample bonds issued in the recession years 2001 and 2008. Our findings remain qualitatively unchanged. Only in the regressions that use the two variables *downgrade first 15/24 months* as dependent variables does the *Top 3* variable become insignificant (15 months) or lose significance (5% instead of 1% level). Finally, because some of our performance measures might be biased against bonds issued early in the sample, we rerun our analyses excluding all bonds issued during the 2000-2002 period. Results remain qualitatively unchanged.

Alternative measures and levels of reputation: When we use the variable *Top 3 annual* (see section 3.2) instead of *Top 3*, our results remain significant in all regressions except those in which *1. rating action downgrade* and *downgrade first 15 months* are used as dependent variables. When we use the variable *Top 3 all*, the results for short-term performance lose significance, but the results for medium- to long-term performance remain significant at conventional levels. When the variable *Top 3 HY* is used, the results remain significant except for the dependent variables *downgrade first 6/15 months* and the *downgrade-to-upgrade ratio*. As variation in the foregoing Top 3 variables comes only from the third rank of each league table, even for the annual league tables (!), we rerun all regressions using the variable *Top 2*. Results remain significant except for the regressions in which we use the two short-run rating performance measures *downgrade first 6/15 months* as dependent variables.

With respect to different levels of lead underwriter reputation, we find the variable *Top 4 - Top 10* to have a significantly positive effect on bond rating performance (i.e., downgrades are less likely), whereas the variables *Top 8* and *Top 10* do not significantly affect bond performance. This result suggests that the top 3 classification is an appropriate cut-off point, and legitimates the use of the binary *Top 3* variable as the primary reputation measure beyond statistical reasons.

5.5. Interpretation of Results

In sum, the results reported above reject our first hypothesis (H1), which states that reputable underwriters are associated with superior underwriting standards and, hence, lower downgrade and default risk for the bonds they underwrite. In fact, we show the most reputable lead underwriters to be associated with significantly higher downgrade and default risk, and also with a higher downgrade-to-upgrade ratio. The possible interpretation that they have below-average underwriting standards, albeit at odds with the traditional certification hypothesis, is consistent with the market-power hypothesis and anecdotal evidence presented in section 1. Apparently, the

most reputable banks are able to underwrite low-quality (high-risk) issues without considerably harming their reputation and market share. This finding is consistent with Gopalan et al.'s (2011) findings for the syndicated loan market, and suggests that the most reputable underwriters, as predicted by Chemmanur and Fulghieri (1994), actually "milk" their reputations. Compared to results for the corporate bond market for the 1990s, our findings further suggest that reputable underwriters may have lowered underwriting standards (i.e., become more lenient) in response to increased competition consequent to the passage of GLBA. In this regard, our findings are in line with several theoretical models that predict a negative effect of competition on incentives for honest certification (e.g., Bouvard and Levy 2009, Mathis et al. 2009, Strausz 2005).

6. Empirical Findings: Firms' Borrowing Costs and Lead Underwriter Reputation

Against the background of the previous results on bond performance, we investigate in this section the extent to which reputable lead underwriters affect bond issuers' informational costs. We thereby test our second hypothesis (H2), which states that reputable (Top 3) lead underwriters can credibly certify issuer quality to investors in the high-yield bond market. Given the significantly positive relation between lead underwriter reputation and bonds' downgrade and default risk, we would expect Top 3 lead underwriters to be associated not with a reduction in issuing firms' informational costs, but rather with higher risk-adjusted borrowing costs in an efficient market. To measure this effect as accurately as possible and avoid omitted variable bias, controls for other certification devices that may affect initial bond spreads are required. We also account for the endogenous matching described in section 4.2.

6.1. Using and Interpreting Inverse Mills Ratios in Bond Pricing Equations

Before discussing the results of our bond pricing regressions, we first review the interpretation of the inverse Mills ratio used to correct for the selection bias that can result from endogenous

matching of bond issuers with lead underwriters. As explained in Puri (1996), the information revealed to bond investors by the endogenous but (at least partly) observable issuer-lead underwriter matching can be evaluated by looking at the inverse Mills ratios in the second-stage regressions. Puri (1996) states that selectivity models like the Heckman approach can be used to control for factors linked to underwriter type and econometrically allow for isolating the information effect of bank underwriting. Market participants, having rational expectations about underwriters' private information and evaluation standards, should update these expectations given the observable matching of bond issuers with lead underwriters. Stated differently, investors may update their evaluations of banks' underwriting standards on the basis of the issuer-underwriter (i.e., client-bank) matching they observe. In this way can the effect of underwriter certification, that is, the value of a bank's underwriting standards, be measured. This approach is in line with McCahery and Schwienbacher (2010) and Fang (2005), the latter measuring the effect of underwriter certification solely by interpreting the inverse Mills ratio.

6.2. Regression Results

We report in Table 9 the regression results of estimations of equation (2), our bond pricing equation. This equation is estimated including an inverse Mills ratio (for the issuer-lead underwriter matching) from the first-stage regressions explained in section 4.2 and shown in Table 5. The dependent variable is a bond's *benchmark spread* (abbreviated *BS*).

$$BS_i = c_0 + c_1\ Top\ 3_i + c_2\ Number\ Underwrit._i + c_3\ NYSE/AMEX_i + c_4\ Rating_i + c_5\ Split\ Rating_i + Controls + e_i \quad (2)$$

[Insert Table 9 about here]

As expected, the results presented in Table 9 reject our second hypothesis (H2). In regression specifications (2) and (3), the inverse Mills ratio for the variable *Top 3* is positive and significant at the 1% level. When the variable *Top 3 annual* is used, in specification (4), the corresponding

Mills ratio is positive and significant at the 5% level. As described in section 6.1, we interpret the inverse Mills ratio as bond investors' aggregate evaluation of Top 3 lead underwriters' underwriting standards. The results are in line with the findings reported in section 5. As the most reputable (Top 3) lead underwriters in the high-yield segment are significantly associated with poor bond performance (i.e., higher downgrade and default risk), investors that buy bonds underwritten by these reputable banks demand compensation. Put differently, investors demand a premium for the higher expected risk born by an average bond underwritten by a Top 3 lead underwriter. This is consistent with the high-yield corporate bond market being efficient. This conclusion is supported by the finding that the regression coefficients of the variable *Top 4 - Top 10* as well as corresponding Mills ratio are negative. As the Top 4 - Top 10 underwriters are not associated with higher downgrade and default risk (but rather the opposite), investors do not demand compensation when these banks act as lead underwriters. We document in addition to these findings that the inverse Mills ratio remains positive, but is smaller in magnitude and no longer statistically significant, when we restrict the sample to bonds issued by firms listed on the NYSE or AMEX (specification 5). This finding, which is in line with the result shown in specification (6) in Table 8, suggests that reputable underwriters, when exposed to higher reputational risk, provide higher-quality services. This result corroborates our conclusion that reputable underwriters adjust the quality of their underwriting standards in response to client-specific reputational exposure, and suggests that investors are aware of this mechanism (in line with Golubov et al. 2012). Results remain significant when we control for Big 4 auditors (in unreported regressions using fewer observations). In these specifications, the coefficient of the Mills ratio for Top 4 - Top 10 lead underwriters remains negative, and even becomes significant at the 5% level.

We examine in additional unreported regressions other measures of lead underwriter reputation. Consistent with the results reported in section 5.4, we find the inverse Mills ratio for the variable *Top 2* to be significant at the 5% level and only slightly smaller in magnitude than the variable *Top 3* (when compared to specification 2). When we use the variables *Top 3 All* and *Top 3 HY (annual)*, the regression coefficients of the corresponding Mills ratios are significant at the 1% and 5% level, respectively, and larger in magnitude than the coefficient of the *Top 3* variable. When we control for Big 4 auditors, the foregoing results remain significant.

For the control variables we employ, the regression coefficients of the variables *HY index*, *number underwriters*, *rating*, *subordinated* (except for specification 5), and *zero or step-up* are all significant at the 1% level throughout the reported regression specifications. These findings are consistent with the existing literature (see, for example, Fenn 2000, Fridson and Garman 1998, John et. al 2003, John et al. 2010, and Livingston and Miller 2000). Also in line with the literature (Helwege and Turner 1999, Livingston and Zhou 2010), we find (in most regression specifications) the coefficient of the variable *maturity* to be significantly negative and the coefficient of the variable *split rating* to be significantly positive. Finally, in line with Datta et al. (1997), the dummy variable *NYSE/AMEX* is significantly negative in most specifications. However, using instead (in unreported regressions) the dummy variable *public*, we find the corresponding coefficient to be larger in magnitude and even more significant, even as our other results remain unchanged.

7. Conclusions

This study deals with the benefits of certification to investors in the corporate bond market. Specifically, it asks whether bonds underwritten by reputable lead banks are associated with significantly higher or lower downgrade and default risk, a question no study, to the best of our

knowledge, has yet attempted to answer. We choose as the optimal test ground for our study the high-yield segment of the bond market, in which certification is highly important to investors and issuers. We document corporate bonds underwritten by the most reputable lead underwriters to be associated with significantly higher downgrade and default risk during our sample period of 2000-2008. We further document that the most reputable underwriters increase rather than decrease issuing firms' informational costs. This finding is consistent with the market efficiency hypothesis and calls into question the traditional certification hypothesis and underlying reputation mechanism. We thus corroborate Gopalan et al.'s (2011) finding that the reputation mechanism does not work for the most dominant banks in the syndicated loan market.

Our results, although contrary to those of earlier empirical studies that use corporate bond data for the 1990s, are in line with recent findings for the equity and loan markets that support the market-power hypothesis. We conclude from this that reputable banks may have lowered their underwriting standards to deal with significantly intensified competition among underwriters resulting from enactment in late 1999 of the Gramm-Leach-Bliley Act. This conclusion is in line with a number of theoretical and empirical studies as well as anecdotal evidence. Some theoretical models posit the reduction of underwriting costs or attraction of new clients as incentives for underwriters to lower their underwriting standards and "milk" their reputations. We provide additional evidence for these models that suggests that reputable underwriters actively manage their underwriting standards in response to client-specific reputational exposure. Bond investors seem to be aware of this incentive scheme, as we document information about the issuer-lead underwriter match to have a significant and positive impact on firms' at-issue yield spreads. This suggests that reduction of informational costs via certification is not necessarily the most important role reputable lead underwriters play, at least in the high-yield bond market, in

which issuing firms have fewer financing opportunities and higher placement risks. It further suggests that underwriters may be chosen for reasons other than their certifier reputation.

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Table 1: Top 10 Underwriters in the U.S. Corporate Bond Market 2000-2008

Rank	Underwriter	Total amount (USD mn)	Market share (%)	Average fee (%)	Rank HY bonds	Rank all bonds	Total deals
1	Citi	1,033,442.94	15.7	0.791	1	2	5,611
2	JP Morgan	991,696.06	15.1	0.589	2	1	7,401
3	Morgan Stanley	559,014.47	8.5	0.710	5	4	7,762
4	Bank of America	546,613.68	8.3	0.692	3	8	8,955
5	Goldman Sachs	510,427.69	7.8	0.548	7	6	2,863
6	Lehman Brothers	506,180.32	7.7	0.493	8	5	3,164
7	Merrill Lynch	498,347.35	7.6	0.795	6	3	5,086
8	Credit Suisse	414,758.63	6.3	0.822	4	9	3,016
9	Deutsche Bank	351,728.70	5.3	0.636	10	7	2,709
10	UBS	234,227.64	3.6	0.703	9	10	4,723

This table presents summary statistics for the 10 largest bond underwriters (by volume underwritten) in the U.S. corporate bond market for the sample period 2000-2008. Data is from Bloomberg, and excludes self-led issues. 'HY' stands for high-yield bonds. 'All bonds' refers to all types of bond issues including corporate bonds. Total deals indicates the total number of all bonds underwritten by a bank between 2000 and 2008.

Table 2: Description of Key Variables

Variable	Definition	Literature
1. rating action downgrade (3/4/5 years)	Dummy variable that takes a value of one if the first credit rating action is a downgrade (as opposed to an upgrade) over the bond's maturity (or within the first 3 or 4 years of bond issue), zero otherwise	
Benchmark spread	The bond's offering yield minus the yield of the (on-the-run) U.S. Treasury with equal maturity (in basis points (bps))	*Gande et al. 1999, John et al. 2003*
Big 4 Auditor	Dummy variable that takes a value of one if the bond issuer employed one of the Big 4 auditing firms, zero otherwise	*Guedhami & Pittman 2008*
Callable	Dummy variable that takes a value of one if the bond is callable, zero otherwise	*Livingston & Miller 2000, Fang 2005*
Clawback	Dummy variable that takes a value of one if the bond has an equity clawback feature, zero otherwise	*Goyal et al. 1998, Daniels et al. 2009*
Default	Dummy variable that takes a value of one if the bond defaulted within the sample period or thereafter (the observation period ends in 2010), zero otherwise	*Altman 1989, Puri 1994*
Downgrade first 6/15/24 months	Dummy variable that takes a value of one if the bond's credit rating is downgraded within 6/15/24 months of bond issue, zero otherwise	*Comparable to Klein & Zur 2011*
Downgrade 3/5 yrs	Dummy variable that takes a value of one if the bond's credit rating is downgraded within the first 3 (or 5) years of bond issue, zero otherwise	
Downgrade-to-upgrade ratio (3 years)	The number of downgrades minus upgrades (over the bond's maturity or within the first three years of bond issue)	*Comparable to Okashima & Fridson 2000*
EBITDA margin	The issuing firm's reported EBITDA margin in the year prior to bond issue	*Comparable to Shivdasani & Song 2011*
First-time issuer	Dummy variable that takes a value of one if the issuing firm did not issue public debt at least 15 years prior to the bond issue, zero otherwise	*Gande et al. 1999*
Guaranteed	Dummy variable that takes a value of one if the bond is guaranteed (i.e., interest and principal on the bond are guaranteed to be paid by another entity), zero otherwise	*Fabozzi 2010*
High-yield (HY) index	The level of the BofA/Merrill Lynch High-Yield Master Index over 10-year Treasuries on the date of bond issue (in bps)	*Fridson & Garman 1998*
LBO -5/+5 (LBO -7)	Dummy variable that takes a value of one if the issuing firm or its parent company was the target of an LBO within 5 years prior to or after bond issue (in the 7 years before bond issue).	
Leverage	The issuing firm's leverage (total liabilities to total assets) in the year prior to bond issue	*Fang 2005*

Market share annual	A bond's (most reputable) lead underwriter's annual market share in the U.S. corporate bond market for the year of bond issue (during the period 2000-2008)	*Schenone 2004*
Maturity	The natural logarithm of the bond's maturity	*Fenn 2000, Fang 2005*
Number underwriters	The number of banks underwriting a bond issue	*Puri 1996*
NYSE/AMEX	Dummy variable that takes a value of one if the issuing firm is listed on either NYSE or AMEX, zero otherwise	*Affleck-Graves et al. 1993, Datta et al. 1997*
Public firm	Dummy variable that takes a value of one if the issuer is a public firm, zero otherwise	*Fenn 2000, Livingston & Zhou 2002*
Rating	S&P's issue-specific credit rating (on notch level); rating classes (BB, B, CCC and below also refer to S&P ratings)	*Fenn 2000, Guedhami & Pittman 2008*
Redeemable	Dummy variable that takes a value of one if the bond is redeemable, zero otherwise	*John et al. 2010*
Rule 144A	Dummy variable that takes a value of one if the bond is issued under SEC Rule 144A, zero otherwise	*Fenn 2000, Livingston & Zhou 2002*
Split rating	Dummy variable that takes a value of one if Moody's and Standard and Poor's assign different initial issue-specific credit ratings to a bond, zero otherwise	*Santos 2006, Livingston & Zhou 2010*
Subordinated	Dummy variable that takes a value of one if the bond issue is subordinated within the issuing firm's capital structure, zero otherwise	*Guedhami & Pittman 2008, John et al. 2010*
Top 3 (all/annual/HY); Top 2, Top 8, Top 10; Top 4 - Top 10	Dummy variable that takes a value of one if the bond's (most reputable) underwriter is ranked Top 3 (Top 2, 8, 10, or Top 4 - Top 10) in the underwriter league table for U.S. corporate bonds for the period 2000-2008 as provided by Bloomberg ('All' designates the league table for all bond issues between 2000 and 2008, 'Annual' the annual league table for U.S. corporate bonds for the years 2000-2008, 'HY' the high-yield-specific league table position for the period 2000-2008), zero otherwise	*McCahery & Schwienbacher 2010, and Ross 2010 (use Top3 dummy for the syndicated loan market); Fang 2005, and Livingston & Miller 2000 (use Top 8, Top10 dummy for the corporate bond market)*
Total assets	The natural logarithm of the issuing firm's total assets in the year prior to bond issue (proxy for firm size)	*Guedhami & Pittman 2008*
Treasury spread	The yield differential of 10-year to 3-month U.S. Treasuries on the date of bond issue (in bps)	*Fridson & Garman 1998*
Unsecured	Dummy variable that takes a value of one if the bond is unsecured, zero otherwise	*John et al. 2010*
Upgrade first 15 months	Dummy variable that takes a value of one if the bond's credit rating is upgraded within 15 months of bond issue, zero otherwise	
Volume	The natural logarithm of the proceeds raised in the bond issue	*Puri 1996, John et al. 2003*
Zero or step-up	Dummy variable that takes a value of one if the bond is a zero-coupon or step-up bond, zero otherwise	*Fenn 2000*

Table 3: Pair-wise Correlations

#	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Callable	1.00																							
2	Clawback	0.58*	1.00																						
3	First-time issuer	0.22*	0.14*	1.00																					
4	Guaranteed	-0.12*	0.03	-0.11*	1.00																				
5	HY index	-0.04	-0.05	-0.11*	0.001	1.00																			
6	LBO -5/+5	0.14*	0.14*	0.13*	-0.06	-0.08*	1.00																		
7	LBO 7yrs prior	0.13*	0.13*	0.11*	-0.07	-0.06	0.84*	1.00																	
8	Market share	-0.15*	-0.12*	-0.19*	-0.04	0.16*	-0.04	-0.03	1.00																
9	Maturity	0.25*	0.21*	0.023	-0.07	0.46*	0.04	0.05	0.17*	1.00															
10	Mills top3	0.08	-0.01	0.31*	-0.001	-0.12*	0.01	-0.03	-0.35*	-0.20*	1.00														
11	Mills top3 annual	0.06	-0.02	0.28*	0.03	-0.12*	0.17*	0.14*	-0.39*	-0.12*	0.76*	1.00													
12	Mills top3 HY	-0.05	-0.11*	0.36*	-0.03	-0.11*	0.05	0.02	-0.39*	-0.20*	0.72*	0.89*	1.00												
13	Num. underwriter	-0.14*	-0.02	-0.18*	-0.06	0.30*	-0.14*	-0.11*	0.34*	0.30*	-0.24*	-0.29*	-0.27*	1.00											
14	NYSE/AMEX	-0.35*	-0.19*	-0.19*	0.09*	0.07	-0.35*	-0.31*	0.22*	-0.04	-0.20*	-0.24*	-0.13*	0.17*	1.00										
15	Public	-0.30*	-0.12*	-0.29*	0.08	0.15*	-0.36*	-0.28*	0.17*	0.02	-0.27*	-0.25*	-0.11*	0.22*	0.71*	1.00									
16	Rating	-0.56*	-0.39*	-0.16*	0.09*	0.35*	-0.20*	-0.20*	0.19*	0.08	-0.12*	-0.21*	-0.10*	0.29*	0.31*	0.24*	1.00								
17	Rule 144a	0.32*	0.15*	0.20*	-0.58*	-0.03	0.16*	0.14*	0.01	0.08	-0.02	-0.03	-0.09*	-0.06	-0.23*	-0.21*	-0.24*	1.00							
18	Split rating	-0.02	-0.03	-0.03	-0.06	0.03	0.02	0.01	0.02	-0.03	-0.08	-0.08	-0.02	0.08*	0.02	0.04	0.05	-0.01	1.00						
19	Subordinated	0.23*	0.15*	0.04	-0.02	0.20*	0.07	0.10*	0.05	0.33*	0.04	-0.04	-0.22*	0.11*	-0.12*	-0.11*	-0.17*	0.07	-0.12*	1.00					
20	Top3	-0.11*	-0.12*	-0.13*	0.01	0.05	-0.01	0.01	0.80*	0.06	-0.33*	-0.32*	-0.30*	0.17*	0.11*	0.13*	0.07	0.004	0.03	-0.04	1.00				
21	Top3 annual	-0.07	-0.08*	-0.12*	-0.02	0.03	-0.06	-0.07	0.82*	0.04	-0.28*	-0.37*	-0.33*	0.17*	0.17*	0.11*	0.08*	0.01	0.02	0.003	0.80*	1.00			
22	Top 3 HY	-0.01	-0.02	-0.14*	0.01	0.04	-0.03	-0.01	0.66*	0.09*	-0.25*	-0.31*	-0.36*	0.20*	0.11*	0.05	0.01	0.04	-0.03	0.08*	0.62*	0.57*	1.00		
23	Volume	-0.22*	-0.10*	-0.19*	-0.01	0.18*	-0.10*	-0.09*	0.29*	0.18*	-0.53*	-0.45*	-0.40*	0.39*	0.16*	0.21*	0.30*	-0.09*	0.13*	-0.13*	0.20*	0.16*	0.12*	1.00	
24	Treasury spread	0.25*	0.29*	0.08	-0.06	-0.07	0.02	-0.01	0.15*	0.18*	-0.21*	-0.37*	-0.49*	0.06	-0.03	-0.10*	-0.13*	0.21*	-0.01	0.15*	0.05	0.14*	0.18*	-0.07	1.00
25	Zero/step-up	0.10*	0.05	-0.05	-0.07	-0.02	0.14*	0.15*	-0.01	0.04	-0.03	0.03	0.001	-0.04	-0.15*	-0.10*	-0.13*	0.04	0.12*	-0.08	0.03	-0.03	0.01	0.06	-0.05

This table reports the pair-wise correlations of the main variables employed in the regression analyses. All variables are defined in Table 2. Asterisks (*) indicate significance at least at the 5% level.

Table 4: Summary of Sample Statistics

This table reports descriptive statistics for the sample of U.S. high-yield corporate bonds issued between 2000 and 2008. S&P's

	(1) *All bonds*			*(2) Top 3*		*(3) Not Top 3*		*Diff in means*
	Obs	*Mean*	*StDev*	*Obs*	*Mean*	*Obs*	*Mean*	*(2)-(3)*
Credit ratings (at bond issue)								
BB	607	0.28	0.45	283	0.31	324	0.25	0.060*
B	607	0.59	0.49	283	0.55	324	0.63	-0.081**
CCC or below	607	0.13	0.34	283	0.14	324	0.12	0.021
Split rating	607	0.53	0.50	283	0.55	324	0.52	0.029
Bond characteristics								
Benchmark spread (bps)	607	497.4	176.7	283	494.0	324	500.3	6.295
Callable	607	0.76	0.42	283	0.71	324	0.81	-0.095***
Clawback provision	607	0.69	0.46	283	0.63	324	0.74	-0.112***
Guaranteed	607	0.13	0.34	283	0.13	324	0.13	0.008
Maturity (months)	607	93.2	19.3	283	94.4	324	92.2	2.261
Number covenants	571	15.9	3.93	267	15.8	304	16.1	-0.277
Offering price (%)	606	98.2	7.73	283	98.0	323	98.4	-0.399
Rule 144A	607	0.75	0.43	283	0.76	324	0.75	0.003
Subordinated	607	0.29	0.45	283	0.27	324	0.31	-0.037
Unsecured	607	0.71	0.45	283	0.73	324	0.69	0.037
Volume ($ mn)	607	289.0	204.1	283	326.8	324	255.9	70.852***
Zero- or step-up	607	0.03	0.18	283	0.04	324	0.03	0.011
Issuer characteristics								
First-time issuer	607	0.22	0.42	283	0.17	324	0.27	-0.109***
LBO -5/+5 years	607	0.20	0.40	283	0.20	324	0.20	-0.006
LBO 7 years prior	607	0.15	0.36	283	0.15	324	0.15	0.004
Public	607	0.62	0.48	283	0.69	324	0.56	0.124***
NYSE/AMEX	607	0.45	0.50	283	0.51	324	0.40	0.114***
Underwriter characteristics								
Num. underwriter/bond	607	3.14	1.42	283	3.41	324	2.91	0.493***
Top 10 (2000-08)	607	0.92	0.27					
Top 3 (2000-08)	607	0.47	0.50					
Top 4 - Top 10 (2000-08)	607	0.45	0.50					
Top 3 annual	607	0.48	0.50					
Top 3 (2000-08) All	607	0.47	0.50					
Bond performance measures								
Downgrade first 6 months	607	0.06	0.24	283	0.08	324	0.04	0.038*
Downgrade first 15 months	607	0.23	0.42	283	0.26	324	0.19	0.067*
Downgrade first 24 months	607	0.33	0.47	283	0.41	324	0.26	0.150***
1. rating action downgrade	607	0.53	0.50	283	0.58	324	0.49	0.088**
1. rating action downgrade 3 yrs	607	0.43	0.49	283	0.51	324	0.36	0.148***
1. rating action downgrade 4 yrs	607	0.49	0.50	283	0.55	324	0.43	0.126***
Downgrade-to-upgrade ratio 3 years	607	0.39	1.45	283	0.53	324	0.27	0.265**
Default	607	0.05	0.21	283	0.07	324	0.02	0.053***
Upgrade first 15 months	607	0.10	0.30	283	0.11	324	0.10	0.014

issue-specific rating classes are shown. The last column reports the results of a t-test (with unequal variances) for differences in means between the two high-yield bond subsamples classified by underwriter reputation. Top 3 refers to the Top 3 underwriters in the league table for U.S. corporate bonds for the period 2000-2008. 'All' stands for all bond issues (i.e., not only corporate bonds).

Table 5: Lead Underwriter Selection Equations (First-stage Regressions)

Variable	(1) Top 3 corporates	(2) Top 4 - Top 10 corporates	(3) Top 3 corporates annual	(4) Top 3 all bonds	(5) Top 3 high-yield bonds
Volume	0.413 (3.62)***	-0.071 (-0.76)	0.341 (3.16)***	0.234 (2.29)**	0.296 (2.82)***
HY index	0.002 (2.36)**	-0.001 (-2.07)**	0.001 (1.73)*	0.001 (2.03)**	0.001 (0.80)
LBO -7	0.336 (1.73)*	-0.231 (-1.16)	0.044 (0.23)	0.019 (0.11)	0.170 (0.79)
First-time issuer	-0.241 (-1.68)*	0.112 (0.78)	-0.243 (-1.71)*	-0.226 (-1.65)*	-0.405 (-2.88)***
Rule 144A	0.072 (0.43)	-0.180 (-1.08)	0.055 (0.34)	-0.033 (-0.21)	0.142 (0.86)
Public firm	0.346 (2.21)**	-0.220 (-1.44)	0.353 (2.29)**	0.357 (2.34)**	0.137 (0.90)
BB	-0.256 (-1.03)	0.344 (1.40)	-0.096 (-0.38)	0.240 (0.97)	-0.092 (-0.38)
B	-0.362 (-1.81)*	0.301 (1.52)	-0.367 (-1.72)*	-0.172 (-0.87)	-0.332 (-1.68)*
Redeemable	-0.159 (-0.58)	-0.156 (-0.59)	-0.043 (-0.18)	-0.082 (-0.36)	0.138 (0.53)
Unsecured	0.010 (0.07)	-0.376 (-2.63)***	-0.152 (-1.04)	-0.327 (-2.24)**	-0.369 (-2.49)**
Guaranteed	0.107 (0.51)	-0.307 (-1.46)	-0.084 (-0.43)	-0.192 (-0.98)	0.076 (0.38)
Year & Industry controls	Yes	Yes	Yes	Yes	Yes
NObs	607	607	607	607	607
Pseudo R-squared	0.1076	0.0754	0.1169	0.0962	0.1029
p-value (Wald $\chi 2$)	0.0000	0.0000	0.0000	0.0000	0.0000

This table reports results of probit regressions of (most reputable) lead underwriter choice on firm and issue-specific characteristics for the sample of U.S. high-yield bonds issued between 2000 and 2008 (first-stage regressions). Underwriter reputation (i.e., Top 3 status or Top 4 - Top 10 status) is defined via the ranking in different league tables (available from Bloomberg). All variables are defined in Table 2. Standard and Poor's issue-specific credit rating classes are used. A constant term (not reported) is included in all regressions; z-statistics based on issuer-clustered standard errors are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**), and 0.10(*) level.

Table 6: Short-term Bond Performance and Lead Underwriter Reputation

Dependent variable	Downgrade first 6 months	Downgrade first 6 months	Downgrade first 6 months	Downgrade first 15 months	Downgrade first 24 months	Downgrade first 24 months	Downgrade first 24 months
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Marginal effect (dy/dx) Top 3	**0.032**	**0.031**		**0.072**	**0.150**	**0.148**	
Top 3	0.427	0.420		0.259	0.426	0.420	
	(2.00)**	(1.93)*		(1.93)*	(3.34)***	(3.26)***	
Mills Top3		-0.148		0.119		-0.067	
		(-0.39)		(0.35)		(-0.20)	
Market share annual			0.048				0.027
			(2.80)***				(2.13)**
Number underwriters	0.018	0.012	-0.012	0.038	0.044	0.042	0.040
	(0.19)	(0.12)	(-0.14)	(0.66)	(0.86)	(0.81)	(0.75)
NYSE/AMEX	-0.319	-0.343	-0.354	-0.193	-0.222	-0.233	-0.231
	(-1.28)	(-1.36)	(-1.42)	(-1.14)	(-1.41)	(-1.39)	(-1.48)
Rating	0.124	0.124	0.114	0.111	0.084	0.084	0.070
	(2.13)**	(2.17)**	(1.80)*	(2.40)**	(1.61)	(1.61)	(1.34)
Split rating	0.467	0.457	0.488	0.212	0.277	0.273	0.279
	(2.45)**	(2.42)**	(2.56)**	(1.58)	(2.16)**	(2.11)**	(2.19)**
LBO -5+5	0.328	0.315	0.310	0.131	0.267	0.261	0.275
	(1.52)	(1.49)	(1.47)	(0.75)	(1.58)	(1.50)	(1.61)
Maturity	-1.828	-1.846	-1.844	-0.647	-0.800	-0.808	-0.746
	(-3.49)***	(-3.46)***	(-3.64)***	(-1.56)	(-1.89)*	(-1.90)*	(-1.73)*
Subordinated	-0.088	-0.077	-0.111	-0.068	-0.171	-0.167	-0.208
	(-0.33)	(-0.29)	(-0.41)	(-0.41)	(-1.02)	(-0.99)	(-1.24)
Callable	0.668	0.684	0.677	0.462	0.282	0.289	0.250
	(2.07)**	(2.11)**	(2.06)**	(2.11)**	(1.24)	(1.27)	(1.08)
First-time issuer	-0.367	-0.339	-0.320	-0.018	0.018	0.033	0.017
	(-1.32)	(-1.17)	(-1.17)	(-0.10)	(0.12)	(0.20)	(0.11)
Rule 144A	-0.132	-0.137	-0.181	-0.174	-0.048	-0.050	-0.064
	(-0.58)	(-0.60)	(-0.75)	(-1.11)	(-0.33)	(-0.34)	(-0.44)
Zero or step-up	-0.029	-0.041	-0.012	0.749	0.424	0.421	0.431
	(-0.08)	(-0.11)	(-0.03)	(2.39)**	(1.31)	(1.30)	(1.35)
Clawback	0.047	0.040	0.072	-0.106	-0.214	-0.216	-0.234
	(0.20)	(0.17)	(0.31)	(-0.64)	(-1.31)	(-1.31)	(-1.42)
Yr. & Ind. Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NObs	605	605	605	607	607	607	607
Pseudo R-squared	0.1778	0.1781	0.1819	0.0865	0.1008	0.1008	0.0908
p-value (Wald $\chi 2$)	0.0000	0.0000	0.0000	0.0009	0.0014	0.0020	0.0039
p-value Wald test of indep. equat. from Heckprob	0.8557	-	-	-	0.0973	-	-

This table reports results of probit regressions of measures of short-term bond performance (i.e., downgrade within 6, 15, and 24 months of bond issue) on firm and issue-specific characteristics for the sample of U.S. high-yield bonds issued between 2000 and 2008. All variables are defined in Table 2. A constant term (not reported) is included in all regressions. Differences in the number of observations are due to exclusion of explanatory variables in instances in which these variables cause separation (see Zorn 2005). The Wald test of independent equations refers to the results of Heckprob regressions of the respective regression equations and selection equation shown in specification (1) in Table 5; z-statistics (in parentheses) are based on issuer-clustered standard errors. Asterisks denote statistical significance at the 0.01(***), 0.05(**), and 0.10(*) level. Marginal effects (dy/dx) are calculated with all other variables at their means.

Table 7: Medium- to Long-term Bond Performance and Lead Underwriter Reputation

Dependent variable	1. rating action downgrade 3 yrs	1. rating action downgrade 3 yrs	1. rating action downgrade 3 yrs	1. rating action downgrade	Default	Default	Default
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Marginal effect (dy/dx) Top 3	**0.185**	**0.177**		**0.155**	**0.022**	**0.017**	
Top 3	0.477	0.455		0.392	0.821	0.651	
	(3.72)***	(3.51)***		(2.95)***	(3.43)***	(2.52)**	
Mills Top3		-0.300		0.283		-0.200	
		(-1.01)		(1.06)		(-0.33)	
Market share annual			0.031				0.044
			(2.35)**				(2.27)**
Number underwriters	0.002	-0.006	-0.003	0.053	-0.163	-0.159	-0.155
	(0.04)	(-0.12)	(-0.07)	(0.98)	(-2.20)**	(-1.93)*	(-1.94)*
NYSE/AMEX	-0.511	-0.563	-0.515	-0.643	-0.889	-0.815	-0.837
	(-3.25)***	(-3.45)***	(-3.31)***	(-4.09)***	(-3.32)***	(-2.71)***	(-3.08)***
Rating	0.114	0.115	0.100	0.145	-0.135	-0.153	-0.158
	(2.17)**	(2.20)**	(1.88)*	(2.86)***	(-2.42)**	(-2.48)**	(-2.92)***
Split rating	0.376	0.363	0.379	0.253	0.023	-0.107	0.074
	(2.98)***	(2.85)***	(3.01)***	(2.03)**	(0.11)	(-0.47)	(0.35)
LBO -5+5	0.539	0.510	0.534	0.420	0.093	-0.084	0.138
	(2.92)***	(2.73)***	(2.85)***	(2.36)**	(0.42)	(-0.37)	(0.64)
Maturity	-0.632	-0.666	-0.572	-1.082	0.141	0.361	0.119
	(-1.53)	(-1.60)	(-1.37)	(-2.59)***	(0.20)	(0.46)	(0.17)
Subordinated	-0.001	0.007	-0.047	0.100	-0.457	-0.460	-0.476
	(-0.06)	(0.04)	(-0.30)	(0.66)	(-1.70)*	(-1.68)*	(-1.77)*
Callable	0.135	0.166	0.103	0.312	-0.518	-0.548	-0.515
	(0.61)	(0.76)	(0.46)	(1.29)	(-1.68)*	(-1.76)*	(-1.62)
First-time issuer	-0.068	-0.004	-0.069	-0.088	0.091	0.096	0.095
	(-0.46)	(-0.02)	(-0.47)	(-0.57)	(0.36)	(0.33)	(0.38)
Rule 144A	-0.028	-0.035	-0.039	-0.021	-0.827	-0.853	-0.811
	(-0.20)	(-0.25)	(-0.28)	(-0.15)	(-3.56)***	(-3.62)***	(-3.46)***
Zero or step-up	0.115	0.102	0.133	0.454	0.407	0.304	0.414
	(0.31)	(0.27)	(0.36)	(1.23)	(1.03)	(0.72)	(1.16)
Clawback	-0.123	-0.133	-0.146	-0.179	-0.127	0.048	-0.166
	(-0.75)	(-0.81)	(-0.89)	(-1.07)	(-0.45)	(0.16)	(-0.59)
1. rating action downgrade 3 yrs						1.081	
						(4.38)***	
Yr. & Ind. Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NObs	607	605	607	607	605	605	605
Pseudo R-squared	0.1281	0.1294	0.1165	0.1416	0.2426	0.3188	0.2089
p-value (Wald $\chi 2$)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
p-value Wald test of indep. equat. from Heckprob	0.5135	-	-	-	0.6360	-	-

This table reports results of probit regressions of measures for medium- to long-term bond performance (i.e., whether a bond's first rating action is a downgrade in the first three years of bond issue or generally over the bond's lifetime (medium-term) and default (long-term)) on firm and issue-specific characteristics for the sample of U.S. high-yield bonds issued between 2000 and 2008. All variables are defined in Table 2. A constant term (not reported) is included in all regressions. Differences in the number of observations are due to exclusion of explanatory variables in instances in which these variables cause separation (see Zorn 2005). The Wald test of independent equations refers to the results of Heckprob regressions of the respective regression equations and selection equation shown in specification (1) in Table 5; z-statistics (in parentheses) are based on issuer-clustered standard errors. Asterisks denote statistical significance at the 0.01(***), 0.05(**), and 0.10(*) level. Marginal effects (dy/dx) are calculated with all other variables at their means.

Table 8: Downgrade-to-Upgrade Ratios and Lead Underwriter Reputation

Dependent variable	Downgrades-to-upgrades 3 yrs	Downgrades-to-upgrades 3 yrs	Downgrades-to-upgrades 3 yrs	Downgrades-to-upgrades 3 yrs	Downgrades-to-upgrades 3 yrs	Downgrades-to-upgrades 3 yrs	Downgrades-to-upgrades
	(1)	(2)	(3)	(4)	(5)	(6) NYSE/AMEX only	(7)
Top 3	0.378		0.398	0.429		0.213	0.498
	(2.62)***		(2.64)***	(2.55)**		(0.89)	(1.72)*
Mills Top3			0.262	0.268		0.229	0.298
			(0.78)	(0.73)		(0.49)	(0.42)
Top 4 - Top 10					-0.445		
					(-3.03)***		
Mills Top 4 - Top 10					-0.842		
					(-1.40)		
Market share annual		0.018					
		(1.37)					
Number underwriters	0.009	0.010	0.016	-0.004	0.010	-0.064	-0.017
	(0.14)	(0.17)	(0.27)	(-0.06)	(0.17)	(-0.74)	(-0.16)
NYSE/AMEX	-0.867	-0.865	-0.824	-0.842	-0.836		-1.732
	(-5.62)***	(-5.42)***	(-5.14)***	(-4.83)***	(-5.40)***		(-5.48)***
Rating	0.142	0.133	0.143	0.132	0.102	0.154	0.396
	(2.72)***	(2.51)**	(2.73)***	(2.23)**	(1.93)*	(1.98)**	(4.00)***
Split rating	0.378	0.380	0.391	0.413	0.372	0.431	0.168
	(3.04)***	(3.03)***	(3.18)***	(2.91)***	(2.91)***	(2.24)**	(0.61)
LBO -5+5	0.350	0.366	0.377	0.486	0.652	0.653	0.711
	(1.53)	(1.52)	(1.65)	(1.79)*	(2.51)**	(2.04)**	(2.04)**
Maturity	-0.785	-0.730	-0.759	-0.765	-0.754	-0.681	-0.959
	(-1.53)	(-1.38)	(-1.49)	(-1.33)	(-1.45)	(-0.93)	(-1.02)
Subordinated	0.038	0.011	0.024	-0.021	-0.118	0.206	0.638
	(0.27)	(0.07)	(0.17)	(-0.14)	(-0.58)	(1.03)	(2.16)**
Callable	0.027	0.002	0.004	0.021	0.152	0.335	-0.022
	(0.11)	(0.01)	(0.02)	(0.08)	(0.62)	(0.96)	(-0.05)
First-time issuer	0.006	-0.005	-0.054	0.141	-0.022	0.187	-0.220
	(0.04)	(-0.04)	(-0.34)	(0.72)	(-0.14)	(0.62)	(-0.62)
Rule 144A	-0.039	-0.045	-0.033	-0.086	0.019	-0.286	-0.485
	(-0.24)	(-0.27)	(-0.20)	(-0.49)	(0.11)	(-1.20)	(-1.43)
Zero or step-up	0.481	0.505	0.494	0.242	0.707	-2.725	0.249
	(1.41)	(1.43)	(1.47)	(0.71)	(2.12)**	(-4.12)***	(0.70)
Clawback	0.156	0.125	0.163	0.156	0.182	-0.242	0.620
	(0.92)	(0.72)	(0.96)	(0.84)	(1.08)	(-0.93)	(1.86)*
Total assets				0.045			
				(0.83)			
Leverage				0.217			
				(0.84)			
EBITDA margin				0.015			
				(1.40)			
Yr. & Ind. Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NObs	607	607	607	513	607	274	351
R-squared	0.2046	0.1933	0.2059	0.2187	0.1573	0.1792	0.2608
p-value (F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

This table reports results of OLS (specifications 1 and 2) and two-stage Heckman regressions of the downgrade-to-upgrade ratio (defined as the number of downgrades minus the number of upgrades within the first three years of a bond's maturity and overall lifetime (specification 7)) on firm and issue-specific characteristics for the sample of U.S. high-yield bonds issued between 2000 and 2008. All variables are defined in Table 2. Specification (6) uses only data for bond issuers listed on NYSE or AMEX to highlight the effect of reputational exposure (see Rhee and Valdez 2009, Golubov et al. 2012). Specification (7) includes only bonds issued between 2000 and 2003 (i.e., all bonds have a rating history of at least seven years). A constant term (not reported) is included in all regressions; t-statistics (in parentheses) are based on issuer-clustered standard errors. Asterisks denote statistical significance at the 0.01(***), 0.05(**), and 0.10(*) level.

Table 9: Firms' Borrowing Costs and Lead Underwriter Reputation

	(1)	(2)	(3)	(4)	(5) NYSE/AMEX only	(6)
Top 3		13.82	12.74		1.58	
		(1.17)	(1.05)		(0.08)	
Mills Top 3		72.50	93.18		53.89	
		(2.76)***	(3.97)***		(1.63)	
Market share annual	-0.65					
	(-0.56)					
Top 3 annual				6.38		
				(0.56)		
Mills Top 3 annual				66.01		
				(2.08)**		
Top 4 - Top 10						-27.47
						(-2.48)**
Mills Top 4 - Top 10						-77.41
						(-1.25)
Number underwriters	-19.53	-18.38	-17.61	-18.51	-19.89	-19.81
	(-4.45)***	(-4.31)***	(-3.93)***	(-4.35)***	(-2.86)***	(-4.75)***
NYSE/AMEX	-39.21	-28.91	-20.99	-30.19		-33.68
	(-2.57)**	(-1.88)*	(-1.43)	(-1.85)*		(-2.06)**
Rating	-43.14	-43.02	-44.88	-42.30	-41.72	-44.56
	(-8.21)***	(-8.32)***	(-8.26)***	(-8.21)***	(-5.68)***	(-7.91)***
Split rating	21.95	25.43	23.22	25.01	27.95	23.77
	(1.83)*	(2.07)**	(1.95)*	(2.03)**	(1.58)	(1.95)*
LBO -7	17.59	28.41	43.85	15.42	-17.39	24.17
	(1.04)	(1.59)	(2.47)**	(0.88)	(-0.50)	(1.33)
Maturity	-100.18	-96.63	-100.33	-94.63	-30.76	-101.04
	(-2.08)**	(-2.04)**	(-1.97)**	(-1.99)**	(-0.49)	(-2.16)**
Subordinated	-61.37	-65.40	-68.10	-58.66	-54.29	-78.17
	(-4.18)***	(-4.54)***	(-4.94)***	(-3.87)***	(-2.36)**	(-3.88)***
Callable	29.61	24.95	11.89	24.50	17.34	30.07
	(1.24)	(1.06)	(0.55)	(1.04)	(0.65)	(1.30)
First-time issuer	38.05	23.98	25.94	24.96	31.32	32.24
	(2.83)***	(1.56)	(1.60)	(1.58)	(1.23)	(2.13)**
Rule 144A	19.40	19.45	10.83	22.56	23.81	19.39
	(1.35)	(1.36)	(0.79)	(1.53)	(1.29)	(1.34)
Zero or step-up	166.54	167.18	176.90	168.75	174.30	166.31
	(5.52)***	(5.52)***	(5.63)***	(5.58)***	(2.85)***	(5.55)***
Clawback	4.86	9.08	11.66	7.17	-8.47	11.63
	(0.30)	(0.57)	(0.79)	(0.45)	(-0.40)	(0.72)
Treasury spread	-0.26	-1.52	0.53	-1.93	11.26	1.07
	(-0.03)	(-0.19)	(0.07)	(-0.24)	(1.03)	(0.13)
HY index	0.59	0.64	0.65	0.62	0.69	0.65
	(8.29)***	(8.46)***	(9.32)***	(8.34)***	(7.05)***	(6.76)***
Total assets			-2.23			
			(-0.52)			
Leverage			62.87			
			(2.80)***			
EBITDA margin			0.32			
			(0.33)			
Yr. & Ind. Controls	Yes	Yes	Yes	Yes	Yes	Yes
NObs	607	607	513	607	274	607
R-squared	0.5624	0.5686	0.6084	0.5663	0.5079	0.5683

This table reports regression results of the (at-issue) benchmark spread on several firm and issue-specific characteristics for the sample of U.S. high-yield bonds issued between 2000 and 2008. The estimation method is the two-step Heckman selection model (second-stage regression), except for specification (1), which is estimated using OLS (for purposes of comparison). Specification (6) uses only data for bond issuers listed on NYSE or AMEX to highlight the effect of reputational exposure. First-step regression of the Heckman model is based on regression specifications as shown in Table 5. All variables are defined in Table 2. All regressions include a constant term (not reported); t-statistics (in parentheses) are based on issuer-clustered standard errors. Asterisks denote statistical significance at the 0.01(***), 0.05(**), and 0.10(*) level.