Deregulation, Underwriter Reputation and Poor Certification in the US High Yield Corporate Bond Market

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ABSTRACT

With the enactment of the Gramm-Leach-Bliley Act (GLBA) in 1999, the long-standing barriers between commercial and investment banking activities were formally removed. In chapter 1, I show that the increased competition, drastic reduction in underwriting fees and the increased issue complexity associated with the rapid entry of large commercial banks in securities underwriting lowered the screening incentives of top tier underwriters and led to deviations from the "underwriter certification hypothesis" (namely, that high-reputation underwriters should be associated with higher quality certification). Using data from the high-yield corporate bond market, I identify three patterns which are difficult to jointly reconcile within the standard reputation literature. First, evidence of increased credit rating variability reveals a structural change in the certification standards of prestigious underwriters after GLBA. This finding suggests that reputation concerns, a key source of discipline, did not prevent underwriters from lowering their screening standards. Second, the high yield bond market is dominated by high reputation underwriters. Hence, to account for such a behavior in a market dominated by prestigious institutions, a coordination device for poor certification would be necessary. Third, after accounting for issuer-underwriter matching, top tier underwriters still achieve lower at-issue yields post GLBA. Following poor certification, I show that market punishment through higher yields is confined to low reputation institutions. My findings suggest limitations of the reputation based disciplining mechanism. To account for these patterns, I adopt the model of Ordonez (2013) to incorporate insights from the global game literature into the reputation mechanism to demonstrate that reputation equilibriums are fragile and can lead to a clustering of poor screening among high- and intermediate-reputation underwriters. Finally, my model suggests that the lack of a credible market based punishment mechanism may indicate sticky priors about the reputation of prestigious underwriters.

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1. Introduction

The introduction of the Gramm-Leach-Bliley Act (GLBA) in September, 1999 abolished the Glass Steagall Act and allowed commercial banks to participate without restrictions in investment banking and hence underwriting activities.[1] Studies suggest that the increased deregulation of financial markets led to intensified competition among financial institutions and to a drastic reduction in underwriting fees (Gande et al. (1999)). The repeal of the Act also meant that the same activity of investment banking could now be pursued under two structures (Acharya (2010)) – one with government guarantees (commercial banks) and one without (non-deposit taking institutions). Moreover, prior work shows that commercial bank entry not only eased capital market access for smaller and riskier issuers but also led to the proliferation of co-led syndicate structures which lowered screening incentives due to a free-rider problem among lead underwriters (Tirole (1996), Shivdasani et al. (2010)). In light of these GLBA-driven events, observers have questioned whether deregulation led to weaker underwriting standards and screening incentives.

In this regard, highly publicized corporate scandals and abusive practices involving many prominent financial institutions continue to feed the debate about whether it was prudent to repeal the Glass-Steagall Act.[2] More recently, the collapse of the securitization market, a market dominated by top tier underwriters, has further added to this debate calling into question both traditional theory (e.g., Booth et al. (1986), Allen (1984)) and empirical results that support the underwriter certification hypothesis for the corporate bond market (Livingston et al. (2000), Fang (2005)). The existing literature is relatively silent, however, on how this regulatory change affected the incentives of underwriters. In this paper, I therefore investigate the effect of GLBA on the incentives of prestigious underwriters to certify the quality of new bond issues.

[1] Prior to GLBA, the Federal Reserve Board allowed commercial banks to engage in limited underwriting of debt securities. In 1987, banks' underwriting powers were allowed up to 5% of the revenues of their Section 20 subsidiaries (a non-bank subsidiary of a bank holding company). In 1989, underwriting powers were expanded to include both debt and equity and the revenue limitation was raised to 10% which was further revised to 25% in 1996.

[2] Agrawal (2010) documents numerous stories in the news media that suggest that some investment banks failed in their certification roles during the late 1990s stock market bubble and provides media reports revealing that even reputable investment banks had underwritten a large number of low-quality IPOs. 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. Andres et al (2013) report that 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. The article stated, "that prestigious banks helped bankroll huge frauds that hurt millions of investors."

Given the problem of information asymmetry that typically exists between issuing firms and investors in security issues, the underwriter certification hypothesis predicts that given a larger compensation for higher reputation, high reputation underwriters should be associated with higher quality underwriting services compared to lower reputation firms because they put their higher reputation capital at stake. However, I argue that deregulation -through increased competition and issue complexity and significant reductions in underwriter compensation- substantially reduced the value of reputation and therefore increased the risk of moral hazard among top tier underwriters. Former Federal Reserve chairman, Ben Bernanke, highlighted the collapse of financial markets' discipline as a key element of the recent financial crises: "Market discipline has in some cases broken down and the incentives to follow prudent lending procedures have, at times, eroded".[3]

My work then attempts to answer the following key questions: Did deregulation cause a break-down of self-discipline (imposed by reputation concerns) and lower the certification standards of prestigious underwriters? In other words, did the enactment of GLBA lead to a deviation from the underwriter certification hypothesis? If so, does the market continue to assign value to underwriter reputation through at-issue yields? While theoretically the role of underwriter reputation is well established, the empirical evidence is less unified. To the best of my knowledge, there is no study that explicitly accounts for the effect of deregulation on the relations between underwriter reputation, security credit performance and pricing. In this paper, I contribute to the literature by studying these relations before and after GLBA.

To determine whether high reputation underwriters are necessarily associated with the highest-quality underwriting standards, I study certification in the US corporate bond market between 1993 and 2008.[4] Specifically, I focus on the high yield corporate bond segment which represents an ideal testing ground for various reasons to be discussed extensively in the next section. My measure of the quality of screening by underwriters is based on the frequency of credit rating adjustments that occur following a bond issue.[5] Using subsequent credit rating upgrades and downgrades as proxies for the quality of underwriter due-diligence, it follows that high quality and hence costly due-diligence should provide more accurate information about an issue and therefore lead to lower credit rating variability in the short- and long-run. The certification hypothesis then implies that bonds underwritten by prestigious underwriters should exhibit a lower likelihood of subsequent

[3] Statement, Board of Governors, December18th, 2007.

[4] Related literature includes Fang (2005), Shivdasani et al. (2010), Gopalan et al. (2011) and Andres et al (2013).

[5] Peristiani (2007) and Gopalan et al (2011) use issuer bankruptcies as measures of quality of underwriting services in the corporate bond and syndicated loan market, respectively. Shivdasani et al (2010) measure quality of screening by underwriters based on fraud lawsuit filings and earnings restatements that occur following a bond issue.

credit rating adjustments relative to low reputation firms both in the short- and long-run. Finally, I use offer yields to study the cross-sectional relationship between reputation and security pricing and determine whether any deviations from the certification hypothesis are accounted for by the market.

Following recent work in the area (Puri (1996), Gande et al. (1999), Fang (2005)), my empirical model takes into account the endogenous nature of the matching between issuers and underwriters.[6] Failing to control for this endogeneity can confound underwriter reputation effects with clientele effects and thus lead to incorrect conclusions. After accounting for issuer-underwriter matching, I test the validity of the underwriter certification hypothesis before and after deregulation. I find that the enactment of GLBA in the late 1990s introduced a structural break in the relationship between quality of certification and underwriter reputation and therefore meant a deviation from the underwriter certification hypothesis in the US high yield corporate bond market. Specifically, for the period prior to deregulation and consistent with the certification hypothesis, I find that bonds sponsored by prestigious underwriters are less likely to be downgraded both in the short and long-run and more likely to be upgraded in the long-run relative to lower reputation institutions. For the period post deregulation, however, I find that bonds sponsored by prestigious underwriters are more likely to be downgraded both in the short and long-run. I find no statistically significant relationship between underwriter reputation and upgrades. Hence, my results corroborate not only earlier studies that support the certification hypothesis prior to GLBA but also add to the recent literature -mainly focused on the IPO market- that reports lower screening standards among dominant underwriters post GLBA.

In light of these findings, I quantify the effects of deregulation and provide probability estimates of bond credit rating changes in the short- and long-run based on an underwriter reputation cohort. For the period prior to deregulation, I estimate the probability of a bond being downgraded within 12, 18, 24 or 36 months from its issue date to be 4.9%, 5.8%, 7.7% and 7.8%, respectively, lower for bonds underwritten by a top-tier underwriter. In contrast, for the period post deregulation, the probability of a bond being downgraded within 12, 18, 24 or 36 months from its issue date is 4.7%, 6.8%, 6.7% and 6.4%, respectively, higher for bonds underwritten by a prestigious underwriter. These results suggest a negative and non-negligible effect of deregulation on the incentives of prestigious underwriters to certify quality. Evidence from upgrades is less conclusive and I discuss it in later sections.

My results then point to a more elusive, but important, impact of commercial bank entry. By reducing rents from maintaining reputation and contributing to the proliferation of underwriting

[6] See also, Ross (2010), Golubov (2011), Andres et al. (2013).

syndicates, increased competition from bank entry may have resulted in lower screening standards among both investment and commercial banks. Indeed, Peristiani (2007) and Shivdasani et al. (2010) find no evidence that commercial banks themselves were less diligent underwriters. In contrast, my results suggest that competition was particularly fierce in the high reputation cohort and hence significantly lowered screening incentives for both reputable commercial and investment bank underwriters.

Given the evidence of weaker certification standards among top tier institutions, I study the cross-sectional and time-series relation between reputation and at issue yields. First, I follow Fang (2005) and assume that the reputation based-disciplining mechanism is effective. My findings for the period before deregulation are in line with Fang (2005) who reports pricing improvements arising from top tier underwriters to be especially large for junk bonds where information asymmetries are expected to be greater. However, despite their weaker screening standards post GLBA, top tier underwriters continue to exhibit lower at issue yields. In light of this finding, I deviate from the standard empirical literature on financial intermediary reputation and do not assume that the reputation based disciplining mechanism is effective but instead I test whether loss of reputation has consequences (Gopalan et al (2011)). I use shocks to a lead underwriter reputation, namely, the post-issue credit rating variability of its sponsored securities -my proxy for poor due-diligence- to study the effect of such shocks on a lead underwriter's subsequent offer yields. Strikingly, market punishment through higher at-issue yields following increased credit rating variability is essentially confined to low reputation underwriters. This evidence supports recent findings by Gopalan et al. (2011) for the syndicated loan market and could be due to the exercise of market power by large and thus high reputation underwriters who account for roughly 70% of the US corporate bond market.[7] My proposed theoretical framework offers a plausible explanation and suggests that the lack of punishment through higher at issue yields may be indicative of investors having strong priors about the reputation of top tier underwriters. In other words, reputation updating is weaker when priors are stronger. Moreover, the fact that coefficients on variables tracking underwriter reputation are statistically significant adds to the widely accepted view that credit ratings are not sufficient statistics in yield determination.

The traditional underwriter certification hypothesis cannot simultaneously explain the main empirical patterns described above. First, evidence of increased credit rating variability reveals a structural change in the certification standards of prestigious underwriters after GLBA. This finding suggests that reputation concerns, a key source of discipline, did not prevent underwriters

[7] The market power hypothesis as in Chemmanur et al. (2012) postulates that high reputation underwriters are able to attract a greater number of market participants (institutional investors, analysts, co-managing underwriters) thereby yielding higher security valuations by increasing the heterogeneity in investors' beliefs.

from lowering their screening standards. Second, to account for this behavior in a market dominated by high reputation underwriters, a coordination device for poor certification would be necessary. Third, cross sectional and time series analyses indicate that top tier underwriters still achieve lower at-issue yields post GLBA. To account for these patterns, I propose a richer theoretical framework based on Ordonez (2013) that mixes two strands of literature -reputation and global games-.

Unlike the standard reputation literature, which is focused on reputation incentives for a single agent living in a state-invariant environment, my model explicitly incorporates a cross-section of underwriters in an environment that evolves stochastically. Based on this setup, the value of underwriters' reputation is fragile and their temptation to perform sloppy due-diligence depends on i) the state of a stochastic aggregate fundamental which in my setup is represented by the level of competition in the market for underwriting services and the degree of issue complexity; and ii) the beliefs of investors about the certification standards of underwriters within a given reputation cohort that they infer from aggregate credit rating variability. This more realistic environment allows me to study the interplay between underwriters' reputation incentives and economic conditions when determining the aggregate behavior of a given reputation cohort.

When such a fundamental is assumed to be observable, the model delivers multiple equilibria based on underwriters' beliefs about similar underwriters' behavior. At one extreme, if an underwriter believes no other underwriter is lowering its certification standards, then it does the same. Underwriters know that in this case the aggregate credit rating variability associated with their reputation cohort will be low, investors will believe no underwriter performs poor screening, and underwriters' continuation will be attributed at least partially to their good behavior, hence improving their reputation. At the other extreme, if an underwriter believes all other underwriters in its reputation cohort carry out poor screening, then it also does the same. In this case, underwriters know the aggregate credit rating variability for their reputation cohort will be high, that investors will believe underwriters carry out poor due-diligence, and their continuation will be attributed to good luck not improving their reputation. Reputation concerns then reduce the risk of poor screening in the first equilibrium but not in the second.

To obtain a unique equilibrium, which is robust to small perturbations of information, I use techniques from the global games literature. I assume that before deciding whether to carry out high or low quality due-diligence, underwriters do not observe the fundamental but just an independent noisy signal. Uniqueness is then characterized by a cutoff in signals about fundamentals, for each reputation cohort, around which underwriters change their decision to perform poor due-diligence. Fundamentals then not only affect the temptation but also become a coordination device for poor due-diligence. This equilibrium selection generates one of two sources of reputation fragility and clustering of behavior. If signals about fundamentals are precise, small changes of fundamentals around the cut-off produce a clustering of behavior among underwriters with the same reputation. The second source of fragility is associated with intermediate and high reputation underwriters having similar cut-offs for different reasons explained in section 3, hence clustering their behavior.

Finally, my empirical work highlights the potential for richer dynamics operating between large lead underwriters and credit rating agencies for the period post enactment of GLBA and before the recent crisis. The increase in rating variability coming from downgrades but not upgrades suggests the possibility that initial ratings on bonds sponsored by top tier underwriters were upward biased during this period. This could be the result of rating agencies failing to properly incorporate the change in screening incentives of high reputation underwriters.[8] Other explanations are discussed in section 5.

The rest of the paper is organized as follows. Section 2 reviews the literature and presents the hypothesis. Section 3 introduces my theoretical framework. Section 4 discusses the data. Section 5 presents the empirical models to test ex-post bond performance and discusses the main empirical findings. Section 6 analyzes the effect of GLBA on at issue yields. Section 7 concludes.

2. Related Literature and Hypothesis

2.1 Theory – Mainstream Hypothesis and the Alternative.

In capital markets, underwriters –investment banks and more recently commercial banks- play the important role of bridging firms that need capital with investors that seek investment opportunities. Intermediation services are valuable first because the banks' specialization in the sales and marketing of securities helps lower the issuers' transactional costs of borrowing. More importantly, banks can provide value through their role in lowering the issuers' informational cost of capital (Diamond (1984)). This role arises from the information asymmetry that typically exists between insiders (issuing firms) and outsiders (investors) in security issues. Banks, standing between the

[8]As noted in Ordonez (2013), because of learning, priors about a firm reputation are harder to change when reputation is either too high or too low. Gopalan et al. (2011), using data on syndicated loans, show that borrower bankruptcies seem to have little impact on lead arrangers who have very dominant or very poor market positions, where market positions are positively correlated with reputation.

insiders and the outsiders, are in the perfect position to reduce information asymmetry and lower the cost of capital that issuers would otherwise have to pay.[9]

But, how does a financial intermediary solve its own information problem with the investor? According to traditional literature, one solution is the reputation capital at stake for the bank. A key difference between underwriters and ordinary issuers is that underwriters are repeated players in the financial markets, and therefore their survival and future income is directly tied to their reputation. Dishonesty may increase short-term profit but such profit will be earned at the cost of losing reputation and future income. As long as the present value of future income exceeds the short-term profit from fraud, investment banks will find defrauding investors suboptimal. 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. Since bad security performance damages the reputation of the underwriter, banks with prominent reputations will select underwriting assignments cautiously. To the extent that these banks are better able to assess issue quality, they will underwrite high quality issues that pose little risk to their reputation. In equilibrium, knowing the investment banks' reputation concerns, investors can infer a positive signal from a reputable underwriter's agreement to underwrite, and ceteris paribus, the market clears at a better price for the issuer. To sustain this equilibrium, banks with good reputations need to be able to charge premium fees, which serve both as compensation for their investment in reputation and as an incentive for the continued provision of high-quality intermediation services. This is the so called underwriter certification hypothesis which serves as the mainstream hypothesis in my empirical work.[10]

The standard theoretical literature –in the banking industry in particular and the products market in general- then suggests that reputation should positively correlate with both the price (gross spread) and quality (security pricing and credit performance) of underwriting services. Specifically, Chemmanur et al. (1994) model reputation acquisition of investment banks and show that reputation is established by adopting stringent evaluation standards. They show that in equilibrium, reputable institutions underwrite less risky issues, obtain higher prices for the issuers, and receive higher compensation. Booth et al. (1986) model underwriter reputation as a mechanism that solves the information problem between the intermediary and the investor. Both papers suggest a positive relation between underwriter reputation, security prices and credit quality.

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[9] Such an information asymmetry, as Akerlof demonstrated in his classic 1970 paper, at best causes investors to discount the securities, and at worst can threaten the existence of the market.

[10] See Klein et al. (1981), Kreps et al. (1982), Rogerson (1983), Diamond (1989a), Diamond (1991), Gorton et al. (1995).

On the relation between reputation and product price (underwriter compensation), the classic works of Shapiro (1983) and Allen (1984) demonstrate that when quality is unobservable, a premium price arises as a means of quality assurance because such a price ensures that the present value of future income is greater than the short-term profit from cutting quality and selling low quality goods at high quality prices. These theories on product prices are applicable to the underwriting market because this market satisfies the key assumption that quality is ex ante unobservable. The theories imply that a fee premium is needed to induce honest information production because it makes the alternative -defrauding the investors and taking the short-term profit- suboptimal.

A recent strand of literature (Ordonez (2013)), however, provides an alternative view to the role of reputation as a mechanism for self-discipline. Unlike the standard reputation literature, which is focused on reputation incentives for a single agent living in a state-invariant environment, his model explicitly incorporates a cross-section of firms in an environment that evolves stochastically. In particular, the model assumes that firms' temptation to take risk varies monotonically with a stochastic aggregate fundamental. Given this more realistic environment, I adapt Ordonez model to characterize the interplay between underwriters' reputation incentives and economic conditions when determining the aggregate screening behavior of a given reputation cohort. This theoretical framework serves as the alternative hypothesis in my empirical work. In the next section, I describe the model in full.

2.2 Empirical Literature on Underwriter Reputation

Empirical studies of the relation between underwriter reputation and issue quality (security pricing) have focused mostly on equity initial public offerings. Evidence in favor of the certification hypothesis in the U.S. corporate bond market is mostly found in studies focusing on the years prior to the introduction of the GLBA in 1999 (see Livingston et al. (2000), Fang (2005)). Using underwriter market share as a proxy for reputation, Fang (2005) shows that debt underwritten by more reputable underwriters carries lower yields and higher underwriting spreads, both features being indicative of better long term performance. In the case of initial public offerings (IPOs), supportive evidence is provided by Michaely et al. (1994) and Carter et al. (1998). Using underwriter tombstone position as a proxy for underwriter reputation, they report that IPOs underwritten by more reputable investment banks tend to have lower underpricing and better long-run performance. This evidence suggests that more reputable underwriters reduce information asymmetry by certifying issuer quality.

However, several studies such as, Gande et al. (1999), Yasuda (2005) and Shivdasani et al. (2010) argue that the increased deregulation of financial markets due to GLBA led to intensified competition among financial institutions and to a drastic reduction in underwriting fees. Yasuda (2005) shows that banks are more likely to win underwriting business if they have established prior lending relationships through their commercial branch and therefore concludes that preexisting commercial bank-issuer relationships intensified the competition in the underwriting market. Moreover, Acharya (2010) argues that the repeal of the Act meant that the same economic activity of investment banking could now be pursued under two structures – one with government guarantees (in the case of commercial banks) and one without (non-deposit taking institutions). Another paper, Sufi (2004) points out that the participation of commercial banks in underwriting activities coupled with their expertise in traditional lending increased the attractiveness of corporate debt among small firms, hence increasing the level of complexity in the high yield corporate bond market. These GLBA driven changes in the operating environment of underwriting entities may have contributed to simultaneously increase the cost of accurate certification of issuers and reduce the compensation for high quality certification, thus reducing the value of reputation and ultimately increasing the risk of moral hazard.

In this regard, recent empirical studies focusing on periods post GLBA provide evidence of the weaker underwriting standards among dominant underwriters for different US asset markets. Agrawal et al. (2009) find for the IPO market that the probability that a newly public firm has serious accounting problems is consistently and positively related to the reputation of its lead underwriter. They conclude underwriters' concerns about generating revenue appear to have overridden their reputational concerns. Chemmanur et al. (2012) find reputable underwriters to be associated with equity IPOs priced further from intrinsic values. Their work also suggests the potential for collusion between issuers and large, reputable underwriters that are able to attract, through their market power, a greater number of professional and retail investors. They find the underwriters' main role shifts from certifying quality to obtaining the highest possible valuation for a security. Gopalan et al. (2011) find striking results for the syndicated loan market that suggest key limitations of the reputation mechanism. Namely, large lead underwriters, those with dominant market shares, are virtually unaffected by large bankruptcies as they report no increases in the portion of loans they retain.

A related paper, Peristiani (2007), documents the effect of GLBA on the US corporate bond market between 1990 and 2003. Different from my paper, the author makes no distinction between reputation cohorts. Instead, the paper focuses on the effect of GLBA on the relative performance of corporate bonds underwritten by commercial and investment banks. The author finds no significant difference in the likelihood of default of bonds underwritten by either commercial or investment banks. Such findings suggest that effects of GLBA on screening incentives (if any) do not operate through type of institutions (commercial vs. investment bank) but may rather do so over reputation cohorts. Shivdasani et al. (2011) focus on the period 1996-2006 and find that increased competition from bank entry and the proliferation of underwriting syndicates lowered screening incentives for both commercial and investment bank underwriters resulting in weaker quality issues coming to market.

Despite the growing evidence of failure of the certification hypothesis across asset markets, to the best of my knowledge, there is no study that explores the validity of this hypothesis for the US corporate bond market before and after the introduction of GLBA. Surprisingly, studies for this asset market are scarce and dispersed. Methodologies differ and often focus on sub-periods, hence failing to directly account for the effect of deregulation. The main contribution of my paper is twofold. First, I provide an alternative theoretical framework where I show that the role of underwriter reputation as a mechanism for self-discipline is fragile and depends on the state of fundamentals. Second, I empirically study whether GLBA led to a structural break in the certification standards of dominant underwriters and hence to a deviation from the underwriter certification hypothesis.

3. Proposed Theoretical Framework

I adapt the model in Ordonez (2013) that combines the literatures on reputation and global games to characterize the behavior of financial institutions in the market for underwriting services. I show that reputation concerns create strategic complementarities across underwriters that operate through investors' beliefs and generate equilibrium multiplicity. Following the literature on global games, I exploit the role of imperfect information in selecting a unique equilibrium. Then, I use this equilibrium to show how concerns about reputation impose discipline and reduce moral hazard, and how this discipline is fragile and can break down due to changes in economic fundamentals. Finally, I show that when discipline collapses, it collapses for a range of reputation cohorts, namely, those of intermediate and high reputation underwriters, thus, clustering their behavior. A complete description of the model is provided in the Appendix.

3.1 Description. I assume a credit market composed of a continuum of long-lived, risk-neutral underwriters (with mass 1) and an infinite number of short-lived risk neutral investors (lenders). Each underwriter sponsors a unique issue per period. The issue can be safe (s) or risky (r). In my setup, a safe issue is one for which the underwriter carries out high quality (costly) due-diligence that translates into a lower likelihood of ex-post credit rating variability. Hence, the issue has a higher probability of success (no rating change) and of underwriter's continuation (c).

Assumption 1. Safe issues make continuation more likely $P(c|s) = p_s > P(c|r) = p_r$.

There are two types of underwriters. Strategic underwriters (S) can choose between safe and risky securities with probability of success p_s and p_r, respectively. Risky underwriters (R) only endeavor in risky issues. Underwriters know perfectly their own type but investors do not. An underwriter's reputation is then defined by ϕ=P(S), the probability that the underwriter is strategic.

If the underwriter does not continue, then current and future cash flows are zero. If the underwriter chooses a risky issue and continues, the issue delivers cash-flows $\Pi_r = 1/R(\phi) - K$, the monetary differential between the issue proceeds and the amount agreed with the issuer (gross spread). If the underwriter chooses a safe issue and continues, the issue delivers not only cash-flow $1/R(\phi) - K$ but also a cost to the underwriter of Θ, such that, $\Pi_s = 1/R(\phi) - K + \Theta$. The single-dimensional variable $\Theta \in$ R, call it fundamental, is common to all underwriters, is independently and identically distributed normal over time.

The fundamental Θ can be interpreted as the level of competition faced by underwriters which operates through the underwriter compensation and ultimately affects the gains from maintaining reputation through costly due-diligence. Another interpretation of the fundamental Θ is that an underwriter can increase the probability of success of an issue (from p_r to p_s) by performing extra activities that generate a cost that is purely determined by an aggregate variable Θ. If Θ <0, the extra activity requires a costly effort. Defining Θ as the complexity of financial instruments that underwriters can sponsor, it may be more appealing to underwrite safe issues by performing costly due-diligence when the issues the underwriters can sponsor are standard and transparent. Both interpretations of Θ fit the effects that the GLBA had on the incentives of underwriters to certify quality.

3.2 Timing. The order of events in each period t is the same in all periods t = {0, 1,.….T} and is given as follows:

- Underwriters and investors meet. Investors do not observe the underwriter's type, just its continuation, its last period reputation ϕ_{t-1} , and the last period aggregate rate of credit rating variability among all underwriters with the same reputation. Based on this information, each investor revises beliefs about the underwriter to ϕ_t . New underwriters start with exogenous ϕ_0 .

- Each underwriter sponsors an issue of size 1 with a discount rate that depends on its new reputation, $R(\phi_t)$.
- Underwriters observe the fundamental Θ_t.
- Strategic underwriters decide between sponsoring safe (s) or risky (r) issues. Low reputation underwriters only sponsor risky issues (r), those for which, they perform poor due-diligence.
- By the end of period t, issue performance is observed and underwriters either continue or not.

3.3 Reputation Updating. When updating a continuing underwriter's reputation from ϕ_t to ϕ_{t+1}, investors have a belief about how strategic underwriters behaved which they infer from the aggregate realized performance of securities of underwriters with the same reputation. Different from Ordonez (2013) that uses aggregate default for a given reputation cohort to infer firm behavior, I introduce a faster mechanism to pin down underwriting behavior and rely on aggregate ex-post credit rating performance. Reputation increases less when many similar underwriters die. This is why a high aggregate rate of credit rating variability is not good news for surviving underwriters, since continuation is not assigned due to high quality due-diligence but to luck.

3.4 Multiple equilibria with complete information. Given the monotonicity of payoffs on Θ, I focus on equilibria in cutoff strategies, in which an underwriter with reputation ϕ decides to sponsor issues with poor due-diligence if fundamentals are below a certain cutoff point, $K(\phi)$, and to choose safe issues if fundamentals are above that cutoff.

For a fundamental to be a cutoff in equilibrium, three equilibria has to coexist at exactly that cutoff. At the one extreme, if underwriters believe no other strategic underwriter will take risks and aggregate credit rating variability will be low, it is in the underwriters' best interest to sponsor safe issues. Underwriters know that in this case their continuation and success of their issues will be attributed at least partly to their good behavior, thereby improving their reputation. At the other extreme, if underwriters believe all other strategic underwriters perform poor due-diligence and aggregate credit rating variability will be high, it is in the underwriters' best interest to take risks. Under these beliefs, underwriters know that their continuation and their sponsored issues' good performance will be attributed solely to good luck, not improving their reputation at all. A third equilibrium is one in which strategic underwriters are indifferent between taking safe and risky actions. A continuum of fundamentals fulfills this condition.

As discussed in Morris et al. (2001), what creates this multiplicity is the assumption of complete information about fundamentals, which at the same time requires an implausible degree of coordination and prediction of other underwriters' behavior in equilibrium.

3.5 A unique equilibrium with incomplete information. I modify the assumption that information about fundamentals is complete and assume instead that underwriters observe a private noisy signal about the fundamental before deciding whether to carry out high or low quality due-diligence. This noise, when small, leads to the selection of a unique equilibrium. What creates the multiplicity is the strategic complementarity across underwriters, which works through investors beliefs. With complete information, each equilibrium is sustained by different fulfilling expectations about what other underwriters do, hence in equilibrium underwriters can perfectly forecast each other's actions and coordinate on multiple courses of action. With incomplete information, however, private signals serve as an anchor for underwriter's actions that avoid the indeterminacy of expectations about other underwriters' actions and hence avoid the indeterminacy of beliefs investors will use to update reputation. Given this incomplete information structure, when signals are precise enough, there exists a unique equilibrium in cutoff strategies for each reputation level ϕ.

Then, fundamentals not only affect screening incentives but also become a coordination device. If an underwriter observes a low signal, it believes the fundamental is low with high probability, which directly induces the underwriter to perform poor due-diligence. Additionally, the underwriter believes that other similar underwriters have observed a low signal and will lower their certification standards as well, which indirectly induces the underwriter to carry out poor due-diligence. This is why fundamentals through the generation of signals determine underwriters' expectations about other underwriters' strategic behavior and coordinate their actions.

3.6 Fragility of reputation concerns. I use the unique equilibrium to show how reputation concerns impose discipline and reduce the temptation for poor screening. Then, I show how this discipline is fragile and can suddenly break-down due to changes in economic fundamentals. Finally, when discipline collapses, it does for a range of underwriters with intermediate and good reputation and thus generates a clustering of poor certification within and across reputation cohorts.

In particular, the equilibrium selection leads to a clustering of poor screening among underwriters with the same reputation level. As shown in Figure 4, when fundamentals are strong enough (high Θ), small variations do not induce underwriters of different reputations to modify their behavior.

However, when fundamentals are weak enough (low Θ), small changes can induce underwriters of different reputation cohorts to perform poor screening.

What creates the convexification of cutoffs and therefore a clustering of reputation fragility across reputation cohorts is the fact that high and intermediate reputation underwriters have similar cutoffs for poor due-diligence for different reasons. Intermediate reputation underwriters have low incentives to perform poor screening not because their continuation value is high but because if they continue they gain a lot from reputation formation. High reputation underwriters have low incentives to loosen their certification standards not because they gain a lot from reputation formation but because their continuation value is high.

In what follows, given the predictions of the model, I study whether the effects of GLBA through increased competition and issue complexity had any meaningful impact on the incentives of large lead underwriters to certify issue quality. Consistent with my theoretical framework, I rely on issues' ex-post credit rating variability to infer quality of underwriter certification.

4. Data

4.1 Measures of quality of Underwriting Services and Underwriter Reputation

I measure quality of underwriter services based on ex-post bond performance (Peristiani (2007), Gopalan et al. (2011), Shivdasani et al. (2010), Andres et al. (2013)). In particular, my measure of the quality of screening by underwriters is based on the likelihood of a credit rating downgrade and upgrade that occurs following a bond issue. Using these events as proxies for the quality of underwriter due-diligence, it follows that high quality and hence costly due-diligence should provide more accurate information about an issue and therefore lead to lower credit rating variability in the short- and long-run. The certification hypothesis then predicts that bonds underwritten by prestigious underwriters should exhibit a lower likelihood of credit rating downgrade and upgrade relative to low reputation firms both in the short and long run.[11]

My measure of quality of certification represents an improvement when compared to existing measures, namely, bankruptcies (Gopalan et al. (2011)) and investors' law-suits (Shivdasani et al.

[11] A higher likelihood of a rating upgrade in the long run, however, could also be consistent with the certification hypothesis and could indicate that top tier underwriters sponsor issuers with better credit prospects.

(2011)).[12] Bankruptcies can be rather extreme and usually longer term events where many factors which are usually unforeseeable at the moment of the due-diligence process can come into place. Moreover, there can be other situations that would classify as poor certification that do not necessarily lead to bankruptcies. Hence, the sole reliance on this type of events to assess quality of certification could lead to spurious and biased results. Nevertheless, my measure does account for the information embedded in bankruptcies. Similarly, investors' law suits can exhibit a bias to events of worsening credit quality, such as, downgrades. However, poor certification can also lead to credit rating upgrades, a situation that is less likely to trigger investors' law suits unless investors hold a short position on the security.[13]

The choice of credit rating actions as my measure of bond performance has several additional justifications. First, existing literature shows that rating actions have a significant effect on bond prices. In this regard, Jorion et al. (2005) shows that the exemption of rating agencies from regulation FD (Regulation Fair Disclosure) in 2000 –providing credit analysts at rating agencies access to confidential information- made the information content of credit ratings and the price effect of rating changes increase significantly.[14] Second, studies suggest that credit ratings exhibit a positive serial correlation, especially when the initial rating change is a downgrade. Third, the structure of the investor base in the high yield segment –predominantly institutional- further justifies the use of bond credit rating performance. Approximately, 75% of the investor base is comprised of highly regulated institutions, namely, mutual funds, pension funds and insurance companies. For these institutions, regulatory capital requirements are associated with the credit rating of their investments. Thus, rating variability can trigger an increase in capital requirements and costly portfolio reallocations.[15] Finally, empirical literature indicates that riskier bonds have lower liquidity. Hence, credit rating variability can increase the exposure of investors to liquidity risk.

Following standard literature (Puri (1996), Gande et al. (1999), Fang (2005)), I use at issue yields to measure the degree of underwriter credibility to certify issue quality. Based on this measure, I

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[12] Ideally, an appealing measure of quality of certification could be based on historical bond prices. Unfortunately, TRACE database, probably the most complete data-source for historical prices, starts in 2004. Nevertheless, this is an interesting avenue for future research.

[13] Hence, Shivdasani et al. (2011)'s measure could be improved by adding issuers' law-suits.

[14] On September 29, 2010, the Securities and Exchange Commission (SEC) issued a final rule release, "Removal from Regulation FD of the Exemption for Credit Rating Agencies", which removed the exemption for disclosures made to a rating agency.

[15] As noted in Andres et al. (2013), for capital requirements, credit ratings in the Ba, B, CCC ranges have values assigned of 3, 4 and 5, respectively. Each value is associated with specific amounts of capital backing. See Kisgen (2006) for a detailed overview.

document whether the GLBA had any impact on the market perception of prestigious underwriters' credibility to certify quality.

For the measure of reputation of an underwriter, I follow Fang (2005) and use the financial institution's market share. As noted by the author, market share reflects the brand name and goodwill of an institution. In this regard, Klein and Leffler (1981) point out that if a firm engages in quality cutting, this information disseminates more rapidly if the firm has a large market share. Economically, market share reflects the revenue stream at stake and hence larger banks have more to lose from a tarnished reputation (De Long (1991))[16]. Following Fang (2005), instead of using market share as a continuous measure of reputation, I discretize the measure into a binary classification of underwriters. The author points out that the binary classification captures the empirically observed two-tiered power structure in the investment banking industry. This hierarchical structure has been observed in both the academic literature and the financial press[17]. Econometrically, the author argues that using a continuous measure relies not only on the assumption that the measure can capture reputation with precision but also that it has a constant effect over the variables of interest. The binary classification avoids both assumptions and enables a better inference on the qualitative differences between large, prominent underwriters and their smaller competitors.

Another popular measure of underwriter reputation -mostly found in studies focusing on the IPO market- is the Carter-Manaster ranking based on tombstone announcements of equity offerings. As in Fang (2005), I do not use this measure in my baseline analysis because the bond underwriting market differs significantly from the equity underwriting market. Namely, there are many more institutions in equity underwriting than in bond underwriting. Underwriters in the bond market tend to be large institutions that do not specialize in only a few segments. Moreover, the author points out that the correlation between market share and the Carter-Manaster measure is close to unity.

4.2 Data and Descriptive Statistics

The corporate bond market, particularly the high-yield segment, is an optimal test ground for several reasons. First, the GLBA led to intensified competition among underwriters and to a sharp decrease in investment banking fees, especially in the high-yield bond market in which commercial

[16] Market share has been used frequently in the existing literature as an empirical proxy for reputation. See, for example, McDonald and Fisher (1972), Simon (1990), De Long (1991), Megginson and Weiss (1991), Beatty and Welch (1996) and Fang (2005).

[17] Hayes (1971), Tinic (1988) and Carter et al. (1998).

bank entry was particularly strong (Gande et al. (1999), Chen et al. (2000), Geyfman and Yeager (2009), Shivdasani and Song (2011)). Second, issuing firms in this segment, often private or smaller public firms, exhibit a higher degree of information asymmetry and are generally less visible than investment-grade issuers, thus increasing the cost of accurate certification. In this regard, commercial bank entry further increased the degree of issue complexity as it eased capital market access for small and opaque issuers, namely, firms that would typically rely on commercial credit lines prior to GLBA. Therefore, the combination of significant reductions in underwriter compensation and the increase in the cost of accurate certification make the high yield bond market an ideal candidate to find evidence of deviations from the underwriter certification hypothesis. Finally, the rich data available on this market segment allows me to identify the channels through which the reputation mechanism works and how its effectiveness varies in the cross-section of institutions and over time.[18]

Data on high yield corporate non-convertible bonds issued in the US market between January 1st, 1993 and September 30th, 2008 are collected from the SDC Platinum database which provides detailed issue information, including the lead underwriters for each issue.[19] Consistent with prior studies, I focus on securities issued by firms domiciled in the US and exclude utility and financial issues from the sample. Bond credit rating performance is obtained from the Mergent FISD database which provides in depth information on credit rating history by rating agencies at the bond level. The resulting sample contains 2295 bond issues and 78 distinct underwriters.

In Table 1, I list the top 15 underwriters in the U.S. corporate bond market by volume underwritten before and after GLBA. As in prior studies, a pronounced feature of the data is that the bond underwriting market is highly concentrated. The largest 8 institutions account for over 87.0% and 76.8% of all volume underwritten before and after GLBA, respectively, while the largest 15 entities account for roughly 95% of all deals in both time periods. A simple inspection of average gross spreads shows a reduction in underwriting fees post GLBA, a feature first noted in Gande et al. (1999). The decline in average gross spreads coupled with a lower concentration among top 8

[18] The choice of the high yield bond market has additional justifications. In particular, this market is highly concentrated among prestigious underwriters (top 5 underwriters account for more than 50 percent of the total amount issued before and after GLBA; see Table 1) so what these institutions do can have a market-wide effect. In addition, the vast majority of high-yield bond investors, are institutional and heavily regulated. According to a 2014 Standard and Poor's Financial Services report, insurance companies (29%), pension funds (28%) and mutual funds (13%) alone account for 70% of the investor base with the remaining 30% being comprised of mostly exchange traded funds (ETFs), collateralized debt obligations (CDOs), hedge funds and commercial banks. Therefore, the relation of underwriter reputation and bond credit rating performance is particularly important to these investors.

[19] My sample ends in September 2008 to avoid the complexity of having to deal with Lehman Brothers bankruptcy as well as the effect of M&As of many financial institutions and the reclassification of several investment banks as commercial banks.

underwriters and the rapid penetration of commercial banks to the top of the ranking corroborates the aggressive competition that characterized this period among high reputation underwriters.

For the baseline analysis, as in Fang (2005), the top 8 institutions by market share are classified as reputable and the rest as less reputable. For the sample prior to GLBA, the top 8 banks include Goldman Sachs, Merrill Lynch, Morgan Stanley, Salomon Brothers, Credit Suisse First Boston, Lehman Brothers, JP Morgan and DLJ. The top 8 banks in the sample post GLBA (1999-2008) include Citi, JP Morgan, Bank of America, Morgan Stanley, Goldman Sachs, Lehman Brothers, Merrill Lynch and Credit Suisse. This initial cut is made on the basis that the groups of eight banks pre and post GLBA appear almost every year among the top 10 ranking in the annual league tables and hence, there is a sense of stability of their reputation over time. Nevertheless, given the degree of arbitrariness in this binary cut, I conduct robustness checks to ensure that the main results do not change upon comparing these particular banks with the rest. Results using the top 5 underwriters are provided in Tables 10, 11 and 15. Findings are in line with those reported in my baseline analysis.

Table 2 provides descriptive statistics including bond characteristics, bonds' at issue credit ratings and ex-post credit rating performance measures as well as issuer and underwriter characteristics. In particular, I offer descriptive statistics for the overall sample and for the two sub-periods for the groups of bonds that are underwritten by one of the top 8 underwriters *[High Reputation]* and those sponsored by less reputable entities *[Low Reputation]*. Results of the univariate analysis, namely, a t-test for differences in means between the two reputation cohorts are also reported for each sub-sample.

A notable feature in Table 2 is that there seems to be a non-random relation between the underwriters' reputation cohort and the features of the bonds they underwrite. Statistical tests for difference in means reveal that the two groups are remarkably different along various dimensions. Bonds underwritten by high reputation institutions exhibit, by construction, significantly larger issue proceeds in both sub-samples (208.4 vs. 165.9 million USD before GLBA; 307.0 vs. 209.4 million USD after GLBA) as well as longer terms to maturity (117.7 vs. 109.5 months before GLBA; 108.1 vs. 100.3 months after GLBA). While prior to GLBA, reputable underwriters sponsored a significantly lower proportion of callable bonds (89.0% vs. 94.0% prior GLBA), no significant difference is reported post GLBA. Callable bonds can be associated with relatively riskier issuers and hence this may indicate a loosening in certification standards post deregulation. Regarding bonds with clawback provisions, my dataset suggests that high reputation underwriters sponsor a significantly lower proportion of bonds with clawback provisions relative to less reputable banks for both sample periods (60.0% vs. 70.0% prior GLBA; 72.0% vs. 77.0% post

GLBA).[20] Existing literature (see Daniels et al. (2009)) suggests that relatively smaller firms with low credit ratings and low profitability favor the usage of this feature and hence debt with clawback provisions typically exhibit the highest yield spreads followed by callable bonds. Regarding subordinated debt, while reputable banks sponsored a significantly higher proportion of subordinated securities prior to GLBA (51.0% vs. 43.0%), there is no statistically significant difference post GLBA (38.0% vs. 35.0%). Finally, in terms of bond registration characteristics, reputable underwriters sponsored a significantly larger proportion of bonds registered under Rule 415 both before and after deregulation (14.0% vs. 6.0% prior GLBA; 12.0% vs. 10.0%). Turning the attention to bonds issued under SEC exemption Rule 144a, there is no statistically significant difference between reputation groups within sub-periods[21]. However, the difference in means for the entire sample suggests a higher proportion of bonds sponsored by reputable underwriters issued under Rule144a. Livingston et al. (2002) find Rule 144A issues to have higher yields than publicly issued bonds and attribute such difference to their lower liquidity, information uncertainty and weaker legal protection for investors.

Regarding initial credit quality, my dataset suggests that high reputation underwriters sponsored a significantly higher proportion of bonds with a credit rating in the Ba range (highest rating in my sample) relative to less reputable banks for both sample periods (23.0% vs. 11.0% prior GLBA; 26.0% vs. 20.0% post GLBA). In line with this, high reputation underwriters sponsored a significantly lower proportion of bonds with a credit rating in the B range relative to less reputable banks for both sample periods (73.0% vs. 80.0% prior GLBA; 61.0% vs. 67.0% post GLBA). For the Caa range and below, however, my dataset reveals that while high reputation underwriters had a significantly lower exposure prior to GLBA (4.0% vs. 9.0%), there is no statistically significant difference relative to less reputable banks post GLBA (13.0% vs. 12.0%). The latter finding is in line with Sufi (2004) and Yasuda (2005) which suggest that the entry of commercial banks in the market for underwriting services increased the access and attractiveness of corporate bond debt among smaller firms which originally relied on commercial credit lines. Turning to market perception towards risk, bonds sponsored by reputable underwriters report on average significantly lower bond spreads (3.7% vs. 4.3% before GLBA; 4.7% vs. 5.1% after GLBA) and lower offer yields to maturity (9.6% vs. 10.3% before GLBA; 9.0% vs. 9.7% after GLBA). In terms of issuer characteristics, reputable underwriters sponsored a higher proportion of bonds issued by public

[20] A clawback provision in debt contracts "gives the issuer an option to redeem a specified fraction of the bond issue within a specified period at a predetermined price and with funds that must come from a subsequent equity offering" (Goyal et al. (1998)).

[21] Since 1990, the Securities and Exchange Commission has allowed firms to sell security issues to qualified institutional buyers under the so-called Rule 144A. Rule 144A issues are not required to be registered with the SEC and may not be resold to individual investors, but may be traded between qualified institutional buyers.

firms and firms with a relatively larger size measured in terms of total assets for both sample periods. All the aforementioned group differences indicate that matching between a bond issuer and a lead underwriter is not a random process. In fact, reputable underwriters, on average, underwrite bonds that differ significantly from those underwritten by underwriters with lesser reputations.

As per number of lead underwriters, my dataset suggests a proliferation of co-led syndicate structures post GLBA with a particular incidence on bonds sponsored by top tier underwriters (1.06 vs. 1.02% prior to GLBA; 2.02% vs. 1.21% post GLBA). This evidence supports the view that competition was particularly fierce in the high reputation cohort and hence it may have significantly lowered screening incentives for both reputable commercial and investment bank underwriters.

Before turning to the multivariate analyses, I briefly describe the relationship between the underwriter's reputation and the ex-post credit rating performance of bonds in my sample. The univariate analysis already suggests interesting results due to GLBA. In particular, consistent with the certification hypothesis, Table 2 indicates a lower rate of credit rating variability coming from downgrades in the short-run and long-run for bonds underwritten by top tier underwriters prior to GLBA. However, for the period post GLBA, my sample shows a significant deviation from the certification hypothesis as bonds sponsored by high reputation underwriters exhibit a larger rate of credit rating variability coming from downgrades. Instead, rating variability coming from upgrades does not support the certification hypothesis prior to deregulation with bonds sponsored by reputable underwriters having a larger likelihood of being upgraded. I find no statistically significant relationship post GLBA.

The systematic differences between the issues from the two reputation cohorts highlight the endogenous nature in the issuer-underwriter matching. Such differences may cause endogeneity problems in my econometric analysis when investigating the role of reputable underwriters in the form of omitted variable bias due to self-selection. In the next section, I address the issue of endogenous matching using a Heckman (1979) two-stage approach.

5. Ex-Post Credit Performance: Empirical Methods and Results

5.1 Issuer-Underwriter Matching

My analysis requires that I address the issue of endogenous matching using a Heckman (1979) two-stage approach as in Puri (1996), Gande et al. (1999), Fang (2005), Ross (2010), Golubov et al. (2012), and Andres et al. (2013), among others. I estimate in the first stage of the Heckman method the selection equation for the issuer-underwriter matching following my definition of underwriter reputation. The dependent variable in my selection equation is the dummy variable *[High Reputation]* which takes a value of one if the bond is sponsored by a prestigious underwriter, that is, a bank in the top 8 ranking, and a value of zero otherwise. The estimation procedure then requires that I identify variables that predict the likelihood that *[High Reputation]* equals 1 in a probit regression. At least some of these variables should be valid instruments in the sense that they are not only meaningful predictors of this likelihood but also independent of a bond's credit rating change and at issue yield and thus properly excludable from the second stage regressions. Next, I construct from this regression the inverse Mills ratio that is added as a control variable in the second stage pooled OLS and multinomial logistic regressions reported in the sections that follow.

I follow the existing literature in general and Fang (2005) in particular regarding the independent variables for the underwriter selection equation and control for: initial credit rating, maturity, principal amount; whether the issuer is a public firm; and a bond feature, namely, if the bond is redeemable. I thus use in the first stage regression a number of variables that differ significantly for reputable underwriters and those with lesser reputation. Furthermore, the first-stage regression should include variables that are not in the second-stage equation unless these variables are relevant explanatory variables in both the issuer-underwriter decision and the second stage regressions. The selection equation is estimated using a probit regression with robust standard errors:

$$\text{High Reputation} = Z_i'\delta + v_i$$

where Z_i' is the vector of variables that affects the choice of a high reputation underwriter,

$$Z_i'\delta = \delta_0 + \delta_1 \text{ Initialrating} + \delta_2 \text{ Issue Size} + \delta_3 \text{ Maturity} + \delta_4 \text{ Public} + \delta_5 \text{ Redeemable}$$

Given the binary nature of my reputation measure,

$$\text{High Reputation}_i = 1 \;\text{ iff }\; Z_i'\delta + v_i > 0 \text{ and } \text{High Reputation}_i = 0 \;\text{ iff }\; Z_i'\delta + v_i \leq 0$$

Then, in the next sections, I estimate different specifications of the following second stage regression:

$$y_i = X_i'\beta + \omega \frac{\varphi(Z_i'\delta)}{\Phi(Z_i'\delta)} \text{High Reputation}_i + \omega \frac{-\varphi(Z_i'\delta)}{1-\Phi(Z_i'\delta)})(1 - \text{High Reputation}_i) + \varepsilon_i$$

where $\varphi(\,.\,)$ and $\Phi(\,.\,)$ are the density function and the cumulative distribution function of a standard normal, respectively. The above equation can be consistently estimated by OLS or maximum likelihood.

Estimation Results

The regression results for the first stage are reported in Table 3. Results generally corroborate the univariate findings reported in Table 2 and are consistent with existing studies such as Fang (2005). In particular, my results show that reputable institutions are more likely to underwrite bonds of higher initial credit rating (those in the Ba range within the junk bond segment) which a priori, indicate that these institutions underwrite less risky offerings, a feature consistent with reputation concerns. Maturity and issue size also increase the probability of a reputable institution being the underwriter, consistent with the need to hire higher reputation underwriters for more complex securities.[22]

5.2 Effect of Deregulation on Underwriting Quality

I begin the multivariate analysis by investigating the effect of GLBA on the credit rating performance of bonds based on their underwriter reputation. The certification hypothesis predicts that bonds underwritten by prestigious underwriters should exhibit lower credit rating variability both in the short and long-run because they exert higher effort during the due-diligence process. This is the hypothesis to be tested.

A pooled cross-section analysis represents a standard methodology for evaluating the impact of certain events or policy interventions and hence, provides me with the appropriate framework to study the effect of GLBA on the certification hypothesis. Consistent with this methodology, I pooled two cross sections of securities, namely, a sample containing securities issued prior to GLBA and another with securities issued post GLBA. A time dummy variable is used to capture structural change over time due to GLBA as well as interaction terms with the dummy to allow coefficients on regressors to vary over time.

[22] For robustness checks, I perform the same econometric analysis for the case of top 5 underwriters as my measure of high reputation. Results for this specification do not vary from those in my baseline analysis.

With regard to my dependent variables, namely, ex-post short and long-term bond credit performance, I screen the credit rating history of each bond in my sample and construct binary variables related to a bond's rating actions. Variables denoted Rating Action 12 months, 18 months, 24 months and 36 months are set to one if the bond's credit rating was downgraded or upgraded within the first 12, 18, 24, or 36 months, respectively, of bond issue. Similarly, variables denoted Downgrade (Upgrade) 12 months, 18 months, 24 months and 36 months are set to one if the bond's credit rating was downgraded (upgraded) within the first 12, 18, 24, or 36 months, respectively, of bond issue. As in Andres et al. (2013), the first two variables are used to measure short-term performance while the other two capture medium- to longer-term credit performance. I find this specification of bond credit performance particularly useful as it allows me to overcome the problem of survivorship bias associated with bonds of different maturities and with callable features that would arise if I relied on a bond's entire rating history. Equally important in the design of my variable is the fact that any adjustments in credit quality as a result of poor screening should be incorporated in a bond's first credit rating action.

The focal point of my investigation is then to test the impact of high reputation underwriting on the conditional probability of a credit rating downgrade (upgrade). My main explanatory variable of interest is the dummy variable *[High Reputation]* tracking the reputation of the underwriter(s) sponsoring the security which takes a value of 1 if the lead underwriter is in the top 8 ranking and a value of 0 otherwise. A negative and significant coefficient on *[High Reputation]* in the downgrade (upgrade) regressions would imply that debt securities managed by reputable underwriters have a lower rate of credit rating variability relative to those sponsored by less reputable underwriters, a result consistent with the certification hypothesis. As noted in Shivdasani et al. (2011), the entry of commercial banks into bond underwriting led to the proliferation of co-led underwriting arrangements which also contributed to lower the incentives of lead underwriters to screen issuer quality. To account for this, I include the variable *[# Leads]* that tracks the number of lead underwriters participating in a given issue.

In addition, I control for issuer and bond offering characteristics proven in the literature to have a meaningful impact in ex-post credit rating performance. In particular, a bond's initial credit rating is an important factor in explaining bond credit rating changes (Altman (1992)). Hence, I control for credit quality by including a numerical analog of the bond's Moody's credit rating at the time of issue *[Initial Rating]*. The regression specification also includes several additional bond-level characteristics that help capture a range of features that may be related to credit rating changes. I control for the size of the bond issue *[Issue Proceeds]* measured by the proceeds of the bond offering. I include several additional dummy regressors that indicate: differences in a bond initial credit rating among rating agencies *[Splitrating]*, the presence of clawback provisions *[Clawback]*, subordinated debt *[Subordinated]* and 144a issues *[Rule 144a]*. I also include the initial yield to maturity of an issue *[Offer Yield]* which serves as a market based proxy for investors' perception of an issue credit quality and has proven to be a good predictor of post-issue rating changes.

Finally, from the first stage Heckman procedure, I construct the inverse Mills ratio *[Mills]* and include it as an explanatory variable in my pool OLS regressions to account for issuer-underwriter bias. Throughout my analysis, I do not control for firm accounting information as a proxy for financial strength for two reasons. First, initial ratings should largely account for these features. Second, including accounting information as additional regressors would significantly reduce my sample size given the non-negligible proportion of securities issued by private firms in my sample (37% of the entire sample).

Econometric Model

To test the validity of the underwriter certification hypothesis before and after GLBA which predicts that bonds underwritten by prestigious underwriters should exhibit lower rating variability both in the short and long-run, I estimate regression equations that are variants of the following form:

$$Y_i = \delta_0 + \delta_1 \text{ GLBA}_i + \beta' X_i + \Pi'(\text{GLBA}^* X_i) + ɣ \text{ mills} + \alpha_i + u_i + \varepsilon_i$$

where Y_i represents depending on the specification, a rating action in general, a Downgrade (only) or an Upgrade (only) within 12 months, 18 months,24 months, 36 months and,

$$\beta' X_i = \beta_1 \text{ (High Reputation)}_i + \beta_2 \text{ (Initial Rating)}_i + \beta_3 \text{ (Split-rating)}_i + \beta_4 \text{ (Offer Yield)}_i + \beta_5 \text{ (Issue Proceeds)}_i + \beta_6 \text{ (Subordinated)}_i + \beta_7 \text{ (\# Leads)}_i + \beta_8 \text{ (Clawback)}_i + \beta_9 \text{ (Rule 144A)}_i + \beta_{10} \text{ (Shelf Registration)}_i$$

where before and after GLBA can be expressed as follows,

$$E [Y_i \mid X_i , \text{GLBA}= 0] = \delta_0 + \beta' X_i + ɣ \text{ mills}_i$$

$$E [Y_i \mid X_i , \text{GLBA}= 1] = \delta_0 + \delta_1 + (\beta + \Pi)' X_i + ɣ \text{ mills}_i$$

Because the variable Y_i can depend on unobserved industry characteristics, I include industry fixed effects α_i in the regression in addition to year fixed effects u_i. Inclusion of industry fixed effects ensures that the effects I identify are within-issuer changes in credit rating performance when the bond is sponsored by a reputable underwriter as compared to a less reputable one. In all specifications, the standard errors are robust to heteroskedasticity. The identifying assumption in my empirical analysis is that after the inclusion of all the above controls, *[High Reputation]* is exogenous.

Estimation Results

I begin my analysis by documenting the effect of underwriter reputation on the likelihood of a credit rating action where a rating action can take the form of either a credit rating upgrade or downgrade. Regression coefficients for the period prior to deregulation are reported in Table 4, Panel A. Coefficients for *[High Reputation]* are negative but not statistically significant for all time horizons. However, as reported in Table 4, Panel B for the period post GLBA, a striking result is that coefficients for *[High Reputation]* are positive and significant within 12 months, 18 months and 24 months relative to issue date. For the longer term horizons (36 months and until maturity), coefficients are positive but not significant. The positive and statistically significant coefficients indicate that bonds sponsored by reputable underwriters post GLBA are more likely to experience a first credit rating action within the first 12 months, 18 months and 24 months when compared to those underwritten by less reputable institutions. The higher credit rating variability observed post deregulation is evidence of lower quality due-diligence and thus of a deviation from the underwriter certification hypothesis. Based on these findings, I carry out the same analysis but now I break down my measure of credit rating actions into downgrades and upgrades to gain a better understanding of the nature of the credit rating variability.

In Table 5, Panel A, I report the effect of underwriter reputation on the likelihood of a bond credit rating downgrade before the enactment of GLBA. The negative and significant coefficients for *[High Reputation]* at the 1% level across all specifications indicate that, ceteris paribus, bonds underwritten by top tier underwriters have a lower likelihood of a credit rating deterioration in the short and long run compared to bonds sponsored by less reputable institutions. The lower rating variability coming from downgrades is evidence of high quality due-diligence and thus, validates the certification hypothesis prior to deregulation (Fang (2005)).

The coefficients on the control variables for the period prior to GLBA indicate that the likelihood of credit deterioration is higher in bonds with higher at issue yields *[Offer Yield]*, a finding consistent with the market applying a higher discount rate on riskier securities. The positive and statistically significant coefficient on *[# Leads]* indicates that the proportion of credit rating downgrades is higher for bonds arranged by multiple lead underwriters. This result validates Shivdasani et al. (2011) who argue that lead underwriters in co-led syndicates face weaker incentives to screen issuer quality and hence are more likely to be involved in financial misrepresentation events. Also, consistent with existing literature, I find a positive and significant relationship between bonds with clawback provisions *[Clawback]* and the probability of credit rating deterioration.

However, as depicted in Table 5, Panel B, a striking result is that bonds sponsored by reputable underwriters post GLBA are more likely to be downgraded both in the short- and long-run compared to those underwritten by less reputable institutions. In particular, the sums of coefficients of [*High Reputation]* and their interaction terms with the dummy *[GLBA]* are positive and significant at all time horizons. Hence, results indicate an increase in rating variability consistent with top tier underwriters performing poor due-diligence. Overall, the evidence on downgrades supports a deviation from the certification hypothesis post GLBA and validates my alternative hypothesis of reputation fragility and clustering of poor certification among top tier institutions following a deterioration in economic fundamentals.

Coefficients on the control variables post GLBA continue to indicate a positive and significant relationship between the likelihood of a rating downgrade and a bond's at issue yield to maturity *[Offer Yield]*. Interestingly, I find a positive and significant relationship between a bond's initial credit rating and the likelihood of a credit rating downgrade within the first 12 and 18 months from issue date. I find, however, no significant relationship in the longer term. On the other hand, the negative and statistically significant relationship between subordinated debt and rating downgrades may be indicative of rating agencies having a conservative approach regarding issues of lower seniority. I find also *[Issue Proceeds]* to be positively correlated with the likelihood of credit rating deterioration.

Regarding credit rating upgrades, in Table 6, Panel A, I report regression results for the period prior to GLBA. I find a positive and significant long-run relationship between underwriter reputation and a bond's likelihood of a credit rating upgrade. Such a result does not support the certification hypothesis. Alternatively, results suggest that high reputation underwriters are more likely to sponsor issues with better credit prospects. Further testing is thus necessary.

Coefficients on the control variables show a negative and significant relationship between a bond's initial rating *[Initial Rating]* and the likelihood of a credit rating upgrade; this might be evidence indicative of rating agencies assigning initial ratings above a bond's intrinsic credit quality. Regarding market based perception of risk, results show a negative and statistically significant relationship between at issue yields *[Offer Yields]* and rating upgrades in the short- and long-run which seems to be in line with my findings for rating downgrades. The variable *[# Leads]* is negatively correlated with the likelihood of a credit rating upgrade which further confirms the findings of Shivdasani et al. (2011).

In Table 6, Panel B, I report my findings post deregulation. It is interesting to find no statistically significant relationship between an underwriter reputation and credit rating upgrades in the short and long-run. Hence, regression results from upgrades remain inconclusive. Coefficients on control variables are substantially similar to those reported in Panel A.

My findings could suggest the potential for richer dynamics operating between large lead underwriters and credit rating agencies for the period post enactment of GLBA and before the recent crisis. The increase in rating variability coming from downgrades but not upgrades suggests the possibility that initial ratings on bonds sponsored by top tier underwriters were upward biased during this period. This could be the result of rating agencies failing to properly incorporate the change in screening incentives of high reputation underwriters. Another possibility points to some degree of implicit collusion between credit rating agencies and large reputable underwriters who are able to attract through their market power a greater number of issuers. Alternatively, results could also indicate that underwriters have better information (at least weakly) relative to rating agencies about the issues they sponsor in an attempt to maximize placement conditions. These are all natural avenues for future research that may shed additional insights on the role of reputation in financial market stability.

Finally, all regression specifications include year fixed effects capturing the impact of aggregate macro conditions or time related variations between 1993 and 2008 as well as industry fixed effects. As a robustness check, Table 10 and 11 report similar regression results for the case of top 5 underwriters by market share by volume underwritten as my measure of high reputation. In the next section, I quantify the effect of GLBA and provide probability estimates of credit rating actions for bonds sponsored by top tier institutions.

5.3 Quantifying the Impact of GLBA on Bonds Post-issue Credit Performance.

To properly quantify the costs of GLBA, I use two different econometric models, namely, a multinomial-logistic and a competing risk model (Peristiani (2007)). In their most general forms, these models can be estimated by a regression panel where the conditional probability of credit rating downgrade (or upgrade) is traced across time for every bond. However, as noted in Peristiani (2007) because due-diligence by lead underwriters is performed before the offering, the specification used in this paper is cross sectional conditioned on information as of the time of issuance. The analysis presented in this section also serves as a robustness check for my previous specifications.

5.3.1 Multinomial-Logistic Model

I follow standard literature on credit rating changes and estimate an unordered multinomial logistic model relating a bond's likelihood of rating change to the reputation of its underwriter. Both sub-samples (before and after GLBA) are considered separately when fitting the model.

The multinomial logistic model has three choices regarding a bond's first rating action over a given time horizon relative to issue date: 1) no change; 2) downgrade; and 3) upgrade.[23] As in previous analysis, I control for different bond features and at issue issuer characteristics known to have an impact on post-issue credit rating performance. The model can be written as follows:

$$\text{Prob}(Y = j) = \frac{\exp(\beta' j\, Xi)}{1+\sum_{k=1}^{3} \exp(\beta' k\, Xi)} \quad \text{for } j = 1, 2, \text{ and } 3.$$

where j and k represent each choice and,

$$\beta'_j X_i = \alpha_0 + \beta_1 (\text{High Reputation})_i + \beta_2 (\text{Initial Rating})_i + \beta_3 (\text{Split Rating})_i + \beta_4 (\text{Offer Yield})_i + \beta_5 (\text{Issue Proceeds})_i + \beta_6 (\text{Subordinated})_I + \beta_7 (\#\ \text{Leads})_i + \beta_8 (\text{Clawback})_i + \beta_9 (\text{Rule 144A})_i + \beta_{10} (\text{Shelf. Registration})_i + \beta_{11} (\text{Mills})_i$$

[23] Demiralp and Hein (2010) represents the closest specification of our setup.

Estimation Results

Table 7, Panel A reports regression coefficients as well as marginal effects for both sample periods for the likelihood of a rating downgrade as the dependent variable. As expected, coefficients of explanatory variables in general and of *[High Reputation]* in particular are in line with my pooled OLS regression results. When calculating marginal effects for the 1993-1998 sample period, I estimate the probability of a bond being downgraded within 12, 18, 24 or 36 months from its issue date to be 4.9%, 5.8%, 7.7% and 7.8%, respectively, lower for bonds underwritten by an underwriter in the top 8 ranking. These probability estimates support the certification hypothesis prior to GLBA. In contrast, for the period post deregulation, the probability of a bond being downgraded within 12, 18, 24 or 36 months from its issue date is 4.7%, 6.8%, 6.7% and 6.4%, respectively, higher for bonds underwritten by a prestigious underwriter. The increased credit rating variability associated with high reputation underwriters indicates a deviation from the underwriter certification hypothesis.

Table 7, Panel B reports regression results with credit rating upgrades as the dependent variable. For the period prior to deregulation, I find the probability of a bond being upgraded within 36 months from its issue date to be 4.9% higher for bonds underwritten by a top tier underwriter. For the period post to GLBA, however, I find no significant relationship between an underwriter's reputation and the likelihood of a bond's rating upgrade.

For comparison purposes, Panels A and B report the marginal effects of other statistically significant control variables. Interestingly, at issue yields post GLBA -a market based proxy for credit risk- is associated with lower marginal effects when compared to the variable *[High Reputation]*. This result reinforces the view of underwriters having additional information about an issue relative to rating agencies and the public in general.

The multinomial logistic regression represents an appropriate first step to quantify the effect of different covariates on the rate of occurrence of downgrades and upgrades. However, this model presents a set of limitations. First, the nature of my dependent variable, the likelihood that a bond's first rating action is a downgrade or alternatively, an upgrade, suggests the presence of right censoring in the data that a multinomial logistic setup is unable to account for. Specifically, the fact that I focus on a bond's first rating action implies that the occurrence of a rating upgrade event impedes the occurrence of the other event of interest, a rating downgrade, which could happen later in the life of the bond. Moreover, the logistic setting does not allow me to estimate hazard functions, that is, the probability of a bond suffering a particular rating action within any given time horizon provided that nothing yet happened. In the next section, I account for these drawbacks by estimating a competing risks model, namely, a type of duration model.

5.3.2 Competing Risk-Hazard Model

Following Peristiani (2007), I use a duration approach to evaluate the credit performance of bonds issued by high reputation underwriters. Duration models (often referred to as hazard models) offer an efficient framework for estimating post-issue performance because securities have well defined points of inception and possess a complete credit rating history.[24]

In my setup, given that I focus on a bond's first rating action relative to issue date, the bond can transition into a number of possible but mutually exclusive events, namely, upgrade, downgrade or no rating change. Consistent with this, the competing risks approach assumes that the occurrence of one type of event effectively eliminates all other outcomes. A key feature of all methods of survival analysis is then the ability to handle right censoring which in my setting may occur due to lost to follow up (the event of interest may occur after the observation period) or to the bond not suffering the event of interest. Survival analysis then offers a convenient framework for modeling all the termination events treating them as competing risks.

Another advantage of using a competing risks model is the estimation of cumulative hazard functions. This function allows me to quantify the probability of occurrence of a certain event and how that probability changes over time. More importantly, I can estimate these functions for particular values of regressors and determine their effect on the rate of occurrence of the event of interest.

The central point of this approach is then to test the impact of underwriter reputation before and after GLBA on the conditional probability of credit deterioration (downgrade) or improvement (upgrade) in the short- and long-run. To estimate the conditional probability of a rating downgrade (upgrade), the status of the bond is established as of end 2001 for bonds in the sample prior to GLBA and as of end 2011 for bonds issued post GLBA[25]. The dependent variable is the probability that the bond has suffered a rating downgrade (upgrade) after τ years, given that it has not done so until that point in time. In this particular setup, the competing risk is a rating upgrade (downgrade).

[24] The nature of my dataset implies no left censoring, that is, for each security in my sample I observe its credit rating history since inception. Otherwise, this would represent a drawback difficult to overcome in a competing risk setup.

[25] Screening periods for each sub-sample end 3 years beyond their last bond issue to minimize the issue of lost to follow up.

Econometric Model

I assume a proportional hazard framework to study the credit rating downgrade (or upgrade) rate of corporate debt securities. Let τ_i denote a random variable representing the time to termination of corporate bond *i* and J = (downgrade = 1, upgrade = 2, maturity = 3) a random variable denoting the three types of bond terminations. The hazard for the termination event (j) for bond (i) where (j = 1, 2, 3) is defined as follows:

$$\lambda_{ij}(t) = \lim_{\Delta t \to 0} \frac{P(t \leq \tau_i \leq t + \Delta t, J_i = j | \tau_i \geq t)}{\Delta t}$$

The total hazard rate for the i-th bond is the sum of the termination hazards, defined as $\lambda_i = \sum_{j=1}^{3} \lambda_{ij}(t)$. The proportional hazard framework asserts that

$$\lambda_{ij}(\tau) = \alpha_j(\tau)\exp(\gamma_j{}'X_{it})$$

and,

$$\gamma_j{}'X_i = \beta_1 \text{ (High Reputation)}_i + \beta_2 \text{ (Split-rating)}_i + \beta_3 \text{ (Initial Rating)}_i + \beta_4 \text{ (Subordinated)}_i + \beta_5 \text{ (Public)}_i + \beta_6 \text{ (Issue Yield)}_i + \beta_7 \text{ (Issue Proceeds)}_i + \beta_8 \text{ (Maturity)}_i + \beta_9 \text{ (\# Leads)}_i + \beta_{10} \text{ (Clawback)}_i + \beta_{11} \text{ (Rule 144A)}_i + \beta_{12} \text{ (Shelf. Registration)}_i$$

The vector X_{it}. represents a set of exogenous variables affecting the termination events of bonds. The function $\alpha_j(\tau)$ is commonly referred to as the baseline hazard function. The parameter vector γ_j captures the impact of the explanatory variables for the different bond termination events (failures). In a first set of regressions, I focus on estimating the determinants of a downgrade as the termination event of interest and treat upgrades as a competing risk. In a different specification, I treat a bond upgrade as my termination event of interest and downgrades as the competing risk.

Estimation of γ_j is done by partial maximum likelihood. For termination event j, I observe k_j ordered lifetimes $t_{j\,1} < t_{j\,2} < \ldots < t_{j\,k}$. The partial likelihood function under competing risks is then,

$$L_p(\gamma_1, \gamma_2, \gamma_3) = \prod_{j=1}^{3} \prod_{i=1}^{k_j} \frac{\exp(\gamma_j{}'x_{it})}{\sum_{r \epsilon R(t_{ji})} \exp(Z_r(t_{ji})^T \beta_j)}$$

where x_{it} is the value of the vector of explanatory variables for bond i experiencing a failure of type j at time t_{ji}, and $R(t_{ji})$ is the risk set at time t_{ji}, that is, the set of bonds still alive immediately prior to t_{ji} (Rouah (2006)).

For each explanatory variable, the proportional hazard model produces a hazard ratio (HR), which represents the percentage change in the hazard rate of the bond brought on by a one unit increase in the value of the regressor. When HR > 1, the variable increases the hazard (decreases survival), and the opposite holds for HR < 1. Hazard ratios can be defined for both binary as well as continuous predictor variables.[26]

Finally, the cumulative hazard function (CHF) represents the probability that a bond suffers the event of interest within a given time horizon and can be defined as follows:

$$F_j(t) = \text{Prob}(\tau \leq t, J=j) = \int_0^t \lambda_j(s)S(s)ds$$

Estimation Results

In Table 8, I present estimation results for the proportional hazard model for both sample periods with downgrades as the termination event of interest. The large and significant likelihood ratio $\chi 2$ statistics on all regressions suggest the proportional hazard model fits the data well. For the period prior to deregulation, the coefficient on the explanatory variable *[High Reputation]* is negative and statistically significant at the 5% level and reports a HR of 0.76. This means that at any given time, a bond sponsored by a top tier underwriter is 0.76 times more likely to experience a credit rating downgrade during the next instantaneous time interval than a bond sponsored by a less reputable bank. This is consistent with my previous results and the existing literature that validates the certification hypothesis before deregulation.

Regarding other explanatory variables prior to GLBA, the coefficients on *[# Leads]* and *[Clawback]* are positive and statistically significant at the 1% level and report a HR of 2.28 and 1.75, respectively. This indicates that at any given time, a bond with clawback provision and more

[26] In particular, suppose that $\gamma_{i\,j}$ is the coefficient for variable i acting on failure type j. For a binary variable, the hazard ratio is defined as $HR = \frac{\exp(\beta_{ij}\times 1)}{\exp(\beta_{ij}\times 0)} = \exp(\beta_{ij})$, so HR represents the change in hazard brought on by the presence of the variable. For a continuous variable, $HR = \frac{\exp(\beta_{ij}Z_k)}{\exp(\beta_{ij}Z_m)} = \exp(\beta_{ij}[Z_k - Z_m])$ so that $HR = \exp(\beta_{ij})$ represents the change in hazard brought on by a one-unit increase in the variable ($[Z_k - Z_m] = 1$). In both cases, the values of the remaining variables are held constant.

than one lead underwriter is 1.75 and 2.28 times, respectively, as likely to experience a credit rating downgrade during the next instantaneous time interval than a bond without these features.

For the period post GLBA, the coefficient on *[High Reputation]* becomes positive and statistically significant at the 5% level and exhibits a HR of 1.26. This indicates that at any given time, bonds sponsored by top tier underwriters are more likely to be downgraded compared to bonds sponsored by less reputable banks. This result is in line with the multinomial logistic analysis and corroborates the evidence of a deviation from the certification hypothesis post GLBA. Control variables exhibit the same qualitative behavior as in the multinomial logistic analysis.

In Table 9, I present estimation results with upgrades as the termination event of interest. For the period before GLBA, the coefficient on *[High Reputation]* becomes positive and statistically significant at the 5% level and exhibits a HR of 1.51. This indicates that at any given time, bonds sponsored by top tier underwriters are 1.5 times more likely to be upgraded compared to bonds sponsored by less reputable banks. For the period post GLBA, however, the coefficient on *[High Reputation]* becomes negative and statistically significant at the 5% level and exhibits a HR of 0.85. This finding suggests the potential for richer dynamics operating between large lead underwriters and credit rating agencies for the period post enactment of GLBA and before the recent crisis. As discussed before, the increase in rating variability coming from downgrades but not upgrades suggests the possibility that initial ratings on bonds sponsored by top tier underwriters were upward biased post GLBA.

Finally, a key benefit of hazard models is the estimation of cumulative hazard functions (CHF). Figure 1 reports CHFs for each sub-sample conditional on a bond being sponsored by a reputable underwriter as well as the CHF when a bond is sponsored by a less reputable bank. While bonds underwritten by high reputation underwriters before deregulation exhibit a lower (higher) propensity of downgrades (upgrades) over their lives, the opposite applies post GLBA. Overall, the inversion of CHFs for different reputation cohorts post GLBA relative to prior to GLBA is a nice graphical representation of a deviation from the certification hypothesis.

6. Does the Market Punish Underwriters for their Poorer Due-Diligence? Evidence from At-issue Yields.

Results suggest a negative and non-negligible effect of deregulation on the screening incentives of dominant underwriters. In light of this evidence, standard theory on reputation states that bad security performance damages the reputation of the underwriter by negatively affecting its credibility to certify issuer quality. Thus, ceteris paribus, a loss of underwriter credibility should lead to an increase in issuers' informational costs in the form of higher at issue yields. This is the hypothesis to be tested in this section.

Following standard literature (Puri (1996), Gande et al. (1999), Fang (2005)), I use at issue yields to measure the degree of underwriter credibility to certify issue quality in the US high yield bond segment. Based on this measure, I document whether the GLBA had any impact on the market perception of prestigious underwriters' credibility to certify quality. In particular, I study whether poor screening is costly for underwriters and how this cost varies in the cross-section of institutions and over time.

Unlike the standard empirical literature on financial intermediary reputation, I do not assume that the reputation-based disciplining mechanism is effective but instead I test whether loss of reputation has consequences. I use shocks to a lead underwriter reputation, namely, the post-issue credit rating variability of its sponsored securities to study the effect of such shocks on a lead underwriter's subsequent offer yields. After accounting for issuer-underwriter matching, top tier underwriters achieve on average lower at-issue yields. However, following poor screening, market punishment through higher yields is confined to low reputation institutions. Results then highlight important limitations of reputation based disciplining mechanisms.

6.1 Role of Underwriter Reputation in Security Pricing

In this first approach, I follow Fang (2005) and assume that the reputation based-disciplining mechanism is effective. That is, after accounting for issuer-underwriter matching and controlling for initial ratings and other issue characteristics, if reputable underwriters obtain lower yields for their issuers, this should be interpreted as reputable institutions providing higher quality underwriting services.

Econometric Model

In order to capture the impact of GLBA (if any) on my bond pricing equation, I estimate different specifications of a pooled OLS regression model. To minimize the effect of omitted variable bias and thus measure the effect of top tier underwriters on at issue yields as accurately as possible, I control for several measures proven in the literature to have an impact on at issue yields. Following Fang (2005), I include the inverse Mills ratio to correct for the endogenous nature of the issuer-underwriter matching. The dependent variable Y_i represents bond *i*'s at issue yield to maturity:

$$Y_i = \delta_0 + \delta_1 \, GLBA_i + \beta' X_i + \Pi'(GLBA{*}X_i) + \gamma \, mills + \alpha_i + u_i + \varepsilon_i$$

with,

$$\beta' X_i = \beta_1 (\text{High Reputation})_i + \beta_2 (\text{Ba})_i + \beta_3 (\text{B})_i + \beta_4 (\text{ Split Rating})_i + \beta_5 (\text{Maturity})_i + \beta_6 (\text{Issue Proceeds})_i + \beta_7 (\text{Public})_i + \beta_8 (\text{\# Leads})_i + \beta_9 (\text{Redeemable})_i + \beta_{10} (\text{Clawback})_i + \beta_{11} (\text{Rule 144A})_i + \beta_{12} (\text{Shelf. Registration})_i$$

and where before and after GLBA can be expressed as follows,

$$E\,[Y_i \mid X_i\,, GLBA = 0] = \delta_0 + \beta' X_i + \gamma \, mills_i$$

$$E\,[Y_i \mid X_i\,, GLBA = 1] = \delta_0 + \delta_1 + (\beta + \Pi)' X_i + \gamma \, mills_i$$

Because at issue yields can depend on unobserved industry characteristics as well as time trends, I include industry fixed effects (α_i) and year fixed effects (u_i) in the regression. In all specifications, the standard errors are robust to heteroskedasticity. Although I pool two samples from different periods, my methodology continues to be purely cross-sectional in nature. In the next section, I follow a time series approach to analyze the effect of poor due-diligence in period $t-1$ on bonds' at issue yields at period t while controlling for underwriter reputation. In any case, the results presented here provide interesting insights about the role of reputation in security pricing.

Estimation Results

Table 12 presents estimation results for the second-stage yield equations. In specification (1), I run a pooled OLS regression with *[High Reputation]* as the only explanatory variable for a bond's at issue yield to maturity. In specification (2), I re-run the pooled OLS regression but also controlling for the measures used in Fang (2005) for the pricing equation. Finally, specification (3) controls for other measures known in the literature to have a meaningful impact on bonds' at issue yields.

The coefficients on *[High Reputation]* in all three specifications are negative and statistically significant at the 1% level for the periods before and after GLBA. Consistent with my hypothesis and in line with Fang (2005), I find for the period prior to deregulation top tier underwriters to be associated with a reduction in at issue yields. However, a striking result is that the increase in at issue yields predicted by the theory as result of poor due-diligence post GLBA is absent for securities underwritten by high reputation institutions. These results are consistent with recent findings for the syndicated loan market (Gopalan et al. (2011)). In the next section, I do not assume that the reputation based disciplining mechanism works but rather test its functionality.

Regarding the coefficients on the control variables, results are in line with existing literature. Coefficients on initial credit ratings are negative and statistically significant at the 1% level in both specifications ((2) and (3)) and for both time periods (before and after GLBA). Moreover, the more negative coefficient the higher the rating cohort is in line with higher credit quality improvements reducing yields more steeply[27]. These results are consistent with Fang (2005), Livingston et al. (2010) and the bond pricing literature in general. The coefficients on *[Maturity]* are negative and statistically significant at the 1% level as in Helwege et al. (1999) and Andres et al. (2013) which also focus on the high yield bond market. The positive and significant coefficient on *[Issue Proceeds]* may be indicative of higher refinancing risks. The positive and significant coefficients on *[Clawback]* (before GLBA) and *[Redeemable]* (post GLBA) are in line with Daniels (2009) that reports higher yields associated with these bond features relative to straight bonds. The negative and significant coefficient on *[Rule 144 A]* before GLBA is in line with Livingston et al. (2002) that find these issues to have higher yields than publicly issued bonds. The coefficient on *[# Leads]* is negative and significant at the 10% and 1% level of significance before and after GLBA, respectively, and suggests that investors believe in more effective certification when more underwriters' reputations are at stake (Song (2003)). The coefficient on *[Public]* is negative and significant at the 1% level post GLBA consistent with less opacity and more accurate certification relative to private firms. Finally, the coefficient on *[Split-rating]* is not significant for both time periods as in Livingston et al. (2010) regarding the high yield segment.

Interestingly, these findings suggest that credit ratings are not sufficient statistics in yield determination. The fact that after controlling for initial credit ratings, the coefficients on *[High Reputation]* and *[Mills]* are statistically significant indicates that investors perceive that underwriters have information beyond that possessed by the rating agencies.

6.2 Testing the Reputation Mechanism: Effects of Poor Screening on At-issue Yields

In this section, unlike the standard empirical literature on financial intermediary reputation, I do not assume that the reputation based disciplining mechanism is effective but instead I test whether loss of reputation has consequences (Gopalan et al. (2010)). I use shocks to a lead underwriter reputation, namely, the post-issue credit rating variability of its sponsored securities -a proxy for

[27] The excluded category is issues rated Caa or below. Therefore, each rating shown in the regression is an improvement, consistent with the negative coefficients on the rating variables.

poor due-diligence- to study the effect of such shocks on a lead underwriter's subsequent offer yields.

The key independent variable that I employ in my baseline analysis is *[Large Rating Variability]*, a dummy variable that identifies lead underwriters that have various bonds outstanding that experience their first credit rating change during the year. I construct the measure of poor screening as follows. I code *[Large Rating Variability $_{j,t}$]* equal to one if the total number of bonds sponsored by underwriter *j* that suffer a first credit rating change during year *t* exceeds 25% of the bonds sponsored by lead underwriter *j* in the previous year. In my regressions, I use lagged values of *[Large Rating Variability]* as my main independent variable. The 25% cutoff is designed to allow for some expected level of post-issue credit rating changes that are unlikely to hurt a lead underwriter's reputation. This is consistent with existing literature on reputation that predicts discontinuous responses to poor performance (Diamond (1989b)).[28]

Econometric Model

I extend my multivariate analysis by examining how increased credit rating variability, a proxy for a lead underwriter's poor screening, affects the at-issue yields of bonds sponsored by the lead underwriter in the subsequent year. As noted, the reputation hypothesis predicts an increase in at issue yields following large credit rating variability. To test this prediction, I estimate regressions that are variants of the following forms,

$$Y_i = \delta_0 + \delta_1 \text{ Large Rating Variability}_{j,t-1} + \beta' X_i + \Pi' X_j + \phi' X_l + \gamma \text{ mills} + \alpha_i + u_i + \varepsilon_i$$

where subscript *i* denotes the bond, subscripts *l* and *j* denote the borrower and the lead underwriter, respectively, and subscript *t* denotes the year in which the bond is issued. I include industry (u_i) and year fixed effects (u_t) and the standard errors are robust to heteroskedasticity. The results of my estimation are presented in Table 13.

Estimation Results

The positive and significant coefficient on *[Large Rating Var $_{t-1}$]* in specifications (1) through (3) indicates that, ceteris paribus, lead underwriters that experience large rating changes in their sponsored securities exhibit higher at-issue yields in the bonds they arrange in the subsequent year.

[28] Gopalan et al. (2010) uses a 10% cutoff where their underlying measure is based on bankruptcies, an event less likely to occur compared to a credit rating change.

This result is consistent with the reputation hypothesis. The sign and significance of coefficients on the control variables are all in line with those discussed for Table 12.

In specification (4) of Table 13, I investigate whether the effect of increased credit rating variability on at-issue yields varies with the lead underwriter's reputation. To do so, I estimate the regression model after replacing *[Large Rating Var $_{t-1}$]* with two interaction terms, namely, *[Large Rating Var $_{t-1}$]* x *[High Reputation]* and *[Large Rating Var $_{t-1}$]* x{1- *[High Reputation]}*. The empirical specification and other control variables are the same as in specification (3).

As can be seen from specification (4), the increase in at-issue yields following increased credit rating variability is essentially confined to low reputation underwriters. Namely, only the coefficient on *[Large Rating Var $_{t-1}$]* x{1- *[High Reputation]}* is positive and significant. In Table 14, I report regression results for different cut-offs of *[Large Rating Var $_{t-1}$]*. In specification (1), I use the 10% cut-off as in Gopalan et al. (2011) and coefficients by reputation cohort do not yield meaningful economic results. As discussed before, this result is consistent with existing literature on reputation that predicts discontinuous responses to poor performance.[29] Specifications (3) and (4) report regression results for 50% and 75% cut-offs. Interestingly, for extreme credit rating variability, the market punishes both low and high reputation institutions through higher at issue yields. Table 15 reports robustness checks using top 5 underwriters as the reputation measure. Results are not conclusive under this specification and therefore merit further analysis.

The above evidence therefore indicates limitations related to the reputation mechanism. In this regard, my proposed theoretical framework offers a plausible explanation and suggests that the lack of punishment except for events of extreme credit rating variability may respond to strong priors about the reputation of top tier underwriters. That is, priors about extreme reputation levels, poor or high, are hard to change. Alternatively, results could indicate the exercise of market power by large lead underwriters that account for roughly 70% of the US corporate bond market. The market power hypothesis, as defined in Chemmanur et al. (2012), postulates that high reputation underwriters are able to attract a greater number of market participants (institutional investors, analysts, co-managing underwriters) thereby yielding higher security valuations by increasing the heterogeneity in investors' beliefs. These are two avenues that I intend to explore further in future work.

[29] For comparison purposes, specification (2) is the same as specification (4) in Table 1.13 for the 25% cut-off.

7. Conclusion

Unlike the standard reputation literature, which is focused on reputation incentives for a single agent living in a state-invariant environment, I propose a model that explicitly incorporates a cross-section of underwriters in an environment that evolves stochastically. In particular, I assume that underwriters' temptation to perform sloppy due-diligence varies monotonically with a stochastic aggregate fundamental. This more realistic environment allows me to study the interplay between underwriters' reputation incentives and economic conditions when determining the aggregate behavior of a given reputation cohort.

Then, I use the high yield bond market as a testing ground to examine the effect of deregulation of the US market for underwriting services on the effectiveness of the reputation-based disciplining mechanism of financial intermediaries -the so called certification hypothesis-. My empirical strategy studies the relationship between the underwriter reputation and the ex-post credit rating performance of bonds issued before and after the enactment of GLBA. In addition, I study whether any deviations from the certification hypothesis are properly punished by market participants. My empirical strategy is similar to that of papers such as Fang (2005) and Andres et al. (2013) but my focus and key findings are very different from these studies which have little to say about the effect of deregulation on the risk-taking behavior of prestigious underwriters.

Consistent with existing literature (Fang (2005)), my findings support the certification hypothesis prior to GLBA. However, for the period post GLBA, I document a deviation from this hypothesis with bonds sponsored by reputable banks exhibiting a higher likelihood of credit rating variability when compared to less reputable institutions. These findings fit my proposed theoretical framework and therefore highlight the role of economic fundamentals on reputation fragility and clustering of behavior within and among reputation cohorts.

Another striking finding of the paper, consistent with Gopalan et al. (2011) for the syndicated loan market, is that high reputation underwriters do not suffer reputation related costs despite the evidence of poor due diligence post GLBA. Hence, results suggest important limitations of reputation-based disciplining mechanisms. Again, my theoretical model offers a plausible explanation and suggests in spite of poor due-diligence, extreme reputations are hard to change due to strong priors. In a separate paper, I explore this issue further and study the effect of bond performance on underwriter reputation not only in the cross section but also in the time series.

My work highlights the potential for richer dynamics operating between ratings agencies and large lead underwriters. In particular, I discuss briefly a set of possibilities: rating bias, underwriters having better information than rating agencies and a scenario of implicit collusion between large lead underwriters and rating agencies. Even some combination of these alternatives cannot be disregarded. Indeed, this is another research area with promising prospects.

My paper also has policy implications. In light of the Great Recession which for many meant tangible proof of the failure of Basel II, regulators are currently debating whether financial markets should move to an era of greater or lesser regulation. Although this paper does not tell us much about whether more or less regulation is better, it does provide some interesting insights about the interplays of regulation and reputation based discipline mechanisms that may prove useful for regulators when designing their policies.

The findings in my paper then raise several related questions: Should regulators take any additional steps when de-regulating markets where the distribution of reputation is biased towards high reputation institutions? If poor performance by large and dominant underwriters is not punished by market participants, then what disciplines their behavior? Do large underwriters exhibit a broader margin for risk-taking compared to their less reputable competitors which are more sensitive to the risk of loss of reputation? (Literature on learning). These are all natural extensions for future research that may shed additional insights on the role of reputation in financial market stability.

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The Model

3.1 Description and **3.2 Timing** were described in full in Section 3.

3.3 Reputation Updating. When updating a continuing underwriter's reputation from ϕ_t to ϕ_{t+1}, investors have a belief about how strategic underwriters behaved which they infer from the aggregate realized performance of securities of underwriters with the same reputation. Let $C_t(\phi_t, \hat{x}_t)$ denote the aggregate rate of credit rating changes of securities from underwriters ϕ_t at period t, where $\hat{x}(\phi_t, \Theta_t)$ is the fraction of strategic underwriters ϕ_t that performed poor due-diligence at t, given fundamentals Θ_t:

$$C_t(\phi_t, \hat{x}_t) = [(1 - p_r)\hat{x}_t + (1 - p_s)(1 - \hat{x}_t)]\phi_t + (1 - p_r)(1 - \phi_t)$$

From the above, investors can infer $\hat{x}(\phi_t, \Theta_t)$ and update the reputation of a single continuing underwriter using Bayes' rule equation:

$$P_r(S|c) = \phi_{t+1}(\phi_t, \hat{x}_t) = \frac{[p_r\hat{x}_t + p_s(1 - \hat{x}_t)]\phi_t}{1 - C_t(\phi_t, \hat{x}_t)}$$

Reputation is non-decreasing in age (continuation) and reputation increases less when many similar underwriters die. This is why a high aggregate rate of rating variability is not good news for surviving underwriters, since continuation is not assigned due to high quality due-diligence but to luck. Note that, for $\phi_t \in (0, 1)$, ϕ_{t+1}=ϕ_t when $\hat{x}_t$ = 1 and $\phi_{t+1} > \phi_t$ when $\hat{x}_t < 1$, with the gap ϕ_{t+1}- ϕ_t increasing as $\hat{x}_t$ goes to 0.

Graphically, underwriters' reputation evolves as in Figure 2. Reputation priors ϕ_t are represented on the horizontal axis and reputation posteriors ϕ_{t+1} are on the vertical axis. For any prior ϕ_t, the following is true:

- Reputation changes less when more strategic underwriters of the same reputation take risks. If investors infer that no strategic underwriter perform poor due-diligence (namely, if $\hat{x}_t$ = 0), then the gap ϕ_{t+1} - ϕ_t represents the gains to the firm, in terms of reputation, from continuing. On the contrary, if investors infer that all strategic underwriters carry out sloppy due-diligence (if $\hat{x}_t$ = 1), then ϕ_{t+1}=ϕ_t and underwriters do not gain, in terms of reputation, from continuing.

- Reputation changes more for underwriters with intermediate reputation. This implies that regardless of $\hat{x}_t$, updating is weaker when priors are stronger (when close to ϕ_t= 0 or ϕ_t= 1).

3.4 A Single Period Version. I introduce a series of simplifying assumptions to highlight the essence of reputational multiplicity and the role of imperfect information in selecting a unique equilibrium. I assume a single period. Underwriters start with a given reputation ϕ_t and investors apply an exogenous discount rate R(ϕ) for the issue (with R(ϕ)'<0). The timing described before applies. At the end of the period, investors observe aggregate credit variability and update the reputation of continuing underwriters up to ϕ'. Finally, an exogenous continuation value V(ϕ') (with V(ϕ') >0) is transferred to each continuing underwriter. Ordonez (2013) relaxes these simplifications, endogenizing discount rates and repeating the game a large number of periods to endogenize continuation values and shows that the properties assumed here hold in equilibrium.

To eliminate equilibria that require an implausible degree of coordination between the underwriter's behavior and its beliefs about other underwriters' behavior, I restrict attention to Markovian strategies, such that x(ϕ, Θ) is the probability that an underwriter with reputation ϕ that observes fundamentals Θ performs poor due-diligence.

Given the monotonicity of payoffs on Θ, I focus on equilibria in cutoff strategies, in which an underwriter with reputation ϕ decides to sponsor issues with poor due-diligence if fundamentals are below a certain cutoff point, K(ϕ), and to choose safe issues if fundamentals are above that cutoff:

$$x(\phi,\Theta) = \begin{cases} 0 & \text{if} \quad \Theta > k(\phi) \\ 1 & \text{if} \quad \Theta < k(\phi) \end{cases}$$

Definition 1. A Markov perfect equilibrium in cutoff strategies consists of a (symmetric) strategy for the underwriters $k(\phi) = \Theta^*(\phi)$: [0, 1] → R and posteriors $\phi'(\phi, \hat{x})$: [0, 1] x [0, 1] → [0, 1], for all $\phi \in$ [0, 1], such that the following statements hold,

- *The equality $k(\phi) = \Theta^*(\phi)$ defines the $x^*(\phi,\Theta) \in \arg\max_{x \in [0,1]} U(\phi,\Theta,x \mid \hat{x})$ for all Θ, with* $U(\phi,\Theta,x \mid \hat{x}) = (1-x)\, p_s\, [1/R(\phi) - K + \Theta + \beta V(\phi'(\phi,\hat{x}))] + x\, p_r\, [\frac{1}{R(\phi)} - K + \beta\, V(\phi'(\phi,\hat{x}))]$

- *The posterior $\phi'(\phi, \hat{x})$ is obtained using Bayes' rule, where $\hat{x}(\phi, \Theta) = x^*(\phi, \Theta)$ for all Θ, and is the updating rule that investors must use if their beliefs are to be correct $(C(\phi, x^*))$.*

Now, I discuss properties of the underwriters' differential gains from sponsoring safe issues relative to risky issues, which characterize each underwriter's decisions. Then, I show how these properties interact with underwriters' beliefs about other underwriters' actions to create multiple equilibria.

Define by $\Delta(\phi,\Theta|\hat{x}) = U(\phi,\Theta,x=0|\hat{x}) - U(\phi,\Theta,x=1|\hat{x})$ the differential gains to underwriters from sponsoring safe issues relative to risky issues when an underwriter with reputation ϕ observes a fundamental Θ, conditional on beliefs $\hat{x}(\phi,\Theta)$. An underwriter chooses safe issues if $\Delta(\phi,\Theta|\hat{x}) > 0$ and risky issues if $\Delta(\phi,\Theta|\hat{x}) < 0$:

$$\Delta(\phi,\Theta|\hat{x}) = (p_s - p_r)\Big[\underbrace{1/R(\phi) - K}_{\text{Short-Term}} + \underbrace{\frac{p_s}{p_s - p_r}\Theta}_{\text{MH}} + \underbrace{\beta V(\phi)}_{\text{Cont}} + \underbrace{\beta\big[V(\phi'(\phi,\hat{x})) - V(\phi)\big]}_{\text{Reputation Formation}}\Big]$$

- "Short term" captures the differential gains from choosing safe issues.
- MH (moral hazard) captures the relative temptation to take risks. Only term depending on Θ.[30]
- "Cont." captures that taking safe issues increases the prob. of the underwriter's continuation, whose value depends on ϕ.
- "Reputation formation" captures that taking safe issues increases the probability of reputation improvement from ϕ to ϕ'.

3.5 Multiple equilibria with complete information. Before discussing multiplicity of equilibria, I identify ranges of fundamentals for which, regardless of other underwriters' actions, an underwriter chooses poorly screened issues (fundamentals below a lower bound $\underline{\Theta}$) or high quality issues (fundamentals above an upper bound $\overline{\Theta}$):

- For each ϕ, there is a lower bound $\underline{\Theta}(\phi)$ such that $\Delta(\phi,\Theta|\hat{x} = 0) = 0$

[30] Poor screening is less tempting as fundamentals increase, $\frac{\partial\Delta(\phi,\Theta|\hat{x})}{\partial\Theta} = p_s > 0$

- For each ϕ, there is an upper bound $\overline{\Theta}$ (ϕ) such that $\Delta(\phi,\theta|\hat{x}=1)=0$

Then, in this single period version of the model,

$$\underline{\Theta}(\phi) = -\frac{p_s - p_r}{p_s}\left[\frac{1}{R(\phi)} - K + \beta V(\phi'(\phi,\hat{x}=0))\right]$$

$$\overline{\Theta}(\phi) = -\frac{p_s - p_r}{p_s}\left[\frac{1}{R(\phi)} - K + \beta V(\phi)\right]$$

The gap $\overline{\Theta}(\phi) - \underline{\Theta}(\phi) = \beta\left(\frac{p_s-p_r}{p_s}\right)[V(\phi'(\phi,\hat{x}=0)) - V(\phi)] \geq 0$ (equals zero for ϕ=0 and ϕ=1) and achieves the maximum at the intermediate reputation level ϕ_M .

Proposition 1. Multiplicity in a single period model. For all reputation levels $\phi \in (0,1)$, all $\Theta \in [\underline{\Theta}(\phi), \overline{\Theta}(\phi)]$ are equilibrium strategy cutoffs $\Theta^*(\phi)$. Only for reputation levels $\phi = 0$ and $\phi = 1$, there is a unique equilibrium cutoff, $\Theta^*(0)$ and $\Theta^*(1)$, respectively.

Figure 3 provides a graphical intuition of multiplicity. Consider a particular cutoff $\Theta^*(\phi)$ for poor due-diligence for some underwriter with reputation $\phi \in (0, 1)$, such that $\Theta^*(\phi) \in [\underline{\Theta}(\phi), \overline{\Theta}(\phi)]$. Then, the equilibrium differential gain $\Delta(\phi, \Theta|x^*)$ for different levels of fundamentals is the bold function with a discrete jump at $\Theta^*(\phi)$. This is an equilibrium because it is a best response for any realization of the fundamental Θ such that underwriters' beliefs about other underwriters' actions are correct. Playing it safe (high quality due-diligence) is optimal for all $\Theta \geq \Theta^*(\phi)$ (since $\Delta(\phi, \Theta|x^*=0)\geq 0$ for all $\Theta \geq \Theta^*(\phi)$) and performing poor due-diligence is optimal for all $\Theta \leq \Theta^*(\phi)$ (since $\Delta(\phi, \Theta|x^*=1)\leq 0$ for all $\Theta \leq \Theta^*(\phi)$). In sum, for a fundamental to be a cutoff in equilibrium, three equilibria has to coexist at exactly that cutoff. Since the difference of payoffs between the two extremes is strictly positive, a continuum of fundamentals fulfills this condition.

3.6 A unique equilibrium with incomplete information. I modify the assumption that information about fundamentals is complete and assume instead that underwriters observe a private noisy signal about the fundamental before deciding whether to carry out high or low quality due-diligence. This noise, when small, leads to the selection of a unique equilibrium. What creates the multiplicity is the strategic complementarity across underwriters, which works through investors beliefs. With complete information, each equilibrium is sustained by different fulfilling expectations about what other underwriters do, hence in equilibrium underwriters can perfectly forecast each other's actions and coordinate on multiple courses of action. With incomplete information, however, private signals serve as an anchor for underwriter's actions that avoid the indeterminacy of expectations about other underwriters' actions and hence avoid the indeterminacy of beliefs investors will use to update reputation.

Assumption 2. Each firm i observes a signal about economic fundamentals $z_i = \Theta + \varepsilon_i$, which is identically and independently distributed across i. The noise $\varepsilon_i \sim N(0, \sigma^2)$ is unbiased and has a variance $\sigma^2 = \frac{1}{\gamma}$.

Signals are useful not only to infer Θ, but also to infer other underwriters' actions and the aggregate credit rating variability investors will use to update reputation. Given this incomplete information structure, the underwriter uses a cutoff strategy over the set of signals rather than over the set of fundamentals. For a current signal z_i, a strategy of an underwriter ϕ is a real number $k_z(\phi)$ such that the underwriter uses safe technologies $(x(\phi, z_i) = 0)$ for $z_i > k_z(\phi)$ and risky ones $(x(\phi, z_i) = 1)$ for $z_i < k_z(\phi)$. The strategic poor screening that investors infer from aggregate credit rating variability $(\hat{x}(\phi, \Theta))$ still depends on the fundamental. Underwriters use their signal z_i to take expectations about $\hat{x}(\phi, \Theta)$. Given this incomplete information structure, when signals are precise enough $(\sigma \to 0)$, there exists a unique Markovian equilibrium in monotone cutoff strategies for each reputation level ϕ.

Proposition 2. Uniqueness in a single period model. For a given ϕ, as $\sigma \to 0$, there exists a unique cutoff signal $k_z(\phi) = z^*(\phi)$ in equilibrium such that $\Delta(\phi, z|z^*) = 0$ for $z = z^*(\phi)$, $\Delta(\phi, z|z^*) > 0$ for $z > z^*(\phi)$, and $\Delta(\phi, z|z^*) < 0$ for $z < z^*(\phi)$, where $z^*(\phi)$ is given by,

$$z^*(\phi) = -\frac{p_s - p_r}{p_s}\left[\frac{1}{R(\phi)} - K + \beta V(\phi'(\phi, \hat{x} = 0.5))\right]$$

Proof of Proposition 2 is provided in the Mathematical Appendix. Intuitively, I relax the assumption of complete information about fundamentals and use the approach provided by global games to select a unique equilibrium by iterated deletion of dominated strategies. For example, assume that a strategic underwriter ϕ uses a cutoff strategy $k_z(\phi) = \underline{\Theta}(\phi)$, which is an equilibrium sustained by $\hat{x} = 0$ under complete information. If signals are very precise, it means that an underwriter that observes $z_i = \underline{\Theta}(\phi)$ believes that around 50% of other strategic underwriters ϕ that use the same cutoff observe a signal below $\underline{\Theta}$ (ϕ) and will decide to take risky issues.[31] Since there is a continuum of underwriters with reputation ϕ, investors will observe 50% of the underwriters taking risks and will update reputation using $\hat{x} = 0.5$. However, with updating based on $\hat{x} = 0.5$, the underwriters would not be indifferent between risky and safe issues at $\underline{\Theta}$ (ϕ), strictly preferring to sponsor risky issues. Then, the only cutoff in equilibrium is the signal at which an underwriter is indifferent between taking safe and risky issues when the expected fraction of underwriters performing poor due diligence that investors use to update beliefs is $\hat{x} = 0.5$ as in Proposition 2. Then, fundamentals not only affect screening incentives but also become a coordination device.

3.7 Fragility of reputation concerns. First, I use the unique equilibrium from Proposition 2 to show how reputation concerns impose discipline and reduce the temptation for poor screening. Then, I show how this discipline is fragile and can suddenly break-down due to changes in economic fundamentals. Finally, when discipline collapses, it does for a range of underwriters with intermediate and good reputation and generates a clustering of risk-taking.

Reputation imposes discipline. A better reputation for an underwriter implies a lower ex-ante probability of poor screening, hence the underwriter achieves higher gross spreads and enjoys higher continuation values. Proof of the following proposition is provided in the Appendix.

Proposition 3. Define $\tilde{z}^*(\phi)$ as the cutoffs for poor due-diligence when reputation is not a concern (when reputation cannot change). Reputation concerns reduce the ex-ante probability of poor due-diligence ($z^*(\phi) < \tilde{z}^*(\phi)$) for all $\phi \in (0, 1)$ and do not change it ($z^*(\phi) = \tilde{z}^*(\phi)$) for $\phi = \{0, 1\}$.

Reputational discipline is fragile. The existence of reputation concerns may suddenly collapse due to changes in fundamentals. Lemma 1 shows that the concerns for reputation formation convexifies the schedule of cutoffs.

Lemma 1. Reputation concerns convexify the schedule of cutoffs, namely, $\frac{d^2 z^*(\phi)}{d^2\phi} > \frac{d^2\, \tilde{z}^*(\phi)}{d^2\phi}$ for all $\phi \in [0, 1]$, where $\tilde{z}^*(\phi)$ are the cutoffs without reputation concerns. Furthermore, there are always

[31] As in Morris et al. (2001), these are Laplacian beliefs, following Laplace's (1824) suggestion that one should apply a uniform prior to unknown events from the principle of insufficient reason.

signals about the underwriter's type that are precise enough ($\frac{p_s}{p_r}$ high enough) such that the schedule of cutoffs is strictly convex (namely, $\frac{d^2 z^*(\phi)}{d^2\phi} > 0$) for all ϕ.

The proof of Lemma 1 is given in Ordonez (2013) but I use the author's graphical representation, Figure 4, to provide intuition. Assume, for example, that without reputation concerns, the schedule of cutoffs $\tilde{z}^*(\phi)$ is linear in ϕ. From Proposition 3, reputation concerns reduce the temptation for poor screening (namely, reduce cutoffs from $\tilde{z}^*(\phi)$ to $z^*(\phi)$ for all ϕ). However, the strength of this force is not the same across reputation levels and depends on reputation formation incentives. In particular, underwriters with reputation $\phi = 0$ cannot change their reputation, which implies that the cutoff for poor due-diligence is the same with and without reputation concerns ($z^*(0) = \tilde{z}^*(0)$). For higher levels of ϕ, underwriters have higher concerns for reputation formation, which rapidly reduces cutoffs. This effect achieves its maximum at ϕ_M, where reputation changes the most. At the other extreme, ϕ=1, reputation cannot improve any further, so the cutoff is the same with and without reputation concerns. Still, high reputation underwriters with ($\phi = 1$) care about maintaining their reputation and this is why $z^*(1) < z^*(0)$.

Proposition 4. Fragility and clustering of risk taking. For highly precise signals about fundamentals ($\sigma \to 0$), the following statements hold when the reputational distribution is held fixed:

(i) *Reputation is fragile at an underwriter level. Small deteriorations in fundamentals (Θ_1 and Θ_2 such that Θ_1 - Θ_2 is arbitrarily small, $\Theta_1 > z^*(\phi)$ and $\Theta_2 < z^*(\phi)$) induce sudden risk-taking ($x(\phi, \Theta_1) = 0$ to $x(\phi, \Theta_2) = 1$). This change is clustered among all underwriters with the same reputation level ϕ.*

(ii) *Reputation is fragile at an aggregate level. As fundamentals Θ decline, underwriters in an increasingly large range of reputation levels perform poor due-diligence.*

Part (i) of Proposition 4 is a result from global games. The equilibrium selection leads to a clustering of poor screening among underwriters with the same reputation level. Part (ii) of the proposition is a corollary of Lemma 1 for a given distribution of reputation cohorts. As shown in Figure 5, when fundamentals are strong enough (high Θ), small variations do not induce underwriters of different reputations to modify their behavior. However, when fundamentals are weak enough (low Θ), small changes can induce underwriters of different reputation cohorts to perform poor screening.

Table 1: Summary Statistics for Top 15 Underwriters

This table presents summary statistics for the top 15 bond underwriters in terms of market share for the periods before and after GLBA for the US corporate bond market. The variable total amount is the total corporate bond underwriting volume for the institution during the period. Each underwriter is given full credit for the deal. The variable total issues is the total number of issues underwritten by each bank for the same time period. The market share variable is computed by dividing each underwriter's underwriting volume (amount or frequency) by the corresponding market total. The average fee is the average gross spread (as a percentage of the issue amount) charged by each bank over the sample period. Data before GLBA is constructed using Fang (2005) data. For the period after GLBA (2000-2008), data is from Bloomberg League Tables. In all cases, we exclude self-led issues.

Before GLBA (1993-2000)

Rank	Underwriter	Total Amount USD (Mln)	Total Issues	Market Share in Amount (%)	Market Share in Issues (%)	Average Fee (%)
1	Goldman Sachs	168,651	797	20.0	18.0	0.85
2	Merrill Lynch	130,868	660	16.0	15.0	0.95
3	Morgan Stanley	120,510	611	14.0	14.0	0.91
4	Salomon	90,341	507	11.0	11.0	0.87
5	Credit Suisse FB	73,801	486	9.0	8.0	0.92
6	Lehman Brothers	55,156	283	7.0	6.0	0.94
7	JP Morgan	52,045	299	6.0	7.0	0.73
8	DLJ	33,369	171	4.0	4.0	2.23
9	Chase Security	23,167	141	3.0	3.0	0.83
10	Bear Stearns	20,134	98	2.0	2.0	1.42
11	Bankers Trust	7,562	42	1.0	1.0	2.46
12	Kidder Peabody	7,494	52	1.0	1.0	1.18
13	Smith Barney	6,945	35	1.0	1.0	1.44
14	Dillon Read	6,238	42	1.0	1.0	1.49
15	Citi Corp	5,315	48	1.0	1.0	1.70

After GLBA (2000-2008)

Rank	Underwriter	Total Amount USD (Mln)	Total Issues	Market Share in Amount (%)	Market Share in Issues (%)	Average Fee (%)
1	Citi	1,024,535.24	4,508	15.7	6.68	0.79
2	JP Morgan	979,900.07	5,256	15	7.79	0.58
3	Bank of America	556,960.99	12,454	8.5	18.45	0.70
4	Morgan Stanley	556,149.65	6,690	8.5	9.91	0.71
5	Goldman Sachs & Co	502,320.89	2,011	7.7	2.98	0.55
6	Lehman Brothers	497,925.36	2,109	7.6	3.12	0.49
7	Merrill Lynch & Co	497,585.96	3,541	7.6	5.25	0.79
8	Credit Suisse	405,992.72	2,048	6.2	3.03	0.82
9	Deutsche Bank AG	345,224.49	1,793	5.3	2.66	0.63
10	UBS	230,872.50	3,191	3.5	4.73	0.71
11	Barclays	201,256.75	1,059	3.1	1.57	0.48
12	Wachovia Corp	181,910.75	5,939	2.8	8.80	1.05
13	RBS	111,681.33	589	1.7	0.87	0.57
14	HSBC Bank PLC	84,203.65	582	1.3	0.86	0.40
15	BNP Paribas SA	56,632.39	371	0.9	0.55	0.44

Table 2: Issue characteristics and Ex-post Performance by Underwriter Reputation

This table reports means of select firm, issue characteristics and ex-post performance for bonds underwritten by the reputable banks as well as those underwritten by the less reputable banks for each sample period. Regarding bond characteristics, the credit rating variable indicates Moody's initial rating for the bond issue. The highest value of 11 is assigned to a Ba1 rating; other ratings are numerated in decreasing order. The variable Issue Proceeds is the issue proceeds in millions of dollars. The maturity variable is the bond's time to maturity in months. Clawback, Redeemable, Rule 415, Rule 144A and Subordinated are indicator variables that take a value of 1 if the event of interest occurs and a value of zero otherwise. The variable Coupon measures a bond's coupon rate if applicable. The variable # of Underwriters reports the number of lead underwriters for a given issue. Turning to initial credit quality, Ba, B, Caa are indicator variables that take a value of 1 the bond's initial credit rating lies in that particular rating range, and a value of 0 otherwise. Splitrating is also an indicator variable that takes a value of 1 if the initial rating from Moody's differs from that of another rating agency (if bond is rated by only one rating agency, the variable reports a value of zero. In terms of issuer characteristics, the variable Assets reports the issuer's total assets before the issue takes place. The variable Public is an indicator variable that a value of 1 if the issuer is a public firms and a value of 0, otherwise. Given the non-negligible proportion of private firms, it is difficult to report additional firm specific variables without severely reducing the sample size. Finally, regarding bond credit performance, downgrades and upgrades measures for different time horizons take a value of one if the event of interest takes place, and a value of 0 otherwise. Finally, we report differences in means between the two reputation cohorts for both sample periods.

	Full Sample			***Before GLBA (1993-1998)***			***After GLBA (1999-2008)***		
	High Reputation	**Low Reputation**	**Diff. in Means**	**High Reputation**	**Low Reputation**	**Diff. in Means**	**High Reputation**	**Low Reputation**	**Diff. in Means**
Bond Characteristics									
Bond Spread (basis points)	453.03	476.71	-23.68***	370.66	432.20	-61.54***	471.80	510.12	-38.32***
Offer Yield to Maturity	9.21	9.99	-0.79***	9.64	10.27	-0.63***	9.08	9.72	-0.64***
Maturity (months)	110.25	104.82	5.43***	117.71	109.50	8.21***	108.09	100.36	7.73***
Clawback	0.69	0.74	-0.05***	0.60	0.70	-0.11***	0.72	0.77	-0.06***
Redeemable	0.96	0.96	0.00	0.89	0.94	-0.05***	0.97	0.97	0.01
Rule 415	0.13	0.08	0.05***	0.14	0.06	0.08***	0.12	0.10	0.03**
Rule 144A	0.38	0.35	0.03*	0.27	0.31	-0.04	0.41	0.38	0.03
Subordinated	0.41	0.39	0.02	0.51	0.43	0.08***	0.38	0.35	0.02
Issue Proceeds	284.90	188.15	96.75***	208.45	165.90	42.55***	307.05	209.42	97.64***
Coupon	8.96	9.59	-0.63***	9.39	9.86	-0.47***	8.83	9.33	-0.50***
# Leads	1.81	1.12	0.69***	1.06	1.02	0.04***	2.02	1.21	0.81***
Initial Credit Quality									
Ba	0.25	0.16	0.09***	0.23	0.11	0.12***	0.26	0.20	0.05***

Ba1	0.049	0.020	0.028***	0.054	0.016	0.037***	0.047	0.024	0.023***
Ba2	0.082	0.049	0.032***	0.088	0.033	0.054***	0.080	0.065	0.014
Ba3	0.120	0.087	0.033***	0.088	0.060	0.027*	0.129	0.113	0.016
B	0.64	0.74	-0.10***	0.73	0.80	-0.08***	0.61	0.67	-0.06**
B1	0.115	0.119	-0.003	0.159	0.139	0.020	0.103	0.100	0.003
B2	0.217	0.253	-0.036***	0.223	0.260	-0.036	0.215	0.247	-0.032*
B3	0.306	0.363	-0.056***	0.342	0.402	-0.060**	0.296	0.326	-0.030*
Caa (or below)	0.11	0.11	0.00	0.04	0.09	-0.04***	0.13	0.12	0.00
Splitrating	0.50	0.49	0.02	0.45	0.49	-0.03	0.52	0.49	0.03
Issuer Characteristics									
Assets	3251.81	1307.15	1944.66***	1653.75	985.42	668.32***	3718.54	1588.29	2130.25***
Public	0.65	0.59	0.06***	0.70	0.60	0.10***	0.64	0.59	0.05**
Bond Credit Performance									
Downgrade (1st 12 months)	0.13	0.11	0.02*	0.05	0.11	-0.06***	0.15	0.11	0.04***
Downgrade (1st 18 months)	0.19	0.16	0.03**	0.09	0.17	-0.08***	0.21	0.15	0.06***
Downgrade (1st 24 months)	0.24	0.22	0.02	0.13	0.22	-0.09***	0.27	0.22	0.05***
Downgrade (1st 36 months)	0.30	0.30	0.00	0.20	0.30	-0.1***	0.32	0.29	0.03*
Downgrade	0.36	0.38	-0.02	0.33	0.42	-0.09***	0.37	0.34	0.03*
Upgrade (1st 12 months)	0.07	0.05	0.02**	0.05	0.02	0.03***	0.07	0.07	0.00
Upgrade (1st 18 months)	0.11	0.07	0.03***	0.08	0.04	0.04***	0.11	0.10	0.01
Upgrade (1st 24 months)	0.13	0.10	0.03***	0.11	0.07	0.04**	0.14	0.13	0.01
Upgrade (1st 36 months)	0.18	0.14	0.04***	0.17	0.09	0.07***	0.18	0.19	-0.01
Upgrade	0.23	0.19	0.04***	0.22	0.13	0.09***	0.23	0.25	-0.01
# Observations	1313	982		295	480		1018	502	

Table 3: Estimation Results for the Issuer-Underwriter Matching Equation

This table presents the probit estimation results for the matching equation between issues and underwriters. The dependent variable is a binary variable equaling 1 if a reputable bank is the lead underwriter of an issue, and 0 otherwise. For issues with multiple lead underwriters, the dependent variable equals 1 if and only if at least one of the banks in the syndicate is a reputable bank.

	High Reputation (Top 8 Underwriters)	**High Reputation** (Top 5 Underwriters)
Maturity	0.0023***	0.0025***
	(0.0009)	*(0.0008)*
Issue Size	0.0020***	0.0016***
	(0.0002)	*(0.0002)*
Ba	0.2255***	0.2445***
	(0.0728)	*(0.0701)*
Redeemable	0.1736	0.0485
	(0.1387)	*(0.1349)*
Public	0.0455	0.0864
	(0.0577)	(0.0573)
Constant	-0.7784***	-0.9414***
	(0.1706)	*(0.1624)*
# Observations	*2295*	*2295*
Pseudo R^2	*0.060*	*0.048*

Table 4: Effect of Deregulation on Quality of Certification of Top-Tier Underwriters

This table reports the results of regressions investigating the impact of GLBA on the quality of certification of high reputation underwriters. I estimate variants of the following pooled OLS regression:

$$Y_i = \delta_0 + \delta_1\, GLBA_i + \beta' X_i + \Pi'(GLBA{*}X_i) + \gamma\, mills + \alpha_i + u_i + \varepsilon_i$$

I estimate this regression by pooling two sub-samples, one covering the period prior deregulation (1993-1998) and the other for the period post deregulation (1999 to September 2008). I include several specifications: 1) the effect of underwriter reputation on short-run bond performance where dependent variables are dummies *Rating Action 12 months* and *Rating Action 18 months* which take a value of 1 if a bond experiences its first rating action (downgrade or upgrade) within 12 months and 18 months from issue date, respectively and zero otherwise; 2) the effect of reputation on medium-long run bond performance where dependent variables are dummies Rating Action *24 months, Rating Action 36 months* and Rating Action; .Xi represents all explanatory variables of interest. I include industry and year fixed effects in all specifications and standard errors are robust.

In Panel A, I investigate the effect of underwriter reputation on ex-post bond credit rating actions for the period prior to deregulation. In particular, I estimate the following:

$$E\,[Y_i \mid Xi\,,\, GLBA{=}\,0] = \delta_0 + \beta' Xi + \gamma\, mills + \alpha_i + u_i$$

In Panel B, I investigate the effect of underwriter reputation on ex-post bond credit rating downgrades for the period after deregulation. In particular, I estimate the following:

$$E\,[Y_i \mid Xi\,,\, GLBA{=}\,1] = \delta_0 + \delta_1 + (\beta + \Pi)\,' Xi + \gamma\, mills + \alpha_i + u_i$$

Panel A: Effect of Underwriter Reputation on Credit Rating Actions –Before GLBA

	Rating Action 12 Months	Rating Action 18 Months	Rating Action 24 Months	Rating Action 36 Months	Rating Action Maturity
High Reputation	-0.029	-0.031	-0.046	-0.022	0.003
Initial Rating	0.003	-0.004	-0.014	-0.017	-0.045***
Split-rating	0.025	0.082***	0.044	0.019	0.022
Offer Yield	0.004	-0.004	-0.002	0.007	-0.010
Issue Proceeds	0.001	0.000	0.001	-0.001	-0.000
Subordinated	-0.022	0.000	-0.007	-0.008	-0.054
# Leads	0.128	0.137	0.195*	0.173*	0.131
Clawback	0.000	0.043	0.072***	0.074*	0.057
Rule 144a	0.013	-0.019	-0.097	-0.216***	-0.436***
Shelf-Regist.	-0.026	-0.024	0.096	0.162	-0.075

Mills	-0.009	0.126	0.109	0.041	-0.192*
GLBA	0.194	0.237	0.397	0.513	-0.005
Constant	-0.031	0.038	0.122	0.2706	0.114

Panel B: Effect of Underwriter Reputation on Credit Rating Actions – After GLBA

High Reputation (GLBA)	0.045*	0.063***	0.052*	0.034	0.020
Initial Rating (GLBA)	-0.007	-0.010	-0.024**	-0.026***	-0.022***
Split-rating (GLBA)	0.033	0.025	0.019	-0.001	0.000
Offer Yield (GLBA)	0.002	-0.003	-0.002	0.001	0.000
Issue Proceeds (GLBA)	0.000	0.000	0.000	0.000	-0.000
Subordinated (GLBA)	-0.075***	-0.102***	-0.101***	-0.106***	-0.082***
# Leads (GLBA)	-0.008	0.014	0.007	-0.006	-0.011
Clawback (GLBA)	0.024	-0.014	-0.030	-0.020	-0.033
Rule 144A (GLBA)	-0.121***	-0.215***	-0.263***	-0.379***	-0.483***
Shelf-Regist. (GLBA)	-0.036	-0.024	-0.007	-0.002	0.042
Obs.	2164	2164	2164	2164	2164
R^2	0.071	0.093	0.102	0.152	0.233
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes

Table 5: Effect of Deregulation on Quality of Certification - Downgrades

This table reports the results of regressions investigating the impact of GLBA on the quality of certification of high reputation underwriters. I estimate variants of the following pooled OLS regression:

$$Y_i = \delta_0 + \delta_1\ GLBA_i + \beta' X_i + \Pi'(GLBA{*}X_i) + \gamma\ mills + \alpha_i + u_i + \varepsilon_i$$

I estimate this regression by pooling two sub-samples, one covering the period prior deregulation (1993-1998) and the other for the period post deregulation (1999 to September 2008). I include several specifications: 1) the effect of underwriter reputation on short-run bond performance where dependent variables are dummies *Downgrade 12 months* and *Downgrade 18 months* which take a value of 1 if a bond's first rating action is a downgrade within 12 months and 18 months from issue, respectively and zero otherwise; 2) effect of reputation on medium-long run bond performance where dependent variables are dummies *Downgrade 24 months*, *Downgrade 36 months* and *Downgrade*.Xi represents all explanatory variables of interest described in detailed in the Appendix. I include industry and year fixed effects in all specifications and standard errors are robust.

In Panel A, I investigate the effect of underwriter reputation on ex-post bond credit rating downgrades for the period prior to deregulation. In particular, I estimate the following:

$$E\,[Y_i \mid Xi\,,\ GLBA = 0] = \delta_0 + \beta' Xi + \gamma\ mills + \alpha_i + u_i$$

In Panel B, I investigate the effect of underwriter reputation on ex-post bond credit rating downgrades for the period after deregulation. In particular, I estimate the following:

$$E\,[Y_i \mid Xi\,,\ GLBA = 1] = \delta_0 + \delta_1 + (\beta + \Pi)' Xi + \gamma\ mills + \alpha_i + u_i$$

Sections C and D reports the same analysis as Sections A and B but for the case of credit rating upgrades.

Panel A: Effect of Underwriter Reputation on Credit Rating Downgrades –Before GLBA

	Downgrade 12 Months	Downgrade 18 Months	Downgrade 24 Months	Downgrade 36 Months	Downgrade
High Reputation	-0.054***	-0.067***	-0.077***	-0.082***	-0.067*
Initial Rating	0.017*	0.023*	0.018	0.026*	-0.000
Split-rating	0.000	0.02	-0.008	-0.026	-0.029
Offer Yield	0.023**	0.025**	0.021	0.030**	0.021
Issue Proceeds	0.047	0.035	-0.020	0.014	-0.014
Subordinated	-0.017	-0.008	-0.004	0.015	-0.055
# Leads	0.196***	0.24***	0.225***	0.187**	0.153
Clawback	0.016	0.063**	0.092***	0.100***	0.091**
Rule 144a	0.005	-0.023	-0.062*	-0.148***	-0.308***
Shelf-Regist.	-0.025	-0.054	-0.015	0.019	-0.047

Mills	0.203*	0.236*	0.042	0.213*	0.136
GLBA	-0.182	-0.169	-0.432	-0.736	-0.617
Constant	-0.882*	-0.925	0.007	-0.229	-0.068

Panel B: Effect of Underwriter Reputation on Credit Rating Downgrades – After GLBA

High Reputation (GLBA)	0.042**	0.060***	0.062***	0.054**	0.060**
Initial Rating (GLBA)	0.020***	0.017**	0.006	0.011	0.016
Split-rating (GLBA)	-0.001	0.003	-0.004	-0.016	0.000
Offer Yield (GLBA)	0.027***	0.031***	0.036***	0.044***	0.041***
Issue Proceeds (GLBA)	0.090***	0.110***	0.054	0.111**	0.063
Subordinated (GLBA)	-0.058***	-0.068**	-0.064***	-0.060**	-0.062**
# Leads (GLBA)	0.003	0.011	0.002	-0.000	-0.000
Clawback (GLBA)	0.023	-0.009	-0.007	-0.011	-0.026
Rule 144A (GLBA)	-0.100***	-0.156***	-0.191***	-0.267***	-0.327***
Shelf-Regist. (GLBA)	-0.049	-0.048	-0.047	-0.081*	-0.09
Obs.	2164	2164	2164	2164	2164
R^2	0.081	0.090	0.092	0.115	0.133
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes

Table 6: Effect of Deregulation on Quality of Certification - Upgrades

Panels A and B report the same analysis as in Table 1.5 but for the case of credit rating upgrades.

In Panel A, I investigate the effect of underwriter reputation on ex-post bond credit rating upgrades for the period prior to deregulation. In particular, I estimate the following:

$$E\,[Y_i \mid Xi\,,\, GLBA=0] = \delta_0 + \beta' Xi + \gamma\, mills + \alpha_i + u_i$$

In Panel B, I report the effect of underwriter reputation on ex-post bond credit rating upgrades for the period after deregulation. In particular, I estimate the following:

$$E\,[Y_i \mid Xi\,,\, GLBA=1] = \delta_0 + \delta_1 + (\beta + \Pi)' Xi + \gamma\, mills + \alpha_i + u_i$$

Panel A: Effect of Underwriter Reputation on Credit Rating Upgrades – Before GLBA

	Upgrade 12 Months	Upgrade 18 Months	Upgrade 24 Months	Upgrade 36 Months	Upgrade
High Reputation	0.026	0.035*	0.031	0.061**	0.065**
Initial Rating	-0.015**	-0.024***	-0.036***	-0.038***	-0.039***
Split-rating	0.023*	0.059***	0.048**	0.038**	0.052**
Offer Yield	-0.019***	-0.030	-0.023***	-0.025***	-0.029***
Issue Proceeds	0.002	0.005	0.035	0.075**	0.043
Subordinated	-0.004	0.008	-0.001	-0.020	-0.005
# Leads	-0.062***	-0.104***	-0.037	-0.008	-0.022
Clawback	-0.012	-0.017	-0.016	-0.017	-0.035
Rule 144a	0.007	0.003	-0.034	-0.069***	-0.131***
Shelf-Regist.	0.001	0.030	0.112**	0.147***	0.121*
Mills	-0.002	-0.014	-0.027	0.115	-0.052
GLBA	-0.009	0.103	0.603	0.703	0.709
Constant	0.497	0.756**	0.437	0.054	0.1945342

Panel B: Effect of Underwriter Reputation on Credit Rating Upgrades – After GLBA

High Reputation (GLBA)	-0.005	-0.007	-0.013	-0.029	-0.042*
Initial Rating (GLBA)	-0.023***	-0.024***	-0.034***	-0.032***	-0.032***
Split-rating (GLBA)	0.035***	0.023	0.023	0.014	-0.000
Offer Yield (GLBA)	-0.023***	-0.033***	-0.037***	-0.043***	-0.041***
Issue Proceeds (GLBA)	0.004	-0.011	-0.017	0.023	-0.014
Subordinated (GLBA)	-0.02	-0.035*	-0.036*	-0.046**	-0.029
# Leads (GLBA)	-0.011	0.005	0.007	-0.003	-0.006
Clawback (GLBA)	-0.006	-0.014	-0.028	-0.017	-0.008
Rule 144A (GLBA)	-0.022	-0.059***	-0.072***	-0.112***	-0.156***
Shelf-Regist. (GLBA)	0.013	0.023	0.039	0.085**	0.133***
Obs.	2164	2164	2164	2164	2164
R2	0.065	0.080	0.084	0.095	0.110
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes

Table 7: Multinomial Logistic Regression Results

This table reports results of multinomial logit regressions for measures of short-run and medium to long-run bond performance (i.e., whether a bond's first rating action is a downgrade (upgrade) in the first three years of bond issue or over the bond's lifetime (long-term) with explanatory variables capturing firm and issue-specific characteristics for the sample of U.S. high-yield bonds issued between 1993-1998 and 1999 -2008. 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.

Panel A: Multinomial logit estimates of credit rating DOWNGRADES

	Prior GLBA (1993-1998)					Post GLBA (1999-2008)				
	Down 12 Months	**Down 18 Months**	**Down 24 Months**	**Down 36 Months**	**Down**	**Down 12 Months**	**Down 18 Months**	**Down 24 Months**	**Down 36 Months**	**Down**
High Reputation	-0.731**	-0.527**	-0.521***	-0.366*	-0.199	0.465***	0.507***	0.385***	0.302**	0.271*
Initial Rating	0.178	0.187	0.110	0.075	-0.164*	0.097*	0.053	-0.031	-0.039	-0.022
Split-rating	0.016	0.216	0.013	-0.081	0.008	0.029	0.043	0.015	-0.046	-0.007
Offer Yield	0.142	0.098	0.056	0.058	-0.021	0.181***	0.151***	0.131***	0.147***	0.105***
Issue Proceeds	0.000	-0.001	-0.001	-0.000	-0.001	0.001	0.001	0.002**	0.001	0.000
Subordinated	-0.140	0.0233	-0.003	0.050	-0.317	-0.593***	-0.527***	-0.461***	-0.457***	-0.474***
# Leads	1.756***	1.680***	1.454***	1.174***	0.889*	0.077	0.102	0.044	-0.018	-0.046
Clawback	0.448	0.678***	0.769***	0.706***	0.494**	0.222	-0.031	-0.102	-0.091	-0.211
Rule 415	-0.648	-0.842	-0.025	0.332	0.029	-0.429	-0.267	-0.161	-0.193	0.068
Rule 144 A	0.289	-0.046	-0.343	-0.868***	-1.835***	-0.902***	-1.210***	-1.285***	-1.750***	-2.242***
Public	0.361	0.231	0.334	0.376*	0.052	0.161	0.020	-0.025	-0.108	-0.155

Mills	0.965	1.005*	0.754	0.974*	-0.287	0.283	0.837	1.023	0.377	-0.424
Constant	-8.207***	-7.266***	-5.355***	-4.472***	1.165	-4.780***	-3.902***	-2.551***	-1.241	0.527
	Marginal Effects					**Marginal Effects**				
High Reputation	-0.049***	-0.058**	-0.077***	-0.078**	-0.067*	0.047***	0.068***	0.067***	0.064**	0.068**
Initial Rating	0.013	0.022*	0.021	0.023	-0.017	0.012**	0.011	0.002	0.005	0.012
Offer Yield	0.011	0.013	0.012	0.017	0.007	0.022***	0.027***	0.032***	0.045***	0.043***
Subordinated	-0.009	0.002	-0.002	0.010	-0.069*	-0.058***	-0.066***	-0.069***	-0.068***	-0.071***
# Leads	0.139***	0.232***	0.214***	0.212***	0.195*	0.009	0.014	0.007	-0.000	-0.003
Clawback	0.030	0.070***	0.103***	0.121***	0.111**	0.023	-0.001	-0.009	-0.009	-0.034
Rule 415	-0.037	-0.073*	-0.023	0.019	-0.039	-0.040*	-0.037	-0.033	-0.058	-0.049
Rule 144 A	0.021	-0.005	-0.042	-0.129***	-0.302***	-0.087***	-0.148***	-0.189***	-0.271***	-0.325***
Public	0.024	0.024	0.046	0.061*	0.009	0.017	0.002	-0.006	-0.019	-0.019
Mills	0.068	0.113*	0.115	0.184*	-0.008	0.037	0.109	0.167	0.082	0.066

Panel B: Multinomial logistic estimates of credit rating UPGRADES

	Prior GLBA (1993-1998)					Post GLBA (1999-2008)				
	Up 12 Months	**Up 18 Months**	**Up 24 Months**	**Up 36 Months**	**Up**	**Up 12 Months**	**Up 18 Months**	**Up 24 Months**	**Up 36 Months**	**Up**
High Reputation	0.664	0.519	0.244	0.418*	0.348*	-0.004	0.062	0.012	-0.021	-0.053
Initial Rating	-0.447***	-0.385***	-0.421***	-0.343***	-0.384***	-0.316***	-0.243***	-0.280***	-0.254***	-0.200***
Split-rating	0.682	1.176***	0.705***	0.424*	0.471**	0.485**	0.224	0.196	0.097	0.004
Offer Yield	-0.767***	-0.608***	-0.309**	-0.232**	-0.221**	-0.374***	-0.348***	-0.317***	-0.253***	-0.211***
Issue Proceeds	-0.001	-0.001	0.000	0.000	0.000	-0.000	0.001	0.000	0.000	-0.001
Subordinated	-0.156	0.160	0.128	-0.027	-0.093	-0.372	-0.515***	-0.453***	-0.569***	-0.471***
# Leads	-13.526***	-13.529***	0.027	0.372	0.289	-0.233*	0.015***	0.025	-0.071	-0.086
Clawback	-0.096	-0.093	0.083	8782	0.074	-0.117	-0.209	-0.325	-0.180	-0.173
Rule 415	-0.089	0.319	1.115**	1.137***	0.666	0.059	0.092	0.187	0.334	0.645***
Rule 144 A	0.475	0.105	-0.604	-1.007***	-2.041***	-0.524**	-1.037***	-1.128	-1.546***	-2.066***
Public	0.646	0.275	0.179	0.335	0.053	-0.033	0.060	0.049	-0.069	-0.191
Mills	0.203	-0.086	-0.31	-0.022	-1.057	-1.026	0.763	0.652	-0.022	-1.878
Constant	19.669***	18.532***	3.249	1.956	4.664**	4.348***	2.760*	3.375***	4.136***	5.599***

	Marginal Effects					Marginal Effects				
High Reputation	0.010	0.015	0.022	0.049**	0.056**	-0.003	-0.002	-0.009	-0.019	-0.033
Initial Rating	-0.006***	-0.010***	-0.028***	-0.033***	-0.038***	-0.017***	-0.020***	-0.028***	-0.034***	-0.034***
Split-rating	0.009	0.030***	0.045***	0.041*	0.058**	0.025**	0.017	0.019	0.016	0.001
Offer Yield	-0.010***	-0.015***	-0.019***	-0.022**	-0.026**	-0.020***	-0.030***	-0.036***	-0.043***	-0.047***
Subordinated	-0.002	0.004	0.008	-0.004	0.006	-0.015	-0.032**	-0.033*	-0.055***	-0.042*
# Leads	-0.177***	-0.337***	-0.016	0.004	-0.014	-0.012*	-0.000	0.001	-0.009	-0.011
Rule 415	-0.001	0.011	0.105*	0.130*	0.097	0.006	0.011	0.025	0.063*	0.122***
Rule 144 A	0.006	0.003	-0.031	-0.062***	-0.132***	-0.020*	-0.060***	-0.075***	-0.119***	-0.165***
Obs.	746	746	746	746	746	1418	1418	1418	1418	1418
R^2	0.083	0.082	0.062	0.069	0.115	0.070	0.080	0.079	0.106	0.140

Table 8: Competing Risk Model - DOWNGRADES

The dependent variable is the probability that the bond has suffered a rating downgrade after τ years, given that it has not done so until that point of time. Symbols (*), (**) and (***) indicate statistical significance at the 10%, 5% and 1%.

	Prior-GLBA (1993-1998)		Post-GLBA (1999-2008)	
Dependent Variable	**Coefficients**	**Sub-Hazard Ratio**	**Coefficients**	**Sub-Hazard Ratio**
High Reputation	-0.271 **	0.76	0.235**	1.26
	(0.127)		*(0.101)*	
Split-rating	-0.129	0.88	0.010	1.01
	(0.121)		*(0.089)*	
Initial Rating	-0.009	0.99	0.037	1.04
	(0.054)		*(0.033)*	
Subordinated	-0.146	0.86	-0.195 **	0.82
	(0.128)		*(0.098)*	
Public	0.057	1.06	-0.036	0.96
	(0.126)		*(0.099)*	
Issue Yield	0.014	1.01	0.123 ***	1.13
	(0.048)		*(0.025)*	
Issue Proceeds	-0.001*	0.99	0.0005 ***	1.00
	(0.0005)		*(0.0002)*	
Maturity	-0.001	1.00	-0.0005	0.99
	(0.003)		*(0.0012)*	
# Leads	0.825 ***	2.28	0.006	1.01
	(0.339)		(0.050)	
Clawback	0.560 ***	1.75	-0.095	0.91
	(0.156)		*(0.109)*	
Shelf-Reg.	-0.226	0.79	-0.207	0.81
	(0.271)		*(0.140)*	
Rule 144 A	-0.884 ***	0.41	-1.208 ***	0.30
	(0.179)		(0.116)	
# Obs.	746		1411	
# Downgraded Bonds	287		517	
χ^2	60.16***		147.62***	

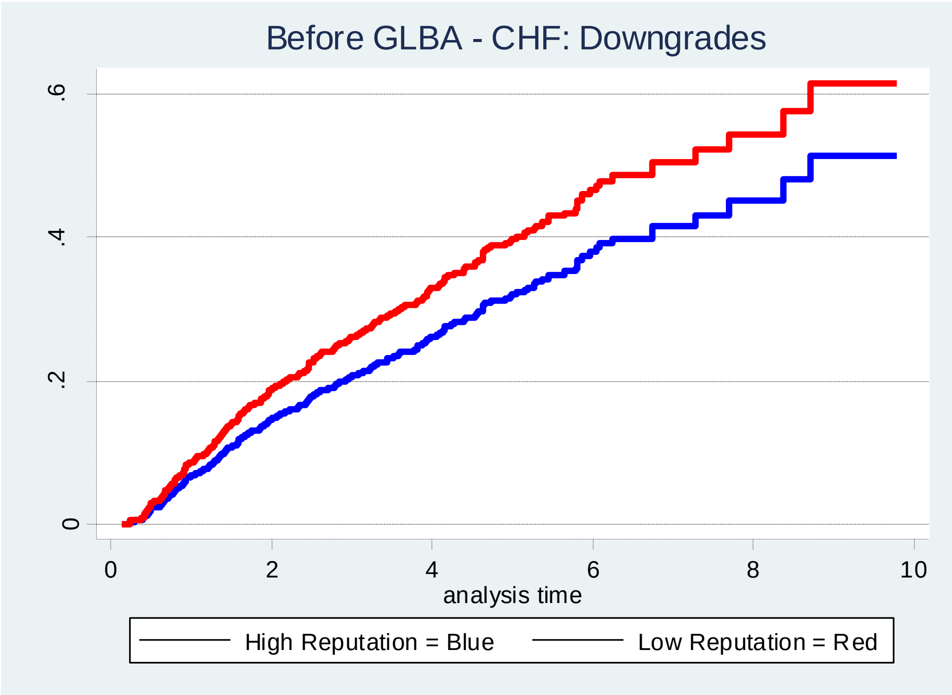
Table 9: Competing Risk Model - UPGRADES

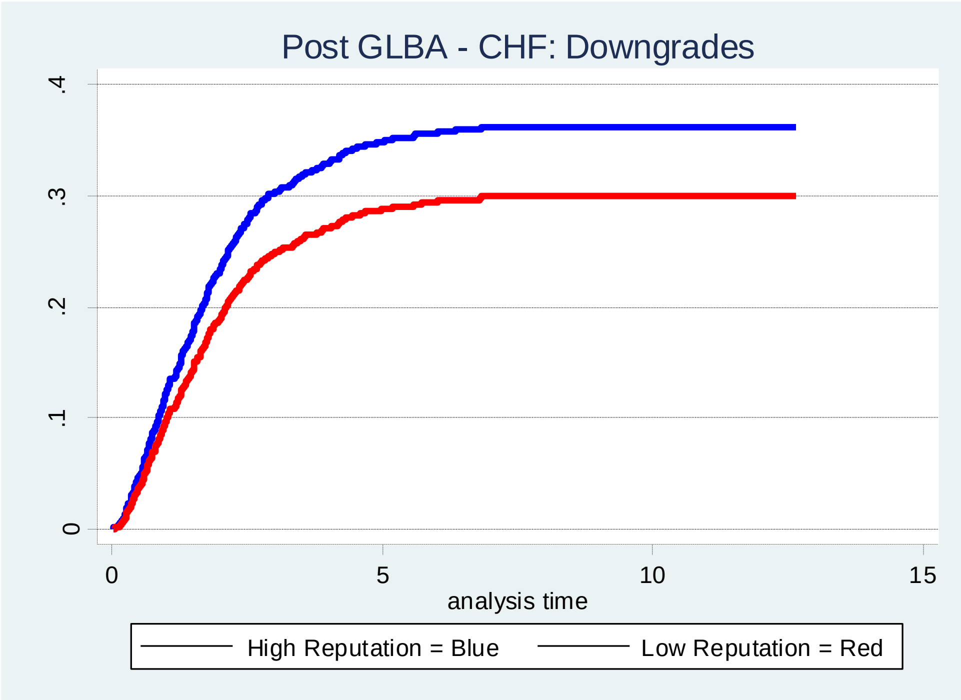
The dependent variable is the probability that the bond has suffered a rating upgrade after τ years, given that it has not done so until that point of time. Symbols (*), (**) and (***) indicate statistical significance at the 10%, 5% and 1%.

	Prior-GLBA (1993-1998)		Post-GLBA (1999-2008)	
Dependent Variable	**Coefficients**	**Sub-Hazard Ratio**	**Coefficients**	**Sub-Hazard Ratio**
High Reputation	0.412**	1.51	-0.163**	0.85
	(0.193)		*(0.126)*	
Split-rating	0.403**	1.50	0.013	1.01
	(0.189)		*(0.111)*	
Initial Rating	-0.222***	0.80	-0.162***	0.85
	(0.079)		*(0.041)*	
Subordinated	0.088	1.09	-0.202*	0.82
	(0.208)		*(0.125)*	
Public	0.106	1.11	-0.022	0.98
	(0.203)		*(0.128)*	
Issue Yield	-0.219***	0.80	-0.243***	0.78
	(0.087)		*(0.037)*	
Issue Proceeds	0.0008*	1.00	-0.0002	1.00
	(0.0004)		*(0.0002)*	
Maturity	0.003	1.00	-0.001	0.99
	(0.003)		*(0.001)*	
# Leads	-0.068	0.93	-0.036	0.96
	(0.375)		(0.068)	
Clawback	-0.060	0.94	-0.021	0.98
	(0.237)		*(0.142)*	
Shelf-Reg.	0.583*	1.79	0.429***	1.53
	(0.325)		*(0.153)*	
Rule 144 A	-1.059***	0.35	-0.937***	0.39
	(0.314)		(0.143)	
# Obs.	746		1411	
# Upgraded Bonds	122		329	
χ^2	53.91***		115.62***	

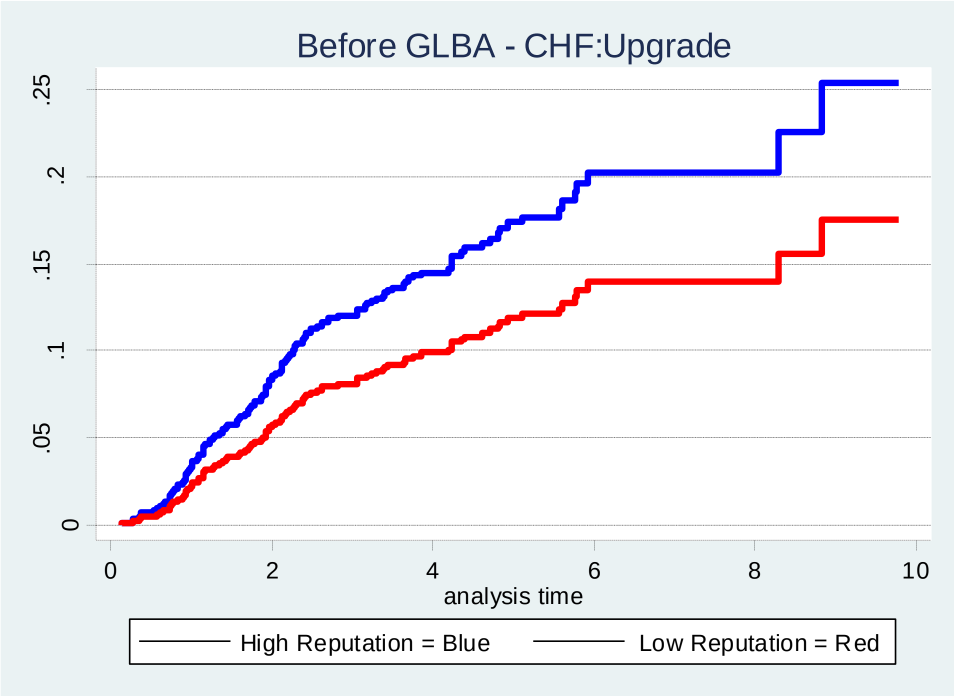
Figure 1: Cumulative Hazard Functions

DOWNGRADES





UPGRADES


Before GLBA - CHF:Upgrade
0
.05
.1
.15
.2
.25
0
2
4
6
8
10
analysis time
High Reputation = Blue
Low Reputation = Red

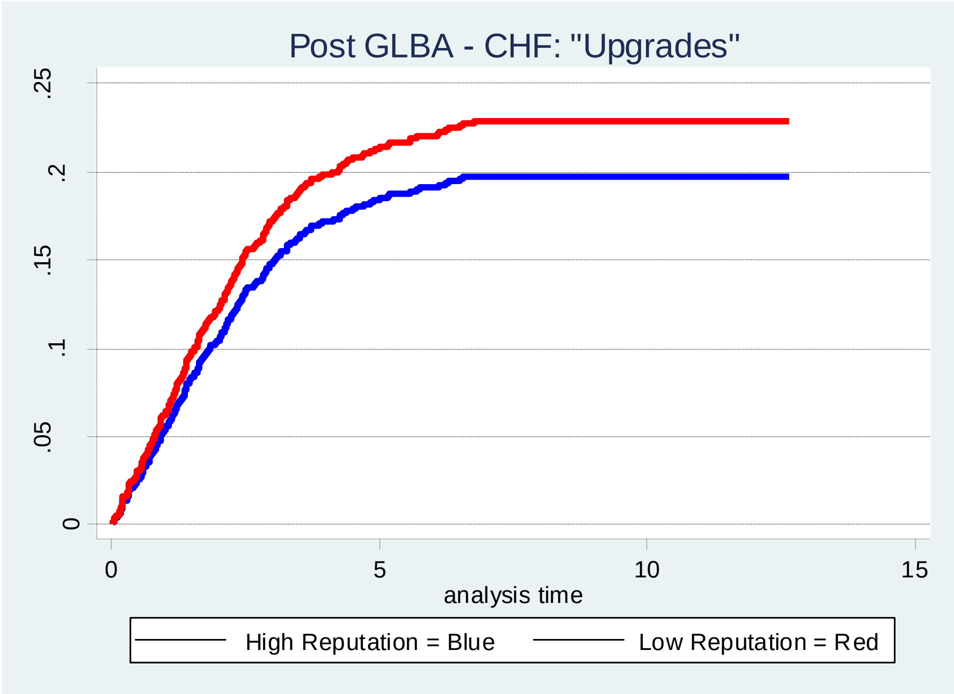

Post GLBA - CHF: "Upgrades"
0
.05
.1
.15
.2
.25
0
5
10
15
analysis time
High Reputation = Blue
Low Reputation = Red

Table 10: Effect of Deregulation on Quality of Certification Top 5 Underwriters – DOWNGRADES (robustness check)

Panels A and B report regression results when the top 5 institutions by market share are defined as the reputable group.

Panel A: Effect of Underwriter Reputation on Credit Rating DOWNGRADES –Before GLBA

	Downgrade 12 Months	Downgrade 18 Months	Downgrade 24 Months	Downgrade 36 Months	Downgrade
High Reputation	-0.049***	-0.071***	-0.080***	-0.080***	-0.061*
Initial Rating	0.013	0.021*	0.017	0.025	-0.003
Split-rating	0.002	0.023	-0.002	-0.019	-0.026
Offer Yield	0.023**	0.024**	0.022*	0.032**	0.020
Issue Proceeds	0.023	0.010	-0.028	-0.005	-0.036
Subordinated	-0.017	-0.009	-0.010	0.006	-0.054
# Leads	0.189**	0.232***	0.220**	0.173**	0.146
Clawback	0.014	0.060**	0.087***	0.091***	0.090**
Rule 144a	0.004	-0.024	-0.063**	-0.150***	-0.310***
Shelf-Regist.	-0.026	-0.055	-0.052	0.014	-0.049
Mills	0.103	0.138	0.021	0.156	0.047
GLBA	-0.113	-0.152	-0.175	-0.260	-0.554
Constant	-0.581*	-0.625*	-0.198	-0.482	0.299

Panel B: Effect of Underwriter Reputation on Credit Rating DOWNGRADES – After GLBA

	Downgrade 12 Months	Downgrade 18 Months	Downgrade 24 Months	Downgrade 36 Months	Downgrade
High Reputation (GLBA)	0.011	0.037*	0.057***	0.042*	0.030
Initial Rating (GLBA)	0.018**	0.016*	0.006	0.012	0.016
Split-rating (GLBA)	0.000	0.004	-0.003	-0.015	0.000
Offer Yield (GLBA)	0.026***	0.030***	0.036***	0.044***	0.041***
Issue Proceeds (GLBA)	0.069***	0.090***	0.051	0.100***	0.063
Subordinated (GLBA)	-0.049***	-0.059***	-0.058***	-0.051**	-0.062**
# Leads (GLBA)	0.007	0.012	0.001	-0.000	-0.000
Clawback (GLBA)	0.021	-0.011	-0.007	-0.012	-0.026
Rule 144A (GLBA)	-0.100***	-0.156***	-0.190***	-0.267***	-0.327***
Shelf-Regist. (GLBA)	-0.046	-0.046	-0.048	-0.079*	-0.090**
Obs.	2164	2164	2164	2164	2164
R^2	0.078	0.088	0.092	0.113	0.131
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes

Table 11: Effect of Deregulation on Quality of Certification Top 5 Underwriters – UPGRADES (robustness check)

Panels A and B report regression results when the top 5 institutions by market share are defined as the reputable group.

Panel A: Effect of Underwriter Reputation on Credit Rating UPGRADES –Before GLBA

	Upgrade 12 Months	Upgrade 18 Months	Upgrade 24 Months	Upgrade 36 Months	Upgrade
High Reputation	0.024	0.035	0.043*	0.072**	0.060*
Initial Rating	-0.014**	-0.023***	-0.035***	-0.036***	-0.038***
Split-rating	0.023*	0.059**	0.047**	0.035	0.046*
Offer Yield	-0.018***	0.029***	-0.023***	-0.025***	-0.031***
Issue Proceeds	0.005	0.014	-0.028*	0.076***	0.044
Subordinated	-0.005	0.006	-0.001	-0.018	0.004
# Leads	-0.061***	-0.101***	-0.034	-0.005	-0.013
Clawback	-0.014	-0.018	-0.016	-0.017	-0.028
Rule 144a	0.007	0.003	-0.034*	-0.067***	-0.128***
Shelf-Regist.	0.001	0.031	0.114**	0.152**	0.125*
Mills	0.014	0.030	0.023	0.122	-0.068
GLBA	0.095	0.120	0.464**	0.541**	0.470*
Constant	0.332**	0.482**	0.310	0.121	0.617*

Panel B: Effect of Underwriter Reputation on Credit Rating UPGRADES – After GLBA

	Upgrade 12 Months	Upgrade 18 Months	Upgrade 24 Months	Upgrade 36 Months	Upgrade
High Reputation (GLBA)	0.001	0.009	0.004	-0.018	-0.040
Initial Rating (GLBA)	-0.023***	-0.024***	-0.032***	-0.031***	-0.032***
Split-rating (GLBA)	0.035***	0.023	0.024	0.015	0.002
Offer Yield (GLBA)	-0.024***	-0.032***	-0.037***	-0.043***	-0.041***
Issue Proceeds (GLBA)	0.007	-0.004	-0.009	0.020	-0.018
Subordinated (GLBA)	-0.021	-0.039**	-0.041**	-0.050**	-0.030
# Leads (GLBA)	-0.012	0.003	0.005	-0.004	-0.005
Clawback (GLBA)	-0.006	-0.014	-0.029	-0.020	-0.007
Rule 144A (GLBA)	-0.022*	-0.060***	-0.072***	-0.114***	-0.155***
Shelf-Regist. (GLBA)	0.013	0.021	0.037	0.085**	0.135***
Obs.	2164	2164	2164	2164	2164
R^2	0.064	0.079	0.084	0.095	0.109
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes

Table 12: Estimation Results for the Yield Equations

This table reports estimation results for three different specifications for the second-stage yield equation. Specification (2) follows closely Fang (2005). Specification (3) includes additional variables known to have a significant impact on at issue yields. I include industry and year fixed effects in all specifications.

Panel A: Effects of Reputation on Yields (Before GLBA)

	(1)	(2)	(3)
High Reputation	-0.642***	-0.215***	-0.289***
Ba1		-3.195***	-3.037***
Ba2		-3.102***	-2.812***
Ba3		-2.421***	-2.314***
B1		-1.817***	-1.810***
B2		-1.377***	-1.341***
B3		-0.863***	-0.829***
Maturity		-0.012***	
Split-rating			-0.040
Issue Proceeds			0.081
Public			-0.044
# Leads			-0.666**
Redeemable			0.127
Clawback			0.025
Rule 144 A			0.196**
Shelf-Reg.			-0.141

Panel B: Effects of Reputation on Yields (Post GLBA)			
	(1)	(2)	(3)
High Reputation	-0.550***	-0.357***	-0.276***
Ba1		-2.806***	-2.686***
Ba2		-2.784***	-2.594***
Ba3		-2.459***	-2.338***
B1		-2.079***	-1.986***
B2		-1.480***	-1.451***
B3		-1.025***	-0.974***
Maturity		-0.005***	
Split-rating			0.110
Issue Proceeds			0.048
Public			-0.360***
# Leads			-0.143***
Redeemable			0.282
Clawback			-0.164
Rule 144 A			0.040
Shelf-Reg.			0.179
Mills		0.653***	0.863
GLBA	0.331**	-0.396	0.475
Constant	9.653***	11.719***	10.294***
Obs.	2164	2164	2164
R^2	15.82	39.05	39.34
Industry & Year FE	Yes	Yes	Yes

Table 13: Impact of Poor Screening on the Yield Equations

This table reports estimation results of regressions investigating the impact of underwriter's poor screening on at issue yields. In specifications (1) through (3), I estimate variants of the following regression:

$$Y_i = \delta_0 + \delta_1 \textit{ Large Rating Variability}_{j,t-1} + \beta' X_i + \gamma \textit{ mills} + u_t + u_i + \varepsilon_i$$

I estimate this regression on all the bonds in my sample issued during 1993 to 2008. I include industry and year fixed effects and standard errors are robust.

In specification (4), I investigate how the impact of large credit rating variability on at issue yields varies with the lead underwriter's reputation. In this case, the key independent variables of interest are the interaction terms between the measure of reputation and rating variability. The empirical specification and control variables are the same as in specifications (1) through (3).

	(1)	(2)	(3)	(4)
High Reputation (HR)	-0.319***	-0.357***	-0.303***	-0.221***
Large Rating Var_{t-1}	0.292***	0.221***	0.222***	
Large Rat. Var_{t-1} x [HR]				0.082
Large Rat. Var_{t-1} x [1-HR]				0.244**
Ba1		-2.929***	-2.780***	-2.784***
Ba2		-2.837***	-2.674***	-2.685***
Ba3		-2.436***	-2.338***	-2.346***
B1		-1.999***	-1.919***	-1.912***
B2		-1.453***	-1.425***	-1.424***
B3		-0.781***	-0.750***	-0.744***
# Leads			-0.146***	-0.144***
Public			-0.252***	-0.248***
Issue Proceeds			0.064	0.066
Redeemable			0.267	0.264
Clawback			-0.118	0.121
Split-rating			0.076	0.080
Rule 144a			0.073	0.074
Shelf-Registration			-0.212**	-0.207*
Mills	2.560***	1.021***	0.958*	0.934*
GLBA			0.434***	0.428***
Constant	7.827***	10.076***	9.849***	9.837***
Obs.	2152	2152	2152	2152
R^2	21.80	38.15	39.07	38.98
Industry & Year FE	Yes	Yes	Yes	Yes

Table 14: Impact of Poor Screening on the Yield Equations -Different cut-offs for Large Rating Variability-

This table reports estimation results of regressions investigating the impact of underwriter's poor screening on at issue yields. I estimate variants of the following regression on all the bonds in my sample issued during 1993 to 2008. I include industry and year fixed effects and standard errors are robust,

$$Y_i = \delta_0 + \delta_1 \textit{ Large Rating Variability}_{j\,,\,t\text{-}1} + \beta' X_i + \gamma \textit{ mills} + u_t + u_i + \varepsilon_i$$

In specifications (1)-(4), I investigate how the impact of large credit rating variability on at issue yields varies with the lead underwriter's reputation. Specifications (1)-(4) include the 10%, 25%, 50% and 75% cut-offs, respectively for [Large Rating Variability].

	(1)	(2)	(3)	(4)
High Reputation (HR)	-0.207**	-0.221***	-0.301***	-0.289***
Large Rating Var$_{t-1}$				
Large Rat. Var$_{t-1}$ x [HR]	-0.204*	0.082	0.302***	0.402***
Large Rat. Var$_{t-1}$ x [1-HR]	-0.100	0.244**	0.256*	0.427**
Ba1	-2.775***	-2.784***	-2.792***	-2.815***
Ba2	-2.683***	-2.685***	-2.680***	-2.668***
Ba3	-2.342***	-2.346***	-2.326***	-2.333***
B1	-1.911***	-1.912***	-1.899***	-1.917***
B2	-1.426***	-1.424***	-1.403***	-1.419***
B3	-0.736***	-0.744***	-0.734***	-0.741***
# Leads	-0.148***	-0.144***	-0.142***	-0.141***
Public	-0.238***	-0.248***	-0.249***	-0.253***
Issue Proceeds	0.065	0.066	0.046	0.056
Redeemable	0.271	0.264	0.261	0.260
Clawback	-0.121	0.121	-0.115	-0.115
Split-rating	0.078	0.080	0.072	0.081
Rule 144a	0.079	0.074	0.077	0.079
Shelf-Registration	-0.202*	-0.207*	-0.209*	-0.204*
Mills	0.892*	0.934*	0.906*	0.943*
GLBA	0.533***	0.428***	0.444***	0.434***
Constant	9.967***	9.837***	9.979***	9.918***
Obs.	2152	2152	2152	2152
R^2	38.94	38.98	39.07	38.98
Industry & Year FE	Yes	Yes	Yes	Yes

Table 15: Impact of Poor Screening on the Yield Equations (Top 5 Underwriters)

My measure of reputation is now the top 5 underwriters by volume underwritten. This table reports estimation results of regressions investigating the impact of underwriter's poor screening on at issue yields. In specifications (1) through (3), I estimate variants of the following regression:

$$Y_i = \delta_0 + \delta_1 \textit{ Large Rating Variability}_{j,t-1} + \beta' X_i + \gamma \textit{ mills} + u_t + u_i + \varepsilon_i$$

In specification (4), I investigate how the impact of large credit rating variability on at issue yields varies with the lead underwriter's reputation. In this case, the key independent variables of interest are the interaction terms between the measure of reputation and rating variability. The empirical specification and control variables are the same as in specifications (1) through (3).

	(1)	(2)	(3)	(4)
High Reputation (HR)	-0.288***	-0.315***	-0.255***	-0.280***
Large Rating Var_{t-1}	0.289***	0.210***	0.207***	
Large Rat. Var_{t-1} x [HR]				0.238*
Large Rat. Var_{t-1} x [1-HR]				0.183*
Ba1		-2.849***	-2.774***	-2.775***
Ba2		-2.747***	-2.655***	-2.653***
Ba3		-2.362***	-2.326***	-2.328***
B1		-1.978***	-1.913***	-1.916***
B2		-1.451***	-1.428***	-1.429***
B3		-0.777***	-0.748***	-0.750***
# Leads			-0.147***	-0.148***
Public			-0.227***	-0.226***
Issue Proceeds			0.007	0.008
Redeemable			0.196	0.194
Clawback			-0.121	-0.121
Split-rating			0.079	0.078
Rule 144a			0.069	0.069
Shelf-Registration			-0.217**	-0.217**
Mills	2.844***	1.148***	0.840*	0.846*
GLBA			0.413***	0.413***
Constant	7.000***	9.697***	10.073***	10.076***
Obs.	2152	2152	2152	2152
R^2	23.68	38.16	38.96	38.97
Industry & Year FE	Yes	Yes	Yes	Yes

Figure 2: Reputation updating for different $\hat{x}$.

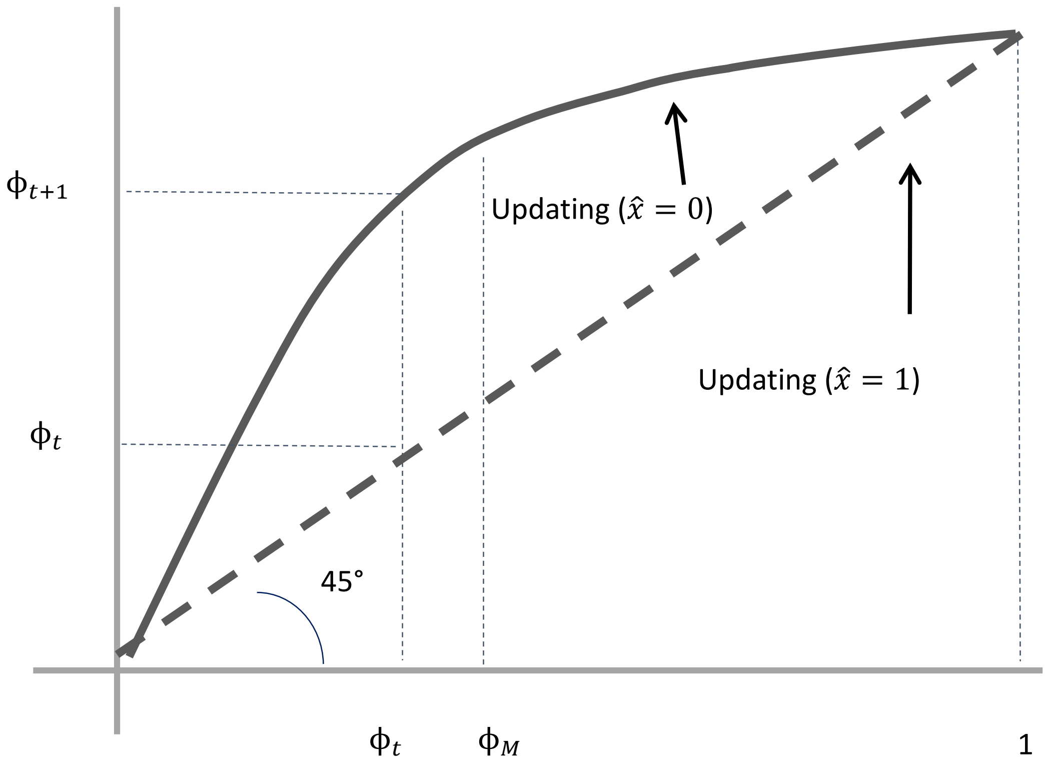
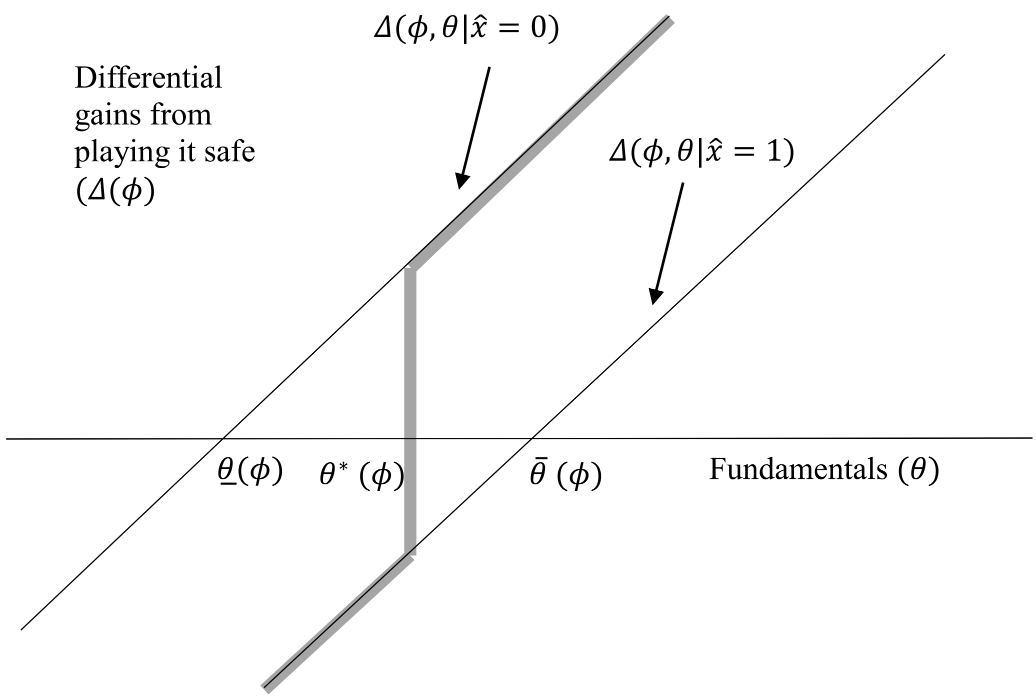


Figure 3: Equilibrium multiplicity.



Source: Ordonez (2013)

Figure 4: Schedule of cutoffs with and without reputation concerns.

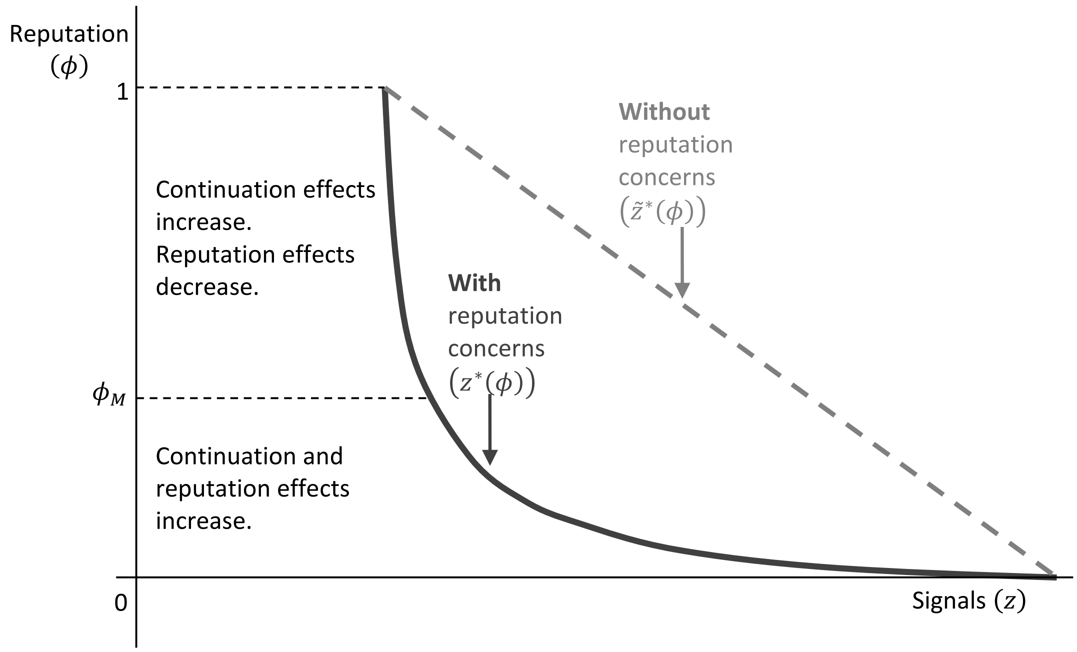
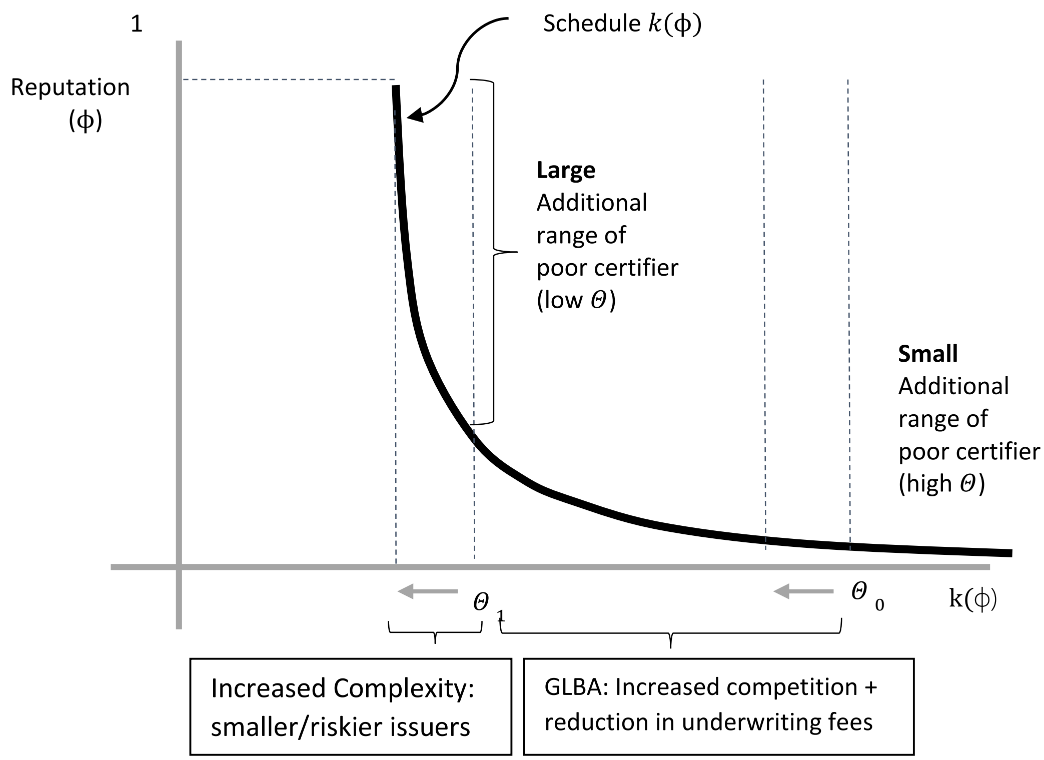


Figure 5: Clustering of Poor Certification.



Source: Adaptation from Ordonez (2013)

Mathematical Appendix

Proof of Proposition 1.

Conditional on observing a signal z_i, underwriter i's expected θ is

$$\hat{\theta}_i = E(\theta|z_i) = \frac{\alpha\mu+\gamma z_i}{\alpha+\gamma}.$$

Given this update on θ, the conditional distribution of signals of another underwriter j is

$$z_j|\hat{\theta}_i \sim N\left(\hat{\theta}_i, \frac{1}{\alpha+\gamma}+\frac{1}{\gamma}\right).$$

The expected fraction of other underwriters having a signal smaller than z_i (and hence taking risks if underwriter i is indifferent at z_i) is

$$E(\hat{x}(\phi,\theta)|z_i) = \Pr\left(z_j < z_i|\hat{\theta}_i\right) = \Phi\left[\sqrt{\zeta}\left(\hat{\theta}_i-\mu\right)\right],$$

where Φ is the standard normal cumulative distribution function (c.d.f.) and

$$\zeta = \frac{\alpha^2(\alpha+\gamma)}{\gamma(\alpha+2\gamma)}.$$

The equilibrium cutoff $z^*(\phi)$ is given by the signal at which underwriters will be ex ante indifferent between performing high or low quality due-diligence, when other underwriters also follow $z^*(\phi)$, such that,

$$\Delta(\phi, z^*|z^*) = 0$$

$$E_{\theta|z^*}(\Delta(\phi,\theta|\hat{x})|z^*) = (p_s-p_r)\left[\frac{1}{R(\phi)} - K + \frac{p_s}{p_s-p_r}E(\theta|z^*) + \beta E\left[V\left(\phi'(\phi,\hat{x}|z^*)\right)\right]\right] = 0.$$

As $\sigma \to 0$ (or $\gamma \to \infty$), $E(\theta|z^*) \to z^*$ and $E\left[V\left(\phi'\left(\phi,\hat{x}(\phi,\theta|z^*)\right)\right)\right] \to V\left(\phi'(\phi,\hat{x}=0.5)\right)$ (since $\zeta \to 0$). Then we have,

$$z^*(\phi) = -\frac{p_s-p_r}{p_s}\left[\frac{1}{R(\phi)} - K + \beta V(\phi'(\phi,\hat{x}=0.5))\right]$$

Proof of Proposition 3.

With reputation concerns, $z^*(\phi)$ is determined by,

$$z^*(\phi) = -\frac{p_s - p_r}{p_s}\left[\frac{1}{R(\phi)} - K + \beta V(\phi'(\phi, \hat{x} = 0.5))\right]$$

Without reputation concerns, $\tilde{z}^*(\phi)$ is determined by,

$$\tilde{z}^*(\phi) = -\frac{p_s - p_r}{p_s}\left[\frac{1}{R(\phi)} - K + \beta V(\phi)\right]$$

since the restriction that reputation cannot change is exactly the same as assuming $\hat{x} = 1$.

Take $\phi \in (0,1)$. Since $V\big(\phi'(\phi, \hat{x} = 0.5)\big) > V(\phi)$, then $z^*(\phi) < \tilde{z}^*(\phi)$. This implies $R(\phi|z^*) < R(\phi|\tilde{z}^*)$, which reinforces that $z^*(\phi) < \tilde{z}^*(\phi)$. For $\phi \in \{0,1\}$, $V\big(\phi'(\phi, \hat{x} = 0.5)\big) = V(\phi)$ and $z^*(\phi) = \tilde{z}^*(\phi)$.