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Essays on financial intermediation

by

Javed Iqbal Ahmed

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Committee in charge:
Professor Terrance Odean, Chair
Professor Michael Katz
Professor Ulrike Malmendier

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Abstract

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In this dissertation, I analyze behavior of two types of financial intermediaries that play critical roles in capital allocation: ratings agencies and merger advisors. Each type of intermediary survives due to (assumed) informational advantages relative to firms and investors. In the following chapters, I analyze how differences in information between market participants and intermediaries lead to signaling behavior related to privately-observed quality. My results explain some seemingly-anomalous aspects of financial markets, and provide a framework for assessing the impact intermediaries can have on efficient capital allocation.

In the first chapter, I examine whether rating agencies strategically manipulate the informativeness of bond ratings in response to competition from private lenders. I model a monopolistic rating agency that caters to a low-quality marginal customer with uninformative ratings. High-quality customers prefer informative ratings but are captive customers of the rating agency in the absence of competition from private lenders. With competition from private lenders, the rating agency uses informative ratings to keep high-quality customers in public markets. The model also suggests that the ratings sector dampens the impact of capital supply shocks, and offers a strategic pricing rationale for the controversial practice of issuing unsolicited credit ratings.

In the second chapter, I test predictions of the model using a measure of informativeness based on the impact of unexpected ratings on a debt issuer's borrowing cost. I analyze two events that increased the relative supply of private vs. public lending: the temporary shutdown of the high-yield market in 1989 and legislation in 1994 that reduced barriers to interstate bank lending. After each event, I find that the informativeness of ratings increased for issuers whose relative supply of private vs. public capital increased most.

In the third chapter, I analyze how acquiring firms select and pay advisors. I present a model in which an advisor with privately known quality screens targets (due diligence) and improves negotiation outcomes (bidding). When a transaction involves only bidding, advisors pool by offering fees contingent on a completed transaction. By contrast, a transaction involving due diligence can lead to a separating equilibrium and fixed fees. The model predicts that acquirers use advisor market share instead of stock return-based measures to select advisors when synergies are not observable, and that acquirers with better information about advisor quality pay higher fees. I argue that investors in leveraged buyouts are skilled in acquisitions, and find that they pay higher fees for both mergers and tender offers, controlling for assignment and deal characteristics. They are also less likely to include contingent fees than other acquirers. Results suggest skilled investors use private information about advisor ability to hire advisors, and do so primarily to screen targets rather than to improve negotiation outcomes.

To my family

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Chapter 1

Rating agency incentives and informative credit ratings

1.1 Introduction

What information do credit ratings contain? Given their role of reducing information asymmetries between borrowers and lenders, we naturally expect them to be informative. However, defaults of highly-rated issuers and perceived conflicts of interest lead to concerns about the rating agencies' incentives to make ratings informative. If information in credit ratings affects the allocation of capital, understanding the rating agencies' incentives to reveal that information is important for optimal design of the ratings sector.

In this paper, I suggest that a previously overlooked competitive channel influences the informativeness of corporate bond ratings. I present a model in which a monopolistic rating agency faces a threat from private lenders targeting high-quality debt issuers. Arms-length public investors know only the issuer's rating, while private lenders can learn the issuer's quality but require a higher- return.[1]

The rating agency chooses the fee and informativeness of the rating, trading off low-quality issuers' desire to pool against the threat that high-quality issuers may borrow from private lenders if ratings do not allow them to separate. High-quality customers' defection affects the rating agency directly through lost revenue from these customers, and indirectly by reducing the value of ratings for all customers. This externality operates through beliefs about rated issuer quality, and links the informativeness of credit ratings to the threat from private lenders.

My model also offers an explanation for the controversial practice of issuing un-

[1]This higher return could arise because private lenders incur monitoring costs or have a lower discount rate, or it could represent the borrower's preference for dealing with arms-length public investors.

solicited credit ratings.[2] It suggests such ratings should be informative. In the model, the rating agency's choice of ratings informativeness and the rating fee lead to an endogenous threshold quality level, such that all issuers with higher quality purchase ratings. By raising the average quality of unrated firms, increases in this threshold present the possibility that unrated issuers can access public markets. Such access jeopardizes the 'gatekeeper' status of the rating agency, and reduces fees it can charge for solicited ratings. Unsolicited ratings act as a strategic pricing tool that allows the rating agency to extract higher rents from paying customers. However, unsolicited ratings lead to underinvestment when borrowers with positive-NPV projects that do not receive unsolicited ratings are unable to raise financing.

1.2 Related literature

This paper is related to the literature on ratings determination and standards, ratings informativeness, and rating agency incentives. It adds to the rating informativeness literature by exploring whether information in ratings is new relative to fundamentals. By relating informative ratings to competition from private lenders, my paper suggests a new competitive channel is important for rating agency incentives.

Lizzeri (1999) considers the rating agency's incentive to make ratings informative, and suggests that low-quality marginal customers prefer uninformative ratings, while high-quality rating customers are captive. In his model, the rating agency caters to low-quality customers with ratings that distinguish between rated and unrated issuers, but do not contain additional information. This result is compelling, but contrasts with both intuition and evidence that suggests ratings are informative (e.g., Kliger and Sarig, 2000; Jorion, Liu and Shi, 2005).

Several recent studies on rating agency incentives suggest that reputation-building, competition between rating agencies and regulatory distortions influence the information content of ratings. Reputation-based studies (Mathis, MacAndrews, and Rochet, 2009; Bolton, Freixas and Shapiro, 2010; and Bar-Isaac and Shapiro, 2010) argue that when there are more issuances (for example, during boom times), accuracy declines because building reputation becomes less important. These results depend on the value of reputation, which in turn depends on the rating agency's discount rate (and, possibly, on investors' ability to understand rating agency incentives). A truth-telling equilibrium arises in these models when the value of reputation is sufficiently high.

Studies of regulatory distortions and competition between rating agencies suggest both factors lead to less informative ratings. This could be due to regulatory arbitrage

[2]Standard & Poor's has an explicit policy to rate all significant corporate bond issues, whether or not the issuer pays (Cantor and Packer, 1994).

(Harris, Opp and Opp, 2010) or ratings shopping (Skreta and Veldkamp, 2009). Doherty, Kartasheva, and Phillips (2010) suggest informative ratings may prevent entry in the ratings sector. Becker and Milbourn (2010) analyze the effects of competition using Fitch's market share and find ratings are less informative when Fitch's market share is higher. I argue that competition between public and private lenders plays an important role, and that competition between agencies in the corporate bond rating sector has been relatively limited.

We have few explanations for the rating agency's incentives to issue unsolicited ratings. Sangiorgi, Sokobin and Spatt (2009) suggest that such ratings allow agencies to avoid litigation. Fulghieri, Ströbl, and Xia (2010) suggest downward-biased unsolicited ratings force issuers to pay higher fees for solicited ratings. Unsolicited ratings are also lower than solicited ratings in my model, but are not biased, and must be informative even if based on public information. Smaller rating agencies argue such ratings are anti-competitive; my paper also relates unsolicited ratings to market power, but suggests they may emerge without threat of entry into the ratings sector.

This paper is the first, to my knowledge, to explicitly focus on how strategic actions of credit rating agencies affect the public debt issuance threshold. The main difference between my model and standard information intermediary models (Lizzeri, 1999; Faure-Grimaud, Peyrache, and Quesada, 2009) is that I model debt issuers rather than asset sales. Lizzeri's (1999) sellers have the same value for a given rating. By contrast, payoffs for debt issuers in my model depend on issuer quality. I show this can lead some borrowers with positive-NPV projects to choose the safe project, and under-investment can obtain.

Finally, this paper relates broadly to literature that analyzes the choice between private and public debt. In contrast to classic studies that explicitly model the role of private lenders (e.g. Sharpe, 1990; Diamond, 1991; Rajan, 1992), my paper treats the cost of private borrowing as exogenous. In my model, the rating agency, acting on behalf of public lenders, uses informative ratings to compete with private lenders. My results suggest that arms-length public lenders are not passive players in debt markets, and instead compete actively using the ratings sector.

1.3 Model

Consider a one-period economy with risk-neutral agents in which a firm's owner-operator ("he", or the "issuer") chooses whether to raise financing to invest in a risky project from either public or private lenders. The issuer has (fungible) initial assets A, and his quality $\theta \sim U[0, 1]$ represents his privately-known probability of success with the risky project. The risky project requires capital $K > A$, and produces cash flow X if successful (otherwise, it produces 0).

The issuer has three investment alternatives. He can deploy his assets in a risk free project which returns zero, borrow from public lenders, or borrow from private lenders. Private lenders can learn θ, but require expected return $P > 0$ in order to lend, while competitive public-market investors need only break even (earn zero expected return). $P > 0$ captures the assumption that public borrowing is less costly from the perspective of the issuer than private borrowing. This can be because of monitoring costs, differences in discount rates, or because the issuer prefers to deal with arms-length investors.

The rating agency offers to produce rating $r \in [0, 1]$ with information level α in exchange for fee ϕ, and can credibly commit to a rating disclosure policy. I restrict consideration to full disclosure by the rating agency,[3] and allow it to choose (without cost) the probability (α) with which it observes and discloses θ. I assume that with probability α, the rating reveals the issuer's quality: $r = \theta$. I interpret this probability as the informativeness of the rating. With probability $(1 - \alpha)$, it reveals only whether the issuer purchased a rating. As discussed below, this is equivalent to setting the rating equal to the average quality of rated issuers: $r = E[\theta \mid \text{issuer rated}]$. I initially assume the rating agency cannot issue unsolicited ratings; I relax this assumption in Section 1.3.2.

This signal structure emphasizes the role of ratings informativeness on the issuer's ex ante decision to purchase a rating. Investors know whether the rating they observe is informative.[4] To understand this signal structure, consider an uninformative rating: $\alpha = 0$. If such a rating is costly ($\phi > 0$), it allows the issuer to signal because some low-quality issuers will prefer investing in the safe project to purchasing a rating. In this way, α captures informativeness of ratings beyond information in the rating purchase decision.

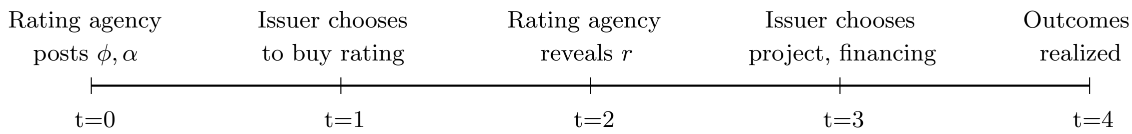

Figure 1.1: Timing of moves

The timing of events is summarized in Figure 1.1. At $t = 0$, the rating agency chooses the rating fee, ϕ, and rating informativeness, α. At $t = 1$, the issuer decides whether to obtain a rating. The rating is produced and disclosed at $t = 2$, and investors update beliefs about the issuer's quality. Next, at $t = 3$, the issuer decides whether to invest in the safe project or the risky project, using required repayment levels implied by investors'

[3] I assume truth-telling can be enforced because the value of reputation is sufficiently high. This is a possible equilibrium outcome in Mathis et al. (2009) and Bolton et al. (2010).

[4] In practice, investors are likely unable to distinguish directly between informative and uninformative ratings. The signal structure I use captures the idea that when ratings are informative, investors place more weight on ratings in estimating issuer quality.

beliefs to evaluate expected $t = 4$ payoffs. If the issuer chooses the risky project, he raises financing by offering repayment $R \in \{R(r), R^{\text{U}}, R^{\text{P}}\}$ which depends on whether he seeks public financing with rating r, is unrated, or seeks private financing. At $t = 4$, project outcomes and payoffs are realized.

1.3.1 Equilibrium with informative ratings

I consider symmetric Bayesian-Nash equilibria of the game. An equilibrium $\{\phi, \alpha, \Theta\}$ consists of a fee, rating informativeness, and a set of decision rules for each type of issuer. I solve the model by backwards induction. At $t = 3$, the issuer decides whether to raise financing and the financing type. At $t = 4$, investors are repaid if the project is successful. If it is not, the investors and issuer receive 0. Because there are no funds to repay debt if the project is unsuccessful, required repayment refers to the amount promised to investors if the project succeeds. If the issuer raises public financing, promised repayment at $t = 3$ depends on the $t = 2$ rating and satisfies investors' participation conditions: public investors expect to break even, while private investors require expected return P. At $t = 1$, the issuer chooses whether to purchase a rating. At $t = 0$, the rating agency chooses ϕ and α to maximize profits.

To seek financing, the issuer must expect to earn more than A, which could be obtained by investing in the safe project:

$$\theta(X - R) \geq A \tag{1.1}$$

where R represents the amount promised to investors if the project succeeds. I first rule out financing when issuers invest less than A:

Lemma 1: *There is no equilibrium in which an issuer invests less than A in the risky project.*

Lemma 1 suggests that all issuers must invest their assets in the risky project (because not doing so would be a negative signal). The amount of financing is $K + \phi - A$ if the issuer purchases a rating, and $K - A$ otherwise.[5]

Because the issuer's expected payoff from the risky project is increasing in θ, I solve for an equilibrium in which there exist quality thresholds that define the strategy of each type of issuer. Because private lenders learn the issuer's quality, high-quality issuers benefit more from private borrowing. Because they value the risky project less, low-quality issuers are more likely to choose the safe project.

[5]The assumption that the owner-manager of the issuing firm cannot invest outside wealth in the project shuts off the signaling mechanism of Leland and Pyle (1977).

For high-quality issuers, informative ratings are favorable and uninformative ratings are unfavorable, while the reverse is true for low-quality issuers. I assume that the issuer first pays for the rating, then makes investment and financing decisions conditional on the rating outcome. A consequence is that some low-quality issuers purchase a rating, hoping it will be uninformative so they can pool with high-quality issuers. Similarly, some high-quality issuers purchase a rating, hoping it will be informative and allow them to separate from low-quality issuers.

For high-quality issuers, an unfavorable (uninformative) rating may lead to a preference for bank financing, while for low-quality issuers, an unfavorable (informative) rating may lead to preference for the safe project. If the rating is informative, investors know the issuer has quality θ, while if it is uninformative they believe the issuer's quality is equal to the average quality of rated issuers.

Each type of financing satisfies investors' break even conditions: public market lenders are competitive, while private lenders require return P. Repayment for rated issuers is:

$$R(r) = \frac{K - A + \phi}{E[\theta|\ r]} \tag{1.2}$$

while private borrowing requires repayment:

$$R^{\mathrm{P}} = \frac{K - A + P}{\theta}. \tag{1.3}$$

Repayment for unrated public issuers is:

$$R^{\mathrm{U}} = \frac{K - A}{E[\theta|\text{unrated}]}, \tag{1.4}$$

which yields expected profits for unrated public issuers:

$$\theta\Big[X - \Big(\frac{K - A}{E[\theta|\ \text{unrated}]}\Big)\Big]. \tag{1.5}$$

To decide whether to get rated, the issuer calculates payoffs conditional on having a rating. After paying the fee, the issuer will receive either an informative or uninformative rating, with which it can seek public financing. Its expected $t = 4$ payoff under each alternative is:

$$\theta X - K + A - \phi \quad \text{public financing with informative rating} \tag{1.6}$$

$$\theta\Big[X - \Big(\frac{(K - A + \phi)}{E[\theta \mid \text{rated }]}\Big)\Big] \quad \text{public borrowing with uninformative rating} \tag{1.7}$$

$$\theta X - K + A - P - \phi \quad \text{rated, but chooses private borrowing} \tag{1.8}$$

$$A - \phi \quad \text{rated, but chooses the safe project} \tag{1.9}$$

Having paid the fee, the issuer may decide to seek private financing or to invest in the safe project. The issuer raises public financing when doing so (with rating r) is preferable to both the safe project and private borrowing:

$$\theta[X - R(r)] \geq \text{Max}\Big(\underbrace{A - \phi}_{\text{safe project}} \;,\; \underbrace{\theta X - (K - A + P + \phi)}_{\text{private borrowing}} \Big) \tag{1.10}$$

While ϕ in Equation (1.10) is a sunk cost from the perspective of the issuer, it still influences the value of alternatives to public lending. The issuer accounts for the possibility that he may not like the rating outcome. If he decides not to seek public financing after purchasing the rating, he will have less to invest in the safe project, and must borrow more from private lenders to invest in the risky project.

Before defining the strategy for each type of issuer, I examine some implications of Equations (1.1) - (1.10). Consider a rated issuer who prefers private borrowing to raising public financing. By examining Equation (1.10), which assumes a rating has already been purchased, we see that high-quality issuers prefer private borrowing, while low-quality issuers prefer the safe project. These preferences are maintained as θ increases: if an issuer prefers private borrowing to public borrowing, or public borrowing to the safe project, higher-quality issuers share these preferences.

This suggests issuers who prefer public financing to purchasing a rating are high-quality issuers, while those who prefer the safe project to public financing have lower quality. Next, consider the issuer's ability to borrow from public lenders without a rating. Such an issuer is likely to have higher quality than an issuer who prefers the safe project, because the risky project links payoffs to quality. However, he is unwilling to pay the rating fee, suggesting his quality is lower than that of a rated issuer.

It is natural to define issuer strategies using quality thresholds. Having established that high-quality issuers are more likely to pursue private borrowing than low-quality issuers, and that low-quality issuers are more likely to pursue the safe project than high-quality issuers, we can define issuer strategies. I summarize the strategy of each type of issuer using thresholds $\Theta \equiv \{\theta_{\text{U}}, \theta_{\text{L}}, \theta_{\text{LU}}, \theta_{\text{HU}}, \theta_{\text{H}}\}$.

This set of thresholds is illustrated in Figure 1.2. Thresholds are defined such that issuers with quality $\theta < \theta_{\mathrm{U}}$ choose the safe project, $\theta \in [\theta_{\mathrm{U}}, \theta_{\mathrm{L}})$ pursue public financing without a rating, and $\theta \in [\theta_{\mathrm{L}}, \theta_{\mathrm{LU}})$ raise public financing conditional on the rating outcome (and choose the safe project if the rating is not favorable). Similarly, issuers with quality $\theta \in [\theta_{\mathrm{LU}}, \theta_{\mathrm{HU}})$ purchase a rating and raise public financing unconditionally, $\theta \in [\theta_{\mathrm{HU}}, \theta_{\mathrm{H}})$ purchase a rating but raise public financing conditional on the rating (and choose private financing if the rating is not favorable), and $\theta \in (\theta_{\mathrm{H}}, 1]$ choose private financing. If $\theta_{\mathrm{L}} > \theta_{\mathrm{LU}}$, all rated issuers prefer public financing to the safe project regardless of the rating.

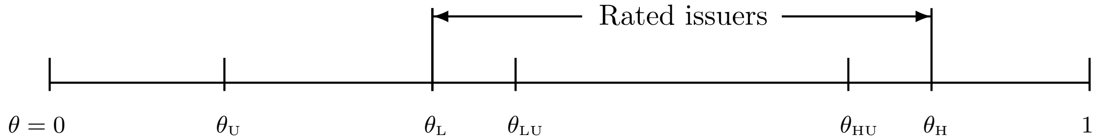

Figure 1.2: Issuer quality notation.

This figure illustrates the notation used for issuer decision thresholds. Issuer quality represents the probability the issuer's risky project will succeed. Issuers with quality $\theta \in [\theta_{\mathrm{L}}, \theta_{\mathrm{H}}]$ purchase ratings, and a subset of these issuers with quality $\theta \in [\theta_{\mathrm{LU}}, \theta_{\mathrm{HU}}]$ raises public financing regardless of the rating outcome. The average rated issuer has quality $(\theta_{\mathrm{H}} + \theta_{\mathrm{L}})/2$. θ_{U} is the threshold for raising public financing without a rating.

For each threshold, I verify that no issuer can profitably deviate, and then consider the rating agency's maximization problem. The rating agency's profits consist of the product of the fee and ratings demand. It solves the following problem:

$$\max_{\alpha,\phi} \left(\theta_{\mathrm{H}} - \theta_{\mathrm{L}}\right) \phi \tag{1.11}$$

subject to participation conditions for the issuer and investors, limited liability, and feasibility conditions. The limited liability condition prevents the issuer from having negative value at $t = 4$ in case the risky project is unsuccessful. Feasibility conditions ensure that required repayment is less than X and that α and θ (as well as any thresholds for θ) lie in the unit interval. The next result rules out public financing by unrated issuers.

Lemma 2 (unrated issues): *In equilibrium* $\theta_{\mathrm{U}} = \theta_{\mathrm{L}}$ *and no unrated issuers raise financing.*

Lemma 2 arises because the willingness of rated customers to pay is higher when unrated issuers cannot enter the market. Whenever unrated issuers would want to raise financing, the rating agency has a profitable deviation. The issuer's participation threshold, θ_{L}, exhibits the following comparative statics:

Lemma 3 (rating demand): *Without private lending, the rating threshold defined by the* *lowest type purchasing a rating,* θ_{L}*, is increasing in* α *and* ϕ *and decreasing in* X*.*

This result describes the influence of rating informativeness on the marginal ratings customer. Without private lending, only the lowest rated issuer is a marginal rating customer. This issuer prefers uninformative ratings to pool with high-quality issuers, and issuers with quality $\theta > \theta_{\text{L}}$ always purchase a rating.

Proposition 1 (baseline solution): *When a high cost of private borrowing rules out private financing* ($\theta_{\text{H}} = 1$)*: (i) the rating agency chooses* $\alpha^* = 0$ *and (ii) there is a fee threshold* ϕ' *such that for* $\phi > \phi'$*, the possibility of unrated public borrowing leads to zero ratings demand, subject to a condition on investor beliefs. (iii) There is an associated project return* X' *such that for* $X \geq X'$*, the rating agency sets* $\phi^* = \phi'$*, and for* $X < X'$ *it sets* $\phi^* < \phi'$*.*

Proposition 1 describes conditions for both corner and interior solutions for the fee. The solution for the fee depends on a demand discontinuity (at ϕ') that arises because increasing the fee beyond ϕ' would allow unrated issuers to borrow. This result arises in the absence of viable outside options relative to public financing with a rating. The first part of the result is a corner solution for rating informativeness and is similar to Lizzeri's result (1999) about pooling of rated issuers.

The second part of the result suggests that there is a discontinuity in the issuers' willingness to pay that arises when unrated issuers become good enough, on average, to borrow from public lenders. To understand this discontinuity, consider the behavior of the marginal rating customer, who is indifferent between purchasing a rating and investing in the safe project without purchasing a rating. As the price of a rating increases, the rating threshold (which defines the quality of this marginal customer) also increases, raising the average quality of issuers who do not purchase a rating.

If it increases enough, unrated issuers may be able to raise financing by offering $R^{\text{U}} < X$. As unrated access to public financing emerges, the baseline equilibrium from the first part of the solution unravels, and the rating agency makes zero profits. This is illustrated in Figure 1.3. If unrated issuers were unable to raise financing for $\phi > \phi'$, there would still be positive rating demand. The rating agency is constrained by the effect of its fee on the issuer's ability to borrow without a rating.

I now modify the solution in Proposition 1 by considering a reduction in P, for example, from a lending supply shock. If P is low enough, a set of issuers with quality $\theta \in [\theta_{\text{H}}, 1]$ chooses not to purchase a rating and raises financing from private lenders. Additionally, issuers with quality $\theta \in [\theta_{\text{HU}}, \theta_{\text{H}}]$ purchase a rating, but choose private financing

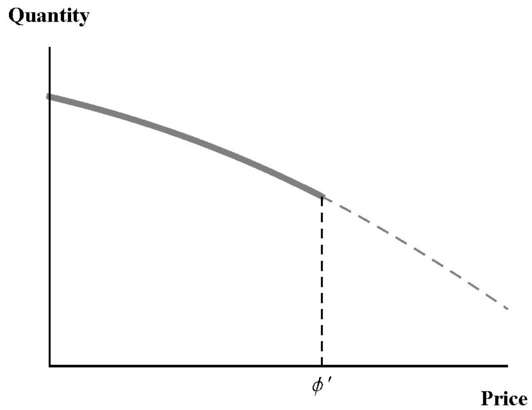

Figure 1.3: Proposition 1: demand discontinuity at ϕ'

The demand curve of the rating agency discontinuously drops to zero (subject to the condition on investor beliefs given by Equation 1.26) because of the ability of unrated issuers to raise capital.

if the rating is unfavorable. Their expected payoff if they purchase a rating is:

$$X - K + A - \phi - (1 - \alpha)P \tag{1.12}$$

while if they borrow from private lenders, their payoff is $X - K + A - P$. Comparing this payoff with that in Equation (1.12) suggests these issuers will never purchase a rating if $\phi > 0$ and $\alpha = 0$.

Proposition 2 (informative ratings): *There is a private borrowing cost P' such that for $P < P'$, the rating agency sets $\alpha^* = \phi/P$.*

When using informative ratings to compete with private lenders, the rating agency loses some low-quality customers (because the low threshold for purchasing a rating, θ_{L}, is increasing in informativeness). It trades off losing those customers against losing some high-quality customers; losing high-quality customers also indirectly reduces the number of low-quality customers, by reducing the value of pooling. Proposition 2 suggests that the emergence of competition from private lenders for high-quality borrowers leads the rating agency to make ratings informative; this result forms the basis for empirical tests of the model in Section 2.2.

1.3.2 Unsolicited ratings

In this section, I consider the rating agency's incentives to issue unsolicited ratings. I modify the time line in Figure 1.1 to allow the rating agency to choose informativeness α_u for unsolicited ratings. As with solicited ratings, I assume that unsolicited ratings either reveal θ or reveal nothing about the issuer, and that the rating agency can costlessly set informativeness of unsolicited ratings.

However, unlike solicited ratings, unsolicited ratings do not convey the borrower's rating purchase decision. Investors already know this decision, so unsolicited ratings that are uninformative cannot influence investor beliefs. The rating agency's use of unsolicited ratings is motivated by the demand discontinuity illustrated in Figure 1.3: because the average unrated issuer seeking financing becomes NPV-positive for $\phi > \phi'$, the rating agency is constrained to $\phi^* \leq \phi'$. By relating unsolicited ratings to beliefs about unrated issuers, the rating agency can reduce the burden of this constraint.

I focus on the simple case in which the rating agency commits to producing unsolicited ratings if issuers do not purchase them, and sets a disclosure rule θ_{UN} such that informative unsolicited ratings are disclosed whenever they indicate the issuer has quality $\theta > \theta_{\text{UN}}$. The specific nature of the disclosure rule is not important, so long as the disclosure policy depends on issuer quality and the rating agency can satisfy the requirement that unrated issuers are, on average, not NPV-positive.

Figure 1.4 illustrates financing thresholds for the model without competition from private lenders and with unsolicited ratings. The unsolicited rating threshold θ_{UN} is defined by the lowest-quality issuer who can raise financing with an unsolicited rating.

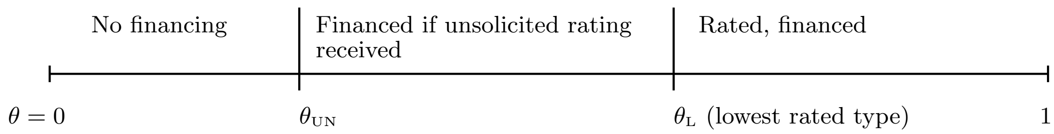

Figure 1.4: Issuer participation with unsolicited ratings

This figure illustrates financing regions in equilibrium with unsolicited ratings. Using unsolicited ratings allows the rating agency to charge higher fees, which increases the quality of its lowest paying customer, θ_{L}. Unsolicited ratings allow issuers with quality $\theta \in [\theta_{\text{UN}}, \theta_{\text{L}}]$ to raise financing if they receive an unsolicited rating. If these issuers do not receive an unsolicited rating, they are pooled with unrated issuers.

Next, I show that unsolicited ratings allow the rating agency to sustain ratings demand for $\phi > \phi'$, preventing issuers that have neither solicited nor unsolicited ratings from public borrowing by reducing the average quality of unrated issuers.

Proposition 3 (unsolicited ratings): *Unsolicited ratings allow the rating agency to charge*

$\phi > \phi'$, where ϕ' is the fee threshold described in Proposition 1, when $\alpha_u > 0$. When the rating agency's optimal fee is $\phi^* < \phi'$, no unsolicited ratings are produced and results are identical to those in Proposition 1.

The portion of the rating agency's demand curve that requires unsolicited ratings is illustrated using dashed lines in Figure 1.5, which describes the effect of an increase in X on the rating agency's choice of fee and use of unsolicited ratings. The fee threshold that allows unrated issuers to access public financing is ϕ'; increases in the fee beyond ϕ' require unsolicited ratings to prevent unrated access to public financing.

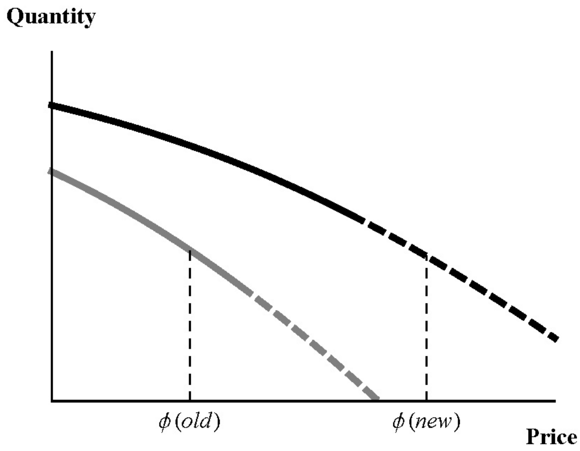

Figure 1.5: Increase in X leads to higher fee and unsolicited ratings
This figure illustrates how an increase in X can lead from equilibrium without unsolicited ratings to equilibrium with unsolicited ratings. The gray line is the rating agency's demand curve when X is low; the black line is the rating agency's demand curve with higher X. The dashed portion of each demand curve is only feasible with unsolicited ratings, which are necessary to prevent unrated firms from borrowing. When X is low, demand is more sensitive to the fee and the rating agency sets $\phi(old) < \phi'$. When X is high, the rating agency prefers $\phi(new) > \phi'$, but must use unsolicited ratings to prevent unrated issuers from borrowing.

From the perspective of the rating agency, unsolicited ratings are used to influence investor beliefs and prevent unrated access to public borrowing; it succeeds if investors believe unrated issuers have low enough quality. Unsolicited ratings allow the rating agency to manipulate beliefs about unrated firms, preventing them from accessing public markets.

1.3.3 Productivity shifts and underinvestment

In this section, I analyze the impact of sudden changes to expected productivity. While such changes may also affect the distribution of issuer types and value of assets in place, I restrict attention to productivity shocks that represent an increase to X, holding other variables fixed. There are two effects of a productivity shock: an increase to X lowers the ratings threshold, and reduces the sensitivity of rating customers to the fee, leading to a higher equilibrium fee. As illustrated in Figure 1.5, change in X can lead to equilibrium with unsolicited ratings.

With fixed K, X can be interpreted as a measure of expected productivity. Demand for ratings is less elastic when expected productivity is high, because the willingness to pay of the marginal issuer is less sensitive to the fee. Thus, Proposition 3 suggests that production of unsolicited ratings is pro-cyclical. During good times, the rating agency uses unsolicited ratings to prevent unrated borrowing, allowing it to charge higher fees.

Due to a higher ratings threshold, rated issues have lower default probability when productivity is low. Additionally, there is less variation in rated firm quality, as the threshold for ratings is higher. I define overinvestment as lost value arising from investment in NPV-negative firms, and underinvestment as value foregone from firms with positive-NPV projects that are unable to obtain financing.

NPV-neutral issuers have quality $\theta_0 \equiv K/X$. For $\theta_0 < \theta_{\mathrm{L}}$, over-investment is:

$$\int_{\theta_{\mathrm{L}}}^{\theta_0} (K - \theta X)\; d\theta \tag{1.13}$$

while otherwise ($\theta_0 \geq \theta_{\mathrm{L}}$), under-investment is:

$$\int_{\theta_0}^{\theta_{\mathrm{L}}} (\theta X - K)(1 - \alpha_u)\; d\theta. \tag{1.14}$$

The second term in Equation (1.14) arises from additional issuers who receive unsolicited ratings. Unsolicited ratings lead to underinvestment (relative to a setting with no unsolicited ratings). This is because of issuers with positive-NPV projects who do not receive unsolicited ratings and are unable to raise financing as a result.

Proposition 4 (dampening): *The rating agency dampens the effect of shocks to X on public lending.*

Proposition 4 suggests the rating agency dampens the effect of shocks to X on public lending. Because demand is more sensitive to price in bad times, the rating agency allows more issuers into public markets by reducing its fee. Similarly, when X is high, the rating agency increases fees. As illustrated in Figure 1.5, this leads to an increase in the quantity demanded and a reduction in the rating threshold. The model suggests that a large increase in X can lead to equilibrium with unsolicited ratings. However, such an equilibrium will feature underinvestment:

Proposition 5 (underinvestment): *Equilibrium with unsolicited ratings features weakly higher underinvestment than equilibrium without unsolicited ratings.*

Unsolicited ratings allow higher fees, and benefit recipients. However, they allow extraction of surplus from rated issuers by the rating agency, and result in underinvestment during good times.

1.4 Conclusion

This paper analyzes a credit rating agency's strategic use of information in corporate credit ratings. The model relates informative credit ratings to competition between public and private lenders facilitated by the rating agency. Tests of the model suggest ratings contain more information when public lenders face increased competition from private lenders. The model also suggests unsolicited ratings 'raise the bar' for solicited ratings during good times. This allows the rating agency to charge higher fees and extract monopolist rents, which can lead to underinvestment. Results shed new light on the gatekeeper role of the ratings sector, and on the nature of competition between public and private lenders.

1.5 Appendix: Proofs

Proof of Lemma 1: Suppose an issuer invests less than A and raises financing for a risky project in equilibrium. Denote by $K - A - \Delta$ the amount raised from investors, and $E[\theta|\Delta]$ the corresponding investor's beliefs about the issuer's type. Note that $\frac{dE[\theta|\Delta]}{d\Delta} \leq 0$ since, because better-quality issuers prefer to borrow less, borrowing more cannot be a positive signal about quality.

To satisfy investors' participation conditions, the issuer offers repayment $R = (K - A + \Delta)/E[\theta|\Delta]$, and obtains profits:

$$\pi_e = \theta \left(X - \frac{K - A + \Delta}{E[\theta|\Delta]} \right) \tag{1.15}$$

Differentiating with respect to Δ yields the sensitivity of the issuer's profit to Δ:

$$\frac{d\pi_e}{d\Delta} = \frac{\theta\Delta \frac{dE[\theta|\Delta]}{d\Delta} - E[\theta|\Delta]\theta}{E[\theta|\Delta]^2}, \tag{1.16}$$

which must be weakly positive to observe $\Delta > 0$ in equilibrium. Examination of Equation 1.16 suggests that $\Delta > 0$ implies $\frac{dE[\theta|\Delta]}{d\Delta} > 0$, a contradiction. ∎

Proof of Lemma 2: When $0 < \theta_L < 1$, where without unrated borrowing, the marginal issuer is indifferent between purchasing a rating and investing in the safe project. Consider $0 < \theta_U < \theta_L < 1$. Compared with the case where unrated issuers cannot borrow, this reduces the attractiveness of purchasing a rating, increasing θ_L. However, such an increase also reduces θ_U, because the average quality of unrated issuers increases. This process continues, ruling out $\theta_L < 1$, which suggests that ratings demand is zero when $\theta_U < \theta_L$ and $\phi > 0$. ■

Proof of Lemma 3: Comparing Equations (1.6) and (1.9), the minimum quality for seeking public financing with an informative rating is $\theta_0 = K/X$. If $\theta_L > \theta_0$, all issuers who seek ratings seek financing. Otherwise, those with quality $\theta \in [\theta_L, \theta_0)$ seek financing only if they receive a favorable rating. Their expected profits from a rating are:

$$\alpha(A-\phi) + (1-\alpha)\theta\Big[X - \frac{2(K-A+\phi)}{\theta_H + \theta_L}\Big] \tag{1.17}$$

Comparing Equation (1.17) with A, solving at equality for $\theta = \theta_L$, and taking the positive root yields:

$$\theta_L = \frac{\Gamma + \sqrt{4X(1-\alpha)(\alpha\phi\theta_H + (1-\alpha)(\theta_H A)) + \Gamma^2}}{2X(1-\alpha)}; \theta_L < \theta_0 \tag{1.18}$$

where $\Gamma \equiv (1-\alpha)(2\phi + 2K - A + \theta_H X)$. In this case, the minimum rated issuer is NPV-negative. For $\theta_L > \theta_0$, and all issuers who seek ratings enter the market. Expected profits from getting a rating are:

$$\alpha(\theta X - K - A + \phi) + (1-\alpha)\theta\left[X - \frac{2(K-A+\phi)}{\theta_H + \theta_L}\right] \tag{1.19}$$

Comparing Equation (1.19) with A and solving at equality for $\theta = \theta_L$ yields:

$$\theta_L = \frac{\Gamma + \sqrt{4(\theta_H\phi\alpha + \alpha K\theta_H + (1-\alpha)\theta_H A) + \Gamma^2}}{2X}; \theta_L \geq \theta_0 \tag{1.20}$$

where $\Gamma \equiv (2-\alpha)(\phi + K) - (1-\alpha)A - \theta_H X$. The result follows from taking derivatives of Equations (1.18) and (1.20) with respect to α and ϕ. ■

Proof of Proposition 1: Since high P rules out $\theta_H < 1$, $\alpha^* = 0$ follows from Lemma 3. The maximum fee arises from the participation constraint of unrated issuers, who seek public financing if:

$$\theta\left[X - \frac{2(K-A)}{\theta_{\mathrm{U}} + \theta_{\mathrm{L}}}\right] \geq A \tag{1.21}$$

Solving Equation (1.21) at equality for $\theta = \theta_{\mathrm{U}}$ (and taking the positive root) yields an expression for the threshold for raising public financing by unrated issuers.

$$\theta_{\mathrm{U}} = \frac{2K - A - \theta_{\mathrm{L}}X + \sqrt{4\theta_{\mathrm{L}}AX + (2K - A - \theta_{\mathrm{L}}X)^2}}{2X} \tag{1.22}$$

If $\theta_{\mathrm{U}} < \theta_{\mathrm{L}}$ entry by unrated issuers leads to unraveling of the solution in Proposition 1. θ_{U} decreases in θ_{L}, which increases in ϕ. Thus, we can solve for ϕ' by setting $\theta_{\mathrm{U}} = \theta_{\mathrm{L}}$:

$$\phi' = \frac{(1-\alpha)(K-A)(X-K)}{(2-\alpha)K - \alpha X} \tag{1.23}$$

It can be verified that $\phi > \phi'$ leads to $\theta_{\mathrm{U}} > \theta_{\mathrm{L}}$, and unrated issuers can raise public financing. The rating agency's first order condition is:

$$1 - \theta_{\mathrm{L}} = \phi\frac{d\theta_{\mathrm{L}}}{d\phi} \tag{1.24}$$

which can be solved for ϕ^*, which is increasing in X. X' is the value of X such that $\phi^* = \phi'$.

For $\phi > \phi'$, there are three possible types of issuer response: (1) everyone over threshold A purchases a rating and unrated issuers cannot raise financing, (2) everyone over threshold B purchases a rating and unrated issuers can raise financing or (3) no issuer purchases a rating and unrated issuers with quality $\theta > \theta_{\mathrm{LU}}$ raise financing. (1) is ruled out becuase, for $\phi > \phi'$, the corresponding solution for the rating threshold implies that the average unrated issuer is NPV-positive, a contradiction. Similarly, (2) is ruled out because for $\phi > \phi'$,, the corresponding solution for the rating threshold implies that the average unrated issuer is NPV-negative, a contradiction.

(3) is a possible issuer response to $\phi > \phi'$ so long as there is no issuer who prefers to deviate and purchase the rating. Define $\hat{\theta}'$ as investors' belief about an issuer who receives an uninformative rating when issuers are pursuing response (3). For such an issuer, the participation constraint for the rating implies:

$$\underbrace{\theta\left[X - \left(\frac{\alpha}{\theta}(K - A + \phi) + \frac{1-\alpha}{\hat{\theta}'}(K - A + \phi)\right)\right]}_{\text{Profit from deviating}} \geq \underbrace{\theta(X - R^{\mathrm{U}})}_{\text{Proft from raising unrated financing}} \tag{1.25}$$

where expected repayment for an issuer who deviates depends on investor beliefs $\hat{\theta}'$. Solving for $\hat{\theta}'$, and setting $\theta = 1$ (the highest possible type) yields a condition on investor beliefs required for zero demand for $\phi > \phi'$:

$$(1-\alpha)\left(\alpha - \frac{2(K-A)}{(K-A+\phi)(1+\theta_{\text{U}})}\right)^{-1} \geq \hat{\theta}' \tag{1.26}$$

The result follows, subject to the condition in Equation 1.26. ■

Proof of Proposition 2: Suppose $\theta_{\text{H}} < 1$ Since higher quality issuers prefer informative ratings, comparing Equations (1.7) and (1.8) yields the high threshold for unconditionally choosing public financing relative to private financing:

$$\theta_{\text{HU}} = \frac{(\theta_{\text{L}} + \theta_{\text{H}})(K+P-A)}{2(\phi+K-A)} \tag{1.27}$$

For issuers with quality $\theta \in [\theta_{\text{L}}, \theta_{\text{H}}]$, paying ϕ must increase expected profits. Comparing Equation (1.12) with profits from private financing yields the participation condition for a high-quality issuer to purchase a rating:

$$\alpha P > \phi \tag{1.28}$$

When $\alpha = 0$, types $[\theta_{\text{HU}}, 1]$ do not purchase ratings, yielding:

$$\theta_{\text{H}} = \theta_{\text{HU}} = \frac{\theta_{\text{L}}(K+P-A)}{2\phi+K-A-P} < 1 \tag{1.29}$$

while for $\alpha > \phi/P$, $\theta_{\text{H}} = 1$. The rating agency's compares profits for $\alpha = 0$ to profits where $\alpha = \phi/P$. $\alpha > \phi/P$ is ruled out because given $\theta_{\text{H}} = 1$, demand for ratings is decreasing in θ_{L}. Profits are lower for $\theta_{\text{H}} < 1$: because of fee income lost from both high-quality and from low-quality issuers. Denote $\theta'_{\text{H}} \equiv \theta_{\text{H}}|_{\alpha=0} < 1$ the threshold for choosing private lending when ratings are uninformative. If $\alpha \geq \phi/B, \theta_{\text{H}} = 1$. However, θ_{H} also influences the behavior of the low-quality marginal issuer. The condition for the rating agency to include information is:

$$\left[\theta_{\text{L}}|_{\alpha=\phi/P,\theta_{\text{H}}=1} - \theta_{\text{L}}|_{\alpha=0,\theta_{\text{H}}=\theta'_{\text{H}}}\right] \leq 1 - \theta_{\text{HU}} \tag{1.30}$$

the result follows from substituting Equation (1.29) for θ_{H} and solving for P (yielding P').■

Proof of Proposition 3: Suppose $X > X'$, so without the rating agency sets $\phi^* > \phi'$ if it can avoid the demand discontinuity discussed in Proposition 1. Let θ_{U} be defined as in

Equation (1.22). To prevent unraveling, the rating agency must satisfy:

$$E[\theta|\text{unrated}] < \frac{\theta_{\mathrm{L}}(\theta \mathrm{X} - \mathrm{A})}{\mathrm{K} - \mathrm{A}} \tag{1.31}$$

As production α_u is increased, issuers with neither solicited nor unsolicited ratings are more likely to have quality $\theta \in (\theta_{\mathrm{U}}, \theta_{\mathrm{UN}})$. Using Bayes' rule, their expected type of an unrated issuer is:

$$E[\theta|\text{unrated}] = \frac{(1-\alpha_u)(\theta_{\mathrm{U}}^2 + \theta_{\mathrm{L}}^2) - \alpha_u \theta_{\mathrm{UN}}^2}{2\Big[\theta_{\mathrm{U}} - \theta_{\mathrm{L}}(1-\alpha_u) - \alpha_u \theta_{\mathrm{UN}}\Big]} \tag{1.32}$$

where the result follows from choosing α_u to satisfy Equation (1.31). Since the rating agency's profits for any $\phi'' \in (\phi', \phi^*)$ are higher than profits for $\phi < \phi'$, this result can obtain even with a cost for unsolicited ratings. ■

Proof of Proposition 4: The demand curve is given by $\theta_{\mathrm{H}} - \theta_{\mathrm{L}}$. Since θ_{H} does not depend on X, the result follows from noting that $\frac{d^2\theta_{\mathrm{L}}(\cdot)}{d\phi dX} > 0$.■

Proof of Proposition 5: Unsolicited ratings occur for $X > X'$. The result follows from comparing (1.20) and (1.22), since $\theta_{\mathrm{LU}} < \theta_{\mathrm{L}}$ when $X > X'$. ■

Table 1.1: Notation summary

X	Project success return (exogenous)
K	Capital required by project (exogenous)
A	Issuer's value for assets in place (exogenous)
P	Private lenders' required return (exogenous)
θ	Probability of project success (*quality* or *type* of issuer)
ϕ	Fee charged by rating agency for producing and disclosing signal
ϕ'	Fee level above which unrated issuers seek financing
X'	Project return associated with $\phi^* = \phi'$ in the baseline model
α	Informativeness of the rating
r	Rating generated by rating agency
Θ	Set of thresholds summarizing issuer participation
θ_{L}	Lowest type who purchases a rating
θ_{LU}	Lowest rated type who pursues public financing unconditional on rating
θ_{HU}	Highest rated type who pursues public financing unconditional on rating
θ_{H}	Highest rated type
θ_{U}	Threshold for entering market: lowest unrated type seeking financing
θ_{UN}	Minimum quality for which unsolicited ratings are disclosed
$R(r)$	Required debt repayment with rating r
R^{U}	Required debt repayment if unrated
R^{P}	Required debt repayment for private financing
α_u	Production level for unsolicited ratings
θ_0	Quality level such that issuer is NPV-neutral

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Chapter 2

Competition in lending and credit rating informativeness: evidence from corporate debt issuance

2.1 Introduction and related literature

In this chapter, I present empirical evidence relating competition between public and private lenders to the information content of corporate credit ratings. I develop and implement empirical methodology related to the theoretical model developed in the previous chapter. I test predictions of the model using a measure of informativeness based on the impact of unexpected ratings on a debt issuer's borrowing cost. I analyze two events that increased the relative supply of private vs. public lending: the temporary shutdown of the high-yield market in 1989 and legislation in 1994 that reduced barriers to interstate bank lending. After each event, I find that the informativeness of ratings increased for issuers whose relative supply of private vs. public capital increased most.

I measure informativeness based on the estimated coefficient on the credit rating from a regression of the yield spread for a new issue on the rating and a set of issue- and issuer-level control variables. This measure of informativeness is based on the premise that when ratings contain information relative to what investors know, investors pay more for a bond issue that is rated higher than expected. By contrast, uninformative ratings have a lower impact on bond pricing.

I regress yield spreads on credit ratings and control variables and find that, on average, the rating determines over 10% of the yield spread for new issues. To address concerns about unobservable firm-level variables correlated with both ratings and access to capital, I control for the issuer's previous rating. As a result, the coefficient on the rating measures the impact of a change in the unpredictable component of ratings on the borrowing cost of the issuer. This approach isolates investors' beliefs about the informativeness of ratings at the time a bond is issued, assuming that investors understand the rating agency's incentives.

Identification of the influence of private lenders on rating informativeness is complicated by difficulties in separately identifying supply and demand, and by challenges specific to measuring total private lending. Studies by Faulkender and Petersen (2006) and Leary (2009) suggest that shifts in loan supply affect the firm's choice between public and private borrowing. An ideal test of the influence of competition relates this borrowing choice directly to the rating agency's informativeness decision.

To test how competition from private lenders influences ratings informativeness, I identify and analyze two events which increased the relative supply of private vs. public lending. The first event I analyze is the 1989 collapse of Drexel Burnham Lambert (the "Drexel collapse"), which led to the temporary shutdown of the high-yield bond market. Lemmon and Roberts (2010) argue that this collapse was exogenous with respect to demand for borrowing. Because it was concentrated in the high-yield segment of the public debt market, I argue that it increased the relative supply of private vs. public lending for high-yield issuers more than it did for investment-grade issuers.

Second, I consider the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 (the "Riegle-Neal Act"). This legislation reduced barriers to interstate branching (Dick, 2006), and had a disproportional affect for young issuers, since older issuers had access to interstate borrowing before the legislation (Zarutskie, 2006). By increasing the supply of private lending for young issuers, without having a similar impact on the supply of public lending, this legislation shifted the relative supply of private vs. public lending for young issuers.

I analyze how each event affected the informativeness of ratings by comparing issuers facing differential shifts to the relative supply of private vs. public lending. I find that rating informativeness increased significantly following both the Drexel collapse and the Riegle-Neal Act for a subset of issuers facing larger supply shifts. For issuers facing smaller supply shifts, the informativeness of ratings did not increase. These results suggest that the informativeness of ratings responds to competition between private and public lenders.

Related studies that analyze ratings determination (e.g., Horrigan, 1966; Kaplan and Urwitz, 1979; Ederington, 1985; Kraft, 2010) focus on the relationship between observable firm characteristics and credit ratings. Studies of rating standards (e.g., Amato and Furfine, 2004; Blume, Lim, and MacKinlay, 2006) focus on variation in the relationship between ratings and fundamentals over time. A number of studies address the informativeness of ratings, usually by analyzing the stock or bond price reaction to upgrades and downgrades.[1]

To relate the informativeness of ratings to rating agency incentives, I focus on ratings assigned to new issues, which comprise the majority of rating fees for corporate issuers (White, 2001). My approach for measuring ratings informativeness is closest to that of Liu and Thakor (1984) and Becker and Milbourn (2010) who consider the effect of ratings on bond yields. This approach measures the incremental impact of ratings (above fundamentals) by regressing bond yields on credit ratings, using control variables that predict the rating.

2.2 Data and methodology

The model suggests ratings should be informative for two reasons. First, informative ratings prevent defection of high-quality customers to private borrowing. Second, unsolicited ratings allow the rating agency to charge paying customers higher fees by preventing unrated public borrowing. Tests of the model focus on the rating agency's strategic use of informative ratings in response to competition from private lenders.

Proposition 2 (from the model in the previous chapter) suggests a critical value exists for P, the cost of private borrowing relative to that of public borrowing. If this relative cost becomes low, the model predicts the rating agency will make ratings informative. In practice, this relative cost is difficult to measure because of difficulties in separately identifying demand and supply, and because we observe incomplete measures of total private lending. A proxy for the cost is the relative supply of private vs. public lending.

I argue that the collapse of Drexel in 1989 and the 1994 Riegle-Neal Act allow identification of a positive shift in the relative supply of private vs. public lending. Each event increased competition from private lenders for a subset of borrowers. This allows for comparison of effects relative to a group of unaffected borrowers.

The collapse of Drexel led to a temporary shutdown in the public high-yield debt market without having a similar impact on the investment-grade market. Even if the supply of private lending decreased after the Drexel collapse, it is unlikely that it decreased for investment-grade borrowers in the same proportion as it decreased for high-yield borrowers. Following Drexel's collapse, I expect ratings to become more informative for high-yield issuers. The Riegle-Neal Act also led to a positive shift in the relative supply of private vs. public lending. By allowing interstate branching, it opened national credit markets to young

[1]Examples include Holthausen and Leftwich (1986), Hand, Holthausen, and Leftwich (1992), Kliger and Sarig (2000), Dichev and Piotroski (2001), Hull, Predescu, and White (2004), and Jorion, Liu, and Shi (2005).

issuers who were otherwise constrained to local borrowing (Zarutskie, 2006). Following this legislation, I expect ratings to become more informative for young issuers.

2.2.1 Data sources

Data for this project come from several sources. Firm-level accounting data are taken from Standard & Poor's Compustat Backtest Database Packages. These data are supplemented with the Compustat Industrial tables as well as the CRSP/Compustat Merged Database maintained by the Center for Research in Securities Prices (CRSP). The primary source for issuance data is Thomson Financial's Securities Data Corporation (SDC) database, which I supplement with data from the Securities and Exchange Commission's (SEC) Registered Offering Statistics tape and the CUSIP master file maintained by Standard & Poor's. SDC contains issue-level ratings data for major ratings agencies, and issuer-level ratings data from Moody's; this data are supplemented with ratings data from Standard & Poors RatingsXpress Database (RX) and the Mergent Fixed Income Securities Database (FISD). I also use CRSP security prices to estimate market model parameters for each issuer.

I use bond issuance data from SDC, which contains information on 248,631 non-convertible public debt issues in the United States between 1980 and 2009. My initial sample includes both straight public debt issues and debt issued under the SEC's Rule 144A. As discussed by Carey, Prowse, Rea and Udell (1993) and Carey (1998), Rule 144A debt offerings are technically private placements but share many similarities with public issues.[2] From this sample, I exclude federal credit agency, sovereign, supra-national, mortgage, emerging-market, asset-backed, and non-dollar denominated deals.

Using the Fama French 12 industry definitions, I exclude financial firms and regulated utilities (Fama-French industries 8 and 11). Removing floating-rate debt and issues where the issuer had over 10 separate debt issuances on a single day leaves 61,949 issues (of these, 50,679 are straight public debt issues and the rest are issued under the SEC's Rule 144A). Matching with Compustat data and aggregating multiple issues on the same day by the same issuer yields the final sample of 7,396 issues. Of these, 5,748 are straight debt issues and 1,648 were issued under Rule 144A. The sample selection process is summarized in Table 2.1.

2.2.2 Description of variables

It is important that the accounting data I match to my sample were publicly available when each deal was priced. Since Compustat historical quarterly data are adjusted

[2]These similarities include having similar covenants and being underwritten. Rule 144A offerings also tend to be rated, while traditional private debt issues are frequently unrated.

for restatements, I use the Compustat Backtest Database Packages to identify firm-level accounting data that were available at the time of each issue. I focus on the Point-in-Time History (PIT) file and the Unrestated Quarterly (URQ) file. Since the PIT file tracks restatements over time, I use the first observation in this file for each datadate. In the event a variable is missing from this dataset, I next look for the variable in URQ. If it is also missing there, I use the value for that variable from Compustat Industrial Tables if available, since it is unlikely to have been restated and be missing from the other two datasets.

My firm-level analysis focuses on variables related to the unobserved credit quality of the firm. These include measures of cash, cash flow, profitability, fixed assets, leverage (book and market), and the ratio of book value to market value for both assets and shareholder's equity. For each variable, I include both the most recent value available at the time of the debt issue, as well as the mean and variance from quarterly data for the past 4 years. Table 2.2 provides details on how variables are constructed, and I present sample summary statistics in Table 2.3.

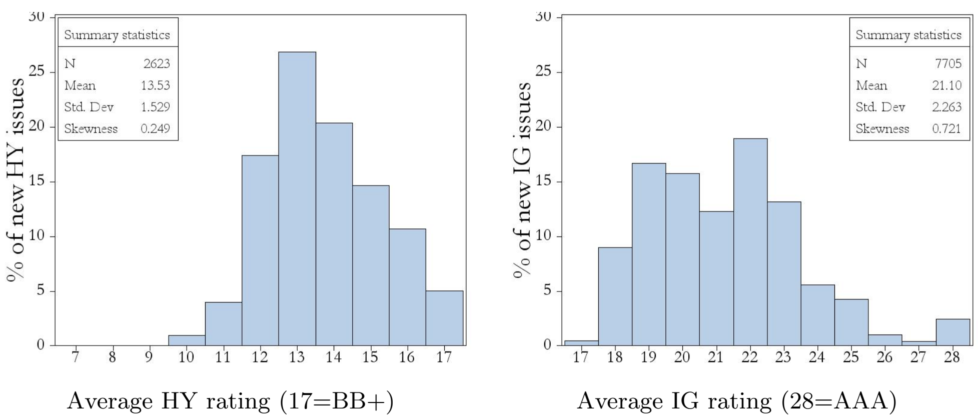

Figure 2.1: Distribution of ratings for high-yield and investment-grade issues
This figure illustrates the distribution of ratings for public debt issuers. The chart on the left is a histogram of ratings for high-yield debt issuers, while that on the right is for investment-grade issuers. A rating is defined as the average of numerical ratings by major rating agencies for a bond issue, where numbers are assigned to each rating class in ascending order following Becker and Milbourn (2010). The highest rating category is AAA; issues with average ratings below 17 are high-yield issues, those with average ratings above 17 are investment-grade issues. Each histogram displays the within-group, rather than across-group, distribution of ratings for issuers of public debt by US non-financial issuers between 1980 and 2009, that are matched to Compustat accounting data. Results of the sample selection process are presented in Table 2.1.

I follow Becker and Milbourn's (2010) numerical conversion of categorical ratings data: ratings are assigned numbers from 28 (AAA or 'extremely strong') to 4 (C or 'significantly speculative'). Only one new issue is assigned a rating below 9 in my sample. When issues are rated by more than one agency, I use the average rating. The sample distributions of the average rating for both high-yield and investment-grade issuers are summarized in Figure 2.1.

2.2.3 The informativeness of ratings

To test the hypothesis relating the informativeness of ratings to competition from private lenders, I require an information measure related to new issues that is relevant for pricing. I focus on pricing of new issues, rather than analyzing upgrades, downgrades, or default outcomes, for several reasons. Measuring informativeness using default outcomes is complicated by assessment of whether default was anticipated and because of timing differences between rating dates and default outcomes. Additionally, most of the rating agency's rating-related income comes from fees on new issues, rather than from ongoing maintenance fees (White, 2001). My measure extracts the information level in ratings from yield spreads. This approach has the advantage of directly estimating investors' expectations about rating quality.

Previous literature offers a variety of rating determination models that can be summarized by the rating prediction equation:

$$r_{i,b,t} = f(X_{i,b,t}) + \varepsilon_{i,b,t} \tag{2.1}$$

where issues are indexed by i, issues (bonds) by b, time by t, and $X_{i,b,t}$ is a vector of firm-level and bond-level characteristics. Typical issue-level variables include the seniority of debt, its maturity, whether it was registered via a Rule 415 Shelf Registration, is lease-related, or syndicated. Several previous studies discussed in Section 1.2 use models based on Equation (2.1) to predict ratings for issues or issuers, measure time trends, and explore cross-sectional variation in ratings determination. As noted by Kaplan and Urwitz (1979) and Kraft (2010), estimation of Equation (2.1) using OLS delivers results very close to results obtained using other methods (for example, results from ordered probit estimation). A concern with (2.1) is that ratings can also be driven by unobservable firm variables that also relate to access to credit. To address this concern, I include the firm's previous issuer-level rating as a control variable.

I also control for observable characteristics of the issue and issuer. The measure of informativeness I analyze relies on the following yield spread (YS) regression:

$$YS_{i,b,t} = \alpha_0 + \alpha_1 r_{i,b,t} + \gamma' X_{i,b,t} + \eta_{i,b,t} \tag{2.2}$$

I interpret the estimate of α_1 from Equation (2.2) as an aggregate measure of ratings informativeness. It can be interpreted as the cost of one rating point. I estimate Equation (2.2) both in a pooled regression context and year by year, to obtain an average level of ratings informativeness over time. As Liu and Thakor (1984) point out, standard errors in Equation (2.2) are likely to be biased upwards because of the high correlation between the control variables ($\gamma' X_{i,b,t}$) and the rating ($r_{i,b,t}$).This suggests the standard errors I estimate are conservative.

2.2.4 The influence of capital supply on ratings informativeness

Next, I relate informativeness to the relative supply of private vs. public lending. I analyze the collapse in 1989 of the high-yield market brought on by the bankruptcy of Drexel. As discussed by Lemmon and Roberts (2010), this collapse led to a temporary shut-down in the high-yield market after 1989. The model predicts the rating agency responds to such an event by increasing the informativeness of ratings for issuers who experienced an increase in the relative supply of private vs. public lending. To measure the influence of the Drexel collapse on ratings informativeness, I analyze a sample of high-yield issues during a 4-year window surrounding 1989. I estimate the following regression:

$$YS_{i,b,t} = \beta_1 I_{1989} * r_{i,b,t} + \beta_2 r_{i,b,t} + \beta_3 I_{1989} + \gamma' X_{i,b,t} + \nu_{i,b,t} \tag{2.3}$$

where I_{1989} is an indicator variable set to 1 during the post-1989 period. The coefficient of interest is β_1, which measures the influence of the credit rating on pricing during the post-1989 period, relative to this impact before 1989. The model predicts $\beta_1 < 0$. Because the shock to the supply of public financing affects high-yield issuers more than investment-grade issuers, I also estimate Equation (2.3) for investment-grade issues during the same period, and expect my estimate of β_1 to be insignificant.

Next, I analyze the Riegle-Neal Interstate Banking Act of 1984. Following Dick (2006) and Zarutskie (2006), I interpret the Riegle-Neal Act as a positive shock to private lending supply. By reducing barriers to interstate branching, this legislation increased the supply of bank lending for issuers constrained to local borrowing, without having a similar impact on the supply of public lending. Following Zarutskie (2006), I relate an issuer's age to its ability to borrow privately, assuming older firms were less influenced by this legislation due to preexisting access to national borrowing markets. I focus on young borrowers, whose first public security issuance was within five years. The distribution of issuer age in my sample is illustrated in Figure 2.2.

Let I^y be an indicator variable for a young firm (I define a young firm as one less than 5 years old). I measure the effect of the Riegle-Neal Act on rating informativeness by

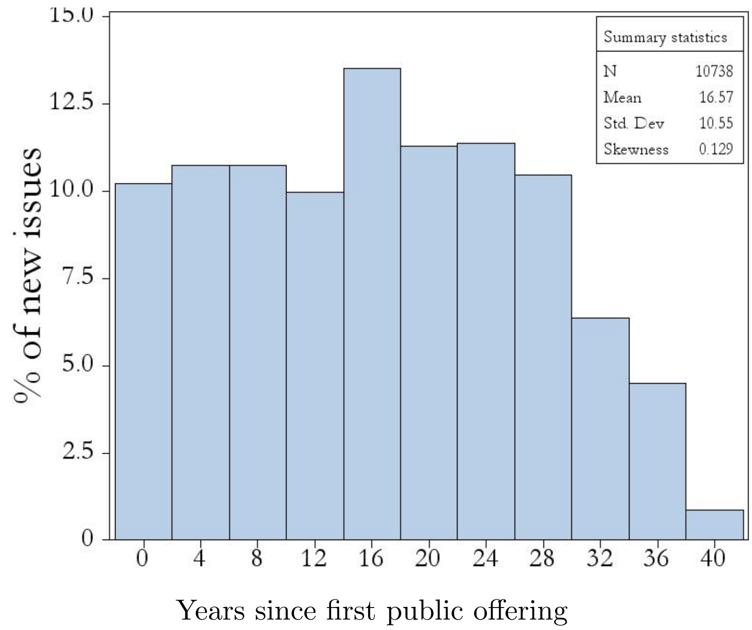

Figure 2.2: Histogram of public debt issuer age, 1980-2009
This histogram illustrates the age distribution of issuers of public debt by US nonfinancial issuers between 1980 and 2009, that are matched to Compustat accounting data. I define age as the number of years since the issuer's first public offering of any security in SDC. Results of the sample selection process are presented in Table 2.1.

estimating the following regression:

$$YS_{i,b,t} = \beta_1 r * RN_t * I^y_{i,t} + \beta_2\ r * I^y_{i,t} + \beta_3 r RN_t + \beta_4 r + \beta_5 RN_t + \beta_6 I^y_{i,t} + \gamma' X_{i,b,t} + \eta_{i,b,t} \quad (2.4)$$

where RN_t is an indicator variable for the post-legislation period and I drop subscripts i, b, t on the rating r for ease of exposition. The model predicts $\beta_1 < 0$ under the assumption that the Riegle-Neal Act increased the supply of private vs. public lending for young issuers.

2.3 Empirical results

My results suggest that when a subset of issuers experiences a positive shock to the relative supply of private vs. public lending, ratings for this subset of issuers become more informative. After the Drexel collapse, I find that ratings became more informative for high-yield issuers, but not for investment-grade issuers. Similarly, I find that ratings became more informative for young issuers following the Riegle-Neal Act, but not for older issuers. My results are robust to alternative window specifications: for each event, I show that my estimate of ratings informativeness decreases as a larger period of time is analyzed. I also test the counter-factual hypotheses that each event occurred during a different event year.

2.3.1 Aggregate ratings informativeness

Results of yield spread regressions from estimating Equation (2.2) annually are illustrated in Figure 2.3. This figure plots the coefficient on the rating in a regression of the yield spread on issue- and issuer-level control variables. The coefficient in Figure 2.3 is scaled by the annual average yield spread, so the level in Figure 2.3 can be interpreted as the percentage of the yield spread driven by unexplained variation in the credit rating.

These results suggest that, on average, one rating point costs borrowers between 20 and 30 basis points, slightly over 10% of the mean yield spread for my sample of 210 basis points. Figure 2.3 illustrates time series variation in the average informativeness for new corporate bond issues, and suggests there is substantial time-series variation in the cost of one rating point for new issuers. This cost reaches its highest level in 1991, following the Drexel collapse.

Since I do not know the full information set of investors, it could be that the ratings I analyze contain less information than I estimate. Kraft (2010) relates off-balance sheet debt and other adjustments to ratings. I argue that these adjustments are not likely to influence my results for two reasons. First, a previous issuer-level rating, if available, likely incorporates similar information to adjustments made by the rating agency for off-balance sheet items. In unreported results, I estimate Equation (2.1). I find higher R^2 than Kraft's model (2010), suggesting off-balance sheet adjustments are correlated with my controls. However, I acknowledge that off-balance sheet items may still affect investors' expectations about an issuer's rating.

2.3.2 The Drexel collapse and rating informativeness

Results from estimating Equation (2.3) are presented in Table 2.4. The coefficient of interest is the (boxed) estimated coefficient on the interaction of the rating and the indicator variable for the post-Drexel period ($\hat{\beta}_1$). My estimate of this coefficient is negative and significant, suggesting ratings became more informative for high-yield issuers following 1989. I estimate Equation (2.3) using both the log of the yield spread (models 1 and 3) and the level (models 2 and 4) as the dependent variable. I present results that treat issues by the same issuer on the same day as separate observations (models 1 and 2). Since these observations are likely correlated, I also present results from estimating Equation (2.3) using a sample that aggregates issues by the same issuer on the same day.

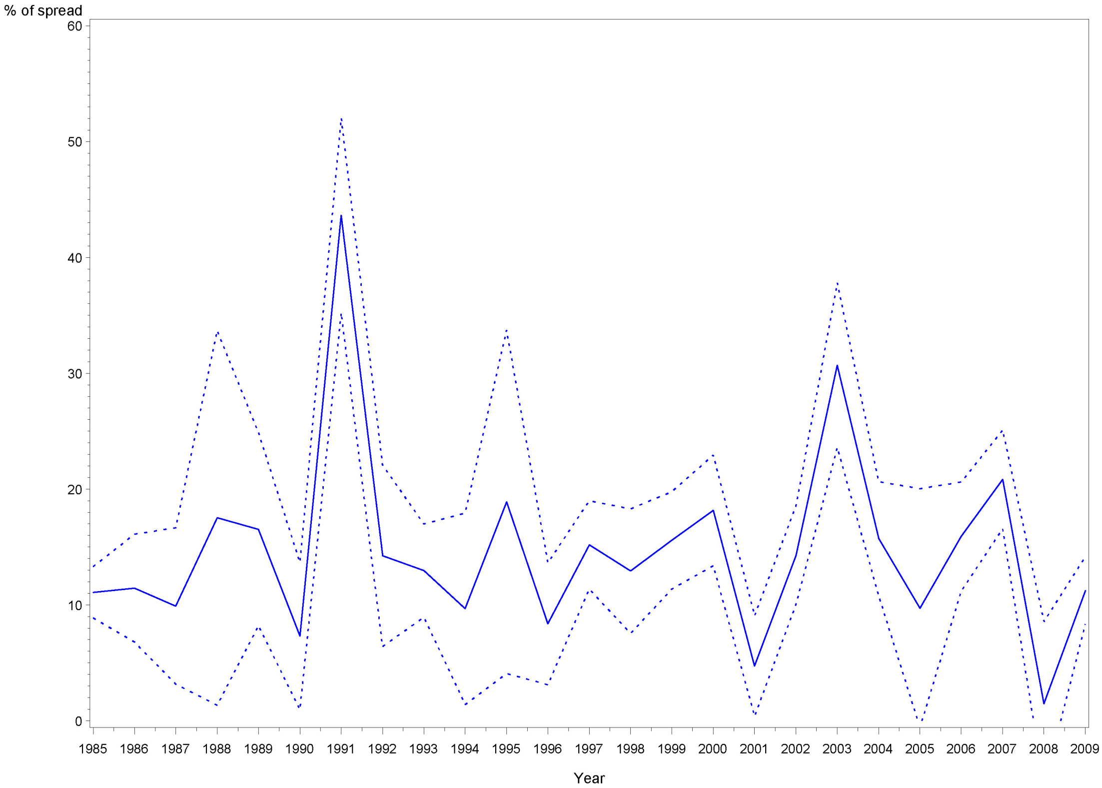

Figure 2.3: Estimated rating informativeness, 1985-2009
This figure illustrates the coefficient of the rating on annual regressions of the yield spread on the rating, issue-level and issuer-level control variables. Each year's estimate of α_1 from Equation 2.2 is scaled by the mean credit spread of all issues in that year. The dashed lines represent intervals of one standard error around each estimate. Each regression includes Fama French 12-industry fixed effects. The sample includes fixed-rate public debt issues by non-financial, non-utility issuers in the SDC New Issues Database, matched to Compustat accounting data. Details on the sample selection process are presented in Table 2.1.

The coefficient on the interaction of the rating and indicator for the post-collapse period suggests that the cost of an unexpected rating was between 20 and 24 basis points higher for high-yield issuers after the Drexel collapse. This is approximately half of the average cost of an unexpected rating point during this period (based on the estimated coefficient on the rating). My estimate of these coefficients include year and industry fixed effects, and control for the issuer's prior rating as well as for issuer- and issue-level variables.

Table 2.5 presents results of estimating Equation (2.3) for investment-grade issuers. My estimate of β_1 in each model in Table 2.5 is insignificant, suggesting ratings did not become more informative following the Drexel collapse for investment-grade issuers. This result is consistent with with the Drexel collapse affecting high-yield issuers more than investment-grade issuers. I follow the same methodology for reporting results in Tables 2.4

and 2.5, and cannot reject the null hypothesis that $\beta_1 = 0$ in models (1)-(4).

Results in Tables 2.4 and 2.5 suggest that the Drexel collapse led to an increase in the informativeness of credit ratings for high-yield issuers, but not for investment-grade issuers. This is consistent with a higher influence of the Drexel collapse on the relative supply of private vs. public capital for high-yield issuers, due to increased competition from private lenders.

2.3.3 The Riegle-Neal Act and rating informativeness

In Table 2.6, I present results from estimating Equation (2.4) over a 4-year window around passage of the Riegle-Neal Act. Following Zarutskie, I compare bond issues before 1994 with issues after 1994. The coefficient of interest is the (boxed) estimated coefficient on the interaction of the rating, RN and an indicator variable for age less than 5 years ($\hat{\beta}_1$). As expected, this estimated coefficient is negative and significant in each specification.

To confirm that my results relate to young issuers, rather than to issuers in other age groups, I also estimate Equation (2.4) using an indicator variable for issuers from other age groups. I cannot reject the null hypothesis that there was no change in rating informativeness for other age groups. In Table 2.7, I report results from using an indicator variable for middle-aged issuers (those whose age is between 10 and 15 years). The only difference in methodology for results reported in Table 2.7 and those reported in Table 2.6 is a different definition of the age variable. My estimate of β_1 is insignificant in each specification in Table 2.7. The results reported in Tables 2.6 and 2.7 suggest ratings became more informative for younger issuers, but not for older issuers, after nationwide passage of the Riegle-Neal Act.

2.3.4 Robustness tests

While my results in Section 2.3 are significant, it could be that these results are driven by the choice of the period length I consider. Alternatively, my results could arise from variation in informativeness unrelated to the specific events I analyze. To account for these possibilities, I analyze the robustness of my results to alternative window lengths, and test the counter-factual hypothesis that each event occurred at a different time.

In Panel A of Table 2.8, I present results from changing the analysis period surrounding the year of the Drexel collapse. Consistent with the hypothesis that the collapse was unexpected, I find stronger results for smaller windows. A two year window yields the largest results, and results become insignificant when the window length is increased to five years. The coefficient on the interaction of the rating and the indicator for post-event period remains negative in these specifications. However, the number of observations decreases quickly around the time of the Drexel collapse due to the resulting temporary shutdown of the high-yield market.

Panel B of Table 2.8 presents results from estimating Equation (2.3) using other years. I find significant results for the coefficient on the interaction of the rating and indicator for post-shock period under the assumption that the shock occurred in 1987, 1988, or 1989. These results are consistent with overlap of the 4-year analysis period with the collapse of Drexel in 1989. Results for 1987, 1990, and 1991 are not significant.

Panel A of Table 2.9 illustrates the effect of changing the analysis period surrounding the date of nationwide passage of the Riegle-Neal Act. Consistent with the results in Table 2.8, I find stronger results for smaller windows. The Riegle-Neal Act appears to have had a lasting impact on ratings informativeness for young firms, as I continue to find significant results as the length of the analysis period is increased to six years. The coefficient on the interaction of the rating and the post-event period remains negative.

Panel B of Table 2.9 presents results from estimating Equation (2.4) using different event years. Using a four-year window, I find significant results for the coefficient on the interaction of the rating, indicator for young firm, and post-shock period under the assumption that the shock occurred in 1993 or 1994. No other year produces a significant result. Interestingly, results are stronger for the hypothesis that the Riegle-Neal Act occurred in 1993, which suggests the legislation was anticipated prior to its formal passage in 1994.

2.4 Conclusion

This chapter includes results suggesting an empirical relationship between the level of competition between private and public lenders lenders and the information content of corporate credit ratings. The evidence suggests that greater competition from private lenders is associated with more informative credit ratings. This evidence is consistent with theoretical predictions presented in the previous chapter, which suggest that the rating agency faces defection of high-quality customers when private lending is abundant, and uses informative ratings to prevent the associated loss in rating value. Identification of increases in lending competition is achieved by analyzing two events which increased the supply of private vs. public lending.

2.5 Appendix: tables

Table 2.1: Sample selection procedure

This table summarizes results of the sample selection procedure for new debt issues described in Section 2.2. I begin with the set of all public debt issues from the SDC New Issues Database (master deal types D and R144D). From this initial public debt sample, I exclude federal credit agency and mortgage-related deals, as well issues from non-US issuers, issues that are not denominated in dollars, and issues of floating-rate debt. I also exclude issues by issuers with over 10 issues on a single day, since such issues by industrial companies are likely related to unusual financing events. These issues are then matched with unrestated quarterly issuer data from Compustat. I exclude financial issuers and utilities (using Fama-French 12 industry definitions) to obtain a final sample of 11,348 issues by nonfinancial industrial companies. I aggregate multiple issues by an issuer on the same day and present results with and without aggregation.

	Number of deals			Principal Amount ($ Millions)		
Selection rule	Total	Straight debt	Rule 144A	Total	Straight debt	Rule 144A
Initial debt sample	248,631	190,636	57,995	$33,534,671	$26,387,483	$7,147,188
Exclude federal agency/GSE/sovereign	131,018	73,219	57,799	20,170,211	13,075,777	7,094,434
Exclude mortgage (issue-type= MB)	121,059	73,219	47,840	19,490,918	13,075,777	6,415,141
Exclude emerging market (issue-type=EM)	120,188	72,966	47,222	19,339,289	13,016,938	6,322,351
Exclude asset-backed (issue-type= AB)	92,168	72,966	19,202	16,483,625	13,016,938	3,466,687
Dollar-denominated	91,588	72,547	19,041	16,118,842	12,742,883	3,375,959
Exclude issues without fixed-rate	63,833	52,075	11,758	11,111,511	8,804,827	2,306,684
Exclude issues with >10 deal(s) per day	61,949	50,679	11,270	10,976,313	8,705,781	2,270,533
Compustat match	21,601	18,632	2,969	5,559,854	4,655,609	904,245
Exclude non-US deals	20,352	17,548	2,804	5,122,880	4,288,550	834,330
SDC Rating data available	20,348	17,545	2,803	5,121,455	4,288,125	833,330
Exclude financials (FF12=11)	13,758	11,267	2,491	3,644,937	2,907,987	736,950
Exclude utilities (FF12=8)	11,348	9,054	2,294	3,233,383	2,563,020	670,363
Combine multiple issuances/day	7,396	5,748	1,648	3,233,383	2,563,020	670,363

Table 2.2: Variable definitions

The data sources and sample selection procedure are described in Section 2.2.2. I access the Compustat Unrestated Quarterly (URQ), Point in Time (PIT), and Fundamental Quarterly Table (Fundq) using Wharton Research Data Services (WRDS). Variable abbreviations refer to variable names in Fundq tables on WRDS. As discussed in Section 2.2.2, I search for each variable first in the PIT or URQ tables, since data in the Fundq table are adjusted for restatements. Quarterly values from cash flow statement (variable names ending in y), presented as year to date numbers, have been adjusted by subtracting the lagged quarterly value in fiscal quarters 2, 3, and 4.

Age	= (Date of first public offering (SDC) - issuedate)/365
Altman Z score	= 1.2(wcapq / atq) + 1.4(req/atq) + 3.3(oiadpq/atq)+
	+ 0.6(prccq*cshoq/ltq)+0.999*revtq/atq
Book assets	= atq
Callable	= Indicator(any part issue is callable) (SDC)
Cash	= Maximum of cheq,chq
Date of first public offering	= Minimum date in SDC for master deal type D, P, C
Datadate	= Date of accounting data in Compustat
Ebit	= Operating income after depreciation (oiadpq)
Ebitda	= Operating income before depreciation (oibdpq)
Fixed assets (PPE)	= ppentq (Property, plant and equipment, net)
Has prior rating	= Indicator(issuer-level rating in RX or FISD)
Interest expense	= xinty
Issuedate	= Date of security issue (SDC)
Leverage (book)	= (dlttq+dlcq) / atq
Leverage (market)	= (dlttq+dlcq) / (dlttq + dlcq + prccq*cshoq)
Market to book (assets)	= (prccq*cshoq+lseq-ceqq) / atq
Maturity	= Date of final maturity (SDC) - Issuedate
Principal	= Total principal amount all markets (SDC)
Rating	= Avg. new issue rating, ordered from 28 to 1
Return on equity	= ni/ceq (Net income / book value of common equity)
Rule 144A	= Indicator(SDC master deal type = R144D)
Shelf registered	= Indicator(SDC flag for rule 415 filing)
Subordinated	= Indicator(SDC flags deal as subordinated)
Syndicated	= Indicator(SDC flags deal as syndicated)
Yield spread	= YTM - spread on treasury with same maturity

Table 2.3: New issue summary statistics

This table reports summary statistics for new public debt issues that survive the sample selection procedure summarized in Table 2.1. Issuance data are taken from the Securities Data Corporation (SDC) New Issues Database, and are matched to the Compustat Backtest databases, as well as to Compustat Industrial Annual data. For each issue-level observation in Panel A, data are from quarterly filings that were publicly available before the issue date (and are not adjusted for subsequent restatement). Four-year average columns reflect averages of unrestated quarterly data over four years preceding each issue. Panel A summarizes issuer-level variables, while Panel B summarizes issue-level variables.

Panel A: Issuer-level summary statistics																
		Full sample, 1980-2009					Drexel subsample, 1986-1993					Riegle-Neal Subsample, 1990-1997				
Issuer variables		Obs	Mean	Median	St. Dev	4-yr Avg	Obs	Mean	Median	St. Dev	4-yr Avg	Obs	Mean	Median	St. Dev	4-yr Avg
Altman Z-score	Investment grade	6907	2.13	1.75	1.48	2.26	1389	1.83	1.55	1.16	1.92	2109	1.92	1.61	1.27	2.01
	High yield	2652	2.18	1.07	33.59	2.00	456	1.36	1.09	2.01	1.52	807	4.02	1.08	60.79	2.53
	All deals	9559	2.14	1.56	17.74	2.19	1845	1.71	1.43	1.43	1.83	2916	2.50	1.46	32.00	2.15
Cash / book assets	Investment grade	8057	0.04	0.02	0.06	0.05	1736	0.04	0.02	0.05	0.05	2662	0.03	0.02	0.05	0.04
	High yield	3197	0.07	0.03	0.11	0.08	598	0.06	0.02	0.09	0.06	1000	0.06	0.02	0.09	0.07
	All deals	11254	0.05	0.02	0.08	0.06	2334	0.04	0.02	0.06	0.05	3662	0.04	0.02	0.06	0.05
Ebitda / interest Expense	Investment grade	7347	13.23	7.72	51.64	21.76	1560	8.91	5.45	24.75	11.60	2430	11.00	6.44	57.48	12.53
(truncated at 0)	High yield	3002	10.02	3.06	103.90	23.27	557	5.59	2.62	14.37	8.22	956	10.69	2.92	107.93	40.06
	All deals	10349	12.29	6.17	70.89	22.20	2117	8.04	4.88	22.53	10.71	3386	10.92	5.74	75.22	20.27
Leverage (book)	Investment grade	7592	0.30	0.29	0.13	0.29	1610	0.32	0.32	0.12	0.30	2490	0.31	0.31	0.12	0.31
	High yield	2962	0.47	0.45	0.24	0.45	555	0.50	0.47	0.27	0.48	923	0.48	0.45	0.27	0.47
	All deals	10554	0.35	0.32	0.18	0.34	2165	0.36	0.34	0.19	0.35	3413	0.36	0.33	0.19	0.36
Leverage (market)	Investment grade	7519	0.27	0.24	0.16	0.27	1597	0.33	0.32	0.16	0.32	2450	0.29	0.28	0.16	0.31
	High yield	2839	0.43	0.43	0.22	0.42	510	0.47	0.47	0.21	0.46	857	0.44	0.43	0.21	0.42
	All deals	10358	0.31	0.28	0.19	0.31	2107	0.36	0.34	0.19	0.35	3307	0.33	0.31	0.18	0.34
PPE / Book assets	Investment grade	8088	0.41	0.37	0.23	0.42	1741	0.46	0.41	0.25	0.47	2681	0.44	0.40	0.23	0.45
	High yield	3167	0.41	0.37	0.26	0.41	595	0.41	0.37	0.23	0.42	993	0.44	0.41	0.25	0.43
	All deals	11255	0.41	0.37	0.24	0.41	2336	0.45	0.40	0.24	0.46	3674	0.44	0.41	0.23	0.44
Asset market/book	Investment grade	7916	1.79	1.50	0.92	1.80	1714	1.50	1.30	0.64	1.46	2604	1.64	1.45	0.72	1.61
	High yield	3050	1.56	1.31	1.00	1.58	544	1.48	1.26	1.17	1.44	930	1.56	1.31	0.90	1.59
	All deals	10966	1.72	1.44	0.95	1.74	2258	1.49	1.29	0.80	1.46	3534	1.62	1.41	0.77	1.60
Revenues / assets	Investment grade	8110	0.27	0.24	0.18	0.29	1743	0.28	0.25	0.17	0.30	2686	0.28	0.25	0.17	0.29
	High yield	3200	0.27	0.22	0.28	0.29	599	0.35	0.26	0.46	0.37	1003	0.30	0.23	0.38	0.32
	All deals	11310	0.27	0.24	0.21	0.29	2342	0.30	0.25	0.28	0.32	3689	0.28	0.25	0.25	0.30
Return on equity	Investment grade	7912	0.05	0.04	0.31	0.05	1716	0.03	0.03	0.05	0.04	2623	0.04	0.04	0.05	0.04
	All deals	2836	-0.02	0.02	0.34	-0.04	2228	0.02	0.03	0.22	0.03	3488	0.02	0.03	0.16	0.04

Tabel 2.3: New issue summary statistics (continued from previous page)

Panel B: Issue-level summary statistics													
		Full sample, 1980-2009				Drexel subsample, 1986-1993				Riegle-Neal Subsample, 1990-1997			
Issue level variables		Obs	Mean	Median	St. Dev	Obs	Mean	Median	St. Dev	Obs	Mean	Median	St. Dev
Principal / assets	Investment grade	8110	0.04	0.02	0.05	1743	0.03	0.02	0.04	2686	0.03	0.02	0.05
	High yield	3201	0.37	0.17	1.64	599	0.49	0.17	3.47	1003	0.52	0.19	2.78
	All deals	11311	0.13	0.04	0.89	2342	0.15	0.03	1.76	3689	0.17	0.03	1.46
Principal	Investment grade	8120	305.96	200.00	395.59	1752	168.60	150.00	133.28	2687	156.96	125.00	154.05
	High yield	3237	232.08	165.00	232.13	609	150.05	105.00	143.98	1010	171.64	130.00	149.94
	All deals	11357	284.90	200.00	358.26	2361	163.81	125.00	136.33	3697	160.97	125.00	153.06
Yield spread (bps)	Investment grade	7374	133.71	108.00	99.16	1571	107.16	95.00	53.54	2122	85.61	77.00	44.30
	High yield	2680	424.30	403.00	178.34	474	433.01	426.00	131.30	612	369.18	354.00	152.67
	All deals	10054	211.17	143.00	179.44	2045	182.69	118.00	158.45	2734	149.09	90.00	143.91
Shelf registered	Investment grade	8120	0.83	1.00	0.38	1752	0.78	1.00	0.41	2687	0.85	1.00	0.35
	High yield	3237	0.17	0.00	0.37	609	0.16	0.00	0.37	1010	0.16	0.00	0.37
	All deals	11357	0.64	1.00	0.48	2361	0.62	1.00	0.49	3697	0.66	1.00	0.47
Callable (indicator)	Investment grade	8120	0.36	0.00	0.48	1752	0.00	0.00	0.06	2687	0.08	0.00	0.26
	High yield	3223	0.13	0.00	0.34	609	0.01	0.00	0.12	996	0.01	0.00	0.10
	All deals	11343	0.30	0.00	0.46	2361	0.01	0.00	0.08	3683	0.06	0.00	0.23
Maturity (log)	Investment grade	6576	2.04	2.30	0.78	1488	2.22	2.30	0.78	2030	1.95	2.30	0.99
	High yield	3139	2.22	2.30	0.31	569	2.25	2.30	0.38	943	2.21	2.30	0.32
	All deals	9715	2.10	2.30	0.67	2057	2.22	2.30	0.69	2973	2.03	2.30	0.85
Subordinated (indicator)	Investment grade	8120	0.01	0.00	0.08	1752	0.02	0.00	0.14	2687	0.01	0.00	0.07
	High yield	3237	0.42	0.00	0.49	609	0.53	1.00	0.50	1010	0.37	0.00	0.48
	All deals	11357	0.12	0.00	0.33	2361	0.15	0.00	0.36	3697	0.10	0.00	0.31
Syndicated (indicator)	Investment grade	8120	0.70	1.00	0.46	1752	0.73	1.00	0.44	2687	0.61	1.00	0.49
	High yield	3237	0.47	0.00	0.50	609	0.41	0.00	0.49	1010	0.43	0.00	0.50
	All deals	11357	0.64	1.00	0.48	2361	0.65	1.00	0.48	3697	0.56	1.00	0.50
Rule 144 A (indicator)	Investment grade	8120	0.07	0.00	0.26	1752	0.01	0.00	0.08	2687	0.02	0.00	0.15
	High yield	3237	0.54	1.00	0.50	609	0.17	0.00	0.38	1010	0.47	0.00	0.50
	All deals	11357	0.20	0.00	0.40	2361	0.05	0.00	0.21	3697	0.14	0.00	0.35
Number of issuers	Investment grade	751				340				418			
	High yield	1225				276				497			
	All deals	1787				584				866			
Number of issues	Investment grade	3237				1752				2687			
	High yield	8120				609				1010			
	All deals	11357				2361				3697			

Table 2.4: Drexel collapse and ratings informativeness, high-yield issues

This table reports results from estimating Equation (2.3) for a sample of public high-yield issuances during a 4-year period surrounding the collapse of Drexel in 1989. The primary coefficient of interest is the coefficient on the interaction between the rating and an indicator variable set to 1 during the post-collapse period (1990-1993). This variable is negative and significant in all specifications, which suggests that ratings became more informative after the Drexel collapse for high-yield issuers. Models (1) and (3) use the log of the yield spread at issuance as the dependent variable, Models (2) and (4) use the level. Models (1) and (2) present results for all issues, including those by the same issuer on the same day as different observations. Models (3) and (4) combine issues by the same issuer on the same day. Each model is estimated using pooled OLS with industry and year fixed effects. Standard errors (reported in parentheses) are robust to clustering at the Fama French 12-industry level; *, **, and *** represent 10%, 5% and 1% significance.

	(1)	(2)	(3)	(4)
Sample: new high yield issues				
Dependent variable: Yield spread	Log	Level (bp)	Log	Level (bp)
Aggregate deals by issuer day	No	No	Yes	Yes
Rating * I(Y>1989)	-0.067 ***	-20.877 **	-0.078 ***	-24.796 **
	(0.022)	(9.246)	(0.029)	(11.615)
Rating	-0.104 ***	-41.617 ***	-0.103 ***	-40.085 ***
	(0.018)	(6.153)	(0.031)	(10.780)
Has prior rating	1.117 ***	464.579 ***	0.697 **	315.610 ***
	(0.294)	(116.351)	(0.307)	(102.347)
Has prior rating * prior rating	-0.076 ***	-31.468 ***	-0.046 **	-20.810 ***
	(0.021)	(8.402)	(0.022)	(7.552)
Log(deal principal / assets)	0.121 ***	47.031 ***	0.062 *	26.859 **
	(0.044)	(15.958)	(0.036)	(12.784)
Log(book assets)	0.071 **	30.522 **	0.014	7.940
	(0.036)	(14.286)	(0.025)	(9.529)
Shelf registration indicator	0.141 **	60.245 ***	0.075	36.416
	(0.063)	(25.797)	(0.077)	(29.589)
Syndicated deal indicator	0.028	15.846	0.037	15.533
	(0.041)	(19.583)	(0.033)	(13.420)
Subordination indicator	-0.190 ***	-77.807 ***	-0.164 ***	-65.987 ***
	(0.050)	(20.615)	(0.053)	(21.369)
Book leverage	0.197	160.729	0.122	130.799
	(0.460)	(191.609)	(0.338)	(145.150)
Book long-term leverage	-0.430	-226.498	-0.447	-234.621 *
	(0.454)	(190.053)	(0.305)	(135.877)
Ebitda / interest (truncated at 0)	-0.003	-2.381	0.000	-0.855
	(0.005)	(2.003)	(0.004)	(1.255)
Altman Z-score	-0.021	1.105	-0.048	-11.119
	(0.064)	(24.122)	(0.059)	(24.044)
Return on equity	-0.262 ***	-117.117 ***	-0.288 **	-133.867 ***
	(0.111)	(49.781)	(0.133)	(43.318)
Property, plant and equipment / Assets	0.116	65.633 *	0.090	56.371
	(0.081)	(34.386)	(0.093)	(35.443)
Revenue / Assets	-0.120	-1.241	-0.199 *	-29.953
	(0.118)	(52.037)	(0.115)	(45.521)
Market equity / Book equity	-0.005 **	-2.244 *	-0.002	-1.271
	(0.003)	(1.352)	(0.003)	(1.280)
Intercept	8.167 ***	1142.180 ***	8.656 ***	1318.112 ***
	0.3436	135.1359	0.2706	102.8851
Number of observations	226	226	158	160
R-squared	0.741	0.711	0.723	0.701

Table 2.5: Drexel collapse and ratings informativeness, investment-grade issues
This table reports results from estimating Equation (2.3) for a sample of public investment-grade issuances during a 4-year period surrounding the collapse of Drexel in 1989. The primary coefficient of interest is the coefficient on the interaction between the rating and an indicator variable set to 1 during the post-collapse period (1990-1993). This variable is insignificant in all specifications, which suggests that ratings informativeness did not change after the Drexel collapse for investment-grade issuers. Models (1) and (3) use the log of the yield spread at issuance as the dependent variable, Models (2) and (4) use the level. Models (1) and (2) present results for all issues, including those by the same issuer on the same day as different observations. Models (3) and (4) combine issues by the same issuer on the same day. Each model is estimated using pooled OLS with industry and year fixed effects. Standard errors (reported in parentheses) are robust to clustering at the Fama-French 12-industry level; *, **, and *** represent 10%, 5% and 1% significance.

	(1)		(2)		(3)		(4)	
Sample: new investment grade issues								
Dependent variable: Yield spread	Log		Level (bp)		Log		Level (bp)	
Aggregate deals by issuer day	No		No		Yes		Yes	
Rating * I(Y>1989)	-0.020		-1.822		-0.016		-1.515	
	(0.015)		(2.232)		(0.013)		(1.246)	
Rating	-0.120	***	-11.709	***	-0.132	***	-14.011	***
	(0.039)		(4.395)		(0.037)		(3.360)	
Has prior rating	0.104		30.968		-0.135		-38.536	
	(0.830)		(112.258)		(0.651)		(71.811)	
Has prior rating * prior rating	-0.004		-1.352		0.007		1.878	
	(0.039)		(5.212)		(0.030)		(3.263)	
Log(deal principal / assets)	0.085	**	10.215	*	0.066	***	8.389	***
	(0.041)		(5.273)		(0.027)		(3.349)	
Log(book assets)	0.052	*	10.420	***	0.013		5.528	***
	(0.027)		(3.808)		(0.021)		(1.914)	
Shelf registration indicator	-0.103		-15.823		-0.041		-7.756	
	(0.079)		(11.791)		(0.047)		(5.831)	
Syndicated deal indicator	0.044		-3.887		0.084		0.664	
	(0.062)		(7.320)		(0.065)		(6.953)	
Subordination indicator	-0.082		-13.864		-0.011		-5.745	
	(0.052)		(10.032)		(0.038)		(8.064)	
Book leverage	0.363	*	63.020	**	0.291	***	51.955	***
	(0.213)		(28.458)		(0.123)		(9.893)	
Book long-term leverage	-0.235		-47.861		-0.282		-53.106	***
	(0.271)		(32.336)		(0.226)		(19.199)	
Ebitda / interest (truncated at 0)	0.001	*	0.038		0.001	***	0.072	***
	(0.000)		(0.034)		(0.000)		(0.031)	
Altman Z-score	-0.039		-1.405		-0.051	**	-3.856	
	(0.029)		(2.480)		(0.026)		(2.758)	
Return on equity	-0.552		-71.963		-0.289		-31.994	
	(0.346)		(46.371)		(0.203)		(26.485)	
Property, plant and equipment / Assets	0.351	***	39.206	***	0.309	***	33.726	***
	(0.086)		(13.874)		(0.088)		(10.070)	
Revenue / Assets	0.319	**	37.622		0.140		21.502	
	(0.154)		(24.122)		(0.134)		(19.255)	
Market equity / Book equity	-0.024	***	-2.303		-0.024	***	-1.603	
	(0.010)		(1.413)		(0.010)		(1.056)	
Intercept	7.182	***	325.892	***	7.566	***	394.741	***
	(0.703)		(85.654)		(0.664)		(68.491)	
Number of observations	1099		1099		862		862	
R-squared	0.643		0.529		0.655		0.545	

Table 2.6: The Riegle-Neal Act and ratings informativeness, young issuers

This table reports results from estimating Equation (2.4) for a sample of public high-yield issuances during a 4-year period surrounding the 1994 adoption of the Riegle-Neal Act in 1994. The main coefficient of interest is the (boxed) coefficient on the interaction of the rating, indicator variable for a young issuer (first public issue $\leq$ 5 years prior to current issue date), and indicator for the period following adoption of the Riegle-Neal act (RN). Models (2) and (4) include age-year interactions. Models (1) and (2) including issues by the same issuer on the same day as different observations, while (3) and (4) combine issues by the same issuer on the same day. Models are estimated using pooled OLS with industry and year fixed effects. Standard errors (reported in parentheses) are robust to clustering at the Fama French 12-industry level; *, **, and *** represent 10%, 5% and 1% significance.

	(1)		(2)		(3)		(4)	
Dependent variable: Log(yield spread)								
Aggregate deals by issuer day	No		No		Yes		Yes	
Age * year controls	No		Yes		No		Yes	
Rating * I(Year>1994) * I(Age<5)	-0.043	***	-0.038	***	-0.032	***	-0.027	**
	(0.014)		(0.014)		(0.013)		(0.012)	
Rating * I(Year>1994)	0.011		0.011		0.009		0.009	
	(0.009)		(0.009)		(0.007)		(0.007)	
Rating * I(Age<5)	0.001		-0.008		-0.003		-0.011	
	(0.009)		(0.009)		(0.008)		(0.009)	
Rating	-0.142	***	-0.141	***	-0.159	***	-0.157	***
	(0.030)		(0.029)		(0.026)		(0.026)	
I(Age<5)	-0.073		0.046		-0.004		0.111	
	(0.152)		(0.160)		(0.148)		(0.153)	
Log(deal principal / assets)	0.075	***	0.075	***	0.067	***	0.066	***
	(0.022)		(0.021)		(0.018)		(0.018)	
Log(book assets)	0.022		0.021		-0.005		-0.007	
	(0.024)		(0.023)		(0.020)		(0.019)	
Has prior rating	0.167		0.174		-0.095		-0.090	
	(0.596)		(0.594)		(0.479)		(0.469)	
Has prior rating * prior rating	-0.021		-0.021		-0.002		-0.003	
	(0.035)		(0.035)		(0.028)		(0.027)	
Syndicated deal indicator	0.018		0.018		0.056	*	0.054	
	(0.028)		(0.027)		(0.034)		(0.034)	
Subordination indicator	0.018		0.016		0.006		0.003	
	(0.046)		(0.046)		(0.050)		(0.048)	
Book leverage	0.025		0.015		-0.030		-0.050	
	(0.136)		(0.140)		(0.171)		(0.176)	
Book long-term leverage	-0.008		0.006		0.003		0.034	
	(0.198)		(0.195)		(0.219)		(0.216)	
Ebitda / interest (truncated at 0)	0.000	***	0.000	***	0.000	***	0.000	***
	(0.000)		(0.000)		(0.000)		(0.000)	
Altman Z-score	-0.054	***	-0.054	***	-0.057	**	-0.057	**
	(0.019)		(0.019)		(0.025)		(0.025)	
Return on equity	-0.066		-0.064		-0.067		-0.063	
	(0.081)		(0.083)		(0.051)		(0.050)	
Property, plant and equipment / Assets	0.293	***	0.292	***	0.266	***	0.265	***
	(0.039)		(0.039)		(0.050)		(0.050)	
Revenue / Assets	0.160	***	0.157	***	0.110		0.105	
	(0.062)		(0.059)		(0.084)		(0.084)	
Market equity / Book equity	0.000		0.000		0.000	**	0.000	**
	(0.000)		(0.000)		(0.000)		(0.000)	
Intercept	7.355	***	7.356	***	7.792	***	7.799	***
	(0.589)		(0.588)		(0.506)		(0.502)	
Number of observations	1866		1866		1278		1278	
R-squared	0.802		0.803		0.822		0.823	

Table 2.7: The Riegle-Neal Act and ratings informativeness, middle-aged issuers
This table reports results from estimating Equation (2.4) for a sample of public high-yield issuances during a 4-year period surrounding the 1994 adoption of the Riegle-Neal Act. This table analyzes the impact of the Riegle-Neal Act on issuers whose first public issue was between 10 and 15 years before the current issue. Because the shock to the supply of private vs. public capital was likely less severe for older issuers, I expect estimates of the (boxed) coefficient on the rating, post-RN indicator, and age variable to be insignificant. Models (2) and (4) include age-year interactions. Models (1) and (2) including issues by the same issuer on the same day as different observations, while (3) and (4) combine issues by the same issuer on the same day. Models are estimated using pooled OLS with industry and year fixed effects. Standard errors (reported in parentheses) are robust to clustering at the Fama-French 12-industry level; *, **, and *** represent 10%, 5% and 1% significance.

	(1)	(2)	(3)	(4)
Dependent variable: Log(yield spread)				
Aggregate deals by issuer day	No	No	Yes	Yes
Age * year controls	No	Yes	No	Yes
Rating * I(Year>1994) * I(10<(Age<15)	-0.017	-0.021	-0.008	-0.013
	(0.019)	(0.021)	(0.015)	(0.016)
Rating * I(Year>1994)	0.003	0.007	-0.001	0.003
	(0.008)	(0.010)	(0.005)	(0.007)
Rating * I(10<Age<15)	-0.003	-0.001	-0.001	0.002
	(0.015)	(0.015)	(0.011)	(0.011)
Rating	-0.139 ***	-0.140 ***	-0.158 ***	-0.159 ***
	(0.031)	(0.032)	(0.028)	(0.028)
I(10<Age<15)	0.196	0.147	0.115	0.054
	(0.306)	(0.313)	(0.237)	(0.252)
Log(deal principal / assets)	0.077 ***	0.076 ***	0.064 ***	0.064 ***
	(0.020)	(0.019)	(0.019)	(0.018)
Log(book assets)	0.020	0.019	-0.006	-0.008
	(0.021)	(0.020)	(0.019)	(0.019)
Has prior rating	0.117	0.121	-0.141	-0.142
	(0.596)	(0.600)	(0.479)	(0.471)
Has prior rating * prior rating	-0.019	-0.019	-0.001	-0.001
	(0.036)	(0.036)	(0.028)	(0.028)
Syndicated deal indicator	0.007	0.009	0.051	0.049
	(0.025)	(0.025)	(0.033)	(0.033)
Subordination indicator	0.038	0.038	0.021	0.018
	(0.052)	(0.056)	(0.054)	(0.055)
Book leverage	0.046	0.045	-0.006	-0.024
	(0.174)	(0.176)	(0.196)	(0.196)
Book long-term leverage	-0.019	-0.010	-0.014	0.016
	(0.210)	(0.217)	(0.220)	(0.222)
Ebitda / interest (truncated at 0)	0.000 ***	0.000 ***	0.000 ***	0.000 ***
	(0.000)	(0.000)	(0.000)	(0.000)
Altman Z-score	-0.055 ***	-0.054 ***	-0.059 ***	-0.058 **
	(0.019)	(0.020)	(0.025)	(0.026)
Return on equity	-0.073	-0.067	-0.074	-0.069
	(0.078)	(0.082)	(0.052)	(0.052)
Property, plant and equipment / Assets	0.303 ***	0.302 ***	0.272 ***	0.271 ***
	(0.041)	(0.039)	(0.053)	(0.052)
Revenue / Assets	0.139 **	0.145 ***	0.095	0.094
	(0.060)	(0.054)	(0.083)	(0.081)
Market equity / Book equity	0.000 **	0.000	0.000 **	0.000 **
	(0.000)	(0.000)	(0.000)	(0.000)
Intercept	7.523 ***	7.466 ***	8.014 ***	7.972 ***
	(0.547)	(0.547)	(0.470)	(0.488)
Number of observations	1866	1866	1278	1278
R-squared	0.802	0.803	0.821	0.822

Table 2.8: Robustness of Drexel results to window length and event year

Panel A of this table reports results from analysis of the robustness of results relating to the Drexel collapse in 1989 to the choice of analysis period. The boxed coefficient of interest is the interaction of the rating and an indicator variable for the post-collapse period, and is analogous to the boxed coefficient in Table 2.4. Panel B analyzes counter-factual choices for the year of Drexel's collapse, re-estimating results from Table 2.4 using several different choices for the event year. Standard errors (reported in parentheses) are robust to clustering at the Fama-French 12-industry level; *, **, and *** represent 10%, 5% and 1% significance.

Panel A: Alternate windows around year of Drexel collapse (1989)

	(1)		(2)		(3)		(4)	
Window around 1989	+/- 2 years		+/- 3 years		+/- 4 years		+/- 5 years	
Sample	High yield		High yield		High yield		High yield	
Dependent variable: Yield spread	Level (bp)		Level (bp)		Level (bp)		Level (bp)	
Rating * I(Y>1989)	-63.656	***	-19.930	***	-20.031	**	-13.848	
	(8.169)		(7.896)		(10.047)		(12.085)	
Rating	11.458		-44.728	***	-36.359	***	-41.689	***
	(18.887)		(7.882)		(5.291)		(7.925)	
Has prior rating	1054.753	***	437.317	***	469.756	***	306.767	***
	(345.503)		(120.098)		(123.847)		(60.710)	
Has prior rating * prior rating	-66.250	***	-30.634	***	-32.179	***	-20.895	***
	(22.861)		(6.444)		(8.581)		(4.215)	
Number of observations	41		121		240		326	

Panel B: Tests of alternative years

	(1)		(2)		(3)		(4)	
Alternative year	1986		1987		1988		1989	
Dependent variable: Yield spread	Level (bp)		Level (bp)		Level (bp)		Level (bp)	
Rating * I(Year > Test year)	-11.927		-21.177	**	-7.949		-7.241	
	(11.739)		(10.656)		(10.548)		(10.563)	
Rating	-31.310	***	-38.346	***	-48.453	***	-64.468	***
	7.857		11.308		7.721		9.202	
Has prior rating	372.116	***	336.443	**	358.135	***	103.673	
	155.870		152.567		85.367		127.067	
Has prior rating * prior rating	-24.674	***	-22.874	**	-24.509	***	-7.957	
	10.455		10.325		5.256		8.670	
Number of observations	187		177		215		208	

Table 2.9: Robustness of Riegle-Neal results to window length and event year
Panel A of this table reports results from analysis of the robustness of results relating to nationwide passage of the Riegle-Neal Act in 1994 to the choice of analysis period. The boxed coefficient of interest is the interaction of the rating and an indicator variable for the post-collapse period, and is analogous to the boxed coefficient in Table 2.6. Panel B analyzes counter-factual choices for the year of Drexel's collapse, re-estimating results from Table 2.6 using several different choices for the event year. Standard errors (reported in parentheses) are robust to clustering at the Fama French 12-industry level; *, **, and *** represent 10%, 5% and 1% significance.

Panel A: Alternate windows around Riegle-Neal passage year (1994)

	(1)		(2)		(3)		(4)	
Window around 1994	+/- 2 years		+/- 3 years		+/- 4 years		+/- 6 years	
Dependent variable: Yield spread	Log		Log		Log		Log	
Rating * I(Year>1994) * I(Age<5)	-0.054	***	-0.042	***	-0.038	***	-0.023	*
	(0.020)		(0.016)		(0.014)		(0.014)	
Rating * I(Year>1994)	0.012		0.000		0.011		0.016	**
	(0.012)		(0.011)		(0.009)		(0.007)	
Rating * I(Age<5)	-0.016	***	-0.009		-0.008		-0.007	
	(0.005)		(0.008)		(0.009)		(0.013)	
Rating	-0.138	***	-0.136	***	-0.141	***	-0.126	***
	(0.039)		(0.034)		(0.029)		(0.029)	
I(Age<5)	0.160		0.048		0.046		0.149	
	(0.103)		(0.146)		(0.160)		(0.229)	
Number of observations	949		1358		1866		3092	

Panel B: Tests of alternative years

	(1)		(2)		(3)		(4)	
Alternative year	1991		1992		1993		1995	
Dependent variable: Yield spread	Log		Log		Log		Log	
Rating*I(Year>Test year)*I(Age<5)	0.002		-0.026		-0.057	***	-0.014	
	(0.018)		(0.019)		(0.019)		(0.018)	
Rating * I(Year > Test year)	-0.041	***	-0.025	***	-0.003		0.026	***
	(0.009)		(0.010)		(0.010)		(0.009)	
Rating * I(Age<5)	-0.024	**	-0.015		0.007		-0.021	
	(0.012)		(0.017)		(0.017)		(0.016)	
Rating	-0.133	***	-0.121	***	-0.132	***	-0.137	***
	(0.020)		(0.024)		(0.023)		(0.017)	
I(Age<5)	0.555	**	0.342		-0.206		0.349	
	(0.259)		(0.288)		(0.316)		(0.265)	
Number of observations	1265		1362		1517		2448	

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Chapter 3

Why do skilled buyers pay higher merger fees?

3.1 Introduction

Advisors are critical participants in mergers and acquisitions (M&A), as evidenced by their fees. Of the nearly $20 trillion in domestic M&A transaction value since 1980, almost 90% comes from transactions involving advisors (the mean fee is approximately 80 basis points of transaction value). However, the economic drivers of advisor selection, fee size, and fee structure remain unexplained: acquirers appear to select advisors based on market share rather than returns on the advisor's past transactions, firms pay advisors more when the firm has a previous relationship with the advisor, and contingent fees are more prevalent in tender offers than in mergers.

In this paper, I develop a model of how acquiring firms select financial intermediaries to advise on acquisitions. Using a setting in which synergies are unobservable, I offer a framework for how advisors are selected, how the level of their fees is determined, and under what conditions their fees depend on transaction completion.

In the model, acquiring firms hire advisors to help screen targets ("due diligence") and to improve the likelihood that a deal will succeed ("bidding"). I assume advisor skill provides cost advantages in screening targets and increases the probability that an offer will be accepted. Advisors' fees are determined by their expected skill conditional on the contract, and advisors signal using the proportion of contingent fees they offer for an assignment. As acquirers learn the advisors' quality, advisors can charge a lower proportion of contingent fees and include fixed fees.[1]

[1]While the risk-neutral advisor I consider is indifferent between fixed and contingent fees, a small amount of risk aversion would lead to a preference for fixed fees, all else equal.

This arrangement captures important aspects of advisors' ability to improve negotiations, and yields implications consistent with several documented characteristics of advisor fees. When advisors are selected only for bidding, they initially pool by offering contingent contracts, and use completion rates to separate over time. Costly diligence allows better advisors to separate when they could not if hired only for bidding.

I present evidence consistent with the model's predictions. I focus on acquirers in leveraged buyouts ("LBO"s), who are likely skilled in acquisitions and have bargaining power relative to advisors. Analyzing data on acquirer advisor fees, I find that LBOs feature much higher fees for mergers, and slightly higher fees for tender offers, compared with other transactions. In addition, LBO investors are more likely to pay fixed fees in mergers than in tender offers.

Finally, I argue the model offers an explanation for the use of market share in advisor selection. It explains why switching advisors can lead to lower fees, as well as a higher likelihood of contingent contracts in tender offers relative to mergers. My analysis suggests that, in contrast to previously offered explanations involving managerial biases, switching costs, or non-pecuniary benefits, several stylized facts about advisor selection arise from a simple setting where synergies are not publicly observable.

The rest of this article is organized as follows. The next section discusses related literature. Section 3.3 presents and solves the model. Section 3.4 summarizes the model's implications, and section 3.5 discusses empirical findings. Section 3.6 concludes. I summarize notation in Appendix A, present proofs in Appendix 3.8, and tables in Appendix 3.9.

3.2 Related literature

Studies of M&A advisors and relevant principal agent problems usually focus on describing contract attributes (for example, McLaughlin 1990 and 1992) or measuring performance associated with different advisors (Rau, 2000), primarily using cumulative abnormal returns (CAR). Such studies compare acquirer stock returns of the acquirer around the announcement date to some benchmark return. Other studies focus on conflicts of interest that affect core determinants of contract specification. Lax and Sebenius (1986) mention the conflict of interest between the firm and investment bank and suggest the typical contract is likely to lead to more transactions than an hourly contract. See Hunter and Walker (1990) for a discussion of some relevant principal agent theory.

Several related studies focus on empirical analysis of advisor contracts. The most relevant works for the model presented here are Rau (2000), who finds that bank market share is more important for advisor selection than CAR, and Saunders and Srinivasan

(2001), who find that acquirers pay lower fees when they switch advisors.

Rau (2000) investigates determinants of investment bank market share in mergers and tender offers. He finds that advisor market share is driven by prior market share in completed deals rather than by performance of a bank's deals. He also finds that the presence of contingent fee payments relates positively to bank market share and to the percentage of past completions, and negatively to acquirer performance. In Rau's analysis, first-tier banks charge higher proportions of contingent fees relative to second- and third-tier banks in both mergers and tender offers, and are more likely to successfully complete tender offers. While better completion rates could be due to higher premia, Bodnaruk et al (2007) suggest higher premia may be due to insider investing and conflicts of interest between the firm and its advisor. Walter, Yawson and Yeung (2005) and Bao and Edmans (2008) confirm Rau's results.

Bao and Edmans find that CAR to acquiring firms associated with individual investment banks are persistent. This persistence continues after controlling for elements outside the bank's influence, and they suggest firms should hire bankers based on past economic performance rather than market share. They suggest that managers might use market share as a measure of quality due to investment bank marketing techniques, and that regulation requiring disclosure of past performance will improve future performance.

Saunders and Srinivasan (2001) investigate the effect of prior relationships on merger advisory fees paid by acquiring firms. Firms that switch advisors are found to pay lower fees than those that retain advisors, for advisors in the same tier. Finding no significant difference between announcement returns and past relationships, they conclude that acquiring firms either face switching costs related to choosing new bank advisors or perceive non-pecuniary benefits of doing business based on existing relationships. The authors develop a measure of advisor relationships based on four years of prior transactions (debt and equity issuances in addition to mergers). The relationship with a given bank is based on the percentage of a firm's total transactions in which the bank played an advisory role. Francis, Hasan and Sun (2006) obtain similar results.

Hunter and Jagtiani (2003) address the amount of fees acquirers pay to advisors, and find that higher payments are related to greater acquirer stock returns but not to the likelihood of deal completion. They find that top-tier advisors are more likely to complete transactions, and to complete them faster, but with lower CAR for the acquirer. Contingent fees play a role in reducing the time to deal completion, and switching advisors within the same tier leads to synergistic gains. Hunter and Jagtiani's analysis also includes some measures of transaction complexity (same SIC code, hostile takeover, tender offer, merger of equals) while excluding others (number of advisors used, nature of advisory assignments, type of consideration used).

Several other studies address the role of advisors in acquisitions. Servaes and Zenner (1996) evaluate the role of the investment bank by comparing deals that occurred with investment banks to those that excluded them. They find the choice to use an advisor depends on complexity of transaction, type of transaction (takeover vs. asset purchase), acquirer's prior acquisition experience, and degree of diversification of the target firm. Michel et al. (1991) study the impact of investment banks on acquisition performance. McLaughlin (1990, 1992) evaluates tender offer contracts, focusing on whether contract design reduces agency problems. Bowers and Miller (1990) suggest the choice of acquisition advisor should impact better selection of target firms, and that investment bank bargaining power should lead to a lower acquisition price because of better investment bank negotiation.

A common element of most empirical work on acquirers and their advisors is the assumption that CAR and transaction synergies are closely related. If so, then CAR seems relevant for determination of advisor selection and fees. As an alternative to the studies discussed, this paper suggests that deal synergies may not be observed until well after a transaction is completed. When they are observed, it may be that only a subset of market participants can observe them. My paper illustrates that unobservable synergies may lead the advisor's market share to influence estimated advisor skill, as acquirers believe market share is related to an advisor's ability to complete deals.

3.3 Model

Three types of risk-neutral agents: an acquirer with known intrinsic value V^A (exclusive of takeover options), a possible takeover target with market value V^T, and a monopolistic financial advisor defined by privately-known skill $\theta \in \{\theta_b, \theta_g\}$, $0 < \theta_b < \theta_g$, participate in an acquisition game in which acquisitions are valuable because merged firms earn synergies. Acquirers have skill $\theta = 0$, so the advisor's quality can be interpreted as quality relative to that of the acquirer. However, acquirers do not know the advisor's skill, and initially believe it is equally likely to be high or low.

Acquisitions proceed in three steps. First, targets are evaluated ("diligence"). Next, the acquirer offers payment ("bidding"). Finally, targets accept or reject. Advisor skill affects both diligence and bidding, providing cost reductions in diligence and improving completion probability in bidding (for a given premium). For simplicity, I assume skill θ applies to both bidding and diligence. If the acquisition is completed, the combined firm enjoys synergies $\eta \in \{0, \eta_g\}$ which are not observable or contractible, and are proportional to target pre-transaction value (dollar synergies are $V^T\eta$). The unconditional probability of a target providing synergy $\eta_g > 0$ is p_u.

There are two types of targets: those for which zero synergies are certain, and those for which either zero or positive synergies are possible. For cost $d(\theta)$, the advisor can distinguish between these types of targets; the acquirer can perform diligence itself at cost $d(0) > d(\theta)$. If diligence reveals that a target is bad (with $\eta = 0$), the target is eliminated. If diligence is undertaken and the target is not eliminated, the probability of synergy η_g increases to $p > p_u$. Thus, diligence will eliminate a target with probability $p_e \equiv 1 - \frac{p_u}{p}$.

In the first stage the acquirer decides whether (1) a target is worth diligence costs (2) whether to perform diligence itself at cost (3) or whether to hire an advisor to perform diligence and bidding. The firm solicits a contract offer (for fee f, which may depend on completion) from the advisor for diligence and bidding, to which it responds on a take-it or leave-it basis. Better skilled advisors can more efficiently conduct diligence:

Assumption 1 *The cost of evaluating the target is decreasing in skill:*

$$\frac{\mathrm{d}d(\theta)}{\mathrm{d}\theta} < 0. \tag{3.1}$$

In the second stage, if the acquirer performed diligence itself (and the target was not excluded during diligence), it solicits a bidding contract offer from an advisor and decides whether to hire the advisor for bidding. I focus on the bidding game that follows diligence; this is equivalent to assuming an upper bound on the unconditional probability the target has positive synergies, p_u. Possibly relying on the advisor, the acquirer bids by offering premium $\pi \geq 0$ (proportional to the target's market value).

In the third stage, the target responds to the acquirer's offer by comparing the premium to its private outside option. Let m represent an indicator variable for target acceptance of the acquirer's offer. The target's response probability is $Q = \mathrm{E}[m|\pi, \theta]$, and depends on the premium and advisor skill: [2]

Assumption 2: *The probability of merger success Q is differentiable and increasing in premium π and increasing in negotiating skill θ for each target firm:*

$$\begin{aligned} \frac{\partial Q(\pi,\theta)}{\partial \pi} \equiv Q_\pi(\pi,\theta) &\geq 0 \quad \forall \pi, \theta \in \{0, \theta_b, \theta_g\} \\ Q(\pi,\theta_1) > Q(\pi,\theta_2) &\;\;\forall \quad \theta_1 > \theta_2, \pi > 0 \\ Q(0,\theta) &= 0 \quad \forall \theta \in \{0, \theta_b, \theta_g\} \end{aligned} \tag{3.2}$$

Denote $Q(\theta) \equiv Q(\pi(\theta), \theta)$ when the premium set by the firm is based on known skill θ, rather than inferred skill $\hat{\theta}$. I use similar notation for the partial derivative Q_π. For

[2] The impact of negotiating ability could arise from an auction mechanism where a skilled advisor receives a noisy signal regarding the target firm's outside option, with the signal to noise ratio increasing in skill.

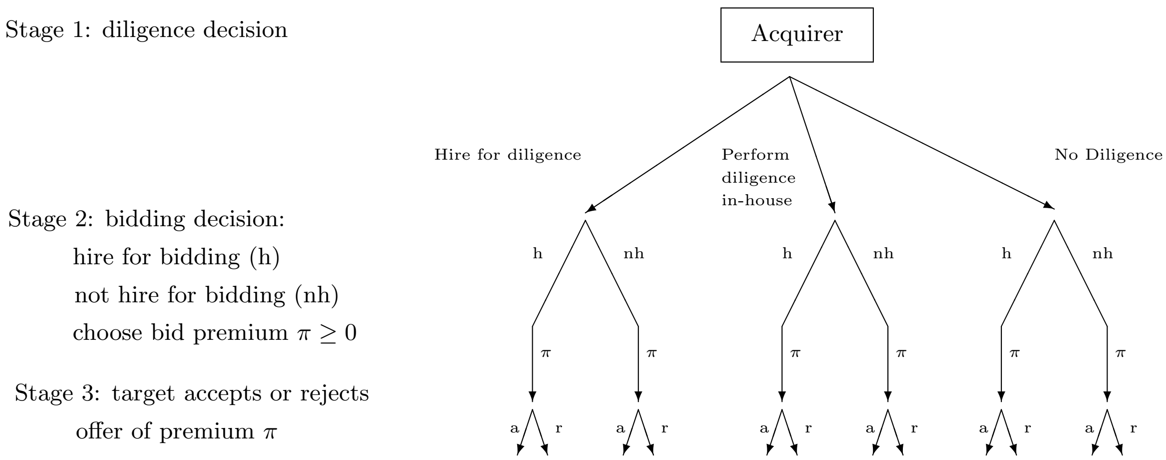

Figure 3.1: Sequence of moves

simplicity, I assume a linear response function:

Assumption 3: *The target response function is linear in the premium:* $Q(\pi, \theta) = \pi\theta$.

Assumption 3 provides a simple example of a response function used throughout most of this paper. Most of my results obtain under Assumption 3, and I consider implications of relaxing it in Section 3.3.4.

3.3.1 The advisor

The acquirer achieves gains from using the advisor (the "gains from trade"). This quantity, denoted $g(\theta)$, represents surplus available to the contracting parties. For convenience, I assume the advisor acts as a monopolist and extracts the full surplus:

Assumption 4: *In the bargaining game between the acquirer and the advisor, the advisor makes a take-it or leave-it offer to the acquirer.*

Allocating bargaining power to the advisor allows for comparison of fee level and composition while holding the level of advisor competition constant. It is straightforward to extend the analysis to the case where bargaining power is split between the firm and the advisor by randomly choosing one party to offer a take-it or leave-it contract. However, my approach allows me to focus on the acquirer's inference of advisor skill.

Based on the contract offered by the advisor, the acquirer forms an estimate of the advisor's skill level $\hat{\theta}$ and calculates expected gains $g(\hat{\theta})$. If expected gains are weakly positive, the acquirer accepts the contract, hires the advisor, and chooses the premium to bid for the target. Since η is not contractible, contracts are tied to transaction completion (m).

Lemma 1: *Any contract with the advisor can be expressed as:*

$$f = c\ m + b \tag{3.3}$$

where the merger fee includes a component c contingent on transaction success and a non-contingent (fixed) base b.

Lemma 1 relies on symmetric information regarding expected synergies conditional on search and shows that any contract can be expressed as a combination of contingent and fixed payments. These contract components are restricted by a limited liability assumption to be weakly positive: $c, b \geq 0$.

3.3.2 Solution and results

I present separate analyses for the primary branches of the game tree illustrated in Figure 3.3. I assume the unconditional probability of good synergies p_u is low enough to rule out positive bids in the case where diligence does not occur. This allows us to focus on two remaining branches: hiring the advisor for diligence and performing diligence in-house. In each case, the acquirer calculates the expected gains from hiring the advisor based on the contract it proposes, and the advisor extracts all of the gains through offering a take-it or leave-it contract to the acquirer.

Since diligence is not verifiable, hiring the advisor for diligence but not for bidding is ruled out. The remaining possibilities include hiring the advisor for both diligence and bidding, hiring the advisor for bidding after performing diligence in-house, and performing both diligence and bidding in-house. In each case, I solve for the outcome of a bargaining solution in which the advisor holds all of the bargaining power.

The simplest case to analyze is the case in which the advisor is hired to help only with bidding. The benefit to hiring an advisor includes the increased likelihood of target acceptance for a given premium. The acquirer's prior belief is that the advisor is equally likely to be good or bad: $\hat{\theta} = (\theta_g + \theta_b)/2$.

I solve for a Bayesian-Nash equilibrium with signaling. I begin by showing some critical quantities for the linear case and allow for I possible targets. First, the value of the combined entity formed when target firm i is acquired is:

$$V^C \mid \text{merger success} \ = V^A + V^T(\eta - \pi) \tag{3.4}$$

At stage 2, the acquirer decides whether to hire a skilled advisor (with $\theta \in \{\theta_b, \theta_g\}$ as discussed above). The alternative is for the acquirer to conduct bidding by itself. If the advisor is hired for diligence, it is also hired for bidding. Since the advisor's skill is expressed relative to the acquirer's skill, and $\theta_b > 0$, good and bad advisors both increase the probability of success.

To investigate the determinants of the advisor contract, I solve for gains from trade $g(\theta)$, then substitute this into the problem of the advisor. The advisor can signal its type based on the contract offered. The advisor maximizes expected payoff from the contract:

$$\max_{c,b} \ c\ E[m|\theta] + b - d(\theta) \tag{3.5}$$

subject to participation conditions for the acquirer and advisor, and limited liability conditions $c, b \geq 0$. The participation condition for the advisor requires positive expected profits in Equation (3.5), and the participation condition for the acquirer:

$$c\ E[m] + b \ \leq \ E[g(\theta)] \tag{3.6}$$

requires that the acquirer's expected benefits from from hiring the advisor $E[g(\theta)]$ exceed its expected fee. A separating equilibrium also requires an incentive compatibility condition:

$$cE[m|\theta = \theta_b] + b < g(\theta_g) \tag{3.7}$$

The incentive compatibility condition in Equation (3.7) prevents the low-quality advisor from offering the same contract as the high-quality advisor. The gains from trade from bidding with higher skill determine the amount the advisor can charge and still satisfy the firm's participation constraint given by Equation (3.6). To calculate gains from trade, I compare the expected increase in the value of the acquirer from having skill $\theta > 0$ to the advisor's fee. Before paying the advisor's fee, the value of the acquirer using skill θ is:

$$E\Big[V^C\Big] = \Big(1 - Q(\pi,\theta)\Big)V^A + Q(\pi,\theta)E\Big[V^C \ \mid \ m = 1\Big] \tag{3.8}$$

where the conditional expectation on the right hand side is given by Equation (3.4). The acquirer, based on information provided by the advisor, chooses the premium to maximize Equation (3.8). The first-order condition with respect to π yields an expression for the optimal premium:[3]

[3]I assume here that the premium is chosen without regard to the advisor's fee. Without this assumption,

$$\pi^*(\theta) = \frac{p\eta_g}{2} \tag{3.9}$$

The optimal premium in Equation (3.9) does not depend on the advisor's skill. This is a consequence of Assumption 3, and I generalize this result in Section 3.3.4. The corresponding expected value of the firm considering bidding is given by:

$$E[V^C(\theta)] = V^A + V^T Q(\theta)\frac{p\eta_g}{2} \tag{3.10}$$

where in the bidding case, the acquirer benefits from the option to bid (firm value in Equation (3.10) exceeds V^A). Evaluation of Equation (3.10) at $\theta = \hat{\theta}$ and at $\theta = 0$ defines the gains from trade expected by the acquirer in bidding:

$$g(\hat{\theta}) = E[V^C(\hat{\theta})] - E[V^C(0)] = V^T \frac{p\eta_g}{2}\Big(Q(\hat{\theta}) - Q(0)\Big) \tag{3.11}$$

Substitution of gains into Equation (3.5) solves the advisor's problem.

Proposition 1: *If the firm hires an advisor for bidding but not for diligence, there is a unique pooling equilibrium where both types of advisor offer* $c = \frac{g(\bar{\theta})}{Q(\theta)}$, *where* $\bar{\theta}$ *represents the average advisor skill level.*

Proposition 1 shows that there is no separating equilibrium in the one-period bidding-only model. A high-quality advisor ($\theta = \theta_g$) places a higher value on contingent payments, but since offering non-contingent payments signals low skill, the low type ($\theta = \theta_b$) can offer a fully contingent contract. Equilibrium in the one-period bidding model features no non-contingent fees.

If the advisor cannot be hired for both diligence and bidding, or if there are two periods, a separating equilibrium will be possible in some cases. Since diligence is costly, the advisor with higher skill can sometimes separate by accepting a contract that the lower-skilled advisor would reject. If other information (such as a history of previous transactions and outcomes) is available, the acquirer can use this information to update expected advisor skill.

If diligence is performed for the target firm at cost $d(\theta)$, it will reveal either that the target is a bad target (with synergies $\eta = 0$), or that good synergies are possible with probability p. Diligence is costly but I assume the cost does not depend on the target firm's size. Since synergies are specified proportional to size, positive synergies $\eta_g > 0$ lead to a

the optimal premium would be: $\pi^* = \frac{p\eta_g}{2} - \frac{c}{2V^T}$. Distortion in the optimal premium from contingent fees is likely to be small (because $2V^T >> c$). However, this distortion could lead to a preference for fixed vs. contingent fees, all else equal.

minimum target size for which diligence is undertaken:

Lemma 2: *Diligence occurs only for firms with valuations above a minimum threshold:*

$$V^T \geq d(\theta)\frac{2}{p_u \eta_g Q(\theta)} \equiv \underline{V}^T(\theta) \tag{3.12}$$

Target firms with values below $\underline{V}^T(\theta)$ will not be selected for diligence or bidding. The threshold is decreasing in skill: diligence can be undertaken profitably for relatively smaller firms when skill is higher. Target size thresholds for diligence are illustrated in Figure 2.

If diligence does not exclude the target, the players move into bidding. Diligence is observable: the advisor can reveal the results of diligence. This enables the acquirer to exclude bad firms from bidding. Since such firm-specific information may seem subjective to an outsider, contracting on diligence is not allowed.

The solution is thus similar to that of the bidding model, with a different specification for trade gains and consideration of diligence costs in the advisor's problem. The advisor hired for diligence and bidding has better signaling opportunities (relative to the bidding-only case) due to costs of diligence.

Proposition 2: *If the advisor is hired for both diligence and bidding, a separating equilibrium is possible if the following two conditions are met:*

$$d(\theta_b) \geq g(\theta_g)\frac{Q(\theta_b)}{Q(\theta_g)} - g(\theta_b) \tag{3.13}$$

$$d(\theta_g) < g(\theta_g) \tag{3.14}$$

When Equation (3.13) holds, diligence is too costly for the low type to accept a contract. This allows the high type to signal by accepting the contract that the low type cannot mimic. In such a case the high type need only satisfy the acquirer's participation constraint.

Proposition 3: *In the one period diligence model, a separating contract can include a fixed payment $b > 0$ if the following holds:*

$$b < \frac{Q(\theta_g)\Big(g(\theta_b) - d(\theta_b)\Big) - Q(\theta_b)g(\theta_g)}{Q(\theta_g) - Q(\theta_b)} \tag{3.15}$$

Here, the high type's ability to separate does not require it to offer a strictly contingent contract, and it can demand a fixed fee. Risk neutrality renders it indifferent (though under risk-aversion the advisor prefers the fixed payment b to the contingent payment c).

Proposition 4: *For target firms with value* $\underline{V}^T(\theta_g) < V^T < \underline{V}^T(\theta_b)$*, only the good type offers a contract.*

For lower-valued targets (Region 2 in Figure 2), only the high type can offer value due to lower diligence costs. For targets in Region 3, the low type is indifferent since its type will be known and there are no gains from trade. Lower diligence costs increase the ability of the highly skilled advisor to separate for targets of any size, even in cases where the bidding model admits only a pooling equilibrium.

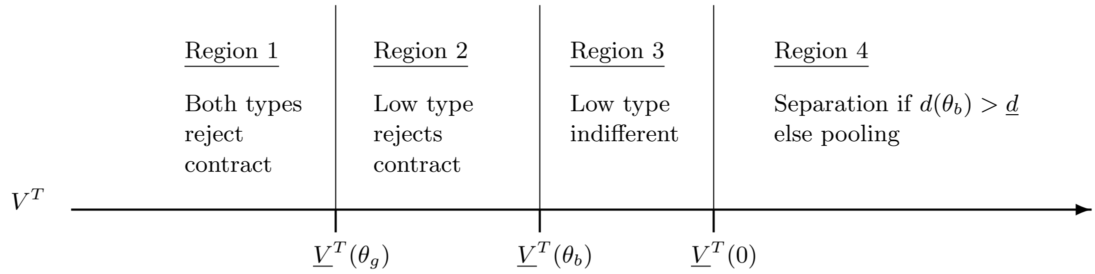

Figure 3.2: Diligence target size thresholds

3.3.3 Two-period bidding model

I extend the bidding model presented above to a two-period model to address the role of learning about advisor skill on fee size and composition. For the second period, it is useful to extend the one target model described above to the case of $I(\theta)$ possible target firms (relevant quantities are subscripted for each target i). After the first period, each acquirer observes period one success rates for its advisor. Premia offered and target responses from the first period are known by the acquirer, who can estimate $\hat{\theta}$ for the advisor hired in the first period by maximum likelihood.

The minimum history observable by the acquirer includes deals in which it was involved. The case where some acquirers can observe a subset of deal history for other acquirers corresponds to allowing the acquirer a prior belief about whether the advisor is good ($P[\theta = \theta_g]$). From above, the acquirer's prior belief of advisor skill is $\bar{\theta}$. After period one, the updated prior belief of advisor skill is $\hat{\theta}_1$. Assuming transaction outcomes are independent, an acquirer bidding on $I(\theta)$ targets forms an ex ante unconditional expectation of the number of successes as a function of premia:

$$E\Big[\sum_{i=1}^{I} m_i\Big] = \sum_{i=1}^{I} Q_i(\pi(\bar{\theta}), \bar{\theta}) \tag{3.16}$$

where the subscript i indicates that Q could depend on the target i. The acquirer can substitute the actual number of observed successes on the left hand side of Equation (3.16), and solve the following equation for $\hat{\theta}_1$:

$$\sum_{i=1}^{I} m_i = \sum_{i=1}^{I} Q_i(\pi(\bar{\theta}), \hat{\theta}_1) \tag{3.17}$$

Proposition 5: *The posterior estimate $\hat{\theta}_1$ exceeds the prior estimate $\hat{\theta}_0$ whenever the number of successes observed in Equation (3.17) exceeds that expected in Equation (3.16).*

Premia offered and transaction success are observable by the advisor. In case an advisor working with an acquirer was involved in more completed transactions than expected, acquirer updating of $\hat{\theta}$ increases the expected gains from trade in both the bidding and diligence cases, and fees increase. [4] After learning about the advisor's skill level through engaging it on a transaction, an acquirer who decides to rehire an advisor can pay the advisor more due to better knowledge of advisor skill.

When the acquirer engages the advisor, it can use available information from its own transactions which were observed perfectly. Additionally, acquirers may have different levels of information from the transactions of other acquirers. Firms that make many offers, for example, may be closer to the market and may have private knowledge of offers made by competing (successful and unsuccessful) acquirers. This may allow such informed firms to better identify advisors with higher skill.

Ideally, the acquirer would know all previous premia offered by other acquirers advised by the advisor, as well as the responses of each target. However, more information is available for completed than for failed transactions. Without detailed knowledge of premia offered and target responses for failed transactions, acquirers are limited by the information that becomes known publicly when transactions are completed.

If completion ratios are correlated with market share (which would be the case unless firms with higher market share have even higher levels of failed transactions), the acquirer may be able to use market share to estimate advisor skill. Under the assumption that advisors with higher market share have better completion ratios, market share becomes a tool for use in estimating advisor skill.

[4] The contract is strictly increasing in $\hat{\theta}$ in the linear case, and in the nonlinear case it is increasing except in the case of a high cross-partial derivative: high sensitivity to skill of the sensitivity to premium.

3.3.4 Nonlinear target response

In this section, I extend the model presented above to discuss results obtained when relaxing the assumption of linearity of the target firm response function.

Bidding-only case

Solving the firm's first order condition yields an expression for the optimal premium:

$$\pi(\theta) = p\eta_g - \frac{Q(\theta)}{Q_\pi(\theta)} \tag{3.18}$$

and the corresponding expected firm value:

$$E[V^C(\theta)] = V^A + V^T \frac{Q(\theta)^2}{Q_\pi(\theta)} \tag{3.19}$$

By comparing this value for different levels of skill I establish gains for trade in the bidding-only model general case:

$$g(\hat{\theta}) = E[V^C(\hat{\theta})] - E[V^C(0)] = V^T \Big(\frac{Q(\hat{\theta})^2}{Q_\pi(\hat{\theta})} - \frac{Q(0)^2}{Q_\pi(0)}\Big) \tag{3.20}$$

Since $\frac{Q(\theta)}{Q_\pi(\theta)} \neq \pi(\theta)$ in the general case, the expression for gains is more complex and cannot even be guaranteed positive without additional assumptions.

Proposition 6: *In the nonlinear bidding-only case, a separating equilibrium is possible only if $g(\theta_b) > g(\theta_g)\frac{Q(\theta_b)}{Q(\theta_g)}$. If this condition is met, the high type signals through use of a contingent contract such that (3.7) is satisfied. If this condition is not met, the only equilibrium is a pooling equilibrium where both types of advisor offer $c = \frac{g(\bar{\theta})}{Q(\bar{\theta})}$, where $\bar{\theta}$ represents the average advisor skill level.*

Proposition 7: *As the skill of the low type approaches that of the acquirer ($\theta_b \to 0$), there is no separating equilibrium.*

Proposition 8: *Under linearity, there is no separating equilibrium and both types pool using strictly contingent contracts.*

Separation is possible in some cases in the bidding-only model when the assumption of linearity is relaxed. Proposition 7 describes special cases of the nonlinear model where there is no separation. If the conditions described in Propositions 7 and 8 do not hold, there will be some parameter values in the bidding-only model where separation is possible.

In the case of hiring for both diligence and bidding, the expected firm value is given by:

$$E[V^C(\theta)] = V^A + V^T\left(\frac{p_u}{p}\frac{Q(\theta)^2}{Q_\pi(\theta)}\right) - d(\theta) \tag{3.21}$$

and the diligence threshold is:

$$V^T \geq d(\theta)\frac{p}{p_u}\frac{Q_\pi(\theta)}{Q(\theta)^2} \equiv \underline{V}^T(\theta). \tag{3.22}$$

Gains from trade follow:

$$g(\hat{\theta}) \equiv \begin{cases} V^T\left(\frac{p_u}{p}\frac{Q(\hat{\theta})^2}{Q_\pi(\hat{\theta})}\right) - V^T\left(\frac{p_u}{p}\frac{Q(0)^2}{Q_\pi(0)}\right) + d(0) & V^T \geq \underline{V}^T(0) \\ V^T\left(\frac{p_u}{p}\frac{Q(\hat{\theta})^2}{Q_\pi(\hat{\theta})}\right) & V^T \in (\underline{V}^T(\hat{\theta}), \underline{V}^T(0)) \\ 0 & V^T \leq \underline{V}^T(\hat{\theta}) \end{cases} \tag{3.23}$$

and the remaining results presented from the linear case hold.

3.4 Implications

Results of the model are consistent with several documented stylized facts about fees in acquisitions, and produces new testable implications about informed acquirers. If market share and the completion ratio are positively correlated, advisors can signal quality by completing deals, and managers can look at market share as a measure of quality. Bao and Edmans (2008) suggest that managers use market share data is due to exploitation of biases by sophisticated financial advisors (who are known to present market share rankings in marketing meetings). This model suggests managers observed in the data are acting rationally.

Saunders and Srinivasan (2001) attribute higher fee payments when advisors are retained due to switching costs or perceived non-pecuniary benefits of working with existing advisors. In the model presented here, higher fees upon re-engagement are expected. Firms' ability to observe deal completion rates and synergies enables better inference of advisor type and thus higher expected trade gains for good advisors.

Intuitively one might expect more informed buyers, who are likely to have bargaining power due to knowledge of the acquisition process and potential benefit to the advisor of repeat business, to pay lower fees. This model shows the opposite is true: acquirers who are more likely to know premia offered and outcomes for bidding undertaken by other firms can afford to pay more because their knowledge of deal parameters allows better inference of the advisor's type. While this is also true of repeat engagement of financial advisors, the model shows that informed buyers should be able to pay even higher fees.

In addition to charging higher fees, advisors with transaction history can signal their type to the extent their engagement is observable. This is true for transactions with repeat acquirers and for large advisors, whose engagements are often observed by industry participants. In the absence of perfect information about engagements, more completed transactions will be correlated with better-skilled advisors.

Because the diligence model provides more opportunities for advisors to signal, non-contingent components are more likely if the advisor is retained for both diligence and bidding. While we do not observe the extent of the engagement directly, it is likely that contracts for tender offers relate more closely to the bidding-only model than contracts for mergers. We should see more contingent contracts in advice on tender offers than in advice for mergers, which is consistent with Rau (2000). In other situations where diligence is more likely, we should observe more non-contingent fees.

3.5 Empirical results

3.5.1 Data and variables

Data for this project are obtained from Securities Data Corporation's ("SDC") Mergers and Corporate Transactions database. They include domestic mergers announced between 1980 and 2007, with information available on total acquirer financial advisor fees and a transaction value of at least $10 million. Most of the information on acquirer fees in SDC comes from acquirers' 14-D filings with the Securities Exchange Commission. I exclude data on recapitalizations, spinoffs, and splitoffs. This yields a data set of 3,183 observations, from which transactions involving a purchase of less than 50% or pre-deal ownership of at least 50% (679 deals) are excluded. 15 additional deals are excluded because the target and acquirer were the same entity, and one because the transaction was withdrawn. The remaining 2,488 deals are summarized in Table 3.9.

Observed fee data are complicated by bundled service categories and a variety of fixed fees as well as contingent fees. In addition to finding targets and structuring deals, data include cases where advisors provide explicit value certification through fairness opinions. They also assist in arranging or providing financing, finding and recommending targets, and negotiating bids. Relevant data include information on advisor fee amounts, the proportion of fees that are contingent, and transaction characteristics for acquisitions.

Transaction characteristics of interest include information that might help to identify the role of the advisor in the model: primarily, whether a transaction involved both search and bidding or bidding only. I argue that tender offers relate to an advisor being hired only for bidding, while mergers are more likely to include identification of targets. In addition, if the target is involved in business different from that of the acquirer, I assume the transaction is more likely to include diligence.

Other data of interest measure the acquirer's ability to observe transaction characteristics (premia offered and success rates) of the advisor it hires, and information on services the advisor provides. The role of the advisor can range from insignificant (offering a fairness opinion) to significant (acting as dealer manager, arranging financing, or investing alongside the acquirer in addition to providing basic advisory services).

Data include information on the role of the advisor in two categories, acquirer advisor assignments and acquirer fee assignments. These categories are summarized in Table 3.9. The primary categories for the advisor's role are *Advisory, Fairness, Dealer manager, Arranged financing, Provided Financing, Equity participant, Bustup* and *Contingency.* There is also a text field ("fee terms") which provides additional details on terms of the transaction.

We know from several studies (Rau 2000; Hunter and Jagtiani, 2003; and Bao and Edmans, 2007) that fees are likely to be higher for firms with higher previous market share. To incorporate this, I control for whether an advisor is among those with high market share. Table 3.9 summarizes the top financial advisors over the sample period of 1980-2007. Advisors are included in the top advisor category based on being among the top ten firms by market share during the decade of the deal (1980-1989, 1990-1999, 2000-2007). As in Rau (2000), I treat each subsidiary as a separate advisor regardless of subsequent acquisitions (the treatment results in a downward bias for firms such as Donaldson, Lufkin & Jenrette, which was acquired in 2000 by Credit Suisse).

SDC fee assignment data frequently contradict fee terms data; such contradictions usually relate to services provided for which the assignment field is missing. Deals in which *Fairness* is part of either advisor assignments or fee assignments almost always indicate a fairness opinion in the fee terms data. However, several deals have contingent fees but no *Contingency* assignment. I construct indicator variables for these assignments by examining the fee terms category. Summary statistics for the data are included in Table 3.9.

To identify transactions in which search takes place, I look at the flag for tender offer, since tender offers are more likely to involve only bidding. I also use an indicator variable for the target's primary SIC code not being among the SIC codes of the acquirer. If a target is outside the acquirer's industry, it is more likely the advisor helps with search.

3.5.2 Collection of contingent fee data

The amount of contingent fees in advisory transactions is important for the model but difficult to determine from advisor fee assignment data. The contingency data is frequently inconsistent with the information in the fee terms field. Several transactions that have no contingency fee type seem contingent when fee terms is analyzed. The amount of contingency fees is also often incorrect for other reasons (for example, it is often higher than total fees).

To determine how much of a given deal's fees are contingent, I hand collect data from the fee terms field in SDC. Creation of this variable involves the following rules: the contingency fee type (a dollar amount) is taken as a base for each transaction. In cases with multiple contingency fee types for a given deal, these are summed. This information is verified by examining the fee terms for each transaction. In cases where the total fee is listed as advisory only and there is no direct information on the contingent portion, data are treated as missing. This procedure corrects inconsistencies between the fee terms and contingency fee type fields, and leads to inclusion of contingent fee amounts for several transactions with missing contingency fee assignment data.

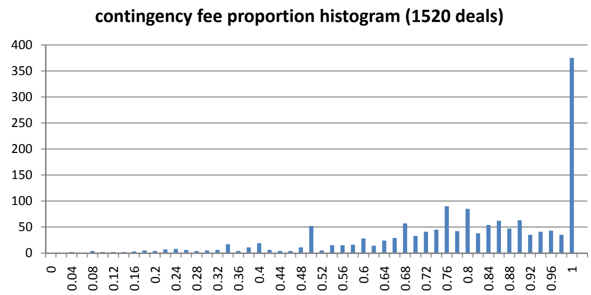

Figure 3.3: Contingent fee percent of assignment fees histogram

In some cases, while the amount of contingent fees could not be estimated, the fee terms indicated that a portion of the fees were contingent. This allows adjustment of the contingency indicator variable despite a missing item for the contingency percentage, and results in 1,520 transactions for which the percentage of contingent fees could be estimated.

Figure 3.3 shows the observed distribution of contingent fees as a percentage of total reported fees, conditional on some contingent fees (transactions without contingent fees are not reported in Figure **??**). In approximately 25% of cases, the fees for such transactions are all contingent fees. In 91% of cases, contingent fees are more than half of the total fee.

3.5.3 Selection bias

Transactions included are subject to a selection bias because those for which advisor data are available tend to be larger transactions. Table 3.4 compares summary statistics for the sample to those of a larger sample of all transactions (with values greater than $10 million) announced during the sample period of 1980-2007. Firms that disclose fees also tend to be public. While acquirers choose whether to disclose fees, it is unlikely that the fee disclosure decision relates to the variables of interest here: fee size and contingency.[5]

3.5.4 Regression analysis

As discussed above, the model suggests hiring based on advisor market share is optimal. Several studies confirm that managers hire advisors based on market share (Rau, 2000; Bao and Edmans, 2007). The model is also consistent with the results of Saunders and Srinivasan (2001), who find that switching advisors within the same tier leads to lower fee payments relative to re-hiring the same advisor. In my model, prior knowledge leads to better ability to estimate gains for retained good advisors.

I focus on several additional implications. The main implication I consider is that acquirers with private information about advisor quality can pay better advisors higher fees. Since LBOs are usually undertaken by professional investors with close ties to investment banks, acquirers in these deals likely observe information that allows better estimation of the advisor's ability.[6] Using the LBO indicator variable to identify transactions undertaken by better-informed acquirers, I estimate the following regression:

$$\text{Log(Fee / Deal value)}_i = \beta_0 + \beta \; LBO_i + \gamma' X_i + \epsilon_i \tag{3.24}$$

where i indexes deals, X_i is a vector of control variables, and LBO_i is an indicator for whether the transaction is a leveraged buyout.

I present regression results for total fees as a percentage of transaction value in Table 3.9. I find significantly positive coefficients on the LBO variable in all specifications. These results are obtained after controlling for known determinants of transaction complexity including type of consideration, nature of advisor assignment, whether the fee is based on a percentage or flat fee, advisor reputation, and whether the target is in a different business than the acquirer.

My results are robust to several combinations of control variables, as well as exclusion of fairness opinions and separation of the sample by mergers and tender offers. These

[5]Disclosure of the advisory fee and contract terms is becoming increasingly common in part due to recent court action in Delaware (see Faegre and Benson, 2007).

[6]Such information includes deal completion outcomes and premia offered

results are presented in Table 3.7. Since the fairness opinion is considered a minor advisory role, I check for robustness to excluding deals whose primary component involves a fairness opinion.

To implement this, I look at the number of advisory assignments. If the total number of assignments is 2 or less, and the deal includes a fairness opinion, the fairness opinion is likely a primary component of the assignment. My results in Table 5 exclude 469 such transactions in models (4) - (6), although this exclusion has a negligible impact on results. Additionally, the role of the advisor is likely to differ between mergers and tender offers. In terms of the model, tender offers correspond to the bidding function, where a target has been previously identified. Separately analyzing tender offers and mergers, I find that the LBO variable remains positive and significant in each specification.

The existence of contingent fees in a transaction has a significant positive impact on fee size. Contingent fees are associated with higher transaction fees in the model. Data are such that it is possible fees identified here as non-contingent are actually contingent fees, complicating the analysis. Still, results in Tables 4 and 5 are consistent with the model's predictions.

I report results from analyzing the proportion of contingent fees Table 6. In Models (1) - (3), I analyze the contingency fee proportion in a subsample of deals that have contingent fees. I estimate the following regression:

$$\text{Contingent fee / Total fee} = \beta_0 + \beta LBO_i + \gamma' X_i + \varepsilon_i \tag{3.25}$$

using OLS. OLS results for (3.25) have low R^2 and most variables appear insignificant. Models (1) - (3) analyze the proportion of fees that are contingent, conditional on some contingent fees. I find top advisors charge higher contingent fees in mergers but not tender offers. To analyze determinants of contingent fees, I analyze the sample of transactions for which I have data on whether any part of the fee is contingent. I estimate the following logistic regression:

$$\Pr[\text{contingent fee}] = f(\beta_0 + \beta LBO_i + \gamma' X_i) + \varepsilon_i \tag{3.26}$$

Results in Table 3.9 present determinants of contingent fees for both mergers and tender offers. Tender offers have a higher proportion of contingent fees, supported by the positive coefficient on the *Tender* variable in model (4), as well as the lower intercept in model (5) relative to model (6). This is consistent with Rau's (2000) result that tender offers have higher contingent fees.

The *New SIC* variable has a small positive impact on the proportion of contingent fees, particularly for mergers (model 5). While this is puzzling if mergers involve more search, the effect is small relative to that of other variables. In particular, the LBO indicator variable is significantly negative and has a higher magnitude, suggesting LBO investors pay higher fixed fees in mergers. This variable is insignificant in the tender offer subsample.

Results from Table 6 are consistent with the hypothesis that investors in leveraged buyouts retain advisors using fixed fees in mergers, where search is more important. Since they pay higher fees, and prefer fixed fees, it appears that advisors are not signaling their quality to LBO investors using the type of advisory contract. I argue this is because LBO investors choose advisors based on private information about advisor skill.

3.6 Conclusion

In this paper, I analyze a buyer's decision to hire a merger advisor. I show that acquirers extract information about skill based on contract offers and observable prior transaction outcomes. In this context, advisor selection based on market share is justified by the correlation of market share with deal completion likelihood. Additionally, contingent fees are more important in tender offers because search costs allow better advisors to separate more easily than in mergers. Finally, the model shows that acquirers who are 'closer to the market' can use private information in estimating advisor skill. I argue that acquirers in LBOs fall in this category, and present evidence from LBO fees that is consistent with the model's predictions: LBO investors pay higher fees, and their advisors are less likely to signal their quality using the contract, because they know they are hiring good advisors. My results suggest advisor selection is conducted in a setting in which deal synergies are not publicly observable.

3.7 Appendix: Notation summary

The following notation is used in the analysis above:
V^A: value of acquiring firm exclusive of takeover option
V^T: market value of target firm
V^C: value of combination of acquirer and target
m = indicator variable for a completed merger
π: premium offered by acquirer to target firm (above its current market value)
$Q(\pi(\theta), \theta)$ is the probability of deal success as a function of skill and premium
$Q_\pi(\pi, \theta)$ derivative of probability Q with respect to premium
$\eta \in \{0, \eta_g\}$: synergies per unit of target firm value
p_e the probability that a target firm will be excluded in diligence $(1 - \frac{p_u}{p})$
p_u unconditional probability of good synergies
p probability of good synergies conditional on surviving diligence
θ: skill level of the advisor $\in \{\theta_b, \theta_g\}$
$\hat{\theta}$: acquirer inference of advisor's skill level
$g(\hat{\theta})$: expected gains from hiring advisor
c: contingent portion of advisor fee
b: fixed (base) portion of advisor fee
$d(\theta)$: Diligence costs related to evaluating a target firm
$I(\theta)$: set of firms for which diligence is performed
$\underline{V}^T(\theta)$: minimum market value for which diligence occurs

3.8 Appendix: proofs

Note that most proofs presented below are presented for the general (nonlinear case). While these apply also for the linear case, these can be simplified by making the substitution $\frac{Q}{Q_\pi} = \pi$.

Proof of Lemma 1: Since synergies are not contractible or observable, any fee element not tied to transaction success can be incorporated in the fixed fee b. An equity contract produces the same results as a cash contract, and all parties agree on expected synergies.

Proof of Proposition 1: Follows directly from proofs of Propositions 6 and 8 .■

Proof of Lemma 2: If diligence is undertaken, the firm is worth (3.10) if diligence goes well. If the target is excluded, the firm is worth $V^A - d(\theta)$. Since the target will be excluded with probability $p_e = 1 - \frac{p_u}{p}$, the expected value of the firm (under linearity) is:

$$E[V^C(\theta)] = V^A + V^T Q(\theta)\frac{p_u \eta_g}{2} - d(\theta) \tag{3.27}$$

If diligence is not undertaken, the firm retains value V^A. For diligence to be profitable, the following must hold:

$$\frac{Q(\theta)V^T p_u \eta_g}{2} \geq d(\theta). \tag{3.28}$$

The result follows from solving this expression for V^T. ■

Proof of Proposition 2: As in Proposition 1, the acquirer's expected payments to the advisor can be no higher than its expected gains from hiring the advisor.

The gains from hiring an advisor for diligence include benefits from evaluating firms in the target space as well as increased value from consideration of targets with values $\underline{V}^T(0) \geq V^T \geq \underline{V}^T(\theta)$ which would otherwise not be part of the target space.

The expected number of firms with good synergies is $p_u I(\theta)$, and diligence allows the target space to be reduced to $I_d(\theta) < I(\theta)$, if diligence occurs for each of the $I(\theta)$ firms. The probability of diligence activities being successful is $\frac{p_u}{p}$ (note that $p_u I(\theta) = p I_d(\theta)$ because diligence cannot eliminate good firms).

Gains from trade in diligence depend on whether the target is in the acquirer's diligence set but not in the advisor's diligence set, or in both diligence sets. Thus, gains from hiring the advisor are:

$$g(\hat{\theta}) \equiv \begin{cases} V^T \frac{p_u \eta_g}{2}\Big(Q(\hat{\theta}) - Q(0)\Big) + d(0); & V^T \geq \underline{V}^T(0) \\ V^T \frac{p_u \bar{\eta}}{2} Q(\theta) & V^T \in \big(\underline{V}^T(\hat{\theta}), \underline{V}^T(0)\big) \\ 0 & V^T \leq \underline{V}^T(\hat{\theta}) \end{cases} \tag{3.29}$$

Solving the acquirer's participation constraint (3.6) for c, the incentive-compatibility constraint (3.7) yields the condition on fixed payment b given in (3.15). This represents the minimum possible fixed payment in a separating equilibrium.

Since $b \geq 0$ by assumption, separation will be possible if the numerator of (3.15) is positive. This yields a condition for a separating equilibrium similar to (3.33) in the Proof of Proposition 3, with the incorporation of diligence costs:

$$d(\theta_b) > \frac{Q(\theta_b)g(\theta_g)}{Q(\theta_g)} - g(\theta_b) \tag{3.30}$$

Higher diligence costs for the low type can prevent its mimicking the high type and provides a greater opportunity for the high type to signal. $d(\theta_g) < g(\theta_g)$ is required to ensure hiring an advisor is feasible. If there is no separation, the contract offered will be strictly contingent. ∎

Proof of Proposition 3: This result follows from the proof of Proposition 6. ∎

Proof of Proposition 4: If the low type can pool with the high type, then following (3.22) expected gains will be lower than $d(\bar{\theta})$. Since $d(\theta)$ is decreasing in θ by assumption, the result follows from $\bar{\theta} > \theta_b$ ∎

Proof of Proposition 5: This follows directly from the assumption that $Q_\theta > 0$ ∎

Proof of Proposition 6: From the IR constraint (3.6) we know the acquiring firm's expected payment will equal gains from trade. If the good type can separate, we can solve the IR constraint for fixed payment c:

$$c = \frac{(\hat{\theta}) - b}{Q(\theta_g)} \tag{3.31}$$

while separation requires that the low type's IC constraint (3.7) hold. The right-hand side of the IC constraint $g(\theta_b)$ represents the value the contract can take if $\theta = \theta_b$ is known by the acquirer.

Substitution into the IC constraint yields an expression the fixed payment b must follow if separation will be possible:

$$b \leq \frac{Q(\theta_g)g(\theta_b) - Q(\theta_b)g(\theta_g)}{Q(\theta_g) - Q(\theta_b)} \tag{3.32}$$

Since $b \geq 0$ by assumption, separation will be possible if the numerator of (3.32) is positive (the denominator is positive from Assumption 2). This yields a relation between gains for the high and low types:

$$g(\theta_b) > g(\theta_g)\frac{Q(\theta_b)}{Q(\theta_g)} \tag{3.33}$$

which means that gains from trade for the low type (the value of its contract in a separating equilibrium) must be high enough to offset the value to the low type of the high type's contract (the contract for the high type, scaled down for the low type's success probability).

If (3.32) cannot hold for any $b \geq 0$, then from the firm's IR condition (3.6) we know that $Q(\hat{\theta})c + b = g(\hat{\theta})$. The acquirer is indifferent between increasing the contingent contract c by $\frac{1}{Q(\hat{\theta})}$ units or increasing the fixed fee b by one unit. The high type prefers increasing the contingent fee while the low type prefers increasing the fixed fee (the value to the high type of an additional $\frac{1}{Q(\hat{\theta})}$ units of contingent fee is $\frac{Q(\theta_g)}{Q(\hat{\theta})} > 1$, while to the low type the value is $\frac{Q(\theta_g)}{Q(\hat{\theta})} < 1$, both types value an additional unit of b at 1).

As a result, offering any contract with $b > 0$ reveals the low type and both types offer a strictly contingent contract with $b = 0$ in a pooling equilibrium. From the IR constraint (3.6) we have $c = \frac{g(\theta_g)}{Q(\theta_g)}$.■

Proof of Proposition 7: As $\theta_b \to 0$, $g(\theta_b) \to 0$. Since $g(\theta_g) > 0$, the right hand side of (3.33) is positive and thus (3.33) cannot hold and there is no separating equilibrium. ■

Proof of Proposition 8: If the probability of merger success is locally linear for both types, we have:

$$\frac{Q(\theta_g)}{Q_\pi(\theta_g)} = \pi^*(\theta_g) = \pi^*(\theta_b) = \frac{Q(\theta_b)}{Q_\pi(\theta_b)} \tag{3.34}$$

where equality of the premia follows from solving (3.9) for each skill level to get:

$$\pi^*(\theta) = \frac{p\eta_g}{2} \tag{3.35}$$

Since the optimal premium does not depend on skill, it will be the same for both types. If there is to be separation, (3.33) must hold as demonstrated above. From the expression for gains from trade in bidding (3.20), incorporating (3.34), we obtain:

$$0 \geq Q(0)\Big(1 - \frac{Q(\theta_b)}{Q(\theta_g)}\Big) \tag{3.36}$$

From linearity, $\frac{Q(\theta_b)}{Q(\theta_g)} < 1$ since $\theta_g > \theta_b$, so the right hand side of (3.36) must be positive, which means (3.36) cannot hold. ■

3.9 Tables

Table 3.1: Summary statistics

1979 to 10/2007	N	Mean	StDev	Number = 1	0
Deal characteristics					
Leveraged buyout (LBO)	2,488	7.3%	26.0%	181	2,307
Tender offer	2,488	34.1%	47.4%	849	1,639
Top advisor	2,488	50.9%	50.0%	1,267	1,221
NewSIC	2,488	49.0%	50.0%	1,219	1,269
Advisor assignments					
Number of assignments	2,488				
Advisory		94.5%	22.8%	2,351	137
Fairness		44.5%	49.7%	1,108	1,380
Dealer Manager		31.4%	46.4%	782	1,706
Financing (arranged or provided)		5.3%	22.3%	131	2,357
Equity participant		2.2%	14.6%	54	2,434
Bustup		4.6%	20.9%	114	2,374
Contingency		61.3%	48.7%	1,526	962

				Percentiles	
Transaction fees	**N**	**Mean**	**StDev**	**25%**	**75%**
Total acquiror advisor fees	2,488	$3.9	$7.9	$0.5	$4.0
Total fees / transaction value	2,488	0.77%	0.95%	0.28%	0.99%
Contingent acquirer advisor fees	1,520	$4.1	$7.9	$0.7	$4.5
Contingent fees/ total fees	1,520	78.33%	20.88%	66.86%	97.33%
Contingent fees/ transaction value	1,520	0.63%	0.67%	0.25%	0.80%

Table 3.2: Example of advisor league table

Merger advisor market share 1980-2007 (advisors not adjusted for mergers)

Advisor	1980 - 2007 Deal Value ($ Mil)	Rank	Mkt. Share	Financial Advisor Fees, Total ($ Mil)	Ranking Value of Target ($ Mil)	Number of Deals
Goldman Sachs & Co	$6,701,476	1	35.1	$13,073	$7,047,865	4,714
Morgan Stanley	5,117,184	2	26.8	9,889	5,465,100	3,694
Merrill Lynch	3,565,990	3	18.7	6,822	3,799,405	2,389
JP Morgan	2,640,142	4	13.8	4,419	2,818,849	1,550
Lehman Brothers	2,552,344	5	13.4	4,352	2,781,105	1,994
Bear Stearns & Co Inc	1,526,204	6	8.0	2,621	1,624,639	1,546
Salomon Smith Barney	1,468,245	7	7.7	2,284	1,595,416	786
Credit Suisse First Boston	1,367,106	8	7.2	3,012	1,428,899	1,217
Citigroup	1,224,190	9	6.4	1,970	1,323,883	577
Banc of America Securities LLC	924,597	10	4.8	1,736	971,386	781
Donaldson Lufkin & Jenrette	880,886	11	4.6	2,324	937,165	1,689
UBS Investment Bank	844,159	12	4.4	1,223	914,263	583
Salomon Brothers	838,618	13	4.4	1,964	901,761	1,442
Lazard Freres & Co LLC	832,251	14	4.4	2,055	881,751	987
Deutsche Bank AG	809,819	15	4.2	1,379	861,041	589
All other advisors	9,458,208	--	49.7	20,011	10,128,957	14,143.0
Subtotal with Financial Advisor	**$16,832,990**	**-**	**88.1**	**$32,717**	**$17,763,680**	**49,307**
Subtotal without Financial Advisor	**2,285,114**	**-**	**12.0**	**0**	**2,322,203**	**154,372**
Industry Total	**$19,118,104**	**-**	**100.0**	**$32,717**	**$20,085,883**	**203,679**

source: Thomson Financial

Table 3.3: Sample vs. all transactions

1980 - 2007				Percentiles		
	N	Mean	StDev	25	50	75
All deals over $10M						
Transaction value	37,904	321.3	2,049.9	22.0	53.0	160.0
Enterprise value	6,454	1,928.7	10,299.8	86.7	263.4	886.6
Deals with fee data (the sample)						
Transaction value	2,491	1,492.5	6,193.6	75.9	234.6	790.7
Enterprise value	1,812	3,420.3	15,829.2	142.0	400.0	1,551.9

Table 3.4: Sample vs. all deals

Table 3.5: Regressions of acquirer advisor fees

	t-statistics in parentheses, bold indicates 95% significance				
	Model (Sample: all deals)				
	(1)	(2)	(3)	(4)	(5)
LBO	**0.771**	**0.687**	**0.526**	**0.659**	**0.672**
	(10.79)	(8.43)	(5.17)	(5.98)	(5.94)
log(transaction value)	**-0.289**	**-0.355**	**-0.361**	**-0.366**	**-0.372**
	(-26.09)	(-33.03)	(-31.09)	(-23.99)	(-23.99)
New SIC	**0.074**	0.029	0.031	0.027	0.034
	(1.98)	(0.86)	(0.80)	(0.59)	(0.73)
Top advisor	**0.292**	**0.264**	**0.041**	**0.146**	**0.152**
	(7.28)	(7.28)	(6.33)	(3.00)	(3.11)
Tender offer	**0.405**	**0.171**	**0.218**	0.132	0.130
	(11.46)	(2.34)	(2.65)	(1.23)	(1.17)
Assignment indicators					
advisory	--	**0.454**	**0.463**	**0.370**	**0.364**
		(4.15)	(4.05)	(2.58)	(2.47)
fairness	--	**-0.146**	**-0.147**	**-0.161**	**-0.189**
		(-3.15)	(-2.89)	(-2.24)	(-2.65)
dealer manager	--	0.035	-0.046	0.051	0.033
		(0.49)	(-0.60)	(0.51)	(0.32)
financing	--	**0.193**	**0.239**	**0.195**	**0.195**
		(2.29)	(2.77)	(2.10)	(2.08)
bustup	--	**0.135**	**0.145**	0.096	0.086
		(2.20)	(2.30)	(1.21)	(1.03)
equity participant	--	**0.292**	**0.413**	**0.385**	**0.390**
		(2.15)	(2.84)	(2.61)	(2.63)
contingency	--	**0.692**	**0.747**	**0.811**	**0.819**
		(17.71)	(14.36)	(12.29)	(12.58)
Fee based on flat fee	--	--	**-0.079**	--	0.106
			(-0.93)		(0.96)
Fee based on % of deal	--	--	--	**0.346**	**0.395**
				(7.04)	(4.91)
Constant	**-4.093**	**-4.427**	**-4.363**	**-4.386**	**-4.440**
	(-60.07)	(-34.54)	(-26.56)	(-25.73)	(-21.65)
Number of observations	2,488	2,488	2,094	1,381	1,338
R-squared	26.5%	39.0%	40.4%	42.2%	42.8%

Table 3.6: Acquirer advisor fees for mergers and tender offers

t-statistics in parentheses, bold indicates 95% significance

	Model (including fairness)			Model (excluding fairness)		
	(1)	(2)	(3)	(4)	(5)	(6)
Sample	All deals	Mergers	Tender offers	All deals	Mergers	Tender offers
LBO	**0.692**	**1.028**	**0.433**	**0.641**	**0.920**	**0.447**
	(8.530)	(8.540)	(3.930)	(8.040)	(7.200)	(4.080)
log(transaction value)	**-0.356**	**-0.363**	**-0.349**	**-0.350**	**-0.349**	**-0.347**
	(-33.330)	(-26.940)	(-21.390)	(-31.690)	(-23.640)	(-21.380)
New SIC	0.028	0.014	0.072	0.033	0.016	0.069
	(0.800)	(0.300)	(1.620)	(0.910)	(0.290)	(1.550)
Top advisor	**0.266**	**0.309**	**0.160**	**0.186**	**0.202**	**0.162**
	(7.340)	(6.370)	(3.110)	(4.820)	(3.630)	(3.110)
Assignment indicators						
advisory	**0.447**	**0.352**	**0.657**	**0.529**	**0.381**	**0.657**
	(4.080)	(2.800)	(3.050)	(2.390)	(1.040)	(2.930)
fairness	**-0.163**	**-0.131**	0.084	--	--	--
	(-3.640)	(-2.410)	(1.080)			
dealer manager	**0.177**	**0.309**	-0.027	**0.180**	**0.277**	-0.054
	(4.170)	(2.410)	(-0.340)	(4.970)	(2.120)	(-0.650)
financing	**0.198**	**0.457**	0.125	**0.212**	**0.428**	0.119
	(2.360)	(3.370)	(1.170)	(2.610)	(3.400)	(1.110)
bustup	**0.141**	**0.099**	**0.212**	**0.166**	0.129	**0.211**
	(2.270)	(1.190)	(2.500)	(2.720)	(1.520)	(2.480)
equity participant	**0.299**	0.129	**0.480**	**0.322**	0.175	**0.466**
	(2.210)	(0.450)	(2.940)	(2.500)	(0.490)	(2.870)
contingency	**0.697**	**0.861**	**0.405**	**0.466**	**0.615**	**0.398**
	(17.840)	(16.370)	(7.400)	(9.010)	(6.440)	(7.140)
Constant	**-4.390**	**-4.420**	**-4.170**	**-4.314**	**-4.330**	**-4.150**
	(-34.880)	(-29.480)	(-17.740)	(-19.180)	(-12.070)	(-16.870)
Number of observations	2,488	1,639	849	2,019	1,177	842
R-squared	38.9%	37.4%	38.8%	36.7%	34.9%	38.7%

Table 3.7: Fee regressions - mergers vs. tender offers

Table 3.8: Contingent fee regression results

OLS t-statistics, LOGIT z-statistics in parentheses, bold indicates 95% significance

	OLS			LOGIT		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Contingent %			Contingency indicator		
Subsample	Contingent fee > 0			Contingent indicator variable available		
Deals:	All deals*	Mergers	Tender offers	All deals*	Mergers	Tender offers
LBO	-0.008	0.050	-0.105	**-1.180**	**-2.456**	-0.257
	(-1.50)	(0.78)	(-1.72)	(-4.73)	(-4.92)	(-0.74)
log(transaction value)	0.006	-0.002	0.012	**0.312**	**0.380**	**0.222**
	(1.11)	(-0.22)	(1.47)	(6.77)	(5.65)	(3.30)
New SIC	0.026	0.044	0.019	**0.347**	**0.444**	0.218
	(1.77)	(1.87)	(0.98)	(2.62)	(2.17)	(1.24)
Top advisor	0.002	**0.061**	-0.040	-0.069	-0.092	-0.104
	(0.10)	(2.77)	(-1.84)	(-0.50)	(-0.42)	(-0.56)
Tender	-0.013	--	--	**0.816**	--	--
	(-0.45)			(3.45)		
advisory	-0.094	-0.108	-0.074	**2.113**	**3.420**	**1.585**
	(-1.11)	(-0.69)	(-0.76)	(4.99)	(3.31)	(3.19)
dealer manager	-0.024	-0.002	-0.031	**-0.479**	-0.755	-0.224
	(-0.82)	(-0.03)	(-0.88)	(-2.01)	(-1.74)	(-0.81)
Constant	**0.883**	**0.899**	**0.853**	**-3.516**	**-5.100**	**-1.915**
	(9.67)	(5.60)	(7.98)	(-7.57)	(-4.78)	(-3.40)
Number of observatio	720	296	424	1,187	537	650
(pseudo) R-squared	2.9%	4.2%	3.4%	10.5%	20.9%	3.7%

* Sample excludes fairness, financing, bustup and equity participant transactions

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