ELSEVIER Journal of Financial Economics 54 (1999) 133–163

JOURNAL OF Financial ECONOMICS

www.elsevier.com/locate/econbase

Commercial banks as underwriters: implications for the going public process☆

Manju Puri*

Graduate School of Business, Stanford University, Stanford, CA 94305-5015, USA

Received 29 August 1997; received in revised form 14 September 1998

Abstract

Commercial bank entry into securities underwriting can affect underwriter behavior because, unlike investment houses, banks also lend to firms. This raises several issues. Are banks better certifiers of firms' securities than investment houses? If banks hold equity in firms rather than debt, does this make certification more credible? Would one type of underwriter drive out the other? This paper provides a model for analyzing such issues, and derives several interesting results. First, banks, as lenders to firms, can actually be better certifiers than investment houses. Second, equity holding can hinder banks' certification ability. Finally, banks and investment houses can co-exist. © 1999 Elsevier Science S.A. All rights reserved.

* Corresponding author. Tel.: + 1-650-723-3402; fax: + 1-650-725-6152.

E-mail address: mpuri@gsb.stanford.edu (M. Puri)

☆I have benefited from discussions with and comments received from Mitchell Berlin, George Benston, Thomas Chemmanur, Peter DeMarzo, Zsuzsanna Fluck, Steven Grenadier, Nikunj Kapadia, Kose John, Vicente Madrigal, N.R. Prabhala, Raghuram Rajan, Anthony Saunders, G. William Schwert (the editor), Stephen Smith, Rangarajan Sundaram, and an anonymous referee. I thank workshop participants at the American Finance Association Meetings, Washington D.C., Case Western Univeristy, Columbia University, Carnegie Mellon University, Duke University, the European Finance Association meetings, Brussels, Financial Management Association meetings, St. Louis, Harvard Business School, Massachusetts Institute of Technology, Northwestern University, New York University, Ohio State University, Rochestor University, Rutgers University, Stanford University, University of Michigan, University of California at Berkeley, University of California at Los Angeles, Wharton School, and Yale University for their comments. This paper is a substantially revised version of an earlier draft entitled 'Conflicts of interest, intermediation, and the pricing of underwritten securities'. Any errors that remain are mine.

PII: S0304-405X(99)00034-3

JEL classification: G21; G24; N22

Keywords: Commercial banks; Underwriters; Certification; Security pricing; Glass–Steagall

1. Introduction

There has been much controversy in the U.S. about the appropriate scope of banks' activities. Much rhetoric has characterized the debate about the expansion of bank powers, particularly in allowing banks to enter the securities market. Quite remarkably though, there are few academic studies addressing the implications of such a step. In allowing banks entry into securities markets, regulators have had three major concerns. The first, which has attracted much press attention in recent times, is whether banks should be allowed to underwrite securities. Banks face a potential conflict of interest that arises from the possibility that a bank's existing claims might be retired from the firm's security proceeds. A second concern is whether banks should be allowed to own equity in firms, and whether holding equity, as opposed to debt, will change the bank's incentives when certifying the firm's securities. The third concern is whether banks, with prior access and superior information about firms to whom they lend, have an unfair advantage in underwriting that can result in their monopolizing the market. Some of these concerns are reflected in the continuing debate over the Glass–Steagall Act of 1933, which effectively prohibited commercial banks from underwriting corporate securities, and recent regulatory relaxations in allowing banks to underwrite corporate securities through Section 20 subsidiaries. While Glass–Steagall remains on the books, in 1987, regulators reinterpreted section 20 of the Glass–Steagall Act and allowed some banks, such as J.P. Morgan and Bankers Trust Co., to set up Section 20 subsidiaries which can underwrite corporate securities. These Section 20 subsidiaries were subject to a set of firewalls that limit information, resource, and financial linkages between them and their respective parent holding companies, as well as their commercial banking affiliates. In addition, these subsidiaries are also limited to generating a maximum of 10% of their gross revenues from underwriting corporate business. Recently, the Federal Reserve has raised this limit to 25%, and has also dropped some firewalls.

This paper provides a model that addresses the above concerns, and examines how the entry of commercial banks into securities market will affect investment houses and underwriting activities. The distinction between a commercial bank and investment house is characterized quite simply. A commercial bank has a prior financial claim in the firm, which can be debt, equity, or some combination of the two, and also underwrites the firm's securities. An investment house only underwrites firms' securities. The bank's prior financial claims give it access to private information about the firm, obtained, for example, through loan monitoring activities. This private information can have two opposing effects. It can cause a conflict of interest in that the bank can misrepresent the value of the firm's securities and use the proceeds to repay loans at the bank, or it can cause better certification as the bank can more accurately certify the firm's value. The paper first examines how prior financial claims held by the bank impact the bank's ability to certify securities it underwrites. The model compares and contrasts the bank's certification with an investment house's certification of similar securities, and derives implications for prices of underwritten securities. Second, the model analyzes the impact the kind of financial claim, equity or debt, held by the bank has on pricing. Finally, the paper examines whether both intermediary types can coexist, when each type is permitted to underwrite securities, with differing access to information.

The model shows that commercial banks, as lenders to firms, can obtain better prices than investment houses, particularly when costs of information production are high, and both commercial banks and investment houses have similar reputations ex-ante. The results tie in with evidence revealed in previous research. For example, bank underwritings have been found to fetch higher prices than investment house underwritings, after controlling for reputation and other characteristics, both in the pre-Glass–Steagall era (Puri, 1996), and post-1990 in bank underwritings through Section 20 subsidiaries (Gande et al., 1997). Consistent with investors rationally believing bank underwritten securities to be of higher quality, Ang and Richardson (1994), Kroszner and Rajan (1994), and Puri (1994) all discovered evidence, in the pre-Glass–Steagall era, that the long-run performance of securities underwritten by banks is superior to those underwritten by investment houses. Further, the price differential between bank and investment house underwritings, both pre-Glass–Steagall as well as post-1990, has been found to be greater for securities associated with high costs for information collection, such as non-investment grade securities. Current work by Hamao and Hoshi (1997), Ber et al. (1997), Ursel and Ljucovic (1998), use these earlier works as a basis for examining differential pricing in bank and investment house underwritten securities in Japan, Israel and Canada. Thus, the model's results are particularly relevant in providing a theoretical basis to the burgeoning empirical literature on the distinction between bank and investment house underwriting, and the subsequent implications for pricing securities. By providing a theoretical basis for banks to have a certification effect, even in the presence of potential conflicts of interest, the paper also adds to literature on the certification effect of banks (e.g., James, 1987; James and Weir, 1990; Lummer and McConnell, 1989).

The model's results on differential pricing apply in a broader context to other financial intermediaries, such as venture capitalists. While it is well known in academic literature that one of the primary roles of financial intermediaries is to help certify the true values of the securities they underwrite (see Smith, 1986), the importance and impact of the kind of financial claims held by different intermediaries has generally received less attention. In firms backed by venture capital, the venture capitalist holds financial claims in the firm, and hence faces a conflict of interest similar to that faced by the commercial bank. Indirect empirical evidence finds, consistent with our model, that venture capital-backed firms demonstrate lower underpricing than other firms (see Megginson and Weiss, 1991). The model's results help motivate further ongoing empirical research as to the magnitude and direction of differential pricing for underwritten securities when the venture capitalist as the underwriter also has a prior financial stake, whether debt or equity in the firm [see Gompers and Lerner (1998), Packer (1996), and Hamao et al. (1998) for ongoing research on the U.S. and Japan].

The model examines how equity claims affect the bank's underwriting behavior, as compared to debt claims. The generally accepted view is that holding equity plays a positive role in enhancing the credibility of the bank, and in reducing potential conflicts of interest (see, e.g., Berlin et al., 1996 and references therein). The model shows this result need not always hold. It finds that when the proceeds of the security issue are used to liquidate bank claims, equity holdings reduce the credibility of the bank as an underwriter, more so than debt claims.

This model also addresses the concern that, given their prior financial claims in firms and associated information advantage, banks may monopolize the market and drive out specialized investment houses [see e.g., Benston (1990), and Saunders (1985) for discussions of potential effects of bank entry into underwriting]. While the information advantage that banks have may allow them to obtain higher prices, the gains to the firm can be offset by banks charging higher underwriting fees, and by their extracting rents from the firm. This provides a rationale as to why banks and investment houses can coexist, as is the case in the U.S. today and in the pre-Glass–Steagall era; internationally, banks and investment houses also operate in the same market, in countries such as U.K. and France. Additionally, the model also finds conditions under which firms will initially choose bank financing and then go to public markets.

The model also provides a number of new predictions, which are potentially testable. For example, the size of the financial claim is important. If banks have small debt or equity claims in the issuing firm, their potential conflict of interest is lower, and in equilibrium, they can fetch higher prices. This prediction presents an interesting area for further research, and can be tested for the pre-Glass–Steagall era in the U.S., as well as in countries where banks are allowed to hold financial claims in firms whose securities they underwrite such as Germany and France. Further, if banks' prior financial claims help them to fetch higher prices than investment houses, then this differential can be offset by rent extraction and higher underwriting fees. This proposition forms one of the basis of empirical investigation in Gande et al. (1999), who investigate differences in underwriting fees between Section 20 bank subsidiaries and investment house underwritings.

The paper is organized as follows. Section 2 describes the basic framework of the model. Section 3 describes the underwriting decision, and Section 4 describes the equilibrium and implications of the model. Section 5 extends the model by examining the initial firm choice between banks and public markets, rent extraction, and intermediary coexistence. Section 6 examines the robustness of the main results in the infinite horizon context. Section 7 concludes.

2. The framework of the model

In the model, there are two types of intermediaries, commercial banks and investment houses. The distinction between commercial banks and investment houses is characterized as follows. Commercial banks hold prior financial claims, such as debt or equity, or some combination of the two, in the firm, and also underwrite the firm's securities. Investment houses do not hold prior financial claims, but underwrite firms' securities.[1] The model is set up to capture how prior financial claims held by commercial banks will affect underwriting in the securities market.

The model has three dates, given by $t = 1, 2, 3$. The other agents in the model are investors and firms. There are two types of firms, Type G and Type B. Each firm is endowed with one project. Type G firms have one good project with expected future cash flow of 1. Type B firms have one bad project with expected future cash flow of 0. All agents are risk-neutral.

Commercial banks are endowed with a loan portfolio. The loan portfolio for most banks contains both good and bad loans. There are, however, a few commercial banks which have only good loans in their portfolio. While all banks know that the firm will be Type G with some probability, α, at the time of making the loan, the banks with only good loans in their portfolio can be thought of as the fortunate few who find that the realization of all their loans is good. An alternate interpretation would be that banks have differing ability, which is not observable to outsiders.[2] A few banks have outstanding ability in that they have no bad loans. However, most banks can only judge probabilistically what the outcome will be, and do end up holding some bad loans. A low volume of bad

[1] In recent times the activities of the two intermediaries have tended to overlap with investment houses, for example, making bridge loans or holding equity portfolios in firms. In such a case, one could argue that investment houses resemble universal banks, who undertake a wide range of financial services, including lending and underwriting, rather than specialized financial institutions. See Benston (1994), and Saunders and Walter (1994) for further discussions on universal banking, and Gorton and Schmid (1994) for evidence on some aspects of universal banking in Germany.

[2] I would like to thank the referee for this suggested interpretation.

loans type is identified as Type L commercial bank and a high volume of bad loans type is identified as Type H commercial bank.

The investment house does not have prior financial claims in the firm, and has to produce information about the firm. For most investment houses, with search costs, c, the investment house can find a Type G firm. It is assumed that the pool of firms is large enough so that the investment house can find at least one good firm to underwrite, if it chooses to investigate and incur the search costs c. There are, however, a few investment houses that have no cost of information production, reflecting superior investigative abilities. The low-cost investment house type is identified as Type L, and a high-cost type is identified as Type H.

Both the commercial bank and the investment house underwrite a single firm's securities at time $t = 1$ and $t = 2$. For the commercial bank, its critical decision is whether to underwrite a good or bad firm. For the investment bank, its critical decision is whether to incur the investigative costs, c, to identify and underwrite a good firm.

Investors do not know firm type at the time that the firm's securities are underwritten, nor do they know if the financial intermediary is Type L or Type H. However, at $t = 1$, investors know the prior probability of the financial intermediary being Type L, which can be taken as a measure of the financial intermediary's reputation. Thus, τ_1 and λ_1 are the prior probabilities at $t = 1$ that the commercial bank and investment house are Type L, respectively. This notation represents the intermediary's reputation ex-ante or the prior probability of the intermediary setting high standards. The true type of the firm underwritten at time $t = 1$ is revealed to investors prior to the intermediary's underwriting at time $t = 2$. Investors update their beliefs about the intermediary's reputation through Bayes' rule, after observing the outcome of the intermediary's underwriting decision at $t = 1$. The estimates τ_2 and λ_2 are the probabilities at time $t = 2$ that investors will assess the commercial bank or investment house to be Type L, respectively. Thus, the intermediary's underwriting decision at time $t = 1$ affects how investors value the securities that it underwrites at time $t = 2$. For instance, if the commercial bank underwrites a bad firm at $t = 1$, investors will realize this prior to the commercial bank's underwriting at $t = 2$. This action will adversely affect the commercial bank's reputation. Investors will believe that the bank will underwrite a bad firm at time $t = 2$, and impute a value of zero to such an underwriting. Detailed equations describing the exact mechanism of how investors update their beliefs of the commercial bank and investment house, and resultant valuation implications, are given in Appendix A.

3. The underwriting decision

We now examine the underwriting decision for both the commercial bank and investment house at times $t = 1$ and $t = 2$.

3.1. Commercial bank

Both the commercial bank and investment house are compensated for underwriting securities by underwriting fees assumed to be a function of the security proceeds raised in the market. The security proceeds being raised are for the full value of the firm, hence the security type issued, whether debt or equity, is immaterial. Since Type B firms, possessing only one bad project, have zero value, underwriters do not gain any fees by underwriting and certifying a firm to be of Type B. Hence, all underwritten firms are certified to be of Type G. The commercial bank has information about the firm type from its loan monitoring activities. The bank has a choice of underwriting a Type G firm or a Type B firm. Thus, the bank faces a trade-off. By underwriting a B firm, the gain to the bank is that it can liquidate its outstanding debt or equity, which are valueless otherwise, for a positive price. The downside, however, is that once the underwriting is done, after time $t = 1$ investors will know the true value of the securities underwritten at $t = 1$. Investors will use this information to value securities that the commercial bank underwrites at $t = 2$. Hence, if investors observe the firm underwritten at $t = 1$ to be Type B, this observation will adversely impact the reputation of the bank. Investors will know that the bank is a Type H bank that will underwrite a Type B firm at $t = 2$. Accordingly, investors will impute a value of zero to the securities underwritten by the bank at $t = 2$.

Working backwards from the end of the game, it is apparent that in the last period, at time $t = 2$, the commercial bank will always underwrite a bad firm, because there are no longer any long-term reputation gains from sacrificing short-term profits. The main decision that the commercial bank faces is what kind of firm to underwrite at $t = 1$. The commercial bank must choose its strategy at each date so that its strategy is optimal for the rest of the game.

The expected profit of the type H commercial bank if it underwrites a good firm at $t = 1$ is

$$\gamma V(\tau_1) + \text{Max}[V(\tau_1)(1-\gamma) - D,\ 0]e + \text{Min}[V(\tau_1)(1-\gamma),\ D] + \delta(\gamma V(\tau_2^G) + \text{Max}[(1-\gamma)V(\tau_2^G) - D,\ 0]e + \text{Min}[(1-\gamma)V(\tau_2^G),\ D]), \quad (1)$$

where $\gamma V(\tau_1)$ and $\gamma V(\tau_2^G)$ are the Time 1 and Time 2 underwriting fees respectively, δ is the discount factor by which Time 2 revenues are discounted to the present. Underwriting fees, γ, are taken to be a percentage of the proceeds of the issue raised in the market. In Eq. (1), D is the outstanding prior debt that the firm owes to the commercial bank, and e is the outstanding equity that the commercial bank owns in the firm prior to the underwriting. The commercial bank recovers its outstanding debt, D, and liquidates its outstanding equity stake in the firm, e, from the proceeds of the new issue. Thus, the second term in the equation reflects the amount recovered for the bank's equity stake. The value of the equity stake recovered is zero if investors assess the underwritten firm to be bad. If the firm value is positive, it is the equity value for the amount raised less underwriting fees and outstanding debt. The third term in the equation gives the amount recovered for the bank's outstanding debt. The bank recovers the lower of the debt value, or the residual value of the firm after underwriting fees are paid. Similarly, the fifth and the sixth terms reflect the amount recovered for the bank's outstanding debt and equity for the firm that the bank underwrites at time $t = 2$.

The expected profit of the Type H bank if it underwrites a bad firm at $t = 1$ is

$$\gamma V(\tau_1) + \mathrm{Max}[(V(\tau_1)(1-\gamma) - D, 0]e + \mathrm{Min}[V(\tau_1)(1-\gamma), D] + (1-D)e + D + \delta(\gamma V(\tau_2^B) + \mathrm{Max}[(1-\gamma)V(\tau_2^B) - D, 0]e + \mathrm{Min}[(1-\gamma)V(\tau_2^B), D]). \tag{2}$$

Eq. (2) is similar to (1), except that the value raised at $t = 2$ is $V(\tau_2^B)$ instead of $V(\tau_2^G)$, since investors see the true value of the firm underwritten at $t = 1$ and revise their expectations accordingly. Insofar as the bank can underwrite only one firm per time period, by underwriting a bad firm, the bank retains its stake in the Type G firm from which it recovers its outstanding debt, D, and its equity claim is worth $(1 - D)e$. Note that the value raised at time $t = 2$, when the bank underwrites a bad firm in the first period, is $V(\tau_2^B)$, as opposed to $V(\tau_2^G)$, which is obtained when the bank underwrites a good firm. This difference reflects the intertemporal link of past representation standards on the amount that can be raised in future. For computational ease, in the remainder of the paper I assume that when $\tau_1 > 0$, the amount raised from the market, $V(\tau_1)$ and $V(\tau_2^G)$, exceeds the debt amount that the firm has outstanding with the bank.

3.2. Investment house

Unlike the commercial bank, the investment house does not have prior financial claims in the firm that gives it access to private information about the firm. Hence, the investment house has to decide whether to spend cost c to search for a Type G firm. If the investment house spends c, it can be sure of underwriting a Type G firm. Without expending c, then, like investors, the investment house only knows that the firm is good with probability α. For the investment house, the gain from not investigating is the investigative cost saved, c. The loss to the investment house is that, if the firm underwritten at $t = 1$ subsequently turns out to be bad, the investment house's reputation will be adversely impacted. Investors will know that the investment house is of Type H, and, in the next period, will value the securities underwritten by it accordingly.

Working backwards from the end of the game, the investment house must choose its strategy at each date so that its strategy is optimal for the rest of the game. In the last period, the Type H investment house will not investigate the firm, since there are no long-term reputation gains to be made from sacrificing short-term profits. The expected profit of the Type H investment house if it investigates at $t=1$ is

$$hV(\lambda_1) - c + \delta hV(\lambda_2^G), \tag{3}$$

where $hV(\lambda_1)$ and $hV(\lambda_1^G)$ are the underwriting fees at Times 1 and 2, respectively, δ is the discount factor by which time 2 revenues are discounted to the present, and c is the investigative cost. Underwriting fees, h, are taken to be a percentage of proceeds of the issue raised in the market.

Similarly, the expected profit of the Type H investment house if it does not investigate at $t=1$ is

$$hV(\lambda_1) + \delta h((1-\alpha)V(\lambda_2^B) + \alpha V(\lambda_2^G)). \tag{4}$$

Eq. (4) is similar to (3), except that, by not investigating, the investment house no longer expends investigative costs c. Note the value raised at time $t=2$ differs when the investment house investigates because there is some probability, $1-\alpha$, that the underwritten firm is bad, and in such a case the value raised from the market is $V(\lambda_2^B)$ instead of $V(\lambda_2^G)$. This difference reflects the intertemporal link of past investigative standards on the amount that can be raised in the future.

The model framework, established above, assesses the impact of prior financial claims, or the lack of them, on securities underwriting using a multiperiod game in which the commercial bank and investment house both underwrite securities twice. This framework employs the finite horizon setting of Kreps and Wilson (1982a) and Milgrom and Roberts (1982). This is not the first paper to use this approach. This approach has been used previously in finance literature (see, for example, John and Nachman, 1985; Diamond, 1991; Maksimovic and Titman, 1991), primarily to show that, in different contexts, reputation matters. In the investment banking context, the setting used here is similar to Chemmanur and Fulghieri (1994) who show how reputation can mitigate the investment bank's incentive problem. In contrast, the focus of this paper is the issue of how financial claims held by the financial intermediary, whether debt or equity, can affect underwriting behavior. Further, rather than focus on how reputation matters, I take this as a given. Instead, I use this modeling framework to allow commercial banks and investment banks to have similar reputations, in that investors have similar priors about intermediary type, with the proportion of Type L commercial banks and Type L investment houses being similar, and then examine how underwriting behavior differs across these two kinds of intermediaries.[3]

[3] Other theoretical literature in this area include Boot and Thakor (1997a,b), who examine the impact of the choice between universal and functionally separate banking, and who argue that a financial system in its infancy will be bank dominated, Kanatas and Qi (1998), who study the effect of intermediaries' incentives on firms' choice of project quality, and Rajan (1998), who studies conditions under which separation of lending and underwriting may be beneficial. None of these papers examine implications for underwriter type on pricing, as is done in this paper.

4. Characteristics of the equilibrium

With the model framework established, the equilibrium behavior of the commercial bank and investment house is now examined. The equilibrium concept used is sequential equilibrium.

Sequential equilibrium requires that the conditions of sequential rationality and consistency of beliefs are met. Sequential rationality means that, from any information set in the game, players choose strategies that are best responses for the remainder of the game. At the same time, the strategies chosen must be consistent with the beliefs of the other players. Conditional beliefs are calculated according to Bayes' rule along the equilibrium path.[4] These conditions rule out dynamically inconsistent choices in the framework of this model.

The Type L commercial bank has no bad loans, hence it underwrites a Type G firm in each period, at both $t=1$ and $t=2$. Similarly, the Type L investment house has no costs of investigation, hence it will investigate at $t=1$ as well as at $t=2$. For the Type H commercial bank and Type H investment house, the underwriting decision is less clear. In the last period, there are no long-term reputation gains, hence both the Type H commercial bank and Type H investment house will maximize their short-term profits. For the commercial bank, this result is achieved by underwriting a bad firm at $t=2$, and the investment house achieves this result by not expending investigative costs c at $t=2$. At $t=1$, however, the Type H commercial bank and Type H investment house face a tradeoff. For the Type H investment house, investigation is costly. If it does not investigate, it may underwrite a bad firm, which will damage its reputation and lower its future profit. Similarly, the Type H commercial bank faces a tradeoff between underwriting a bad firm, which helps the bank recover its bad loan but damages its reputation. Investors will assess that the bank's future underwriting will be an endorsement of a bad firm, which will lower the bank's future profits. The following proposition describes the equilibrium and resultant price.

[4] For a more technical definition of sequential rationality and consistency of beliefs, which are necessary for a sequential equilibrium, see Kreps and Wilson (1982b). In a multi-stage game of incomplete information, if either player has at most two possible types, or there are two periods, as in this game, the set of perfect Bayesian equilibria and sequential equilibria coincide (see Fudenberg and Tirole, 1991). Hence, it is adequate for the proofs to satisfy the conditions for a Bayesian equilibrium. Further, while the model is set up for two periods, similar results would obtain for a more complicated model having more time periods [see, e.g., Kreps and Wilson (1982a) and Milgrom and Roberts (1982), who show for an n-period model, while the analysis gets much more complicated, similar results obtain for smaller amounts of incomplete information].

Proposition 1A. *For the type H commercial bank*:

(i) *if* $0 < \tau_1 < [e + D(1-e)(1-\delta)]/[\delta(e+(1-e)\gamma)] < 1$, *there exists a unique sequential equilibrium such that the bank underwrites a good firm with probability* $g_1 = [\tau_1(1-\delta)(D+(1-D)e) - \delta(1-e)\gamma]/[(-1+\tau_1)(D(1-\delta)(1-e)+e)]$ *in the first period. The bank never underwrites a good firm in the last period* (*i.e.*, $g_2 = 0$). *The pricing of the security is* $V(\tau_1) = [\tau_1\delta(e+\gamma(1-e))]/[((1-\delta)D(1-e)+e)]$.

(ii) if $1 > \tau_1 > [e + D(1-e)(1-\delta)]/[\delta(e+(1-e)\gamma)]$, *there exists a unique sequential equilibrium in which the bank underwrites a good firm in the first period. The bank never underwrites a good firm in the last period* (*i.e.*, $g_1 = 1$, $g_2 = 0$). *The pricing of the security is* $V(\tau_1) = 1$.

(iii) *if* $\tau_1 = 0$ *or* $e + D(1-e)(1-\delta) > \delta(e+(1-e)\gamma)$, *there exists a unique sequential equilibrium in which the bank never underwrites a good firm in either of the two periods* (*i.e.*, $g_1 = 0$, $g_2 = 0$). *The pricing of the security is* $V(\tau_1) = 0$.

Proposition 1B. *For the type H investment house*:

(i) *if* $\mathrm{Max}[0, [c\alpha]/[(\alpha-1)(c-\delta h(1-\alpha))]] < \lambda_1 < c/[\delta h(-1+\alpha)^2] < 1$, *there exists a unique sequential equilibrium in which the investment house investigates with probability* $s_1 = [1 + (c(1-\lambda_1)\alpha)/(\lambda_1(c-\delta h(1-\alpha)^2))]/[1-\alpha]$ *in the first period. The investment house never investigates in the last period* (*i.e.*, $s_2 = 0$). *The pricing of the security is* $V(\lambda_1) = [\delta h\lambda_1(-1+\alpha)^2]/c$.

(ii) *if* $1 > \lambda_1 > c/[\delta h(-1+\alpha)^2]$, *there exists a unique sequential equilibrium in which the investment house investigates in the first period. The investment house never investigates in the last period* (*i.e.*, $s_1 = 1$, $s_2 = 0$). *The pricing of the security is* $V(\lambda_1) = 1$.

(iii) *if* $\lambda_1 = 0$ *or* $\lambda_1 < [c\alpha]/[(\alpha-1)(c-\delta h(1-\alpha))]$ *or* $c > \delta h(-1+\alpha)^2$, *there exists a unique sequential equilibrium in which the investment house never investigates in either of the two periods* (*i.e.*, $s_1 = 0$, $s_2 = 0$). *The pricing of the security is* $V(\lambda_1) = \alpha$.

For the proof of Proposition 1A and 1B, see Appendix B. For a specification of investors beliefs see Appendix A. Intuitively, when the intermediary has a poor reputation, when τ_1 and λ_1 are zero, investors will believe that the intermediary is Type *H*, regardless of its actions. Hence, there is little benefit from the intermediary trying to maintain its reputation, so the intermediary reverts to its one-period behavior, leading to low certification standards and low prices. Since the commercial bank, by underwriting a Type *B* firm, will obtain no revenues from underwriting and cannot recover any of its debt, the bank will be indifferent between participating or pulling out of the underwriting business. If the intermediary has a strong reputation, when τ_1 and λ_1 are very high, investors believe that the intermediary is of Type *H* with a high probability. The intermediary has a strong incentive to maintain its reputation, leading to high certification standards and high prices. This result is a pooling equilibrium in which all commercial banks and investment houses underwrite Type G firms in the first period. Effectively, the Type H commercial bank and Type H investment house are hiding behind the Type L intermediaries. If τ_1 and λ_1 are of intermediate value, the intermediaries play mixed strategies. Here the Type H bank chooses to underwrite a bad firm at $t = 1$ and the Type H investment house chooses not to investigate the firm at $t = 1$ with sufficiently high probability so that the probability assessed by investors of the intermediary being of Type H, after observing a good firm being underwritten, is just sufficient to make the profits under the alternative strategies equal. The prices follow from the mixed strategy.

The results of the effect of reputation generalize those derived in previous literature (such as Chemmanur and Fulghieri, 1994), which emphasize that reputation matters to multiple intermediary types. More importantly, this modeling framework now permits us to analyze a number of interesting issues. If the commercial bank and investment house have similar reputations ex-ante, in that investors have similar priors of each intermediary being Type L, would it matter which underwriter the firm chooses? Proposition 1 suggests that, even in such a case, the type of underwriter is still important in determining prices.

The extent to which pricing differs for securities underwritten by a commercial bank as opposed to securities underwritten by an investment house, depends on the underlying parameters. In particular, the cost of information and the size and structure of claims the bank holds in the issuing firm are important. Some results that immediately follow from Proposition 1 are as follows. When the prior probabilities, τ_1 and λ_1 are 0, suggesting that the commercial bank and investment house have poor reputations, the price of bank underwritten securities is zero, while the price of investment house underwritten securities is α. When the prior probabilities, τ_1 and λ_1, are sufficiently high, suggesting that the commercial bank and investment house have strong reputations, the Type H investment house always investigates, and the Type H bank always underwrites a good firm. For both cases, the price of underwritten securities is equal to one. Finally, for intermediate values of τ_1 and λ_1, the Type H bank and the Type H investment house play mixed strategies. The key feature that guides these strategies is the level of c, the cost of investigation to the investment house. The prices obtained by the bank will be higher than those obtained by the investment house if c is sufficiently large so that the following inequality holds, $c > [h\lambda_1(-1+\alpha)^2(e + D(1-\delta)(1-e))]/[\tau_1(e + \gamma(1-e))]$. Bank underwritten issues will fetch lower prices than investment house underwritten issues if this inequality is reversed.

Empirical evidence of commercial bank and investment house setting different prices for similar securities, after controlling for reputation and other characteristics, is found for the pre-Glass–Steagall period by Puri (1996), and post-1990, for Section 20 subsidiaries, by Gande et al. (1997). Recent empirical studies in the banking and venture capital literature build on these earlier works, investigating how the pricing of securities is affected when the underwriter, either a bank or venture capitalist, also has a financial stake in the firm, whether debt or equity, in various countries including the U.S. Canada, Israel and Japan (see, e.g., Packer, 1996; Hamao and Hoshi, 1997; Ber et al., 1997; Gompers and Lerner, 1998; Hamao et al., 1998; Ursel and Ljucovic, 1998). Indirect empirical evidence of this phenomenon is also found by Barry et al. (1990), and Megginson and Weiss (1991) in the venture capital industry, where the venture capitalist who holds equity in the firm faces a conflict of interest similar to the one faced by the bank. The evidence shows that, consistent with a certification effect, firms backed by venture capital demonstrate lower underpricing than a matched sample of non-venture capital backed firms. Further, some of the results demonstrating Proposition 1 add to the literature on the certification role of banks. The certification role of banks has been well documented but largely in the absence of conflicts of interest, (see, e.g., James, 1987; James and Weir, 1990; Lummer and McConnell, 1989). The model's results provide a theoretical basis for banks having a certification role, even in the presence of conflicts of interest.

Another interesting issue is the manner in which the kind of prior financial claim held by the bank, debt or equity, affects its underwriting behavior in equilibrium. I also examine how the cost of information collection, underwriter fees, and discount rate can affect the underwriter's equilibrium behavior.

Proposition 2.

(i) *In the mixed strategy equilibrium, if the Type H commercial bank holds equity claims, rather than debt claims, in the issuing firm, it has a greater incentive to underwrite a bad firm. The holding of equity decreases the credibility of the bank and leads to a lower price of underwritten securities.*

(ii) *The Type H commercial bank is more likely to underwrite a good firm, and hence the prices of its underwritings are higher, the smaller its debt and equity claims, the higher the underwriting fees, and the less it discounts the future.*

The Type H investment house is more likely to investigate, and hence the prices of its underwritings are higher, the lower the cost of information production, the higher the underwriting fees, and the less it discounts the future.

The proof of Proposition 2 can be found in Appendix B. The nature of the financial claim held by the bank turns out to be an important determinant of bank underwriting behavior. In particular, equity increases the incentives of the bank to underwrite a bad firm more than debt. The result on the effect of debt versus equity may seem surprising in the light of previous literature, where if a financial intermediary holds equity its credibility in certifying the value of the firm is enhanced [see, e.g., Leland and Pyle (1977), which gives a formal analysis of how equity holdings in the firm can provide a signal of the firm value]. Further, established academic literature suggests that allowing banks to hold equity claims helps reduce conflicts of interest (see e.g., Berlin et al., 1996; Allen and Winton, 1995, and references therein). Such literature has tended to support banks' holding of equity, which is banned in the U.S., though allowed in countries like Japan [see James (1995) for a thorough description of existing regulation on banks' holding of equity capital]. This model shows that the time horizon for which equity is held is critical in the certification process. If the equity held by the financial intermediary is retired by the proceeds of the issue, then the intermediary's credibility is adversely affected.[5] In such a scenario, equity hurts the credibility of the bank more than debt. This proposition is testable internationally, in countries in which banks are allowed to hold equity, such as Germany and France.

In comparing the certification standards and pricing across intermediaries, two major empirical implications emerge. As the cost of information increases, the investment house will find it more costly to investigate the firm, and its incentives to investigate the firm will decline. Investigative costs are likely to be higher for junior securities, and for securities that are information sensitive. This result would suggest that banks will have a comparative advantage in underwriting such securities. Empirical support is found in Puri (1996), which examines corporate bond and preferred stock underwritings by commercial banks and investment houses in the pre-Glass–Steagall era, and finds that bank underwritings were priced higher than similar investment house underwritings. Consistent with the model's results, the price differential was higher for issues for which information production costs were greater. In particular, there was a higher price differential between securities underwritten by banks and investment houses for new versus seasoned issues, preferred stock versus bond issues, and low-credit versus high-credit rated issues. This result is also consistent with more recent evidence of bank underwriting by Gande et al. (1997), which finds post-1990 bank underwritings, through section 20 subsidiaries, were priced higher than investment house underwritings, particularly for low-credit rated issues, where information collection costs were higher.

Another interesting empirical implication is that the larger the financial claims of the bank, represented by D and e, or debt and equity, the larger its loss from keeping a bad firm, and hence the greater its incentives to underwrite a bad firm. This relation leads to a small 'toehold' effect, that is, if the bank has small debt or equity holdings, its potential conflict of interest is lower, and hence it is likely to fetch higher prices in equilibrium. This relation is potentially testable for the pre-Glass–Steagall in the U.S., when banks could underwrite corporate securities. This relation is also testable internationally, in countries such as

[5] Note this is similar to the situation in which the financial intermediary agrees to hold equity, but there are no mechanisms in which the bank's ex-ante commitment to hold equity can be enforced ex-post. Thus, while the bank may commit to continue to hold equity, such a commitment will not be credible if it could turn around and have the firm buy back its equity the moment the public issue of the new securities is over.

Germany, the U.K., and France, where banks are allowed to hold financial claims in firms whose securities they underwrite.

5. Intermediary coexistence and firm choice

The model finds that one intermediary type can get higher prices than the other for securities that it underwrites. This raises some additional questions. Will a single intermediary type dominate the market, or can both intermediaries coexist? Further, the model assumes that, initially, all firms have bank debt outstanding. Why do firms prefer to borrow from banks at the start, and why do firms choose to convert from private to public securities?

To address these questions, I now extend the model backwards by two dates, $t = 0$ and $t = -1$. In the beginning, at time $t = -1$, assume that firms need some, relatively small, amount of financing, and therefore have to choose between going to a bank or going directly to the public market. At this point, firms are young, they have no track record, and it may not be possible, even with investigative costs, for outsiders to determine their type. If the firm chooses to first go to a bank, then subsequently, at time $t = 0$, it can choose to go to an investment house. Consider now the choice of the Type G firm choice. It has to compare profits from the two alternatives to determine its choice. Some possible equilibria are considered below.

Proposition 3. *Initial financing choice*:

(i) *Investment bank has high reputation* $(1 > \lambda_1 > c/[\delta h(-1 + \alpha)^2])$; *Type G firm will choose to go to the bank rather than go to public markets first if* $(1 - h)((1 + V(\lambda_2^G))/2 - \alpha) > D(1 - \alpha)$.

(ii) *Investment bank has no reputation* $(\lambda_1 = 0)$; *Type G firm will choose to go to the public markets immediately, rather than first going to the bank.*

(iii) *Investment bank has some reputation considerations* $(\mathrm{Max}[0, c\alpha/[(\alpha - 1)(c - \delta h(1 - \alpha))]] < \lambda_1 < c/[\delta h(-1 + \alpha)^2] < 1)$; *Type G firm will choose to go to the bank rather than go to public markets first if* $(1 - h)((V(\lambda_1) + V^*)/2 - \alpha) > D(1 - \alpha)$, *where* $V^* = (\alpha + (1 - \alpha)s_1)V(\lambda_2^G) + (1 - s_1)(1 - \alpha)\alpha$.

For the proof of Proposition 3, see Appendix B. A specification of investors beliefs is set out in Appendix A. We further assume when a firm is with a bank and is subsequently underwritten, there is an equal probability that the firm will be underwritten at Times 1 or 2. Parts (i) and (iii) of Proposition 3 will hold for sufficiently small D and small h, that is, for small levels of bank financing and low underwriting fees. The intuition here is that the firm's initial financing takes place when its type cannot be determined by anyone but itself, and hence the firm has to pay more for its financing than if it is known to be Type G. So long as the underwriter has a reputation it wants to preserve and maintain, the underwriter sets high certification standards that will ensure a value of more than α to the firm's securities. The lower the firm's initial financing, which is at a premium, and the higher the amount it gets in public markets later, which increases with underwriter reputation and decreases with underwriting fees, the higher the firm's payoff by first going to a bank. When Type G firms behave in this manner, Type B firms are forced to follow suit and also go to banks first. Otherwise if Type B firms go to public markets directly, the market will know that they are Type B firms and they will be unable to raise any money for securities issued.

Proposition 3 demonstrates that it is optimal under certain conditions for firms to first go to banks for financing and then go to public markets. This proposition support results in Diamond (1991) that firms first go to banks, build up a reputation, and then go to public markets. While it is also possible to go to public markets through a commercial bank, doing so does not change the results in any way. Under circumstances described below, which allow for the two intermediary types to coexist, the net profit to the firm from staying with the bank or going to the investment house is identical.

We now come to the question of coexistence of intermediaries. If banks, with full knowledge of their clientele, enter the underwriting business and obtain better prices for firms that they underwrite, will they drive out specialized investment houses? I show that this is not necessarily true, and derive sufficient conditions for banks and investment houses to coexist. There are potentially two additional costs incurred by firms going to banks for securities underwriting. The first cost is rent extraction, and the second cost is differences in underwriting fees. The bank that has a lending relationship with the firm has a monopoly position, because it knows firm quality without error or marginal cost. Since the bank has a monopoly position, it can extract rents from the firm. The bank is also in a position to dictate whether or not it will underwrite the firm, as it can alternatively continue to fund loans to the firm. At time $t = 0$, firms know their type, whether it is Type G or Type B, and must choose whether to stay with the commercial bank or go to the investment house. The firm's alternative is to go to an investment house that will underwrite the firm's securities.

The price the firm gets for its securities depends on its available alternatives, particularly the certification standards of the investment house. For computational simplicity, I assume there is an equal probability that a firm will be underwritten at time $t = 1$ or time $t = 2$ since the underwriter randomly picks a firm in both periods. The delay in underwriting a specific firm can be explained by a variety of factors, such as procedural delays, or constraints on the number of firms that can be underwritten at a given time. In equilibrium, the commercial bank will extract the maximum possible rents, ϕ. The higher the prices the bank can get, the more valuable its private information becomes, and hence the higher the potential rent extraction from the firm. The rent extraction explains why firms may choose to pay underwriting costs to convert from private to public securities. This result is consistent with related arguments made by Diamond (1991), Dinc (1997), Fama (1985), and Rajan (1998).

A sufficient condition for the coexistence of commercial banks and investment houses is that the level of rent extraction and the relative underwriting fees adjust so that firms are indifferent between going to commercial banks or investment houses. I examine two possible equilibria to illustrate circumstances in which this condition occurs.

Proposition 4. *The following are sufficient conditions for banks and investment houses to coexist in the sequential equilibria given below*:

(i) *Equilibrium where both intermediaries have high reputation and high certification standards* ($s_1 = 1,\ s_2 = 0,\ g_1 = 1,\ g_2 = 0$):

$$h_1 = 1 - \frac{V(\tau_2^G)(1-\gamma)}{V(\lambda_2^G)} \quad \textit{and} \quad \phi_1 = \frac{1-e}{2}(2 - \gamma - (1-h_1)(1 + V(\lambda_2^G))).$$

(ii) *Equilibrium where the commercial bank has high reputation and high certification standards, investment house has no reputation and low certification standards* ($\lambda_1 = 0,\ s_1 = 0,\ s_2 = 0,\ g_1 = 1,\ g_2 = 0$):

$$h_2 = 1 - \frac{V(\tau_2^G)(1-\gamma)}{\alpha} \quad \textit{and} \quad \phi_2 = \frac{1-e}{2}(2 - \gamma - 2\alpha(1-h_2)),\ \textit{with}\ h_2 < h_1.$$

For (i) *and* (ii) *respectively*, h_1 *and* h_2 *are the investment house underwriting fees, and* ϕ_1 *and* ϕ_2 *are the rent extraction by the commercial bank.*

The proof for Proposition 4 can be found in Appendix B. The specification of investor beliefs is given in Appendix A. Commercial banks will extract the maximum possible rents, ϕ, to the point that the Type G type firms are indifferent between going to the commercial bank or the investment house. Type B firms will also be indifferent between going to either intermediary if the relative underwriting fees, h, adjust so that the net gains to the firm in either scenario is equal. I assume that underwriting fees for the commercial bank, γ, are exogenously determined. The underwriting fees for the investment house, h, are then found as a function of γ and other parameters. In such circumstances the commercial bank and the investment house will have both Type G and Type B firms approaching them for underwriting and the two intermediaries will co-exist.

One of the implications of the above proposition is that, when investment houses have low certification standards relative to commerical banks, they will also charge lower fees (e.g., $h_2 < \gamma$ when $\gamma < 1$ and $V(\tau_2^G) > \alpha$). Note that when investment houses reduce their underwriting fees, this action also reduces the rent extraction by banks. Banks' rent extraction is limited by the net payoff that firms can get by going to alternative underwriters. The amount of bank rents will depend on the price that the firm will receive, net of underwriting fees from going to alternative underwriters.

A concern about universal banking is that if banks, possessing full knowledge of their clientele and superior information about firms to which they lend, enter the market, specialized investment houses will be driven out. However, as we have seen, both can coexist in equilibrium. From a regulatory viewpoint, this conclusion means that circumstances exist such that free entry by commercial banks as underwriters will not result in other more specialized financial institutions being crowded out.

6. Lending and underwriting in an infinite horizon model

The model and the conclusions obtained so far are obtained using a finite horizon. This setting raises the question of whether similar results would occur in an infinite horizon model or whether these results are being driven by the idiosyncracies of a finite horizon model. To address this question, I now consider an infinite time horizon in which I examine the underwriting behavior of investment houses and commercial banks.

As in the finite horizon model, assume the investment house has investigative costs of c. I show an equilibrium exists such that, if the investment house has costs lower than a certain cutoff point it will always investigate, and if costs are higher than a certain point, it does not investigate.

Similarly, for the commercial bank, assume bad debt outstanding of amount D. The amount of outstanding bad debt can be thought of as a function of the bank's ability. The initial loan that a bank makes to a firm, and the potential losses associated with this loan are a function of this ability. I show an equilibrium exists such that, if the bank has bad debt outstanding below a certain cutoff point, it would always underwrite a good firm. If the bank has bad debt outstanding greater than a certain cutoff point, it would underwrite a bad firm.

The basic results obtained in the finite horizon model will continue to hold. In particular, commercial banks or investment houses can fetch higher prices in equilibrium. The exact price for underwritten securities will depend on the level of investigative costs for the investment house, and on the amount of bad debt outstanding for the commercial bank. The results on the effects of debt versus equity and comparative statics regarding the effect of underwriting fees and the discount rate, are also similar.

An equilibrium of the infinite horizon model is briefly formalized along these lines below. The symbols c and D are as defined above, and the other notation used is similar to that used in the finite horizon model. Thus, α stands for the unconditional probability that the firm is good, and δ is the discount factor by which the next period's profits are discounted to the present. k stands for underwriting fees. Unlike the finite horizon model, a multiplicity of equilibria are possible. Hence, an equilibrium selection criterion is required. I use Pareto dominance for this purpose.

Proposition 5.
(i) *The investment house will always investigate if* $c < [\delta k(1-\alpha)^2]/(1-\alpha\delta)$. *It will not investigate if* $c > [\delta k(1-\alpha)^2]/(1-\alpha\delta)$.
(ii) *The commercial bank will always underwrite a good firm if* $D < [\delta/(1-\delta)]k$. *It will underwrite a bad firm if* $D > [\delta/(1-\delta)]k$.

The above proposition shows that when investigative costs are below a certain cutoff point, the investment house always investigates. Clearly, when costs are very high it will not be profitable for the investment house to investigate. The commercial bank faces a similar situation. When the level of bad debt outstanding is below a certain cutoff point, it always underwrites a good firm. If the commercial bank has bad debt outstanding greater than this cutoff then the bank will underwrite a bad firm. The proof of Proposition 5 can be found in Appendix B.

The outcome for the prices obtained for underwritten securities would thus depend on the level of investigative costs of the investment house, and the amount of bad loans outstanding for the bank. When the level of investigative costs is high, and the bank has a small amount of bad debt outstanding, then the bank will fetch higher prices in equilibrium than the investment house. Conversely, when the bank has a large amount of bad debt outstanding, and the investment house's costs of investigation are low, then the investment house will fetch higher prices than the commercial bank.

It can also be shown that the effect of debt and equity holdings and other comparative statics, such as the effect of underwriting fees, and the discount factor, are similar to that obtained in the finite horizon model in Proposition 1A and 1B. In the context of the infinite horizon model, by reworking the proofs with equity instead of debt, it can be shown that if the bank holds equity instead of debt it is more likely to underwrite a bad firm. It can be shown for similar levels of debt and equity, the condition for a one period deviation from always underwriting a Type G firm is less stringent for equity as compared to debt. Thus equity holdings hurt the credibility of the bank more than debt holdings. The other comparative statics that obtain are for the investment house, the equilibrium state of always investigating firms is more likely the higher the underwriting fees, and the less the future payoffs are discounted. This result can be proven by taking partial derivatives of the right-hand side (RHS) of the inequality of $c < [\delta k(1-\alpha)^2]/(1-\alpha\delta)$. The RHS increases with underwriting fees, and with the discount factor. Thus, for a given level of c, the cost of investigating, the equilibrium state for investment houses to always investigate is more likely as underwriting fees increase, and as future payoffs are discounted less. In a similar fashion, it can be shown that for the commercial bank, the equilibrium of underwriting a good firm is more likely the higher the underwriting fees, and the less the future payoffs are discounted.

7. Conclusions

One of the primary roles of financial intermediaries is to help certify the true value of firm securities they underwrite. However, if an intermediary holds financial claims in the firm prior to the issue of the new securities, as a commercial bank with outstanding loans to the firm might hold, this setting can affect underwriting behavior. This paper addresses several interesting questions relating to how the entry of banks into the securities market affects underwriting activities. First, the paper identifies how prior financial claims held by the commercial bank affects its underwriting behavior. I compare and contrast the underwriting behavior of banks with underwriting behavior investment houses, and derive implications for pricing. Second, the paper analyzes whether the kind of financial claim held by the bank, either debt or equity, affects the ability of the bank to certify securities, and the prices of securities that it underwrites. Finally, the paper addresses whether the prior financial claims held by banks gives them access to superior information about firms, and whether this informational advantage will allow banks to drive specialized investment houses from the market.

The model shows that the prior financial claims held by commercial banks can cause banks to obtain better prices for underwritten securities than investment houses, particularly when information collection costs are high. The magnitude and direction of this price differential is fairly intuitive. The paper helps provide a theoretical basis to ongoing work in both the banking and venture capital fields on how prior financial claims held by the intermediary, whether debt or equity, affect the pricing of securities being underwritten.

Apart from providing a theoretical basis for existing empirical evidence, the paper also has a number of new predictions that are potentially testable. For example, if banks obtain higher prices for securities that they underwrite, then banks may also charge higher underwriting fees from firms. This result is a subject of ongoing empirical investigation. Further, if banks have small toeholds of debt or equity claims in the issuing firm, their potential conflict of interest is lower, and they can fetch higher prices in equilibrium. This proposition is an interesting area for further research, and can be tested internationally in countries like Germany and France where banks are permitted to hold financial claims in firms whose securities they may underwrite.

The generally accepted view is that equity plays a positive role in enhancing the credibility of the bank. This result need not always be the case. By demonstrating that when the proceeds of the issue are used to liquidate bank claims, equity reduces the credibility of the bank more than debt, this paper also contributes to the literature on the implications of allowing banks to hold equity in firms.

The model shows that banks and investment houses can coexist in a given economy. Opponents of universal banking argue that allowing banks to enter the securities field will prevent specialized investment houses from serving the market. This paper demonstrates that even if banks underwrite securities for clientele for which they have full prior knowledge, specialized competition in the form of investment houses can still exist in the market. It thus provides a rationale for the observed coexistence of banks and investment houses, both in the pre-Glass–Steagall era in the U.S., and internationally in countries such as the U.K. and France.

Appendix A. Specification of investor beliefs

A.1. Investors' beliefs about the commercial bank and firm securities valuation

The value of the firm as assessed by investors before the bank underwriters at $t = 1$ is a function of the intermediary's ex-ante reputation, τ_1, and is given by

$$V(\tau_1) = \Pr[f = G|C = L]\Pr[C = L] + \Pr[f = G|C = H]\Pr[C = H]$$
$$= \tau_1 + (1 - \tau_1)g_1, \tag{A.1}$$

where g_1 is the probability with which the Type H bank underwrites a good firm, f stands for firm, and C stands for commercial bank. The Type L bank always underwrites a good firm with probability 1. At $t = 2$, before the bank underwrites a second time, the true valuation of the firm underwritten at $t = 1$ becomes common knowledge. Investors update their belief about the reputation of the bank based on their observation of the outcome of the first period underwriting. If the underwritten firm turns out to be good, the updated reputation value is

$$\tau_2^G = \frac{\Pr[f = G|C = L]\Pr[C = L]}{\Pr[f = G|C = L]\Pr[C = L] + \Pr[f = G|C = H]\Pr[C = H]}$$
$$= \frac{\tau_1}{\tau_1 + (1 - \tau_1)g_1}. \tag{A.2}$$

The updated reputation value τ_2^S, $S \in \{G, B\}$ is used by investors to assess the value of underwritten securities at $t = 2$. Thus if the firm underwritten at $t = 1$ is revealed to be good, then the value of the firm underwritten at $t = 2$ is assessed to be

$$V(\tau_2^G) = \Pr[f = G|C = L]\Pr[C = L] + \Pr[f = G|C = H]\Pr[C = H]$$
$$= \tau_2^G + (1 - \tau_2^G)g_2. \tag{A.3}$$

If the underwritten firm turns out to be bad, the updated reputation value is

$$\tau_2^B = \frac{\Pr[f = B|C = L]\Pr[C = L]}{(\Pr[f = B|C = L]\Pr[C = L] + \Pr[f = B|C = H]\Pr[C = H])}$$
$$= 0. \tag{A.4}$$

Consequently, the value of the firm underwritten at $t = 2$ is assessed to be

$$V(\tau_2^B) = \tau_2^B + (1 - \tau_2^B)g_2 = 0. \tag{A.5}$$

A.2. Investors' beliefs about the investment house and firm securities valuation

The value of the firm, as assessed by investors before the investment house underwrites at time $t = 1$, is a function of the intermediary's ex-ante reputation, λ_1. Even if the investment house does not investigate, there is probability, α, that the underwritten firm is good, and that the valuation of the firm reflects this. The value of the firm as assessed by investors at $t = 1$ is

$$V(\lambda_1) = \Pr[f = G|I = L]\Pr[I = L] + \Pr[f = G|I = H]\Pr[I = H]$$
$$= \lambda_1 + (1 - \lambda_1)\frac{\alpha}{(\alpha + (1 - s_1)(1 - \alpha))}, \tag{A.6}$$

where s_1 is the probability with which the Type H investment house investigates, f stands for firm, and I stands for investment house. The Type L investment house always investigates with probability 1. At $t = 2$, before the investment house underwrites a second time, the true valuation of the firm underwritten at $t = 1$ becomes common knowledge. Investors update their belief about the reputation of the investment house based on their observation of the outcome of the first period underwriting. If the underwritten firm turns out to be good, the updated reputation value is

$$\lambda_2^G = \frac{\Pr[f = G|I = L]\Pr[I = L]}{\Pr[f = G|I = L]\Pr[I = L] + \Pr[f = G|I = H]\Pr[I = H]}$$
$$= \frac{\lambda_1}{\lambda_1 + (1 - \lambda_1)\alpha/(\alpha + (1 - s_1)(1 - \alpha))}. \tag{A.7}$$

The updated reputation value λ_2^S, $S \in \{G, B\}$ is used by investors to assess the value of underwritten securities at $t = 2$. Thus, if the firm underwritten at $t = 1$ is revealed to be good, then the value of the firm underwritten at $t = 2$ is assessed to be

$$V(\lambda_2^G) = \Pr[f = G|I = L]\Pr[I = L] + \Pr[f = G|I = H]\Pr[I = H]$$

$$= \lambda_2^G + (1 - \lambda_2^G)\frac{\alpha}{\alpha + (1 - s_2)(1 - \alpha)}. \tag{A.8}$$

If the underwritten firm turns out to be bad, the updated reputation value is

$$\lambda_2^B = \frac{\Pr[f = B|I = L]\Pr[I = L]}{(\Pr[f = B|I = L]\Pr[I = L] + \Pr[f = B|I = H]\Pr[I = H])}$$

$$= 0. \tag{A.9}$$

Consequently, the value of the firm underwritten at $t = 2$ is assessed to be

$$V(\lambda_2^B) = \Pr[f = G|I = L]\Pr[I = L] + \Pr[f = G|I = H]\Pr[I = H]$$

$$= \lambda_2^B + (1 - \lambda_2^B)\frac{\alpha}{\alpha + (1 - s_2)(1 - \alpha)} = \alpha. \tag{A.10}$$

Appendix B. Proofs of propositions

B.1. Proof of Proposition 1A

A(i) I first establish that the given equilibrium is a sequential equilibrium, and then establish that it is unique.

A strategy profile and a system of beliefs is a sequential equilibrium of the game if the following conditions are satisfied: (a) consistency of beliefs, and (b) sequential rationality.

(a) *Consistency of beliefs*: Along the equilibrium path, beliefs are defined by Bayes' rule, and are therefore consistent. To check that off-equilibrium beliefs are consistent, we need to check the events which have zero probability. The only such event when $g_1 = 1$ is when a bad firm is underwritten. When a bad firm is underwritten, the investors put probability 1 on the bank being Type H. It follows that if an out-of-equilibrium action of a bad firm being underwritten occurs, $\tau_2^B = 0$ is trivially consistent.

(b) *Sequential rationality*: Sequential rationality requires that, at any information set, players choose strategies that are best responses given their beliefs for the remainder of the game. At $t = 2$, future profits do not depend on the bank's strategy, so the Type H bank will maximize its immediate profits by underwriting a bad firm, so $g_2 = 0$.

At $t = 1$, the bank will be indifferent between underwriting a good or bad firm if and only if the profit it obtains from underwriting either kind of firm is equal.

Equating Eqs. (1) and (2) and solving for g_1, yields $g_1 = [\tau_1((1-\delta)(D+(1-D)e) - \delta(1-e)\gamma)]/[(-1+\tau_1)(D(1-\delta)(1-e)+e)]$. For $0 < \tau_1 < [e + D(1-e)(1-\delta)]/[\delta(e+(1-e)\gamma)] < 1$, $0 < g_1 < 1$.

The uniqueness of g_1 is established by showing that there does not exist a pure strategy sequential equilibrium if $0 < \tau_1 < [e + D(1-e)(1-\delta)]/[\delta(e+(1-e)\gamma)] < 1$.

Suppose that underwriting a good firm is an equilibrium strategy for a Type H bank. The total profit from underwriting a good firm at $t = 1$ is

$$\gamma V(\tau_1) + \text{Max}[V(\tau_1)(1-\gamma) - D, 0]e + \text{Min}[V(\tau_1)(1-\gamma), D] + \delta(\gamma V(\tau_2^G) + \text{Max}[(1-\gamma)V(\tau_2^G) - D, 0]e + \text{Min}[(1-\gamma)V(\tau_2^G), D]). \tag{A.11}$$

A Type H bank that deviates and underwrites a bad firm at $t = 1$ makes a profit of

$$\gamma V(\tau_1) + \text{Max}[V(\tau_1)(1-\gamma) - D, 0]e + \text{Min}[V(\tau_1)(1-\gamma), D] + D + (1-D)e. \tag{A.12}$$

The difference in profits is $D + (1-D)e$, made at $t = 1$, by the bank retaining its stake in the good firm and underwriting a bad firm, as compared to $\delta(\gamma V(\tau_2^G) + \text{Max}[(1-\gamma)V(\tau_2^G) - D, 0]e + \text{Min}[(1-\gamma)V(\tau_2^G), D])$, derived by not deviating. The bank will deviate if $\tau_1 < [e + D(1-e)(1-\delta)]/[\delta(e+(1-e)\gamma)]$. In such a case, underwriting a good firm is not an equilibrium strategy.

Similarly, it can be shown that always underwriting a bad firm is not an equilibrium strategy, and that a deviation is always optimal so long as $e + D(1-e)(1-\delta) < \delta(e+(1-e)\gamma)$. This result is subsumed in the condition $0 < \tau_1 < [e + D(1-e)(1-\delta)]/[\delta(e+(1-e)\gamma)] < 1$.

Consequently, if an equilibrium exists, it must be the case that the Type H bank plays a mixed strategy, which is $g_1 = [\tau_1((1-\delta)(D+(1-D)e) - \delta(1-e)\gamma)]/[(-1+\tau_1)(D(1-\delta)(1-e)+e)]$. From the above, g_1 is therefore unique.

A(ii) The proof for consistency of beliefs follows the proof given in A(i).

Below, I show that the pure strategy $g_1 = 1$ is a sequential equilibrium at $t = 1$ if $1 > \tau_1 > [e + D(1-e)(1-\delta)]/[\delta(e+(1-e)\gamma)]$. The probability that the bank is of Type H is τ_1 at $t = 1$, and also at $t = 2$ if it underwrites a good firm. The probability that the bank is of Type H at $t = 2$ is zero if it has underwritten a bad firm at $t = 1$. Given these beliefs, a bank that has underwritten a good firm at $t = 1$ gets a profit of

$$\gamma V(\tau_1) + \text{Max}[V(\tau_1)(1-\gamma) - D, 0]e + \text{Min}[V(\tau_1)(1-\gamma), D] + \delta(\gamma V(\tau_2^G) + \text{Max}[(1-\gamma)V(\tau_2^G) - D, 0]e + \text{Min}[(1-\gamma)V(\tau_2^G), D]). \tag{A.13}$$

A bank that underwrites a bad firm in the first period makes a profit of

$$\gamma V(\tau_1) + \text{Max}[(V(\tau_1)(1-\gamma) - D, 0]e + \text{Min}[V(\tau_1)(1-\gamma), D] + D + (1-D)e. \tag{A.14}$$

The profits from underwriting a good firm is higher than that obtained from underwriting a bad firm if and only if $\tau_1 > [e + D(1-e)(1-\delta)]/[\delta(e + (1-e)\gamma)]$. Hence, underwriting a good firm at $t = 1$ is an equilibrium strategy for the bank.

In general, when $\tau_1 > [e + D(1-e)(1-\delta)]/[\delta(e + (1-e)\gamma)]$, it is optimal for the bank to underwrite a good firm, irrespective of investor beliefs about its action. This implies that the above equilibrium is unique.

A(iii) When $\tau_1 = 0$, the future profits at $t = 2$ do not depend on strategies chosen at $t = 1$. Hence, the bank will behave as in the endgame situation, and underwrite a bad firm at $t = 1$. Alternatively, if τ_1 is positive, and $e + D(1-e)(1-\delta) > \delta(e + (1-e)\gamma)$, it will always be optimal for the bank to underwrite a bad firm. In general, when this condition holds, it is optimal for the bank to underwrite a bad firm, as the profit from underwriting the bad firm exceeds the profit from underwriting the good firm, irrespective of investor beliefs about its action. This implies that the above equilibrium is unique.

B.2. Proof of Proposition 1B

B(i)(a) *Consistency of beliefs*: Along the equilibrium path, beliefs are defined by Bayes' rule, and are therefore consistent. To check that off-equilibrium beliefs are consistent, we need to check events with zero probability. The only event with zero probability when $s_1 = 1$ is that a bad firm is underwritten. When a bad firm is underwritten, the investors put probability 1 on the bank being Type H. It follows that, if an out-of-equilibrium action of a bad firm being underwritten occurs, $\lambda_2^B = 0$ is trivially consistent.

(b) *Sequential rationality*: Sequential rationality requires that, at any information set, players choose strategies that are best responses given their beliefs for the remainder of the game. At $t = 2$, future profits do not depend on the investment house's strategy, so the Type H investment house will maximize its immediate profit by not investigating, hence $s_2 = 0$.

At $t = 1$, the investment house will be indifferent between investigating or not investigating the firm if and only if the profit it obtains from these two options are equal. Setting Eq. (3) equal to Eq. (4) and solving for s_1 yields $s_1 = [1 + (c(1-\lambda_1)\alpha/\lambda_1(c - \delta h(1-\alpha)^2))]/[1-\alpha]$. So long as $0 < \lambda_1 < c/[\delta h(-1+\alpha)^2] < 1$, $0 < s_1 < 1$.

The uniqueness of s_1 is established by showing that there does not exist a pure strategy equilibrium if $0 < \lambda_1 < c/[\delta h(-1+\alpha)^2] < 1$. The proof follows A(i).

B(ii) The proof for consistency of beliefs follows the proof given in B(i).

Below I show that the pure strategy $s_1 = 1$ is a sequential equilibrium at $t = 1$ if $1 > \lambda_1 > c/\delta h(-1+\alpha)^2$. If the investment house investigates at $t = 1$, then its profits are

$$hV(\lambda_2) - c + \delta h V(\lambda_2^G). \tag{A.15}$$

If the investment house does not investigate at $t = 1$, then its profits are

$$hV(\lambda_2) + \delta h((1-\alpha)V(\lambda_2^B) + \alpha V(\lambda_2^G)). \tag{A.16}$$

The profit if it investigates is higher than the profit if it does not investigate only if $\lambda_1 > c/[\delta h(-1+\alpha)^2]$. In general, when this condition holds, it is optimal for the investment house to investigate, irrespective of investor beliefs about its action. This implies that the above equilibrium is unique.

B(iii) When $\lambda_1 = 0$, the future profits at $t = 2$ do not depend on strategies chosen at $t = 1$. Hence, the investment house will behave as in the endgame situation, and not investigate the firm at $t = 1$. When $0 < \lambda_1 < c\alpha/[(\alpha - 1)(c - \delta h(1-\alpha))]$, even if the investment house plays a positive mixed strategy, it cannot improve its profits over not investigating the firm. Therefore, even in this situation it will not investigate the firm at $t = 1$. Alternatively, when $c > \delta h(-1+\alpha)^2$, it is optimal for the investment house to not investigate the firm at $t = 1$. In general, when this condition holds, it is optimal for the investment house to not investigate, irrespective of investor beliefs about its action. This implies the above equilibrium is unique.

To obtain the expected price of the firm's security, in Propositions 1.A and 1.B, substitute the equilibrium strategies into the equations determining the valuation of underwritten securities for the bank and investment house. Once g_1 and s_1 are uniquely determined, $V(\tau_1)$ and $V(\lambda_1)$ are also uniquely determined.

Proof of Proposition 2

(i) In the mixed strategy equilibrium, when the bank holds both debt and equity, taking first derivatives of g_1 with respect to D and e shows that, for equivalent amounts of debt and equity, an increase in equity has a larger negative impact on g_1 as compared to an increase in debt.

(ii) The proof for Proposition 2, part (ii), has two parts. I examine the effects of the parameters in determining which equilibrium holds, and, within the equilibrium, how they affect prices. To determine the first part, I examine the impact of a change in parameters on τ_1 and λ_1. To examine the second part, I examine the impact of parameter changes on prices, $V(\tau_1)$ and $V(\lambda_1)$, when the mixed strategy equilibrium holds.

(a) When $1 > \tau_1 > [e + D(1-e)(1-\delta)]/[\delta(e + (1-e)\gamma)]$, $g_1 = 1$. Taking the first derivatives of the RHS of this inequality shows that the RHS increases with D and e, and decreases with γ and δ. Hence, τ_1 is more likely to be greater than the RHS, for lower values of D, e and for higher values of γ and δ. As τ_1 increases, the likelihood of g_1 being equal to one increases.

(b) Taking the first derivatives of g_1, in the mixed strategy equilibrium, when $\tau_1 < [e + D(1-e)(1-\delta)]/[\delta(e + (1-e)\gamma)] < 1$, shows that g_1 decreases in D, and e, and increases in δ and γ.

From (a) and (b) it is apparent that underwriting a good firm is more likely for lower values of D and e, and for higher values of δ and γ. An increase in g_1 leads to an increase in $V(\tau_1)$, or the price of the firm's securities.

Similarly for the Type H investment house:

(1) When $\lambda_1 > c/[\delta h(-1+\alpha)^2]$, $s_1 = 1$. Taking first derivatives of the RHS of this inequality shows that the RHS decreases with h, and δ, and increases with c. Hence, λ_1 is more likely to be greater than the RHS for lower values of c, and for higher values of δ and h. As λ_1 increases, the likelihood of s_1 being equal to one increases.

(2) Taking the first derivatives of s_1, in the mixed strategy equilibrium, when $\lambda_1 < c/[\delta h(-1+\alpha)^2]$, shows that s_1 decreases in c, and increases in δ and h.

From (1) and (2) it is apparent that investigating the firm is more likely for lower values of c, and for higher values of δ and h. An increase in s_1 leads to an increase in $V(\lambda_1)$, or the price of the firm's securities.

Proof of Proposition 3

For simplicity, we assume that $e = 0$, and that at $t = -1$, when the firm's type is unknown to all except the firm itself, banks place a probability of α of firms being good. Under risk-neutral pricing, with the riskless rate being zero, the firm will obtain a loan of αD from the bank, for which the promised payment is D.

(i) Investment house has high reputation: For the Type G firm the profit from going to public markets at $t = -1$ is $\alpha(1-h)$. Since the firm type is not verifiable, the firm gets the unconditional average value, α, less the underwriting fees.

For the Type G firm, the profit from going to banks first, and then to public markets (assuming an equal probability of being underwritten at $t = 1$ or $t = 2$), is

$$0.5(1-h)(1+V(\lambda_2^G)) - D(1-\alpha). \tag{A.17}$$

Comparing the expected profit in the two scenarios, the firm will prefer to go to banks first and then to public markets if

$$(1-h)\left(\frac{1+V(\lambda_2^G)}{2} - \alpha\right) > D(1-\alpha). \tag{A.18}$$

(ii) and (iii) The mode of proof follows (i).

Proof of Proposition 4

Assume an equal probability that the firm is picked up for underwriting by the intermediary at $t = 1$ or $t = 2$.

(i) For the Type G firm, the profit from going to the commercial bank is

$$0.5(1-e)(V(\tau_1)(1-\gamma)-D+(1-D))-\phi_1. \quad (A.19)$$

The profit for this firm from going to the investment house is

$$0.5(1-e)(V(\lambda_1)(1-h_1)-D+V(\lambda_2^G)(1-h_1)-D), \quad (A.20)$$

where h_1 is the underwriting fees in equilibrium (i). Note that when $g_1=1$, $V(\tau_1)=1$, and that when $s_1=1$, $V(\lambda_1)=1$.

The equilibrium level of rent extraction is the maximum possible rent ϕ that the bank can extract that leaves the Type G firm indifferent between going to the commercial bank or to the investment house. Setting the above two equations equal yields

$$\phi_1=\frac{1-e}{2}(2-\gamma-(1-h_1)(1+V(\lambda_2^G))). \quad (A.21)$$

Consider now the decision of the Type B firm. Equate its profit, if it goes to the bank with its profit if it goes to the investment house to obtain the equilibrium level of relative underwriting fees that will make the Type B firm indifferent between going to the commercial bank and going to the investment house. This yields

$$h_1=1-\frac{V(\tau_2^G)(1-\gamma)}{V(\lambda_2^G)}. \quad (A.22)$$

(ii) The mode of proof follows (i). $V(\lambda_2^G)>\alpha$, hence $h_2<h_1$.

Proof of Proposition 5

For the investment house, its profits, if it always investigates, are

$$\sum_{t=0}^{\infty}\delta^t(k\tilde{V}-c)=\frac{1}{1-\delta}(k-c). \quad (A.23)$$

In equilibrium, investors' beliefs that the investment house always investigates are justified, so that $\tilde{V}=1$. The equilibrium strategy for the investment house to always investigate is sustainable only if a one-period deviation is not optimal. If there is no one-period deviation that is profitable, then no finite number of deviations that are profitable exist.

A one-period deviation will be optimal if

$$k+(1-\alpha)\sum_{t=1}^{\infty}\delta^t k\alpha+\alpha\sum_{t=1}^{\infty}\delta^t(k-c)>\frac{1}{1-\delta}(k-c)\Leftrightarrow c>\frac{\delta k(1-\alpha)^2}{1-\alpha\delta}. \quad (A.24)$$

Profits from adopting a strategy of never investigating are

$$\sum_{t=0}^{\infty} \delta^t k\alpha = \frac{1}{1-\delta}k\alpha. \tag{A.25}$$

The equilibrium strategy to never investigate is trivially sustainable. If investors believe that the investment house will never investigate, then they will pay only α for the securities. It does not pay for the investment house to deviate from this equilibrium.

Profits from adopting the strategy to always investigate will exceed those from never investigating if $c < k(1-\alpha)$. This condition is subsumed in the condition $c < \delta k(1-\alpha)^2/(1-\alpha\delta)$. When $c < \delta k(1-\alpha)^2/(1-\alpha\delta)$, the equilibrium strategy of always investigate is Pareto dominant over the equilibrium strategy of not investigating. The equilibrium strategy to always investigate results in higher profits for the investment house and the investors get the true, full value of the security. When $c > \delta k(1-\alpha)^2/(1-\alpha\delta)$, the investment house does not investigate.

Similarly, for a commercial bank, the profit from always underwriting a good firm is

$$\sum_{t=0}^{\infty} \delta^t k\tilde{V} = \frac{1}{1-\delta}k. \tag{A.26}$$

A one-period deviation in which the bank underwrites a bad firm is optimal if

$$k\tilde{V} + D > \frac{1}{1-\delta}k \Leftrightarrow D > \frac{\delta}{1-\delta}k. \tag{A.27}$$

The equilibrium of always underwriting a bad firm is trivially sustainable if investors believe that the bank will always underwrite a bad firm. When $D < [\delta/(1-\delta)]k$ the equilibrium of underwriting a good firm is Pareto dominant over the equilibrium of underwriting a bad firm, since the bank makes higher profits and investors are no worse off.

References

Allen, F., Winton, A., 1995. Corporate financial structure, incentives and optimal contracting. In Jarrow, R.A., Maksimovie, V., Ziemba, W.T. (Ed.), Handbooks in Operations Research and Management Science, Volume 9: Finance, North Holland, New York.

Ang, J.S., Richardson, T., 1994. The underwriting experiences of commercial bank affiliates prior to the Glass–Steagall Act: a re-examination of evidence for Passage of the Act. Journal of Banking and Finance 18 (2), 351–396.

Barry, C.B., Muscarella, C.J., Peavy, J.W., Vetsuypens, M.R., 1990. The role of venture capital in the creation of public companies: evidence from the going-public process. Journal of Financial Economics 27, 447–471.

Benston, G.J., 1990. The Separation of Commercial and Investment Banking. Oxford University Press, Oxford.

Benston, G.J., 1994. Universal banking. Journal of Economic Perspectives 8 (3), 121–143.

Ber, H., Yafeh, Y., Yosha, O., 1997. Conflict of interest in universal banking: evidence from the post issue performance of IPO firms. Unpublished working paper. Tel Aviv University, Tel Aviv, Israel.

Berlin, M., John, K., Saunders, A., 1996. Bank equity stakes in borrowing firms and financial distress. Review of Financial Studies 9 (3), 889–920.

Boot, A.W.A., Thakor, A.V., 1997aa. Banking scope and financial innovation. Review of Financial Studies 10 (4), 1099–1131.

Boot, A.W.A., Thakor, A.V., 1997bb. Financial system architecture. Review of Financial Studies 10 (3), 693–733.

Chemmanur, T., Fulghieri, P., 1994. Investment house reputation, information production and financial intermediation. Journal of Finance 49, 57–79.

Diamond, D., 1991. Monitoring and reputation: the choice between bank loans and directly placed debt. Journal of Political Economy 99, 689–721.

Dinc, S., 1997. Bank reputation, bank commitment and the effects of competition in credit markets. Unpublished working paper. Stanford University, Stanford, CA.

Fama, E., 1985. What's different about banks? Journal of Monetary Economics 15, 5–29.

Fudenberg, D., Tirole, J., 1991. Perfect Bayesian equilibrium and sequential equilibrium. Journal of Economic Theory 53, 236–260.

Gande, A., Puri, M., Saunders, A., 1999. Bank entry, competition and the market for corporate securities underwriting. Journal of Financial Economics 54, 165–195.

Gande, A., Puri, M., Saunders, A., Walter, I., 1997. Bank underwriting of debt securities: modern evidence. Review of Financial Studies 10 (4), 1175–1202.

Gompers, P., Lerner, J., 1998. Reputation and conflict of interest in the issuance of public securities: evidence from venture capital. Unpublished working paper. Harvard University, Boston, MA.

Gorton, G., Schmid, F.A., 1994. Universal banking and the performance of German firms. Unpublished working paper. University of Pennsylvania, Philadelphia, PA.

Hamao, Y., Hoshi, T., 1997. Banks underwriting of corporate bonds: evidence from Japan after 1994. Unpublished working paper. University of Southern California, Los Angeles, CA.

Hamao, Y., Packer, P., Ritter, J., 1998. Institutional affiliation and the role of venture capital: evidence from initial public offerings in Japan. Unpublished working paper. University of Florida, Gainseville, Fl.

James, C., 1987. Some evidence on the uniqueness of bank loans. Journal of Financial Economics 19, 217–235.

James, C., 1995. When do banks take equity in debt restructurings? Review of Financial Studies 8 (4), 1209–1234.

James, C., Weir, P., 1990. Borrowing relationships, intermediation and the cost of issuing public securities. Journal of Financial Economics 28, 149–171.

John, K., Nachman, D., 1985. Risky debt, investment incentives and reputation in a sequential equilibrium. Journal of Finance 37, 863–880.

Kanatas, G., Qi, J., 1998. Underwriting by commercial banks: incentive conflicts, scope economics, and project quality. Journal of Money, Credit and Banking 30 (1), 119–133.

Kreps, D.M., Wilson, R., 1982aa. Reputation and imperfect information. Journal of Economic Theory 27, 253–279.

Kreps, D.M., Wilson, R., 1982bb. Sequential equilibrium. Econometrica 50, 443–459.

Kroszner, R.S., Rajan, R.G., 1994. Is the Glass–Steagall Act justified? A Study of the U.S. experience with universal banking before 1933. American Economic Review 84(4), 810–832.

Leland, E., Pyle, D.H., 1977. Informational asymmetries, financial structure, and financial intermediation. Journal of Finance 32 (2), 371–387.

Lummer, S.L., McConnell, J.J., 1989. Further evidence on the bank lending process and the capital-market response to bank loan agreements. Journal of Financial Economics 25, 99–122.
Maksimovic, V., Titman, S., 1991. Financial policy and reputation for product quality. Review of Financial Studies 4, 175–200.
Megginson, W.L., Weiss, K., 1991. Venture capital certification in initial public offerings. Journal of Finance 46, 879–903.
Milgrom, P., Roberts, J., 1982. Predation, reputation and entry deterrence. Journal of Economic Theory 27, 280–312.
Packer, F., 1996. Venture capital, bank shareholding, and IPO underpricing in Japan. In: Levis, M. (Ed.), Empirical Issues in Raising Capital. North-Holland, Amsterdam, pp. 191–214.
Puri, M., 1994. The long-term default performance of bank underwritten security issues. Journal of Banking and Finance 18 (2), 397–418.
Puri, M., 1996. Commercial banks in investment banking: conflict of interest or certification role?. Journal of Financial Economics 40, 373–401.
Rajan, R.G., 1998. An investigation into the economics of extending bank powers. Unpublished working paper. University of Chicago, Chicago, Il.
Saunders, A., 1985. Conflicts of interest: an economic view. In: Walter, I. (Ed.), Deregulating Wall Street. Wiley, New York, pp. 207–230.
Saunders, A., Walter, I., 1994. Universal Banking in the United States. Oxford University Press, New York.
Smith, C.W., 1986. Investment banking and the capital acquisition process. Journal of Financial Economics 15, 3–29.
Ursel, N., Ljucovic, P., 1998. The impact of bank ownership of underwriters on the underpricing of initial public offerings. Canadian Journal of Administrative Science 15 (1), 17–27.