

Cross-Selling Lending and Underwriting: Scope Economies and Incentives*

CHRISTIAN LAUX¹ and UWE WALZ²

¹Goethe-University Frankfurt am Main, Center for Financial Studies (CFS) and European Corporate Governance Institute (ECGI); ²Goethe-University Frankfurt am Main, and Center for Financial Studies (CFS)

Abstract. We highlight the implications of combining underwriting services and lending for the choice of underwriters and for competition in the underwriting business. We show that cross-selling can increase underwriters' incentives, and we explain three phenomena: first, that cross-selling is important for universal banks to enter the investment banking business; second, that cross-selling is particularly attractive for highly leveraged borrowers; third, that less-than-market rates are no prerequisite for cross-selling to benefit a bank's clients. In our model, cross-selling reduces rents in the underwriting business.

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“Perhaps it was not such a bright idea to offer credit to investment-banking clients at less-than-market rates—even though this has been a chief calling card over the past few years for those commercial banks that wanted to get into the juicy business of investment banking. After all, it is precisely the riskiest borrowers, those who have trouble borrowing elsewhere, that are most likely to take up aspiring investment banks on their offers of credit.” (The Economist, “Thanks a bundle,” August 24, 2002)

1. Introduction

For many years, the Glass-Steagall Act of 1933 prevented commercial banks from engaging in investment banking. But in the late 1980s the strict separation of the financial services industry in the United States was relaxed, and in 1999 it was finally repealed by the Gramm-Leach-Bliley Financial Modernization Act. This development was much anticipated by those commercial banks that were eager to enter the investment-banking business.

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Reports in the popular press, such as the *Economist*, suggest that the ability to combine both lending and investment-banking services (cross-selling or combined deals) is a main competitive weapon for universal banks and plays an important role in winning investment-banking clients. Indeed, lending to investment banking clients seems to be widespread in practice. For example, Drucker and Puri (2005) find that 20% of seasoned equity offerings in the first half of 2001 involved a loan from the underwriter to the issuer. However, it is less clear why debt is crucial for universal banks to enter the investment banking business. For example, making the firm an attractive offer by providing debt at a less-than-market rate cannot be the only benefit of debt as this could also be achieved by offering attractive terms on the underwriting contract. Also, if universal banks used their market power in the debt market to enter the underwriting business through cross-selling, it is unclear, why they would offer debt at a less-than-market rate.

Our aim in this paper is to examine the benefit of combining underwriting services and lending and its implications for the choice of underwriters and for competition in the underwriting business. We show that a potential benefit of cross-selling is that the debt that universal banks provide increases their underwriting incentives, which is beneficial in the presence of contracting problems in underwriting. The analysis is based on informational economies of scope in lending and underwriting, which are potentially very important in universal banking.

Informational economies of scope can lead directly to a potential cross-selling benefit if a firm needs debt and equity and the cost of monitoring or building a relation is lower when lending and underwriting are provided by the same financial institution at the same point in time (e.g., Kanatas and Qi, 1998; Drucker and Puri, 2005). However, informational economies of scope are also important if a firm needs bank credit after a failed attempt to issue securities and the universal bank uses its information advantage to lend to the firm at later stages at a lower cost. Kanatas and Qi (2003) show that this type of cost saving results in a rent for the universal bank after a failed underwriting issue and therefore reduces its incentives to exert underwriting effort. As a consequence, a firm may prefer a specialized investment bank.

We focus on this negative incentive effect of a universal bank's ability to provide credit after a failed equity issue and discuss the role of cross-selling, where the underwriter also provides initial debt together with the underwriting services. Cross-selling can be important for the universal bank even if there is no cost saving of combining initial debt and underwriting services and even if the initial debt in the combined deal is correctly priced on a stand-alone basis. The benefit of initial debt is that risky debt in combined deals increases effort incentives in underwriting. The incentives stem from the negative effect of a failure of underwriting on the value of the initial debt, which increases in the debt's risk.

Our analysis sheds light on two characteristics addressed in the *Economist*: first, that cross-selling is important for universal banks to enter the investment banking business; second, that cross-selling is attractive for risky borrowers. The use of the term “less-than-market rates” in the *Economist* quote seems to suggest that universal banks were willing to accept expected losses on the loans to enter the investment-banking business. However, we are not aware of any evidence that the loans in combined deals are or were indeed underpriced. Our paper shows that there are benefits to cross-selling even when debt is correctly priced on a stand-alone basis. Moreover, cross-selling may allow universal banks to offer debt at a lower rate than commercial banks without making expected losses if it is cheaper for a universal bank to offer both services, e.g., because of economies of scope between initial debt and underwriting services.

We provide a novel role for cross-selling above and beyond informational economies of scope: positive effects of cross-selling may not only stem from reduced costs of information, but also from higher underwriting incentives. However, cross-selling reduces the underwriter’s rent that stems from limitations of contracting as debt substitutes for monetary incentives. Therefore, cross-selling is a double-edged sword for universal banks. On the one hand, it helps them to compete against specialized investment banks and may be a prerequisite for entering the market. On the other hand, it reduces the rent to be earned in investment banking.

Our model’s predictions are consistent with the observation that debt in combined deals is often chosen by highly leveraged firms, which is confirmed by the empirical findings of Drucker and Puri (2005). Our model also predicts that universal banks that provide combined deals are most likely to be chosen by listed firms (SEOs) and by less innovative firms with few growth options.

We note that in our model, cross-selling is in the interest of clients. Indeed, in the main part of the paper, the universal bank can make two separate and unconditional offers for the initial debt and the underwriting service. If it is optimal for the firm to use a universal bank, it is optimal for the firm to obtain both offers from the universal bank. The reason is that debt is correctly priced on a stand-alone basis and the firm’s benefit of using a universal bank as underwriter stems from the additional underwriting incentives that combining debt and underwriting services provides. In our extension, where we consider, for example, economies of scope between initial debt and underwriting, the universal bank’s offer may be conditional on cross-selling. However, cross-selling is still in the interest of clients: rather than cross-selling being forced on them, firms demand it. Hence, combined deals in our setting do not violate the “anti-tying” provision of the Bank Holding Company Act, which prohibits a commercial bank from requiring, as a prerequisite to extending

credit, that a customer must purchase additional products or services from the bank.¹

There are many studies on the potential costs and benefits of universal banks compared to those of functionally separated investment and commercial banks. These studies also address the concern of potential conflicts of interest associated with universal banking, which was a primary justification for the Glass-Steagall Act of 1933. Of particular relevance from the perspective of our paper is that universal banks may have an incentive to use underwriting to rescue their shaky loans, and that they abuse their information advantage. However, the empirical evidence on underwriting and lending relations does not suggest that this potentially negative effect is detrimental for the firm-bank relation.

Many empirical studies for the pre-Glass-Steagall era find higher prices (Puri, 1996) and higher long-run performance (Kroszner and Rajan, 1994; Puri, 1994) for securities underwritten by banks that can provide both lending and underwriting than securities underwritten by specialized investment banks. Gande et al. (1997) and Schenone (2004) provide post-1990 evidence on higher prices obtained for securities underwritten by banks with an established lending relation with the issuer. This evidence is consistent with the assertion that firms choose a universal bank as underwriter when the positive effect of informational economies of scope dominates potential negative incentives.

For a theoretical discussion of the costs and benefits of universal banking see, for example, Benston (1990), Rajan (1996), Puri (1999), Boot and Thakor (1997), Kanatas and Qi (1998, 2003), and Ber et al. (2001). The notion that a loan can align the interests of a firm and a bank is also discussed by Hakenes (2004). In his model, the loan makes it credible for a bank (the risk manager) to acquire the information needed for risk management.

The paper proceeds as follows. In section 2 we outline the model. In section 3 we explore the differences between specialized investment banks and universal banks and present a benchmark case. We introduce cross-selling in section 4 and analyze its role in overcoming the incentive problems of universal banks. In section 5 we discuss additional benefits of cross-selling and how these benefits affect the choice of underwriter. In section 6 we derive the main empirical hypotheses that emerge from our theoretical analysis. In section 7 we summarize our results. All proofs are in the appendix.

¹ See BHCA (1970), Sec. 106(1), and Johnson (2002) for a discussion of the Bank Holding Company Act and cross-selling of credit and underwriting from a legal perspective.

2. The Model

We consider a firm in a risk-neutral economy. The firm has to raise capital to finance a new investment project. Intertwined with the investment project is a choice of strategy, which affects the project's expected cash flow and risk. The first-best strategy A is not contractible and allows the firm to switch to a riskier strategy C . Alternatively, the firm can choose strategy B , which is contractible.

For each strategy, the required initial investment is I and the project can either succeed or fail. In the case of failure, the payoff is $\underline{\pi}$. The strategies $s \in \{A, B, C\}$ differ in their success probability $q_s \in (0, 1)$ and payoff in the case of success $\bar{\pi}_s > \underline{\pi}$. The project's expected payoff given strategy s is $V_s \equiv \underline{\pi} + q_s(\bar{\pi}_s - \underline{\pi})$. The risk-free rate is normalized to zero. We make the following assumptions for the parameters of the different strategies:

1. $V_A > V_B > I > V_C$
2. $q_A > q_B > q_C$
3. $\bar{\pi}_C > \bar{\pi}_A > \bar{\pi}_B$

Strategies A and B have a positive net present value, but are mutually exclusive because they involve different strategies to enter a market or because of a limit to the firm's ability to simultaneously grow and invest in different business areas, e.g., due to a lack of talent and frictional cost of change in the organization.

Neither strategy A nor strategy C is contractible. In contrast, strategy B is contractible ex ante so that the firm can commit to implement strategy B . For example, the firm can start at a smaller scale or choose to invest in a different business field that involves less flexibility and where there are more tangible assets available.

Stage 1 financing: initial debt and equity to finance strategy A . Strategy A has the highest expected payoff, but the presence of strategy C creates a potential risk-shifting problem. If the firm does not commit to strategy B (in the debt contract), it has the flexibility to choose either strategy A or strategy C after it takes on the debt. For a given level of debt repayment obligation $D > \underline{\pi}$, the firm will choose strategy C rather than strategy A if $q_A(\bar{\pi}_A - D) < q_C(\bar{\pi}_C - D)$. Therefore, the maximum D for which the firm still chooses strategy A is given by

$$\hat{D} = (q_A \bar{\pi}_A - q_C \bar{\pi}_C) / (q_A - q_C), \quad (1)$$

which is strictly lower than $\bar{\pi}_A$. Equation (1) puts an upper bound on the amount of debt that can be used to finance the project while retaining incentives to choose strategy A . We assume that this level is sufficiently low so that the firm needs to issue equity to finance strategy A .

Although it is necessary to raise equity, there are also benefits to using debt. These benefits may, for example, result from a tax benefit of debt. The maximum

debt that the firm can use is constrained by the maximum repayment obligation $\hat{D}$. We assume that a bank's cost of providing the initial debt is given by k (monitoring cost, due diligence, etc.) and that it is optimal to use as much debt as possible. Since the risk-free rate is zero and all parties are risk neutral, a bank's cost of funds is zero.

In principle, the firm could choose private or public equity. There are potential costs and benefits to both alternatives, which we do not model explicitly. Instead, we assume that it is optimal for the firm to try a public equity issue.²

To raise equity, the firm needs an underwriter. We model the equity issue as follows. With probability $p(e)$, the required amount of equity can be raised at no discount, i.e., the price equals the expected payment to equity holders. The success probability depends on the underwriter's effort e . The equity issue fails (is withdrawn) with probability $1 - p(e)$. In the latter case no equity can be raised. For ease of exposition, we assume that the success probability of the equity issue does not depend on the amount of equity that needs to be raised.

It should be noted that we interpret the failure of the issue rather broadly, including the withdrawal of the issue plans before the prospectus has been written. Withdrawals are rather common even after prospectuses have been written and after the offer has been filed with the regulatory body. For all US IPOs filed with the SEC between 1979 and 1982, Dunbar (1998) finds that 32% of all best-effort offers and 29% of all firm-commitment offers are withdrawn. Ritter (1987) obtains similar numbers. Even with firm-commitment agreements, essentially all of the risk of failure is borne by the issuing firm since the final commitment of the underwriter usually takes place as late as just one day before the offer (see Ritter, 1987). Therefore, the underwriter's effort in marketing, information processing, and setting up the prospectus is a primary concern for firms.

The cost of effort is $c(e) = 0.5e^2$ and the probability of success is $p(e) = \alpha e$. We assume that α is sufficiently low so that $p(e^*) < 1$. Since the firm cannot observe the underwriting effort e , the firm must provide the underwriter with incentives.

The investment bank receives a fee w_1 if the equity issue succeeds and w_0 if it fails. Equivalently, we can interpret w_0 as a fixed fee, with $\beta \equiv w_1 - w_0$ as a bonus if the equity issue succeeds. If it is successful, then the investment bank's compensation, $w_1 = w_0 + \beta$, is paid out of the proceeds of the equity issue.

The market for underwriting services is competitive. We assume that it is optimal for the firm to employ an underwriter in an attempt to issue equity to pursue strategy A .

² Chemmanur and Fulghieri (1999), Mello and Parsons (2000), and Zingales (1995) provide a theoretical analysis of the decision to go public; see also Brau and Fawcett (2006) for a recent empirical analysis of the motives for the choice of public equity.

Stage 2 financing: credit after a failed equity issue to finance strategy B . If the equity issue fails, then the firm must seek an alternative source of financing. For example, the firm might now try to raise private equity. However, private equity could be very costly for the firm's management or current owners who may fear a loss of private benefits of control. We assume that it is optimal for the firm to resort to credit if the equity issue fails. Of course, this implies that the firm now has to commit to strategy B , which can be financed entirely with debt. (Recall that otherwise, if the firm does not contractually commit to strategy B , it will, given the high level of debt, choose strategy C .) Commitment to strategy B is costly since $V_B < V_A$, where $V_{AB} \equiv V_A - V_B$ can be interpreted as the cost of commitment. In addition, raising credit after a failed equity issue in a competitive market costs c .

The underwriter: specialized investment bank versus universal bank. The firm can choose a specialized investment bank or the investment bank branch of a universal bank as underwriter. There are two main differences between the two types of underwriters in our model.

First, the universal bank can provide credit if the equity issue fails. We follow Kanatas and Qi (2003) in assuming that a universal bank that has been used as underwriter has a cost advantage when providing the credit after a failed equity issue, which results in a (quasi) rent to the universal bank when acting as underwriter. The cost advantage stems from informational economies of scope, as a universal bank can economize on monitoring costs and/or relationship-building costs. We assume that the cost saving is γc , with $\gamma \in (0, 1)$, and that the universal bank cannot commit in stage 1 to the terms of the credit after a failed equity issue in stage 2. As all other banks will provide credit at a cost c after a failed equity issue, a universal bank that served as underwriter can also demand c and is therefore able to earn a (quasi) rent of γc when the equity issue fails. Alternatively, as in the literature on relationship-lending (Sharpe, 1990; Rajan, 1992; and von Thadden, 2004), the underwriter may gain private information that allows it to extract an information rent when providing credit. For ease of exposition we assume that the initial lender does not gain any information advantage.³ Moreover, in the main part of the paper we also assume that there are no economies of scope between providing the initial debt and underwriting services.

Second, a universal bank can provide both the initial debt and underwriting services in the first round of financing. We refer to this case as cross-selling.

³ If the initial borrower has the same cost saving as the underwriter, Bertrand competition between the initial borrower and the underwriter may result in zero rent after a failed equity issue. However, if the initial borrower has a lower cost saving or if both have asymmetric information, the underwriter may still earn an information rent based on its inside information (Rajan, 1992).

The sequence of moves is as follows.

Stage 1. In this stage, the firm chooses the underwriter and raises the initial debt with a repayment obligation $\hat{D}$. Commercial banks that specialize in lending can provide debt; specialized investment banks only provide underwriting services; and universal banks can provide initial debt and/or underwriting services. We assume that there are multiple banks of each type, which simultaneously make their offers. Thus, the firm has complete market power. In the main part of the paper, we assume that the terms of the debt contract can be conditional on the terms of the underwriting contract. Therefore, the firm, when choosing the underwriting contract, internalizes the effect of underwriting effort on the value of the initial debt and maximizes the total firm value. We discuss and relax this assumption in section 5.2. Cross-selling occurs if the universal bank provides both initial debt and underwriting services. But even in the case of cross-selling, in the main part the paper, we assume that each universal bank makes two separate offers for the initial debt and the underwriting, which the firm can pick individually: there is no issue of potentially illegal tying.

The amount of debt, $P(\hat{D}, \beta)$, that a bank is willing to provide in exchange for the promised repayment of $\hat{D}$ is a function of the underwriting bonus β . We define $P_0(\hat{D}, \beta)$ as the present value of a promised repayment obligation $\hat{D}$, given the underwriter's effort implied by β and the firm's optimal investment strategy. Thus, taking into account a bank's cost of providing initial debt, the debt is correctly priced if $P(\hat{D}, \beta) = P_0(\hat{D}, \beta) - k$.

The terms of the underwriting offer are determined by w_0 and β .

Stage 2. The chosen underwriter exerts effort e , and the equity issue succeeds with probability αe . If the equity issue succeeds, then the firm will implement strategy A . If the equity issue fails, then the firm cannot immediately start a new attempt to issue equity, but it can, at this stage, raise credit (additional junior debt) at cost c to finance strategy B .

Stage 3. The project succeeds or fails. The expected payoff depends on the strategy: strategy A after a successful equity issue and strategy B if the equity issue fails.

Figure 1 illustrates the sequence of events given that the firm chooses not to commit to strategy B in the first stage.

Stage 1	Stage 2	Stage 3
Banks offer initial debt $(\hat{D}, P(\hat{D}, \beta))$ and underwriting services (w_0, β) Firm chooses lender and underwriter	Underwriter chooses e Equity issue succeeds or fails After success, firm implements A After failure, firm uses credit and commits to strategy B	Payoff realized

Figure 1. Time line

3. Benchmark Case: Underwriting Absent Cross-Selling

3.1 INITIAL DEBT AND THE FIRM'S OBJECTIVE

As a benchmark case, we first analyze the situation without cross-selling. Thus, we assume that a universal bank offers only underwriting services and that the firm obtains the initial debt from a bank that only provides debt. Thereby, we do not preclude that a universal bank provides credit after a failed equity issue. In a competitive market, banks will set $P(\hat{D}, \beta) = P_0(\hat{D}, \beta) - k$. Thus, the firm's cost of initial debt is given by k .

The firm chooses the underwriting contract that maximizes the expected net payoff to the firm's initial equity holders (owners). This contract also maximizes the expected firm value since, for any β , the amount of debt that the firm receives equals the expected repayment net of the cost k . If the equity issue succeeds, the firm will pursue strategy A and its net payoff is $V_A - \beta - w_0 - k$. If the equity issue fails, the firm has to obtain credit at cost c and is forced to commit to strategy B . Thus, in the case of failure, the firm's net payoff is $V_B - c - w_0 - k$. In a competitive market, an underwriter's offer maximizes the firm's expected net payoff, $\alpha e(V_A - \beta) + (1 - \alpha e)(V_B - c) - w_0 - k$, which is equivalent to maximizing the expected incremental net payoff, i.e.,

$$\max_{e, w_0, \beta} \alpha e(V_{AB} + c - \beta) - w_0, \quad (2)$$

subject to the underwriter's participation and incentive constraints.

3.2 UNDERWRITING WITHOUT LIMITED LIABILITY

Specialized investment bank. For a specialized investment bank, the participation constraint and the incentive constraint are

$$w_0 + \alpha e \beta \geq \frac{1}{2} e^2 \quad (\text{PC}_i)$$

$$e = \alpha \beta, \quad (\text{IC}_i)$$

where the incentive constraint is given by the first-order condition for the optimal choice of e .

w_0 is determined by the investment bank's participation constraint, which will be binding: $w_0 = \frac{1}{2} e^2 - \alpha e \beta$. We note that it is straightforward to check that w_0 is negative for any level of β . Inserting w_0 and (IC_i) in (2) gives us

$$\max_{\beta} \alpha^2 \beta (V_{AB} + c) - \frac{1}{2} \alpha^2 \beta^2. \quad (3)$$

The first-order condition for the optimal β is $\alpha^2(V_{AB} + c) - \alpha^2\beta = 0$ and

$$\beta = V_{AB} + c. \quad (4)$$

Inserting (4) in (3) gives the firm's expected incremental net payoff when a specialized investment bank acts as underwriter:

$$\pi_i = \frac{1}{2}\alpha^2(V_{AB} + c)^2. \quad (5)$$

Universal bank. Instead of using a specialized investment bank, the firm might use the investment bank branch of a universal bank as the underwriter. The main difference is that the universal bank can provide the credit if the equity issue fails, which results in a (quasi) rent γc , with $\gamma \in (0, 1)$. Because of this rent, a universal bank's participation and incentive constraints differ from those of a specialized investment bank. These constraints are

$$w_0 + \alpha e\beta + (1 - \alpha e)\gamma c \geq \frac{1}{2}e^2 \quad (\text{PC}_u)$$

$$e = \alpha(\beta - \gamma c). \quad (\text{IC}_u)$$

The cost saving γc has two effects. First, it relaxes the investment bank's participation constraint. Therefore, a universal bank is *ceteris paribus* willing to provide investment banking services at a lower cost than would a specialized investment bank. This is a potential positive effect of economies of scope between underwriting and providing credit after a failed equity issue. Second, the cost saving reduces the universal bank's incentive to exert effort, as the investment bank earns the rent only if the equity issue fails.

Again, the participation constraint is binding. Inserting $w_0 = \frac{1}{2}e^2 - \alpha e\beta - (1 - \alpha e)\gamma c$ and (IC_u) in (2) gives us

$$\max_{\beta} \gamma c + \alpha^2(\beta - \gamma c)(V_{AB} + c - \gamma c) - \frac{1}{2}\alpha^2(\beta - \gamma c)^2. \quad (6)$$

The first-order condition for the optimal β is $\alpha^2(V_{AB} + c) - \alpha^2\beta = 0$, which yields

$$\beta = V_{AB} + c. \quad (7)$$

Inserting (7) in (6) yields

$$\pi_u = \gamma c + \frac{1}{2}\alpha^2(V_{AB} + c - \gamma c)^2. \quad (8)$$

Lemma 1. *When it uses a universal bank as underwriter, a firm's expected profit is strictly increasing in the cost saving γc after a failed equity issue.*

Economies of scope reduce the cost of providing credit after a failed equity issue. As a consequence, the benefit of a successful underwriting is lower, which implies that the first-best underwriting level for a universal bank is also lower than that of a

specialized investment bank. By choosing $\beta = V_{AB} + c$, the firm transfers the total incremental benefit of a successful equity issue to the underwriter, which chooses the first-best underwriting effort, $e = \alpha(V_{AB} + c - \gamma c)$. Without limited liability, the firm is left with the positive information effect: the quasi rent from the expected fee and the cost saving are ex ante transferred to the firm through a lower w_0 .

The choice of underwriter. Since there is no cost saving if the firm uses a specialized investment bank, the next proposition directly follows from Lemma 1.

Proposition 1. *Without limited liability, the universal bank dominates the specialized investment bank as underwriter.*

In this setting, the firm cannot observe the underwriter's effort, but there are no other limits on admissible contracts. In this case, the firm will always use a universal bank as underwriter because this saves costs and the cost saving is passed to the firm. Thus, it is only in the presence of additional limitations on admissible contracts that economies of scope may turn out to be a liability for the universal bank (For example, Kanatas and Qi (2003) assume that $w_0 = 0$).

3.3 UNDERWRITING WITH LIMITED LIABILITY

Here, we introduce limited liability and assume that $w_0 \geq 0$. Given the discussion above, it is clear that in this case, it is optimal to choose $w_0 = 0$.

Empirically, $w_0 \geq 0$ is prompted by the absence of up-front payments of underwriters to their clients in practice. With limited liability, our compensation contract resembles those observed in practice, in which underwriters receive a certain percentage of the proceeds of the offer (see Chen and Ritter, 2000; Hansen, 2001). One reason for non-negative up-front payments is that they might attract firms that stand no chance of issuing equity, but are merely trying to collect the up-front payment.

Specialized investment bank. Substituting $w_0 = 0$ and (IC_i) in (2), the firm's optimization problem is given by

$$\max_{\beta} \alpha^2 \beta (V_{AB} + c - \beta). \quad (9)$$

The first-order condition for the optimal β is $\alpha^2 [V_{AB} + c - \beta] - \alpha^2 \beta = 0$ and

$$\beta = \frac{1}{2}(V_{AB} + c). \quad (10)$$

Substituting (10) in (9) gives the firm's expected incremental net payoff when a specialized investment bank acts as underwriter:

$$\pi_i = \frac{\alpha^2}{4}(V_{AB} + c)^2. \quad (11)$$

Universal bank. Substituting $w_0 = 0$ and (IC_u) in (2) yields

$$\max_{\beta} \alpha^2(\beta - \gamma c)(V_{AB} + c - \gamma c - \beta). \quad (12)$$

The first-order condition for the optimal β is $V_{AB} + c - 2\beta = 0$, which yields

$$\beta = \frac{1}{2}(V_{AB} + c). \quad (13)$$

Inserting (13) in (12), we obtain

$$\pi_u = \frac{\alpha^2}{4}(V_{AB} + c - \gamma c)^2. \quad (14)$$

The choice of underwriter. The universal bank is preferred if $\pi_u > \pi_i$, which is never satisfied.

Proposition 2. *With limited liability, the firm will never choose the underwriting services of a universal bank absent cross-selling.*

Absent cross-selling, because of the negative incentive effect of the cost saving after a failed equity issue, universal banks cannot enter the underwriting business. Because of limited liability, the cost saving γc cannot be transferred to the firm, leaving the firm exposed to only the negative effect of lower underwriting incentives. It is costly to offset this negative effect by increasing β , because increasing β increases the universal bank's rent. Therefore, when it uses a universal bank as underwriter, the firm's expected profit is strictly decreasing in the cost saving γc .

4. Cross-Selling Lending and Underwriting

We now examine the role of cross-selling, i.e., universal banks offer both the initial debt and the underwriting services to the firm. To break even, the total expected net payoff from the loan and the underwriting business must not be lower than the cost of underwriting effort.

If we allow universal banks to freely choose $P(\hat{D}, \beta)$ subject to the overall participation constraint, then the debt can serve as a pure rent extraction instrument to overcome the limited liability constraint on w_0 : providing loss-making debt to the firm to win in the underwriting business is akin to paying an entry fee $w_0 < 0$. Thus, we are back to the case without limited liability where a universal bank dominates a specialized investment bank. However, it is not clear, why debt would

be needed: what is the benefit of using debt to make a transfer to the firm instead of using w_0 ? If there are reasons to assume that it is not optimal for underwriters to pay an entry fee in the underwriting business, it is also reasonable to assume that it is not optimal to use loss-making debt as a back-door entry fee.

We are interested in whether cross-selling can play a role above and beyond the pure transfer of rents through initial debt. Therefore, we continue to assume that the initial debt is priced correctly on a stand-alone basis so that $P(\hat{D}, \beta) = P_0(\hat{D}, \beta) - k$. Moreover, we assume that universal banks make two separate offers for the initial debt and the underwriting service.

When we examine the role of combined deals in which universal banks offer both the initial debt and the underwriting services to the firm, the effect of the underwriting success on the value of the debt is important. If the equity issue succeeds, then the value of the debt claim is $\pi + q_A(\hat{D} - \pi)$. If the equity issue fails, the firm pursues strategy B and the value of debt is $\pi + q_B(\hat{D} - \pi)$. Therefore, with a successful equity issue, the debt value increases by $\hat{\delta} = (q_A - q_B)(\hat{D} - \pi)$. For this reason, with cross-selling, risky debt provides the underwriter with incentives to issue equity. Thus, a universal bank's incentive constraint is now given by $e = \alpha(\beta - \gamma c + \hat{\delta})$.

We note that $\hat{\delta}$ equals the expected increase in the firm's debt value if the equity issue is successful. A prerequisite for $\hat{\delta}$ to be positive is that the outstanding debt is risky, i.e., $\hat{D} > \pi$, and switching to strategy B increases the default probability, i.e., $q_A > q_B$. $\hat{\delta}$ is higher for firms with higher leverage, as measured by $\hat{D}$.

Cross-selling also affects a universal bank's participation constraint. Risky debt provides the universal bank with incentives to exert effort. Of course, to break even, the bank has to be compensated for this effort. Given $P(\hat{D}, \beta) = P_0(\hat{D}, \beta) - k$, the terms of the debt do not include this compensation. However, the expected underwriting bonus and the future rent from a loan after a failed equity issue may be sufficiently high to cover these costs. If the expected underwriting bonus and the future rent are not high enough, the universal bank has to receive a fixed underwriting fee. Thus, $w_0 > 0$ is now possible.

With cross-selling, the underwriting contract maximizes (2) subject to

$$w_0 + \alpha e \beta + (1 - \alpha e) \gamma c \geq \frac{1}{2} e^2 \quad (\text{PC}_u^{cs})$$

$$e = \alpha(\beta - \gamma c + \hat{\delta}) \quad (\text{IC}_u^{cs})$$

$$w_0 \geq 0. \quad (15)$$

We substitute (IC_u^{cs}) in (PC_u^{cs}) and rearrange terms to obtain

$$w_0 \geq \Omega \equiv \frac{1}{2} \alpha^2 (\beta - \gamma c + \hat{\delta})^2 - \gamma c - \alpha^2 (\beta - \gamma c + \hat{\delta}) (\beta - \gamma c) \quad (16)$$

for future reference. We note that without limited liability, the firm optimally chooses $w_0 = \Omega$ and (PC_u^{cs}) is always binding. This case would be equivalent to the case that we discussed in section 3.2 where the universal bank always dominates a specialized investment bank: there is no benefit of cross-selling. Here, we are interested in the case with limited liability. With limited liability, there are three possibilities given the optimal choice of β . First, the participation constraint is binding, but not the limited liability constraint. Second, the limited liability constraint is binding, but not the participation constraint. Third, both constraints are binding. We now derive the optimal solutions for the three cases.

Limited liability constraint is not binding. We first consider the relaxed problem and ignore the limited liability constraint, i.e., $w_0 = \Omega$. Substituting w_0 and (IC_u^{cs}) into (2), we obtain

$$\max_{\beta} \alpha^2(\beta - \gamma c + \hat{\delta})(V_{AB} + c - \gamma c) - \frac{1}{2}\alpha^2(\beta - \gamma c + \hat{\delta})^2 + \gamma c. \quad (17)$$

The first order condition for β yields $\alpha^2(V_{AB} + c - \gamma c) - \alpha^2(\beta - \gamma c + \hat{\delta}) = 0$, and hence,

$$\beta = V_{AB} + c - \hat{\delta}. \quad (18)$$

Given (18), $e = \alpha(V_{AB} + c - \gamma c)$ and the universal bank chooses the first-best underwriting effort.

Our next step is to check whether the limited liability constraint is indeed not binding, i.e., whether $\Omega \geq 0$ for $\beta = V_{AB} + c - \hat{\delta}$. Plugging (18) into (16) gives us $w_0 \geq \Omega_{LL} \equiv \frac{1}{2}\alpha^2(V_{AB} + c - \gamma c)^2 - \gamma c - \alpha^2(V_{AB} + c - \gamma c)(V_{AB} + c - \gamma c - \hat{\delta})$. Thus, the limited liability constraint is non-binding and $w_0 = \Omega_{LL}$ if

$$\Omega_{LL} = -\frac{1}{2}\alpha^2(V_{AB} + c - \gamma c)(V_{AB} + c - \gamma c - 2\hat{\delta}) - \gamma c \geq 0. \quad (19)$$

Lemma 2. *There exists a critical $\bar{\delta}_{LL} \leq V_{AB}$ so that the limited liability constraint is binding for $\hat{\delta} < \bar{\delta}_{LL}$ and non-binding for $\hat{\delta} \in [\bar{\delta}_{LL}, V_{AB})$. If $\hat{\delta} \in [\bar{\delta}_{LL}, V_{AB})$, then a universal bank chooses the first-best underwriting effort given cross-selling.*

If $\hat{\delta}$ is high, then cross-selling gives the underwriter strong incentives to provide effort, which also results in high effort cost for the underwriter. Hence, it is optimal for the firm to use a low-powered incentive scheme with a low β , but a positive fixed fee to compensate the universal bank for the underwriting effort that the debt induces. It arises if $\hat{\delta} \in [\bar{\delta}_{LL}, V_{AB})$, but this case is only possible if $\bar{\delta}_{LL} < V_{AB}$.

Given $\hat{\delta} \geq \bar{\delta}_{LL}$, substituting (18) in (17) yields

$$\pi_u^{cs} = \gamma c + \frac{\alpha^2}{2}(V_{AB} + c - \gamma c)^2. \quad (20)$$

For $\hat{\delta} \geq \bar{\delta}_{LL}$, $\hat{\delta}$ has no effect on the expected incremental net payoff. The reason is that if the limited liability constraint is non-binding, then $\hat{\delta}$ and β are perfect substitutes: if $\hat{\delta}$ increases, then the optimal β in (18) decreases by the same amount. Nevertheless, the debt's risk is not irrelevant. A sufficiently high $\hat{\delta}$ is a prerequisite for the limited liability constraint to be non-binding: the firm can obtain the same expected incremental profit as in our benchmark case without limited liability and without cross-selling, which is given by (8).

Limited liability constraint is binding. If (19) is not satisfied, then the limited liability constraint is binding. In this case, it is optimal to choose $w_0 = 0$. Without cross-selling, $w_0 = 0$ always implies that the underwriter earns a rent and the underwriter's participation constraint is not binding. The reason is that in this case all incentives stem from β , which is more than sufficient to cover the effort cost. With cross-selling, incentives stem from debt and β , so that both the limited liability constraint and the participation constraint may be binding.

We first consider the relaxed problem, ignoring, for the moment, the participation constraint. Substituting (IC_u^{cs}) and $w_0 = 0$ in (2) yields

$$\max_{\beta} \alpha^2(\beta - \gamma c + \hat{\delta})(V_{AB} + c - \beta). \quad (21)$$

The first-order condition for the optimal choice of β is given by $\alpha^2(V_{AB} + c - \beta) - \alpha^2(\beta - \gamma c + \hat{\delta}) = 0$. Rearranging terms yields

$$\beta = \frac{1}{2}(V_{AB} + c + \gamma c - \hat{\delta}). \quad (22)$$

We now check whether (PC_u^{cs}) is satisfied, which is the case if $\Omega \leq 0$ for the optimal β in (22). Substituting (22) and $w_0 = 0$ into (16) gives us

$$0 \geq \Omega_{PC} \equiv -\frac{1}{8}\alpha^2(V_{AB} + c - \gamma c + \hat{\delta})(V_{AB} + c - \gamma c - 3\hat{\delta}) - \gamma c. \quad (23)$$

Lemma 3. *There exists a critical $\bar{\delta}_{PC} \in (\gamma c, \bar{\delta}_{LL}]$ so that (PC_u^{cs}) is non-binding if $\hat{\delta} \leq \bar{\delta}_{PC}$ and binding if $\hat{\delta} > \bar{\delta}_{PC}$. A universal bank does not earn a rent if $\hat{\delta} \geq \bar{\delta}_{PC}$.*

For low-risk debt, incentives from debt are low. Thus, the firm still chooses a high β , which results in a rent for the universal bank if $\hat{\delta} < \bar{\delta}_{PC}$. As $\hat{\delta}$ increases, the firm reduces β only by $0.5\hat{\delta}$, so that total underwriting incentives increase in $\hat{\delta}$. Given $\hat{\delta} \leq \bar{\delta}_{PC}$, we obtain the firm's marginal expected profit by substituting (22) in (21):

$$\pi_u^{cs} = \frac{1}{4}\alpha^2(V_{AB} + c + \hat{\delta} - \gamma c)^2. \quad (24)$$

We note that $\bar{\delta}_{PC} = \bar{\delta}_{LL}$ in Lemma 3 can only arise if $\bar{\delta}_{LL} = V_{AB}$. In this case, the universal bank's participation constraint is never binding.

For $\bar{\delta}_{PC} < \hat{\delta} < \bar{\delta}_{LL}$, the participation constraint and the limited liability constraint are both binding, and the optimal β is determined by $\Omega = \frac{1}{2}\alpha^2(\beta - \gamma c + \hat{\delta})^2 - \gamma c - \alpha^2(\beta - \gamma c + \hat{\delta})(\beta - \gamma c) = 0$ so that

$$\beta = \gamma c + \sqrt{\hat{\delta}^2 - \frac{2\gamma c}{\alpha^2}}. \quad (25)$$

Equation (25) is derived in the appendix.

The choice of underwriter. The firm chooses a universal bank if $\pi_u^{cs} - \pi_i > 0$, where π_i is given by (11).

Proposition 3. *With cross-selling,*

- (i) π_u^{cs} is strictly increasing in $\hat{\delta}$ for $\hat{\delta} < \bar{\delta}_{LL}$ and reaches the first-best level for $\hat{\delta} \geq \bar{\delta}_{LL}$.
- (ii) For $\hat{\delta} < \gamma c$, a specialized investment bank dominates a universal bank.
- (iii) For $\hat{\delta} = \gamma c$, the firm is indifferent.
- (iv) For $\hat{\delta} > \gamma c$, a universal bank dominates a specialized investment bank.

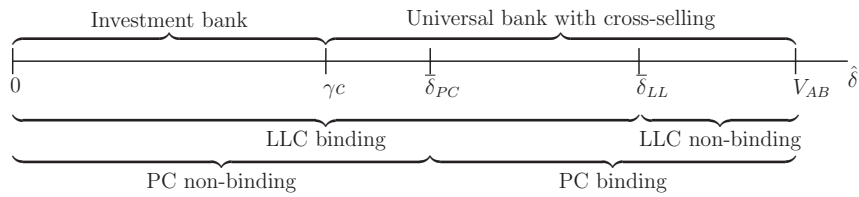


Figure 2. Three possible cases

Figure 2 illustrates the three cases discussed above and the results in Proposition 3. In the figure we assume that $\bar{\delta}_{PC} < \bar{\delta}_{LL} < V_{AB}$ so that all three cases may be possible, but it should be noted that $\bar{\delta}_{PC} \leq \bar{\delta}_{LL} = V_{AB}$ is also possible. For example, for $\bar{\delta}_{PC} = \bar{\delta}_{LL} = V_{AB}$ the last two regions in figure 2 vanish and the universal bank's participation constraint is non-binding for all possible $\hat{\delta}$. However, the existence of these regions is not crucial for the choice of underwriter: The critical threshold for $\hat{\delta}$ that determines whether a universal bank with cross-selling or a specialized investment bank is used as underwriter, γc , always lies in the region where $\hat{\delta} < \bar{\delta}_{PC}$ and where the universal bank's participation constraint is non-binding.

The incentive effect of cross-selling increases in $\hat{\delta}$, which reduces the bank's rent. Indeed, if $\hat{\delta} > \bar{\delta}_{PC}$, then the bank's participation constraint is binding. Moreover, if $\hat{\delta}$ increases further, then the limited liability constraint may no longer be binding if $\hat{\delta} \geq \bar{\delta}_{LL}$. The firm's expected incremental profit strictly increases in $\hat{\delta}$ for $\hat{\delta} < \bar{\delta}_{LL}$.

If $\hat{\delta} \geq \bar{\delta}_{LL}$, the limited liability constraint is not binding and the firm can implement the first-best solution.

Absent cross-selling, the firm will never choose the universal bank with limited liability (see Proposition 2). With $\hat{\delta} < \gamma c$, the incentive effect from cross-selling is not sufficient to compensate for the negative effect that stems from the universal bank's ability to earn a rent after failure of the equity issue. In this case, the universal bank's intrinsic net underwriting or implicit incentives $\hat{\delta} - \gamma c$ are negative. A necessary and sufficient condition for the firm to choose a universal bank is that $\hat{\delta}$ exceeds γc , so that the universal bank's intrinsic incentives are positive. Thus, highly leveraged borrowers are more likely to choose a universal bank.

Since debt is priced correctly on a stand-alone basis, universal banks can offer both contracts separately without forcing the firm to take either both or none. But of course they offer both contracts at the conditions above only if $\hat{\delta} \geq \gamma c$ so that it is optimal for the firm to choose a universal bank with cross-selling.

We summarize our findings in the following proposition.

Proposition 4. *In the presence of limited liability and cost saving of providing credit after a failed equity issue,*

- (i) *cross-selling is a prerequisite for universal banks to enter the investment banking business,*
- (ii) *cross-selling increases an underwriter's incentives,*
- (iii) *cross-selling is particularly effective for firms with high leverage,*
- (iv) *cross-selling reduces a universal bank's rent in the underwriting business.*

5. Extensions

5.1 ECONOMIES OF SCOPE BETWEEN UNDERWRITING AND INITIAL DEBT

Of course, informational economies of scope between underwriting and lending may also exist between underwriting and initial debt. Here, we consider the consequences if economies of scope lead to lower costs of providing initial debt. We assume that the universal bank's cost of providing the initial debt with cross-selling is $\hat{k} < k$. Hence, the universal bank can provide initial debt in combined deals at a lower rate than commercial banks that only provide debt and still make no loss on the debt, i.e., $P(\hat{D}, \beta) = P_0(\hat{D}, \beta) - \hat{k}$. Thus, when compared to the terms of stand-alone credits, the debt in combined deals is offered at a less-than-market rate.⁴ However, the reason is not to lure firms into choosing a universal bank as underwriter, but

⁴ We assume that the firm adjusts the equity issue so that the total debt and equity proceeds continue to be just sufficient to cover the investment and the cost of raising funds.

the force of competition between universal banks and the presence of economies of scope between initial debt and underwriting.

Because of the lower cost of initial debt, using a universal bank as underwriter and cross-selling has a cost advantage of $k - \hat{k} > 0$ compared to using a specialized investment bank. If $\hat{\delta} > \gamma c$, then the cost advantage has no effect on the choice of underwriter, since in this case, the universal bank already dominates a specialized investment bank even absent the cost advantage. However, the cost advantage may affect the choice of underwriter if $\hat{\delta} < \gamma c$, since the universal bank may now be chosen as underwriter. This requires that the universal bank can make a conditional offer where the terms of the debt depend on the firm also choosing its underwriting service.

We note that this type of bundling of initial debt and underwriting services is in the interest of the firm (consumer). Hence, bundling services and offering this bundle at a lower price is not prohibited by the anti-tying provision of the Bank Holding Company Act since the bundle is not forced onto the firm but chosen voluntarily.⁵ In the absence of such bundling the firm would consider the two products independently and, for $\hat{\delta} < \gamma c$, combine the low-cost debt from a universal bank with the underwriting services of a specialized investment bank.

Proposition 5. *Given economies of scope between underwriting and initial debt ($\hat{k} < k$), a universal bank can offer initial debt at a less-than-market rate with cross-selling.*

- (i) *There exists a critical $\hat{\delta}^k < \gamma c$, at which the firm is indifferent between underwriters. If $\hat{\delta} < \hat{\delta}^k$, then the firm chooses an investment bank as underwriter. If $\hat{\delta} > \hat{\delta}^k$, then the firm chooses a universal bank with cross-selling.*
- (ii) *For $\hat{\delta} < \gamma c$ a universal bank is more likely to be chosen the lower are V_{AB} and α .*

If $\hat{\delta} < \gamma c$, the cost benefit, $k - \hat{k}$, must overcompensate for the negative net intrinsic incentives, which are more severe if the cost of commitment, V_{AB} , and

⁵ For example, in the most recent and binding interpretation of the relevant section 106 of the Bank Holding Company Act (BHCA), the Federal reserve states: “Even if a condition or requirement exists tying the customer’s desired product to another product, a violation of section 106 may occur only if the condition or requirement was imposed or forced on the customer by the bank. . . . It was not the purpose of the statute to prohibit bank customers from using their own bargaining power to obtain a package of desired products from a bank and its affiliates or a price discount on those products. Similarly, it was not the purpose of the statute to prohibit customers from voluntarily seeking and obtaining multiple products that the customer desires from a bank or its affiliates.” (see Federal Reserve System, 2004, p. 14). In a similar manner, Johnson (2002) states that courts required a damage to the customer in order to establish a violation of the anti-tying provisions of the BHCA. If there are no specific anti-tying provisions for the banking industry as in the US, the general anti-tying laws prevail, requiring as well that tying imposes harm on the customer.

the productivity of the underwriter, α , are high. Hence, given negative intrinsic net underwriting incentives, the firm is more likely to choose a universal bank if V_{AB} and α are low. If the intrinsic net underwriting incentives $\hat{\delta} - \gamma c$ are positive, then the universal bank always wins out over a specialized investment bank. Thus, in this case, V_{AB} and α have no effect on the choice of underwriter.

5.2 DEBT OVERHANG PROBLEM AND UNDERWRITING INCENTIVES

So far, we have assumed that the terms of the initial debt are conditional on the terms of the underwriting contract so that the firm chooses the underwriting contract that maximizes the total firm value. We now discuss the implications of this assumption in greater detail. If the terms of the initial debt are not conditional on the underwriting contract, given limited liability of equity holders and the (fixed) terms of the initial debt, β is chosen to maximize the expected incremental benefit of underwriting to equity, $\alpha e(V_{AB} - \hat{\delta} + c - \beta)$, instead of the incremental benefit to the firm, $\alpha e(V_{AB} + c - \beta)$. Thus, there is a debt overhang problem in the choice of β : equity holders bear the full cost of underwriting, but debt holders reap some of the benefits. Debt holders anticipate the firm's equilibrium choice of β , β_e , and price their debt correctly so that $P(\hat{D}, \beta_e) = P_0(\hat{D}, \beta_e) - k$ continues to hold in equilibrium. But $P_0(\hat{D}, \beta_e)$ is now lower for any level of $\hat{D}$. (If the terms of the initial debt depend on β , the debt is priced correctly for every possible β , and not only for the equilibrium choice β_e .)

To analyze the debt overhang problem, we consider the case of a specialized investment bank. The firm chooses the underwriting contract that maximizes the incremental benefit of underwriting to equity given $\hat{D}$ and therefore $\hat{\delta}$. The optimization problem is given by

$$\max_{\beta} \alpha e(V_{AB} - \hat{\delta} + c - \beta) \quad (26)$$

subject to the incentive constraint of the investment bank, $e = \alpha\beta$. Substituting e into the objective function leads to $\alpha^2\beta(V_{AB} - \hat{\delta} + c - \beta)$. Maximizing with respect to β gives us

$$\beta = \frac{1}{2}(V_{AB} - \hat{\delta} + c), \quad (27)$$

which banks anticipate in equilibrium so that (27) also determines β_e . The expected incremental payoff to equity holders is

$$\pi_i^D = \frac{\alpha^2}{4}[V_{AB} + c - \hat{\delta}][V_{AB} + c + \hat{\delta}] = \frac{\alpha^2}{4}[(V_{AB} + c)^2 - \hat{\delta}^2]. \quad (28)$$

Given the terms of the initial debt, it is optimal for the equity holders to ignore the effect of underwriting on the value of initial debt. Therefore, if the (unconditional)

terms of the debt and the underwriting terms are chosen simultaneously, the specialized investment banks will offer underwriting contracts that do not consider the impact of β on the value of the debt and for which β is inefficiently low. Hence, in addition to the distortion introduced by limited liability of the underwriter, we now also have a distortion due to the debt overhang problem, which reduces underwriting incentives even further. The banks that provide the initial debt anticipate the firm's choice of underwriter. Thus, the cost of the debt overhang problem is borne by the firm's equity holders. One possibility around this problem is that the firm signs the underwriting contract with the specialized investment bank first and then takes on the debt. However, if this is not possible, there may be another benefit of a universal bank.

A universal bank can help to overcome the debt overhang problem. As in subsection 5.1 we assume that the universal bank provides – in the interest of firms – bundled deals where the debt is priced conditional on the firm obtaining both the initial debt and the underwriting services from the firm. By bundling the initial debt and the underwriting services, the universal bank can help the firm's equity holders to overcome the debt overhang problem. The reason is that by choosing the bundled contracts, the firm is committing to the terms of the underwriting contract, i.e., a higher β , when choosing the initial debt. The firm's equity holders benefit by this commitment in the form of a higher $P_0(\hat{D})$ that reflects the higher underwriting incentives. Avoiding the debt overhang problem can be an additional benefit of using a universal bank and a reason for why a universal bank may dominate a specialized investment bank even if $\hat{\delta} < \gamma c$.

Proposition 6. *Assume that there is a debt overhang problem of initial debt on underwriting incentives in the case of a specialized investment bank, but not in the case of a universal bank with cross-selling. Then:*

- (i) *There exists a critical $\hat{\delta}^D < \gamma c$ so that the firm chooses a universal bank if $\hat{\delta} > \hat{\delta}^D$, and an investment bank if $\hat{\delta} < \hat{\delta}^D$.*
- (ii) *For $\hat{\delta} < \gamma c$, a universal bank is more likely to be chosen the lower is V_{AB} .*

Bundling avoids the debt overhang problem so that the firm provides higher underwriting incentives when it chooses a universal bank. Therefore, the probability of success is higher and, ceteris paribus, the risk of the debt is lower, and the interest rate implied by $P(\hat{D}) = P_0(\hat{D}) - k$ is also lower with cross-selling than without cross-selling. If $\hat{\delta} < \gamma c$, then the benefit of overcoming the debt overhang problem through bundling must overcompensate the negative net intrinsic incentives. The debt overhang problem is more severe if the cost of commitment, V_{AB} , is high, and the firm is more likely to choose a universal bank if V_{AB} is low.

6. Empirical Implications

A first set of empirical predictions emerges from the main body of our analysis in section 4. First, universal banks, which provide combined deals, are more likely to be chosen by firms with high levels of risky debt held by the underwriting bank (high $\hat{\delta}$) (see Proposition 4). Second, cross-selling is more likely to occur in situations in which the economies of scope between underwriting and lending in the case of failure of the equity issue are sufficiently low (low γ) (see Proposition 3). Third, cross-selling leads to fiercer competition and lower rents in the underwriting business (see Proposition 4). To make our research more accessible to empirical analysis, in what follows we elaborate on some of our empirical predictions.

Since $\hat{\delta}$ directly increases in $\hat{D}$, our analysis leads us to expect that firms with high leverage are the most likely to be clients of universal banks that act as underwriters and use combined deals. This hypothesis is confirmed by Drucker and Puri (2005).

After a failed equity issue, a universal bank will earn a high rent from the credit if there are pronounced informational economies of scope and/or a high level of asymmetric information between the underwriter and outside creditors. When providing credit, an intermediary incurs the cost of (i) establishing a customer relationship, (ii) evaluating the existing operations, and (iii) evaluating the new investment opportunity. The underwriter does not have to incur the costs (i) and (ii) again, which implies that informational economies of scope are large if the costs (i) and (ii) are relatively high. Public information reduces informational economies of scope and the degree of informational asymmetries. Therefore, the rent from a failed equity issue is lower for listed firms than for privately owned firms, and lower for rated firms than for non-rated firms. Universal banks dominate specialized investment banks if the rent is sufficiently small (i.e., if $\hat{\delta} > \gamma c$) so that universal banks using combined deals are likely to act as underwriters for firms that are already listed, i.e., for seasoned equity offerings (SEOs), and which already have a rating. In contrast, privately owned firms that want to pursue initial public offerings (IPOs), and which usually do not have a rating, are more likely to choose a specialized investment bank.

The prediction about the choice of underwriter by rated and non-rated firms is consistent with recent empirical evidence by Parthasarathy (2007), who finds that when choosing an equity underwriter, unrated firms value specialized skills in the lending and underwriting business and only infrequently choose cross-selling, compared to rated firms.

Our paper complements Fernando et al. (2005). These authors show that more reputable underwriters underwrite issues of firms with lower uncertainty and lower asymmetric information or monitoring needs. We assume that underwriters have the same reputation, but differ with respect to their ability to provide credit in addition to their underwriting services. Since Fernando et al. consider issues by U.S. firms

between 1970 and 2000, their sample primarily comprises specialized investment banks. It would be interesting to test for the effect of the type of underwriter, specialized investment bank or universal bank, for the matching between firms and underwriters.

A further set of empirical predictions results from our extensions in section 5: If cross-selling has advantages in addition to the pure incentive effect, our model predicts that universal banks are chosen for a larger set of parameters, and universal banks will offer initial debt at a less-than-market rate in combined deals and are more likely to be chosen if the expected loss in value due to commitment to strategy B is low (low V_{AB}) (see Propositions 5 and 6).

Our extension in section 5.1 reveals the importance of distinguishing between different types of informational economies of scope, as discussed in the introduction, and their impact on the role of cross-selling. Informational economies of scope between underwriting and credit after a failed equity issue reduce universal banks' underwriting incentives, and cross-selling is important to enter the underwriting business. But the initial debt's risk in cross-selling has to be sufficiently high relative to the rent after a failed equity issue to overcome the negative incentive effect. Informational economies of scope between underwriting and initial debt provide another motive for cross-selling, in addition to the positive incentive effect. Thus, *ceteris paribus*, a universal bank is more likely to be chosen if the economies of scope between underwriting and initial debt are large.

The cost of commitment is higher for firms with high benefits of remaining flexible, high growth options, few tangible assets, and greater benefits of starting at a large scale. Therefore, the cost of commitment should be high for innovative firms with superior technological knowledge, which can lead to high growth potentials, and which have few tangible assets. In contrast, commitment is likely to be less costly for firms operating in mature industries with little growth potential and pronounced tangible assets. Therefore, our analysis predicts that firms in mature industries with few growth options and with a large proportion of tangible assets should choose universal banks as underwriters. These are also the firms that are more likely to be already listed, and to raise money through a SEO.

7. Conclusion

In this paper we examine a particular aspect of the expansion of universal banks' activities into investment banking: the ability of universal banks to cross-sell lending and underwriting. This phenomenon has occurred with increasing frequency in the last decade. Our theoretical framework makes it possible for us to investigate different aspects of this phenomenon, and to shed light on the underlying

mechanisms and reasons for cross-selling as well as on the consequences of cross-selling for the parties involved.

Universal banks face a dilemma when entering the underwriting business. Although informational economies of scope between underwriting and lending can reduce the cost of raising capital, they can also reduce incentives in the underwriting business. We show that cross-selling lending and underwriting can help to resolve this incentive problem and enable universal banks to compete against specialized investment banks. However, in combined deals, holding risky debt in the firms they underwrite also reduces universal banks' rent compared to specialized investment banks. Hence, cross-selling turns out to be a mixed blessing, since it allows universal banks to enter the underwriting markets only at the cost of fiercer price competition and lower overall profitability.

On the basis of our main model, we expect that universal banks are more likely to be chosen as underwriters for SEOs by less innovative firms with high leverage, and that specialized investment banks are more likely to underwrite IPOs of innovative start-ups or the SEOs of growth firms.

Although we focus on equity underwriting, the benefit of combined deals is also present for other investment-banking services whenever the quality of the investment-banking service affects the value of the client's outstanding debt. Examples include corporate restructuring and mergers and acquisitions where the quality of advice affects not only a firm's outstanding equity, but also its risky debt positions.

Appendix

This appendix contains the formal proofs.

Proof of Lemma 1. $\frac{\partial \pi_u}{\partial \gamma c} = 1 - \alpha^2(V_{AB} + c - \gamma c) > 0$ since the probability of a successful equity issue is $\alpha e = \alpha^2(V_{AB} + c - \gamma c) < 1$ for $\beta = V_{AB} + c$. ■

Proof of Lemma 2. Define $\hat{\delta}_{LL}$ as the $\hat{\delta}$ for which $\Omega_{LL} = 0$. Since $\frac{\partial \Omega_{LL}}{\partial \hat{\delta}} = \alpha^2(V_{AB} + c - \gamma c) > 0$, $\Omega_{LL} > 0$ for $\hat{\delta} > \hat{\delta}_{LL}$ and $\Omega_{LL} < 0$ for $\hat{\delta} < \hat{\delta}_{LL}$. $\hat{\delta}_{LL}$ may exceed V_{AB} , but $\hat{\delta}$ is strictly lower than V_{AB} . We thus obtain $\tilde{\delta}_{LL} \equiv \min\{\hat{\delta}_{LL}, V_{AB}\}$. ■

Proof of Lemma 3. Define $\hat{\delta}_{PC}$ as $\Omega_{PC} = -\frac{1}{8}\alpha^2(V_{AB} + c - \gamma c + \hat{\delta}_{PC})(V_{AB} + c - \gamma c - 3\hat{\delta}_{PC}) - \gamma c = 0$. Since $\frac{\partial \Omega_{PC}}{\partial \hat{\delta}} = \frac{2}{8}\alpha^2(V_{AB} + c - \gamma c + 3\hat{\delta}) > 0$, we obtain $\Omega_{PC} \leq 0$ if $\hat{\delta} \leq \hat{\delta}_{PC}$ and $\Omega_{PC} > 0$ if $\hat{\delta} > \hat{\delta}_{PC}$. We first show that $\hat{\delta}_{PC} > \gamma c$. In a second step, we prove that $\hat{\delta}_{PC} < \hat{\delta}_{LL}$.

A sufficient condition for $\Omega \leq 0$ is $\alpha^2(\beta - \gamma c + \hat{\delta})\beta \geq \frac{1}{2}\alpha^2(\beta - \gamma c + \hat{\delta})^2$ (see Equation (16)). Rearranging terms yields $\beta \geq \hat{\delta} - \gamma c$, which is always satisfied if $\hat{\delta} \leq \gamma c$ since $\beta \geq 0$. Thus, (PC_u^{cs}) is always non-binding for $\hat{\delta} \leq \gamma c$. Hence, $\hat{\delta}_{PC} > \gamma c$.

To show that $\hat{\delta}_{PC} < \hat{\delta}_{LL}$, we first note that $\hat{\delta}_{PC}$ and $\hat{\delta}_{LL}$ are defined such that $\Omega_{PC} = 0$ and $\Omega_{LL} = 0$ given the optimal β s, (22) and (18) respectively. β is strictly higher for $\hat{\delta}_{LL}$ than for $\hat{\delta}_{PC}$ since, taking the difference between (18) and (22), $V_{AB} + c - \hat{\delta} - 0.5(V_{AB} + c + \gamma c - \hat{\delta}) = 0.5(V_{AB} + c - \gamma c - \hat{\delta}) > 0$. Furthermore, $d\Omega = [\alpha^2(\beta - \gamma c + \hat{\delta}) - \alpha^2(\beta - \gamma c) - \alpha^2(\beta - \gamma c + \hat{\delta})]d\beta + [\alpha^2(\beta - \gamma c + \hat{\delta}) - \alpha^2(\beta - \gamma c)]d\hat{\delta} = 0$ and hence $d\Omega = [-\alpha^2(\beta - \gamma c)]d\beta + [\alpha^2\hat{\delta}]d\hat{\delta} = 0$. Therefore, $\frac{d\beta}{d\hat{\delta}} = \frac{\hat{\delta}}{\beta - \gamma c}$. To show that $\frac{d\beta}{d\hat{\delta}} > 0$, we first note that $\frac{d\beta}{d\hat{\delta}}$ is continuous. We define $\beta(\hat{\delta})$ as the β for which $\Omega = 0$ given $\hat{\delta}$. For an arbitrarily low $\hat{\delta}$, if $\beta(\hat{\delta}) > \gamma c$, then $\frac{d\beta}{d\hat{\delta}} > 0$ and $\beta(\hat{\delta})$ increases in $\hat{\delta}$; and if $\beta(\hat{\delta}) < \gamma c$, then $\frac{d\beta}{d\hat{\delta}} < 0$ and $\beta(\hat{\delta})$ decreases in $\hat{\delta}$. Thus, assume that $\frac{d\beta}{d\hat{\delta}} < 0$, this is true for all β and β never exceeds γc . However, for $\hat{\delta}_{LL}$ we obtain $\beta = V_{AB} + c - \hat{\delta}$, which exceeds γc since $V_{AB} + c - \gamma c - \hat{\delta} > 0$ and therefore contradicts the assumption. Hence, $\frac{d\beta}{d\hat{\delta}} > 0$ so that $\beta > \gamma c$ and $\hat{\delta}_{PC} < \hat{\delta}_{LL}$.

As a last step we note that $\hat{\delta}_{PC}$ may exceed V_{AB} , but $\hat{\delta}$ is strictly lower than V_{AB} . We thus obtain $\bar{\delta}_{PC} \equiv \min\{\hat{\delta}_{PC}, V_{AB}\}$. ■

Proof of Equation (25). Equation (25) is obtained from rearranging $\Omega = \frac{1}{2}\alpha^2(\beta - \gamma c + \hat{\delta})^2 - \gamma c - \alpha^2(\beta - \gamma c + \hat{\delta})(\beta - \gamma c) = 0$, which yields $(\beta - \gamma c)^2 = \hat{\delta}^2 - \frac{2\gamma c}{\alpha^2}$. We first note that $\hat{\delta}^2 > \frac{2\gamma c}{\alpha^2}$ for $\hat{\delta} \in (\bar{\delta}_{PC}, \bar{\delta}_{LL})$ since, using (23), we get $\frac{\alpha^2}{8}[(V_{AB} + c - \gamma c - \bar{\delta}_{PC})^2 - 4\bar{\delta}_{PC}^2] + \gamma c = 0$ and therefore $\bar{\delta}_{PC}^2 = \frac{2\gamma c}{\alpha^2} + \frac{(V_{AB} + c - \gamma c - \bar{\delta}_{PC})^2}{4} > \frac{2\gamma c}{\alpha^2}$. Hence, $\hat{\delta}^2 > \frac{2\gamma c}{\alpha^2}$ for $\hat{\delta} > \bar{\delta}_{PC}$. Moreover, since $\beta > \gamma c$ (see proof of Lemma 3), β is given by $\gamma c + \sqrt{\hat{\delta}^2 - \frac{2\gamma c}{\alpha^2}}$. ■

Proof of Proposition 3. (i) For $\hat{\delta} \leq \bar{\delta}_{PC}$, π_u^{cs} is given by Equation (24) and strictly increasing in $\hat{\delta}$. In the following we show that π_u^{cs} is also strictly increasing in $\hat{\delta}$ for $\hat{\delta} \in (\bar{\delta}_{PC}, \bar{\delta}_{LL})$. Since $\pi_u^{cs} = \alpha^2(\beta - \gamma c + \hat{\delta})(V_{AB} + c - \beta)$, we obtain $\frac{\partial \pi_u^{cs}}{\partial \hat{\delta}} = \alpha^2[(\frac{d\beta}{d\hat{\delta}} + 1)(V_{AB} + c - \beta) - (\beta - \gamma c + \hat{\delta})\frac{d\beta}{d\hat{\delta}}]$, which is positive if $\frac{d\beta}{d\hat{\delta}}(V_{AB} + c - \beta - (\beta - \gamma c) - \hat{\delta}) + (V_{AB} + c - \beta) > 0$. If we substitute $\frac{d\beta}{d\hat{\delta}} = \frac{\hat{\delta}}{\beta - \gamma c}$ (from the proof of Lemma 3) and rearrange terms, we obtain $\frac{\hat{\delta}}{\beta - \gamma c}(V_{AB} + c - \beta - \hat{\delta}) + (V_{AB} + c - \beta - \hat{\delta}) > 0$. Since $\frac{\hat{\delta}}{\beta - \gamma c} > 0$, the condition is satisfied if $\beta < V_{AB} + c - \hat{\delta}$, which holds since $\beta = V_{AB} + c - \hat{\delta}$ would induce the first best effort, which is not optimal for the firm to implement given that the limited liability constraint is binding for $\hat{\delta} \in (\bar{\delta}_{PC}, \bar{\delta}_{LL})$.

(ii) With $\hat{\delta} < \gamma c$, (PC_u^{cs}) is non-binding and the firm's profits in case of cross-selling is given by (24). Hence, $\pi_u^{cs} - \pi_i = \frac{\alpha^2}{4}[(V_{AB} + c + \hat{\delta} - \gamma c)^2 - (V_{AB} + c)^2] < 0$ for $\hat{\delta} < \gamma c$.

(iii) With $\hat{\delta} = \gamma c$, we obtain $\pi_u^{cs} = \pi_i$.

(iv) With $\gamma c < \hat{\delta} < \bar{\delta}_{PC}$, (24) applies again. Using our arguments from (i) reveals that $\pi_u^{cs} > \pi_i$ in this case. If $\hat{\delta} > \bar{\delta}_{PC}$ firm's profits are even larger than in (24) implying again $\pi_u^{cs} > \pi_i$. ■

Proof of Proposition 5. (i) The firm will choose the universal bank if $\Gamma \equiv \pi_u^{cs} - \pi_i + k - \hat{k} > 0$. We have to analyze the choice of underwriter for $\hat{\delta} < \gamma c$ since the universal bank already dominates a universal bank for $\hat{k} = k$ if $\hat{\delta} > \gamma c$ and $\hat{k} < k$ increases the benefit of using a universal bank. For $\hat{\delta} < \gamma c$, π_u^{cs} is given by (24) and we obtain $\Gamma_1 = \frac{1}{4}\alpha^2(V_{AB} + c + \hat{\delta} - \gamma c)^2 - \frac{1}{4}\alpha^2(V_{AB} + c)^2 + k - \hat{k}$. Setting Γ equal to zero allows us to define

$$\hat{\delta}^a \equiv \sqrt{(V_{AB} + c)^2 + \frac{4}{\alpha^2}(\hat{k} - k)} - (V_{AB} + c) + \gamma c < \gamma c.$$

We note that $(V_{AB} + c)^2 + \frac{4}{\alpha^2}(\hat{k} - k) > 0$ since $\frac{1}{4}\alpha^2(V_{AB} + c)^2 - c > 0$, which is a necessary condition for the equity issue to be optimal. Since $\partial\Gamma/\partial\hat{\delta} > 0$, $\pi_u^{cs} - \pi_i > 0$ for $\hat{\delta} > \hat{\delta}^a$ and $\pi_u^{cs} - \pi_i < 0$ for $\hat{\delta} < \hat{\delta}^a$. However, as $\hat{\delta}^a$ may be negative, but $\hat{\delta} > 0$, we define $\hat{\delta}^k \equiv \max\{0, \hat{\delta}^a\}$.

(ii) This follows from $\partial\hat{\delta}^a/\partial V_{AB} > 0$ and $\partial\hat{\delta}^a/\partial\alpha > 0$. ■

Proof of Proposition 6. The firm chooses the universal bank if $\Gamma_2 \equiv \pi_u^{cs} - \pi_i^D = \frac{\alpha^2}{4}[(V_{AB} + c + \hat{\delta} - \gamma c)^2 - (V_{AB} + c - \hat{\delta})(V_{AB} + c + \hat{\delta})] > 0$. Define $\hat{\delta}^D$ so that $\Gamma_2(\hat{\delta}^D) = 0$.

(i) Since $\partial\Gamma_2/\partial\hat{\delta} > 0$ and $\Gamma_2(\hat{\delta} = \gamma c) > 0$, we obtain $\hat{\delta}^D < \gamma c$, $\Gamma_2 < 0$ if $\hat{\delta} < \hat{\delta}^D$, and $\Gamma_2 > 0$ if $\hat{\delta} > \hat{\delta}^D$.

(ii) Since $\partial\Gamma_2/\partial\hat{\delta} > 0$ and $\partial\Gamma_2/\partial V_{AB} = \frac{\alpha^2}{2}(\hat{\delta} - \gamma c) < 0$ for $\hat{\delta} = \hat{\delta}^D$,

$$\partial\hat{\delta}^D/\partial V_{AB} = -\frac{\partial\Gamma_2(\hat{\delta}^D)/\partial V_{AB}}{\partial\Gamma_2/\partial\hat{\delta}} > 0.$$

Furthermore, since $\partial\Gamma_2(\hat{\delta}^D)/\partial\alpha = 0$, $\partial\hat{\delta}^D/\partial\alpha = 0$. ■

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