Asset Services and Financial Intermediation

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Section 1: Introduction

Financial intermediaries are agents, or groups of agents, who are delegated the authority to invest in financial assets. In particular, they issue securities in order to buy other securities. A first step in understanding intermediaries is to describe the features of the financial markets in which they are important and the technology that allows them to provide beneficial services. In particular settings where intermediation is important, it is possible to obtain an endogenous specification of the form of the contracts written by the intermediaries, allowing predictions about how changes in the economy or in regulations affect the behavior of intermediaries and the markets in which they operate.

A major focus of recent literature on intermediation has been on the types of services supplied by intermediaries and how their organizational form facilitates providing these services. Intermediaries provide services: this is clear because intermediaries issue "secondary" financial assets to buy "primary" financial assets. If the intermediary provided no services, those investors who buy the secondary securities issued by the intermediary might as well directly purchase the primary securities and save the intermediary's costs.

Microeconomic studies of intermediaries have integrated the study of financial institutions into the economics of corporation finance and the theory of optimal contracts. Most of the advances involve understanding the role of intermediaries when there are financial contracting problems caused by private information. Much of the motivation for recent work comes from the suggestion in Leland-Pyle [1977] (LP, hereafter) that information collection by intermediaries might help to improve on the costly signalling equilibrium in markets for new issues that they analyze. Although LP do not model intermediaries, their suggestions have proved to be insightful in identifying a specific role for intermediaries. A review and extension of their approach is presented in section 3.

1.1 Three types of intermediary services

To explain the sorts of services that intermediaries offer, it is useful to categorize them in terms of a simplified balance sheet. **Asset services** are those provided to the issuers of the assets held by an intermediary, e.g., to bank borrowers. An intermediary that provides asset services is distinguished by its atypical asset portfolio. Relative to intermediaries not providing asset services, its portfolio will be specialized in assets that the intermediary has a comparative advantage in "holding." The literature that we discuss below develops a foundation for understanding this aspect of intermediation. There are two other important aspects of intermediation that we do not survey here: liability services and transformation services. **Liability services** are those provided to the holder of intermediary liabilities, that are in addition to the services provided by most other securities. Examples include the ability to use bank demand deposits as a means of payment and the personalization of contingent contracts available from life insurance companies. Some liability services, for example check
clearing, are well understood, while others relate to unresolved issues regarding the role of money in microeconomic theory, see Townsend [1979,1983]. Some services do not fit into this balance sheet dichotomy because they relate to both assets and liabilities. **Transformation services** involve the conversion of illiquid assets into liquid liabilities, offering improved risk sharing compared with non-traded direct investment in the assets that intermediaries hold (see Diamond-Dybvig [1983]); these are discussed elsewhere in this volume, in the chapter by Jacklin.

If intermediaries provide asset services, then they provide services to borrowers who issue assets to them. That is, it matters to the issuer of an asset that the asset is to be held by an intermediary rather than directly by investors. This means there are some costs that are lower if the asset is held by an intermediary rather than a large number of individuals. We examine how a financial intermediary acting as a middleman can reduce these costs, and develop the implications of this role for the structure of intermediaries.

Whether intermediaries are viable depends on their net cost saving. The imperfections that give rise to costs of issuing securities by primary borrowers could offer also give rise to similar costs to an intermediary that issues deposits. The goal of a theory of financial intermediation is to show how intermediaries help, even when they face the same technology as others in the economy (or to explain why they have access to a better technology).

**Section 2: Financial Intermediation and Monitoring**

2.1 **The Value of Information in Loan Contracts**

Theories based on the collection of private information by an intermediary require that there be some benefit to using this additional information in lending. A key result in the agency theory literature is that monitoring by a principal can allow improved contracts. In section 3 below we review results that show that additional information can be useful when the problem is adverse selection (private information of a borrower about his default prospects). Whether there is a net demand for this monitoring depends on the cost of monitoring as well. This cost depends on the number of lenders who contract with a given borrower.

In contracting situations involving a single lender and a single borrower, one compares the physical cost of monitoring with the resulting savings of contracting costs. Let $K$ be the cost of monitoring and $S$ the savings from monitoring. When there are multiple lenders involved, either each must be able to monitor the additional information directly at a total cost of $M \times K$, where $M$ is the number of lenders per borrower, or the monitoring must be delegated to someone. Delegating the monitoring gives rise to a new private information problem: the person doing the monitoring as agent now has private information and perhaps even the fact that he actually monitored is not directly verifiable. Delegated monitoring can lead to delegation costs. Let $D$ denote the delegation cost per
borrower. A complete financial intermediary theory based on contracting costs of borrowers must model the delegation costs and explain why intermediation leads to an overall improvement in the set of available contracts. That is, delegated monitoring pays when

\[ K + D \leq \min \{ S, M \times K \}, \]

because \( K + D \) is the cost using an intermediary, \( S \) is the cost without monitoring, and \( M \times K \) is the cost of direct monitoring.

Diamond [1984] presents a model of monitoring by a financial intermediary. The model analyzes delegation costs and the organizational structure and contractual form that minimizes these costs. Although the points developed there are more general, the analysis is carried out in the simplest setting where there is an obvious need for monitoring additional information.

To study the benefits of intermediation, the first step is to find the best available contracts between borrowers and lenders if there is no intermediary and no monitoring. This is an input in determining the value of \( S \). The complication assumed is that the ex-post profitability of each investment project is observed only by risk neutral potential borrowers who have limited wealth. All other information, such as the expected return of the project, is symmetric. The project is large and therefore capital is needed from many lenders. Because the return of the investment project is not observed by potential lenders, if there is no monitoring the contracts that borrowers write cannot be contingent on the realized return and must be uncontingent (debt) contracts. The optimal financial contract between borrowers and lenders is shown to be a debt contract that involves positive expected deadweight bankruptcy costs which are necessary to provide incentives for repayment. The gross demand for monitoring arises because one can use lower cost contracts (with reduced bankruptcy costs) if the project's return can be made observable, with a saving of \( S \). In practice, the type of contract that could be used with monitoring is one with a more restrictive set of covenants that are renegotiated on the basis of costly information if there is a potential default on a covenant.

Monitoring is costly, especially if duplicated. The act of monitoring, if delegated, and the information then obtained by the intermediary are not publicly observed. As a result, there are delegation costs associated with providing incentives for the intermediary to monitor the information and to take the appropriate actions based on that information. Because the depositors in the intermediary do not observe the intermediary's information, the claims they hold on the intermediary are also simple debt contracts (for the same reason that debt contracts are best when lenders and borrowers contract directly).

2.2 Diversification and Delegation Costs

If the intermediary did not diversify, and monitored a single lender, it would have delegation costs just as high as the contracting costs the borrower would incur if it borrowed directly without monitoring. In any situation where the borrower would have
defaulted and incurred bankruptcy costs, the intermediary would also default and incur the same cost, implying that $D \geq S$.

Diversification within the intermediary is shown to reduce delegation costs. If the returns of borrowers' projects are mutually independent and bounded, the per-borrower delegation cost, $D$, approaches zero as the number of borrowers grows. If there are systematic risks influencing many borrowers' projects, then the intermediary will condition the required payments on these observable risks. If the contracts are not conditioned on these variables, then the intermediary (or the borrowers themselves) will hedge as many of those risks as possible in futures markets. This provides a positive theory of within-the-intermediary diversification (than cannot be replaced by diversification by depositors) and of hedging by publicly held intermediaries or firms.

2.2.1 The Role of Diversification

One explanation for the value of the diversification is that it helps to remove the information asymmetry between the intermediary and its depositors. The realization of any given project's return is private information, but the distribution of project outcomes is public information. With diversification over a large number of independent projects, the realization of the average converges in probability to its expected value. Even limited diversification can suffice for viable intermediation based on collection of private information.

The diversification discussed above involves an intermediary making and monitoring loans to large numbers of borrowers and issuing debt deposits to many depositors. All investors and bankers are assumed to be risk neutral: the diversification is useful because it reduces delegation costs. The intermediary was assumed to have a single manager (or top manager who provides incentives to lower level employees). If intermediary managers are risk averse, diversification might be thought to also make their income stream less risky. However, the value of diversification to a risk averse agent is traditionally due to the ability to subdivide risks and share them with others: it is less risky for each of two agents to bear 50% of two independent identical gambles than to bear either one alone. With a single manager, there is no subdivision of risks—increasing the number of loans made increases the number of independent risks added rather than subdividing any risk, see Samuelson [1963]. A class of risk averse preferences for which diversification by adding risks does improve expected utility of wealth is characterized in Diamond [1984] (decreasing absolute risk aversion and positive fourth derivative of utility of consumption). This allows a motivation in addition to saving on delegation/bankruptcy costs for diversification in single-top-manager intermediaries when there is risk aversion.

Another way to model diversification with an intermediary is to assume that there are no incentive problems within the intermediary itself, and that as a result there can be substantial risk sharing (subdivision) among agents working together in the intermediary. If
there is a tradeoff between risk sharing and incentives or self-selection, then risk sharing within an intermediary can reduce the magnitude of the tradeoff. Risk sharing then provides another reason why there could be an overall improvement in the set of available contracts when an intermediary spends resources to monitor private information.

Ramakrishna-Thakor [1984] generalizes the analysis of adding risks in Diamond [1984], providing a model of delegated information production based on risk subdivision, assuming there is no incentive problem within the intermediary. They examine the feasibility of delegating the production of reliable information when the act of investing in information and the information itself is not publicly observed. The main result is that if the information is produced about N firms with independently distributed returns and there are N risk averse agents who all directly observe each other's actions and information, then the risk bearing cost of providing incentives for producing information and revealing it truthfully is a decreasing function on N. If N grows very large, then there is perfect risk sharing among the agents working within the intermediary, and the risk sharing cost of providing incentives to them approaches zero. If the agents working within the intermediary cannot directly observe each other's actions and information, then there is no benefit to diversification, because large amounts of risk must be imposed on each agent to provide incentives to produce the information.

The contracts to provide incentives to information producers make the compensation of each employee of the information producer depend directly on the average of the information announced by all employees of the producer and on the information that subsequently becomes available about each firm investigated. These contracts need not have any special structure common to financial intermediaries. As a result, it appears that the value of diversification by subdivision is quite general in reducing costs of moral hazard or adverse selection caused by suboptimal risk sharing, and that it could also provide a useful basis for a theory of conglomerate firms. The most troubling aspect of the analysis is the assumption that there are no moral hazard or adverse selection problems within an organization. It would be interesting to integrate the analysis of diversification by adding risks (that implies concentration of risk bearing by a "top manager" of an organization) with some limited risk sharing within an organization made incentive-compatible by effort monitoring by the "top manager". The analysis in Mookherjee [1984] of the possibilities for internal monitoring when various agents within a firm optimally break up tasks provides a promising foundation for such an integration.

Section 3: Self-Selection and Intermediary Information Production

Another factor that complicates contracting between borrowers and lenders is a borrower's possession of private information about his ex-ante ability to repay. This implies that there is an adverse selection problem where borrowers with unpromising projects are the most likely to sell securities to outsiders. Such problems can
result in market failure, as in Akerlof [1970], or in possibly costly signalling equilibria, as in LP. Boyd-Prescott [1986] presents an intermediation model based on adverse selection, that we describe next. The implications for intermediation of LP are developed in section 3.2, where the related work of Chan [1983] is discussed.

Boyd-Prescott [1986] analyzes a model where risk neutral individuals have private information about the prospects for their production projects, and the information is useful for deciding whether to fund the projects. Projects require outside financing and even individuals with bad projects have an incentive to borrow to operate them. There is a project evaluation technology that can reveal to the public, at a cost, some information about a project's prospects. The paper characterizes an optimal contractual mechanism, that generally involves contracting for the use of the evaluation technology and uses the ability to commit. This implies that agents are promised different ex-post treatment than they would receive in a security market for the purpose of facilitating self-selection of agents with profitable projects. All can observe whether an evaluation takes place and the outcome of the evaluation.

Under certain conditions, there is a role in this environment for diversified financial intermediaries, rather than for contingent contracts between groups of agents. This occurs when the evaluation technology reveals some information that is not known even to the project owner. The evaluation serves two purposes: one as a signal (to reveal the individual's confidence that he will get a good evaluation), and one as a further input to production decisions, even given the signal of the individual's information. Intermediaries are modeled as large coalitions where diversification is useful because it allows the coalition to use the information about the proportion of each type of agent (i.e., the number who will receive good evaluations and the number who will receive bad evaluations) before contracts are written. Diversification is useful in this environment because it facilitates commitment by the agents. Agents contract for investment decisions and contingent payments between agents that differ from what an ex-post market would produce. Without diversification, the realized fraction of each type of agent is random, and if too many agents have promising projects, the coalition may have insufficient capital to fund them all. This can force some agents into the ex-post market, which increases the costs of producing self-selection. If the evaluation served only to enforce truthful signalling, and did not reveal useful new information, diversification would not be necessary because any size coalition would have a non-stochastic proportion of each type of agent, conditional on the self-selection actions of the agents.

This approach, with intermediaries performing a screening function, appears promising and realistic. The role of diversification in the Boyd-Prescott [1986] model is similar to that in Diamond [1984]: it allows the population (rather than sample) parameters to be those used in contracting. It suggests an interesting extension: diversification allows an intermediary to get around incentive
problems when the outcome of its evaluation is not observed to the public. It simply commits to give a certain fraction of each type of evaluation, knowing that someone will deserve each type: this is similar to the advantages of rank order tournament or a seniority system (see Bhattacharya [1983] and Carmichael [1983]). If the outcome of the evaluation is not observed by the public, then the intermediary must have incentives to reveal or at least take acts based on the information. This would provide a theory of screening by intermediaries in an environment similar to the monitoring theory in Diamond [1984]. Next we review the LP paper, which presents an environment where screening could be useful. Then we show how it can serve as a foundation for a screening based intermediary theory, in a way consistent with the original conjectures in LP.

3.1 Project specific risk and signalling costs in the Leland-Pyle model

The LP paper shows how private information observed by a firm going public, but facing unlimited liability, can lead to costs of excessive bearing of specific (diversifiable) risk, compared to a situation of no private information. The only private information the firm's owner possesses is about the project's mean; the model assumes that the variance of the project and its covariance with the exogenously specified "market" are common knowledge.

The LP paper shows that the fraction of equity an entrepreneur will retain in his project is increasing in his assessment of its mean and that there is strict overinvestment in the project by the manager, relative to full information. The remainder of the results in the paper use the assumption of a normal distribution of project returns and exponential utility for the entrepreneur. The assumption of normal distributions and the restriction to the linear risk sharing offered by equity and unlimited liability debt implies that the covariance with the market will not affect signalling costs or contractual forms because the entrepreneur can eliminate the "market risk" by trading in the "market portfolio." The entrepreneur cannot sell off the firm-specific risk separately from the return of the project itself (because the firm specific component is not observed elsewhere), so the entrepreneur must bear some of it to enforce truthful signalling.

Signalling costs are never prohibitive because any project that has a positive net present value under full information will be financed (the entrepreneur will invest at least a small amount in any favorable lottery, and because the outsiders know the specific risk, a smaller investment in a project with high specific risk will indicate that the entrepreneur a given amount of good news). The amount of equity retained by the entrepreneur is decreasing in the specific risk and in the entrepreneur's coefficient of risk aversion because high specific risk or risk aversion implies outsiders are impressed with even small investments. One other result, Proposition III, contains an error.

Proposition III as stated claims that increased specific risk increases the entrepreneur's expected utility. In fact, it is shown
in Diamond [1984] that the reverse is true, it decreases expected utility (Barclay [1984] also notes this error). The intuitive reason behind the correct result is that a small increase in specific risk increases the variance of the entrepreneur's wealth in equilibrium, but leaves its mean unchanged. Referring to the proof of Proposition III in LP, the correct expression for the derivative of expected utility with respect to specific risk, \( Z \), is shown in Diamond [1984] to be:

\[
\frac{dE[U]}{dZ} = -b \{ (1-\alpha) \left[ \log(1-\alpha) + \alpha \right] + (\alpha/2) \} < 0.
\]

LP obtained a positive sign for the derivative by omitting the final \( \alpha/2 \) term.

### 3.2 Financial Intermediation in the Leland-Pyle Model

In addition to providing a model of the determinants of the cost of signalling, LP propose the basis of a financial intermediation theory. No analysis is presented, but they make two suggestions about such a theory. They suggest that one reason why delegating ex-ante information production to an intermediary may be important is a general problem with markets for information that stems from opportunities for reselling information. Chan [1983] constructs a search model extending this notion of a public-good problem with information collection: information collectors capture only a fraction of the social benefit of higher effort by entrepreneurs. This is an alternative model of the gross demand for intermediation. Delegation costs are assumed to be absent.

The second suggestion is that information collection might be reliably delegated to an intermediary if the intermediary itself were required to signal. Rather than entrepreneurs' signalling directly, the information could be collected at a cost by an intermediary, and then signalled by the intermediary. For this suggestion to be useful, one must analyze the associated delegation costs. Are the signalling costs of the intermediary, per-project, less than the costs of directly signalling the information by the individual project entrepreneurs? If not, intermediation would not be viable even if the intermediary could observe each firm's information at no cost. Campbell-Krackaw [1980] recognizes a related problem and presents a model quite different from that of LP, providing an example where intermediation cannot be explained by information collection. The Campbell-Krackaw analysis neither considers diversification nor permits intermediaries to write observable optimal contracts. As a result, it is an incomplete analysis of the feasibility of "delegated signalling".

An analysis of the feasibility of intermediation in the LP model, based on diversification, is presented in Diamond [1984]. Diversification by adding risks (many independent projects investigated by a single top intermediary manager who signals with retained equity) is shown to be neutral: under the assumed preferences in LP, the per-project signalling costs are exactly the same for the intermediary as they would be if the individual project managers signalled directly by retaining their own equity. This implies that this does not lead to viable intermediation,
because there are no cost savings to offset the intermediary's information production costs. For other valid risk averse preferences, that would complicate solving the model, but not violate its logic, this type of diversification is beneficial. Diversification by subdividing risks (many independent projects investigated by many employees in an intermediary who observe each other's information and effort) does allow delegated signalling, because the variance of specific risk per-employee is a decreasing function of the number of independent projects investigated. The corrected version of Proposition III shows that this will reduce signalling costs. Delegated signalling is potentially viable in the LP structure, but this conclusion depends on the information structure within the intermediary.

Section 4: Conclusion

The recent literature on asset services and the role of intermediation has produced a large crop of positive implications about the structure of intermediaries. The importance of diversification and the collection of private information helps explain the reasons for the comparative advantage possessed by intermediaries in some financial markets.

Many fundamental aspects of intermediation remain unexplored. The collection of private information by an intermediary often implies that its assets will be illiquid, perhaps because the information asymmetry results in the absence of any secondary market for them. In multiple period models with private liquidity shocks received by depositors, exogenous illiquidity of assets leads to the desirability of demand deposits and potential problems with bank runs (see the chapter by Jacklin). It would be interesting to integrate these two approaches and examine bank runs and optimal multiperiod contracts when intermediaries collect private information. In addition, private information about the ex ante risk and value of assets can give rise to moral hazard problems with deposit insurance. Most studies of these problems (eg. Kareken-Wallace [1978], Merton [1978], and Dothan-Williams [1980]) assume complete markets where intermediaries provide no services. This implies that any distortion caused by deposit insurance is a net social loss. It would be interesting to investigate the second best optimum with useful intermediaries and the moral hazard constraint on deposit insurance pricing. Finally, some results on the determinants of the demand for intermediation by different sorts of borrowers would be useful. The analysis in Diamond [1985] suggests that moral hazard and adverse selection problems are most severe for borrowers with a short track record (and an implied low value of reputation capital), implying that these borrowers receive the greatest benefit from the asset services of intermediaries. This hints at a possible "life cycle" model where borrowers have a choice each period between borrowing through an intermediary and issuing securities directly. Analysis of the competing roles of financial markets and financial institutions should help us understand the microeconomic structure of corporate and individual financial decisions.
REFERENCES


