

Market microstructure: intermediaries and the theory of the firm

This book presents a theory of the firm based on its economic role as an intermediary between customers and suppliers. Professor Spulber demonstrates how the intermediation theory of the firm explains firm formation by showing why firms arise in a market equilibrium with costly transactions. In addition, the theory helps explain how markets work by showing how firms select market-clearing prices. Models of intermediation and market microstructure from microeconomics and finance shed considerable light on the formation and market-making activities of firms. The intermediation theory of the firm is compared with existing economic theories of the firm, including neoclassical, industrial-organization, transaction-cost, and principal-agent models.

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Preface and acknowledgments

Two fundamental and closely related questions raised by microeconomics are “Why are there firms?” and “How do markets work?” In this book, I set out an intermediation theory of the firm that addresses these two important questions. The intermediation theory of the firm provides explanations for the formation of firms by showing how firms arise in a market equilibrium. In addition, the theory helps explain how markets work by showing how firms select market-clearing prices. Models of intermediation and market microstructure from microeconomics and finance shed considerable light on the formation and market-making activities of firms.

The analysis of firms begins with the observation that firms act as intermediaries between their customers and their suppliers. Without firms, consumers acting as buyers and sellers would engage in direct exchange, searching for each other and bargaining over the terms of trade.

The intermediation theory of the firm can then be summarized: *Firms are formed when the gains from intermediated exchange exceed the gains from direct exchange.* Intermediated exchange can have advantages over direct exchange for many reasons, which are set forth in this book. These include lowering the costs of transacting through centralization of exchange, reducing costs of searching and bargaining, reducing moral hazard and opportunism, alleviating the effects of adverse selection, allowing buyers and sellers to make credible commitments, and reducing the costs of monitoring performance through delegation.

Resources are allocated through decentralized processes of direct exchange, through centralized exchange managed by intermediaries, or through some combination of the two. The institutions of exchange are referred to as market microstructure.

The analysis suggests an intermediation theory of markets that explains how markets work. With intermediated exchange, firms select prices, clear markets, allocate resources, and coordinate transactions. Thus *firms establish and operate markets.*

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I confine my analysis to economic issues pertaining to the economic theory of the firm and market mechanisms. The book does not cover a number of related topics. I do not consider the vast and rapidly growing literature on empirical analysis of financial markets. See Campbell, Lo, and MacKinlay (1997) for an outstanding integrative survey of the econometrics of financial markets. I do not consider research on the sensitivity of market outcomes to changes in the rules for price setting, matching orders, time priority, market versus limit orders, size precedence, trade class (specialist, market maker, or dealer quotes), and so on. Some of these issues are specific to financial markets in which market performance can depend significantly on small variations in trading rules.¹ Financial studies of market microstructure raise important theoretical and empirical questions about how prices are adjusted and communicated and how changes in demand and supply are reflected in the allocation of goods and services over time. I also do not address theoretical issues bearing on the detailed theory of financial institutions. For excellent treatments of the theory of financial market microstructure and financial institutions see O'Hara (1995) and Frankel, Galli, and Giovannini (1996). I consider only briefly issues pertaining to the theory and institutions of banking; see the excellent recent text of Freixas and Rochet (1997) on the microeconomics of banking.

I draw on the following previously published papers.

- Spulber, Daniel F., 1996, "Market Making by Price-Setting Firms," *Review of Economic Studies* 63, 559–80.
- Spulber, Daniel F., 1996, "Market Microstructure and Intermediation," *Journal of Economic Perspectives* 10, 135–52.
- Spulber, Daniel F., 1995, "Bertrand Competition when Rivals' Costs are Unknown," *Journal of Industrial Economics* 43, 1–12.
- Spulber, Daniel F., 1994, "Economic Analysis and Management Strategy: A Survey Continued," *Journal of Economics & Management Strategy* 3, 355–406.
- Spulber, Daniel F., 1992, "Economic Analysis and Management Strategy: A Survey," *Journal of Economics & Management Strategy* 1, 535–74.
- Spulber, Daniel F., 1993, "Monopoly Pricing," *Journal of Economic Theory* 59, 222–34.
- Spulber, Daniel F., 1993, "Monopoly Pricing of Capacity Usage Under Asymmetric Information," *Journal of Industrial Economics* 41, 1–17.

The present work is the product of two decades of teaching economics to students of economics, law, and business. I thank my many students whose stimulating questions helped me to reevaluate neoclassical economics and especially my business students, whose concerns required addressing the economic theory of the firm.

¹ See Domowitz (1992, 1993) for taxonomies of automated trade execution systems that consider these and other aspects of market microstructure.

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Introduction

The intermediation theory of the firm provides an explanation for why firms exist. Firms are formed when intermediated exchange provides greater gains from trade than direct exchange between consumers and suppliers. The theory also helps to explain how markets work. Markets reach equilibrium through strategic pricing and contracting by intermediaries.

Under some circumstances, intermediaries may have advantages over direct exchange in a number of activities:

1. Reducing transaction costs.
2. Pooling and diversifying risk.
3. Lowering costs of matching and searching.
4. Alleviating adverse selection.
5. Mitigating moral hazard and opportunism.
6. Supporting commitment through delegation.

In this introductory chapter, I illustrate the intermediation theory of the firm with a series of basic examples. Later chapters present a more complete analysis of the models that underlie these examples.

Some advantages derive from coordination economies: the firm is recognized as a central place of exchange, thus reducing costs of search. Other advantages derive from economies of scale and scope in subtle ways. For example, because an intermediary can handle a higher volume of transactions than individual buyers and sellers, the intermediary is able to reduce risk through pooling and diversification. Other advantages stem from longevity and economic incentives to build a reputation. In particular, intermediaries who are able to make credible commitments bring advantages over contracts between buyers and sellers that are subject to renegotiation.

The intermediation theory of the firm

In this section, I illustrate the intermediation theory of the firm by means of a simple example. The example is consistent with a pure exchange economy but applies to production economies as well.

Consider a simple economy with one consumer and one supplier (who may be another consumer). The supplier has one unit of a good available for purchase by the consumer. The supplier has an opportunity cost C of supplying the good. The consumer has a willingness to pay V for a unit of the good. I use the term direct exchange to refer to the consumer's purchase of a unit of a good from the supplier. The consumer and the supplier meet and bargain over the terms of exchange.

I start with a simplistic notion of transaction costs as a lump sum. Later on, I will be much more specific about the nature of transaction costs. Suppose that the consumer and the supplier encounter total transaction costs equal to T . Assume for now that there are positive net gains from trade:

$$V - C - T > 0.$$

The process of decentralized exchange can involve noncooperative bargaining processes such as first-and-final offers and exchanging alternating price offers. Assume for simplicity that the consumer and the supplier evenly divide the net gains from trade:

$$(V - C - T)/2.$$

All the results in this chapter generalize easily to uneven splits in gains from trade.¹

Suppose that an intermediary can purchase the good from the supplier at some price w and resell it to the consumer at some price p . Assume that the intermediary can commit to price offers. With intermediated exchange, suppose that the intermediary bears all the transaction costs, which equal K . The intermediary competes with direct exchange. Suppose for now that the consumer and the supplier have the same willingness to pay and the same opportunity cost in intermediated exchange and in direct exchange. Then it is apparent that intermediated trade will occur if and only if intermediation lowers transaction costs:

$$K \leq T.$$

This is the main building block of the intermediation theory of the firm. In general, the introduction of intermediaries can change the equilibrium levels of gains from trade and even the transaction costs of direct exchange, as later examples will demonstrate.

The entry of an intermediary can be illustrated by means of a basic noncooperative game. The consumer and the supplier must choose individually whether to trade directly or through an intermediary. If the

¹ An even division of the net gains from trade corresponds to the Nash bargaining solution.

buyer and the seller decide to trade directly, they can make side payments to each other before negotiating the terms of trade. The sequence of events is as follows.

- Period 1. The intermediary makes a binding offer of an ask price p and a bid price w .
- Period 2. After observing p and w , the consumer and the supplier decide whether to try to trade directly with the other agent or to accept the intermediary's offer. If they do not agree to transact with each other, they both transact with the intermediary.
- Period 3. If the consumer and the supplier both choose to transact with the intermediary, trade takes place at p and w . If the consumer and the supplier both choose to transact with each other, they negotiate over the allocation of gains from trade.

The game among intermediaries, consumers, and suppliers assumes that intermediaries are able to make binding commitments to prices. Individual consumers and suppliers are able to commit to trade with each other, but they are not able to make price commitments. The ability of the intermediary to make price commitments reflects the idea that the intermediary wishes to uphold a reputation for trading at posted prices.

An intermediary trades a larger volume of goods than individual buyers and sellers. Moreover, an intermediary is in the market for more periods of time than individual buyers and sellers. Firms often are said to be bearers of reputation that outlasts the individuals who comprise the firm at any particular time. The volume of trades and the longevity of the intermediary create returns to building a reputation.

Consider first the case of a monopoly intermediary. The monopoly ask price p^M and bid price w^M leave the buyer and the seller indifferent between transacting with the intermediary and direct exchange:

$$V - p^M = (V - C - T)/2 = w^M - C.$$

The monopolist's markup exactly equals the transaction cost of direct exchange, $p^M - w^M = T$, so the monopolist's profit equals

$$p^M - w^M - K = T - K.$$

Thus the monopoly intermediary is economically viable if and only if $K \leq T$.

Consider the case of Bertrand price competition between intermediaries. Competition drives the profits of the intermediaries to zero so that the markup just equals their transaction costs:

$$p^C - w^C = K.$$

The consumer and the supplier who deal with competitive intermediaries obtain total gains from trade equal to $V - C - K$. Suppose that these gains are split evenly by the competitive prices:

$$V - p^C = (V - C - K)/2 = w^C - C.$$

Consumers and suppliers will be attracted by the prices p^C and w^C if and only if transaction costs of intermediated exchange do not exceed those under direct exchange. As in the monopoly case, the competitive intermediaries are economically viable if and only if $K \leq T$.

Transaction costs under intermediated and direct exchange can arise because of many different factors. Suppose for example that intermediated exchange occurs immediately while direct exchange requires a delay for search and bargaining. After the delay, gains from trade $V - C$ are realized and divided evenly between the consumer and the supplier. If the consumer and the supplier discount future benefits at rate δ , then the present value of returns from direct exchange equal $\delta(V - C)/2$.

This is equivalent to assuming that the transaction costs of direct exchange are

$$T = (1 - \delta)(V - C).$$

An intermediary is viable if and only if $K \leq (1 - \delta)(V - C)$. The intermediary is more likely to be viable if the discount factor is low, the consumer's willingness to pay is high, and the supplier's opportunity cost is low. Because there are time costs of search and bargaining, higher gains from trade increase the chance that an intermediary will be economically viable.

The process of search can be imperfect so that the consumer and the supplier meet only with some probability β . Suppose that the intermediary has a well-known address. Then the transaction costs of direct exchange are

$$T = (1 - \beta)(V - C).$$

If the matching process is inefficient so that β is small, intermediated exchange will have an advantage over direct exchange.

These examples introduce the intermediation theory of the firm. The existence of firms can be justified even in a pure-exchange economy, since the comparison between modes of exchange does not depend on production of goods. Firms arise as a means of economizing on transaction costs, not by internalizing transactions but by carrying them out more efficiently. I now turn to other ways in which intermediated exchange can lower transaction costs.

Market microstructure

Neoclassical economics leaves open the question of how markets attain equilibrium prices. In contrast, intermediation theory identifies price setting by firms as the mechanism by which the economy attains market-clearing prices. I address these issues in Chapters 1–4, which look at market microstructure in a number of settings including monopoly, oligopoly, Bertrand competition with entry, and general equilibrium.

Firms select prices to balance their purchases and sales. They select ask prices to earn revenues and ration consumer demand. They select bid prices to stimulate suppliers and keep down purchase costs of inventories. Buy and sell prices are adjusted to equate marginal revenues and marginal cost subject to sales not exceeding purchases and inventories.

Market microstructure theory requires that some firms have a measure of local market power, that is, there must be some price makers in the economy. In balancing their purchases and sales over time, firms allocate resources and clear markets.

Intermediaries provide other important market-making services as well. They hold inventories of goods on hand and stand ready to sell to customers. They further have cash on hand and stand ready to buy from suppliers. This avoids the problem of the coincidence of wants, in which a buyer and a seller need to want to transact with each other at the same time. This function is familiar in securities markets, in which financial intermediaries provide liquidity by standing ready to buy and sell stocks. In retail and wholesale markets, intermediaries provide similar immediacy services by standing ready to buy and sell commodities. The cost of carrying inventories serves to create a bid–ask spread. The dynamic path of prices responds to the intermediary’s inventory level and associated risks.

The inventories of firms help to clear markets, smooth the patterns of demand and supply fluctuations, and reduce the risks of exchange. Quantity rationing of buyers and sellers is complementary to the firm’s price-setting activities. As market makers, firms allocate goods and services across buyers and adjust purchases from suppliers to reduce the costs of carrying inventories while providing availability to customers.

In securities markets, intermediaries like stock specialists smooth the pattern of exchange, creating market liquidity by holding inventories.² Demsetz (1968) investigates the effects of trading volume on transaction

² Baumol (1965) examines market makers and stability in the stock market. Stoll (1985) surveys alternative views of financial market making, examining the market maker as auctioneer, price stabilizer, information processor, and supplier of immediacy. He observes that only the latter two roles are based on maximizing behavior by the market maker.

costs at the New York Stock Exchange and observes that “the ask–bid spread is the markup that is paid for predictable immediacy of exchange in organized markets; in other markets it is the inventory markup of retailer and wholesaler.” Specialists on the New York Stock Exchange are compensated for managing orders and for assuming risk by standing ready to carry out trades on their own account.

In an early model of market structure due to Garman (1976), buy and sell orders arrive randomly.³ The rates at which orders arrive can be interpreted as stationary demand and supply functions that depend on the ask and bid prices. A risk-neutral dealer with market power maximizes expected profit per unit of time, subject to the restriction that the stock inventory does not drift upward or downward, which means that the market clears at each date.⁴ Ho and Stoll (1980, 1981) and Stoll (1978b) assume that the securities dealer is risk averse. The bid–ask spread reflects the elasticity of demand and supply and the dealer’s degree of risk aversion. In addition, the bid–ask spread tends to increase the longer the dealer’s planning horizon. Adding more periods provides the dealer with more opportunities for price adjustment, but increases the dealer’s risk, thus requiring greater compensation and widening the bid–ask spread.

Firms in product markets provide analogous market-making services. Clower and Leijonhufvud (1975) observe that intermediaries provide availability of products. They note that since consumers and firms face fixed transaction costs, they produce or sell at discrete time intervals, which can create problems of the double coincidence of timing. Intermediaries hold inventories to provide immediacy or availability to buyers and sellers. This happens both when retailers and wholesalers purchase goods from suppliers and hold the inventories needed to serve buyers and when manufacturers keep inventories of parts on hand and create product inventories. Just-in-time inventory management is a means of providing immediacy while lowering inventory costs.

By holding inventories, firms acting as intermediaries reduce the risk of market transactions when demand fluctuates randomly. Retail and wholesale intermediaries diversify by purchasing and reselling a variety of products, thus pooling supplier risk; see Lim (1981). Spulber (1985) shows that manufacturers and wholesalers enter into financial

³ On the determinants of the bid–ask spread, the interested reader might begin with West and Tinic (1971), Tinic (1972), Benston and Hagerman (1974), Logue (1975), Stoll (1978a, 1978b), Ho and Stoll (1980, 1981), and Cohen et al. (1981).

⁴ Since profits and inventories of the stock follow random walks, the intermediary with finite inventories will almost certainly go bankrupt at some point. However, Garman (1976) avoids this issue by considering the case in which the intermediary has infinite inventories of both cash and stock.

risk-sharing arrangements with retailers and pool inventories in central warehouses to smooth out differences in demand across stores. Large retail chains achieve important advantages through diversification of demand risk across individual stores.

Intermediaries have an advantage over direct exchange between buyers and sellers because the increased volume of transactions reduces the variance of sales and of purchases. In direct exchange, buyers and sellers face the possibility of being rationed because of demand and supply side shocks. By standard law of large numbers arguments, the variance of expected purchases and sales falls with scale. Moreover, by serving multiple markets or by handling a broader range of products, intermediaries reduce risk through diversification.

Intermediated exchange versus matching and searching

Market intermediaries coordinate the actions of buyers and sellers. Firms carry out transactions, operating the system of payments, inventory control, and record keeping that is essential for markets to function. In addition, firms provide a central place of exchange, thus reducing the search costs of buyers and sellers. Chapters 5 and 6 compare the costs of intermediation with those of direct exchange in markets with matching of buyers and sellers or costly search.

Marketers – including retailers, wholesalers, used-car dealers, and energy dealers – purchase and resell goods. Brokers – including travel agents, real estate agents, insurance agents, and stockbrokers – provide coordination services without buying and selling goods.⁵ These intermediaries improve the welfare of consumers and suppliers by reducing or eliminating the uncertainty associated with making a satisfactory match. Intermediaries also add to the number of potential trading partners, thereby increasing the likelihood of encountering a trading partner and reducing search costs.

Intermediaries must compete with decentralized exchange, in which consumers and suppliers seek each other out and negotiate prices directly.⁶ Sometimes both forms of exchange exist side by side. For example, an organized used-car market operated by automobile dealers coexists with a decentralized market in which buyers and sellers meet informally, often

⁵ In Yinger (1981), real estate brokers set housing prices, fix commissions, and invest in search for buyers and sellers of houses. His model explains the value of shared listings such as the Multiple Listings Service.

⁶ See Rubinstein and Wolinsky (1987), Bhattacharya and Hagerty (1987), Yavas (1992), Yanelle (1989), and Gehrig (1993).

through newspaper advertising. What are the advantages of transacting with an intermediary?

Consider first the matching market. Consumers have diverse levels of willingness to pay and suppliers have different opportunity costs. If consumers and suppliers are matched randomly, in a highly decentralized fashion, the terms of the exchange become uncertain and the risk of not completing a trade rises. After all, when consumers and suppliers bargain directly, the buyer has an incentive to understate willingness to pay and the seller to overstate opportunity costs. Asymmetric information about willingness to pay and opportunity costs causes efficiency distortions in the amount traded or even results in the breakdown of trade. An intermediary can eliminate this uncertainty by posting bid and ask prices and thus offer an advantage over a decentralized matching market.

Buyers and sellers can choose between using intermediaries to trade at a known price and the risky option of the decentralized market. Gehrig (1993) models this choice and shows the profitability of intermediation. Suppose that each consumer purchases at most one unit of the good and suppliers sell at most one unit. Then the market demand and supply functions represent the distribution of buyer willingness-to-pay levels and supplier opportunity costs, respectively. The intermediary chooses a profit-maximizing bid–ask spread, given the value to buyers and sellers of the matching-market option. At the market equilibrium, consumers with a willingness to pay above a critical level (greater than the ask price) purchase from the intermediary. Suppliers with opportunity costs below a critical level (less than the bid price) sell to the intermediary. Consumers and suppliers with values between these two critical levels enter the matching market.

The advantage of intermediated exchange can be illustrated by means of a simple example. Suppose that the consumer’s willingness to pay can take one of two values with equal probability, v_L and v_H . Assume that $v_L < v_H$. Denote the expected value of the consumer’s willingness to pay by

$$v = (1/2)v_L + (1/2)v_H.$$

Also suppose that the supplier’s opportunity cost can take one of two values with equal probability, c_L and c_H . Assume that $c_L < c_H$. Denote the expected value of the supplier’s opportunity cost by

$$c = (1/2)c_L + (1/2)c_H.$$

Before entering the matching market, the consumer and the supplier do not know the type of their trading partner. Assume that after a consumer and a supplier decide to trade, they learn each other’s type. At

that point, trade occurs if and only if they have gains from trade. The consumer and the supplier split the gains from trade evenly.

A high-willingness-to-pay consumer can trade with both types of suppliers: $v_H > c_H$. A low-opportunity-cost supplier can trade with both types of consumers: $v_L > c_L$. The market outcome will depend on whether a high-opportunity-cost supplier can trade with a low-willingness-to-pay consumer, that is, v_L may be greater than or less than c_H .

Suppose first that $v_L > c_H$, so that all types will trade in the direct-exchange market. Then, since they are uninformed about the type of their trading partner, the expected gains from trade of a type i consumer and a type j supplier from the direct-exchange market are, respectively,

$$(v_i - c)/2, \quad i = 1, 2, \quad (v - c_j)/2, \quad j = 1, 2.$$

It is easy to demonstrate that there are no prices at which a monopoly intermediary is profitable, (even with zero transaction cost K). For example, suppose that the intermediary chooses the highest ask price and the lowest bid price that will attract the high-willingness-to-pay consumer and the low-opportunity-cost supplier. These prices are

$$p^M = v_H - (v_H - c)/2, \quad w^M = c_L + (v - c_L)/2,$$

It follows that $p^M - w^M = (c_H - v_L)/2 < 0$.

Now suppose that $v_L < c_H$, so that a high-opportunity-cost supplier cannot trade with a low-willingness-to-pay consumer. The expected gains from trade for a high-willingness-to-pay consumer and a low-opportunity-cost supplier do not change. However, because a low-willingness-to-pay consumer has only one other potential trading partner, the low-willingness-to-pay consumer expects gains from trade in the direct exchange market equal to $(v_L - c_L)/4$. A high-opportunity-cost supplier expects gains from trade equal to $(v_H - c_H)/4$.

The intermediary offers prices p^M and w^M and is profitable if $(c_H - v_L)/2 \geq K$. The prices attract the high-willingness-to-pay consumer and a low-opportunity-cost supplier. The low-willingness-to-pay consumer and the high-opportunity-cost-supplier are inactive since they do not gain from direct exchange with each other. Thus, when there is a chance of trade breaking down under direct exchange, $v_L < c_H$, an intermediary will enter the market and a separating market equilibrium will result.

When consumers search for a product, they face costs of travel and costs of learning about prices and comparing product features. When suppliers search for a willing buyer, they incur costs of travel and

of communicating information about their products. As noted earlier, intermediaries reduce transaction costs by centralizing exchange.

However, in a world with multiple intermediaries, consumers and suppliers continue to incur search costs from visiting multiple intermediaries. Spulber (1996a) models a search market with many intermediaries. Consumers and suppliers discount future net benefits, so that the time spent searching is costly. As before, consumers have diverse willingness to pay levels, and suppliers have different opportunity costs. Moreover, firms that intermediate have different transaction costs. Firms set both bid and ask prices. Consumers search across firms to obtain a lower ask price, and suppliers search across firms to obtain a higher bid price. As a result of heterogeneity and costly search, the market equilibrium is a distribution of bid prices and a distribution of ask prices. The equilibrium depends on the discount rate of consumers and suppliers, for which a higher rate of discount lowers the number of active consumers and suppliers and raises the number of active firms. The intuition behind this result is that a higher discount rate increases the cost of time-consuming search for consumers and suppliers. This allows firms to raise ask prices and lower bid prices since consumers and suppliers are willing to pay a premium to avoid further search, thus raising the returns to intermediation by firms. The number of intermediary firms that are active in equilibrium increases.

The discount rate determines the costs of search. As the discount rate falls to zero, the costs of search are eliminated, which shows the relationship between the size of the bid–ask spread and transaction costs. In such a model, the Walrasian equilibrium is the limiting case of an intermediated market as transaction costs diminish. The supply-and-demand model can thus be viewed as an ideal case that is consistent with an underlying market with search costs and price-setting firms.

Alleviating adverse selection

Chapters 7 and 8 examine models in which intermediaries address problems of adverse selection. In Chapter 7, I consider allocation by intermediaries under asymmetric information about buyer willingness-to-pay levels and seller opportunity costs and certification of product quality. In Chapter 8, I turn to adverse selection problems in financial markets, including pricing by informed and uninformed market makers and credit rationing by financial intermediaries.

Brokered exchange differs from trade between a buyer and seller in a subtle way. In direct trade, the buyer's payment must equal the seller's receipt, which constrains the possibilities for bargaining. A

broker introduces many other possibilities for bargaining since the broker can effectively tax or subsidize the transaction. By taxing the transaction, a broker can capture some of the gains from trade by improving the chance that trade takes place.⁷ The broker designs a trading rule that elicits offers from the buyer and the seller and earns a return by creating a spread between the buyer payments and the seller receipts.

In many markets buyers and sellers are asymmetrically informed. Sellers often do not know customer characteristics that underlie market demand. Buyers frequently do not know the quality, durability, or safety of products they seek to purchase. Intermediaries help to fill this gap by collecting and supplying information to their customers and suppliers, often bundled with products and other services. Retailers can test products and describe their characteristics to their customers. Wholesalers report on market demand and customer requirements to their suppliers. Consolidating transactions through intermediaries can yield returns to scale in producing and distributing this information. Intermediaries can capture gains from trade that would be lost because of information asymmetries.

Not only do intermediaries have advantages in gathering and reporting information, they can guarantee that the information they provide is accurate, backing up the guarantee with reputation and binding contracts. Product characteristics frequently are difficult for consumers to observe. Consumers are uncertain about the efficacy of pharmaceuticals, the durability of appliances, or the quality of automobiles. If consumers are less informed than suppliers about product quality, the market can fail to exist as bad suppliers drive out good. In Akerlof's (1970) well-known market-for-lemons model, low-quality used cars drive out high-quality used cars, since consumers are willing to pay only an average price for cars of unknown quality, and only sellers of low-quality cars can trade at that price.

The market for lemons fails to realize potential gains from trade. Customers would be willing to pay for a good car if they could observe its quality. An intermediary can capture some of these foregone returns by certifying the quality of the product. Biglaiser (1993) shows that introducing a monopoly intermediary into a market with adverse selection enhances efficiency. The intermediary has a greater incentive to invest in monitoring quality than does an individual buyer, since the intermediary buys more goods. Thus intermediaries are better able to distinguish higher-quality suppliers from those with lower quality.

⁷ See Myerson and Satterthwaite (1983), Spulber (1989b), and Mookherjee and Reichelstein (1992).

In addition, the intermediary's incentive to report accurately the quality of goods stems from the returns to building a good reputation. These returns can be greater for intermediaries since they carry out more transactions than individual suppliers. Buyers and sellers decide whether to transact directly with each other or to buy and sell through the intermediary. In equilibrium, all high-quality goods are sold through the intermediary and most low-quality goods are sold directly to buyers. As a result of this separation, the lemons problem is alleviated at the intermediated market equilibrium.

A retail or wholesale intermediary can offer many different products for sale, and consumers can rely on the reputation of the intermediary without having to investigate the many product suppliers. In particular, intermediaries can serve as guarantors of the product quality of their suppliers through warranties and contract terms. A manufacturer's brand name often conveys information to customers who then do not need to know the quality of components purchased by the manufacturer. Since intermediaries handle the products of two or more suppliers, their incentives to sell a lower-quality good differ from those of individual suppliers. The intermediary that sells a low-quality product suffers a loss of reputation and thus loses customers for all other products. Intermediation lowers the threshold prices that are required for sustaining high-quality production.

To illustrate the basic problem, consider an example with a single consumer and supplier. The supplier's product can be of high or low quality. Supplying a product of quality j entails an opportunity cost of c_j , $j = L, H$, where the opportunity cost increases with quality: $c_L < c_H$. The consumer has a willingness to pay that increases in quality: $v_L < v_H$. Assume that gains from trade are always positive: $c_L < v_L$ and $c_H < v_H$.

Let λ be the probability that the good is of high quality. Assume that the lemons condition holds:

$$v \equiv (1 - \lambda)v_L + \lambda v_H < c_H.$$

Thus the consumer's willingness to pay based on expected quality of the good is less than the supplier's opportunity cost of providing the high-quality good.

Suppose for example that consumers cannot distinguish in equilibrium between high-quality and low-quality goods, so that the high-quality sellers have an incentive to leave the market. The consumer and the supplier split the gains from trade: $(v_L - c_L)/2$. A supplier with a low-quality good will agree to trade, so that trade occurs with probability $(1 - \lambda)$.

Suppose that an intermediary can observe product quality at cost K and then credibly certify its quality to the consumer. The intermediary will offer $w_H = c_H$ to the high-quality seller. The intermediary will select the price for the low-quality seller w_L such that the supplier is indifferent between selling to the intermediary and direct exchange:

$$w_L - c_L = (v_L - c_L)/2.$$

The intermediary will select an ask price $p_H = v_H$ for the high-quality good. The intermediary will offer the consumer a price for the low-quality good p_L such that the consumer is indifferent between purchasing the low-quality good and the expected net benefit from direct exchange:

$$v_L - p_L = (1 - \lambda)(v_L - c_L)/2.$$

The intermediary must invest in the testing technology K before observing the quality of the good. Thus the intermediary's expected profit is

$$\begin{aligned}\Pi &= (1 - \lambda)(p_L - w_L) + \lambda(p_H - w_H) - K \\ &= (1 - \lambda)\lambda(v_L - c_L)/2 + \lambda(v_H - c_H) - K.\end{aligned}$$

The intermediary will find entry profitable if there are sufficient gains from trade from both types of goods. Note that the intermediary earns returns certifying the low-quality good by eliminating uncertainty for the consumer.

Suppose that $v_H - c_H > K$. Then there is a critical value λ^* that lies strictly between zero and one such that the intermediary is profitable if and only if the proportion of high-quality goods is greater than the critical value.

In financial markets, the market maker must deal with informed and uninformed traders. The informed traders may have better information than the intermediary about the value of the asset. Thus the informed traders may know that the value of the asset is above the ask price or below the bid price. In this case, trading with informed traders results in losses for the intermediary. Uninformed traders trade for liquidity and purchase at the ask price or sell at the bid price, depending on their estimates of the asset value of liquidity requirements. The intermediary sets bid and ask prices to recover losses from trades with informed agents through trades with uninformed agents (Copeland and Galai, 1983; Glosten and Milgrom, 1985).

Mitigating moral hazard and opportunism

As I have emphasized, firms form if they can lower transaction costs relative to direct exchange. This means improving the performance of

markets, not necessarily bringing transactions within the firm. In Chapters 9 and 10, I review the contractual theory of the firm and consider the transaction-cost aspects of the intermediation theory of the firm.

Ronald Coase (1937) drew economists' attention to the importance of transaction costs in determining the boundaries of the firm, as firms substitute internal production for costly markets. Intermediation theory presents a different but complementary approach by emphasizing that firms create the least-cost market institutions, substituting market-making services when these are less costly than decentralized exchange.

Market contracts can be inefficient because of the costs of writing and enforcing contingent agreements. Buyers and sellers can have difficulty making binding commitments. Oliver Williamson (1975, 1985) emphasizes the substitution of organizational management for market contracts that are subject to opportunism. Firms vertically integrate to control transaction-specific assets that require irreversible investment. Grossman and Hart (1986) and Hart and Moore (1990) apply a property rights approach in which firms seek to own assets whose services are complementary to transaction-specific investment.

Binding contracts provide a way of mitigating opportunism that does not rely on organizational expansion. Firms acting as intermediaries between buyers and sellers can provide a means of making credible commitments. Intermediaries earn returns from making credible commitments to prices that would not be feasible in direct exchange. To illustrate how this works, consider a simple example.

A consumer purchases a unit of a good from a supplier. The supplier has opportunity cost C . Suppose that the consumer can undertake a relationship-specific investment A that enhances the consumer's willingness to pay for the good. Without the investment, the consumer has willingness to pay v_L for the supplier's good, and with the investment, the consumer has willingness to pay v_H . Suppose that investment is worthwhile if the consumer captures all the returns, but investment costs are greater than half the returns:

$$v_H - v_L > A > (v_H - v_L)/2.$$

Assume that in direct exchange the consumer and the supplier cannot commit to a price before the consumer's investment decision. After the consumer decides whether or not to invest A , the consumer and the supplier bargain over the division of the gains from trade. Surplus is evenly divided. If the consumer does not make investment A , then both the consumer and the supplier receive $(v_L - C)/2$. If the consumer invests, then the consumer and the supplier each receive $(v_H - C)/2$. This leads to the classic underinvestment result. The consumer will not

find it worthwhile to make the relationship-specific investment since the buyer must split the returns to investment with the supplier:

$$(v_H - C)/2 - A < (v_L - C)/2.$$

Investment is not desirable for the consumer since half of the net return is less than the cost of investment.

Suppose that an intermediary can commit credibly to posted ask and bid prices p and w . Equivalently, suppose that the intermediary can achieve binding agreements at fixed prices with both the consumer and the supplier. If the consumer were to purchase the good at price p , the consumer will always make the relationship-specific investment since incremental benefits exceed the cost of investment.

Then the intermediary can choose prices such that the consumer and the supplier are indifferent between trade with the intermediary (given transaction specific investment) and direct exchange (without specific investment):

$$v_H - A - p = (v_L - C)/2 = w - C.$$

Therefore the intermediary's markup exactly equals the consumer's net return to investment:

$$p - w = v_H - v_L - A.$$

The foregone net return is the transaction cost of direct exchange. The intermediary is profitable if the net return exceeds the intermediary's transaction cost, $v_H - v_L - A > K$.

Thus binding commitments with a third party are means of alleviating opportunism in bilateral contracts. In Chapter 10, I also show that commitment by intermediaries can reduce the efficiency effects of different ownership arrangements for productive assets. This implies that when binding contracts with intermediaries are feasible, the need for firms to own productive assets is correspondingly reduced.

Delegation to intermediaries

In Chapter 11, I review organizational-incentive theories of the firm that identify critical principal-agent incentives within organizations. Firms extend their boundaries when organizations can mitigate adverse selection or moral hazard problems that arise in market contracts. In Chapter 12, I emphasize that agents often are market intermediaries. This suggests a modification of traditional principal-agent models and helps explain the interplay between agency and intermediation in the theory of the firm.

The role of the firm as a monitor of its own personnel is well known. For example, Alchian and Demsetz (1972) emphasized the role of the firm as a specialist who monitors team production efforts, designs incentives, and receives the residual rewards: in their words (p. 793), “the firm serves as a highly specialized surrogate market,” since the firm collects and implicitly sells information to employees by organizing their production activities.

The intermediation theory of the firm, in contrast, views employees as agents who carry out delegated contracting for the firm. Employees act as the firm’s purchasing and sales agents. Principals retain agents as intermediaries in part because of their ability to make commitments in third-party relationships by making credible agreements with their agents. Thus agents are a means of influencing the outcome of bargaining by committing to pay a maximum price. Moreover, strategic delegation is a means of influencing the outcome of competition. The firm’s owners affect the competition equilibrium through incentives for managers.

In addition, the firm itself is a monitor of its suppliers and distributors, making sure that suppliers deliver high-quality parts on time or requiring distributors to improve customer service. Monitoring the efforts of trading partners is costly, leading to moral hazard problems. It can be costly for consumers to observe whether service providers, from auto mechanics to attorneys, are working in their interests. Intermediaries can earn returns through delegated monitoring by supervising suppliers for their customers. In building a house, a consumer hires a contractor who subcontracts with electricians, plumbers, masons, and carpenters. The contractor takes on the transaction costs of locating skilled tradespeople, writing contracts, and monitoring their performance. The contractor gains skills at these tasks, thus lowering the costs of supervision. Specialized intermediaries thus reduce the problem of moral hazard in markets.

Financial intermediation can provide economic advantages over direct lending since lenders delegate monitoring of borrowers to intermediaries who diversify risks. In other words, monitoring costs create an opportunity for intermediaries in which intermediaries incur debt from lenders and in return make loans to borrowers. The structure of the debt contracts results in more effective monitoring than would occur without intermediaries.

In Douglas Diamond’s (1984) model, for example, deadweight bankruptcy penalties are imposed on the borrower because of the unobservability of investment returns. The intermediary has a cost advantage in collecting information about borrowers since lenders would duplicate their efforts if they were individually to monitor borrowers. Also, the

intermediary avoids the free-rider problem, which occurs if all lenders fail to monitor since they rely on the efforts of other lenders. Lenders still incur costs of delegation since they must monitor the intermediary. However, the intermediary maintains a net-cost advantage over direct monitoring because the returns to centralized monitoring of borrowers exceed the cost of delegation to the intermediary. The delegated monitor has a cost advantage because the financial intermediary reduces risk by pooling payments from multiple borrowers.

Outline of the book

The book is organized as follows. Part I introduces the concepts of market microstructure and the intermediation theory of the firm. Chapter 1 considers market microstructure and intermediation in the economy. The chapter also compares the intermediation theory of the firm with the main economic theories of the firm—neoclassical, industrial organization, contractual, and organizational incentive. Chapter 2 presents the basic model of market microstructure and sets out the monopoly market-making model.

Part II extends the basic monopoly model of market microstructure. Chapter 3 presents a set of models of competition between intermediaries. Chapter 4 examines market microstructure in a general-equilibrium setting and compares the outcome with the Walrasian market equilibrium.

Part III compares intermediation with decentralized trade. Chapter 5 examines competition between intermediaries and decentralized markets with direct exchange. Consumers and suppliers can enter into markets that require search or some matching process followed by bargaining or they can transact through intermediaries. If intermediaries are economically viable in equilibrium, then the model explains the formation of firms. Chapter 6 illustrates intermediation by presenting a model of markets in which prices are set by firms. Consumers search across firms for the lowest ask price and suppliers search across firms for the lowest bid price. Search is time consuming and therefore costly, since all agents discount future returns. This emphasizes that operating markets is costly. By posting prices, firms operate the market mechanism. The model features three types of heterogeneity. Consumers differ in terms of their willingness to pay, suppliers in terms of production cost, and firms in terms of transaction costs. The model departs from the law of one price in two significant ways. In equilibrium, there is a distribution of prices across firms as a consequence of the heterogeneity of market agents and the costs of search. In addition, each firm offers a positive bid–ask spread, with a

markup over search costs that reflects the local market power of firms as the result of costly search. This markup provides a return to the firm's market-making activities. It is shown that as the time costs of search fall, market equilibrium approaches the idealized competitive equilibrium. As the time costs of search increase, the market tends toward a monopoly outcome.

Part IV examines intermediation under asymmetric information. Chapter 7 examines models of allocation by intermediaries and guaranties of product quality by expert intermediaries. Buyers have private information about their willingness to pay, and sellers have private information about their opportunity cost. Intermediaries design mechanisms to allocate goods and clear markets under asymmetric information. I consider both small-numbers bargaining and markets with many buyers and sellers. Chapter 8 examines the economic role of financial intermediaries in models of adverse selection. I consider pricing of financial assets by specialists, pricing by informed intermediaries, and credit rationing by financial intermediaries.

Part V compares the intermediation theory of the firm with the transaction cost or contractual theory of the firm. In Chapter 9, I review the contractual theory of the firm, including the Coasian analysis of transaction costs, the Knightian consideration of uncertainty and bounded rationality in the organization of firms, Oliver Williamson's analysis of opportunism, and the property rights approach to the firm of Oliver Hart and others. In Chapter 10, I suggest that, in contrast to organizational solutions to transaction costs, firms acting as intermediaries can lower transaction costs by providing alternative institutions of exchange in the market place.

Part VI compares the intermediation theory of the firm with the agency or organizational-incentive theory of the firm. In Chapter 11, I review the organizational-incentive theory of the firm, stressing the agency-based analysis of vertical integration, coordination of multiple agents within the firm, delegation of authority by owners to managers, and delegation of authority by managers to employees. Then, in Chapter 12, I consider principal-agent relationships in which agents represent the principals' interests in interaction with third parties, that is, relationships in which agents are intermediaries. I present some models of delegated authority in which agents carry out bargaining, competition, contracting, and monitoring. The final chapter concludes the discussion.