

ECON 600
Lecture 10: Vertical Integration

I. The Make or Buy Decision

The fundamental question that defines the issue of vertical integration (or the lack thereof) is the make-or-buy decision. The more a firm makes its inputs, the more vertically integrated it is; the more it buys its inputs, the less vertically integrated it is.

Make-or-buy is not really an all-or-nothing proposition. There is actually a continuum: from arm's length market transactions, to long-term contracts, to strategic alliances and joint ventures, to parent/subsidiary relationships, to fully internal activities.

We should also note that a firm's processes can be divided into two broad groups: the supply chain and the support activities. The supply chain is what we usually think of as the production process: everything from the collection of raw materials to the construction of the product to its distribution to its retailing. We think of the earlier parts of the supply chain as being "upstream" and the later parts as being "downstream," and it is in this context that the "vertical" in vertical integration seems most apropos. The support activities include accounting, finance, human resources, legal services, marketing, and planning. These activities are not obviously "upstream" or "downstream" relative to the links in the supply chain. But they, too, are subject to the make-or-buy decisions. Some firms outsource their accounting, for example. Once all of these activities and their inputs are considered, it becomes apparent that no firm is completely integrated. (Do any firms besides 3M make their own Post-It notes?)

Some terminology that will ease our discussion: The "subject firm" is the firm that is making the make-or-buy decisions, in other words, the firm we are focusing on. "Market firms" are the firms in the external market that provide goods/services when the subject firm chooses to buy instead of make.

II. Fallacies about Make-or-Buy

The text lists several fallacious, or at least misleading, ideas about a firm should choose to make or buy.

1. A firm should make something if it's a source of competitive advantage.

Response: What does it mean for something to be a source of competitive advantage? If it's less expensive to buy the input than to make it in-house, then it's not really a source of competitive advantage.

2. A firm should buy in order to avoid cost of making something.

Response: *Somebody* has to pay the cost of making it. If you buy it, you have to pay the supplier enough to make it worth their while to make it. The real question is whether they can make it more cheaply than you can.

3. A firm should make in order to avoid paying the profit margin of a market firm.

Response: This argument is not totally fallacious, but it should be treated skeptically. If the market firm is making a profit that seems high, there's probably a good reason. There could be barriers to entry in that market, which the subject firm might not be able to overcome any better than other potential competitors of the market firm. Or the market firm's profits could be merely accounting profits, which don't take into account some implicit costs that the subject firm would have to incur as well if it chose to make instead of buy. Or the market firm may have special advantages, like proprietary technology or privileged access to inputs, that the subject firm cannot duplicate.

4. A firm should make to avoid paying high market prices during periods of high demand or low supply.

Response: 1. If the market price of the input is currently high, then if the subject firm makes it and chooses to use it instead of selling it, the *opportunity cost* of using it is still the high market price. In addition, the price may rise because of high costs of production, which the subject firm would incur if it tried to produce the input. 2. If the issue is just that the firm wishes to smooth out variation in profits, the subject firm can use futures (a form of insurance) to hedge the risk. Or it could use the capital needed to start the new division to set up a reserve fund instead. There are plenty of ways to insure against risk without taking over production of an input.

III. The Costs and Benefits of Making and Buying

Here is a summary of the benefits of using the market (i.e., buying), which of course are also the costs of producing in-house (i.e., making), followed by the costs of using the market, which are also the benefits of producing in-house.

Benefits of Using the Market (and Costs of Making In-House):

1. Market firms can achieve economies of scale; an in-house department producing only for the firm's needs might not have high enough production to do so.

Example: External health insurance is usually purchased by small and medium companies, while large companies often self-insure. Large companies have enough employees that the insured population is sufficient for risk-spreading.

But why not produce enough to achieve scale economies and then sell the rest? Even if that happens, *somebody* ends up buying in the market. Also, the buyers may be the subject firm's competitors, who may fear hold-up problems.

2. Market firms may have already achieved learning economies that an in-house department would take a long time to achieve. Also, since the market firm produces enough for many different buyers, it will tend to achieve high cumulative production sooner (moving down the learning curve more quickly).

3. Market firms may possess proprietary information or technology (e.g., a patent) that allows for lower costs.

4. Market firms must be efficient to survive, whereas an inefficient department may be enabled to survive by the “cover” provided by the firm’s overall success. The inefficient department also faces no competition for the services it provides to the firm.

Example: The in-house copy center. If the center is guaranteed to get all the copy orders from the company, it has no particular reason to cut costs.

5. The principal-agent problem is a bigger difficulty for the larger firm, because it’s more difficult to distinguish the particular gains and losses attributable to any particular person or division. There may also be a free-rider problem, since everyone benefits from the productive activity of one person, while that one person will bear the costs of his efforts.

6. Larger firms may be subject to *influence* costs. Departments lobby for a greater share of resources allocated by central management. This is costly (a) because of the time and effort spent on such lobbying, and (b) because of the misallocation of resources that may result.

7. Lack of internal pricing can cause the misallocation of resources within a large firm. Each division will tend to use a resource until the marginal benefit to that division is zero.

Example: Using the computer services personnel to install software and do other simple activities, thus distracting them from areas where their skills are more valuable.

Costs of Using the Market (and Benefits of Making In-House):

1. Coordination in the supply chain may be compromised. It is particularly important in certain types of production process to assure “perfect fit,” and this may be easier to do if production is kept in-house. This is an issue when a production process has “design attributes,” meaning attributes of goods/services for which small errors can have very large consequences.

2. Private information may be leaked if the firm makes use of market firms.

3. The existence of relationship-specific assets change the bargaining situation between the firm and its suppliers and buyers. This can increase negotiation costs and lead to costly hold-up problems. This is the most important of the costs of using the market, and the following sections expand on it.

IV. On Contracts

To fully understand how relationship-specific assets create transaction costs (in the form of bargaining or hold-up problems), it is useful to delve into the economics of contract.

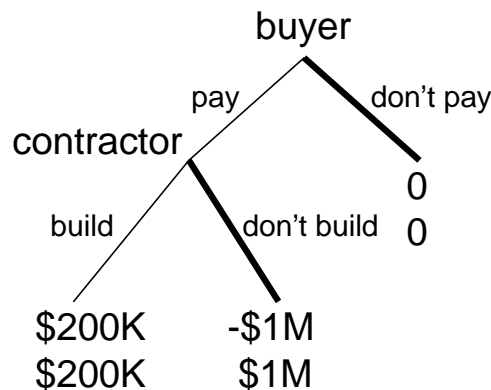
A. Opportunistic Behavior and Hold-Up Problems

A contract is an agreement between two or more parties. In general, a contract represents an exchange: a payment for delivery of goods or performance of services. The question is, why do we need contract for exchanges? After all, I don't need a contract for me to buy milk from the corner grocery -- I pay money, they give me milk.

But many exchanges are more complicated than that. Many such complex exchanges involve transactions that take place over an extended period of time, such as:

- building a house on my property (which may take months to do)
- leasing an apartment in which to live for a year
- arranging a series of deliveries of raw materials for use in ongoing production

In cases like these, a variety of problems may arise from the opportunistic behavior of the players. Consider the case of building a house on my property. I agree to pay you \$1 million to build it. If I pay it now, you can take the money and run. So we need a way to make sure you actually do what you promised. If I can't be sure you'll do what you say, that will make me less inclined to agree to have you build it in the first place. And that could make us both worse off. Suppose it costs \$800,000 to build the house, and the house is worth \$1.2 million to me. The gains from trade here are \$400,000, which we agree to split by having me pay you \$1 million to build the house. The diagram below shows the strategic situation if the agreement cannot be enforced.



The result is that I (the buyer) predict that you (the contractor) will not build the house. Therefore, I don't pay. Yet we would both have been better off if I had paid and you had built. It would be in your interest to commit to building while I commit to paying.

There is another option: you could build, and I could pay you after the fact. But then we would have the same problem in reverse. If you finish the house, I refuse to pay and take occupancy of the house (which is on my property), leaving you screwed. Knowing you'll be screwed, you choose not to build the house in the first place.

Seen this way, enforcing contracts is a way to ensure that mutually beneficial exchanges get made. But are there other means of effecting such exchanges, without the assistance of the courts? Perhaps.

- There could be an intermediate solution, such as having payments made a little at a time. But you can run into a bilateral monopoly situation, brought on by the fact that once you've started to build my house, I am reliant on you in a way that I wasn't before. As you build the house, you acquire specialized information about the structure (including what still remains to be done, what needs to be fixed, etc.) that

other builders don't have. As a result, you could at some point demand an increase in the price for finishing the house. Say the value of your specialized information is \$100,000 (it will cost that much for a new builder to get up to speed). Then you could demand an increase in an price, and I'll pretty much have to accept. This is known as the hold-up problem. Of course, I'm the only potential buyer of your specialized information (the information is about my house, not anyone else's), so you can't necessarily demand an increase equal to the whole \$100,000. What we have here is a bargaining game, which is much like a Chicken game. Negotiating to solve it could cost us both time and money, and it's possible we won't even reach an agreement (especially if both of us are trying to establish reputations as tough bargainers).

- Reputation can deal with the problem. If you intend to stay in the construction business, you don't want to be known for screwing over your customers. This is a powerful incentive that works well in many circumstances. But there are a couple of problems. First, reputation is not important for parties who aren't likely to be in similar exchanges in the future; I may not intend to build another house, so I might be able to screw you over by refusing to make the last payment. Second, reputation doesn't work as well for complicated transactions with many variables. Either of us could cite a variety of contingencies about the cost of construction, timing, etc., that are likely to confuse the issue in the eyes of third parties. They might not be able to tell who screwed whom.
- Repeated dealings can deal with the problem. Aside from the reputational effects on third parties, I may intend to deal with you in the future. A department store wants your business, for example, so it's likely to let you exchange items or get a refund. But the problem here is obvious: repeated dealings are not universal. Consider again the person who only intends to build one house. Or for an even better example, consider goods and services sold to tourists.

Another, related reason that contracts are required is to deal with complex transactions that do not necessarily extend over time, but which may give rise to questions at a later date. For instance, suppose you own a piece of land, and you divide it and sell one half to me. This may seem a simple, instantaneous transaction. But later, questions may arise about ingress and egress from my land (e.g., I drive across the edge of your land to reach the road, and then you build a pool there), or about the exact boundaries of the land, or about what parts of the bundle of rights I've actually sold to you (i.e., I have a factory on my parcel, you build a factory on yours, and later I convert my land to residential uses and sue you to reduce the noise from your factory). A contract may help to resolve these issues, by setting down the terms agreed upon by the parties at the time of the transaction.

B. Incomplete Contracts

Contracts can solve a lot of problems. They can help to avoid all the difficulties with relying on intermediate payments, reputation, and repeated dealings. Insofar as contracts are available and enforceable, the considerations above do not argue against using the market instead of making in-house. The problem is that contracts are not perfect. They do not, and cannot, cover all possible contingencies. Sometimes they include vague

terms – deliberately vague terms, and also terms whose vagueness only becomes apparent later. We say that contracts are not complete. As a result, there may be “wobble room” in contracts, and that wobble room creates opportunities for hold-up problems like the one discussed above.

Suppose I'm a business owner, and I'm contracting with your computer company to deliver 50 business computers to my office. The question comes up: Should the computers already have Windows installed on them?

Installing Windows is something I could do myself. But I'm no expert, and doing so would cost me \$500 in man-hours (because I'd need someone to install it on every computer or else teach each employee to do it). Your computer company could do it in a matter of minutes at your factory, at a cost of only \$100. It seems logical enough that Windows installation should be included in our contract, along with an increase in price of between \$100 and \$500. Will the provision be included? Most likely it will. There could conceivably be a bilateral monopoly problem, because we might haggle a lot over the \$400 gains from trade. But given that we've already reached a meeting of the minds in writing the contract already, it seems unlikely this provision will break the deal. Moreover, the existence of competitors will reduce the bargaining range: if other computer companies will install include a Windows installation for only \$150, then we only have \$50 to haggle over.

So most of the time, we expect contractual provisions to be efficient. Provisions that increase the aggregate wealth of the parties more than they decrease it will be written in; provisions that don't won't. This is a nice illustration of the Coase Conjecture: when transaction costs are relatively low, we expect parties to bargain to efficient outcomes.

This goes for "contingencies" as well. A contingency is a circumstance that will arise only with a certain probability. For example, there could be a 5% chance of an accident that prevents your company from delivering my computers on time, unless you spend \$8000 for a special delivery. The late delivery will cost me, say, \$10,000 in lost revenue. A provision requiring on-time delivery would save me an expected \$500, with an expected cost to you of \$400. If the contract as is does not have such a provision, I could raise the price I'm offering to \$450 in exchange for adding it.

But sometimes the logic breaks down. Why? Because while the marginal cost of adding provisions to a contract is typically small, it is not zero. Meanwhile, some provisions may not increase total wealth by very much in expected value. Indeed, sometimes it will cost more to identify and quantify a wealth-increasing provision than the provision is worth. So if the costs of discovering and adding a provision exceed the benefits, the provision will not be added.

To take the example above, we may not think of the late delivery contingency, or we might think of it but decide it's too much trouble to include. We might leave the contract ambiguous in that regard -- and then, when the incident occurs, we end up in court. The courts have the job of filling in the gaps by deciding the default rules. In this case, the

court would have to decide between saying your company must delivery on time (even at high cost), or it doesn't have to deliver on time, or it can deliver late but only if it compensates you. We will leave aside the question of how courts decide such matters, and simply point out the reasons why contracts will never be perfectly complete:

1. *Bounded rationality*: we can't always think of every possible contingency.
2. *Contracting costs*: it is increasingly costly to specify every possible contingency, and the marginal benefit gets ever smaller, so it is efficient not to specify all contingencies.
2. *Specification and measurement problems*: even for the problems we can foresee, we can't always come up with an unambiguous way to specify the agreed-upon outcome. Quality, for instance, can be quite hard to measure.

C. Asset Specificity

Because contracts are necessarily incomplete, there will necessarily arise circumstances in which opportunistic behavior can occur. In addition, the costliness of contract enforcement can allow for opportunism even in when a contract ostensibly covers the situation in question. Some of the most important instances of opportunistic behavior involve relationship-specific assets.

A relationship-specific asset is an asset that results from one or both parties having made investments to support a particular relationship. Remember that assets may be intangible; knowledge can be an asset, for example. Here are the types of relationship-specific asset listed in the text:

1. *Site specificity*: physical assets may be located nearby each other in order to decrease transportation and increase the speed of production. Once the assets are located near each other, it may be costly or impossible to move them elsewhere; as a result, some of their value is specific to the relationship.
2. *Physical asset specificity*: physical assets may be created or modified based on the assumption that they will be used with the inputs provided by a particular supplier.
3. *Dedicated assets*: physical assets may be created for a particular buyer and be useless for any other buyer. For example, molds created for a particular company's distinctive bottle shape are useless to the bottle-maker if its relationship with that company ends.
4. *Human asset specificity*: People who work for a firm learn skills, routines, procedures, etc., that are valuable only within that firm.

Note that in all these cases, both parties to the transaction may make investments; it's not always the case that the buyer makes the investment or the seller makes the investment. Take the case of human asset specificity. Investments in getting a new worker to learn the relevant skills may be made by both the worker and the firm. The firm has to use time and resources to train the worker; the worker has to spend time and effort to absorb the training.

D. Rents and Quasi-Rents

Any time someone makes a worthwhile investment, it creates some amount of net value or profit. We will refer to this as the rent from the investment; it is equal to the present value of the benefits of the investment minus the up-front cost of the investment and the present value of any subsequent costs that must be incurred in the course of the investment. Now, some costs (particularly the up-front costs) may be non-recoverable or partially non-recoverable; in other words, there may be some sunk costs. After costs are sunk, we could calculate the net value of going through with the investment activity as planned (rather than quitting or taking some second-best option). We call this net value the quasi-rent from the investment. Note that the quasi-rent will typically be higher than the rent, because the sunk costs are not subtracted from it. It turns out that the existence quasi-rent creates the opportunity for hold-up problems.

Suppose you're a parts manufacturer, and a firm offers to buy some quantity of parts that you'll produce for him. The up-front cost of the investment is \$2 million. The marginal cost of each unit is \$3, and the specified quantity is 1 million. Thus, the total cost of the investment is \$5 million. Suppose the value to the buyer firm is \$6 million. Then the potential gains from trade are \$1 million; this is the rent. After bargaining, you and the buyer firm agree on a price between \$5 and \$6 per unit. Let's assume that you have equal bargaining power, so you split the difference with a price of \$5.50. This splits the gains from trade equally at \$500,000 each.

But after you've made the up-front investment, the buyer firm can exploit an ambiguity in the contract to demand a lower price. Unless you're willing to go to court, you'll have to bargain again. Since you've already incurred the \$2 million investment, it's unavoidable and thus doesn't really affect the bargaining. The added cost of going through with the project is \$3 million (variable production cost), and the added gain is still \$6 million (value to the buyer firm), so the quasi-rent is \$3 million. Equal bargaining power again implies an equal split, so you end up agreeing on a new price of \$4.50 per unit. This quasi-rent is split, \$1.5 million each. But taking into account the up-front cost of investment, you end up \$500,000 in the hole.

What we have here is a sequential game. Using backward induction, we can predict the outcome. In the second stage of the game, the up-front investment has been made, and the bargaining game leads to a price of \$4.50 per unit. In the first stage of the game, you decide whether to make the up-front investment. You can predict the future price of \$4.50; therefore, you reject the deal, because \$4.50 is not enough to justify your up-front investment. The buyer firm might promise to pay \$5.50 each, but he cannot credibly commit not to demand another round of bargaining later on.

This story is not dependent on the assumption of an equal split of gains from trade in bargaining situations – although that is in fact the prediction of many game theoretic bargaining models. If we suppose (say) that the buyer is a hard bargainer and you are not, so that the buyer gets 75% of the gains from trade in any bargaining situation, you

would still want to make the transaction if no future round of bargaining would occur. Yet the creation of quasi-rents will increase the size of the gains from trade, leading to a new bargaining situation in which the buyer will be able to demand more. Even if you are the hard bargainer and the seller is not, you would need at least $\frac{2}{3}$ of the gains from trade (the up-front cost as a percentage of the quasi-rents) in order to be sure you'd cover your up-front investment cost.

What if we changed the situation, so that the buyer firm made the initial investment? As long as the initial investment is specific to the firm's relationship with the manufacturer, there is now the potential for a hold-up by the manufacturer. After the investment is made, the manufacturer can demand a higher price. (If everything is exactly the same numerically, except that the buyer must pay \$2 million up-front, then the ex ante value to the buyer is \$6 million - \$2 million = \$4 million, the cost to the manufacturer is \$3 million, so the rent is again \$1 million. After the investment cost is sunk, the value to the buyer is \$6 million, cost to the manufacturer is still \$3 million, so the quasi-rent is \$3 million.)

What if we changed the situation so that both parties had to make some kind of initial investment? In the example above, maybe the buyer and manufacturer each have to invest \$1 million initially. In that case, there isn't as big a problem with the newly created quasi-rents skewing the results one way or the other, but it still increases the size of the quasi-rent pie. Both parties will have an incentive to try to negotiate more favorable terms. Because of the relationship-specific assets, they are locked in a bilateral monopoly situation. The negotiations could turn out to be quite costly. (Note that the larger is the size of the pie, the more effort it makes to expend trying to get a larger share of it.)

The situation I have described sounds relatively simple, so it might be hard to understand why a contract could not be written to deal with it. But remember that real-world situations may be more complicated. Contingencies may arise that make it questionable whether the contract's terms still apply. For instance, perhaps the buyer firm could claim that something's wrong with the product's quality, and that makes the output no longer as valuable to the firm.

E. The Cost of Hold-Ups

There are several costs that may result from hold-up problems.

1. More frequent bargaining.
2. More contentious initial bargaining, for the purpose of forestalling subsequent bargaining.
3. Investments designed to improve bargaining position. E.g., a firm might build standby production facilities as a hedge against a supplier's attempt to hold-up supply.
4. Reduced investment. As noted above, some productive investments may go sour simply because of the possibility of future hold-ups.