

## 2. THE NATURE OF THE FIRM

Production side of the economy made up of firms. Firms buy resources from consumers, transform them into output, and sell this back to consumers.

Simple neo-classical model: 1) The firm is the decision making unit. 2) Firms are organized into industries. 3) Intermediate products are outputs of one industry that are sold to another, all in the chain of production that starts with consumers and ends with consumers. In this simple outline, the organization of the production sector is ambiguous. It can be thought of as a single firm or a series of many firms transacting with each other as intermediate products evolve from the most basic resources into the final items purchased by consumers.

Several real world questions are raised about this simple model: 1) Firms are not really the decision makers. Firms are not people. People make up firms and the people associated with firms make decisions. 2) Industries are characterized by the principle output of firms. However, most firms produce many outputs. (DuPont probably produces over 2000 different goods.) Moreover, there is vast diversity in the degree to which firms engage in multi-line production. 3) Production of intermediate goods is not always formed along a chain. Many times firms buy supplies from numerous independent jobbers that feed into a pipeline of production. Examples are firms hiring cleaning services for their facilities or buying the many components necessary to assemble a car all from different, independent suppliers. However, we see that some firms choose to integrate all of these processes into their own company. Firms are many times associated by elaborate contracts as in the case of chicken farmers or fast food restaurant franchises. Consider the contracts that form the basis of sports leagues.

### Why Does The Firm Exist?

Our quest is to understand the organization of production. We generally think of production being organized around units called firms. The question often posed is, what is a firm? This question can be restated more empirically oriented as, what are the boundaries of the firm?

Neoclassical economic theory defines the concept of efficiency. (The Pareto criterion says that efficiency exists when no one can be made better off without hurting someone else.) Efficiency implies maximized profits and we know that profits are maximized when the marginal profitability of each resource unit divided by its price is equal across all resource units. Neoclassical theory treats the production sector as completely integrated; that is, one firm starts with the most basic resources and transforms these into a product that is delivered to the consumer's living room. In a technical sense there is nothing wrong with this analysis. Efficiency in the neoclassical sense can be defined and the conditions for achieving it can be mandated. Indeed, in principle, centrally planned economies can work. However, they don't.<sup>1</sup> We know that; the experiment has been run. Why don't they work? Simply enough, mandating that resources should go to one sector or another in the economy doesn't get them there. Communist countries have the termite-man problem everywhere. The market economy evolves in organizational form in order to efficiently enforce contracts.

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<sup>1</sup> Scholarly, scientific analysis of communism came to the conclusion in the 40's and 50's that there was no technical information problem that prevented central planning from achieving all of the efficiencies of the market economy. Resources could be assigned to the appropriate sectors of the economy by a central planner in exactly the same way as the market would do so. Of course, the information problem that stopped this from happening is not technical.

What we want to do is determine how this neoclassical production sector is broken down into separate business units based on the methods and types, and costs and benefits of organization.

The neoclassical firm's problem is to determine the answer to three questions: What to produce; how much to produce; and how to produce. These same questions are posed in the organizational context. Moreover, the generic answer to each is the same as in the neoclassical paradigm: The equimarginal principle operates to determine input mix and marginal revenue equals marginal cost determines the level of production. However, the questions become more complicated. What to produce and How much to produce become intertwined with how to produce. The firm's goal is to capitalize potential economies of scale without incurring overwhelming costs of management. Bigness is better, but bigness creates a coordination problem.

Ronald Coase was one of the first academic writers to form the question in this way.<sup>2</sup> Coase said: Firms exist because of contracting costs. Coase said that the firm is a suspension of the price mechanism. What he meant by this is not exactly clear. My best interpretation is that the resources that the firm brings together are bought in blocks or bundles. That is, the firm is an organization that purchases a bundle of resources and then, for some period, ignores price signals while that bundle of resources is transformed into output.

Coase said that it was the difficulty of knowing all relevant prices that causes the firm to exist.<sup>3</sup> The firm is an entrepreneur/manager of resources that saves on marketing costs. This concerns finding the right price of inputs and outputs. Can also be phrased in terms of buying the right quantity of inputs relative to their prices and productivities, and the price of output—the equimarginal rule. Knowledge of all relevant prices may be a problem because of sequential contracting as in the movie business. However, Coase was more concerned with the standard problem of multiple input production as we discuss in terms of the formula:

$$\frac{w_1}{MP_1} = \frac{w_2}{MP_2} = \dots = \frac{w_n}{MP_n}$$

Coase was primarily concerned with the numerator of the this equation. The fundamental insight offered by Coase is that the management of the firm is concerned with determining the proper mix of inputs, i.e., solving the equi-marginal equation.

In this sense, difficulty in knowing all relevant prices and choosing the right resource mix increases with:

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<sup>2</sup> Coase, Ronald. "The Nature of the Firm," *Economica*, November, 1937. It is interesting that Coase posed the question in this way in 1937. His query, stated in this way, is prescient of the scholarly work between 1937 and 1970 that proved that the organizational size of the firm was not determined by technical efficiency in the allocation of resources across sectors or because of efficiency in capital structure.

<sup>3</sup> Coase contrasts his view of the firm with that of Frank Knight. Knight was a leading economist at the University of Chicago at this time. Knight held two views of the firm. First, the firm was a risk management tool. Coase disagreed because risk management could be and often was contracted for outside of the firm. In spite of Coase's dismissal of this idea it will come back into play shortly. Second, Knight claimed that the firm was an institution in which an entrepreneur guaranteed the pay of other resource owner, which he would not do without the option of controlling their behavior. Coase also disputed this. Coase said if that was the only thing involved in the firm, it could be contracted for in market transactions. Again, it now appears that Coase was probably too quick to throw out the ideas of Knight. Essential parts of Knight's insights are embodied in later work of Alchian, Demsetz, Jensen and Meckling.

- the number of transactions,
- the lack of detailed information on all uses of each input,
- the difficulty of measuring varied and changing activities.

A hub and spoke analogy is a good way of thinking about the problem that Coase describes. The manager at the hub is efficiently placed to observe production, collect information about productivity and prices, and make decisions about the right mix of inputs.

One of seminal insights made by Coase is that something causes firms to be limited in size. In almost every setting, engineering principles say that bigger is cheaper. That is, cost-per-unit declines as volume grows. However, we clearly observe that firms are not infinitely big. Something limits their expansion. That something is management costs. Diminishing returns to entrepreneurial abilities gives rise to the U-shaped AC curve we are so used to in the standard analysis.

### Economies of Scale

Armen Alchian in his famous work, “Costs and Outputs” developed several principles of cost.<sup>7</sup> Actually there are two: Costs increase at an increasing rate with respect to *rate* and increase at a decreasing rate with respect to *volume*. Volume effects result from the forces of nature that create scale economies. Big planes and ships carry cargo more cheaply than smaller vessels. The durability of dies is also a scale phenomenon. Rate effects result from the inefficiencies of speed and the diseconomies of management.

Together the forces of rate and volume combine in a given time frame to produce a U-shaped average cost function. The volume effects always tend to force average cost down; the rate effects pull cost up. The volume effects dominate early; the rate effects catch up and ultimately force average cost to rise. This U-shaped average cost function that is the composite of volume and rate forces can be thought of as the **strategic planning curve** for the firm. The firm must make a choice of where along this menu of costs and output levels to produce.

The value of management is to reduce the diseconomies of organization so that the declining cost forces of volume can be more fully achieved. In this sense, there are always

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<sup>4</sup> Equimarginal principle of input usage.

<sup>5</sup> Coase, Ronald. “The Nature of the Firm,” *Economica*, November, 1937. It is interesting that Coase posed the question in this way in 1937. His query, stated in this way, is prescient of the scholarly work between 1937 and 1970 that proved that the organizational size of the firm was not determined by technical efficiency in the allocation of resources across sectors or because of efficiency in capital structure.

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<sup>7</sup> Alchian, Armen. “Costs and Outputs,” in *Economic Forces at Work*. See also, Cotton M. Lindsay and M.T. Maloney, “Economies of Scale,” manuscript, Clemson University. Maloney and R.E. McCormick, “Intermittent Production, Cost, and the Multiproduct Firm,” *Journal of Business*, April 1983, 139-154. George J. Stigler, “Division of Labor is Limited by the Extent of the Market,” *JPE*, June 1951, reprinted in *The Organization of Industry*.

advantages of being bigger—if the firm can manage them. I think that this was the main idea that Coase was driving at.

### Another Piece of the Puzzle

Alchian & Demsetz somewhat disingenuously mock Coase.<sup>8</sup> Coase tells us the “firm” exists because of the difficulties of management, but what are the dimensions of this problem. To say that the firm exists because of transactions cost is a difficult proposition to disagree with—or refute. A&D try to remedy this problem by identifying the nature of the costs of transacting. Most importantly, they try to explain why firms have the characteristics that are so commonly associated with them: Firms are organizations that revolve around managers and residual claims to uncertain returns or profits. In many and varied degrees, these are the details that we associate with the business unit called the firm. Why does such an institution exist?

Alchian & Demsetz say the answer is *shirking*.<sup>9</sup> Some workers stand around the water fountain while others work like bees on elaborate spreadsheets. Who is more productive? It is the manager’s job to know. **The firm exists to manage resources.**

What does management do? In the efficiency equation shown above, A&D concentrate on the denominator. They claim that the firm exists to determine what the potential marginal products of various inputs are. Then the firm has to monitor the revealed performance of the inputs because there is an incentive to shirk. Finally the firm meters the rewards paid to the resources in order to satisfy the equi-marginal rule. Measure; Monitor; Meter. Good management, which is the firm, measures potential productivity,<sup>10</sup> monitors actual input

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<sup>8</sup> Alchian, Armen, and Harold Demsetz. "Production, Information Cost, and Economic Organization," *American Economic Review*, December 1972, 777-95.

<sup>9</sup> Coase was not expressly concerned about *shirking* and does not use the word or stress the ideas. Cheung restates Coase and does play up the idea especially in the context of piece rate pay (like sharecropping and franchising). Cheung, Steven N.S. "The Contractual Nature of the Firm," *Journal of Law & Economics*, April 1983, 1-22.

<sup>10</sup> As a measure of the difficulty of measuring marginal productivity, consider the case of programming. When the Fox Broadcasting Network bought the rights to NFL football, they paid a large amount of money that could never be and has never been recovered from sales of advertising during these football telecasts. Indeed, most of what is advertised during these events are other Fox programs, so there is no positive cash inflow from these plugs. However, the value of the marginal product of televising NFL games is seen by the fact that CBS, which was closed

out of NFL broadcasting when Fox won its contract, turned around and outbid NBC in the next round.

The Fox contract was for \$1.58 billion (or \$395 million) for 4 years. After they signed the contract, fox projected the following revenues:

\$120,000 per 30 second spot commercial (approx annual revenue of \$250 million)

\$25 million from NFL related programming

\$75 million from sale of ad time in super bowl 1997

\$40 million deal with McDonald's Corp for 4th quarter marketing promotion.

"[T]hey didn't make money on the national telecasts, but the relentless promoting of other fox shows expanded the audience at the time when fox was struggling to establish itself as a network."

Sources:

The New York Times, November 13, 1997, Thursday, Late Edition - Final, Section C; Page 8; Column 5; Sports Desk, 245 words, PRO FOOTBALL: NOTEBOOK; N.F.L. Takes Notice Of N.B.A.'s TV Deals, By RICHARD SANDOMIR,

The New York Times, February 10, 1995, Friday, Late Edition - Final, Section B; Page 9; Column 5; Sports Desk, 904 words, TV SPORTS; Fox Is Losing Big, But Winning Bigger, By Richard Sandomir

Advertising Age, June 13, 1994, Pg. 66, 1506 words, MURDOCH ADDS FOOTBALL TO LIST OF GLOBAL AMBITIONS, By Joe Mandese

productivity and meters rewards. Good management matches rewards to productivity. Profits are maximized where marginal productivity divided by pay is equal across workers and between various resource units.

Management is necessary when there is *team* production among inputs. There is more need for management to prevent shirking when:

- multiple types of resources are used,
- synergistic effects among resources,
- multiple owners of resources come together in the firm,
- hard to measure productivity (this often means that it is more efficient to measure input effort as opposed to output),
- difficult to detect shirking (coolies pulling the water taxi).

Shirking also explains why the firm is organized around residual claims to the profits. The efficient way to pay managers is by making them residual claimant to the difference in the revenues of the firm and costs paid to the resource owners. When the manager is the residual claimant, then paying one worker more than his productivity comes directly out of the managers pocket. Similarly, paying another less than his productivity will encourage that worker to work less and lower productivity. Again profits suffer.

Indeed, contingency claims are a compelling way to reduce shirking at any level of production. Piece-rate pay for assembly line workers encourages them to move quickly (it may also encourage them to move sloppily). However, contingency claims create risk. In the context of the firm it is efficient for the manager to bear the risk of the organization of production and for the workers *not* to. Take the case of salesmen's commission. Sales commissions are dependent on many dimensions of the organization decided by management. To the extent that sales people bear the cost of capricious restructuring, the efficiency of the contingent claims is negated. In a similar sense, it may not be efficient for the manager to bear the burden of the business risk of an enterprise, but this means that some method of monitoring the manager must be found.

In the Coasian sense, there are gains from collecting information and organizing production in bigger and bigger units. In the hub and spoke analogy, the firm grows like a molecule. Teams of teams are linked together. If groups of teams work together, the manager of one team becomes a team member at the second level. Hence, the manager of the first level team cannot be an autonomous firm. The cost of teams of teams, or pyramiding management is that the lower level managers are increasingly insulated from residual claims to the profits of the firm. This means that there is a value in making the firm bigger, while the costs of controlling shirking *especially among managers* puts a limit on how big the firm can get.

As we think about the various forms of businesses that we observe around us (stock corporations, proprietorships and partnerships, closely held corporations with limitations on sale of shares, nonprofits—hospitals, universities, mutual funds and insurance associations, sports leagues and other franchises) we will try to apply our understanding of the firm as a management device to understand the efficiencies and inefficiencies of each.

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Advertising Age, April 25, 1994, NEWS; Pg. 1, 584 words, Fox keeps pace with grizzled vets for football deals, By Joe Mandese

The Associated Press, January 14, 1994, Friday, AM cycle, Business News, 527 words, Fox Says It Will Energize, Won't Trivialize NFC Franchise, By LYNN ELBER, AP Television Writer, PASADENA, Calif.

In outline form:

### Theory of the Firm.

- The firm is the entity that represents producing units in the economy.
- There are two broad ways that the firm is characterized both in the popular press and in economic literature:
  - Real thing: like a person; an economic actor with good and bad intentions (i.e., socially productive and socially unproductive motivations).
    - Called the *Neoclassical Firm*.
  - Nexus of contracts: not singularly driven; awash in political maneuvering just like other institutions like government agencies, clubs, and families. Manager v. manager; division v. division; union v. union; management v. workers; management v. stock holders; stock holders v. bond holders.
    - Called the *Coasian Firm*.
- Firm's Objective: Maximize Profit
- Economic profit = Revenues minus cost of all resources.
- Three Questions: What to produce? How to produce it? How much to produce?
  - Coasian Firm → What and How
  - Neoclassical Firm → How much

### Why does the Firm Exist?

- Why doesn't communism work? — Termites Man example
- Firm solves problems of contract enforcement and incentive alignment.
  - Knight – U. of Chicago – circa '20s | Coase – Nature of the Firm – '37 | Alchian & Demsetz – '72 | Jensen & Meckling – '76
- Knight: risk management; manager/capital owner pays up front and has to monitor
- Coase:
  - Size is the issue. What are the boundaries of the firm? Why does the firm do what it does and not more or less? Chain of production. Chicken farming.
  - Equi-Marginal Principle of Profit Maximization:
 
$$\frac{w_1}{MP_1} = \frac{w_2}{MP_2} = \dots = \frac{w_n}{MP_n}$$
  - Coase focuses on numerator. Knowledge of relevant prices is the problem solved by the firm. Hard to know what relevant, relative prices are at each moment in time. Hub and spoke analogy. Central contractor required to continuously monitor prices and solve the equation.
  - Coase criticizes Knight because K. doesn't tell us what determines boundary of firm.
    - However, the same charge was leveled at Coase by Alchian & Demsetz.
    - Even so: Coase gives us an early explanation of the alleged reasons for the AOL/Time-Warner and Bell Atlantic/Nynex/GTE mergers. Relevant prices.

- Alchian & Demsetz:
  - Singular characteristic of the firm is claims to residual profits.
    - E.g.: non-profit firms are different – No one is directly claimant to the residual if revenues exceed costs.
  - Someone has to be the residual claimant — but why is it normally the manager/owner?
    - Not always true: movies, concerts, oil wells, etc.
    - But vast majority of economic activity is organized by for-profit firms.
    - Owners claim residual profits/manage or control managers.
  - Contract enforcement is the key.
    - Shirking is the main problem in economic organization.
    - The firm exists to manage resources in the face of shirking.
  - Managers must:
    - Measure | Monitor | Meter.
    - Measure productivity; monitor effort; meter rewards. ]
  - This view looks at the denominator of the Equi-Marginal Rule.
    - Hub-n-Spoke analogy still works
  - Team production makes management most difficult
    - multiple types of resources
    - synergistic effects
    - multiple resource owners
    - variance between effort and output
    - difficulty in detecting shirking
  - Meter rewards to sanction shirking. Piece-rate pay; tournament labor contracts.
  - Answer to the Big Question:
    - *Managerial shirking is monitored by claims to residual profits.*
      - Aligns incentives of manager to solve Equi-Marginal Rule, implies maximize the value of the firm.
  - Size of the firm is limited by scope of managerial control.
- Jensen & Meckling:
  - Big firms reduce residual claims of managers.
  - Separation of ownership and control.
  - *Agency cost* between stock holders and managers.
  - Ownership and Control in the Modern Public Corporation
    - Specialized resource suppliers, most importantly financial capital.
      - Stocks and bonds are instruments.
    - Diversified portfolios minimize risk, implies efficiency in supply of financial capital.
    - Financial claims are limited liability because this facilitates portfolio diversification.
    - Corporate bankruptcy is contractual renegotiation among financial capital suppliers to the firm.
    - Stock option payments to corporate managers is a way to extend the scope of management and solve the agency cost problem.

**Why does the firm want to be large?**

- 1) Economies of scale. Bigger is better.
  - 2) Economies of scope ???
    - Use common resources more intensively.
    - Correctly prices transfer of goods and sharing of resources.
    - Minimizes enforcement costs.
  - 3) Create monopoly / market power.
  - 4) Managerial entrenchment.
- Mergers:
    - Common way for firms to grow. Enjoy benefits of size.
    - Better use of existing resources. Resource realignment. Bust up takeovers.
    - Merger by stock swaps or cash purchase.
    - Merger by negotiation or forceful takeover.
    - Merger returns: Some evidence in support of all motives.