

AEC 841--MODULE 3E

SUBSECTOR ANALYSIS AND VERTICAL COORDINATION

I. Introduction

- A. Subsector approach is an attempt to extend I-O in a vertical sense
 1. **Overhead of food systems matrix.**
 2. Nothing highly complicated about the approach. Just a vertical way of looking at food system coordination issues.
- B. In the U.S. arose in U.S. partly in response of ag. economists to deal with unforeseen changes in production/distribution systems for ag. commodities, particularly poultry, after World War II, when U.S. food system began to change rapidly.
- C. In US, most fully developed by NC-117 research group and subsequent work
- D. Similar approaches arose independently in Europe and in different U.S. disciplines
 1. Chayanov's work in early 1900s in Russia (**overhead**)
 2. French *filière* approach
 3. German *marketing channel* approach
 4. U.S.
 - a. Ag. economists (e.g., NC-117 and subsequent work)
 - b. Work by sociologists, like Larry Busch on how social relations affect marketing systems.
 - c. Business school work on *channel mapping*
- E. Aimed at addressing I-O type questions of the determinants of performance, but in a vertical sense.

AEC 841--MODULE 3E

Subsector Analysis and Vertical Coordination

Page 2

1. What are the consequences for performance of alternative ways of organizing the various vertical stages of production of a commodity?
2. Why is it organized the way it is? (We'll discuss this later when we discuss transaction costs).
3. How do changes in technology, demand, etc. lead to changes in subsector organization?
4. Illustrate with an overhead of the beef subsector, which has moved from integration (at the household level) to dis-integration (through the market) back to re-integration through contracting.

II. Basic Definitions (overheads)

A. **Subsector**

1. "The vertical set of activities in the production and distribution of a closely related set of commodities." Shaffer, 1968. Like a small economy or a pipeline.
2. "An interdependent array of organizations, resources, laws, and institutions involved in producing, processing and distributing an agricultural commodity." Marion et al., 1986.
3. Thus , one can view the subsector as:
 - a. A set of activities and a related set of rules governing those activities.
 - b. A conceptual way view of a problem.

- c. A way of organizing research.

B. Vertical Coordination

1. "All the ways of harmonizing the vertical stages of production and marketing." Mighell and Jones, 1963. (*Vertical coordination as a process*)
2. "The sufficiency of the system of prices and other mechanisms as carriers of information and incentives and directors of the allocation of resources in a subsector." Marion et al., 1986. (*Vertical coordination as a state*).
3. Coordination has thus been used to refer to both a *process* and a *state*.
4. Types of coordination
 - a. *Synchronization*--static concept
 - b. *Adaptation*--dynamic change in response to new technologies, demand structures, etc.
 - c. Possible tradeoffs between the two.

C. Stage of Production

1. "Any operating process capable of producing a saleable product or service under appropriate circumstances." Mighell and Jones, 1963.
2. Equivalent to Williamson's "technologically separable interfaces."

D. Basic problem is how to harmonize the various stages of production over time and in a manner that covers costs of production, given:

1. Biological lags in production

AEC 841--MODULE 3E

Subsector Analysis and Vertical Coordination

Page 4

2. Perishability of products
 3. Uncertainty due to:
 - a. Stochastic variation in production (e.g., weather-induced)
 - b. Technical innovations
 - c. Unforeseen shifts in demand (e.g., export demand)
 - d. Human behavior
 4. Heavy amount of fixed investment at risk.
 5. This may lead individual firm to be unwilling to rely on open market for supplies of critical inputs or for outlets for its products.
 - a. E.g., reluctance in a developmental setting to move from subsistence to greater reliance on the market for food.
 - b. E.g., reluctance to invest in a processing facility if you can't get a reliable source of fruit, spread out over time, in order to achieve optimal use of a processing plant.
 6. From society's point of view, this means that simple reliance on the open market may not be efficient. May need to look at other coordination mechanisms to improve performance. This leads to alternative ways of organizing subsectors.
- E. Illustrate with **overhead** from Marion et al. on alternative subsector structures, one with totally integrated firms, and one with a monopoly enforcers at a certain stage. Illustrates tradeoffs:

1. Manufacturing monopolist has complete control over the quantity, quality, form and timing of products sold to retailers.
 - a. Monopolist would likely restrict total output produced to earn higher profits--poor performance in this respect
 - b. Quality, mix, timing, and location of products might be consistent with demand preferences, if the monopolist exerts sufficient control over producers and retailers.
2. Totally integrated firm may harmonize individual stages better to achieve better production efficiency within a given firm, but may not succeed well in overall balancing of supply and demand, because each firm has to make its decisions in partial ignorance of the actions of other firms in the industry.

III. **Subsector Performance Dimensions**--from NC117--Aspects typically stressed in subsector studies. (**Overhead**)

A. ***Resource allocation***

1. Pareto optimality criterion, given property rights.
2. Pragmatic evaluation has to recognize the impact of time, information and risk--i.e., resource allocation is judged relative to the information and risk facing the participant when the decision had to be made. May not look optimal ex post.
 - a. Thus, information availability and risk sharing mechanisms may play

critical role in resource allocation. These get special attention in subsector analysis.

- b. Weak competition and unequal info. may also lead to poor resource allocation.

B. *Transaction costs*

1. Costs of carrying out transactions--gathering info. necessary to trade, processing the info., negotiating deal, carrying out the physical trade, and enforcing it.
2. Related to TCE--presence of TC is the main reason we don't leave everything to the market--Coase argument.
3. Transaction costs have become more important as ensuring quality specifications in the food system has increased. Enforcement of these through control of production is a major reason for movement away from spot market to other coordination mechanisms like contracting and vertical integration.
4. Key point to think about when examining alternative coordinating mechanisms is how they affect transaction costs. Just as farm-level production technologies can be ranked in terms of how they affect costs of production, alternative exchange mechanisms can be ranked in terms of:
 - a. How they affect costs of exchange.
 - b. Distribution of those costs of exchange among various actors in the

system.

C. *Dynamic Stability*

1. Avoidance of resource waste through periodic over and undercommitment of resources to production--as exemplified by hog and beef cycles.

Remains a big problem in U.S. food system and is an even bigger problem in many developing countries.

2. Many of these cycles are related to:
 - a. Long biological lags in production (e.g., livestock, tree fruits)
 - b. Fixed assets, which may lead to reluctance to adjust to initial external shocks.
 - c. Lack of information by dispersed producers on aggregate consequences of everybody else's actions (Prisoner's dilemma?)
 - d. Lack of willingness of some parts of subsector (e.g., retailers) to adjust prices fully to changes in S & D conditions because they do not want to create problems for clients (increase the clients' transaction costs)

D. *Equity*--"Equal treatment of all system participants to the extent that they can deliver equal performance." Marion et al., 1986. Includes things like:

1. Rewards accrue to those who control the product attributes involved (related to grading)

E. *Accessibility of Markets and Information*--one type of equity question (also

relates to efficiency in that it deals with barriers to entry), but which receives explicit attention in marketing literature.

1. Accessibility--
 - a. Are there barriers to entry, precluding lower-cost firms from certain stages of the subsector?
 - b. Access to marketing alternatives--may be a problem in fringe production and consumption areas.
2. Balance of access to information and other sources of market power. Public-good nature of information, and questions of how best to provide it.--More on this later in the course.

F. Like in I-O, performance evaluation involves comparing different dimensions and assessing tradeoffs, as illustrated in the subsector studies summarized in Chapter 3 of Marion et al.

IV. Methods of Coordination

- A. As mentioned on first day of class, theory of perfect competition assumes that everything is coordinated by price
 1. In real world of imperfect information, economies of scale, opportunism, etc., need to rely on other mechanisms to complement price as a coordinating tool.
 - a. In some cases, price serves as the main allocator of resources and income, while in others it is an adjunct to other forms of resource

allocation (e.g., contracting with formula pricing)

- b. Therefore, we will look at the interaction of pricing methods and other mechanisms, drawing illustrations from specific subsectors (refer to handout of table 2.2 from Marion et al.)

- 2. Also we will be concerned with how each method handles the process of *price discovery*:

- a. the process of finding a set of prices that clears the market at a given time. This is done through interaction between and among buyers and sellers by which they identify alternatives and arrive at a transaction price.
- b. Price is determined by the fundamental factors that affect supply and demand, but these prices are not immediately self-evident to participants. Need a process of interaction to determine them, especially in presence of:
 - (1) imperfect knowledge regarding quantities available and demanded.
 - (2) dynamics of market--often moving from one equilibrium to another.
- c. Main point is that price discovery is neither automatic nor costless, and various pricing and other coordination mechanisms will vary in the ease and cost with which they help participants discover

market-clearing prices.

B. *Methods of Pricing*

1. *Auctions*

a. This is the type of pricing of most of economic theory, at least in models stressing competition--the Walrasian auctioneer. It is the most investigated of all pricing methods and ones in which there have been lab experiments to see under what conditions the results approach pricing outcomes of perfect competition (see Marion et al.)

b. 5 types

(1) English or ascending bid

(2) Dutch clock or descending bid (timed, descending bid where first acceptance takes the goods)

(3) Double or converging bid--e.g., commodity futures exchanges, where

(a) each trader acts as his or her own auctioneer. Bids and offers are simultaneously adjusted until a deal is struck.

(b) System is most efficient--prices rapidly converge towards the competitive equilibrium

(c) Does not accommodate passive buyers and sellers,

like third-party auctioneers

- (4) Simultaneous bid auction--Japanese auction--requires all bidders to simultaneously submit single bids for the lot being sold to the auctioneer at one time at auctioneer's signal, with sale going to highest bidder. Very quick.
- (5) Sealed bid auctions.--Used for large transactions where considerable effort goes into the bid or offer. E.g., construction, sale of big lots to a grain agency.

c. The main advantages of auctions are:

- (1) Accessible to a broad range of participants, although there may be restrictions on who can participate in sealed bid auctions.
- (2) Open information. Auctions generate open information as an externality of the pricing method.
- (3) Efficient pricing that results from the open competition, leading to prices close to the competitive equilibrium
- (4) Creation of additional information as an externality of this pricing method.

d. Disadvantages

- (1) Results carry little information to sellers about what characteristics of the product buyer valued or didn't value.

- (2) The time cost involved in making minor purchases by auction.

2. Private Treaty

- a. Involves direct buyer-seller negotiation
- b. Negotiations not covered by formal rules, as are auctions
- c. Very widespread in food system--e.g., between food retailers and distributors of fresh produce. Also very common in developing countries (Haggling).
- d. Often takes place in situations where knowing the identity (reputation) of your trading partner is important , e.g., to assure quality (as in fresh produce) and that the terms of sale will be respected.
- e. Advantages
 - (1) Convenient (don't need 3rd party)
 - (2) Physical efficiency--don't necessarily have to have product present, if participants are willing to trade on the basis of description.
- f. Disadvantages
 - (1) Pricing not necessarily efficient
 - (2) Can be inequitable unless there is adequate access to market information on both sides of the deal and roughly equal

market power. Search costs for information can be high, and are likely to favor trader over farmer due to latter's larger volume of trade, which justifies greater searching for information.

- (3) Lacks the positive externality of generating information for others that auctions provide.

3. Administered pricing (list prices)
 - a. Prices with which most of us are most familiar in the food system-- e.g., supermarket pricing
 - b. Prescribed by buyer, seller, or third party (e.g., gov't). Other party to trade can either accept them and trade or reject them and attempt to find better prices elsewhere.
 - c. Widely used by food manufacturers and wholesalers as well as retailers, especially for branded products. Also the mode for government support prices and other official prices (e.g., ceiling prices)
 - d. This is the pricing system implicitly assumed in much of the economic theory of imperfect competition--e.g., monopoly models.
 - e. Advantages:
 - (1) Targeted information transmitter
 - (2) Saves on buyers transaction costs (esp. important for small

purchases--e.g., in a supermarket)

f. Disadvantage--Inefficient prices, esp. when there are few sellers.

4. Formula pricing

a. "Pricing off of somebody else's price." Mathematical formula that relates transaction price to some other indicator of value.

b. A hybrid between private treaty pricing and administered pricing

(1) Formula agreed upon through private negotiations

(2) Indicator of values used are usually estimated or quoted by some third party.

c. Wide variation in forms, but is widely used in food industry:

(1) Pricing for future delivery based on Chicago Board of Trade grain price adjusted by the basis.

(2) Milk pricing based on M-W manufacturing milk price

(3) Cheese pricing

(4) Eggs--off of Urner Berry quote

(5) Beef pricing off the Yellow Sheet (National Provisioner)

d. Advantages:

(1) Reduction in transaction costs, which facilitates trade (this is its biggest advantage).

(2) May reduce individual firm's risks under certain circumstances.

- e. Disadvantages:
 - (1) How often are formulas revised to reflect changing conditions?
 - (2) How reliable is the reference price--problem of thin markets
--
 - (a) Definition: Markets with low trading volume and low liquidity (e.g., residual markets), in which individual firms can sometimes exert undue influence on price and other terms of trade, often leading to prices that do not accurately reflect overall market supply-demand situation.
 - (b) Problem becomes more acute due to the free-rider characteristics of market information, such as price. After someone has gone to the cost of discovering a price, there is an incentive to simply use that price in a formula rather than incurring the transaction costs of negotiating yourself. If taken to the extreme, everyone has an incentive to contract, and the reference market eventually disappears.
 - (c) Dangers for contracting:
 - i) Using reference prices that don't clear the

- market--inefficiency
- ii) Manipulation--e.g., charges of manipulation of Yellowsheet price by packers, in packer-to-packer carcass trades, which influence the prices upon which packers sell beef (including boxed beef) to wholesalers and retailers. [Explain shift to boxed beef and formula pricing of the sub-primals off of carcass pricing by private treaty.]
- (d) Extremes, where reference market seems to have disappeared--> efforts to "call the market" by technical committees and other mechanisms
 - i) Urner-Berry in the egg market--Fictive prices accepted by industry, but volatile, suggesting room for improvement.
 - ii) Some co-ops (e.g., Pro-fac) for CMV of some vegetables that are no longer delivered to IOF processors
 - iii) Wisconsin Cheese auction.

C. Methods of Coordination that Complement Pricing Methods

1. 5 elements in carrying out a transaction

- a. Negotiating the deal (specification of terms of performance by each participant)
 - b. Transfer of ownership
 - c. Establishing a price
 - d. Physical delivery to the buyer
 - e. Monitoring and enforcement of the contract terms
2. These elements, especially the first 4, can be done all at once or separated over time and space.
- a. The various mechanisms outlined below vary in the degree to which these various functions are grouped together or separated.
 - b. The various mechanisms can be viewed as lying along a continuum from pure reliance on open market to internalization of transactions via integration. We will discuss more of this when we discuss TCE.
3. ***Terminal markets***
- a. Includes all public assembly markets for agricultural goods, e.g.,
 - (1) Large terminal livestock markets at Omaha or Chicago
(now closed)
 - (2) Wholesale/retail fruit/vegetable markets in Lansing, Detroit, and Abidjan--Typical for developing countries
 - b. In U.S. food system, still important for produce, but less so for most other commodities.

- c. Distinguishing features are public trading and product assembly.--
Combines all 5 functions listed above of a transaction (except enforcement?)
- d. Sometimes sellers and buyers will use commission agents
- e. Pricing by private treaty or auction.
- f. Advantages
 - (1) Open trading (open access) and usually large numbers of buyers and sellers generally lead to efficient prices.
 - (a) The economies of scale in selling lead to generating a positive externality of increased competition.
 - (b) Periodic markets developed to do this.
- g. Disadvantages:
 - (1) High physical assembly costs (transaction costs)
 - (2) As they get thinner, may lead to distorted prices. This can be particularly problematic if those markets are used as reference markets for formula pricing.

4. ***Direct marketing***

- a. Decentralized, individual transactions between buyers and sellers.
- b. Private trading, in that both negotiations and outcomes are known only to the participants
- c. This is the most dominant form of market transaction in much of

the food system, especially beyond the farmer-first handler stage. E.g., between food manufacturers and food distributors. But it is also important between farmers and assemblers (e.g., grain elevators).

- d. Pricing typically by private treaty, although sometimes based on formula pricing or list pricing.
- e. Has displaced terminal markets as the most important coordinating mechanisms for ag. commodities in the U.S. since WWII.
- f. In order to capture physical efficiencies available from this exchange mode, it is critical to have invested in communication infrastructure, decentralized transport system (especially secondary roads), and the ability to trade on the basis of description rather than physical inspection.
- g. Advantages:
 - (1) Convenience
 - (2) Physical efficiency--don't ship the goods until you seal the deal.
- h. Disadvantages:
 - (1) Possible problems with pricing efficiency and equity, due to possible imbalance in information between participants (see discussion of private treaty pricing above)

- (2) Not public. No information transmission to the rest of the system, to make other trades more equitable. Controversy about proposals for mandatory reporting of contract terms.
- i. Therefore, there is a tradeoff of reduced pricing efficiency compared with greater operational or technical efficiency compared with terminal markets.

5. *Electronic Markets*

- a. An attempt to combine the openness of access and pricing efficiency of terminal markets with the physical efficiency of direct marketing. Separates the public trading from the product assembly
- b. A few function (e.g., for cotton (TELCOT), hogs in Ontario, and cattle in the Western US, using videotape.
- c. Require good product descriptions to work.
- d. Pricing typically by some sort of auction.
- e. Experience to date is that they
 - (1) increase competition and efficiency of pricing
 - (2) have high unit costs due to low volumes
- f. Advantages
 - (1) physical and pricing efficiencies
- g. Disadvantages
 - (1) Start-up costs (including initial low volumes)

(2) Education of users

h. Also redistributes information and power in system.

6. **Contract Coordination**

a. In broad sense, all forms of transactions have an implicit contract-- approach of TCE--Here we will deal in a more narrow sense of agreements between actors at various stages of the subsector to make forward commitments to produce and buy/sell with each other.

b. Types of contracting varies widely. 3 broad categories of farmer-first handler contracts (*contract farming*):

(1) **Market Specification Contracts**

(a) Establishes amount, time, quality, and place for future delivery.

(b) Price may be established at time contract is made (in which case it is a forward contract), or some rule specifying how price will be determined can be established.

(c) Most of the production risk remains with the farmer.

(d) Main differences with spot market coordination

i) Guarantees outlet for farmer and source of supply for buyer

- ii) If quality specifications are rigidly set, contract may increase risk of farmer.

(2) **Production Management Contracts**

- (a) Call for direct participation in contractor in production management. Usually in the form of specification of inputs or cultural practices, often with the presence of the contractor's personnel (field agents) to ensure compliance.
- (b) Contractor often then accepts some of the farm-level production risk.

(3) **Resource-Providing Contracts**

- (a) Contractors in addition to specification provide key inputs and assume much of production and price risks.
- (b) E.g., broiler contracts--integrator provides chicks, feed, and other inputs, and grower provides facilities and labor, and is paid on a piece basis--i.e., grower approaches role of hired labor.
- (c) Payment often on a tournament basis to reward relative efficiency of grower in achieving efficiencies (see reading)

- c. Advantages:
 - (1) Assurance of product availability and specification for buyer and assured market outlet for seller (both important when large fixed assets are at risk)
 - (2) They thus allow participants to capture some of the benefits of internalizing a transaction, while retaining some of the advantages of decentralized decision making.
 - (3) May provide farmer with easier access to new technologies and capital. E.g., note speed of technical change in the broiler industry and the benefits these have brought consumers.
- d. Disadvantages:
 - (1) Problems of unequal information and market power in their negotiation.
 - (2) Contract terms often not public-->no addition to information in broader system.
 - (3) Degrading of remaining spot markets as market volume falls.
- e. Concept of a Forward Deliverable Contract Market (FDCM) as a way to overcome these problems.
 - (1) Specified delivery contracts made before major production

decisions taken.

- (2) FDCM set up as an organized exchange to trade these contracts
- (3) Would still need some spot market to deal with last-minute quantity adjustments.

7. ***Integration***

- a. Ownership of two or more vertically adjacent stages of production within one firm, with the attendant internalization of transactions between the stages within the firm.
- b. It runs counter to the economic argument that there are economies to be gained from specialization and exchange. Integration eliminates both.
- c. Logic--elimination of transaction costs--will discuss these next time, but include assurance of product availability and quality, elimination of risks of market, overcoming market power in adjacent market stages.
- d. Widespread in food system--e.g., poultry industry, food manufacturers owning retail outlets, etc.
- e. Advantages:
 - (1) If it eliminates transaction costs, this improves efficiency, at least for the firm.

- (2) May improve dynamic stability by improving coordination within the firm. But unless there is industry-wide coordination, macro instability may persist.--e.g., poultry
- f. Disadvantages: Questions of how it affects the remaining parts of the subsector that haven't integrated those stages:
 - (1) Thin markets
 - (2) Market access to those not integrated may decrease. If integration is economically justified, this just reflects increase in efficiency.
- 8. **Cooperatives**--Will discuss these in more detail later in the course.
 - a. Play major roles in U.S. food system, both on input provision and output marketing (overhead)
 - b. In U.S., these have been largely grass-roots organizations controlled (until recently) by farmers rather than organized and controlled by the state.
 - (1) State has played important facilitating role with legislation and technical support.
 - (2) Control question is now more an agency question--management or farmer control.
 - c. Two major types of cooperative activity
 - (1) **Cooperative bargaining**--horizontal integration to gain

countervailing bargaining power--similar to labor unions.

- (a) May promote coordination by helping to:
 - i) assemble information on supplies and prices--e.g., farmers' planting intentions.
 - ii) Helping assure product quality to processor.
- (b) Widespread in produce industry, especially for processed products
- (c) In U.S., often hindered by free rider problems--move for Exclusive Agency Bargaining.
- (d) In other countries (e.g., Scandinavia), often granted right to bargain directly with gov't over prices and farm incomes (farmers' unions).

(2) **Cooperative integration**--Attempts to:

- (a) Raise prices--generally unsuccessful over long run (free rider and lack of supply control)--Sapiro
- (b) Competitive Yardstick--Edwin Nourse
- (c) Both attempts were attempts to deal with perceived unequal market power across industries.
- (d) Different from other types of market integration in that co-op can rarely dictate to farmer what to do, and hence has less control over farmers' output.

Question of farmer commitment to the co-op.

(e) Similar to a contingent contract.

- (3) Co-ops often work in conjunction with government sponsored programs, like marketing orders--Implementing agencies of these orders.

D. Complements to these Coordinating Mechanisms

1. *Futures market*

- a. Future contracts for delivery, but usually not delivered on. Standardized contracts that can be canceled by an offsetting transaction.
- b. Means of:
- (1) Price insurance through hedging
- (2) Future price discovery--and therefore used a lot in formula pricing
- c. Mechanics discussed in other classes--e.g., AEC 845. The principal is that the basis fluctuates less than the cash market.

2. *Market Information* (more on this later in the course)

- a. Public good nature given its indivisibility and nonappropriability
- b. Role of public sector provision in improving coordination and redistributing power in system.
- c. More on this later in course

AEC 841--MODULE 3E

Subsector Analysis and Vertical Coordination

Page 28

3. Various types of gov't programs, such as price supports, marketing boards and marketing orders--more later in the course.
- E. Interaction of pricing and coordination mechanisms--see handouts.
- V. Policy issues
 - A. Achieving an Accurate Redefinition and Vertical Coordination of Commodity Quality.--i.e., assuring the role of commodity quality in vertical coordination.
Assuring that the consumers get the attributes they want.
 1. Examples--beef, pork grading, milk pricing
 2. Food safety issues
 3. Role of pricing efficiency
 4. Importance of transaction costs in getting info communicated to producers.
 - B. The temporal coordination of quantities produced and marketed
 1. E.g., cycles of production
 2. Role of information, fixed assets, and mechanisms for making and enforcing collective decisions.
 - C. Assure transaction mechanisms to mitigate thin markets
 - D. Assess the nature of agribusiness market power.
- VI. Use of subsector studies--See French reading.