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COMPETITIVE MARKETS AND BILATERAL EXCHANGE: THE WHOLESALE SEAFOOD MARKET IN HAWAII

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INTRODUCTION

The modern corporation is analyzed increasingly as an organization which seeks to economize on transactions costs (Williamson 1981). At the same time, the commercial seafood industry has been a frequent subject for economic analysis because of competitive imperfections associated with joint use of a naturally available resource (Sissenwine 1982). However, the role of seafood marketing firms is less studied although their business precisely is to handle transactions in an industry beset by uncertainty, risk, and productive inefficiencies (Wilson 1980).

The purpose of this paper is to explore a market with mixed product forms. The context is the seafood market of Hawaii but observation of other seafood markets suggests that the case can be generalized. Furthermore, the seafood case may be extended to markets for other fresh agricultural products, such as vegetables, fruits, and flowers, where quality is a major concern. Finally, the case may be generalized further to any market where information and product quality are important (Smith and Smith 1985).

Wholesale seafood firms engage in a range of business functions through which they internalize transaction costs. These costs include those associated with high-frequency exchange of heterogeneous products (multiple agreements and documentation), inventory and liquidity costs of uncertain supply conditions, and a range of transactions specific investments pertaining to communication, transportation, and contracting. Wholesale seafood dealers also internalize the costs of determining market prices and quantities demanded at decentralized final exchange locations.

Market (equilibrium) prices exist but are seldom observed, especially at the wholesale level. Wholesale firms are effectively responsible for transmitting information on supply and demand conditions to both ends of the market (Hirshleifer and Riley 1979). They also are located centrally to implicit contracting and to forecasting market trends, all of which are central to the information basis of the firm (Coase 1937).

Wholesale seafood firms reduce the number of separate business transactions required in the open market (i.e., between firms) and thus reduce the overall cost of distribution. These firms also help manage the risk associated with seafood harvesting through their inventories and arbitrage (Lim 1981). Wholesale seafood inventories take on both precautionary and speculative functions in respect to uncertain supply conditions. Wholesale firms allow production units (i.e., fishing vessels) to be used in optimal production schedules by absorbing variations in harvesting levels, within the limits of processing and distributing capabilities.

Finally, wholesale firms can minimize the costs associated with self-insurance against production irregularities and perishable inventories by diversifying the range of products they handle and the range of producers from whom they purchase. This effectively pools the risk of several product lines and producers. In this they also offer greater advantages of scope (i.e., product diversity) than could be obtained by individual producer units. (Panzor and Willig 1981).

These advantages are not without costs to the harvester and retailer, and they are not without cost to the wholesaler. The wholesalers control the information flow (Grossman and Stiglitz 1976) and generally are more concentrated than either supplier or demander. In many situations "bilateral exchange" (i.e., situations of implicit, nonmarket contract) dominate the relationship between the harvester and wholesaler. In these situations, informational inefficiencies may diminish the quality of these transactions and the quality of the product (Wilson 1980).[1]

The efficacy of wholesale seafood dealers in meeting the transactional needs of their market depends to a substantial extent on their institutional setting. In many cases the seafood industry is highly regionalized, small, parochial, and oligopolistic. In other situations the wholesale market is dominated by processors who have no incentives to explore alternative marketing arrangements. It appears that a combination of competitive auctions and bilateral exchange is a solution to improving the transactional quality of the market.

THE HAWAII MARKET

The Hawaii seafood market, although constrained on a national and international level by its relative size and geographical location, has been able to take advantage of a number of market characteristics to create an efficient, high product quality market. The Hawaii market involves:

1) a spot market (the auctions) which centralizes price-quantity-quality information for fresh fish;

2) bilateral arrangements between individual commercial harvesters and wholesale dealers to compensate for fluctuations in market supply;

3) integration of fresh and frozen products sales, and domestic and imported product, to allow ready substitution, consolidation of distribution channels, and reduced risk; and

4) development of specialized export markets in high valued product which expands the scope and range of the domestic market, thus "amortizing" the average transaction costs.

Hawaii's domestic fishery and seafood markets are limited in size but not in scope. The fresh fish wholesale market consists of 2,300 t (5 million lb) annually of locally harvested oceanic and bottom dwelling species in myriad variety and 3,600 t (8 million lb) of imported fresh fish. These are sold to a local retail market with per capita consumption substantially above average and a growing tourist market (Hudgins 1981; Cooper and Pooley

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[1] Interestingly Wilson's investigations have helped lead to the development of an auction based seafood marketing complex in New England.

1982). Prices of locally harvested fresh fish are substantially higher than the average for fresh fish in the United States as a whole. However, Hawaii is also a substantial consumer of frozen seafood, approximately 5,000 t (12 million lb), mostly imported (not differentiated between foreign imports and purchases from mainland U.S. suppliers). The wholesale marketing network is illustrated in Table 1. There is also substantial direct purchasing from the U.S. mainland by retail firms, such as supermarkets, which may amount to 50% of the market (Higuchi and Pooley 1985). This is mostly frozen or fresh-frozen product.

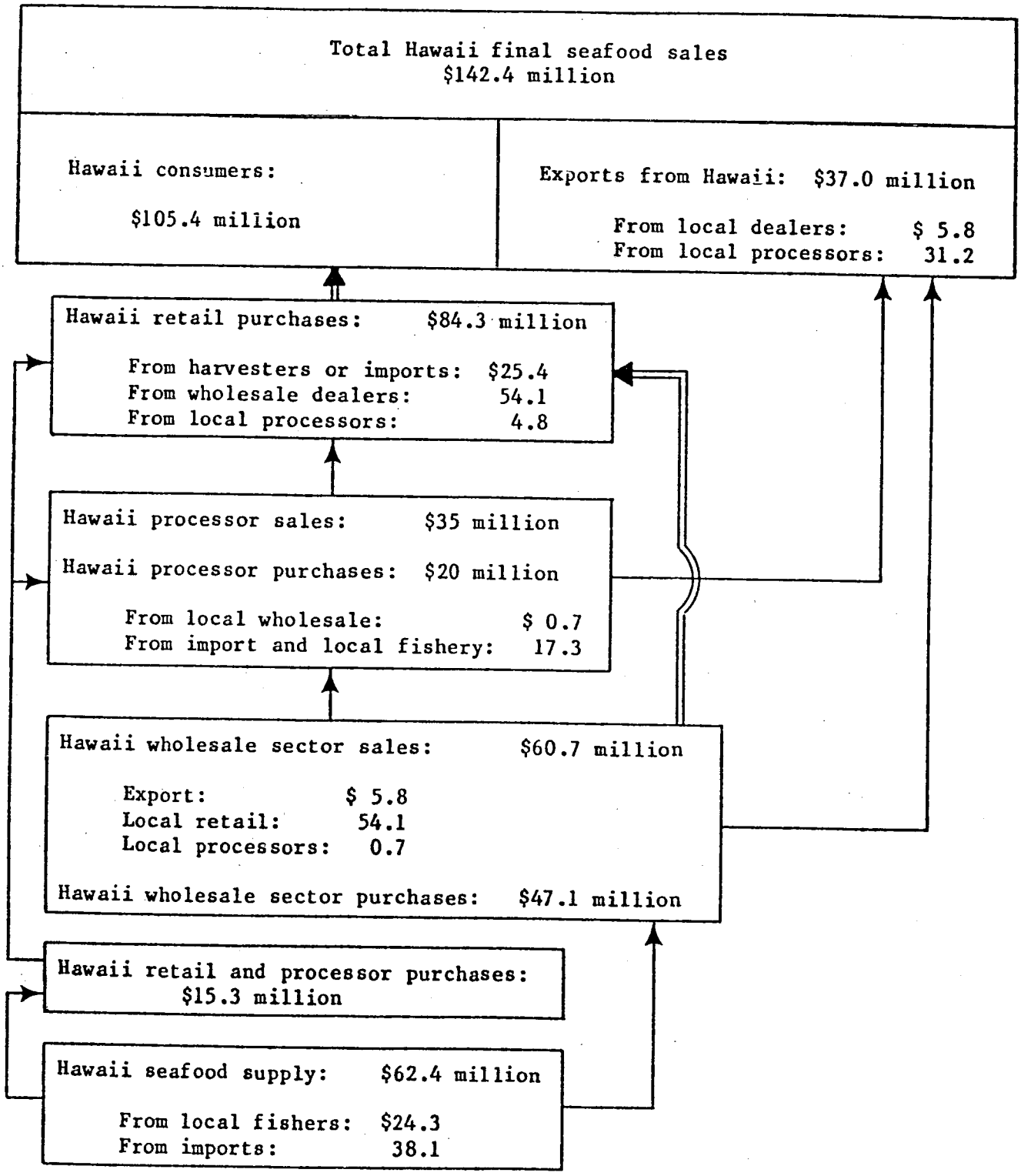
Hawaii's wholesale seafood market involves over 100 firms: specialized seafood wholesalers (fresh and frozen product), frozen food wholesalers, and wholesale-retail fish dealers (Cooper and Pooley 1982). Forty percent of the locally harvested fresh seafood passes through two auction markets, whereas the remainder moves directly from harvesters (or harvesting cooperatives) to wholesalers and retailers.

The Hawaii auctions represent a dramatic difference from seafood markets in most places in the U.S. Wilson (1980) emphasized the importance of long-term bilateral arrangements between commercial harvesters and shoreside buyers in New England. These arrangements served to overcome transactional problems associated with uncertainty and limited information. The Hawaii auctions serve to pool information on price, quantity, and quality, creating a quasi-public good in market information and provide a baseline for nonauction transactions. Consignment and reciprocal agreements are the primary form of transaction in the frozen seafood sector in the Hawaii market, as they are elsewhere. Such arrangments are also typical of bilateral agreements between local Hawaii harvesters and wholesalers who wish to avoid dependence on the publicly visible auctions. As a result, the Hawaii seafood market combines aspects of bilateral exchange with the advantages of spot market.

COMPETITION AND EXCHANGE

If we look at the behavior of individual wholesale firms, they have choices over time concerning the location of their supply--whether to buy directly from fishers or use the auctions--and choices concerning the composition of their supply--whether to specialize in fresh or frozen product or to diversify. At auctions major fresh fish wholesale dealers are involved in an iterative buying situation where a firm's willingness to buy is a function of its economies of scale, and where its willingness <u>not</u> to buy is a function of its bilateral arrangements. Small fresh fish wholesale dealers, lacking financial as well as distributive economies of scale, have less choice in the auction setting. As a result, small fresh fish wholesale firms frequently purchase from larger wholesale firms. Firms which specialize in frozen products would face significant information costs if they chose to begin participating in the fresh fish trade and thus are unlikely to venture into auctions. Larger fresh fish wholesale dealers, having developed a market network for locally landed fish, can expand into frozen trade with relatively little additional capital or managerial investment. Their ability to break into the frozen market, however, is constrained by the joint product nature of that market (seafood is usually only

Table 1.--Seafood market channels.



one of several products sold by wholesale firms dealing in frozen product) and the overall level of competition in that market. Their alternative is to combine limited participation in the frozen import market with development of the fresh-frozen export market. They thus spread the risk of pioneering a new market and are able to share a variety of productive inputs among product states.

We might depict the situation for fresh fish wholesale dealers as facing a sinuous production total cost curve for undifferentiated wholesale output (Fig. 1, TC(*)).[2] In range A, capacity is extremely limited and transactions cost are high. As such, firms in this range represent extremely marginal operations from an industry standpoint. They tend to have a greater direct retail share, thus spreading their purchasing costs through the retail markup. In range B, traditional economies of scale take over with investment in greater cooler and freezer space, telephone systems, bookkeeping, transportation, etc. In this range a few firms can develop large market shares and industry competition as a whole could become limited. In range C, a firm can begin to explore joint product forms and the export market. This requires additional capital and managerial investment, especially in the range of telecommunications and inventory control. Development of a multifaceted seafood market requires this stage even though the costs of failure may prove rather high. Essentially an export threshold must be mounted before further economies of scale and scope can be achieved. Finally, in range D, limited competition is reinstated by those firms who now are able to tap the export market also playing a dominant role in the domestic market.

Substitutability of productive factors occurs at an uneven rate within most ranges and may be completely discontinuous between ranges A and C or B and D as shown with TC(!). That is, financial barriers to entry may exist in terms of rationalizing a new wholesale network in competition with existing firms. Entry may be limited to periods of historical change in the industry. In Hawaii, the passing of the immediate post-World War II generation of entrepreneurs and managers is one such period. Although sales networks allow economies of scale and scope, buying arrangements are more difficult to rationalize. The decision boils down to a problem of maintaining transactional expertise in a small market--both bilateral and auction purchases require time and financial resources. There are costs associated with participation in each mode and the transition between the two is not smooth. Wholesale dealers are faced with strategic choices in allocating their management resources, and these choices are connected with the depth of their financial liquidity and their willingness to face risk.

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[2]The functional form of this total cost curve resembles the case of multi-plant long-run cost curves described by Henderson and Quandt (1980). They introduce a "plant size" variable, K, which causes fixed costs to be an increasing function of product <u>over</u> plant sizes. The family of short-run cost curves for various plant sizes (K) is differentiated over the long-run, creating the sinuous, if not discontinuous, cost function identified in Figure 1 (Henderson and Quandt 1980, p. 89-90).

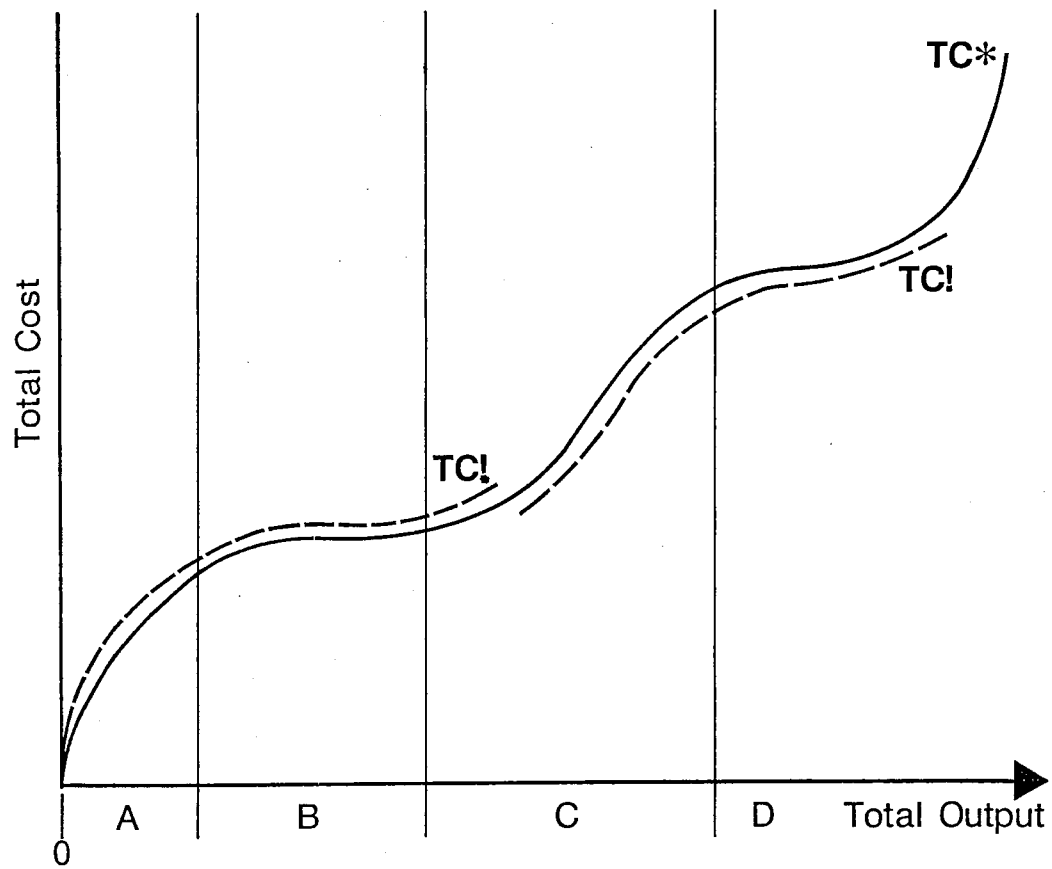

Figure 1.--Wholesale total cost function.

The nonlinearity, nondiminishing, aspect of the midrange cost curve has a number of implications concerning the competitive behavior of firms. Information of the nature of consumer demand and the ability of one's competitors to meet that demand are important aspects of decision making. In many ways it is classic oligopoly behavior. As Ponssard (1979) has shown, information about the demand situation facing the industry is highly valued. Firms which are able to trade on many levels are more likely to achieve such informational advantages, although their activity at the auction may provide influential clues about their nonauction decision.

One factor which affects choices of market participation is the firm's ability to withstand fluctutations in price and quantity. The expected variance in seafood quantities available throughout the auctions is less than for individual bilateral arrangements where buyers depend on the success of individual harvesters. Larger dealers can bear the cost of reducing the difference in these variances by establishing a large number of contractual arrangements with a diverse base of harvesters, or by holding inventory. Auction prices have a greater short-term variance than bilateral prices, even if their long-term average might be the same. Thus smaller dealers might be leery of dependence on the auction because of the liquidity implications of unexpected high price periods. The ability of firms to handle these types of costs probably determines their market choices (Carlton 1979).

From the retail side of the market, the picture is reversed. The expected variance in received price is still probably greater for open market operations compared to prepurchase consignment arrangements. However, quantity and quality are also more variant. There are additional costs to consignment sales: the costs of contracting and obtaining supply in unfavorable market conditions. Trade offs exist and large firms are probably more able to bear the cost of such consignment sales. In this case, larger firms may be able to broker these unstable fresh seafood transactions with the stability of frozen seafood marketing to attain significant economies of scale. There may be a transactional tendency toward monopolistic competition.

Two factors prevent monopolization of the industry. First, although there are advantages of scale in seafood wholesaling, these do not offset the high cost of concluding individual contracts with harvesters and retailers. Therefore with adequate availability of information in the general seafood market, larger wholesale seafood firms may tend to concentrate on high volume sales whereas smaller wholesale dealers may be left with the lower volume sales. Interestingly this corresponds to Okun's (1981) conception of shopping behavior in product markets where stability of transactions is one means of reducing information costs. Second, because fresh seafood is perishable, firm size is limited by geographic market size. Although fresh and fresh frozen export of locally harvested seafood may be lucrative in a revenue sense, it is transactionally expensive and undoubtedly involves more risk. As a result the fresh wholesale seafood industry probably has a stronger tendency away from national concentration than most industries. The internalization of distant market functions is costly and external or multiple internal markets are required for transactional efficiency.

COMPETITION IN HAWAII'S SEAFOOD MARKETS

Individual fresh fish wholesalers have incentives to obtain information on seafood supply outside the auction setting to inform their bidding and their bilateral arrangements. Although their auction bids may indicate expectations about the supply of fresh fish, a larger wholesaler's ability to purchase local fish through bilateral exchange, to import frozen fish, and expand its market through exports provides a greater latitude in auction

behavior. Reliance on the auctions not only exposes the dealer to public inspection but also subjects the dealer to daily reliance on the external market. Thus reliance on the auctions reduces the efficacy of internal control of transactions. As such, combined market forms make sense as a business strategy.

The combination of fresh fish auctioning, limited backward integration, and frozen fish brokerage allows pooling of risk and reduction in the distortions which might otherwise be caused by reactions to uncertainty. Successful wholesale seafood dealers in Hawaii combine types of marketing whereas less successful dealers are limited in their span of the market. The relatively small number of major wholesale seafood dealers in Hawaii increases the chance for economies of scale in product distribution and information handling despite the small size of the local market. This combination of market forms is a fairly recent phenomenon and appears to have played an important role in offsetting a decade (1960-70) of stagnant fresh fish demand.

The Hawaii auctions are not neutral ground wherein the famous microeconomic paradigm of the invisible hand is played. Commercial harvesters frequently engage in informal agreeements to schedule supply to avoid flooding the market, and dealers follow similar behavior through inventories and bilateral arrangements with harvesters to schedule the arrival of fresh fish. Peterson (1973) observed that although competitive in nature, the auctions are not exempt from their social setting.

Thus it appears that the Honolulu fish dealers have avoided some of the risks of their business by eliminating extreme competition among themselves through a system of established social relations. The use of a social system to reduce risk is not unusual; for one can think of many examples where society protects its members from the unknown or the uncertain. (Peterson 1973, p. 229).

Adams (1981) found market leadership in Hawaii fresh fish wholesaling but turnover of firms in the market was sufficiently high to suggest barriers to entry are not creating monopoly conditions. Cooper and Pooley (1983) found that whereas 62% of auction sales go to only 4% of Hawaii's wholesale dealers, this nonetheless represents a moderate industrial concentration ratio (34.9%, a Gini coefficient calculated as the square root of sum of squared market shares). Auctions provide an exchange arena substantially different from that characterized by bilateral exchange. Two years auction receipts show a high degree of price response to fluctuation in quantity, despite substitution in species groups (Pooley 1986). Bilateral arrangements, on the other hand, are known for their fixed-price nature. Thus, despite the greater volume of bilateral transactions, the auctions provide highly visible quality premiums and are the focus of Hawaii's fresh seafood transactions.

Although Hawaii is surrounded by water, over half of its seafood consumption consists of frozen imports. The frozen seafood market is not directly subject to the impact of the fresh fish auction because of limited substitution. This sector of the industry appears to be more stable and

more characteristic of generalized commodity agribusiness. However, even in the frozen seafood sector issues of market behavior arise because of the increasing tendency for larger fresh fish dealers to import frozen seafood to complement their restaurant trade. Experiments are also being undertaken to extend the shelf life of locally caught seafood, increasing its competiveness with imported seafood and expanding its capacity for export. As a result, frozen seafoods expand the level of bilateral transaction in the local seafood market as a whole.

What has evolved is an increasing separation between major seafood wholesale firms and the smaller traditional fresh fish dealers. Major fresh fish dealers either have a dominant role at the auctions or have substantial bilateral arrangements. Yet instead of intensifying the market inequities that were frequently discussed before expansion of the market (in the late 1970's), the new market structure appears to be assisting the growth of Hawaii's seafood industry. Broader avenues of distribution now exist for local harvesting firms and some varieties of local seafood are becoming luxury items with national markets. As a result the exchange environment is improving because economies of scope and scale can be realized. In terms of the sinuous production function sketched in Figure 1, historical evidence exists on ranges A and B in Hawaii's seafood markets before 1975, and more recent evidence suggests behavior in ranges C and D for successful firms.

Although frozen seafood is important throughout the market very small firms tend to concentrate on fresh fish sales and 40 of 118 wholesale fish dealers have no trade in frozen product at all. As a result many small firms in the wholesale network are actually engaging in wholesale-retail, some in centralized retail markets. (Large firms also have a retail business, but it is a much smaller share of their business.) There is a positive correlation between firm size and percentage of business at the wholesale level ($r = 0.28$, $P = 0.01$) and a negative correlation ($r = -0.43$, $P = 0.00$) between wholesale business and percentage of revenue obtained from fresh fish (Cooper and Pooley 1983). Transactions theory suggests several reasons why this might be so. Customs and warehousing requirements, problems with holding costs while foreign product is inspected by the Food and Drug Administration, and the difficulties involved in making profitable trade arrangements contribute to scale economies for importing foreign frozen product. Technology also plays a role since smaller dealers may not be able to compete effectively with the consolidated dealers of frozen products in terms of storing and delivering frozen product. Although it is possible for specialization in an individual transaction "market," this does not seem to be a stable phenomenon.

Diversity in product line is apparently important for establishing a position in the market, although the industry involves some firms which specialize totally in fresh product (27 firms, mostly small) and in frozen product (20 firms). Firms also specialize in particular product groups, and insofar as concentrated market structure is important, it is found within specific segments of the market (e.g., fresh or frozen, and species groups) rather than in the market as a whole. This confirms the importance of informational assets in a heterogenous market.

Concentration ratios calculated on varieties of seafood handled suggest that firms also specialize in particular species and look for specific market areas of comparative advantage.[3] Recognizable differences and distinctions in "seafood" allow individual firms the opportunity of acting as monopolistic competitors by promoting specific brands or quality premiums within their sphere of the market.

Nonetheless, a weighted concentration ratio based on species concentration for the industry as a whole indicates much less concentration in the handling of individual species than previously was suspected in Hawaii.[4] This might suggest a higher degree of product homogeneity and substitution than is commonly attributed to Hawaii's seafood markets, as well as to the importance of economies of scope. There is a negative (but statistically insignificant) correlation ($r = -0.10$, $P = 0.29$) between species concentration and firm size, perhaps indicating that larger firms may be more diversified traders but only marginally so.

Retail firms (supermarkets, restaurants, etc.) need a diversity of seafood and can look to particular wholesale dealers for supply. This reduces their information and transactional burdens if species-specific strata of the market are delineated. In general the retail market allows substitution although generally within species and product form groups (Pooley 1986).

The role of export-import and intramarket wholesale activity also provides latitude for greater transactional diversity, and thus greater chance for business growth through inventory control and market segmentation. Because of the distinction between fresh fish dealers and wholesalers handling frozen fish (97.7% of frozen fish is imported), there appears to be no correlation between firm size and percentage of sales made to other wholesalers or with percentages of purchases from other wholesale firms. However, a ratio measuring a firm's tendency to purchase fish from a sole source indicates a negative correlation between such concentration and firm size ($r = -0.36$, $P = 0.01$). Larger firms obtain economies of scale and scope precisely because they can diversify their product lines, their sources of supply, and the final sales locations. This increases their transaction costs but reduces risks and maximizes opportunities for profitable sales.

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[3] Species concentration ratios were calculated as Gini-Herfindahl coefficients of product share within each firm for 12 species categories. The ratios ranged from 40 to 100% with an average of 74% on a theoretical range of 28.9% for equal distribution of all species in a firm's product mix to 100% for complete specialization in just one species (Cooper and Pooley 1983).

[4] The industry species composition Gini coefficients were calculated over all firms for each of the 12 species groups. The ratios ranged from 33% for tunas (indicating most firms trade in tuna) to 66% for relatively rarely traded species such as shark and opelu (a nearshore pelagic species).

There is a fairly strong positive correlation between extent of participation in the auctions (percentage of a firm's total purchases) and the percentage of frozen seafood in a firm's total revenue ($r = 0.34$, $P = 0.01$). Although correlation between firm size and the use of the auctions is fairly low, the positive correlation, combined with a positive correlation between firm size and role of frozen product, supports the idea of complementarity between use of the auction and frozen seafood. Although large wholesale firms have a variety of sources from which to obtain their seafood, the larger fresh fish wholesale dealers tend to play a larger role in the auctions where quality and price standards are set. When considering only firms participating in the auctions, then 72% of all auction fish is purchased by just five firms. The same firms account for 40% of all seafood purchased by firms handling fresh fish, and 50% of all fresh fish purchases.

It appears that the auctions are most important for insuring continued access to supply, for obtaining, on a continuing basis, high quality fresh fish, and for providing a means of examining the behavior of other dealers. At the same time, small firms appear to be denied the possibility of using frozen product to stabilize supply and develop their market share, presumably because of inventory and transaction costs. With an irregular or uncertain demand and supply horizon, small firms may carry more fresh product than they would wish, reducing their capacity for diversifying into frozen product categories. Inability to adequately adjust for risk and uncertainty reduces a firm's opportunities (Pindyck 1982). Small wholesale seafood firms also must face the greater cash flow resources of the larger firms when bidding in the auctions and this reduces their ability to fill high margin retail contracts.

CONCLUSION

Analyses of apparently oligopolistic industries have stressed the importance of "contestable markets" in which the number of firms and the nature of their product is less important in predicting market behavior than the character of the competition they actually face (Baumol 1982). There are a number of factors in Hawaii's seafood markets which might warrant the conclusion that significant market imperfections exist. Certainly the cost of transactions resulting from distance is significant in establishing mainland U.S. and foreign markets.

However, the existence of highly visible competitive institutions (the auctions) seems to reduce the importance of other market imperfections and diseconomies, such as distance. In addition, the geographical centralization of Hawaii's domestic market provides a viable means of bilateral arrangement between harvester and retailer which adds an element to the competitive balance. Neither might be able to sustain the competitive norm alone, but in concert a viable market has been preserved.

The classic role of wholesale firms is to use inventories to stabilize the flow of production to the retail sector. Yet fresh fish inventories are inherently short-lived. A government fisheries managment policy that includes time-area closures will play havoc with the wholesale market unless domestic fishers have access to close substitutes. In Hawaii such closures

could have a particularly negative impact on the ability of the local fishing industry to maintain its newly increased share of Hawaii's hotel restaurant market and to penetrate mainland United States and Japanese markets. On the other hand, development activities which promote vessel storage capacities or shelf-life of fresh fish might play a major role in stabilizing fresh fish supply and tend to rationalize commercial fishing strategies which are now dictated by fear of market gluts.

In a situation of ex ante disequilibrium, wholesale firms act to balance producer and consumer behavior in the short run. They do this not only through inventories but also by expanding the range of transactions over what would be efficient for individual producers and retailers. However, in doing so, transactions tend to become bilateral. As such, market price determination is uncertain. The existence of a spot market, even when only a subsidiary segment of the market, appears to improve the strength of price signals in such disequilibrium situations. In factor markets, quantity adjustments to disequilibrium may have significant social costs. In consumer product markets, disequilibrium may have a longer term benefit by encouraging the internalization of exchange activities in wholesale firms and promoting in product substitution. The "mixed market" form explored in this paper appears to avoid a number of market distortions which might otherwise occur in situations of uncertainty and costly information.

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