Lesser, William H.

Working Paper

Vertical Exchange Relationships and Performance in the Great Lakes Yellow Perch Industry

Staff Paper, No. SP 81-02

Provided in Cooperation with:
Charles H. Dyson School of Applied Economics and Management, Cornell University

Suggested Citation: Lesser, William H. (1981) : Vertical Exchange Relationships and Performance in the Great Lakes Yellow Perch Industry, Staff Paper, No. SP 81-02, Cornell University, Charles H. Dyson School of Applied Economics and Management, Ithaca, NY, https://doi.org/10.22004/ag.econ.183802

This Version is available at:
https://hdl.handle.net/10419/276591

VERTICAL EXCHANGE RELATIONSHIPS AND PERFORMANCE IN THE GREAT LAKES YELLOW PERCH INDUSTRY

William Lesser*

January 1981 81-2

*Assistant Professor of Agricultural Economics, Cornell University. This paper was presented at the Annual Meeting of the Southern Agricultural Economics Association, February 1-4, Atlanta, Georgia.

The author would like to thank Bruce Marion, John Connor and William Tomek for helpful comments. Errors remain his own responsibility.

ABSTRACT

Perch fishermen in the Great Lakes yellow perch industry are found to use informal vertical exchange relationships which bind together fishermen and buyers through "moral obligations." These exchange arrangements while providing an assured outlet also raise substantial entry and exist barriers to perch processing. Available empirical evidence supports the hypothesis that the market is performing poorly in terms of equity for fishermen. Remedies call for the ending of allegedly illegal conduct of the dominant firm and providing alternative outlets for fishermen, possibly through a publically operated purchase and buy-back program.

VERTICAL EXCHANGE RELATIONSHIPS AND PERFORMANCE IN THE GREAT LAKES YELLOW PERCH INDUSTRY

In recent years agricultural economists have shown a strong interest in vertical exchange relationships for agricultural products and the effect of such relationships on competition, efficiency and equity (e.g., Marion, Hayenga, Campbell and Hayenga). These analyses have, however, largely ignored the fishing sector, a sector generally less well documented and analyzed than agriculture. The purpose of this paper is to fill part of this gap by providing (1) a descriptive analysis of the structure and first handler exchange relationships in the Great Lakes yellow perch industry, and (2) a preliminary analysis of the effects of these relationships on sector performance and equity. This analysis shows that the perch fishery, like some other near-shore fisheries in North America, uses informal exchange relationships rather than written contracts between producers and processors. Further analysis of the perch and other fisheries is needed to document the competitive effect of these arrangements, but they do raise the possibility of restricting factor mobility and thus raising entry barriers. The high buyer concentration, partially a result of the exchange relationships, along with the conduct used by buyers and a limited amount of empirical evidence while not conclusive do suggest that perch fishermen receive sub-competitive prices.

The information for this study was collected from in-person interviews in 1976-77 with fishermen in the major producing areas and with six processors representing about 75 percent of industry throughput. Available secondary information is limited to data on prices and volume at the port market level. For this reason some of the material included here is based on undocumented testimony by participants and should be interpreted with caution.

Although present in temperate waters throughout the world, commercial stocks of yellow perch are limited to the Great Lakes region. Lake Erie and notably the Canadian western basin provides the great bulk of the catch while Lake Michigan and the International Lakes constitute other important producing areas. Since heavy commercial fishing began early in the century supplies have been quite volatile with the total North American catch peaking in 1969 at 36 million pounds then dipping to 10.4 million pounds in 1976 (National Marine Fisheries Service (NMFS)).[1/] The reasons for this downturn are only partially understood and have been alternatively explained as the result of pollution, over fishing, predation by smelt, water temperature or a combination of several factors (Leach and Nepszy; Regier and Hartman; Smith and Busch; Scholl and Hartman).

The ex-vessel price for round or unprocessed perch has risen sharply following the supply declines beginning in 1970. The average implicit[2/] price rose from 9 cents/lb. in 1970 to 73 cents/lb. in 1976. In 1977, an increase in landings resulted in the first price decline in nine years (NMFS). The major landings occur in the spring and fall with smaller catches made throughout the remainder of the year. Despite the seasonality of the catch and differences in the meatiness of the perch during the year there are no discernible seasonable price patterns (Ontario Minestry of Natural Resoruces (OMNR)). This is probably largely a result of the predominance of wholesale sales of frozen rather than fresh fish.

Structure of the Industry

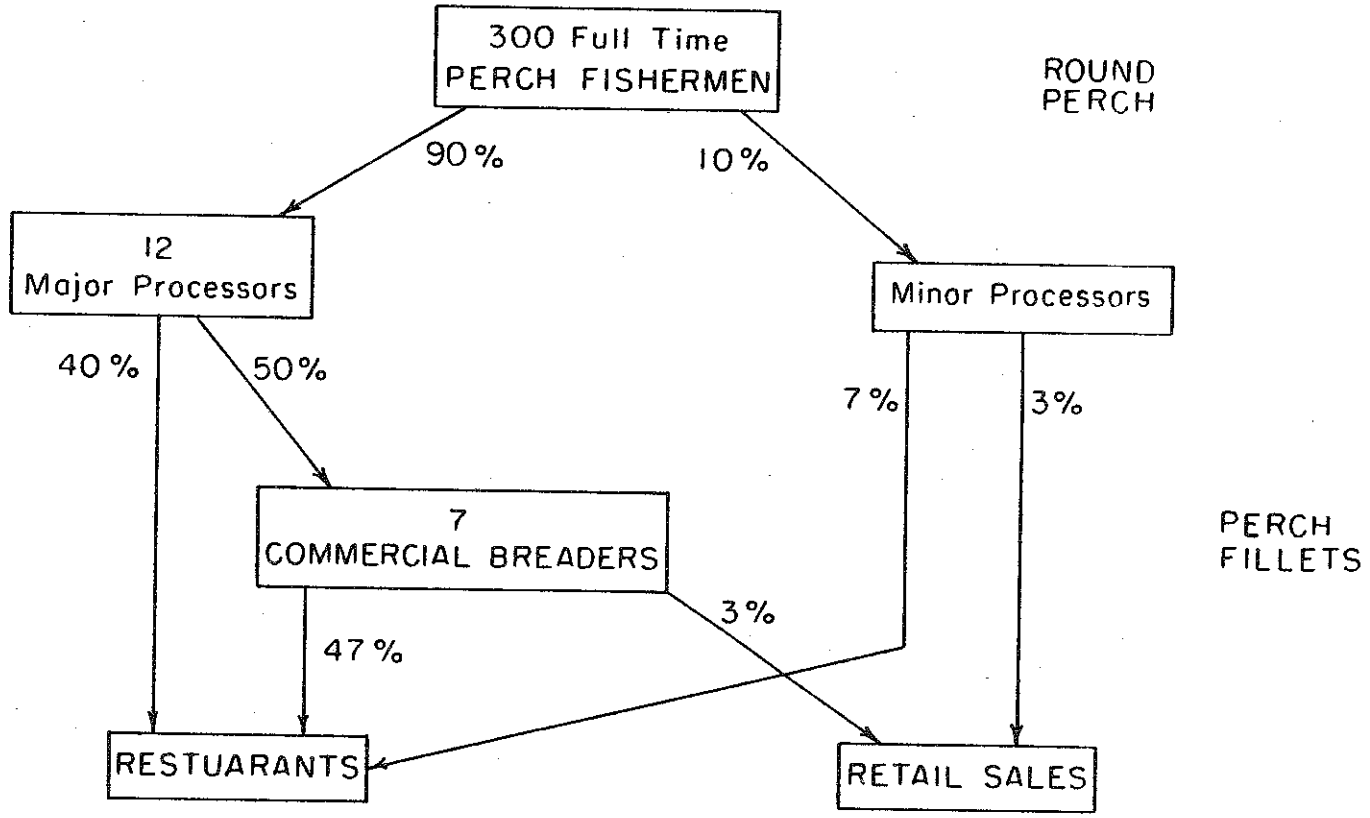
The perch industry is a relatively small one with, in 1975-77, 300 full time fishermen,[3/] 12 processors, 7 breaders, and 6 brokers who sell round (unprocessed), filleted, or breaded perch. Typically the perch will be sold directly to a processor from the fishing boat where it will be filleted and

frozen (or frozen, filleted and re-frozen). From there about half of the catch is sold to commercial breaders and half directly to restaurants where it is hand breaded (figure 1). Perch is consumed almost entirely in restaurants in the Midwest and particularly in Wisconsin at the traditional Friday night fish fry (Follett; Spira). This figure does not reflect the small amount of formal vertical integration which exists. Three firms, two in Ontario and one in Ohio, incorporate both fishing and filleting. The major Ontario firm operates 7 vessels providing approximately 15 percent of its requirements. The second Ontario firm is a cooperative, the only one in the perch fishery, which beginning in 1976 fillets half the catch of its 30 member vessels.[4/] (This coop has since become a proprietary firm).

The concentration of round perch buyers is greater than the number of firms implies. Considering the entire producing region, one Canadian firm (referred to as the dominant firm) handles about half of the total catch, or 9 million pounds round weight in 1974. Exact data on throughput by firms from which concentration ratios may be calculated are not available from these privately held companies, but the estimates of managers and other informed participants indicate that the four largest processors have an estimated market share of .67 to .75. The remaining firms are much smaller with volumes of only one-half million pounds or less in 1974. As a practical matter the actual buyer concentration for individual fishermen who have access to one to four buyers is far higher. As will be discussed below the vertical exchange relationships used in the industry have the effect of further increasing buyer concentration.

During the low point of perch supplies in 1974-76 all firms in the industry were operations at approximately 50 percent of capacity.[5/] Despite the cronic surplus capacity there has been little structural change from 1970-77 and no major entry or exit since 1967. Continued operation despite substantial

FIGURE I. THE GREAT LAKES YELLOW PERCH INDUSTRY



SOURCE: INTERVIEWS WITH FISHERMEN AND PROCESSORS

surplus capacity is due in part to the diversity of the firms which all handle a range of fresh and frozen fishery products while the largest firms also process vegetables. Among fishery products, yellow perch accounts for 10 to 50 percent of sales revenues.

Of the four entry barriers identified by Bain only the absolute cost barrier for the raw material, round perch, is important for perch processing. Production differentiation is not important, operational size economies appear to be very modest,[6/] and the investment necessary to construct a plant should be available to a favored potential entrant. The aboslute cost barrier is important because the supply arrangements with fishermen act in a manner similar to control over strategic raw materials (see below) and make it difficult for a new entrant to purchase directly from fishermen. Some unprocessed perch is available through brokers, but with the typical margin 20 percent, the absolute cost disadvantage of processors without direct access to fishermen is "high" under Bain's classification (pp. 100-01).

Entrants could secure supplies by entering as an integrated firm. Ownership of fishing vessels, however, substantially increases the capital and management requirements of entry.[7/] Limited entry commenced fishing regulations further restricts entry if rights are non-transferable or increases the cost of access if rights can be sold.

In a declining, excess capacity industry such as perch processing it is more relevant to discuss preservation of market share and exit barriers than entry barriers. Here too the interpersonal supply arrangements between fishermen and processors appear to restrict rationalization of the capacity. Personal allegiance means that exchange arrangements are not made solely on the basis of monetary returns and the opportunity for more efficient processors to bid away fishermen from the less efficient firms is limited. This delays exiting.

Additionally, to the extent that excess profits exist in the industry, they form a "cost umbrella" over the less efficient firms enabling them to remain in operation.

VERTICAL COORDINATION

Informal Arrangements

The exchange arrangements between independent fishermen and processors is entirely informal in the sense that no written agreements are used. These informal understandings nevertheless are generally of long standing and contain many of the arrangements typical of a written contract except that compliance is achieved through "moral obligation" rather than legal remedies. Specifically, the condition under which the principles operate is a mutually recognized expectation that a fisherman will sell his entire catch from a vessel to a single dealer at the prevailing port price and that the dealer in turn will accept the entire catch at that price even if it exceeds "requirements." (Those with more than one vessel may have a separate understanding for each vessel).

These interpersonal exchange agreements often transcend purely economic factors. Typically fishermen and buyers are personal acquaintances (the fisherman generally delivers his catch in person directly to the buyer) and possibly friends in the small, close-knit fishing communities. The strength of the bond can be judged by the expressed (but unobserved) willingness of fishermen to restrict their catch through reduced effort as a means of prompting their customary buyer to match a higher price offered by a competiting buyer. Switching allegiance to another buyer is seen as a last choice. The relationship between producers and processors also appears to be tempered by many fishermen's perceptions of "rights". This group apparently sees access to the fishery as their right just as the processor has the right to a supply of unprocessed fish to keep his business operating. It is not the proper place for a fishermen to

deny this right for a few cents a pound advantage. As the fishermen feel increasingly beleagured by more stringent regulations and limited entry plans they may feel even closer bonds to processors as fellow victims of outside forces.

The use of informal exchange arrangements is typical of many small scale near-shore fisheries in North America (Cf. Alverez, Andrew and Prochaska, p. 10). A principal reason for not using formal contracts appears to be the limited additional control over production and quality which the contractor could gain through contracts. Unlike agriculture, quality control is limited to stipulating on-board handling practices.[8/] Yet only very basic procedures are needed in this fishery with its single day voyages. Considering production, contracts could influence effort but not of course the stock which has been the principal determinant of landings. However, effort appears to respond very quickly to price changes so that effort could be controlled effectively through the price mechanism without the use of contracting.[9/]

The fishermen for their part are principally concerned with maintaining market access for their highly perishable product. For the independent perch fishermen who have no storage facilities it is important that a buyer be available at the end of the voyage. The uncertainty of supply can also mean that the price may change substantially from the first to the last boat in. Perch fishermen find this instability difficult to accommodate and prefer a stable exchange relationship for transferring some of this supply and price risk. Both of these requirements can and are met through the existing informal supply agreements, and fishermen seem to feel no need to move to a more formal arrangement.

These informal agreements do have distinct limitations, especially for the fishermen. These understandings make exchange conditions less responsive to economic factors, shifting rivalry among buyers away from price to gaining and maintaining the "loyalty" of fishermen. In cases where the advantages of

the agreement are insufficient to maintain the bond there is unverified testimony from the fishermen that other tactics are used, particularly by the dominate firm. This firm allegedly has withdrawn moorage privileges and black-balled fishermen who rent the firm's dockage but do not sell exclusively to it. With its almost complete control of facilities in a major port, explusion by the dominant firm requires a permanent change of fishing grounds which is somewhat restricted by the territorial restrictions of commercial fishing licenses in Ontario. Thus a defector from the dominant firm risks a lost livelihood, a strong disincentive. This conduct, if true, reduce short run competition by curtailing factor mobility and long term competition by erecting entry barriers.

Further reducing short run factor mobility is the practice by which the dominant firm secures loans for fishermen from local banks. Under this system repayment is deducted from the fish check. Although this arrangement is justified for use with the poorly secured fishermen it does serve to tie the borrower to the dominant firm for the duration of the loan unless refinancing can be arranged. Many fishermen in the vicinity of the dominant firm are said to have been engaged in such loan agreements at some point in their fishing careers.

The notable exception to the exchange arrangements of the proprietary firms is those used by the Kingsville (Ontario) Fishermen's Cooperative. There, buyers of round perch must be approved by the manager and agree to appear at the co-op every fishing day and accept a predetermined share of the catch. Price data were not available, but there is no evidence that the member fishermen received prices above those of independent fishermen. Any excess profits earned by processors would, however, be available to the co-op members for the part of the catch which is filleted. The resulting higher returns to co-op members would be expected to attract additional members

under the open membership policy used. This does not appear to have happened to a substantial extent partially because commercial fishing licenses in the county containing the Cooperative have been limited for many years.

One wonders why there have not been further efforts in other areas to expand group action in this industry with its potential for oligopsony pricing by processors. Some contributory factors are present; the small size and geographic dispersion of ports makes effective and efficient group action difficult, and the control of available warfage in a major port by the dominant firm would seem to prevent any organization there. The major reason, however, appears to be that many fishermen are satisfied with the existing system and see no need for an alternative. Low income is seen as a supply rather than a price problem. It is felt that the existing system provides good long term security and a price which is at least adequate. Studies in some developing countries have also found support among sellers for similar paternalistic arrangements even when there is evidence that sellers are being exploited (Cf. Wharton).

PRICING OF ROUND PERCH

The following information is based on interviews with managers of six major processing firms in Ontario, Illinois, Michigan, and Wisconsin. The dominant firm price leader model developed below is plausible and consistend with the available information, but represents supposition rather than documented evidence.

Prior to the beginning of the spring run the management of the dominant firm appraises cold storage holdings and expected supply[10/] and demand and establishes an offer price for round perch. According to the manager, he attempts to maintain this price through the entire season as a service to the fishermen who consider price stability to be very important. This price,

transmitted from buyer to seller to buyer through an informal information network which many buyers feel keeps them well informed about prices and quantities, is adopted by buyers in other areas, making the dominant firm the price leader.[11/] Categorizing the form of price leadership, it would fall between barometric (smaller firms look to the major, better managed operation for pricing guidance) and dominant firm (based on this firm's control of about half the volume and the spread between its share and that of the next sized firm). The conduct allegedly employed by this firm strongly suggests that it is aggressive in maintaining its market share and could be expected to have a role closer to dominant firm price leadership than barometric.

As the price leader the dominant firm would establish a price between the competitive price and the simple monopsony price. Typically the higher price would attract entry and cause a slow decline in market share (Cf. Scherer, pp. 164-66). However, with the relatively high entry barriers in this industry this would occur only slowly at best, and the dominant firm would be expected to set a price near the monopsony level.

Along with serving fishermen's needs the price rigidity maintained by the firm places fewer demands on the information system, thus facilitating parallel pricing among dealers. The emphasis by the fishermen on the non-monetary aspects of the exchange relationship further aids parallel action. Suppose one of three buyers in a port raises his price. Suppliers of the other buyers would then reduce effort rather than switching to him. As a result either all prices in the port would move up to the new level or the attempt would be abandoned and prices would again drop to the original level. In either case little switching of buyers occurs so that there is little incentive for a buyer to offer a higher price and pricing is likely to remain in parallel.

PERFORMANCE

Performance analysis is limited to an evaluation of the equity between fishermen and processors at the port market level. This is done because the high level of local buyer concentration and the alleged conduct of the dominant firm suggest that imperfect competition if it exists in the perch industry is most likely at this level.

To test the hypothesis that perch fishermen are receiving sub-competitive prices an approximate procedure is developed below which draws inferences about the competitiveness of the price based on different rates of price adjustment during periods of relative surplus and deficit supply. Prices which adjust downward faster than upward are considered to provide one source of excess profits for dealers. This method does not provide unambiguous results because other interpretations such as an underlying charge in demand conditions between the two periods can also explain the empirical results. This method nevertheless yields results which are consistent with the hypothesis and the forms of industry conduct discussed above.

Other means of testing the hypothesis of sub-competitive port market prices are not applicable in this case. The "yardstick" approach involving a comparison of prices in the study area with a "competitive" price in another market is not usuable because no such independently determined price exists.[12/] Alternatively, structure-performance analysis (Cf. Weiss, Clevenger and Campbell) are not possible for several reasons. First, profit data are not available from the privately held firms. Second, even with the necessary data, excess profits if any could be partially of totally a result of seller concentration in the fillet market causing ambiguity in interpreting the empirical results.

Model Development

During periods of relative surplus supply such as characterized the perch fishery in 1968-69[13/] it is to be expected that the buyer is in a relatively strong bargaining position.[14/] Thus prices should move down rapidly to the competitive level as the supply function is observed to shift outward under the impact of good stocks and favorable weather. During periods of relative shortfalls such as occurred in 1974-76 when scarce supplies were allocated to restaurants (Spira), the situation should be reversed with fishermen effectively negotiating higher prices. Prices should move up to equilibrate supply and demand as the supply function is perceived to be shifting to the left. The fishermen may, however, be hesitant to establish too high a reserve price during periods of relative scarce supply for fear of being cut-off when the supply balance tips back the other way again. McKie put it this way, "... sellers hesitate to give buyers their own medicine [during tight supply periods], fearing the imminent return of a buyers' market." (p. 25). Thus perch prices may equilibrate more rapidly during periods of relatively abundant supply than tight supply with the lag constituting one source of excess profits for the dealers.

To quantify this hypothesis that price adjustments are non-symmetrical across periods, the theoretical literature on price dynamics is used which is based on the concept that price changes depend on excess demand $E(P_t)$.[15/] This relationship can be expressed as:

$$(1) \quad dP/dt = \phi\,(D(P_t) - Q(P_t)) = \phi\,(E(P_t)).$$

In practice, the excess demand relationship must be redefined in discrete time periods. Assuming ϕ to be linear and letting P_t represent price and E_t excess demand, t time and k a positive constant, the relationship is:

$$(2) \quad P_t - P_{t-1} = kE_t.$$

Excess demand is unobservable, however, and estimable expressions must be based on appropriate specifications for the commodity under study. For perch, for reasons to be discussed below, demand is:

$$(3)\quad D_t = \alpha_1 + \alpha_2 P_t + \alpha_3 S_t \qquad \alpha_2 < 0,\ \alpha_3 > 0$$

and supply is:

$$(4)\quad Q_t = \beta_1 + \beta_3 P_t + \beta_3 C_t \qquad \beta_2 > 0,\ \beta_3 < 0.$$

where P_t is the price of yellow perch, S_t the price if substitute products and C_t represents costs. Then excess demand is:

$$(5)\quad E_t = \alpha_1 - \beta_1 + (\alpha_2 - \beta_2) P_t + \alpha_3 S_t + \beta_3 C_t$$

Substituting (5) into (2) and solving P_t,

$$(6)\quad P_t = \frac{\alpha_1 - \beta_1 + \Phi P_{t-1} + \alpha_3 S_t - \beta_3 C_t}{\alpha_2 - B_2}$$

with: $\alpha_i, B_i > 0$, $i = 1, 2, 3$ and $\Phi > 0$.

Φ represents the coefficient of the lagged price term incorporating the constant k which dropped out of the remaining terms.

This specification, however, assumes symmetric price adjustments; by construction for a given change in E_t prices will fall by the same amount and at the same rate when supply is excessive as they will rise when supply is deficit. Thus, this may not be a valid description of price responses in the yellow perch port market where prices are hypothesized to adjust downward faster than upward following a unit change in E_t. Allowing for different rates of price adjustment is possible in equation (6) by defining μ as the "adjustment coefficient" which

indicates the rate of adjustment of P_t, the actual price, to P_t^*, the true equilibrium price. The actual price and the equilibrium price are assumed to be related as follows (Kmenta, p. 476):

$$(7) \quad P_t - P_{t-1} = \mu(P_t^* - P_{t-1}) \quad 0 < \mu \leq 1.$$

Substituting (7) into (6) where P_t is replaced by the true equilibrium price P_t^* and adding random disturbances ε_{t1}, ε_{t2}, and ε_{t3} for the supply, demand and adjustment equations respectively gives:

$$(8) \quad P_t = \gamma(\beta_0 - \alpha_0) + \gamma\beta_2 C_t + \gamma\alpha_2 S_t + (1 - \mu) P_{t-1} + \theta$$

where $\gamma = \alpha/(\alpha_1 - \beta_1)$, $\theta_t = \varepsilon_{t3} + \frac{\mu\varepsilon_{t2}}{(\alpha_1-\beta_1} - \frac{\varepsilon_{t1}}{\alpha_1-\beta_1)}$

Equation (8) has the same variables as (6), but differs in interpretation.[16/]

The proposed test consists of comparing the μ's estimated for periods of relative excess demand and excess supply. The coefficient of the lagged price term for the excess demand period is expected to exceed the coefficient for the excess supply period, indicating a lag in equilibrating prices during periods of excess demand. This suggestion of a disequilibrium situation during periods of excess demand leads to additional predictions about the estimated coefficients from the models when applied to the two periods. With the market in disequilibrium during deficit supply periods the coefficients of the cost and substitute product terms should be less significant than for the period of abundant supplies and rapid price adjustments. The coefficient of the lagged price term, however, is expected to have a larger t ratio for the excess demand period since the current period price is hypothesized to reflect to a greater degree the price of the preceeding period than underlying changes in supply or demand. If there is market power on the sellers side or if the market is perfectly competitive the coefficient of the cost term will be positive and

significant. If buyers' market power dominates (the hypothesized situation), the cost coefficient may have a smaller t ratio and even be negative, signifying that sellers do not always recover costs.

Application to the Perch Fishery

The demand for yellow perch given in (3) is considered to be a function of its price (P_t) in dollars per pound (Ontario Ministry of Natural Resources (OMNR), unbpulished data) and the price index of substitutes (S_t) (index of dock prices, edible fish, National Marine Fisheries Service (NMFS)). Income was found to be unrelated and probably is unimportant for the short sample period used. For supply (equation (4)) the function is a positive factor of the yellow perch price (P_t). In addition the equation must reflect important aspects of the short run marginal cost function. This does not include labor since crew members receive a lay, or share of the profit. Limited investment data show little change in amount or technology over the period and are excluded. This leaves fuel as the principal cost component (CPI for gasoline, Statistics Canada). The unit cost of fuel varies with the catch since fuel consumption is independent of the catch level. The effective fuel cost per fish landed ($AFPI_t$) is then calculated by dividing the fuel cost index by the average catch per unit effort for the area and multiplying by 100 (OMNR, unpublished data). With this change in terminology the supply equation is:

$$(4') \quad Q_t = \beta_1 + \beta_2 P_t + \beta_2 AFPI_t.$$

Seasonal adjustments are not used because most of the product is purchased for frozen storage so that seasonality is not as important as in many fisheries with a distinct fresh market.

This approximate test is applied to the model in equation (8) for two periods representing relative surplus (1968-69)[17/] and relative deficit (1974-76).

The data consists of 16 and 24 monthly observations respectively for the eight month major fishing season.

The ordinary least squares estimates (OLS) of equation (8) for the two time periods are reported in Table 1. In both cases the hypothesis of zero serial correlation cannot be rejected at the 5 percent level for either a one or two tailed test using the Durbin-Watson statistic.[18/]

The results agree with expectations. The adjustment coefficient for the excess supply period (.571) is larger than for the excess demand period (.018) and the coefficient for the lagged price term in the latter period is significantly larger than for the earlier period.[19/] The coefficients for the remaining terms have larger t ratios for the excess supply period than for the excess demand period. One factor which may reduce reported significance for 1974-76 is the high collinearity between P_{t-1} and S_t(r^2 = .89). The limited significance and negative sign of the cost term in the later periods suggests the fishermen were unable to bargain for a price which covered increased unit fuel cost resulting from higher gasoline prices and lower catches.

These results are consistent with the hypothesis of a non-symmetric price response and thus with the expectation that buyers are paying sub-competitive prices.[20/]

CONCLUDING COMMENTS

The predominant vertical coordination mechanism in the yellow perch industry is noteworthy because it consists entirely of informal agreements, a sharp contrast to the written contracts used for many perishable agricultural products. These agreements provide two principal advantages for the fishermen - assuring market access and shifting to the processor some short run price risk caused by unexpected heavy landings - while giving processors access to a share of the catch determined by the number, skill and location of the fishermen supplying them.

TABLE 1: ESTIMATES OF THE PRICE ADJUSTMENT MODELS FOR 1968-69 AND 1974-76

Period	Int.	P_{t-1}	S_t	$AFPI_t$	$\bar{R}^2$	D.W.	n
1968-69 (excess supply)	-.0864 (-1.64)	.4285 (1.68)	.1064 (1.96)	.0581 (1.72)	.68	2.02	16
1974-76 (excess demand)	-.0943 (-0.56)	.9818 (10.05)	.0423 (0.59)	-.00010 (-0.18)	.96	2.32	24

Note: t-statistics are in parenthesis

Although these agreements provide important coordinating functions they do have the potential of reducing factor mobility and interfering with the efficiency of the market. These problems come about primarily because the agreements are similar to long term full supply contacts[21/] while the personal association which underlies them reduces the responsiveness to economic incentives, thus raising substantial entry barriers. As a result there are strong indications but insufficient empirical documentation that the producers are receiving sub-competitive prices.[22/] More research is needed to better document this hypothesis and to evaluate the long term effects of these agreements on industry structure and risk. Additionally, further research is needed to evaluate alternative coordination forms which could enhance equity and economic efficiency. Part of this research should be directed to better understanding the coordination mechanisms used in other near-shore fisheries in North America and how they influence equity, performance and competition.

As a shorter term response the alleged coersive conduct by the dominant firm could be halted through an antitrust suit. This conduct by the dominant firm in the industry may be construed as "monopolization" and thus be in violation of section 2 of the Sherman Act or alternatively as conduct which has been found to violate section 3 of the Clayton Act. These changes can be brought against a Canadian firm since they affect the industry in the U.S., but as a practical matter such a case is unlikely to be brought in this minor industry. And even if this conduct were successfully enjoined it would likely lead, at best, to a slow decline in the dominant firm's share. A more direct and immediate approach would be to use public means to provide an alternative outlet for fishermen. This could take the form of a self-supporting purchase and buy-back frozen storage system for round perch which would give the fishermen greater leverage in making sales arrangements at the dock while also

allowing them to assemble trucksized loads for sales to more distant buyers. Further analysis is needed to determine the feasibility of this proposal. Finally, the mobility of the fishermen and hence their access to alternative markets would be enhanced in Ontario if the restrictions on fishing in the southeast counties were eliminated. This policy should not be followed without a thorough analysis of the effect on fishing pressure and the stock. However, to the extent that these traditional limitations are intended to insure adequate incomes for the fishermen, one of the objectives, the current regulations are partially inhibiting rather than advancing this goal.

REFERENCES

Alvarez, J., C. O. Andrew and F. J. Prochaska. Economic Structure of the Florida Shrimp Processing Industry. State University System Florida, Sea Grant College Program, Report No. 9, February 1976.

Applegate, V. C. and H. D. VanMeter. "A Brief History of Commercial Fishing in Lake Erie." U.S. Fish and Wildlife Service, Fishery Leaflet No. 630, April 1970.

Bain, Joe S. Barriers to New Competition. New York: John Wiley and Sons, Inc. 1959.

Busch, W. D., R. L. Scholl, and W. L. Hartman. "Environmental Factors Affecting the Strength of Walleye Year Classes in Western Lake Erie, 1960-70." Jr. Fish Res. Board Canada, 32(10): 1975.

Campbell, G. R. and M. L. Hayenga (Eds). Vertical Organization and Coordination in Selected Commodity Subsectors. NC-117, WP-20, August 1978.

Clevenger, T. S. and G. R. Campbell. "Vertical Organization: A Neglected Element in Market Structure-Profit Models." Ind. Org. Rev. 5(1977).

Fisheries Price Support Board of Canada. News Releases, 16 March 1970, 14 April 1969.

Follett, R. "The Restaurant Trade and Lake Perch Aquaculture." In Aquaculture: Raising Perch for the Midwest Market, Univ. Wisconsin Sea Grant, Adv. Rep. No. 13, June 1975.

Fresh Water Fish Marketing Corporation. Annual Report, 1976.

Hayenga, M. L. Vertical Coordination in the Beef Industry: Packer, Retailer and HRI Linkages. NC-117, WP-22, October 1978.

Kmenta, J. Elements of Econometrics. New York: MacMillan Co., 1971.

Leach, J. H. and S. J. Nepsey. "The Fish Community in Lake Erie." Jr. Fish Res. Board Canada, 33(3): 1976.

Lesser, W. H. Marketing Systems for Warm Water Aquaculture Species in the Upper Midwest. Unpublished Ph.D. dissertation, University of Wisconsin, 1978.

Marion, B. W. (Ed). "Coordination and Exchange in Agricultural Subsectors." NC-117, Monograph 2, January 1976.

McCallum, B. T. "Competitive Price Adjustments: An Empirical Study." Am. Econ. Rev. 64(1974): 56-65.

McKie, J. W. Tin Cans and Tin Plate. Cambridge: Harvard University Press, 1969.

National Marine Fisheries Service. Fisheries of the United States. Various years.

_____. Great Lakes Fisheries: Annual Summary. Various years.

Ohio Department of Natural Resources, Unpublished information.

Ontario Ministry of Natural Resources, unpublished data.

Regier and Hartman. "Lake Erie's Fish Community: 150 Years of Cultural Stress." Science. 180, June 1973.

Ricker, W. E. Compulation and Interpretation of Biological Statics of Fish Populations. Ottawa: Fisheries Research Board of Canada, Bulletin 191, 1975.

Scherer, F. M. Industrial Market Structure and Economic Performance. Chicago: Rand McNally College Publishing Co., 1970.

Smith, S. H. "Species of Interactions of the Alewife in the Great Lakes." Trans. Am. Fish Soc. 1, 1970.

Spira, M. "The Institutional Trade." In Aquaculture, op cit.

Statistics Canada. Prices and Price Indexes. Various Years.

Weiss, L. W. "Quantitative Studies in Industrial Organization." In M. D. Intriligator (Ed)., Frontiers of Quantitative Economics. New York: North Holland Publishing Co., 1971.

Wells, LaRue. "Recent Changes in Yellow Perch Production in Lake Michigan." Paper presented at the Percid International Symposium, Toronto, 1975.

Wharton, C. R. Jr. "Marketing, Merchandising and Money Lending - A Note on Middlemen Monopsony in Malaya." Malayon Econ. Rev. 7(1962).

FOOTNOTES

1/ The actual harvest which includes the sport fishing take is significantly larger. For estimates of the sport catch see Applegate and VanMeter, Wells, and the Ohio Department of Natural Resources.

2/ Prices are estimated from data on landings and receipts reported by the fishermen.

3/ This figure is an estimate based on direct observation and information from participants. Actual numbers cannot be determined from license records because licenses are not species specific.

4/ In addition the Red Lake (Minnesota) Reservation processes and markets its residents' perch ctach, but this constitutes a minor producing area. In Canada west of Ontario the Freshwater Fishing Marketing Corporation has a federal monopoly over freshwater fish sales. Much of the perch and other species handled by the Corporation are filleted, but the perch volume is low, only 128,000 pounds in 1973-74 (Annual Report, 1976).

5/ The dominant firm operates 8 to 10 specialized mechanical filleters which operated on one shift have an annual capacity of 13 million pounds. The capacity of the remaining firms which use hand filleters is more variable so that management estimates are used.

6/ Size economies have not been determined empirically. For hand filleting operations according to the five interviewed managers there are limited processing economies of diseconomies over the relevant range. Based on the estimate of an equipment manufacturer there are no operational economies for multiple machines except for the need to keep a trained mechanic fully employed in making frequent adjustments. Quantity discounts of up to 20 percent are available for these custom manufactured machines. In total the operational

size economies are judged to be "shallow" following the classification developed by Bain, (pp. 100-01).

7/ The average investment in a 20-40 foot vessel in the Lake Erie fishery in 1978 was $9,550. Equipping each vessel with 10 trap nets ar $1,410 each and 10 grill nets at $450 each brings the average total investment per vessel to $28,000 (Ontario Minstry of Natural Resources (OMNR)).

8/ The length of time the fish remains in the gill nets also influences their quality. (Gill nets suffocate the fish while trap nets keep them alive). Recently, however, the length of time between "lifts" has been established by regulatory authorities in some areas.

9/ No effort was made to estimate effort elasticity in the perch industry. In the larger term higher prices ceteris paribus would be expected to increase the investment in fishing gear while in the short run it is likely to induce fishermen to lift their nets more frequently, making them more effective at trapping additional fish (Ricker, p. 19).

10/ The Ohio DNR makes an annual young-of-the-year sample which indicates the year class strength and can be used to project future supplies.

11/ The relationship between monthly prices in the port occupied by the dominant firm and neighboring districts along the north shore of Lake Erie can be summarized as follows (t-statistics are in parenthesis):

$$P_2 = -1.427 + 1.051P_1 \qquad R^2 = .98$$
$$(-2.53) \quad (50.91)$$

$$P_3 = 1.732 + .958P_1 \qquad R^2 = .98$$
$$(3.18) \quad (49.46)$$

$$P_4 = 2.325 + .919P_1 \qquad R^2 = .96$$
$$(3.80) \quad (37.77)$$

$P_5 = 3.560 + .923P_1 \qquad R^2 = .98$

(6.27) (49.87)

N = 63

P_i - i = 1 price in district dominated by major firm

i = 2, ..., 5 price in district dominated by fringe firms

Following partial differencing the hypothesis of no first order serial correlation cannot be rejected using a one-tailed test at the five-percent level.

The coefficients of the dependent price term are not significantly different from one while the sizes and signs of the intercepts reflected the decreasing size and thus value of perch moving westward along Lake Erie. These results are not incapatable with price leadership by the dominant firm although the same pattern could also result from a highly competitive market.

12/ Restaurants discontinuing yellow perch typically substitute cod or ocean perch for the fish fry. These products are, however, quite different in taste and appearance, and their supply and demand situations are vastly divergent.

13/ During these years commercial storage space was completely filled and the Canadian government began buying supplies from dealers under the stipulation that they be bought back at cost and the fishermen be offered a minimum price (Canadian Fisheries Price Support Board).

14/ The terms "bargaining" and "negotiating" are used here to refer to the all- or none offer/acceptance system used by price taking fishermen.

15/ This section is based on McCallum, pp. 56-65.

16/ Since prices are sometimes different for different size perch a change in the size mix would change the imputed price. The size of fish caught in an area, however, tends to be very uniform and dependent on available nutrients and fishing pressure (e.g., age frequency in catch). See Leach and Nepsey.

17/ It is during this period that the Price Support Board intervened in the perch market by providing storage space at cost on the condition that fishermen were paid at least a prescribed minimum price. To the extent this minimum price became the effective price (a plausible situation), the round perch price would be stabilized and the coefficient of the lagged price term biased toward one.

18/ This test may be inaccurate in an autoregressive model estimated with OLS (Kmenta, p. 295).

19/ With $P_t = \phi_0 + \phi_1 P_{t-1} + \phi_2 S_t + \phi_3 C_t$ (ω_1) (1974-76)

$P_t = \beta_0 + \beta_1 P_{t-1} + \beta_2 S_t + \beta_3 C_t \beta_4 D \cdot P_{t-1}$ (ω_2)

where D is a dummy variable for 1968-69

Then $F_{16,35} = \dfrac{(SSE_{\omega_1} - SSE_{\omega_2})/16}{SSE_{\omega_2}/35} = \dfrac{(12.279 - .042)/16}{.043/35} = 622.47$

$F_{16,35}\ (.05) = 2.31.$

20/ The existence of excess profits is also suggested by the continued filletings of Ontario perch in Wisconsin rather than the less expensive importation of fillets as shown by these comparative cost figures:

	Cost of Fillets Processed In: (cents per pound)	
	Wisconsin	Ontario
Transport of Round Perch (assuming 45% yeild)	8	-
Hand Processing Costs	25	21
Tariff	0	1.5
Shipment of Fillets	-	3.5
TOTAL	33	26

Source: Information form the dealers

21/ For a discussion of the anti-competitive effects of long term exclusive-dealing contracts see e.g., United States v. American Can Company (District Court of California, 1949).

22/ One reviewer questioned but what the sub-competitive port market prices tentatively identified here are but risk premiums required by processors for accepting short term price risk caused by unexpectedly heavy daily landings. This risk premium could explain why prices declined relatively rapidly during periods of abundant supply but not the upward stickiness during deficit supply periods when the price risk would seem small.