EXCLUSIVE DEALING AND VERTICAL INTEGRATION:
The Efficiency of Contracts in the Tuna Industry

by

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Bureau of Economics Staff Report
to the Federal Trade Commission

August 1984

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ACKNOWLEDGMENTS

I would like to thank Professor Benjamin Klein for his suggestion to study exclusive dealing arrangements in the U.S. tuna industry. I am also especially indebted to Steven Tator, a former investigator at the Los Angeles Regional Office of the FTC, whose knowledge of the tuna industry was invaluable to my research. Had Steve remained at the FTC, he would have co-authored the report. I would also like to recognize the contributions of several current and former FTC staff members in the Bureau of Economics. The report was substantially improved by the discussions and extensive comments on numerous earlier drafts and on the final manuscript provided by Douglas Dobson, Pauline Ippolito, and Ronald Bond. The report also benefited from the comments of William Burnett, Scott Harvey, John Hilke, Ronald Lafferty, and Edward Manfield. I am grateful to John Hamilton for his computer expertise and assistance throughout the empirical stage of my study. The research assistance provided by Susan Painter and Carolyn Samuels was simply outstanding. The technology of word processing was adeptly demonstrated by Angela Newsome and Betsy Zichterman who provided incredibly short turnaround times on drafts too numerous to count.

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CHAPTER I

INTRODUCTION AND SUMMARY

A. Overview

The procurement of tuna by U.S. processors relies on a complex set of formal and informal contractual arrangements between tuna processors and captains. Domestic processors make investments in modern tuna vessels in return for exclusive supply contracts and a share of the net earnings of the vessel. Each captain generally co-owns his vessel with a processor and is largely responsible for the fishing operations of the vessel. In return, the captain earns a share of the net earnings of the vessel, a wage for being a crew member, and a bonus for exceptionally large annual catches.

What initially motivated this inquiry was the observation that the price processors paid for domestic tuna was typically below the (delivered) price paid for comparable foreign tuna. Although this price differential suggested the possibility of monopsony power among processors in the procurement of domestic tuna, an FTC investigation found that the price difference reflected, in part, the nonprice payments that processors extended to captains. Consequently, there was insufficient evidence to support a case against the major processors. Its structural characteristics notwithstanding, the industry appeared to behave competitively.

The FTC finding that a significant portion of the observed price differential is explained by the nonprice payments on U.S. landed tuna raises two questions: (1) what explains the remaining portion of the price differential and (2) why do processors make nonprice payments for domestic tuna? At issue is whether the remaining price differential and the nonprice payments are consistent with competition in the U.S. tuna industry.

The first objective of this study is to show how contracting for U.S. tuna promotes efficiency and therefore competition despite structural and behavioral characteristics which may suggest the contrary. One possible explanation of the remaining differential between the U.S. price and the relatively higher foreign price is that the foreign price reflects the higher costs of marketing tuna through competitive auctions. The theory is quite simple: The U.S. market differs from foreign markets in that most consumption in the U.S. is of canned tuna rather than raw tuna. As a result, the inspection, sorting, and grading required for the fresh fish market (in foreign ports) represents an unnecessary cost in the U.S. market. To reduce these costs to efficient levels, it would be preferable for processors to simply buy the boatowner's entire unsorted catch at a price reflecting average quality. However, if processors tried to do this without restricting the boatowner's ability to sell part of his catch elsewhere, boatowners would have an incentive to sell the higher quality tuna to competiting processors (at higher prices, and thus increase the sorting and inspection costs of marketing tuna. Exclusive dealing contracts between boatowners and processors that require that a boat's entire catch be sold to a particular processor prevent the duplicative inspection and sorting costs that would otherwise result.

The second objective of explaining the emergence of nonprice payments is achieved by noting that nonprice payments emerged with the introduction of a major technological change in the method of domestic harvesting. The fishing technology changed from a pole-and-line method to a mechanized net retrival system. Joint ownership of modern tuna vessels by U.S. captains and processors also increased due to this change. Both nonprice payments and vessel co-ownship became necessary because the technological change in fishing increased the costs of using exclusive dealing arrangements to procure domestic tuna. The principal hypothesis is that the change in technology increased the expected contract costs of exclusive dealing to such an extent that vessel co-ownership emerged as an additional efficient form of organization. In turn, nonprice payments by processors are an efficient response by processors to correct the malincentives of the captain which results from co-ownership of a technologically improved vessel. Thus, an understanding of nonprice payments requires an understanding of vessel co-ownership.

Since vessel co-ownership is only one of several institutions which simultaneously emerge in the modern period, however, it can not be analyzed independently of the other new institutions. Additional new institutions are (1) the provision of vessel financing by processors, (2) a change in the method of determining tuna prices, and (3) the levying of demurrage fees on processors for delays in vessel unloadings. Accordingly, another objective of the study became the explanation of the emergence of all these institutions. Although the analysis is necessarily more complex, its implications are richer and more easily tested.

The study is therefore broader than the initial questions which motivated it. In brief, this is a study of contracting for the supply of U.S. landed tuna. The study demonstrates that the efficiency of such contractual arrangements justifies a differential between U.S. and foreign tuna prices. The emergence of vessel co-ownership and other institutions are methods of minimizing the costs of maintaining the exclusive dealing arrangements between captains and processors. But the use of vessel co-ownership or any other institution is not costless. One cost of vessel co-ownership, for example, is that it provides the captain with an incentive to over-use the vessel. Nonprice payments are a means of reducing this cost of vessel co-ownership. The ultimate effect of exclusive dealing and its ancilliary institutions is to increase the supply of U.S. landed tuna and to increase the quantity of canned tuna available for U.S. consumption.

B. The Organization of the Study

The above arguments and underlying principles are presented in the following sequence.

Chapter II develops the motivation for exclusive dealing arrangements in the procurement of tuna for canned consumption. Although exclusive dealing is found to be efficient in reducing a specific type of marketing cost, its use is not costless. One malincentive cost of exclusive dealing is that it provides the contracting processor with the incentive to renege on the contract and to appropriate the return to the tuna harvests which become specialized assets under the contract. The incentive to behave in such an opportunistic manner is exacerbated by a technological change in the method of fishing. For this reason, the provision of financial assistance by processors, the new method of determining the price of tuna, and the levying of demurrage fees on processors for delays in vessel unloading -- at the time of the introduction of modern purse-seine vessels into the U.S. tuna fleet -- are related to the increased costs of assuring contractual performance. The theory is that these new institutions reduce the costs of continuing to use exclusive dealing contracts as bait boats are transformed into or replaced by the larger and technologically improved purse-seine vessels. Thus, exclusive dealing remains the preferred form of contracting in the modern purse-seiner period. The relative efficiency of exclusive dealing arrangements over competitive auctions (in the marketing of tuna for U.S. consumption) results in a lower U.S. price and therefore in a price differential between foreign and U.S. tuna.

The empirical support for the theory outlined above is presented in Chapter III. The available evidence suggests that the potential saving in marketing costs under exclusive dealing is substantial. This is an important finding since the incentive to honor the terms of the contract in the bait-boat period and, to a greater extent, in the modern purse-seine era varies directly with the magnitude of the potential savings in marketing costs. In addition, the commitment of assets by the processor to the harvesting operation (such as vessel equity, loan guarantees, and second mortgages) is explained remarkably well by the theory. This is in contrast to the leading alternative hypotheses which are developed and analyzed in Chapter IV.

Chapter V concludes that exclusive dealing arrangements promote competition in the procurement of U.S. landed tuna. A comparison of the U.S. marketing scheme with the Japanese system of competitive auctions suggests that the U.S. system is relatively more efficient in providing tuna for canned consumption. For the 1964-80 period, the savings under the U.S. system is estimated in excess of $12.2 million a year. It is these savings in marketing costs that provide the incentive for U.S. processors and captains to use exclusive dealing agreements and to create institutions which reduce the malincentive costs of exclusive dealing. The ultimate effect of exclusive supply agreements is to reduce the cost of tuna and to increase the production of canned tuna in the U.S. The policy implications of the study suggest an efficiency rationale for several contractual provisions including exclusive dealing, vertical integration, nonprice payments, financial assistance, and regulation.

The basis for understanding the present contractual arrangements between domestic processors and captains lies in an understanding of the motivation for exclusive dealing in the earlier (bait-boat) period. From an institutional perspective, the Appendix provides a description of the technology and contractual arrangements of the U.S. tuna fleet in the bait-boat period. A technological change in the method of fishing transformed the bait-boat fleet into a modern (purse-seiner) fleet. Contractual arrangements in the modern period are then reviewed with an emphasis on the new institutions which appear shortly after the change to the purse-seine technology. One such institution is the co-ownership in the modern vessel by the captain and processor. Substitutes for co-ownership are also identified. This method of contracting for the procurement of U.S. landed tuna is distinguished from the purchase of tuna through competitive auctions (or spot markets) such as those operated in Japan. Lastly, the observed price differential between the relatively higher foreign price and the lower U.S. price is analyzed.

CHAPTER II

THE SPECIALIZED ASSETS HYPOTHESIS

A. Introduction

Since, at least, the early 1950s, the procurement of domestic tuna by U.S. processors has relied on exclusive dealing contracts with U.S. harvesters. In the mid-1960s, however, a major technological change in the method of harvesting stimulated the construction of modern tuna vessels. The introduction of these new vessels was associated with a number of institutional changes in the industry. For example, some processors became joint owners in the new vessels while others provided second mortgages and guarantees on the vessel mortgages issued by banks. The method of determining the tuna price was changed from the time of delivery to the time of departure (to the fishing grounds). Demurrage fees (or fines) were also levied on processors who failed to off-load a vessel within 10 days.

One major purpose of this inquiry is to provide an explanation of these new institutions. The hypothesis is that the institutional changes are a response to the increase in costs of exclusive dealing produced by the new fishing technology. The general theory is that exclusive dealing is necessary if certain costs in the procurement of U.S. tuna are to be avoided. The technological change increased the costs of using exclusive delivery contracts and thereby threatened to increase tuna procurement costs. In response, several institutions emerged to reduce these contract costs and to maintain the efficiency of the U.S. tuna marketing scheme. The lower costs of marketing domestic tuna relative to foreign tuna may explain why the domestic tuna price is typically below the foreign price.

B. Contracting in the Bait-Boat Period

Until the early 1960s, the domestic tuna fleet was comprised of a large number of "bait boats."[1] Tuna was caught with live bait fish using hooks and line. Captains wholly owned their boats and contracted with processors[2] for delivery of the catch. Why processors contracted for the delivery of tuna is not obvious. In fact, it may seem that a competitive auction could efficiently allocate each incoming tuna delivery among the several competing processors. An understanding of this contracting incentive is fundamental to our understanding of the competitive nature of the industry. Thus, we first consider the major provisions of the contract and attempt to identify the principal motivation for contracting.

The fishing contract generally provided for the following:

(a) the method of determining the tuna price,

(b) the limits, if any, on the quantity delivered,

(c) the services to be provided by the processor such as financial, accounting, and legal, and

(d) the exclusive delivery of the catch to the processor.[3]

The tuna contract price was typically a daily posted price offered by each processor to U.S. captains (under contract) upon their return to port with a harvest available for immediate

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1 Richard J. Marasco, "The Organization of the California Tuna Industry: An Economic Analysis of the Relations between Market Performance and Conservation in the Fisheries" (unpublished Ph.D. dissertation, University of California at Berkeley, 1970), Chapter II, pp. 12-17, (hereinafter referred to as the Marasco Study).

2 Throughout this discussion, the term processors will always refer to U.S. processors. For emphasis, the term domestic or U.S. processors is sometimes used. All other processors will be referred to explicitly (e.g., foreign, European, or Japanese processors).

3 J.W. Adams and Robert Hamlisch, Report on Monopolistic Controls in the Tuna Industry, Bureau of Industrial Economics, FTC, (December 31, 1952), pp. 19-26, (hereinafter referred to as the FTC Report); Forbes, Stevenson and Co., Feasibility Study: A Tuna Transshipment Plant in San Diego and Other Ocean-Oriented Facilities (Project No. 07-6-09121, Items I and II Prepared for the Economic Development Administration, U.S. Department of Commerce, Washington, D.C., June 25, 1968), Chapter IV, pp. 4-5, (hereinafter referred to as the Forbes-Stevenson Study); and the Marasco Study, p. 30.

processing.[1] Although the price often remained relatively stable over several months, there was never an ex ante commitment by processors to guarantee a price on future tuna deliveries. Throughout the bait-boat period, the price of domestic tuna was always determined at the time of delivery. This method of pricing reflects the processor's requirement for a continuous supply of tuna. If the rate of incoming boats was less than expected by the processor, his posted price would rise until some captains found it profitable to stop fishing and return to port with their current harvests. Conversely, if processors anticipated an abnormally long queue of boats ready for off-loading, the posted price would fall until the rate of incoming boats declined to the rate consistent with the processing requirements of the tuna plant.

If processors were only concerned with procuring a steady inflow of tuna to maintain desired rates of canned tuna production, competitive contacting for tuna deliveries appears to be inefficient relative to a competitive auction. That is, it is unclear why processors would prefer to contract with a subset of the tuna fleet given the option to bid for each catch of the entire fleet. The decision of the captain to return to port would depend on the expected daily price determined by all processors (and incoming deliveries) in contrast to a daily posted price offered by a single processor to his contracted boats. The processor with the highest opportunity cost of running short of tuna (and reducing his rate of canned tuna production) would be able to outbid all other processors for the next incoming tuna delivery. The auction would therefore seem to allocate each tuna delivery to its highest valued user. From an efficiency point of view, such an open competitive auction appears to be preferred. Consequently, the motivation for

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[1] Tuna processors had no in-plant freezer capability and therefore could not accept frozen tuna. Thus, the processing technology required that tuna deliveries be thawed so that the tuna could be directly off-loaded into the plant for immediate processing. See Forbes-Stevenson Study, p. IV-5.

competitive contracting is unlikely to be found in the pricing provision.

Throughout the 1950s, U.S. boatowners attempted to obtain minimum volume guarantees.[1] Processors sometimes opposed such quantity guarantees since they tended to reduce the ability of the processor to procure tuna from foreign suppliers. During times of abnormally low foreign tuna prices, U.S. processors sought to acquire the right to "tie-up" its domestic contract boats. That is, deliveries of imported tuna could be substituted for the expected future deliveries of domestic tuna by requiring U.S. contract boats to remain in port (or tie-up) and not resume fishing for a specified number of days. Thus, tie-up orders represented an attempt by processors to limit the (maximum) annual harvest of U.S. contract boats and to substitute cheaper imported tuna. More recently, however, contracts in this period generally omit an explicit quantity provision with the apparent understanding that the processor will accept the entire harvest of each U.S. boat under contract.

The fishing contract also recognizes that the processor may provide advance money for each fishing trip (and/or accounting and legal services to the boatowner). The term of the contract is a stated number of years or as long as the boatowner or boat remain in debt to the processor, whichever is longer. Generally, if the processor extended a trip advance (loan) to the captain, the expected harvest on that trip would be taken as collateral and the principal and interest would be deducted from the gross revenues of the harvest upon delivery to the processor.[2] Thus, the provision of trip advances by the processor would not extend the length of the contract unless the size of harvest was unusually small. Such changes in the term of the contract could often be avoided by obtaining short term (operating capital) loans from commercial banks.

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[1] Forbes-Stevenson Study, Chapter IV, pp. 1-2; and Marasco Study, Chapter II, pp. 13-15.

[2] Marasco Study, p. 47.

1. <u>Exclusive Dealing</u>

The principal motivation for U.S. fishing contracts appears to be reflected in the exclusive dealing provision. The U.S. tuna marketing arrangement, which relies on exclusive dealing contracts by captains, is a means of eliminating some of the marketing costs inherent in competitive auctions.

Competitive bidding among tuna processors in the U.S. market is likely to result in excessive sorting of tuna into "blocks" and duplicative inspections of each "block" of tuna offered for sale. A block of tuna refers to the number of tons of a given tuna category. For example, a 100 ton block of skipjack tuna may refer to 100 tons of frozen, whole, skipjack weighing between 10 and 13 pounds each. One initial cost of a competitive auction is to sort tuna into blocks. Although sorting costs would be minimized by offering each harvest as a single block, prepurchase inspection costs would be substantial since the units within the block would be extremely heterogeneous. Further, the harvest may be so large and diverse that the winning bidder may sort out units he can not use and resell them in one or more blocks. Consequently, each harvest is likely to be sorted into a number of blocks. Whether the competitive auction is socially desirable will depend, in part, on whether sorting costs are socially desirable.

Another cost of a competitive auction is the prepurchase inspection costs incurred by the bidders. In a competitive auction, it is quite possible for several potential buyers to bid on the same block. Each bidder therefore inspects the same block to determine its value. Yet, only one bidder will purchase the block. The costs of such duplicative inspections may be justified if the bidders possess different tastes. For example, if fresh tuna is not sufficiently categorized by number of days after harvest (e.g., 1/2 day, 1 day, or 2 days), some bidders may search among otherwise similar blocks until a particular degree of freshness is found. Buyers may disagree on the value or alternative uses of fresh tuna as its degree of freshness diminishes. In this instance, competitive search would be socially desirable.

On the other hand, if some average amount of search by all bidders would result in each bidder placing the same value on each block, duplicative inspections would be socially wasteful. There would be no social gain from the aggregate inspections performed by all potential bidders relative to the one inspection by the bidder who ultimately acquires the block. In a canned tuna market such as the U.S., duplicative inspections of tuna are socially undesirable. There is no social value of such competitive bidding oversearch by tuna processors because they would all agree on the value of each block, given some minimum amount of pre-purchase inspection. U.S. canners (potential buyers) are unlikely to disagree on the quality attributes of tuna (such as its freshness, yield, taste, and use) or on the value of any given set of attributes. Under these conditions, there is a strong incentive to eliminate competitive bidding oversearch and to reduce other marketing costs of procuring domestic tuna. If sellers or buyers could prevent such wasteful activity, they could potentially gain an amount equal to the real resources expended in competitive bidding oversearch. To the extent that the alternative marketing scheme can also reduce the sorting of tuna into blocks, an additional savings in marketing costs may be realized.

Although prices pre-set by the captain (seller) or the processor (buyer) may eliminate the potential for competitive bidding oversearch, each pricing scheme introduces the potential for another type of oversearch. If the captain attempted to set some average price over a tuna catch of varying quality, processors would tend to search out the higher quality and to reject the lower quality units.[1] As long as the captain had less than perfect information about the market value of each unit, processors would attempt to obtain an information advantage over the captain in order to search out the underpriced units.[2] In response, the captain may sort the catch into more homogeneous blocks, each with an average price closer to the average market value of the units within each block. However, as long as the pre-set price differs from the market clearing price for each quality within a block, processors will continue to search out the higher quality units. Consequently, such buyer oversearch results in duplicative inspection and excessive sorting costs. Perhaps more importantly, since the captain is not the final user of the tuna, he would never be able to fully communicate the quality of the catch to the processor. Regardless of the amount of search performed by the captain to determine average quality and price, the processor would have to fully reinspect the catch to determine, for himself, the true average quality of the harvest.

If, on the other hand, a processor inspected a captain's entire catch and made a one-time offer of a single price reflecting the average quality or value of all units in the catch, sorting and inspection costs might be dramatically reduced. Such a pricing scheme, however, provides the captain with an incentive to supply only the below-average quality units and to offer the remaining higher-quality units to another processor. As a result, sorting costs are not significantly

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1 The quality of tuna varies with its size, condition, and specie. For canning purposes, one major quality attribute is size: larger tuna can be processed more quickly and cheaply and in this production sense are of higher quality. Similarly, tuna delivered in a semi-processed condition (e.g., gilled and gutted) represent a higher quality since the remaining processing time and cost is reduced relative to round (or whole) tuna. In the consumption sense, white meat or albacore tuna is considered higher in quality because it possesses a less "fishy" taste than the lightmeat species such as yellowfin and skipjack.

2 The tuna example is analogous to the example of the wholesale marketing of rough uncut diamonds in Roy W. Kenney and Benjamin Klein, "The Economics of Block Booking," Journal of Law and Economics XXVI, No. 3 (October 1983), pp. 497-540. Kenney and Klein refer to such buyer behavior as Gresham's Law oversearching; see Kenney and Klein, pp. 502-05.

reduced and duplicative inspections are not eliminated. As long as the harvest is not homogeneous, a single price (based on the average value of all units in the harvest) will always create this form of adverse selection.

This adverse selection, however, can be constrained by an exclusive dealing contract. The purpose of the exclusive dealing provision of the fishing contract is to reduce oversearching and its associated costs. Throughout the term of the exclusive supply contract, the captain must deliver all catches to the contracting processor. The price of each catch is determined at the time of delivery after the processor makes a pre-purchase inspection. Although the price still reflects the average value of all units in the catch, the exclusive delivery requirement prevents the captain from sorting out the above-average quality units and offering them to another processor. In this way, exclusive dealing minimizes sorting costs and eliminates duplicative inspections initiated by domestic tuna harvesters. The incentive for processors to accept the captain's entire catch, to minimize pre-purchase search, and to eliminate duplicative inspections is provided by an exclusive dealing contract that enables processors on average to earn rents.[1] In effect, the domestic tuna price is discounted below its (costly search) market price to processors who require exclusive delivery contracts. This discounted price is necessary to encourage processors to accept all tuna contract deliveries including occasional deliveries of below average quality. In this way, pre-purchase search costs are minimized by keeping the inspection sample small and duplicative inspections are avoided by eliminating sales to non-contracting processors.

This tuna price discount is reflected in the processor's share of the cost savings under the U.S. marketing scheme. In essence, the price discount is "paid" or offset by the avoidance

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1 See, Kenney and Klein, pp. 505-09.

of excessive inspection and sorting costs.[1] As long as the present value of these expected price discounts (over the term of the contract) exceeds the present value of sorting and competitively bidding for substitute blocks of tuna (that are undervalued by other bidders), exclusive dealing arrangements will be required by processors, <u>ceteris paribus</u>.

U.S. captains agree to exclusive delivery contracts because such contracts reduce sorting costs and, in turn, the marginal cost of harvesting. Since skipjack and yellowfin often share the same fishing grounds and since each species can vary substantially in size (quality), harvesting costs could be saved if the catch could be marketed with minimal sorting.[2] Each harvest, for example, might be delivered as "run of the catch" (i.e., without sorting by size or specie). As the harvest is off-loaded for sale to processors, sorting limited to specie and damage (e.g., crushed, bruised, or broken fish) could be performed. Thus, for any given tuna price, a reduction in sorting costs would be expected to lead to larger and more profitable annual harvests. Competition among captains to supply processors, however, will result in the passing of this cost saving onto processors in the form of lower prices and larger deliveries of domestic tuna. Ultimately, such reductions in processing costs benefit consumers in the form of lower prices and higher quantities of canned tuna.

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[1] In a perfectly efficient marketing arrangement, the "rents" merely reflect the distribution of the cost savings (per unit of output) to the buyer (processor). Such payments should not be interpreted as a bribe or side-payment offered by the seller (captain) which, in turn, increase his costs of production. Rather, the improved efficiency of the marketing scheme relative to a competitive auction, for example, is expected to result in lower production costs to the seller and in lower input prices to the buyer. The ultimate effect is greater output of the final product to consumers.

[2] It appears that U.S. captains perform a minimal amount of sorting. The major types of sorting are (1) to remove all nontuna species from the catch and (2) to remove tuna which are under the legal size limit. The remaining tuna are believed to be further sorted only to minimize damage in the storage wells until delivery to the cannery. The larger tunas, for example, are generally placed in the bottom of the wells to avoid crushing the smaller tunas. Based on Michael K. Orbach, <u>Hunters, Seamen and Entrepreneurs: The Tuna Seinermen of San Diego</u>, (Berkeley and Los Angeles: University of California Press, 1977), pp. 57-65; and Richard L. McNeely, "Purse Seine Revolution in Tuna Fishing," <u>Pacific Fisherman</u>, LIX (June 1961), pp. 27-58.

In short, exclusive dealing contracts are efficient in the marketing of U.S. landed tuna because they avoid unnecessary marketing costs. Some of the marketing cost saving will be retained by captains and processors to offset the costs of exclusive dealing and the remainder of the cost saving will passed on to consumers.

2. The Potential Appropriation of Quasi-Rents by Tuna Processors

The quasi-rent of an asset is any payment in excess of that necessary to keep the asset in its current use (or market). Since the highest-valued alternative use of an asset is its salvage value, the quasi-rent of an asset is simply any payment over its salvage value.[1] For example, if a newly restored "classic" automobile can be used as a taxi at a daily rental value of $180 or as an exhibit in a museum at a daily rental of $100, the quasi-rent earned by the automobile is $180 - $100 = $80 per day.

Whether the quasi-rent is appropriable depends on the alternative users, if any, of the asset in the same use. Thus, if I bid $180 to use the car as a taxi and you bid $150/day, the potentially appropriable quasi-rent is $180 - $150 = $30, per day. That is, I can contract with the owner to rent the automobile as a taxi for $180/day and then impose costs on (or "hold up") the owner up to $30/day. Since the next highest-valued user of the automobile is only willing to pay $150/day, the owner is no worse off renting the car to me. If I was the only user of the automobile in the taxi market, I could potentially appropriate $180 - $100 = $80, or the entire quasi-rent earned by the automobile in its current use.[2] On the other hand, if there were several taxi drivers who valued the automobile at $180/day, the quasi-rents would not be appropriable.

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1 Thus, the size of the potential holdup may be over-estimated if we ignore the possibility that the asset may switch to another use (market). This is why it is necessary to distinguish between alternative users and uses.

2 Benjamin Klein, Robert G. Crawford, and Armen A. Alchian, "Vertical Integration, Appropriable Rents, and the Competitive Contracting Process," Journal of Law and Economics, XXI (October 1978), pp. 297-326.

One consequence of the exclusive delivery provision of the fishing contract is that it makes each delivery of tuna a specialized asset. A U.S. captain who agrees to an exclusive delivery contract must deliver his tuna catches to a specific U.S. processor. Exclusive dealing therefore eliminates all alternative users (processors) of tuna harvested under contract. In addition, the principal alternative uses of tuna are pet food and industrial products such as fish meal and body oil. These products are dramatically lower in value relative to canned tuna and, equally important, they are typically produced as by-products by the tuna processors. Hence, freshly caught tuna under contract to a processor represents an extremely specialized asset, the quasi-rent value of which is potentially appropriable.

Under these conditions, U.S. processors have an ability to hold up U.S. harvesters in the sense of opportunistically taking advantage of some unenforceable provision of the contract.[1] Processors were in a position to renege on their contracts in, at least, two ways: (1) by imposing costs on captains in the form of unnecessary off-loading delays and (2) by refusing to accept the catch unless the (implicit) contract price was lowered. Let us consider each in turn.

Throughout the bait-boat period, processors were able to impose unloading delays on boats under contract despite the captains' beliefs that such delays were often abitrary and/or unnecessary.[2] The legitimate reasons for delaying vessel off-loadings are so numerous and varied that the processor could always claim a "legitimate" reason when, in fact, he was acting opportunistically. The degree of bargaining power held by domestic captains varied inversely with the arrival of imported

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1 See Benjamin Klein, "Transaction Cost Determinants of 'Unfair' Contractual Arrangements," American Economic Review, LXX (May 1980), pp. 356-62; and Oliver E. Williamson, Markets and Hierarchies: Analysis and Antitrust Implications (New York: The Free Press, 1975), Chapter II.

2 Forbes-Stevenson Study, Chapter IV, pp. 1-5, and FTC Report, p. 24.

tuna at domestic ports. That is, the greater the number of foreign deliveries arriving at a processors dock, the weaker the ability of U.S. captains to avoid off-loading delays and lengthy price negotiations.[1] Consequently, the order in which a domestic vessel arrived into port was no indication of the order in which it would be off-loaded. Between 1964 and 1966, for example, the monthly average unloading time for U.S. vessels ranged from a low of 3 days to a high of 33 days.[2]

Perhaps more importantly, the typical fishing contract has always provided the processor with an escape clause allowing him to refuse delivery. The FTC report finds that in 1952, the typical contract contained the following escape clause:

> "In the event the canner is unable to accept delivery of fish by reason of strikes, fire, labor difficulties, breakdowns or any cause beyond the control of the canner, the canner has the privilege of refusing to accept such deliveries provided the canner shall immediately use due diligence in finding another canner or canners who will accept immediate delivery; otherwise the fishermen, at their option, may make delivery of fish to such other canner or canners as they may desire until such time as the canner notifies the fishermen that he is ready and able to accept further deliveries."[3]

The fishing contracts in the mid-1960s contained a similar provision:

> "...If, as a result of any condition or cause beyond the reasonable control of canner, canner is unable at any time to accept or pack fish caught by boat owner, canner shall have the right to refuse to accept fish hereunder and shall not be required to pay for any fish not accepted or canned. Without in any way limiting the generality of the foregoing, plant breakdown,

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1 FTC Report, pp. 22-30; interviews with industry sources during the FTC industry-wide tuna investigation; Forbes, Stevenson Study, Chapter III; Emil L. deGraeve and James H. Forbes, Jr., The Impact of Imports on the United States Tuna Industry (Stanford Research Institute Project 1191, Prepared for the Tuna Industry Committee, Stanford, California, December 1954), p. 8, (hereinafter referred to as the Tuna Imports Study); and the Marasco Study, Chapter II, p. 14.

Between 1950 and 1965, the percentage of imported to total U.S. tuna deliveries increased five-fold and represented 50 percent of the processors' tuna requirements by the early 1960's.

2 FTC Report, pp. 22-23; and data provided by the American Tunaboat Association (ATA), cited in the Forbes-Stevenson Study, Table 11, p. III-18.

3 FTC Report, p. 22.

> shortage of labor or materials, fire, government regulations, forece majeure, strikes, boycotts and other union activity preventing prompt delivery and processing of fish, shall be deemed to excuse canner from accepting or packing fish hereunder..."[1]

In one respect, the escape clause seems reasonable because processing plants throughout the bait-boat and early purse-seiner periods had no freezer storage capability and therefore processed tuna as it was off-loaded from incoming boats.[2] At the same time, however, such an escape clause provides the processor with a means of refusing delivery unless the price is lowered (i.e., to behave opportunistically).

It seems clear that with exclusive contracts tuna processors had the potential to hold up U.S. captains. The high contract costs to specify the necessary contingencies to prevent the processor from behaving opportunistically, to police and detect a contract violation, and to prove the violation in the courts made it unlikely that an explicit contract could eliminate the hold-up potential of processors. Even if an explicit contract could eliminate opportunistic behavior, the costs of doing so were likely to make this form of organization prohibitively costly.

Since the potential holdup is created by the exclusive delivery provision of the fishing contract, it may seem irrational on the part of the captain to agree to such a provision. If there is no incentive to behave opportunistically, however, it would be quite rational for captains to enter into exclusive deals with processors. Recall that the motivation for exclusive dealing is to eliminate excessive sorting and inspection costs. Thus, both captain and processor should expect to share in the net benefits of a lower cost marketing scheme for domestic tuna. The costs of eliminating the hold-up incentive can be simply viewed as a cost of exclusive dealing. If the savings in marketing costs exceed the cost of preventing the

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1 Tuna fishing agreements subpoenaed in FTC industry-wide tuna investigation, document numbers BE3-1 and BE3-2.

2 Forbes-Stevenson Study, p. II-4.

holdup, exclusive dealing remains efficient. What is required, then, is a viable alternative to explicit contracting.

One alternative to explicit contracting that may eliminate the hold-up incentive of the processor is implicit contracting.[1] Implicit contracts or guarantees are market enforced by the threat of termination of future business if opportunistic behavior occurs.[2] The captain, for example, could offer the processor a future premium (or extra payment) sufficient to assure contractual performance. If the processor violates the contract, all future business is immediately withdrawn and all expected future premiums are lost by the processor.[3] As long as the captain and processor both agree that the present value of the future premiums exceeds the present value of the short-run gain from reneging on the implicit contract, the opportunistic incentive of the processor will be eliminated.[4]

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1 The distinction between explicit and implicit contracts is more fully described in Klein, Crawford, and Alchian, pp. 303-307.

2 A model of how a market enforcement mechanism can assure contract performance is provided in Benjamin Klein and Keith B. Leffler, "The Role of Market Forces in Assuring Contractual Performance," Journal of Political Economy, LXXXIX (August 1981), pp. 615-41.

3 If both parties are assumed to know the length of the current contract, then it is also assumed that neither party can determine with certainty the last transaction in the contract period. Alternatively, if both parties can identify the last transaction within the current contract, then there must exist some positive probability that the contract will be renewed. Under these assumptions, a finite uncertain horizon is assured and implicit contracting becomes a rational alternative mode of organization. See, for example, Lester G. Telser, "A Theory of Self-enforcing Agreements," Journal of Business, LIII (January 1980), pp. 27-44.

4 The premium stream does not create excess profits in the long run. One condition for a zero-profit equilibrium is that the present value of the premiums offered by the captain equal the present value of the non-salvageable brand-name assets (or collateral) acquired by the processor to guarantee his contractual performance. The premiums include a normal rate of return to the brand-name assets. See, Klein and Leffler, pp. 626-27.

A second condition for a no hold-up equilibrium is that the present value of the premiums not exceed the present value of the savings in marketing costs, net of the present value of price discounts necessary to encourage processors to accept all tuna deliveries under the exclusive dealing contract including occasional deliveries of below-average quality. (See supra, pp. 13-14.

A possible alternative or partial substitute to the pure price-premium method of assuring contract performance is the use of nonsalvageable production assets.[1] The normal return (quasi-rents) to such an asset also acts to assure contract performance. One competitive equilibrium would be defined where the present value of the nonsalvageable production assets owned by the processor equalled the present value of his reneging on the implicit contract. Given this condition, if the processor were to behave opportunistically, all U.S. captains would refuse to deal with him and he would be forced to procure tuna from more costly sources. The increase in production costs would result in losses and eventually drive the processor out of the industry. Although capital inputs (e.g., buying a tuna canning machine rather than buying cans from an independent supplier) increase standard production costs, such expenditures may reduce the price premium paid by captains (and the corresponding brand-name assets acquired by processors) to assure contractual performance. Competition among processors to contract with captains may therefore result in some substitution of non-salvageable production assets for brand-name assets.

Since the carrying capacity of bait boats are small relative to modern tuna vessels[2] and since the smaller boats make numerous deliveries (or "repeat sales") to the same processor each year,[3] the expected short-run profit from holding up the captain is not

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1 Klein and Leffler, pp. 627-33.

2 The weighted average carrying capacity of bait boats over the 1946-66 period is approximately 200 tons. Based on data reported in Dale G. Broderick, "An Industry Study: The Tuna Fishery (unpublished Ph.D. dissertation, Columbia University, 1973), Appendix Table 7, p. 343, (hereinafter referred to as the Broderick Study).

3 The largest bait boats (commonly referred to as clippers) average 4 to 5 trips a year. In contrast, smaller bait boats have been reported to make over 30 trips in a 90 day period. See, FTC Report, pp. 13-15; U.S. Department of Commerce, NOAA, NMFS, Tuna 1947-72: Basic Economic Indicators, Current Fishery Statistics No. 6130, (Washington, D.C.: June 1973), p. 3; and U.S. Department of Commerce, NOAA, NMFS, Analysis of the Operations of Seven Hawaiian Skipjack Tuna Fishing Vessels, June-August 1967, by Richard N. Uchida and Ray F. Sumida, Special Scientific Report, Fisheries No. 692 (March 1971), p. 6.

substantial.[1] Assuming that U.S. captains costlessly communicate among one another, a holdup of any U.S. tuna boat will result in a termination of business by all captains delivering to the opportunistic processor. The costs of being branded an "opportunistic processor" by the industry would therefore include (1) the loss of all expected future premiums paid by captains delivering to the processor under implicit contracts at the time of the holdup, (2) the loss of all nonsalvageable assets employed to produce brand-name capital and tuna at the harvesting stage, and (3) the additional costs of procuring greater proportions of annual tuna requirements from the foreign export market (due to the reluctance of U.S. captains to renew or negotiate supply contracts with the processor).[2] The present value of these costs are likely to be substantially greater than the present value of a one-time holdup on a single delivery of tuna harvested by a bait boat. A processor who reneged on such a contract would therefore be worse off. Consequently, the incentive to behave opportunistically is not likely to be strong. In this case, exclusive dealing is not only rational, it is also socially efficient.

Thus, in the bait-boat period, exclusive dealing arrangements appear to be efficient. What remains unexplained, however, is why U.S. processors began to commit assets to the harvesting sector in the late 1960s. Beginning in 1967, processors began to hold equity interests in vessels, to extend second mortgages to harvesters, and to guarantee vessel loans. Other major institutional changes included the pricing of tuna before the vessel departed for the fishing grounds (instead of upon its return with the catch) and the imposition of demurrage fees on processors who failed to unload vessels within a

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1 Further, the bait boats built before 1945 were of wooden construction and therefore relatively short-lived. Dry rot, sea life, and tropical storms tended to damage the wooden hulls. See, for example, Roesti, "Economic Analysis of Factors Underlying Pricing in the Southern California Tuna Canning Industry," p. 82, (sometimes referred to as the Roesti Study).

2 If this cost becomes prohibitive, any nonsalvageable assets in the processing stage will also be lost.

specified number of days. Although exclusive dealing contracts continued to prevail throughout the 1960s and 1970s, the increasing involvement of the processors in the harvesting operation was unquestionable. Since these new institutions appear at the same time as a technological change in the method of fishing, we consider how the change in technology might have affected the costs of exclusive dealing in the modern (purse-seine) period.

C. <u>The Technological Change in Fishing</u>

The first major impact of the new technology was observable between 1958 and 1963: the larger bait boats were modified to permit fishing with a technologically improved, mechanized net retrival system.[1] It was not until 1967, however, that newly constructed purse-seine vessels were added to the U.S. fleet on a significant scale. (See Table 1.) For this reason, 1967 marks the beginning of the modern purse-seiner period. The technological change in fishing provided captains with the opportunity to transform labor-intensive, hook and line vessels into more capital-intensive purse-seine (net) vessels.

One major effect of the technological change was to dramatically increase the tuna carrying capacity of the new purse-seine vessels. Throughout the last 20 years of the bait-boat period (1946-66), the average carrying capacity of a bait boat was 200 tons.[2] During the first 10 years of the modern purse-seine era (1967-76), 105 newly constructed seiners entered the U.S. tuna fleet.[3] The carrying capacities of these vessels ranged from a remarkable high of 2,175 tons to a low of 150 tons. On average, the technologically superior purse seiner possessed a carrying capacity of 1000 tons---five times the capacity of a bait boat.

The increase in the carrying capacity of purse-seine vessels contributed to a substantial increase in total fleet capacity,

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[1] See, McNeely, pp. 27-58; and Roesti Study, p. 86.

[2] <u>Supra</u>, p. 20, n. 2.

[3] See data source cited in Table 1, p. 23, <u>infra</u>.

TABLE 1

GROSS ADDITIONS TO CARRYING CAPACITY
OF U.S. PURSE-SEINE FLEET
(Measured in Tons and Number of Vessels)

	YEAR	CONVERSIONS		NEW SEINERS		TOTAL ADDITIONS	TOTAL ADDITIONS divided by FLEET CAPACITY
		(tons)	vessels	(tons)	vessels	(tons)	percent
Transition Period	1958	0		0		0	0
	1959	3,979	(13)	0		3,979	59.9
	1960[a]	14,684	(52)	0		14,684	141.1
	1961	8,324	(20)	460	(1)	8,784	36.5
	1962	4,319	(10)	779	(1)	5,098	15.9
	1963	4,659	(6)	779	(1)	5,438	15.5
	1964	0		779	(1)	779	1.9
	1965	0		550	(1)	550	1.4
	1966	0		550	(1)	550	1.4
Modern Period	1967	0		4,030	(5)	4,030	10.5
	1968	0		6,214	(9)	6,214	15.5
	1969	1,860	(3)	6,810	(10)	8,670	19.9
	1970	0		7,700	(7)	7,700	15.4
	1971[a]	0		18,950	(17)	18,950	34.0
	1972	900	(1)	16,850	(14)	17,750	25.2
	1973	0		13,300	(12)	13,300	15.4
	1974	0		9,605	(9)	9,605	10.0
	1975	0		11,650	(11)	11,650	11.3
	1976	0		6,900	(5)	6,900	5.9

[a] Peak year within period.

Source: "Description of the United States Tuna Fleet: December 31, 1976," by the American Tunaboat Association, 1976 Summary of Newly Constructed Tuna Purse Seiners: Chronological Listing.

despite the reduction in the number of vessels in the fleet.[1] The average fleet capacity of 42,809 tons during the bait-boat period increased to 73,560 tons by 1971 (or by 72 percent) with purse seiners accounting for 95 percent of total fleet capacity.[2] At the same time, the average number of boats in the fleet declined from 215 to 158, or by approximately 25 percent.

In short, the major effects of the new fishing technology on the size and composition of the U.S. tuna fleet were as follows:

(1) to increase the carrying capacity of the new vessels entering the fleet,

(2) to increase total fleet capacity and,

(3) to almost eliminate bait boats from the fleet.

D. Contracting in the Purse-Seiner Period

1. The Potential Holdup of Purse-Seine Tuna Deliveries and the Emergence of Countervailing Institutions

One effect of the technological change was to disturb the no hold-up equilibrium in the bait-boat period. The dramatically larger carrying capacities of the modern purse seiners increased the potentially appropriable quasi-rents on each tuna delivery. The maximum delivery by an average seiner was 1,000 tons. This represented five times the maximum delivery of a typical bait boat. From the viewpoint of the contracting processor, the potential short-run gain from post-contractual reneging was five times greater in the purse-seine period than in the bait-boat period. The change in fishing technology therefore increased the expected gain and, at the same time, reduced the expected costs of opportunistic behavior. Consequently, there was much less incentive for the processor to honor the implicit contract. Under these conditions, captains would be unlikely to agree to the same exclusive delivery contracts as in the bait-boat period.

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1 Fleet capacity is defined as the maximum tonnage that can be harvested if every vessel in the fleet makes one fishing trip and returns to port with a full load of fish.

2 Compiled from data reported in the Broderick Study, Appendix Table 7, p. 343.
By 1978, total fleet capacity reached a high of 115,546 tons and represented a 170 percent increase over the average fleet capacity in the bait-boat period. Annual Report of the Inter-American Tropical Tuna Commission: 1978 (La Jolla, CA: 1979), Appendix II, Table 4, p. 158.

Moreover, without some form of exclusive dealing, the marketing costs saved under the U.S. tuna marketing arrangement could be lost.

In addition, the introduction of modern purse seiners to and the displacement of numerous small bait boats from the tuna fleet resulted in less frequent deliveries or "repeat sales" to each contracting processor. A reduction in the frequency of deliveries, <u>ceteris paribus</u>, reduces the present value of the expected future premiums under the implicit contract. The present value of $12 received at the end of one year, for example, is less than the present value of $1 received at the end of each month for twelve months, assuming a positive rate of interest. Similarly, if a processor receives a single 1,000 ton delivery from a purse seiner at the end of 60 days, the present value of a $1/ton premium on the seiner delivery will be less than the present value of the same $1/ton premium on 10 bait boat deliveries, each for 100 tons and arriving every 6 days over the 60 day period. The cost of behaving opportunistically therefore decreases.

In response to the adverse effects of the technological change on exclusive dealing, countervailing institutions[1] emerged in the purse-seiner period to reduce the processor's incentive to behave opportunistically. Let us consider the effects of four new institutions: (1) joint ownership in the vessel, (2) guarantees on vessel mortgage loans, (3) price determination prior to each fishing trip, and (4) demurrage fees for delays in vessel off-loadings.

In sharp contrast to the bait-boat period, processors generally held an equity interest in the new purse seiners entering the U.S. fleet. Most processors typically held at least

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1 Fundamentally, an institution is any means of decreasing a transaction cost. Harold Demsetz, for example, treats an institution as a means of internalizing transaction costs. The nonexistence of an institution in the bait-boat period implies that it had no relative advantage. See, Harold Demsetz, "The Exchange and Enforcement of Property Rights" <u>Journal of Law and Economics</u>, VII (October 1964), pp. 11-26; and "Toward a Theory of Property Rights," <u>Proceedings</u>, <u>American Economic Review</u> (May 1967), pp. 34-59.

a 20 percent minority interest in the vessel.[1] Under joint ownership, any costs that the processor may impose on the harvesting operation will also reduce the return to his vessel equity. More specifically, the (dollar) return on the processor's equity will fall in direct proportion to his ownership interest. If the processor owns 40 percent of the vessel, for example, a $100,000 reduction in vessel earnings imposes a $40,000 reduction on the return to his equity. Co-ownership in the new seiners therefore reduces the processor's incentive to behave opportunistically.

Unless the processor wholly owns the vessel, however, joint ownership may be insufficient to fully offset the increased hold-up potential of the modern purse seiner. From the perspective of the processor, joint ownership represents a partial integration backwards into harvesting. If the processor is only a minority owner in harvesting but a majority owner in processing, he may still have an incentive to hold up the captain under an exclusive delivery contract. This is because the loss on his vessel equity will be more than offset by the gain in equity on his processing operation. Consider, for example, a processor who holds a 40 percent ownership interest in a purse seiner and wholly owns a tuna processing plant. A $100,000 reduction in the cost of tuna due to an unexpected price concession by the captain reduces the processor's earnings in harvesting by $40,000 but increases his earnings in processing by $100,000. The net gain to the processor is $60,000. Without the co-ownership interest in the vessel, the processor would have realized a net gain of $100,000. Thus, the joint ownership requirement does reduce the likelihood of postcontractual reneging.

The additional provision of mortgage guarantees, however, further reduces the likelihood of the holdup. One effect of the mortgage guarantee is to limit the ability of the processor to shift earnings from the harvesting to the processing operation.

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1 See Table 5, p. 57, <u>infra</u>.

That is, the earnings of the vessel must always be sufficient to cover the loan payments to the bank. If the loan goes into default, the assets pledged by the processor under the loan guarantee are subject to sale by the bank to the extent necessary to retire any outstanding debt under the loan agreement. Thus, the effects of joint ownership and mortgage guarantees are reinforcing and, to some extent, substitutable.

From the perspective of the captain, the joint provision of a guarantee and a second mortgage may represent a stronger substitute for equity held by the processor. The provision of guarantees on first mortgages is most important when the processor does not hold an equity interest in the vessel. Whereas the guarantee limits the ability of the processor to shift earnings from the harvesting to the canning stage, the expected payments of interest on the second mortgage limit the processor's ability to reduce earnings at the harvesting stage. Second mortgages without guarantees, however, represent a weaker substitute for equity. The reason is that the default provision of the second mortgage agreement is likely to give the processor (lender) the right to repossess and sell the vessel and to keep the sale proceeds net of the principal on the first mortgage. As a result, the processor may not lose his principal on a second mortgage. On the other hand, if the processor held equity instead of a second, a reduction in vessel earnings resulting in default on either the first or second mortgage could impose an equity loss on the processor (and the captain). Thus, the guarantee is able to limit the greater potential to shift earnings to the canning stage when the processor holds little, or no, vessel equity. By requiring the processor to guarantee the first mortgage and to also hold the second, any opportunistic behavior by the processor that reduces vessel earnings also increases the probability of bankruptcy and the possible loss of his assets pledged under the guarantee plus the interest income and principal on the second. The following empirical observation is thereby suggested: the provision of equity is expected to be inversely related to the joint provision of guarantees and second mortgages by the processor.

Another major institutional change was to determine the domestic price of tuna prior to the vessel's departure to the fishing grounds. In the bait-boat period, processors offered prices on delivered tuna ready for immediate processing. This apparently put the harvesters at a great disadvantage since their catch was subject to deterioration in the holds of their vessels while they were negotiating prices or waiting to be off-loaded. In 1967, the American Tuna Sales Association (ATSA), a marketing cooperative, was established to assume the sales responsibilities for the domestic tuna fleet, with the exception of those vessels wholly owned by processors.[1] Since 1968, the price of domestic tuna received by each ATSA member is determined prior to its departure on a new fishing trip. As a result, the ability of the processor to renege on the (implicit) contract price for tuna is substantially limited.

In addition, the potential for unnecessary delays in vessel off-loadings appear to be restrained by a fourth major institutional change. Off-loading delays had been a principal source of dissatisfaction among captains in the bait-boat period. Beginning in 1968, however, the ATSA was permitted to charge the processor a demurrage fee of $1 per ton for each day that tuna remained on board eleven or more days after returning to port.[2] On a 1,000 ton purse seiner, for example, the fee could be as high as $1,000/day. Thus, the ability of the processor to hold up the captain by threatening to delay off-loading his vessel was reduced in the purse-seiner period.

2. The Malincentives of the Countervailing Institutions and Their Non-Emergence in the Bait-Boat Period

The reason why these institutions did not emerge in the earlier bait-boat period is that the malincentives associated

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[1] See, Forbes-Stevenson Study, Chapter IV; and Marasco Study, Chapter II. The ATSA is more fully described in the Appendix: The Structure of the Tuna Industry, pp. 129-35, infra.

[2] Forbes-Stevenson Study, Chapter IV, p. 3; and Marasco Study, Chapter II, p. 17.

with each institution made it a too costly alternative. According to Arrow:

> "... there is a wide variety of social institutions ... which serve in some means as compensation for failure or limitation of the market, though each in turn involves transaction costs of its own."[1]

Let us consider these costs in more detail.

The malincentives of vessel co-ownership are largely analogous to those of share tenancy (or sharecropping).[2] Namely, the captain (original owner) has an incentive to under-supply his labor and to over-use the vessel. The emergence of co-ownership, however, was also associated with the introduction of annual bonuses offered by processors for exceptionally large seasonal catches.[3] These bonuses are interpreted as a means to offset the under-fishing incentive of the captain. At the same time, processors assumed some of the responsibility of the harvesting operation. In particular, processors paid for (and sometimes arranged for) some repairs and maintenance of the vessel, unloading crews at dockside, and insurance on the vessel. In this way, the captain's ability to over-use the vessel was restrained. The additional costs incurred by the processor were deducted from the tuna price.

Since a mortgage guarantee increases the captain's ability to obtain loans, the malincentives of guarantees are associated with those of outside financing using loans. Analytically, loans are equivalent to bonds. So the fundamental question is: what

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1 See Kenneth J. Arrow, "The Organization of Economic Activity: Issues Pertinent to the Choice of Market Versus Nonmarket Allocation," in The Analysis and Evaluation of Public Expenditures: The PPB System, Joint Economic Committee, Congress of the United States, 1969, Vol. I, p. 48.

2 See Steven N.S. Cheung, "Private Property Rights and Sharecropping," Journal of Political Economy, LXXVI, No. 6 (November/December 1968), pp. 1107-22. More generally, co-ownership creates agency costs (which include monitoring costs) between the processor (principal) and the captain (agent and principal), see Michael C. Jensen and William H. Meckling, "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," Journal of Financial Economics, III (1976), pp. 305-60.

3 A discussion of the observed price gap between foreign and domestic tuna and the nonprice payments and bonuses made by processors is provided in the Appendix at pp. 137-39, infra.

are the malincentives of outside financing using bonds?[1] In the tuna industry, a captain with a majority equity interest in the vessel may promise lenders that he will operate his vessel in a particular manner. Once the loans are approved, however, the captain may undertake much riskier operations in an attempt to substantially increase the return on his equity despite the increased risks (costs) imposed on the lenders. Consequently, lenders may attempt to specify in the loan agreement how the vessel will be operated. Such provisions are unlikely to cover all contingencies and may seriously limit the ability of the captain to operate the vessel efficiently.[2] To the extent that lenders anticipate these incentives, the terms of the loan will be modified. A higher rate of interest, additional collateral, and a larger guarantee may be required. As long as these costs are less than the opportunity loss of not fishing for tuna, the captain will accept the loans despite their higher cost.

The (malincentive) costs of providing guarantees in the bait-boat period appear to be high. Captains generally invested their entire personal savings to own their own boat. Their personal savings, however, rarely exceeded the minimum loan requirements set by commercial banks. Thus, the mortgage on the boat was large relative to the captain's equity. As a result, additional loans secured by processor guarantees were likely to create the incentive for the captain to take greater risks with his boat. Given that the modern bait boats had a cruising range of 10,000 miles and that a single trip could take up to 100 days,[3] the costs of monitoring the activities of the captain were

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1 Jensen and Meckling (pp. 333-43) suggest that the (agency) costs of debt include (1) the incentive of the owner-manager to undertake investments with a high payoff but with a low probability of success, (2) the monitoring costs of limiting the owner-manager's ability to undertake such investments, and (3) the reduction in the market value of the bonds in the event of bankruptcy.

2 See, Stewart Maculay, "Non-Contractual Relations in Business: A Preliminary Study," American Sociological Review, XXVI, No. 1 (February 1963), pp. 55-67.

3 U.S. Department of the Interior, Fish and Wildlife Service, Survey of the Domestic Tuna Industry, (Washington, D.C.: May 1953), p. 31, (hereinafter referred to as the DOI Survey); and Orbach, p. 3.

quite high. In addition, the refrigeration, navigation, communication, and foreign repair capabilities throughout most of the period were significantly inferior to those available in the modern period. Consequently, the possibility of (1) the boat sinking, (2) delays in foreign ports due to unavailability of repair parts, (3) the catch spoiling or (4) problems with the availability or condition of the live bait[1] was much higher in the bait-boat than in the purse-seiner period. A captain who attempted to increase his catch by fishing more distant waters or by extending the length of the trip was therefore increasing the riskiness of the harvesting operation.

The high transaction costs of establishing a tuna price for each bait boat before it departed for the fishing grounds rendered the "empty boat auction" method of pricing too costly relative to the (ex post) posted price system used throughout the bait-boat period. For any given annual harvest, the smaller carrying capacity of the boats in the bait-boat fleet required that they complete more trips.[2] As a result, the number of ex ante price determinations would be substantially greater in the bait-boat period than in the modern purse-seiner era. Since the costs of estimating the ex ante prices vary directly with the number of trips (and are independent of the size of the harvests by individual boats or the entire fleet), the empty boat auction would be more costly to operate in the bait-boat period.[3]

There are a number of transaction costs associated with an empty boat auction. One significant transaction cost is

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1 DOI Survey, pp. 220-22.

2 Although the carrying capacity of tuna fleets operating during the 1948 to 1959 period were larger than the capacity of the modern purse-seiner fleets, the average capacity of a bait boat was substantially below that of a modern purse seiner; see Table 12, p. 110 and pp. 22-24.

3 Since the empty boat auction permits the captain and the processor to individually determine the price for each fishing trip, such an ex ante pricing scheme may also enable the processor to price discriminate among the incoming deliveries. In contrast, the (ex post) posted price system makes it more difficult to price discriminate since the processor would have to change his posted price for all deliveries rather than for the deliveries of an individual captain.

pre-contract search costs.[1] By fixing an <u>ex ante</u> price for each fishing trip, the captain and the processor are, in effect, agreeing on how to distribute the expected gain from each trip. Consequently, both the captain and the processor have a stronger incentive to search for information about future costs and prices than under an <u>ex post</u> pricing scheme. Thus, the <u>ex post</u> pricing arrangements utilized throughout the bait-boat period can be viewed as a means of reducing pre-contract search costs. In addition, contract enforcement and renegotiation costs are likely to be higher under <u>ex ante</u> pricing. As the expected contract price rises above the market price at time of delivery, the processor has a greater incentive to renege on the price agreement. Similarly, as the contract price falls below the market price, the captain has a greater incentive to renegotiate a higher price. The <u>ex post</u> pricing provision together with the relatively short length of the contracts used in the bait-boat period served to lower such costs.[2] A third possible cost of the empty boat auction relates to the processor's inability to inspect the catch prior to agreement on its price. Such "blind" selling arrangements may provide the captain with an incentive to lower the quality of the catch (below the average quality expected by the processor) in an attempt to increase the size of the catch.[3] The captain, for example, may harvest tuna that are smaller than the average size implicit in the <u>ex ante</u> price. From the processor's viewpoint, this represents a reduction in quality because smaller tuna require more processing than larger

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1 In the market for petroleum coke, this cost is explained by Victor P. Goldberg and John E. Erickson, "Long-Term Contracts for Petroleum Coke," University of California at Davis Department of Economics Working Paper No. 206 (September 1982), especially pp. 14-15 and pp. 39-42.

2 The shorter the length of the contract, the less likely is a substantial divergence between contract and market prices and the incentive for postcontractual reneging. This positive relationship between contract length and enforcement costs is suggested in Steven N.S. Cheung, "Transaction Costs, Risk Aversion, and the Choice of Contractual Arrangement," <u>Journal of Law and Economics</u>, XII, No. 1 (April 1969), pp. 23-46.

3 For a discussion of "blind" selling and seller brand names, see Kenney and Klein, pp. 515-16.

tuna.[1] Under ex post pricing arrangements, however, the costs of blind selling can be reduced substantially.

The institution of demurrage fees clearly recognizes the ability of the processor to arbitrarily delay vessel unloadings. The malincentive (cost) introduced by such a levy is to encourage captains to return to port prematurely in order to "earn" the demurrage fee. Since the demurrage fee is a substitute for net income, the captain will stop fishing before catching a full load if the opportunity loss (of a larger catch) is at least offset by the gain in demurrage fees. Thus, boats approaching full capacity and fishing along the coastlines of California and Mexico could easily increase their earnings by returning to port during times of unusually long unloading queues. In the bait-boat period, a demurrage fee would have been extremely costly because of the small capacities of many of the boats, the numerous deliveries made by the smaller boats, and the local nature of the fishing operation for many of the boats in the fleet.

The malincentive cost of the demurrage fee explains why the fee was set below the exact level of the true damages necessary to compensate the captain. The fee was introduced in 1967 and was set at $1 per ton for tuna that was not unloaded after 10 days in port. This closely approximates the cost of additional refrigeration and rejects (spoilage) due to unloading delays.[2] The setting of the demurrage charge equal to the refrigeration and reject costs of a delay is therefore a means of compensating the captain for additional operating costs attributable to the delay without also providing the captain with the incentive to return to port prematurely.

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[1] In the modern purse-seiner period, processors did, in fact, complain about the problem (cost) of correctly anticipating the average size of the catch, see Forbes-Stevenson Study, p. IV-4.

[2] In 1956, the layover costs of the larger bait boats were estimated at 75 cents per ton; see California Fisheries Trends and Review for 1956, p. 4.

E. Summary and Implications

The principal motivation for exclusive delivery contracts in the bait-boat period is to avoid duplicative inspection and sorting costs in the marketing of U.S. tuna. Exclusive dealing, however, transforms the domestic tuna harvests into a specialized asset. The return to a specialized asset, by definition, is a quasi-rent. Consequently, the contracting processor has an incentive to renege on the contract and attempt to appropriate the quasi-rents of the tuna catch. The processor could, for example, threaten not to accept the entire delivery unless the captain conceded to some nominal price for his tuna. Alternatively, the processor could threaten to prolong price negotiations and/or vessel off-loading unless the captain agreed to a lower price. Under these conditions, captains would not likely agree to exclusive deliveries.

The possible loss in marketing cost savings yielded by the U.S. tuna marketing arrangement, however, provides the processor and captain with the incentive to reduce the size of the potential holdup. Since explicit contracting appeared to be too costly an alternative, implicit contracting was considered. The two necessary conditions for a no hold-up equilibrium are: (1) that the captain and processor both agree that the present value of the future premiums (or quasi-rents on non-salvageable production assets) exceeds the present value of the short-run gain from reneging on the implicit contract, and (2) that the present value of the future premiums not exceed the present value of the savings in marketing costs. Both conditions appeared to be met because bait boats tended to make numerous small deliveries throughout the year. Consequently, the potential gain from a one-time holdup of a bait boat delivery was likely to be small. Hence, the implicit premiums were likely to be small and the net savings in marketing costs were likely to be substantial.

The technological change in the method of harvesting disturbed the no hold-up equilibrium in the bait-boat period. By reducing the frequency of tuna deliveries and by increasing the carrying capacity of the new vessels, the processor's incentive to behave opportunistically increased. Under these conditions, captains would be unwilling to accept exclusive delivery contracts.

As in the bait-boat period, the possible loss in marketing cost savings provided processors and captains with the incentive to reduce the increased hold-up potential. Within the first year of the purse-seiner period, four new institutions emerged. Possible contractual disputes regarding price and unloading delays were specifically recognized by instituting an "empty boat" pricing scheme for tuna and demurrage fees for unloading delays. Joint ownership more generally discouraged post-contractual reneging by imposing a cost on the processor for any reduction in vessel earnings. Lastly, mortgage guarantees limited the incentive of the processor to hold up the captain by shifting earnings from the harvesting to the canning stage of production or by reducing vessel revenues below the value of the next scheduled mortgage payment. As long as all contract costs (including the costs of institutional changes) do not exceed the savings due to the avoidance of excessive inspection and sorting costs (under the U.S. tuna marketing arrangement), exclusive delivery contracts remain efficient in the purse-seiner period.

The major empirical implications of the theory include the following:

(1) There are fewer marketing classifications or categories of tuna under exclusive dealing arrangements.

(2) There are more pre-purchase inspections in the marketing of tuna in the absence of exclusive dealing arrangements.

(3) A substantial proportion of U.S. tuna deliveries in the purse-seiner period are under some form of exclusive dealing arrangement.

(4) Off-loading delays were more common in the bait-boat period than in the purse-seiner period.

(5) The foreign export price of tuna (delivered to the U.S.) is generally above the U.S. price.

(6) The vessel equity held by the processor varies inversely with his joint provision of a loan guarantee and a second mortgage on the vessel.

CHAPTER III

SOME EVIDENCE IN SUPPORT OF THE SPECIALIZED ASSETS HYPOTHESIS

A. Introduction

The principal empirical proposition of the specialized assets hypothesis is that marketing costs can be reduced under exclusive dealing arrangements. Since tuna is marketed under exclusive dealing contracts in the U.S. and under competitive bidding or auctions in Japan, the contrast between the two marketing arrangements is expected to provide evidence in support of the hypothesis. Specifically, the tuna market in Japan is expected to exhibit numerous classifications of tuna and therefore higher prices than in the U.S. (for comparable tuna). Despite the data limitations, an attempt is made to estimate the savings in marketing (or sorting and competitive bidding) costs under the U.S. marketing scheme.

A somewhat related issue is whether the Japanese market exerts a competitive influence on the contracting and pricing of U.S. tuna. The specialized assets hypothesis relies heavily on the assumption that contracting for fishing contracts is highly competitive. Evidence which suggests that the Japanese market may constrain potential noncompetitive behavior in the U.S. makes the competitive contracting assumption even more plausible. Empirically, if the difference between the relatively higher foreign price and the lower U.S. price is constant, variations in the U.S. price would be expected to be correlated with variations in the Japanese price, <u>ceteris paribus</u>. Thus, if marketing costs are relatively constant, the highly competitive nature of the Japanese market would increase or strengthen the competition for U.S. tuna. A simple regression of U.S. prices against Japanese prices might be expected to provide evidence on whether the U.S. price adjusts quickly and easily to changes in the Japanese price (the slope of the estimated regression line) and on the magnitude of marketing costs (the constant term of the estimated regression line). Unfortunately, the adjustments to the data necessary to avoid the major criticisms of this approach reduce the constant term to zero or make it difficult to interpret economically. For this reason the regression approach to estimating sorting costs is inappropriate. Nonetheless, regression analysis does provide some evidence that the U.S. market price is sensitive to the Japanese market price. When combined with other evidence on the structure of the markets, it seems clear that the Japanese marketing area exerts a competitive influence on the U.S. marketing area. Thus, the competitive contracting assumption seems quite reasonable.

The pattern of vessel equity held by U.S. processors in the modern purse-seiner period provides strong evidence in support of the specialized assets hypothesis. The assets committed by processors varies directly with the size of the vessel (or potential holdup), and the varying pattern of substitution among processor's equity, second mortgages, and guarantees is remarkably consistent with the theory. Available evidence concerning off-loading delays in U.S. ports is also reported. Lastly, a recent study of the New England fresh fish market is reviewed because it reflects a marketing scheme that is remarkably similar to the marketing of tuna in the U.S.

B. Estimating the Marketing Cost Saving Under the U.S. Pricing Scheme

1. Extensive Sorting in Japanese Markets

A wide variety of sorting classifications have been utilized in Japanese tuna markets over the 1960-80 period. Tuna prices have been reported in the following classifications:[1]

1. by specie such as skipjack, yellowfin, and albacore (Foreign Fishery Information Releases: one or more issues each month),
2. by condition such as round, gilled and gutted, headless, and fillets (61-34, 62-21, and 62-31),
3. by degree of freshness such as fresh, iced, and frozen (62-19, 67-12, 67-18, and 76-12),
4. by weight such as 20-80 lbs., 80-100 lbs., 100-120 lbs., and over 120 lbs. for yellowfin (62-5, 62-6, 62-21, 62-36, 64-29, and 67-5); and 0-3.2 lbs., 3.3-5.4 lbs., 5.5-9.8 lbs., and 9.9-13.2 lbs. for skipjack (76-7),

[1] U.S. Department of Commerce, NOAA, NMFS, Foreign Fishery Information Releases. The numbers in parentheses indicate the number of the release. The first two digits represent the year of the release.

5. by damages including bruised, crushed, and broken (69-12),

6. by gear type such as pole-caught and longliner-caught (61-10, 63-8 and 69-17), and

7. by fishing area such as coastal water and distant water (69-17).

The FTC industry-wide tuna investigation confirmed that U.S. processors imported tuna from Japan by specie, condition, and weight. Interviews with the leading processors revealed that the weight or size of the imported tuna was a significant consideration in placing an order. Generally speaking, smaller tuna command a lower price. Since additional processing costs are incurred with smaller tuna, however, it was not always in the processor's best interest to import the smallest tuna. Only when the price of the smallest tuna was sufficiently low to offset its additional processing costs did it represent a good buy.

Subpoena specification 27(b) required processors to provide documents sufficient to show the annual delivered cost of tuna imports by condition and specie (for the 1972-77 period). Some processors provided fish settlement or liquidation sheets which summarize the deliveries made by supplier and transshipment vessel. These documents show the date of delivery, the quantity and total cost by specie and condition, any payments made to the supplier, and any allowances for rejects which are charged back to the supplier. In addition, the weight class of the tuna is sometimes recorded along with the specie and condition. It is clear from these documents that imported tuna is priced according to numerous weight classifications.

In contrast, tuna harvested by the U.S. tuna fleet are delivered as "run-of-the-catch." That is, the tuna are landed at the processor's dock with little or no sorting by specie or size.[1] Thus, the price differential between Japanese and U.S. tuna is expected to reflect, in part, the relatively higher sorting costs incurred in the Japanese markets.

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[1] The procurement of U.S. and foreign tuna is described in the Appendix, pp. 117-22.

In addition, sorting increases the value of tuna to Japanese consumers. The increase in the personal valuation of sorted tuna, however, also increases competitive bidding costs. Thus, the increase in demand for sorted tuna must also account for the associated costs of inspection and bidding in foreign markets. Nevertheless, the net effect of sorting is expected to result in a higher demand for tuna sold in foreign auctions. It is on this basis that the differential between the Japanese and U.S. tuna prices is expected to reflect the difference in marketing costs under the two marketing arrangements.

2. The Size of Tuna

The estimate of the price differential between Japanese and U.S. tuna will be biased unless the Japanese and U.S. prices correspond to tuna of comparable size (weight). Since Japanese landings tend to include larger (and therefore more valuable) tuna than U.S. harvests, the estimated price differential would generally be upward biased. Ideally, if the weight distributions of U.S. harvests were known and if Japanese prices were available by size class for each specie and condition, the U.S. catch could be priced out using the appropriate Japanese size-price schedule and compared to the actual U.S. prices to determine the price differential for tuna by specie, condition, and size. Unfortunately, Japanese price data by size class is not available on a systematic basis.[1]

The approach taken was to obtain information on the size of tuna harvested by fishery and by country. About 90 percent of the yellowfin and skipjack tuna landed by the U.S. are in the Eastern Pacific Ocean. In contrast, approximately 90 percent of the Japanese skipjack landings and over 50 percent of its yellowfin landings are in the Western Pacific.[2] Since skipjack in the Eastern and Western Pacific tend to be younger and smaller

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[1] The Washington D.C. Office of the Embassy of Japan tried to obtain price data in this form from appropriate Japanese agencies but was unsuccessful. It is possible that the data is considered confidential. Price data was provided, however, by specie and condition for the 1961-81 period.

[2] Computed from Yearbook of Fishery Statistics, Food and Agricultural Organization of the United Nations, 1960-80.

tuna, annual catches are not considered to differ significantly in size.[1]

On the other hand, the size of yellowfin harvested in the Eastern and Western Pacific can vary dramatically. Yellowfin caught with the longline fishing technology, for example, tend to be big, adult tuna and comparable to the largest yellowfin caught with the purse-seine method. According to Dennis King:

> "... most imported tuna comes from Japan and a good deal of it is taken by longliners. On the average, these are larger fish than those supplied by U.S. purse seiners and larger fish yield more marketable meat per ton."[2]

Thus, Japanese long-line yellowfin from the Western Pacific are expected to be substantially larger than U.S. purse-seine yellowfin from the Eastern Pacific. Estimating price differentials between Japanese and U.S. yellowfin catches is therefore expected to be significantly upward biased and highly misleading. As a result, the analysis of price differentials focuses on skipjack landings by commercial tuna vessels in Japanese ports and in U.S. ports.

3. The Data

With the assistance of the Embassy of Japan, Japanese tuna prices were obtained from a monthly survey of 67 Japanese ports for the period 1961 to 1981. This data set includes only those ports which can be identified from 1957 to the present. Therefore, the annual data are comparable in the sense that the

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1 The Inter-American Tropical Tuna Commission provided data on the size of skipjack and yellowfin tunas from commercial landings in the Eastern Tropical Pacific for the 1960-80 period. The average weight of skipjack was 6.7 pounds (with a high annual average of 8.1 and a low annual average of 5.3 pounds) over the 21 year period.

2 Dennis M. King, "Measuring the Economic Value of the Eastern Tropical Pacific Tuna Fishery," presented at the Proceedings of the Western Division Meetings of the American Fisheries Society (July 1978), p. 7. This finding is confirmed by research conducted by the IATTC during the mid-1970s. Using the IATTC data, yellowfin caught by U.S. purse seiners averaged 25.6 pounds in the eastern-most region of the Eastern Pacific (the CYRA) and 67.2 pounds between the CYRA and the western boundary of the Eastern Pacific. In contrast, the largest yellowfin averaged 271.4 pounds in the CYRA and 217.4 pounds in the western portion of the Eastern Pacific. Long-line yellowfin caught by the Japanese are therefore likely to be three to four times the size of average U.S. yellowfin catches (i.e., over 200 pounds).

same ports are included in each year. This data set is entitled Annual Fishery Product Distribution Statistics (AFPDS) and is published by the Statistics and Information Department of the Ministry of Agriculture, Forestry and Fisheries, Government of Japan.

The AFPDS data are disaggregated by specie (e.g., yellowfin and skipjack), by condition (e.g., round, loins, and fillets), and by condition of freshness (e.g., fresh or frozen). Price data on frozen tuna are not available until 1965.

Since the AFPDS data are printed in Japanese, prices are reported in yen per kilogram and quantities are in metric tons (which equal increments of 1,000 kilograms).[1] Extreme care was exercised in translating the data. The initial translation was provided by the Washington D.C. Office of the Embassy of Japan and was confirmed using another Japanese publication entitled Monthly Statistics of Agriculture, Forestry and Fisheries which provides the English translation of the tuna species and conditions.

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[1] The conversion of prices quoted in yen per kilogram (Y/kg) to U.S. dollars per short ton ($/ST) is given by the second term on the left hand side of equation (1):

$$(1)\quad \frac{Y}{kg} \bullet \frac{\$/Y}{\left(\frac{2.20462\ lbs./kg}{2000\ lbs./ST}\right)} = \frac{\$}{ST}$$

where,

$$(2)\quad \frac{\$/Y}{\left(\frac{2.20462\ lbs./kg}{2000\ lbs./ST}\right)} = \frac{ER}{\left(\frac{2.20462}{2000}\right)\left(\frac{ST}{kg}\right)} = \frac{ER}{.001102\ (ST/kg)},$$

and ER equals the exchange rate. ER is the fraction of a dollar per unit yen. Substituting (2) into (1) yields:

$$(3)\quad \frac{Y}{kg}\left(\frac{ER}{.001102\ (ST/kg)}\right) = \frac{\$}{ST}.$$

Thus, to convert prices stated in Y/kg, multiply the price times the exchange rate (ER) and divide by .001102. The exchange rates are reported in the International Statistics Section in the Economic Report of the President. It should be noted that the exchange rate was fixed at $.0027778 per yen (or 360Y per $) from the late 1950s until mid-1971. See, for example, Board of Governors of the Federal Reserve System, "Foreign Exchange Rates by Country" in Banking and Monetary Statistics, 1941-1970, p. 1040. Minor variations in the actual exchange rate from the (official) fixed exchange rate are insignificant for computational purposes.

Data on tuna prices paid at the principal skipjack port of Yaizu, Japan are also available. The Yaizu data are reported in the Foreign Fishery Information Release supplement to the (U.S.) Market News Report.[1] Skipjack prices are reported on a continuous monthly basis beginning in 1967 and are quoted in Y/kg and $/ST.

U.S. prices for skipjack and yellowfin landed in California ports was provided by the U.S. Department of Commerce, NMFS. The basic source data are as follows:

1960-67 Bureau of Commercial Fisheries Statistical Digest

1968-76 National Marine Fisheries Service Statistical Digest

1977-80 Preliminary data from Data Management and Statistics, NMFS.

The data are expressed as annual weighted average ex-vessel prices per short ton ($/ST). These data appear to represent the most consistent data available over the 1960-80 period.

4. The Price Differential Between Japanese and U.S. Tuna

Before the differential between the relatively higher Japanese oprice and the lower U.S. price can be meaningfully interpreted, three price adjustments are necessary. The first adjustment is to correct for inflation. Accordingly, both the Japanese and the U.S. nominal prices were deflated using a Producer Price Index by Stage of Processing as reported in the Economic Report of the President.[2] A second adjustment is made to the Japanese prices to allow for transportation and handling charges to California ports. In this way, both Japanese and U.S. prices are delivered prices to California ports. During the FTC industry-wide tuna investigation, industry sources explained that approximately 20 percent of the delivered price of imported tuna reflects transporation and handling to the U.S. On this basis,

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1 This is a weekly newsletter which includes reports on Yaizu tuna prices, harvests, and current events which are initially published in Japanese trade journals and newspapers. The newsletter is published by the U.S. Department of Commerce, NOAA, NMFS.

2 The specific index used was Crude Materials for Further Processing: Foodstuffs and Feedstuffs. The deflated prices are expressed in 1967 dollars (i.e., 1967 = 100).

the deflated Japanese prices were marked up by 25 percent. The third adjustment accounts for the fact that U.S. processors make payments (including bonuses) to U.S. captains in addition to the price of tuna. These nonprice payments were estimated at 13.56 percent of the U.S. (or ATSA) price during the modern purse-seiner period.[1] Therefore, the 1967-80 deflated U.S. prices were multiplied by a factor of 1.1356. Foreign captains delivering to Japanese ports receive no similar payment.

The three estimated skipjack price differentials are shown in Table 2. They range from a high of $88/ST to a low of $62/ST. Despite the necessary adjustments to the basic data, all three price differentials are remarkably similar. The fundamental difference among them reflects differences in the level of aggregation across conditions and in the degree of freshness. The largest price differential ($88/ST) is associated with the highest Japanese price ($408/ST). As indicated in Table 2, however, this price is biased upward due to the inclusion of conditions other than round as well as the inclusion of fresh skipjack. The Yaizu price differential ($66/ST) is a more reliable estimate of the true differential. Since Yaizu is the largest skipjack auction for canned tuna in the Orient, the skipjack landed in Yaizu are largely for local canning and export. Consequently, a substantial proportion of these skipjack landings are round and therefore more comparable to U.S. landings. Nevertheless, some of the landings represent fresh rather than frozen tuna. This biases the Yaizu differential slightly upwards. The third estimate of the price differential ($62/ST) is the most comparable to U.S. skipjack harvests. These Japanese harvests are composed of round, frozen skipjack and are the least valuable of the skipjack landings ($382/ST).

Thus, our best estimate of the marketing (or sorting and competitive bidding) cost saving under the U.S. marketing

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1 For the discussion of nonprice payments and bonuses, see Appendix at pp. 138-39, *infra*. Since these payments were estimated at $67/ST (in nominal dollars) relative to a U.S. nominal (weighted average) price of $494/ST, the percentage adjustment is 13.56 (= $67/ST ÷ $494/ST).

TABLE 2

SKIPJACK TUNA PRICE DIFFERENTIALS
($/ST)

Tuna Classification	Skipjack Prices U.S. (1)	Skipjack Prices Japan (2)	Price Differential (3)=(2)-(1)	Time Period
Round/Frozen, Calif. Ports	320			1964-80
Round/Frozen, Calif. Ports	334			1967-80
All Conditions, Fresh and Frozen, Japanese Ports		408	88 = 408-320	1964-80
All Conditions, Fresh and Frozen, Yaizu		400	66 = 400-334	1967-80
Round/Frozen, Japanese Ports		382	62 = 382-320	1964-80

Source: See discussion on the basic data and price adjustments at pp. 40-43.

arrangements is $62/ST. With one exception, both the Japanese and the U.S. prices have been adjusted for the major factors that are likely to produce a price differential. The exception is the sorting and duplicative inspection costs incurred in the Japanese competitive tuna auctions.[1] One major reason for the price differential is therefore the relatively higher marketing costs which are reflected in a higher Japanese price. Since other factors may also contribute to a higher Japanese price or to a lower U.S. price, the $62/ST price differential is likely to represent the maximum estimate of the marketing cost savings under the exclusive dealing arrangements in the U.S.[2]

As anticipated, the yellowfin price differentials are not reliable estimates. Table 3 shows that the Japanese price of round, frozen yellowfin is more than double the U.S. price. A differential of such magnitude, for a given condition and degree of freshness, is indicative of a substantial difference in the size of Japanese tuna relative to U.S. tuna.[3] The price differential increases from $461/ST to $530/ST when the Japanese landings include fresh tuna and other conditions (such as loins and fillets) in addition to round. Without being able to adjust for the size difference between Japanese and U.S. yellowfin, these price differentials provide little, or no, information about relative marketing costs. The remaining analysis of the Japanese tuna market therefore focuses on skipjack tuna.

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[1] Recall that these marketing costs result from competitive bidding oversearch and Gresham's Law oversearch; see pp. 10-14, supra.

[2] For example, the existence of a possible upward trend in the true transportation adjustment to the Japanese price may be thought to explain part of the price differential. This does not appear to be a significant factor. Since the transportation adjustment is based on the 1972-75 period, a constant trend over the entire 1960-80 period would generate an overestimate during the first 12 years (1960-71) and an underestimate during the last 5 years (1976-80). While the errors are partially offseting, the Japanese price remains somewhat overestimated. If the nonprice adjustment to the 1967-80 U.S. prices is also trended upward, however, the actual adjustment (based on the 1972-80 period) will overestimate the true adjustment for the 1967-71 period and thereby bias the U.S. price upwards. Thus, the net effect of possibly overestimating both the Japanese and the U.S. price is ambiguous.

[3] The dramatic size difference between Japanese and U.S. yellowfin is reported at supra, p. 40.

TABLE 3

YELLOWFIN TUNA PRICE DIFFERENTIALS
($/ST)

Tuna Classification	Yellowfin Prices U.S. (1)	Japan (2)	Price Differential (3)=(2)-(1)	Time Period
Round/Frozen, Calif. Ports	370			1964-80
All Conditions, Fresh and Frozen, Japanese Ports		900	530 = 900-370	1964-80
Round/Frozen Japanese Ports		831	461 = 831-370	1967-80

Source: See discussion on the basic data and price adjustments at pp. 40-43.

It may be helpful to consider, for a moment, the relation between the marketing cost saving and the implicit payments received by U.S. processors under the exclusive dealing arrangements.[1] The estimated \$62/ST saving in marketing costs, for example, includes a payment to processors for reducing their oversearch activities in the form of excessive sorting of the harvests, lengthy pre-inspections of each catch, and duplicative inspections.[2] This implicit payment to reduce search costs should not be confused with the implicit premiums that captains may offer processors to assure contractual performance (i.e., to eliminate the incentive of the processor to hold up the captain by refusing to accept the catch unless the contract price is renegotiated downward). Competition among processors may result in substitution of nonsalvageable production assets for brand name capital assets and therefore in a reduction in the size of these implicit premiums necessary to assure contractual performance. Yet, the extent of this substitution will be limited by the state of technology. Thus, the estimated marketing cost saving is likely to represent both types of implicit payments. These payments, however, are "paid" or offset by the reduction in marketing costs achieved under the exclusive dealing contracts.[3]

The existence of these marketing cost savings does not imply that the Japanese marketing scheme is socially undesirable. The relative efficacy of each pricing scheme lies in the agreement or disagreement among buyers on the value of any given unit or block of tuna. The U.S. system is relatively more efficient in the marketing of tuna for canned consumption. In this case,

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1 Recall the discussion at pp. 13-14 and pp. 19-21, *supra*.

2 See pp. 13-14, *supra*.

3 The tuna price differential also reflects the cost saving of U.S. harvesters under exclusive dealing contracts. The marketing cost saving realized by U.S. harvesters lowers the supply price of U.S. tuna. (See p. 14, *supra*.) These savings are therefore passed onto processors in the form of lower domestic tuna prices which encourages processors to increase purchases of domestic tuna and to reduce purchases of foreign tuna. Ultimately, U.S. consumers benefit in the form of lower prices and higher quantities of canned tuna.

processors are likely to agree on the value of any unit of tuna. Competitive bidding is inefficient since the aggregate search performed by all bidders is no more valuable than the single search performed by the winning bidder. Consequently, sorting and inspection costs can be reduced by contracting for entire tuna harvests on an annual basis. The Japanese pricing scheme, on the other hand, is relatively more efficient in the marketing of tuna for raw consumption. Bidders do not agree on the value of a given block of tuna. Thus, additional search is warranted to satisfy the particular tastes and preferences of competing buyers.

5. The Limitations of Regression Analysis in Estimating Marketing Costs

Assuming that U.S. and Japanese tuna are in the same geographic market and assuming that marketing costs are relatively constant, movements in the U.S. price would be expected to be assocated with movements in the Japanese price. After adjusting the U.S. and Japanese prices to reflect all nonmarketing costs for comparable tuna, a statistically significant relationship between the two prices would be expected.

Thus, a simple regression model in the form:

$$Y_i = \alpha + \beta X_i + \varepsilon_i$$

where

Y_i = the dependent variable (observable),

X_i = the explanatory variable or regressor (observable),

α = the constant term,

β = the regression parameter indicating the marginal effect of X on Y, and

ε_i = the stochastic disturbance or error term (unobservable) reflecting the difference between any observed and expected value of Y_i,

provides a means of testing for a U.S. - Japanese tuna market (β) and estimating the marketing costs in the Japanese market (α). If β does not significantly differ from 1 and if the coefficient of determination (r^2) is large and significant, the simple model appears to be sufficient.[1] Given $\hat{\beta} = 1$, it can be shown that $\hat{\alpha} = \bar{Y} - \bar{X}$, where $\bar{Y}$ and $\bar{X}$ denote the average of Y_i and X_i, respectively.[2] Thus, if Y_i and X_i represent Japanese and U.S. tuna prices, respectively, $\hat{\alpha}$ will yield the <u>same</u> price differentials as given in Table 2.[3] It will suggest the maximum marketing cost savings under the U.S. marketing arrangement because the influence of other relatively unimportant explanatory variables that are unaccounted for in the regression model may be reflected, in part, in $\hat{\alpha}$.

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1 The reason why $\beta = 1$ (or equivalently, $\partial Y_i/\partial X_i = 1$, where Y_i and X_i represent U.S. and Japanese prices, respectively) is a necessary condition for a single geographic market relates to the underlying cross-market and own-market demand and supply elasticities. If $\partial Y_i/\partial X_i = 1$, both prices adjust quickly and easily to one another and, in equilibrium, are equal. As a result, the relevant measure of the cross-market elasticities also equals unity which indicates a single market. See Ira Horowitz, "On Defining the Geographic Market in Section 7 Cases," in <u>Bank Structure and Competition</u>, 1977, pp. 170-75.

2 For the least squares normal equations, $\hat{\alpha} = \bar{Y} - \hat{\beta}\bar{X}$, where $\hat{\alpha}$ and $\hat{\beta}$ are the least squares estimators of α and β. See, for example, Jan Kmenta, <u>Elements of Econometrics</u>, (New York: Macmillan Publishing Co., Inc., 1971), pp. 206-09.

3 Each price differential in Table 2 is equal to:

$$\frac{\Sigma Y_i}{n} - \frac{\Sigma X_i}{n} = \bar{Y} - \bar{X},$$

where n is the number of observations or prices in the sample. Our preference for directly computing the price differentials as summarized in the preceding subsection is based on two considerations: (1) as will be discussed below, the adjustments to the data necessary to avoid the major criticisms of the regression approach force $\hat{\alpha} = 0$, and (2) the regression method attempts to minimize the sum of the <u>squared</u> errors or, in the present case, the sum of the <u>squared</u> price differentials (i.e., $\Sigma\hat{\varepsilon}_i^2 = \hat{\Sigma}[Y_i-(\hat{\alpha} + \beta X_i)]^2$, whereas our concern is with the price differential $(\bar{Y} - \bar{X})$. Only when $\hat{\beta} = 1$, are the two approaches equal $(\hat{\alpha} = \bar{Y} - \bar{X})$. Recall the preceding footnote.

The regression approach to estimating the geographic market has been severely criticized in the literature.[1] The major shortcomings of the approach include the following:

(1) Inflationary bias may produce a positive correlation when the data are otherwise unrelated;[2]

(2) Seasonal and/or trend components may bias the correlation when markets are, in fact, separate;[3]

(3) Different competitive conditions may generate different equilibrium prices, yet the price correlation could be strong (e.g., if there existed a common input supplier) and indicate a single market instead of separate markets;[4]

(4) If markets adjust slowly (i.e., with a lag), a low correlation of contemporaneous data may incorrectly suggest separate markets;[5] and

(5) The Horowitz methodology restricts the adjustment process to a simple first order process: that is, the price difference is assumed to continuously approach the long-run price difference over time without possibility of variation.[6]

These five qualifications, however, are general propositions and may not apply in specific cases. Consider the U.S. and

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1 There are two schools of thought on the use of price relationships to delineate geographic markets. See, Douglas C. Dobson, Denis A. Breen, and James A. Hurdle, "Geographic Market Definition: A Review of Theory and Method for Domestic and International Markets," The Journal of Reprints for Antitrust Law and Economics, forthcoming, pp. 16-21. One method is to test for uniformity or the tendency toward equality in the price data such as in Ira Horowitz, "Market Definition in Antitrust Analysis: A Regression-Based Approach," Southern Economic Journal, LXVIII, (July 1981); Draft, pp. 1-16. The alternative is to test whether prices in two geographic areas are correlated and therefore tend to equality quickly and easily; see, for example, Horowitz, "On Defining the Geographic Market," supra, p. 49, n. 1.

2 Margaret E. Slade, "Causality Tests for Market Extent Applied to Petroleum Products," FTC Working Paper No. 87, June 1983; and Horowitz, "Market Definition."

3 Slade, "Causality Tests."

4 Dobson, et al., op. cit., pp. 19-20; and Robert A. Rogowsky and William F. Shughart II, "Market Definition in Antitrust Analysis: Comment," FTC Working Paper No. 77, Revised October 1982.

5 Slade, "Causality Tests;" and Horowitz, "Market Definition."

6 John Howell, "An Examination of the Dynamic Behavior of Cross-Regional Price Differences in Regular and Unleaded Gasoline," U.S. Federal Trade Commission mimeo, Washington, D.C.; Phillip E. Giffin and Joseph W. Kushner, "Market Definition in Antitrust Analysis: Comment," Southern Economic Journal, XLIX, No. 2, (October 1982), pp. 559-62; and Rogowsky and Shugart, "Market Definition in Antitrust Analysis."

Japanese tuna marketing areas. Both appear to be highly competitive and, consequently, limitation (3) is not likely to apply. Since the U.S. contract price (from 1967-80) is generally negotiated in January of each year (with minor changes made within the year), it seems reasonable to expect the U.S. price to be sensitive to both current and past year prices determined in Japan. Thus, a one year time lag may be appropriate and thereby eliminate limitations (4) and (5). Given that the tuna price data have been deflated and annualized, inflationary (1) and seasonal (2) biases should be minimal. Finally, by removing the trend from both the U.S. and the Japanese prices, the remaining limitation in (2) is taken into account.

The regression equation based on the properly adjusted price data for the U.S. and Japanese marketing areas is as follows:

$$AP_{US} = \underset{(.36)}{2.42} + \underset{(4.22)}{.54}\ AP_J + \underset{(2.57)}{.34}\ LAP_J \qquad (r^2 = .67)$$

where,

AP_{US} = trend-adjusted U.S. price (\$/ST) for round, frozen skipjack,

AP_J = trend-adjusted Japanese price (\$/ST) for round, frozen skipjack, and

LAP_J = one year lagged, trend-adjusted Japanese price (\$/ST) for round, frozen skipjack.[1]

The t-values (for n=16) are given in the parentheses and are significant at the .05 level (on a 1-tail test) for each of the price coefficients; the constant term is not statistically

[1] Because a discrete, one-period adjustment seems most characteristic of the U.S. marketing area, a modified price correlation approach is utilized rather than a continuous dynamic model which tests for the tendency of prices to converge over several time periods. A priori, prices are expected to adjust "quickly and easily" (Stigler, The Theory of Price, pp. 85-87) within one time period. A geometric distributed lag (Kmenta, pp. 474-75), on the other hand, has little, or no, theoretical basis and was statistically insignificant.

different from zero.[1] The r^2 of .67 is significant at the 99 percent level of confidence. In addition, the correlation coefficient of .11 between the two Japanese price variables suggests that multicollinearity is not present. Lastly, the Durbin-Watson statistic of 2.39 is insignificant at the .05 level indicating that positive serial correlation among the error terms in not a concern.[2]

The regression analysis suggests that U.S. skipjack prices are sensitive to Japanese skipjack prices. A $10/ST increase in the current Japanese price, for example, will be associated with an increase in the U.S. price by $5.40/ST in the current year and by an additional $3.40/ST in the following year, ceteris paribus. Thus, the $10/ST increase in the Japanese price is associated with an $8.80/ST increase in the U.S. price within one year. Yet, the adjustment is incomplete and the partial derivative of the two current price variables is substantially less than one.[3] This fails to meet either price relationship criterion for a

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1 Since the U.S. (and Japanese) price is trend adjusted, it is simply the residual of a linear trend equation. It can be shown that if this trend equation contains a constant term, the residuals sum to zero. See, for example, James L. Kenkel, Introductory Statistics for Management and Economics, (Boston: Prindle, Weber and Schmidt, 1981), p. 550. This was the case for both the U.S. and Japanese linear trend equations. Consequently, the regression equation reported above, which contains all trend-adjusted variables, determines a zero value for the constant term (i.e., $\bar{X} = \bar{Y} = 0$ implies $\hat{\alpha} = 0$).

2 The decision rules for the Durbin-Watson test are taken from Kmenta, Elements of Econometrics, pp. 294-96. The test for negative serial correlation is insignificant at the .025 level.

3 The finding is not surprising given that Japanese tuna are sold on a spot market basis whereas U.S. tuna are sold under exclusive delivery contracts. Only small quantities of U.S. landed tuna are sold in Japanese (or other foreign) ports and roughly 15 percent of U.S. tuna purchases are ordered from Japanese ports. The demand for tuna is also fundamentally different in each region: the Japanese demand is primarily for raw consumption in contrast to the U.S. demand for canned tuna. As a result, the taste parameter in the Japanese demand function is extremely more sensitive to the sorting classifications of each harvest.

single market.[1] Consequently, it can not be concluded that the U.S. and Japanese marketing areas compose a single geographic market.[2]

What the price correlation does indicate, however, is that an increase in the U.S. tuna price is likely to increase imports of Japanese tuna into the U.S. Any attempt by U.S. harvesters to raise price above the delivered Japanese price (which is a competitive price) would therefore be constrained, to some extent, by additional imports of tuna from Japanese ports. The ability of U.S. processors to offer below competitive prices to U.S. harvesters, on the other hand, is likely to be limited given the potential for U.S. harvesters to deliver to Japanese (or other foreign) ports. The Gann fleet, a group of U.S. purse seiners and possibly the most productive fleet in the world, occasionally delivers tuna to foreign ports. Although the Japanese price is not generally above the U.S. price <u>plus</u> transportation costs to Japan, a fall in the U.S. price would increase the incentive of U.S. harvesters (such as Ed Gann) to deliver to foreign ports (<u>ceteris paribus</u>).[3] Therefore, one major economic effect of the Japanese tuna market is to limit deviations of the U.S. tuna price from the marginal cost of harvesting. Alternatively stated, the assumption that contracting for U.S. tuna is highly competitive appears to be quite reasonable.

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1 Recall the discussion at p. 50, n. 1. The partial derivative of the <u>current</u> Japanese and U.S. prices of .54 is substantially less than one and therefore fails the price correlation test. Given that a geometric distributed lag was statistically insignificant (p. 51, n. 1) and that the one-period lag coefficient is .34, the Japanese and U.S. prices do not tend toward equality. Hence, the test for tendency toward uniformity is also failed.

2 For a summary and critique of the product shipments approach to measuring international geographical markets, see Dobson, et al., Draft, pp. 21-26 and pp. 36-50.

3 The ability of U.S. processors to raise the price of canned tuna is also restrained by the importation of canned tuna. The percentage of U.S. supply of canned tuna from imported canned tuna averaged 7.9 percent over the 1972-80 period. See Appendix, Table 15, p. 126.

C. The Substitutibility of Vessel Equity, Second Mortgage, and Guarantee Commitments of Processors to the Purse-Seine Fleet

The specialized assets hypothesis explains the emergence of several institutions as a response to the greater potential for processors to behave opportunistically in the modern purse-seiner period. Competition for exclusive delivery fishing contracts leads processors to commit assets to the harvesting operation to assure their contractual performance. The theory suggests that processors may offer to take equity ownership interests in the vessel, to provide second mortgage money to captains, and to pledge assets to guarantee commercial lenders repayment of the first mortgage.[1] Given that equity in the vessel represents partial vertical integration by the processor and an opportunity to shift vessel earnings to the processing division, the three alternative forms of committing assets to the harvesting stage are generally substitutible or reinforcing. As the processor's equity ownership interest approaches 100 percent, however, his incentive to behave opportunistically approaches zero and the provision of a guarantee and second mortgage becomes redundant. At the other extreme, when little, or no, vessel equity is held by the processor, the provision of guarantees and second mortgages must be sufficient to prevent postcontractual reneging by the processor. Thus, the following empirical proposition:

> The vessel equity held by the processor varies inversely with his joint provision of a loan guarantee and a second mortgage on the vessel.

A review of the certificates of vessel ownership, (formal) fishing contracts, and mortgage agreements over the 1972-77 period show that processors did commit assets to the harvesting operation in the three forms suggested by the theory.[2] Moreover, the expected substitution between equity and the joint provision of loan guarantees and second mortgages is clearly evident for purse seiners with at least a 1,000 ton capacity. The 1972

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1 *Supra*, pp. 25-28.

2 These documents were subpoenaed from processors in the FTC industry-wide tuna investigation.

evidence is summarized in Table 4. Although the number of large purse seiners entering the U.S. fleet doubled by 1977, the same pattern of substitution is observable. Table 5 indicates that when the processor held at least a 55 percent interest in the vessel, no additional commitments of assets were made. Guarantees and second mortgages are substituted for larger equity holdings of the processor as the processor's equity declines from 51 percent to 25 percent. Despite the incompleteness of the data for vessels in which the processor held a less than 25 percent ownership interest, the substitution of guarantees and mortgages for equity held by the processor is apparent.

The provision of mortgage guarantees by processors is less common for intermediate size vessels (650-999 ton capacity). Since the hold-up potential varies directly with vessel size, the smaller vessel does not require as large a commitment of processor assets to assure contractual performance. Thus, equity and second mortgages appear to be strong substitutes for mid-size vessels, suggesting that guarantees may be redundant (see Table 6).[1] Another indicator that the hold-up potential is substantially less for the smaller vessel sizes is the greater reliance on formal, long-term fishing contracts. In fact, a long-term contract is associated with each mid-size vessel in which the processor held no equity interest. Not surprisingly, the greatest reliance on long-term contracts is observed among the smallest vessels (under 650 ton capacity). As shown in Table 7, equity held by the processor and long-term contracts are the strong substitutes. The lower hold-up potential for small relative to mid-size vessels is evidenced by the ability of processors to secure exclusive delivery contracts without providing second mortgages.

To summarize, the emerging pattern of processor assets committed to the harvesting operation is well explained by the specialized assets hypothesis. Equity and the joint provision of

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[1] The data for each of the remaining years (1973-77) is not significantly different.

TABLE 4

PROCESSOR ASSETS COMMITTED TO THE U.S.
PURSE-SEINE FLEET, 1972
(Vessels with at Least 1,000 Ton Capacity)

	Equity (%)	Capacity[a] (tons)	Contract (years)	Mortgage (2nd)	Guarantee on Vessel Mortgage
1	100	1,000			
2	60	1,000			
3	60	1,400			
4	60	1,400			
5	60	1,400			✓
6	60	1,100		✓	✓
7	55	1,100			
8	55	1,400			✓
9	55	1,400			✓
10	51	1,000			
11	51	1,100			✓
12	11	1,400[b]			
13	11	1,100[b]			
14	10	1,000[b]	10		
15	0	1,400	10	✓	
16	0	1,400	15	✓	✓
17	0	1,100	10	✓	✓
18	0	1,100	5	✓	✓
19	0	1,100	10	✓	
20	0	1,100	15	✓	✓
21	0	1,100	8	✓	✓
22	0	1,100	15	✓	✓
23	0	1,100	15	✓	✓
24	0	1,100[b]	5		
25	0	1,100[b]	5		
26	0	1,100	15	✓	✓

[a] Rounded to nearest common capacity to preserve the confidentiality of the source documents.

[b] File may be incomplete.

Source: Compiled from certificates of ownership, fishing contracts, and mortgage agreements subpoenaed in FTC industry-wide investigation.

TABLE 5

PROCESSOR ASSETS COMMITTED TO THE U.S. PURSE-SEINE FLEET, 1977
(Vessels with at Least 1,000 Ton Capacity)

	Equity (%)	Capacity[a] (tons)	Contract (years)	Mortgage (2nd)	Guarantee on Vessel Mortgage
1	100	1,400			
2	100	1,200			
3	100	1,200			
4	100	1,200			
5	100	1,100			
6	100	1,100			
7	100	1,100			
8	100	1,100			
9	100	1,100			
10	100	1,100			
11	100	1,100			
12	100	1,100			
13	100	1,000			
14	100	1,000			
15	100	1,000			
16	60	1,000			
17	60	1,000	10		
18	60	1,400	1		
19	55	1,100			
20	51	1,100			✓
21	50	1,200			✓
22	50	1,100			✓
23	50	1,000	1		✓
24	50	1,200			✓
25	50	1,200	1		✓
26	50	1,200	1	✓	✓
27	50	1,200	1	✓	✓
28	50	1,200	1	✓	✓
29	50	1,200	8	✓	✓
30	50	1,100	1	✓	✓
31	50	1,200	1	✓	✓
32	50	1,200	1	1st	
33	41	1,400[b]			
34	33	1,200		✓	✓
35	31	1,400[b]			
36	26	1,400[b]			
37	26	1,400[b]			
38	25	1,100	1	✓	✓
39	25	1,100	1	✓	✓
40	24	1,200[b]	1		
41	24	1,200[b]	1		
42	20	1,200			
43	0	1,400	1	✓	✓
44	0	1,400	1	1st	
45	0	1,400	5	✓	✓
46	0	1,200	1	✓	
47	0	1,100	1	✓	
48	0	1,100	1	✓	✓
49	0	1,100[b]	8		
50	0	1,100[b]	8		
51	0	1,100[b]	8		
52	0	1,100[b]	8		
53	0	1,100[b]	5		
54	0	1,000[b]	1		✓

[a] Rounded to nearest common capacity to preserve the confidentiality of the source documents.

[b] File may be incomplete.

Source: See Table 4.

TABLE 6

PROCESSOR ASSETS COMMITTED TO THE U.S.
PURSE-SEINE FLEET, 1972
(Vessels with 650-999 Ton Capacity)

	Equity (%)	Capacity[a] (tons)	Contract (years)	Mortgage (2nd)	Guarantee on Vessel Mortgage
1	100	900			
2	100	650	12		
3	100	800		✓	✓
4	50	800			
5	50	650			
6	50	800	7		
7	22	900	1		
8	20	900	7		
9	11	900	1		
10	10	800			
11	10	650	1		
12	10	900	1		✓
13	0	900	15		✓
14	0	900	10	1st	
15	0	900	10	1st	
16	0	900	8	✓	✓
17	0	800	5	✓	✓
18	0	800	10	✓	
19	0	800	10	✓	
20	0	650	10	✓	
21	0	650	7	✓	
22	0	650	10	✓	

[a] Rounded to nearest common capacity to preserve the confidentiality of the source documents.

Source: See Table 4.

TABLE 7

PROCESSOR ASSETS COMMITTED TO THE U.S.
PURSE-SEINE FLEET, 1972
(Vessels with Less Than 650 Ton Capacity)

	Equity (%)	Capacity[a] (tons)	Contract (years)	Mortgate (2nd)	Guarantee on Vessel Mortgage
1	100	300			
2	100	200			
3	100	200			
4	100	540			✓
5	80	200			
6	75	400			
7	61	400			
8	40	200			
9	30	200			
10	25	200			
11	25	200			
12	22	400			
13	11	540	1		
14	11	540	1		
15	11	540	1		
16	0	540	7		
17	0	540	7		
18	0	500	5		
19	0	500	5		
20	0	500	5		
21	0	500	5		
22	0	500	5		
23	0	500	5		
24	0	500	5		
25	0	400	5		
26	0	400	5		
27	0	400	5		
28	0	300	5		
29	0	300	3		
30	0	300	5	1st	
31	0	200		✓	

[a] Rounded tonearest common capacity to preserve the confidentiality of the source documents.

Source: See Table 4.

second mortgages and guarantees are strong substitutes for the largest size class of vessels. Unless the processor holds a majority interest in the vessel, all three forms of commitments are generally observed. In the extreme case where no equity is held by the processor, formal, long-term contracts in addition to second mortgages and guarantees are generally extended by the processor.

The most extensive commitments are therefore associated with the greatest hold-up potential of the processor (i.e., the largest vessels). For the class of mid-size vessels, the reduced incentive for post-contractual reneging is associated with the processor no longer being required to provide loan guarantees when less than a majority interest is held. For the smallest class of vessels, the hold-up potential is weakest and, accordingly, the processor is generally able to negotiate exclusive supply contracts without providing guarantees, second mortgages, or majority equity in the vessel.

D. Vessel Unloading Delays

Data comparable to the average unloading times reported for the 1964-66 period is apparently unavailable for the modern purse-seiner period.[1] Outside counsel for ATSA explained that prior to its formation in 1967, the American Tunaboat Association collected the data on off-loading times. When the ATSA assumed the responsibility for negotiating prices for its vessel members, data on vessel unloading times was not consistently reported to or collected by ATSA.

Nonetheless, two sources suggest that the problems of off-loading delays experienced during the bait-boat period were less frequent in the modern purse-seiner period. First, the California Fisheries cited seven instances of major unloading delays (or tie-ups) between 1951 and 1965.[2] Yet, according to industry sources, similar instances are uncommon during the

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1 See Appendix, Table 19, p. 136.

2 See Market News Annual Summary: California Fisheries, U.S. Department of Commerce, NOAA, 1951, 1955-57, 1959, and 1963-64.

1967-80 period. Second, the 1968 Forbes-Stevenson Study finds that:

> "More recent data are either incomplete or unavailable, but conditions have improved measurably since (the) 1965 (experience) and turnaround delays have not been a significant problem over the past two years or so."[1]

Although such evidence is far from conclusive, it does indicate that unloading delays were probably less severe and/or less frequent in the modern period. No evidence was found to the contrary.

E. The New England Fresh Fish Market

The use of exclusive delivery contracts to reduce marketing costs in a competitive environment is not unique to the sale of tuna in the U.S. Another example is provided by the New England fresh fish market.[2] This market is composed of approximately 1,800 individually owned fishing boats which deliver 27 different species to over 400 dockside buyers (located in more than 200 ports between Connecticut and Maine).

In the New England fresh fish market, marketing costs take two forms: (1) estimating the quality of the fish (i.e., sorting and inspection costs analogous to the marketing of tuna) and (2) estimating the market value of the fresh catch. The fisherman is generally less well informed about the current market value of the catch relative to the dockside buyer who supplies restaurants and institutional buyers on a daily basis. On the other hand, the dockside buyer is less knowledgeable than the fisherman about the composition and quality of the catch. The quality of the fish, for example, is affected by the specie, size, degree of

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1 Forbes-Stevenson Study, p. III-17. The off-loading delays for 1965 and 1966 are reported in Table 19, *infra*, p. 136.

2 A five year study of this market was conducted by James A. Wilson and reported in his article entitled, "Adaptation to Uncertainty and Small Numbers Exchange: the New England Fresh Fish Market," The Bell Journal of Economics, XI, No. 2 (Autumn 1980), pp. 491-504. The purpose of this subsection is not to critically evaluate the study but rather to draw on the factual background of how the market operates in order to highlight its apparent similarities with the marketing of tuna in the U.S.

freshness (or the time out of water), storage aboard the vessel, and location of catch.

These marketing costs are reduced by long-term implicit contracts (or "reciprocal agreements") under which the fisherman promises to supply exclusively a dockside buyer. The price is an *ex post* price determined at the time of delivery. It is based on a rough sorting of each catch by specie and size, and it is generally adjusted for prior deliveries given current information about the value of past transactions. Thus, the contract forms the basis for a trustworthy relationship, the value of which lies in the reduction in the (marketing) costs of verifying the estimate of quality and market value provided by the fisherman and dockside buyer, respectively.

Contract enforcement is accomplished through the formation of a mutual reliance relation.[1] That is, both the dockside buyer and the fisherman invest in specialized assets which are potentially subject to appropriation by the other.[2] The dockside buyer develops a reputation or brand name capital in the timely delivery of fresh fish to his clients (e.g., restaurant owners). The fisherman can therefore threaten to delay his deliveries and thereby impose a cost on the dockside buyer. On the other hand, the exclusive delivery contract requires the fisherman to deliver all of his catches to the contracting dockside buyer. The exclusive contract severely limits the ability of the fisherman to seek multiple bids since buyers without a fishing contract do not purchase directly from fishermen. Thus, the fresh catch also represents a specialized asset and is potentially appropriable by the contracting buyer who could threaten not to accept delivery unless the price was reduced.

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1 Oliver E. Williamson, "Credible Commitments: Using Hostages to Support Exchange," *American Economic Review*, LXXXIII, (September 1983), p. 528. The following explanation differs from that provided by Wilson in that the specialized asset created by the exclusive supply contract (i.e., the daily catch) is an important determinant of the no hold-up equilibrium.

2 This is sometimes referred to as a reverse holdup.

Although the payment of "premiums" to the fisherman by the dockside buyer[1] may simply reflect a payment for exceptionally high quality fish or for timely delivery, another possible explanation is that such payments represent a portion of the savings in marketing costs which are being distributed to the fisherman by the dockside buyer.

Given the short shelf life of fresh fish and given that buyers may differ in their evaluation of each catch, it is not surprising that these contractual relationships are not as stable as those found in the U.S. tuna market. Trading among buyers is also common, especially during periods of excess supply. Nevertheless, the underlying incentive to save marketing costs through exclusive dealing arrangements is apparent in both markets.

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1 Wilson, p. 501.

CHAPTER IV

SOME ALTERNATIVE HYPOTHESES

A. Introduction

Some alternative hypotheses to explain the emergence of the four major institutional changes in the modern purse-seiner period are considered in this chapter. The new institutions were (1) joint ownership in the vessel, (2) guarantees on the vessel mortgage, (3) the empty boat system of pricing tuna, and (4) demurrage fees for delays in vessel unloading. The first three alternative hypotheses offer competitive explanations while the fourth hypothesis incorporates the economic focus of the Federal Trade Commission's industry-wide investigation of the possible anticompetitive behavior in the tuna industry.

The competitive hypotheses are presented in order of increasing plausibility. Thus, the major weakness of the first two hypotheses are overcome by the third hypothesis. In this way, we can focus on the major theoretical and empirical issues of the principal alternatives hypothesis while giving some consideration to other alternative explanations. For completeness, a possible anticompetitive hypothesis is presented. The economic theory behind the FTC industry-wide investigation of the tuna industry represents an extremely plausible explanation for the price differential between foreign and domestic tuna delivered to the U.S. processors. Since its empirical implications are testable and since the data gathered during the investigation also provide additional insight into the structure and competitiveness of the industry, the FTC hypothesis is worthy of consideration.

B. The Cost of Capital Hypothesis

One possible alternative hypothesis for the emergence of vessel co-ownership is that the technological change in fishing raised the costs of new vessels beyond the financial capability of most captains. Betweeen 1967 and 1973, construction costs of new purse seiners entering the U.S. tuna fleet averaged $1.9

million.[1] This represented roughly five times the cost of a 200 ton bait boat.[2] If captains could not obtain the necessary vessel financing (or "capital") from conventional lenders, it was quite reasonable, according to this theory, for captains to approach processors as potential investors.[3] Thus, co-ownership of the modern seiners simply represents an efficient means of raising capital.

A major problem with this explanation is that it seems to implicitly assume imperfect capital markets. That is, relatively small amounts of capital can not be obtained despite the expectation that the return on such funds would exceed the market rate of interest.[4] The evidence in support of such market imperfections is weak.[5] What appears to be an imperfection in

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1 Document numbers BE5-1 to BE5-12 subpoenaed in FTC industry-wide tuna investigation. See, also, U.S. Department of Commerce, NOAA, NMFS, Economic Research Laboratory, An Evaluation of the Data on Vessel Construction Costs for Application in Administering the Capital Construction Fund, by Bruno G. Noetzel, Technical Paper Number 1: Financial Assistance, File Manuscript 118 (December 1972), p. 12 and p. 17.

2 One leading processor estimated the cost at $.4 million in 1970 (document number BE5-13). This is equivalent to $.36 million in 1967 dollars, based on the Machinery and Equipment Wholesale Price Index reported in Economic Report of the President, 1976, p. 226. The Collura Report estimates the cost of a 350 ton bait boat at $.35 million in 1973, which is equivalent to $.29 million in 1967 prices; see Collura Report, p. 8.

3 The fivefold increase in the cost of the vessel would require the captain to apply for a loan that was substantially larger than those granted in the past. Bankers may therefore charge the captain a much higher rate of interest because he has not demonstrated the ability to generate profits on such a large scale investment. See James C. Van Horne, Financial Management and Policy, 3rd. ed. (Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1974), pp. 122-24.

Alternatively, there may be real economies in raising capital. Co-ownership with a major processor (corporation) could reduce the transaction costs of securing the additional capital. See F.M. Scherer, Industrial Market Structure and Economic Performance, 2nd. ed. (Chicago: Rand McNally College Publishing Company, 1980), p. 104; and Hans R. Stool, Anne Marie and Thomas B. Walker, Jr., "Small Firms' Access to Public Equity Financing," Vanderbilt University Owen Graduate School of Management Working Paper Number 81-115, (Revised January 1982), pp. 1-76.

4 George J. Stigler, The Theory of Price, 3rd. ed. (New York: The Macmillan Co., 1966), p. 224.

5 See for example, John S. McGee, "Predatory Price Cutting," Journal of Law and Economics, I (October 1958), pp. 137-69; and George J. Stigler, "Imperfections in the Capital Market," Journal of Political Economy, LXXV, No. 3 (June 1967), pp. 287-92.

the capital market may, in fact, be a cost of obtaining information about the future. Banks may therefore charge captains higher interest rates on loans to build and operate a modern purse-seine vessel because it is more costly to determine the rate of return on the new vessel. Such costs are not capital market imperfections.

On the other hand, if perfect capital markets are assumed, there are alternative and superior methods of raising capital. The theory provides no explanation why at least some captains did not prefer to pay a higher bank rate of interest, maintain complete control over their vessels, and thus avoid the incentive problems created by co-ownership. Secondly, given that processors are more knowledgeable about tuna harvesting than banks, there is no explanation why processors did not simply lend to captains at more favorable rates than banks. This would save both processors and captains income. Co-ownership in the vessel does not logically follow.

Another problem with the capital requirements hypothesis is that it can not explain the three other major institutional changes in the modern purse-seiner period. First, it offers no explanation for the demurrage fees paid by processors for vessels not unloaded within 10 days after reaching port. Second, the change to the empty boat (or ATSA) auction whereby the domestic price of tuna is determined before the vessel departs for the fishing grounds also remains unexplained. Third, the theory can not adequately account for the provision of mortgage guarantees by processors without suggesting an alternative hypothesis.

If banks are willing to accept loan guarantees provided by the processor, for example, it is no longer clear why banks initially refused to lend to captains who did not obtain loan guarantees. That is, the theory fails to explain why the bank is unwilling to accept a higher rate of interest in lieu of a loan guarantee. Similarly, if co-ownership sufficiently reduces the size of the bank loan requested and thereby qualifies the captain for some smaller amount of bank financing, it is not clear how the bank determines the maximum size of the loan it will extend on the purchase of a new purse seiner (i.e., the loan value of the vessel). It appears that implicit in the capital requirements hypothesis is a fundamental question about the captain's ability to repay the loan which, in turn, suggests some underlying risk that is perceived by the banks. If true, a risk hypothesis may seem more appropriate.

C. The Price Risk Hypothesis

Another alternative hypothesis is that vessel co-ownership is a means of sharing the risk created by of uncertain prices for domestic tuna. According to this theory, the technological change in fishing raised the size of the vessel investment to a level where the captain was no longer willing to bear all the price risk. The fivefold increase in equity necessary to own a modern seiner would require the captain to invest additional assets in the vessel. Consequently, the diversification of his asset portfolio would be dramatically reduced and he would demand additional compensation. Co-ownership, however, represents a means of sharing the risk. In effect, the captain can sell an equity interest in the vessel to the processor and thereby minimize the increase in his risk burden. The processor, on the other hand, may view co-ownership as a hedge against unexpected increases in the domestic tuna price. That is, an increase in the price of domestic tuna would increase the return to his vessel equity and partially offset the lower return to his tuna processing operation.[1]

To the extent that captains expect tuna prices to show greater variability in the modern purse-seiner period, the price risk perceived by captains would be greater than suggested by the loss of diversification in their asset portfolios. Given that the new vessels are substantially larger and make fewer trips

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[1] The willingness of the processor to avoid such a risk is questionable once it is realized that the processor is typically a subsidiary of a large corporation. Although the stockholder-owners of the corporation may be risk averse, they can more simply diversify their own stock portfolios than constrain the profit maximizing objective of the tuna processing subsidiary. See Goldberg and Erickson, p. 40.

(per season) than the typical bait boat, the pattern of deliveries to each processor is likely to be less continuous than in the bait-boat period. The possibility of several modern seiners arriving in port simultaneously (individually), for example, could result in significantly lower (higher) prices on the next trip. On this basis, captains could rationally expect a greater price variance in the modern purse-seiner period.

The institution of the empty boat auction may be explained, in part, as reducing some price risk.[1] Knowledge of the tuna price immediately prior to a fishing trip does eliminate price uncertainty with respect to that trip. The probability of suffering a loss on any given trip is thereby reduced. Nevertheless, the price uncertainty between subsequent fishing trips or fishing seasons remains. From the point of view of a potential investor, therefore, prices remain relatively uncertain over the life of the vessel, although the degree of downside risk may be somewhat reduced.[2]

The provision of vessel mortgage guarantees by processors may act to offset the price risk as perceived by commercial lenders. Banks may question the ability of the captain to repay a loan on a modern purse-seine vessel.[3] With a loan guarantee by the contracting processor, however, the bank may be satisfied that the loan will be repaid. The difference in expectations

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1 The empty boat auction determines an <u>ex ante</u> price for each vessel before it departs for the fishing grounds. See Appendix, pp. 129-35.

2 Similarly, the optimal long-term labor contract would provide for downward rigid wages rather than fully rigid wages. See Bengt Holmstrom, "Equilibrium Long-Term Labor Contracts," <u>Quarterly Journal of Economics</u>, XCVIII, Supplement (1983), pp. 23-54.

3 This explanation of guarantees assumes that the variance in tuna prices will increase in the modern purse-seiner period. An alternative assumption is that captains have the <u>ability</u> to repay but may not be <u>willing</u> to repay the loan. Processor guarantees are therefore required by banks to enforce the loan contract. See Daniel K. Benjamin, "The Use of Collateral to Enforce Debt Contracts," <u>Economic Inquiry</u>, XVI (July 1978), pp. 333-59. One major weakness with this hypothesis is that it is unable to explain the three other institutions which emerge in the modern period.

between the bank and the processor may reflect differences in information about the harvesting operation and about the ability to predict price changes. If processors are more knowledgeable about the harvesting of tuna than are conventional lenders, they may correctly perceive less price risk.

There are several major problems with the price risk hypothesis. First, the magnitude of the actual price changes during the early years of the modern purse-seiner period (1967-73) do not appear to be substantially greater than in the bait-boat period. Table 8 shows that although the standard deviation of nominal yellowfin prices (column 2) more than doubled, the standard deviation of deflated prices[1] (column 3) did not significantly increase relative to its mean. Moreover, these deflated prices are almost within one standard deviation of their mean. This suggests that the variability of prices, as measured by the standard deviation, is small relative to the mean of the distribution. In addition, the variability exhibited in the nominal price distribution (column 2) can be further reduced by taking two-year moving averages of the original data. The resulting distribution is shown in column 5. The increase in the standard deviation (of nominal prices) relative to its mean which occurs between the two time periods in column 2 is almost eliminated when prices are averaged as indicated in column 5.

The relatively low variability in yellowfin prices raises a second criticism of the price risk hypothesis. If price variability was a principal concern of the captain and the processor, the price provision of the fishing contract could be modified to allow for the averaging of (deflated) prices over a fishing season, over several fishing seasons, or over the length

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1 The Wholesale Price Index for Foodstuffs and Feedstuffs was used to deflate the nominal price series. Economic Report of the President, 1976, p. 227.

TABLE 8

AVERAGE DOMESTIC EX-VESSEL YELLOWFIN TUNA PRICES, 1951-1973[a]
(Dollars per Ton)

Year (1)	Nominal Price (2)	Deflated Price[b] (3)	2-Year Moving Averages Nominal Price (4)	2-Year Moving Averages Deflated Price (5)
1951	310	249		
1952	320	273	315	261
1953	320	305	320	289
1954	344	328	332	316
1955	306	322	325	325
1956	270	290	288	306
1957	266	274	268	282
1958	270	262	268	268
1959	260	270	265	266
1960	250	263	255	267
1961	256	273	253	268
1962	304	318	280	295
1963	264	284	284	301
1964	258	284	261	284
1965	280	288	269	286
1966	366	346	323	317
1967	274	274	320	274
1968	312	308	293	308
1969	324	297	318	297
1970	360	321	342	321
1971	416	364	388	364
1972	440	345	428	345
1973	488	271	464	271
Mean:				
1951-66	290	289	287	289
1967-73	373	312	365	317
Standard Deviation:				
1951-66	34.8	27.1	28.1	20.8
1967-73	77.1	34.8	63.6	23.0
Average Percent Annual Change:				
1951-66	1.8	2.6	.5	1.6
1967-73	5.1	-2.4	5.6	-.1

[a] Monthly weighted average prices.

[b] 1967 = 100.

Source: U.S. Department of Commerce, NOAA, NMFS, Prices Received by Fishermen: 1939-74, prepared by the Statistics and Market News Division Office of Resource Utilization (Washington, D.C.: June 1975), p. 9.

of the contract.[1] Such a pricing provision could allow for some adjustment to the contract price if it deviated more than a given percentage from the current market price. Given that the average change in annual prices was only 2.6 percent in the bait-boat period and -2.4 percent in the modern period (Table 8, column 3), it seems quite plausible that the risk of price variability could be effectively reduced through a contract.

The lack of a substantial increase in price variability during the early years of the modern period (1967-73) raises serious questions about the ability of the theory to explain the empty boat auction and guarantees. To the extent that price variability is necessary to explain vessel co-ownership, the hypothesis is further weakened. Given that the price risk hypothesis is unable to provide an explanation of the institution of demurrage fees, it is reduced to, at best, an ad hoc explanation of co-ownership.

D. The Bankruptcy Risk Hypothesis

In the bait-boat period, the captain generally owned his own boat. Banks extended loans to captains for the purchase and repair of boats and also for trip expenses (or operating capital). As a general rule, however, the captain's equity in the boat was relatively small and often accounted for a major part of the net worth of the captain.[2] On the other hand, fixed costs represented a relatively small proportion of total harvesting costs. If a "bad season" (i.e., a low annual harvest)

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1 Given the relatively systematic movement of prices, it seems quite reasonable to assume that captains and processors acquire and process past and present price information and form expectations about the price of the next catch. For example, it might be expected that the price of the next catch equals some weighted average of current and past prices. See Rodney Maddock and Michael Carter, "A Child's Guide to Rational Expectations," Journal of Economic Literature, XX, No. 1 (March 1982), pp. 39-51. Examples of how rational expectations about the level of interest rates and unemployment can be formed based on systematic movements in the quantity of money are provided in Milton Friedman, "The Role of Monetary Policy," American Economic Review, LVIII, No. 1 (March 1968), pp. 1-17.

2 The owners of older bait boats were often unable to secure loans to purchase new bait boats. In addition, processors sometimes provided the financing necessary to make boat repairs. See Roesti, "Southern California Tuna Canning Industry," p. 303 and p. 82.

was expected to inflict a loss on the captain, it was usually offset by higher expected revenues in the next season. As a result, banks held low expectations of bankruptcy by the captain. That is, the likelihood of a captain suffering a loss (in one or more seasons) large enough to make the captain default on the boat mortgage and forfeit his equity interest in the boat was extremely remote.

The technological change in the method of fishing resulted in modern purse-seine vessels which were substantially more costly than the typical bait boat. The larger carrying capacities of the new seiners, according to this theory, increased the variability of the expected size of the catch. Consequently, revenue was less certain in the purse-seiner period. In addition, the higher construction costs of the new vessels increased fixed costs relative to total harvesting costs.

Most importantly, the theory provides a strong rational for guarantees on vessel mortgages. From the viewpoint of commercial lenders, the greater uncertainty about revenues and the higher ratio of fixed costs to total costs increased the risk of bankruptcy on a purse-seine vessel relative to a bait boat. With high fixed costs, the captain is more likely to default on the vessel mortgage and/or take more chances to find a large catch to meet his costs. The alternative is to go out of business. As a result, the incentive for the captain to risk the vessel and the crew is stronger in the purse-seiner period than in the bait-boat period. One bad season would bankrupt the average captain of a purse seiner since the inability to pay the high fixed costs for one season was unlikely to be reversed by earning short-run profits in a subsequent period. Some lenders, therefore, refused to extend mortgages on purse seiners while others would lend if, and only if, additional collateral could be provided. The provision of mortgage guarantees by processors is a response to the higher collateral requirements on purse-seiner loans.

The provision of guarantees is costly to processors. The existence of the loan agreement implies some attenuation of the processor's rights to the collateral pledged under the guarantee.[1] Further, the processor's ability to secure additional bank financing may be reduced since additional assets offered as collateral may be more costly to the processor. Although captains are willing to offer processors some compensation for providing guarantees, a mechanism must exist to determine the market value of each guarantee.

The determination of the market value of the processor's guarantee is performed by the empty boat system of pricing, the ATSA auction. According to this theory, the ATSA auction determines a price which is discounted relative to the foreign tuna price to reflect the implicit value of the processor's guarantee. In contrast to the posted prices in the bait-boat period, the ATSA price is not a competitive price because changes in the ATSA price are not expected to be systematically related to changes in foreign tuna prices. Since one important determinant of the ATSA price is the value of the processor's guarantee, ATSA price movements may sometimes be more responsive to changes in the value of a processor's guarantee (or opportunity costs) instead of to changes in foreign tuna prices.[2] Thus, the new auction system can be interpreted as a device which allows each contracting processor to discount the domestic tuna price by, at least, his opportunity cost of providing the guarantee.

Demurrage fees are explained by the bankruptcy risk hypothesis as a means of reducing annual catch and revenue variability. Since vessel unloading delays could cost the captain one additional fishing trip within a season, the institution of demurrage

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1 See Benjamin, "The Use of Collateral," pp. 33-35.

2 Since the transferability of assets pledged under the guarantee are significantly limited, changes in factors exogenous to the tuna industry, for example, may change the opportunity costs of assets presently committed under a guarantee. The costs of non-transferability will therefore vary with changes in the (processor's) expected rate of return on assets invested in other industries. Thus, changes in the demand or supply of products which are totally unrelated to tuna (or canned tuna) and changes in the market rate of interest may change the opportunity costs of assets pledged under a tuna vessel guarantee.

fees reduces the probability of unloading delays and of bankruptcy risk.

The major empirical propositions of the bankruptcy risk hypothesis include the following:

(1) (a) The carrying capacity and (b) construction costs of purse seiners increased substantially relative to bait boats;

(2) The ratio of fixed costs to total costs was higher for purse-seine vessels than for bait boats;

(3) In contrast to the bait-boat period, processors extended guarantees on purse-seiner mortgages issued by commercial banks;

(4) The domestic price of tuna is generally below the foreign price;

(5) Vessel unloading delays were more common in the bait-boat period than in the modern purse-seiner period; and

(6) Changes in the ATSA price of tuna are not always responsive to changes in the foreign price.

Propositions (1-b), (2), (3), and (6) serve to differentiate the bankruptcy risk hypothesis from the specialized assets hypothesis. That is, the specialized assets hypothesis does not require a substantial increase in vessel construction costs, an increase in fixed costs relative to total costs, the provision of guarantees instead of co-ownership by processors, or a weaker sensitivity of movements in ATSA prices to movements in foreign tuna prices. The empirical results, however, do not provide a strong basis of support for the theory. Let us consider the evidence.

The strongest evidence in support of the theory is that the construction costs of the new vessels did increase in the modern purse-seiner period. Because of the upward trend in (real) construction costs, the magnitude of the increase varies with the number of years after the technological change. The average cost of the new vessels which entered the fleet in the first four years of the modern period (1967-70), for example, was $1.1 million, or three times the cost of a bait boat ($.36 million). In the seven year period ending in 1973, construction costs averaged $1.9 million or approximately five times the cost of a bait boat.[1] Thus, regardless of the time period selected, the increase in construction costs of a modern seiner appears to be substantial.

The evidence on the fixed-to-total-cost ratio is not strongly supportive of the theory. Based on a U.S. Department of Commerce study,[2] the fixed cost ratio for (650-800 ton) purse seiners entering the fleet in 1969 was 24.80 percent. It was significantly higher than the 15.79 percent ratio for (150 ton) bait boats operating in 1965.[3] The fixed cost ratio for bait boats, however, is biased downward because the 150 ton boats in the sample are smaller and less capital intensive than the modern (200 ton) bait boats which are more representative of the bait-boat fleet. Making the conservative assumption that the fixed cost ratio varies in direct proportion with boat size, some of the bias can be removed. Given that the cost ratio is 15.79 percent for 150 ton boats, the constant of variation is .1053 percent per ton (= 15.79 percent divided by 150 tons). The estimated fixed cost ratio for 200 ton boats is therefore equal to 21.06 percent (= .1053 percent per ton times 200 tons). Consequently, the fixed cost ratio for modern purse seiners

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1 The data source for the cost figures is cited at p. 65, n.1 and n.2, supra.

2 Tuna 1947-72: Basic Economic Indicators, pp. 2-3.

3 The fixed cost ratio for purse seiners is confirmed by the 1974 Flagg sample which reports a ratio of 24.91 percent for vessels in the 700-1099 ton size class. See Virginia Flagg, "Analysis of the Eastern Tropical Pacific Purse Seine Fleet", Appendix II, Table II, p. 25. A 1977 study by Noetzel suggests a slightly lower fixed cost ratio for (780-1100 ton) seiners, 22.37 percent. Although it also reports a significantly lower ratio for bait boats (11.17 percent), the boats in the sample are only 100 ton capacity and therefore not representative of the more efficient (200 ton) bait boats operating in the mid-1960s. See U.S. Department of Commerce, NOAA, NMFS, Revenues, Costs and Return from Vessel Operation in Major U.S. Fisheries, by Bruno G. Noetzel, (Washington, D.C.: February 1977), p. 19.

(24.80 percent) does not appear to be substantially higher than the estimated ratio for 200 ton bait boats (21.06 percent).[1]

The bankruptcy risk hypothesis relies heavily on the use of guarantees to eliminate the increase in default risk due to the technological change. The processor assets committed to the harvesting stage, however, are much more diversified than suggested by the theory. Purse seiners with at least a 1000 ton carrying capacity, for example, receive various combinations of guarantees, equity ownership, second mortgages, and long-term fishing contracts from processors. By 1972, joint ownership appears as a strong substitute for guarantees in several cases. (See Appendix, Table 17, p. 131.) When processors do not hold equity in the vessel, long-term contracts and second mortgages are provided by processors in addition to guarantees. By 1977, guarantees, second mortgages, and equity are jointly provided by the processor. (See Appendix, Table 18, p. 132.) It seems that the processor can minimize his equity share in the vessel by providing both a second mortgage and a guarantee. Yet, co-ownership is the general rule. Why guarantees are insufficient to eliminate the risk of default is unexplained by the theory.

The role of guarantees is even more questionable for medium size vessels (650-999 ton capacity). Table 9 shows that processors seldom provide guarantees to this class of seiners. Rather, second mortgages plus long-term fishing contracts substitute for

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[1] A related issue is whether the increase in the fixed cost ratio (from 21.06 percent to 24.80 percent) is sufficient to substantially increase bankruptcy risk. If the fixed-to-total-cost ratio in tuna harvesting (at the beginning of the modern purse-seiner period) was higher than in most other industries, one could conclude that the ratio is high. Unfortunately, such a benchmark cost ratio is not readily available.

Limited evidence suggests that the fixed cost ratio in tuna harvesting is not unusually high. In crab harvesting, for example, the larger vessels (200 tons) operating in the Northeast Pacific show a fixed cost ratio of 23.02 percent. (Noetzel, p. 20.) F. M. Scherer indicates that the railroad, rayon manufacturing, cement, steel, heavy electrical equipment, and the petroleum extraction and refinning industries are extremely high fixed cost industries. Yet, it is unlikely that the producers of such products receive loan guarantees from their customers as a prerequisite to securing loans from commercial banks. See F. M. Scherer, Industrial Market Structure and Economic Performance, (Chicago: Rand McNally College Publishing Company, 1970), pp. 196-97.

TABLE 9

PROCESSOR ASSETS COMMITTED TO THE
U.S. PURSE-SEINE FLEET, 1972
(Vessels with 650-999 Ton Capacity)

	Capacity[a] (tons)	Equity (%)	Contract (years)	Mortgage (2nd)	Guarantee on Vessel Mortgage
1	900	10	1		✓
2	900	22	1		
3	900	11	1		
4	900	20	7		
5	900	100			
6	800	100		✓	✓
7	800	50	7		
8	800	10			
9	800	50			
10	650	10	1		
11	650	50			
12	650	100	12		
13	900		15		✓
14	900		10	1st	
15	900		10	1st	
16	900		8	✓	✓
17	800		5	✓	✓
18	800		10	✓	
19	800		10	✓	
20	650		10	✓	
21	650		7	✓	
22	650		10	✓	

[a] Capacity rounded to nearest common capacity to preserve the confidentiality of the source documents.

Source: Compiled from certificates of ownership, fishing contracts, and mortgage agreements subpoenaed in FTC industry-wide tuna investigation.

equity held by the processor. No guarantees are extended by processors to smaller size vessels. (See Appendix, Table 16, p. 130.) The inability to explain why processors choose different methods or forms of committing assets to the purse-seiner fleet is a major deficiency of the bankruptcy risk hypothesis.[1]

Vessel co-ownership is not a major element of the analysis. Co-ownership may be viewed as a means of shifting some of the risk from the bank to the processor. The theory does not explain under what conditions processors prefer to hold equity rather than to guarantee the vessel mortgage. Co-ownership appears to be the more costly alternative, yet the evidence suggests that it is often provided in lieu of additional commitments of processor assets.

A fundamental problem with this hypothesis is that it ignores the contractual relationships between captains and processors that were established during the bait-boat period. Consequently, the technogical change is interpreted to impact the enforcement of debt contracts on modern vessels without consideration of how pre-existing contractural arrangements may also be affected. Granted, the technological change did increase construction costs and the carrying capacity of the modern seiners. The increased carrying capacity, however, also changed the incentive to contact in the modern period. Therefore, the emergence of new institutions in the modern purse-seiner period may be a response to changes in contract costs other than the

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1 In the event of bankruptcy, the need for funds is crucial to any reorganization plan. In this respect, a loan guarantee seems to represent a source of much more liquity or "fresh capital" (to meet current liabilities) than co-ownership, second mortgages, or long-term fishing contracts. See Philip B. Nelson, Corporations in Crisis: Behavioral Observations for Bankruptcy Policy (New York: Praeger Publishers, 1981), pp. 108-14.

More fundamentally, a guarantee from a leading processor such as Ralston Purina or H.J. Heinz will dramatically increase the loan value of the collateral. Given the relatively small size of the firm (i.e., the captain), the bank's concern is less likely to be with the viability of the firm than with the market value of the collateral. In this sense, the role of loan guarantees is fundamental to the bankruptcy risk hypothesis. See John Argenti, Corporate Collapse: The Causes and Symptoms (New York: John Wiley and Sons, 1976), Chapter 9, especially p. 172.

contract costs of obtaining bank finance. Yet, this possibility is totally ignored by the bankruptcy risk hypothesis.

E. An Anticompetitive Hypothesis: Monopsony

The possibility of anticompetitive behavior in the tuna industry was considered by the Federal Trade Commission (file no. 751-0016). From 1974 to 1980 the FTC investigated various possible anticompetitive arrangements at both the fishing and processing levels. The economic focus of the investigation centered on the price gap between the relatively higher foreign tuna price and the lower domestic price. The principal anticompetitive hypothesis was that domestic processors possessed some monopsony power and that the price gap was evidence of the existence and magnitude of that power.

Throughout the bait-boat period, concentration at the processing level was relatively high. In 1952, for example, three major canners (Van Camp, French Sardine Co., and Westgate-Sun Harbor) accounted for 70-75 percent of total canned tuna production in the Southern California area.[1] A few large processors were alleged to control domestic tuna canning and harvesting.[2] Nevertheless, little potential for monopsonistic power of processors over the U.S. bait-boat fleet existed because a bait-boat owner could always fish for nontuna or sell his boat to a foreign

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1 FTC Report, p. 10.

2 FTC Report, p. 8 and p. 17.

user if his expected rate of return on the boat fell below the competitive rate.[1]

The technological change in the method of fishing reduced the alternative uses and users of modern purse-seine vessels and increased the potential for monopsonistic behavior by processors. The value of a new seiner in harvesting fish other than tuna was extremely low since few, if any, fish can be commercially landed in sufficient quantities to justify the use of a mechanized net retrieval system. Nonfishing uses of a modern seiner might include the transshipment of freshly caught fish. Yet, the relatively small capacity and/or high operating costs of the seiner render it vastly inferior to commercial freighter or reefer vessels.[2]

The technological change also eliminated foreigners as alternative users of the purse-seine vessels. These modern vessels were most efficiently utilized in the high seas. Foreign fishermen who harvested tuna along coastal waters were therefore eliminated as alternative users of the new vessels. Another disadvantage of purse seining is that it can not be effectively employed in the clear waters of the Central and Western Pacific where tuna tend to feed in the deeper depths of the ocean. The nets can not descend to a sufficient depth to reach the tuna, the

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1 If processors cooperate to act monopsonistically in the purchase of tuna, the returns to assets specialized in tuna harvesting (i.e., industry-specific assets) are potentially appropriable. Since the tuna vessel may represent an industry-specific asset, the ability of processors to behave monopsonistically will depend, in part, on the existence of alternative users and uses of the tuna vessel.

Although bait boats were somewhat specialized in light-meat fishing, they possessed a number of alternative uses. Bait boats could be used to harvest albacore, sardines, mackeral and some other types of fish. (DOI Survey, pp. 191-98.) Nonfishing uses included the use as a mothership operation such as a salmon-freezer ship: a mothership operation in which the tuna vessel would serve as a floating storage dock and base for 8-10 salmon catcher boats and their crews. In 1952, for example, the estimated conversion costs were $4,000 - $6,000, or roughly 1 percent of construction costs. (DOI Survey, pp. 227-36.)

In addition, all foreign harvesters used a hook-and-line technology to fish tuna and, therefore, some alternative users of U.S. bait boats existed. Bait boats were readily adaptable to independent, long-line catcher boats which could be used, for example, by the Japanese to harvest tuna in the Central Pacific. (DOI Survey, p. 166 and p. 28.)

2 Based on a general discussion of tuna vessels with a 500 ton carrying capacity. See DOI Survey, pp. 234-35.

nets frighten the tuna away in these extremely clear waters, and the nets are unable to catch tuna at an acceptable rate since tuna tend not to school or the schools are too large, too fastmoving, or too erratic in behavior.[1] Purse seining also damages the physical appearance of the tuna.[2] Although broken, smashed, or bruised tuna is quite suitable for purposes of canning, it must be sold at a substantial discount in foreign markets, which were primarily fresh fish markets.

Thus, the technological change together with the price gap and several other structural features of the industry in the modern purse-seiner period suggested the possibility that the industry may not be highly competitive. Between 1973 and 1978, four firm concentration at the processing level averaged 79 percent with the top two processors controlling over 60 percent of canned tuna sales.[3] No entry at the processing stage occurred during this period despite major additions of plants and vessels by the top three processors. A new vessel entrant attempted to arbitrage the gap between foreign and domestic tuna prices by acquiring several existing vessels and contracting with domestic processors. Since these vessels were under contract to supply specific processors, however, no competiting processor would bid for the entrant's tuna. Further, the processor holding the

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1 DOI Survey, p. 28; and Douglas Souter and Gordon Broadhead, "Purse-Seine Fishing for Yellowfin and Skipjack in the Southern Waters of the Central and Eastern Pacific: Jeanette C Charter," Pacific Tuna Development Foundation Technical Bulletin Number 2 (September 1978), pp. 4-21.

2 Forbes-Stevenson Study, p. III-15; and Souter and Broadhead, "Purse-Seine Fishing in the Central and Western Pacific," pp. 19-20.

3 Based, in part, on "SAMI" (Selling Area Marketing, Inc.) statistical reports. SAMI reports warehouse withdrawals of products shipped to retail grocery stores. Since SAMI only reports aggregate private label sales, an estimate of private label sales by company was made and factored into the SAMI market share data.

supply contract would only offer the entrant the lower domestic price. Ultimately, the entrant exited the U.S. market.[1]

The explanation of the four major institutional changes in the purse-seiner period provided by the monopsony hypothesis is similar to the explanation given by the specialized assets hypothesis. This should not be surprising since the possibility that the captain will not be paid the competitive price for his catch exists under both hypotheses. What distinguishes the theories is the motivation of the processor to reduce the tuna price below the competitive price. In the specialized assets hypothesis, the technological change increases the processor's incentive to renege on the price under the exclusive delivery contract with the captain. His incentive to do so does not require the cooperation of competing processors. What is required is that the tuna deliveries be specialized to the contracting processor (i.e., firm-specific assets). In the monopsony hypothesis, however, each major processor has an incentive to restrict the output of the U.S. fleet and to pay his contract vessels a price below the price paid for comparable foreign deliveries. The ability of each processor to behave in this monopsonistic manner depends on the willingness of other processors to behave likewise. Thus, the theory requires that the major processors cooperate and jointly act as a monopsonist vis-a-vis the U.S. tuna fleet. In this case, the returns to industry-specific assets are potentially appropriable.

There are three basic conditions necessary to show <u>substantial</u> monopsony power. In the procurment of tuna, these conditions (or empirical propositions) take the following form:

(1) a <u>significant</u> price differential between the effective domestic and foreign prices of raw tuna,

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[1] Since the processor typically commits additional assets to the vessel, the fishing contract names both the captain and the vessel as one party. The entrant apparently purchased the vessels without being aware that the contracts would remain in force. Competing processors were, therefore, unwilling to bid for the tuna deliveries because such behavior would encourage the breaking of all contracts, reduce the incentive for processors to commit assets to the vessel, and ultimately raise contracting and marketing costs in general.

(2) excessive profits earned by processors,[1] and

(3) substantial barriers to entry at the harvester and processor levels.

In terms of the monopsony model, domestic processors are expected to enjoy excess profits if they have managed to establish a significant price differential between domestic and foreign tuna prices by exercising monopsony power over domestic harvesters. Since we have no evidence that suggests the processors enjoy substantial monopoly power in the sale of canned tuna,[2] any excess profit that they earn must necessarily be explained by the monopsonistically low prices they pay for domestic tuna. Hence, excess profits cannot exist without a price "gap" between the domestic and foreign prices; that is, condition (2) requires condition (1). Furthermore, since excess profits cannot be sustained without substantial entry barriers, condition (3) must also be present. Since the absence of any one condition implies that the two other conditions will be short-lived, all three conditions must prevail. Let us now consider the evidence.

The strongest evidence in support of the monopsony theory is the existence of a price differential between the relatively higher foreign price and the lower domestic price. The observed price differential for skipjack tuna was estimated at $135/ton (= $622/ton-$487/ton) over the 1972-77 period. After adjusting the domestic price for the nonprice price payments and bonuses received by U.S. captains and the foreign price for the additional in-plant processing costs, the adjusted (or effective)

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1 Strictly speaking, excessive profits is not a necessary condition for monopsony power. Nevertheless, excessive profits is likely to be associated with substantial monopsony power. A legal case based, in part, on the economic theory of monopsony would also be much harder to present without evidence of excessive profits at the processor level.

2 Despite the high concentration in the processing sector, there is a wide range of substitutes for canned tuna. Consequently, processor control over one product--within a group of close substitutes--is unlikely to result in substantial monopoly power in the pricing of canned tuna.

price differential is reduced to $78/ton.[1] The adjusted price differential is admittedly a rough approximation and may reflect errors and omissions in measurement as well as the possibility of monopsony pricing.

There is no evidence that processors earned excessive profits during the 1972-77 period. In fact, the evidence is counter-indicative of condition (2). A leading CPA firm was hired by the FTC to perform a profit study based on the tuna division's consolidated financial statements.[2] Their report showed that the rate of return on assets (before taxes and interest are deducted) was well below the 15 percent benchmark exhibited by a group of several hundred firms.[3] Furthermore, this conclusion seems to be true for all five major processors.

Although there is some evidence that single-stage entry into the tuna industry at either the harvesting or processing stage may be extremely costly, any cost disadvantage can be avoided by

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1 This evidence, including the estimation of nonprice payments and bonuses, has been reviewed in detail in the Appendix, pp. 137-41. The FTC estimate of $78/ton is not comparable to the $62/ton price differential estimated in Chapter III (pp. 42-43). The $78/ton estimate includes all foreign deliveries to the U.S. whereas the $62/ton estimate is limited to deliveries from Japanese ports. Since several nations operate in waters closer to the U.S. than Japan (e.g., Canada, Mexico, Peru, and Ecuador), a price based on all foreign deliveries is likely to be less than a price based on deliveries from Japanese ports, *ceteris paribus*. Thus, the price differential computed from all foreign deliveries to the U.S. will be less than the corresponding U.S.-Japan price differential. Expressing the $78/ton differential (for the 1972-77 period) in 1967 prices yields $44/ton which is substantially below the $62/ton differential based on foreign deliveries from Japanese ports.

2 Most of the nontuna activities reported in the financial data were removed by the FTC accountants. What remained accounted for less than 10 percent of the earnings used in the accountant's profit study (document numbers BE5-14 to BE5-21).

3 The benchmark rate of return was taken from company data available on the FTC COMPUSTAT tapes.

two-stage entry.[1] The apparent unavailability of bank financing for tuna investments may discourage some potential entrants. Interviews and investigational hearings with four major banks suggest that additional bank finance to expand the U.S. purse-seiner fleet is extremely unlikely.[2] Since the nonprice payments seem to vary with each vessel and since they are often not documented, banks are reluctant to adjust the ASTA price to reflect the expected annual per ton value of these nonprice payments. Consequently, applicants for tuna vessel loans are often unable to show sufficient income to repay the loan and are ruled to exceed bank credit-risk guidelines. Given our estimate of nonprice payments of $57/ton and given that a typical 1,100 ton vessel is expected to harvest roughly 2,000 tons per season, the gross income of the vessel would be underestimated by $114,000 per year. Further, banks appear reluctant to lend to new processors who do not have a source of domestic tuna.

A processor entrant may find it difficult to obtain a domestic source of supply. Existing processors owned or controlled about 80 percent of the domestic fleet during the 1972-77 period. The remaining vessels, except for six, were under contract to one of the major processors. If an entrant was unable to supply roughly half of its tuna requirements with the lower-priced domestic tuna (as existing processors are able to do), the relatively greater reliance on higher-priced foreign tuna would place the entrant at a competitive disadvantage.

It appears, then, that the present structure of the industry may well force an entrant to incur the cost of entering at both the harvesting and processing levels simultaneously. The two-stage entry would ensure a source of domestic supply for the processing plant and an outlet for the harvesting vessels.

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1 The discussion of barriers to entry summarizes a November 9, 1979 memorandum from FTC economists Edward C. Gallick and Charles Needy to William A. Arbitman, Regional Director of the San Francisco FTC Office, which reviews the economic theory and evidence of the investigation and recommends that no complaint be issued (41 pages).

2 Document numbers BE5-24 to BE5-27.

Unfortunately, the artificially low ATSA price may preclude the possibility of bank financing.[1] Even if financing were available, the necessity of entering the industry at two levels instead of one would increase the costs of entry.

Such entry costs, however, do not seem substantial enough to sustain large excess profits. Although the problems of obtaining bank financing and the additional costs of vertical integration could well discourage hundreds of potential entrants, it is hard to explain why a firm like General Mills would be unable to resolve such problems--if large excess profits were really there for the taking.

To summarize, after a massive undertaking to collect and evaluate the subpoena returns and to consider the profit and cost studies of a consulting CPA firm, the evidence for each of the three indicators of monopsony power was found to be weak or lacking and the combined evidence was considered insufficient to support a case against the major domestic processors. More specifically, the available evidence was insufficient with respect to condition (1), actually counter-indicative of condition (2), and lacking with regard to condition (3).[2] Thus, the evidence suggests that processors did not exercise substantial monopsony power (during the 1972-77 period). Furthermore, the lack of evidence in support of significant entry barriers and excess profits at the processing level indicates that the social harm attributable to monopoly power (in the sale of canned tuna) is minimal. Thus, despite its structural characteristics, the industry could not be shown to behave monopsonistically. The industry-wide investigation was closed in May 1980.

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[1] According to this theory, the ATSA price is not only an artificially depressed price because it is below the competitive price, it is also misleadingly low because it ignores the nonprice benefits received by harvesters.

[2] Consequently, regardless of the costs that are associated with government intervention, there was not sufficient economic evidence to indicate any potential social benefits from such intervention.

F. Summary

With the exception of the bankruptcy risk hypothesis, none of the alternative hypotheses are able to explain the emergence of the new institutions (in the modern purse-seiner period) as well as the specialized assets hypothesis. A deficiency with the capital requirements and price risk hypotheses is that they are unable to provide a consistent explanation for each of the new institutions. Consequently, they are easily dismissed.

Although the bankruptcy risk hypothesis is less subject to this criticism, the hypothesis ignores the motivation for captains and processors to contract in the bait-boat period. Its view of the emerging institutions is therefore too simplistic: it is unable to differentiate sufficiently the processor's motivation to hold equity interests from his motivation to provide guarantees and second mortgages on the new vessels. Nevertheless, the bankruptcy risk hypothesis represents one of the more plausible alternatives to the specialized assets hypothesis. Therefore, empirical propositions were identified which could distinguish between the two theories. The evidence, however, was not strongly supportive of the bankruptcy risk hypothesis.

The anticompetitive hypothesis that was evaluated is a monopsony explanation of the new institutions. What initially motivated this inquiry was the observation that the price processors paid for domestic tuna was typically below the (delivered) price paid for comparable foreign tuna. This observed price gap suggested the possibility of monoposony power among processors in the procurement of domestic tuna. However, an FTC investigation based on the economic theory of monopsony was unable to discover sufficient evidence (during the 1972-77 period) to support a complaint against the processors. The industry-wide investigation was therefore closed in May 1980.

CHAPTER V

CONCLUSIONS AND POLICY IMPLICATIONS

A. Conclusions

The structure of the U.S. tuna industry may not appear to be conducive to competition. The four leading processors control the total supply of U.S. landed tuna through exclusive supply contracts (many of which are relatively long term) and through financial ties (such as vessel equity, second mortgages, and loan guarantees). Since the price of domestic tuna is substantially below the price of comparable tuna ordered from trading companies located in foreign ports, a potential entrant at the processing level may be discouraged if his primary source of tuna is a trading company. Perhaps this is why concentration is high (80 percent) at the processing stage. Further, the inability of a U.S. harvester entrant to successfully arbitrage the price differential (by offering U.S. landed tuna to processors at a price above the U.S. contract price but below the foreign price) may suggest that the harvesting stage is not highly competitive.

Despite the high market concentration at the processing stage, an FTC industry-wide tuna investigation found no evidence of substantial anticompetitive behavior (during the 1972-77 period). In particular, profits at the harvesting or processing level were not excessive and entry by vertically integrated firms (i.e., a harvester-processor) was open. Accordingly, the assumption that processors and captains behave competitively was deemed appropriate.

Moreover, once it is realized that some of the costs of marketing tuna for raw consumption can be avoided when tuna is used for canning, the same industry structure can be interpreted as an efficient response to specific marketing costs. Major consideration was given to the widespread use of exclusive dealing arrangements in the marketing of U.S. landed tuna. Exclusive supply contracts permit the processor to minimize his pre-inspection search and to offer the captain an average price for the entire catch despite any quality differences among units of the catch. The exclusive nature of the contract prevents the captain from selling the below-average quality units to one processor and then approaching another processor with the remainder of the catch. In this way, exclusive dealing contracts reduce competitive over-search activities which take the form of (1) lengthy pre-inspection search, (2) excessive sorting, and (3) duplicative inspections of each catch. It is the potential saving of these marketing costs that provides the motivation for domestic captains and processors to negotiate exclusive dealing arrangements.

The evidence suggests that the saving in marketing costs under the U.S. marketing scheme is substantial. A comparison was made between the relatively higher tuna prices determined in Japanese ports (through competitive auctions) and the lower prices determined in the U.S. (under exclusive dealing arrangements). After adjusting the Japanese and U.S. price data to make them comparable to total delivered prices in the U.S., the real (trend-adjusted) price differential is estimated at $62/ST for round, frozen skipjack. This represents a 15 percent reduction from the Japanese price and a potential saving of approximately $4.7 million per year over the 1964-80 period.[1] Although the annual saving in the marketing of U.S. landed yellowfin can not be directly measured, it is certain to exceed the $62/ST estimate for skipjack.[2] Given that the annual catch of U.S. yellowfin averaged 120,307 ST[3] and using the $62/ST estimated saving for skipjack the annual saving in the marketing of yellowfin under exclusive supply arrangements is at least $7.5 million. Thus,

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1 Based on an average U.S. skipjack catch of 75,431 short tons per year as reported in the Yearbook of Fishery Statistics, selected annual volumes, Food and Agricultural Organization of the United Nations.

2 The evidence indicates that Japanese landed yellowfin are more finely sorted (prior to auction) than skipjack. For example, yellowfin are substantially larger than skipjack and are therefore sorted into more size categories than skipjack. On the other hand, U.S. landings of yellowfin and skipjack are both delivered as run-of-the-catch (i.e., with little, or no, sorting prior to delivery).

3 Yearbook of Fishery Statistics.

the combined saving in the marketing of U.S. landed skipjack and yellowfin is roughly estimated in excess of $12.2 million a year.

A potential cost saving of this magnitude provides a strong incentive to maintain exclusive supply agreements. As long as the present value of the marketing cost saving exceeds the present value of postcontractual reneging, processors and captains have an incentive to maintain exclusive dealing arrangements.[1] Further, the estimated $12.2 million annual saving in marketing costs appears quite large relative to the costs of contract enforcement.

The financial commitments of the processor to the modern tuna vessels can therefore be interpreted as an efficient means of reducing the costs of enforcing exclusive dealing contracts and thereby avoiding the need for an alternative marketing arrangement. An exclusive supply contract, by its very nature, transforms the contracted tuna harvests into specialized assets. Consequently, the processor has an incentive to capture some of the payments (or quasi-rents) of the catch. Although this malincentive cost was relatively small throughout most of the bait-boat period, the technological change in the method of harvesting substantially increased the gain and reduced the cost of such opportunistic behavior.[2] It is therefore no coincidence that new institutions (such as the financial commitments of the processor to the vessel, the pricing of tuna prior to the vessel's departure to the fishing grounds, and the levying of demurrage fees on a processor who failed to unload a tuna delivery within 10 days) emerged at the time of the introduction of modern purse seiners into the U.S. tuna fleet. Thus, the reason why a processor made financial commitments to a modern purse-seine vessel was to minimize the enforcement costs of exclusive dealing contracts with the captain and thereby preserve

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1 The conditions for a no hold-up equilibrium are discussed <u>supra</u>, at pp. 19-21.

2 See pp. 24-25.

the saving in marketing costs made possible through the U.S. marketing scheme.

The exit of two processors in the modern purse-seiner period (Del Monte and Westgate) and the consequent increase in concentration can also be explained as a response to the increased costs of enforcing exclusive dealing contracts after the technological change in the method of harvesting. Since the technological change increased the opportunity for the processor to hold up the captain, a contracting processor must be offered a greater share of the saving in marketing costs (under exclusive dealing arrangements) or perceive a higher cost of violating the contract. Otherwise, the contractual performance of the processor is uncertain. Given the annual marketing cost saving of the U.S. tuna fleet, one method of increasing contract enforcement among processors is to reduce the number of processors and to increase the number of vessel deliveries (or "repeat sales") received by the remaining processors. In this way, the costs of postcontractual reneging by a processor will be higher[1] and, in equilibrium, will equal the higher present value of his opportunistic behavior in the modern purse-seiner period. This may explain why the Del Monte and Westgate tuna canning facilities were acquired by existing processors.

To summarize, several major structural and behavioral features of the U.S. tuna industry have been shown to be fundamentally related to the efficient marketing of tuna for canned consumption. The following industry characteristics were considered:

(1) the exclusive dealing contracts between processors and captains for the delivery of U.S. landed tuna,

(2) the price differential between the relatively higher Japanese price and the lower U.S. price,

(3) the complex pattern of financial commitments (such as equity, second mortgages, and loan guarantees) provided by U.S. processors to the modern purse-seiner fleet,

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[1] Recall that all captains delivering to a processor are assumed to costlessly communicate among one another; see supra, p. 21.

(4) the contract (or ATSA) system of pricing U.S. landed tuna, and

(5) the institution of demurrage fees for vessel unloading delays.

Each of the above factors has been explained as a competitive response to the costs of marketing tuna in the U.S. Moreover, the efficiency of the U.S. marketing system appears to be substantial: an estimated savings in excess of $12.2 million in marketing costs annually.

Regardless of how these cost savings are initially distributed among processors, captains, and consumers, the ultimate effect of the U.S. marketing scheme is to increase the quantity of U.S. landed tuna and the quantity of tuna canned by U.S. processors. Given competitive markets, any excess profits created by the U.S. marketing scheme will be competed away over the long run. Granted, some captains may earn short-run profits for initially recognizing the cost-saving value of exclusive dealing arrangements and for negotiating above-competitive shares of the marketing cost saving. Nevertheless, to the extent that exclusive dealing reduces (marginal) harvesting costs, competition among captains will result in an increase in the supply of U.S. landed tuna available to U.S. processors. Similarly, any excess payments for contractual performance or excess share of the marketing cost saving initially received by some processors will be competed away by less greedy rival processors. Competition among processors in the sale of canned tuna is expected to increase the supply and to reduce the price of canned tuna available for U.S. consumption.

It is on this basis that the study concludes that exclusive dealing arrangements promote competition in the marketing of tuna for canned consumption. In fact, the structure of the harvesting stage of production is, in large part, a result of the cooperative efforts of domestic processors and captains to minimize the costs of marketing tuna in the U.S.

B. Policy Implications

A theory of contracts was applied in the tuna industry to demonstrate how contractual arrangements between buyers and sellers of tuna can be efficient in reducing marketing costs. The application of these principles and concepts, however, is not limited to the tuna industry. In fact, the explanatory power of the contracting approach can be seen in its widespread applicability in other industries. Most importantly, vertical arrangements between buyers and sellers which are often presumed to be anticompetitive may sometimes be shown to be competitive or efficient responses when viewed as a solution to a contracting problem or cost.

Consider how the application or extension of the tuna industry analysis suggests an efficiency motivation for the following contractual provisions.

1. Exclusive dealing

Exclusive dealing arrangements are sometimes considered to impede competition by restricting the ability of the buyer to deal in the commodities of a competing seller. From a legal perspective, exclusive dealing may be considered a violation of the antitrust laws because it is alleged to foreclose access to the market and thereby lessen competition, or otherwise be an unfair method of competition. In the tuna industry, exclusive dealing involves an output contract whereby the seller (captain) is restricted from delivering to a competing buyer (processor). Thus, the tuna analysis extends the concept of an exclusive deal to output contracts and, at the same time, provides a strong business justification of the practice.

A marketing cooperative, for example, that contracts with growers for the exclusive supply of their harvests is, during the contract period, foreclosing raw input from rival marketing organizations. From a contracting viewpoint, however, exclusive dealing arrangements permit the output of varying quality to be sorted into relatively homogeneous groups and valued on the basis of the average quality of the units within each group. The exclusive supply contract prevents the seller from withholding the above-average quality units and thereby makes it possible to value the average quality output rather than to value each unit of output separately. Thus, exclusive dealing contracts may serve to reduce sorting, inspection, and negotiation (i.e., marketing costs).

As a related example, Sunkist Growers, Inc. is a grower-cooperative marketing organization that has marketed the majority of the industry's citrus fruit since at least the 1930s. Fresh grade fruit (such as oranges and lemons) is sorted into a limited number of grades and growers are paid according to the number of units harvested per grade, despite any remaining within-grade quality differences. The packinghouse and its affiliated growers, however, must exclusively contract with Sunkist to market all the fruit of the affiliated growers throughout the contract year. Additional grading, inspection, and negotiation costs are thereby avoided by exclusively dealing on the basis of the average within-grade quality over the contract period. Similarly in the marketing of rough diamonds, the Central Selling Organization of the DeBeers group pays independent mine owners on the basis of the number of stones provided per classification, the variance in value within each category notwithstanding. The exclusive supply requirement (in addition to controlling total supply) prevents the producer from searching out the higher valued stones within each category for sale in the open market.[1]

2. Vertical integration

Partial vertical integration or joint ownership may represent a means of enforcing contractual performance. When one party to a contract is required to invest in specialized assets, the other contracting party may have an incentive to renege on the contract in an attempt to appropriate the return to such assets. One method of reducing this incentive is to require that both contracting parties jointly own the specialized assets. In order to reap the benefits of the contract, a firm operating

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1 See Kenney and Klein, pp. 500-02.

at one stage of production may therefore be required to partially integrate into another stage of production.

In the tuna industry, the processors' equity interests in vessels serve to reduce the hold-up incentive of the processor created by the exclusive fishing contracts. This same motivation for joint ownership may exist in any industry where specialized assets are found. In the automobile industry, for example, assemblers tend to own all the specialized tools and equipment employed by their suppliers in fabricating parts for an automobile company.[1] Another example is provided by the plastics and turbine industries where assemblers are observed to own the specialized molds and patterns utilized by their suppliers.[2] In addition, the specialized nature of oil-producing properties and refineries relative to the pipeline typically results in the joint ownership of the pipeline by the oil-field owners and the refinery owners.[3]

As assets become more highly specialized, the incentive to behave opportunistically increases. At one extreme, the costs of contracting may become so high that it is cheaper to fully integrate into another stage of production. Thus, one seldom recognized incentive for vertical integration is that it represents a substitute for contractual arrangements when assets are extremely specialized. The inability of General Motors to effectively contract with Fisher Body for automobile bodies, for

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1 See Kirk Monteverde and David Teece, "Appropriable Rents and Quasi-Vertical Integration," Journal of Law and Economics, XXV (October 1982), pp. 321-29; and Robert W. Crandall, "Vertical Integration and the Market for Repair Parts in the United States Automobile Industry," Journal of Industrial Economics, XVI (July 1968), pp. 212-34.

2 Kenneth Dunmore, "An Empirical Assessment of Intermediate Goods Contracting Theory," (unpublished Ph.D. dissertation, University of Pennsylvania, 1980), p. 127.

3 This example is analyzed in Klein, Crawford, and Alchian, "Vertical Integration," pp. 310-11.

example, resulted in the vertical acquisition of Fisher by GM in 1926.[1]

3. Nonprice payments

The provision of nonprice payments to induce exclusive dealing contracts may appear questionable on competitive grounds. Manufacturers of hard ice cream, for example, were charged by the FTC with attempting to induce exclusive dealing contracts with retailers of ice cream products. In the matters of Carnation Company, et al., nine manufacturers were charged with unlawfully lessening competition by providing refrigeration cabinets, service for the equipment, and loans to some of its retailers to maintain an exclusive dealing relationship.[2]

Another basis for challenging nonprice payments may be that such payments increase the information and capital requirements of a supplier and thereby unnecessarily discourage entry. Providing maintenance or repair on special tools and equipment utilized by an upstream supplier, for instance, may be thought to increase the information and capital requirements of the independent downstream supplier and thereby discourage entry at the latter stage of production.

An efficiency motivation for nonprice payments, however, is suggested by the tuna industry. When the captain and the processor share in the ownership of the vessel, the captain no longer bears the full cost of improper or inadequate maintenance and operation of the vessel. Thus, the captain has an incentive to overuse the vessel in order to increase his income from the sale of larger annual catches. As a result, the processor may offer to pay for (and possibly arrange for) the repair and maintenance of the vessel, unloading crews at dockside, and insurance on the vessel. Such nonprice payments limit the ability of the captain to overuse (or to abuse) the vessel. The

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1 Ibid., pp. 308-10.

2 60 F.T.C. 1274 (1962). The complaints were dismissed because of insufficient evidence that the practices were illegal or "opposed to good morals."

additional costs incurred by the processor will be reflected in a lower contract price for the catch. The full price of the catch, however, must include the value of any nonprice payments.

In general, when contracting partners share in the ownership of a capital asset, the absentee owner may offer nonprice payments in order to minimize the opportunity of the operating owner to depreciate excessively the value of the asset. Since joint ownership of capital assets is common in the automobile manufacturing and petroleum industries, it would not be suprising if nonprice payments were observed and associated with seemingly low contract prices in these markets.

The ice cream example suggests an extension of our analysis. When the owner of a capital asset does not operate or monitor the use of the asset, provisions in the contract may serve to protect the value of that asset. It appears that the ice cream manufacturers were concerned that retailers not depreciate their reputations for providing a consistent quality of hard ice cream. Retailers may be able to increase their earnings by not strictly maintaining the refrigeration standards agreed to in the contract. The full costs in the depreciation of the reputation or brand-name capital of the manufacturer will therefore not be borne by the retailer. Under these circumstances, it may be more efficient for the manufacturer to provide and maintain the refrigeration system in the retailer's establishment.

The application of the same principles to franchising agreements should be clear. Many of the contractual provisions that appear to be "unfair" are simply an attempt by the franchisor to protect the value or brand name of his franchise.[1] The initial capital requirements and termination clauses in these agreements are designed to minimize the ability of the franchisee to supply a lower quality than agreed to in the franchise agreement.

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1 See, Klein, "Unfair Contractual Arrangements," pp. 356-361.

4. Financial assistance

In 1940, the Federal Trade Commission ruled on an exclusive dealing arrangement which was similar to that in the tuna industry. In the matter of Darling & Company involved a purchaser of raw material (e.g., unprocessed hides and calfskins) from butchers.[1] Darling & Company, the purchaser, was found to have offered loans (among other things) to butchers who agreed to exclusively deal with Darling. The Commission found such action to constitute an unfair method of competition. As in the provision of nonprice payments, one objection to the granting of financial assistance is that it may encourage exclusive dealing. In the Carnation case, the Commission warned the ice cream manufacturers that the granting of loans to retailers who entered into exclusive dealing contracts would be closely scrutinized.[2]

The study of exclusive dealing in the tuna industry finds that the provision of financial assistance by processors to captains is a reasonable business practice. Exclusive dealing makes it possible to value units of a product or service, at the average price, despite the variation in the quality of individual units. Thus, an efficiency motivation for exclusive dealing is that (under certain conditions) it reduces sorting, inspection, and negotiation costs. One cost of exclusive dealing, however, is that it creates a specialized asset in the form of the product or service delivered under the exclusive contract. Consequently, some provisions in the contract may serve to minimize the incentive of a contracting partner to behave opportunistically. The provision of financial assistance by one party to the contract limits his ability to reduce the value of the product (i.e., the return to the specialized asset) because the reduction in revenues may render the borrower unable to meet his obligations under the financial assistance agreement. Thus, the

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1 30 F.T.C. 739 (1940).

2 60 F.T.C. 1274 at 1620-21.

commitment of financial assets by a tuna processor in the form of first and second mortgages and loan guarantees (on vessels owned by his contracting captains) is believed to reduce the hold-up potential of the processor under each exclusive delivery contract for tuna. The same rationale is likely to apply in the Darling and Carnation cases or in similar situations where exclusive dealing creates a highly specialized asset.

5. Regulation

Can the contractual provisions that have evolved in the private sector be applied in the public sector? Regulation may be thought of as an implicit contract between the regulated firm(s) and a regulatory authority who acts as the agent for the individual customers in its jurisdiction. Viewed in this way, a re-examination of the regulation of natural monopolies (such as natural gas, electricity, and telephone service), for example, may suggest a possible efficiency motivation for some regulation.[1] When the expected benefits to customers from increased durability and specialization of capital assets exceed the expected costs to customers from being unable to shift to a superior technology, regulation may be appropriate in granting a firm a conditional right to serve a jurisdiction for a given period of time. The right to serve might be conditional upon the provider meeting its contractual commitments. In this way, the regulator would have the authority to suspend (or revoke) the right to serve if the provider was found in violation of a contractual provision. Thus, governmental administered contracts may increase economic efficiency when the contracting costs of individual customers arranging for service are especially high.[2]

Furthermore, if regulation of entry rights is viewed as forward-looking, it may be seen to foster innovation rather than

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[1] Victor P. Goldberg, "Regulation and Administered Contracts," Bell Journal of Economics, VII, No. 2 (Autumn 1976), pp. 426-48.

[2] Ronald Coase, "The Problem of Social Cost," Journal of Law and Economics, III (October 1960), pp. 17-18.

to retard it.[1] That is, a superior technology may be available in the present only if the provider can be assured that his right to serve a jurisdiction is sufficiently long to expect a normal rate of return on the specialized assets (such as underground gas lines) necessary to produce the service at a lower cost. Otherwise, customers could opportunistically threaten to induce a competing technology (or supplier) into the jurisdiction unless the current provider reduced the price of his service.

Caution then must be taken not to focus on the static misallocation problems of regulation without considering whether such costs are worth bearing. The question at issue is the proper assignment of property rights. When transaction costs are positive, the initial legal assignment of rights matters. In this case, the proper procedure is to compare the total social product yielded by these alternative arrangements.[2]

How insightful this contracting approach to regulation will be remains unclear. Although entry restrictions are certainly unwarranted in many instances, other regulations which appear inefficient or a response to special interests may be seen as efficient responses to contracting costs. Taxi regulation in the form of administered uniform pricing (i.e., average pricing) and in the form of the requirement to haul all customers (i.e., a form of exclusive dealing) are examples of possibly efficiency-based regulation. Little work has been done in this area. Studies of specific examples of regulation which identify the terms of the implicit contract with the regulator and attempt to differentiate alternative motives for regulation would represent the type of research necessary to shed light on this question.

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1 Goldberg, (op. cit.), pp. 434-35.

2 Coase, (op. cit.), p. 34.

APPENDIX A

STRUCTURE OF THE TUNA INDUSTRY

A. Raw Tuna

Tunas are one of the world's most valuable fishing resources. There are five principal species of tuna that are landed in the U.S. to be processed and sold as canned tuna. They are as follows:

1. albacore,
2. skipjack,
3. yellowfin,
4. bluefin, and
5. little tuna.

Albacore has a lighter meat and a less fishy taste than other species, and is the only one which, when canned, is permitted (by the Food and Drug Administration) to be labelled "white-meat" tuna. While individual fish may reach a maximum of 80 pounds, those taken commercially usually average from 12 to 25 pounds.[1]

All other tuna species are termed light-meat tuna. Tuna harvested by the U.S. largely consists of skipjack and yellowfin.[2] Since they both are largely in the same areas, there is, to a large extent, a single fishery for the two species. Skipjack is the smallest of the tuna species averaging between 4 and 20 pounds. In contrast, yellowfin may reach weights from 300 to 400 pounds. Average size commercial landings of yellowfin range from 30 to 40 pounds. California regulations prohibit the

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1 U.S. Department of the Interior, Fish and Wildlife Service, Survey of the Domestic Tuna Industry, (Washington, D.C.: May 1953), 7, (hereinafter referred to as the DOI Survey).

2 It should be noted that in Japan, skipjack is not considered a tuna. Nonetheless, price and quantity data on Japanese skipjack landings are available. See, for example, Government of Japan, Ministry of Agriculture, Forestry and Fisheries, Statistics and Information Department, Monthly Statistics of Agriculture, Forestry and Fisheries, (January 1983), p. 47.

harvesting of skipjack under 4 pounds and yellowfin under 7.5 pounds.[1]

Tunas are widely distributed in temperate, semi-tropical, and tropical waters throughout the world, primarily between 30° N and 30° S.[2] In the Eastern Pacific, (which is a primary fishery for U.S. harvesters) yellowfin is found from southern California to Peru, while skipjack ranges from southern California to central Chile.[3] These tropical species are also available in the northern and southern ranges of the Atlantic and Indian Oceans. Albacore and bluefin are found in the cooler waters of the North Pacific and North Atlantic. The Japanese harvest yellowfin and skipjack in the coastal waters of the Western Pacific along the Japanese islands, yellowfin and albacore in the Central Pacific, and yellowfin in the Southwest Pacific.[4]

B. The Hook and Line Technology

Until the early 1960s, the principal method of fishing utilized by U.S. harvesters was live-bait, hook and line gear.[5] Its success is due to the habits of skipjack, yellowfin, and other species which feed in schools on sardines, anchovies, and other small fish. On locating a school of tuna, fishermen would throw live bait overboard to attract tuna to the boat. When the

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1 These legal limits remained in force from 1950 through 1976 for yellowfin and from 1950 through 1974 for skipjack. Fish and Game Code, State of California. See also Inter-American Tropical Tuna Commission, Organization, Functions, and Achievements of the Inter-American Tropical Tuna Commission, Special Report No. 1, by William H. Bayliff, (La Jolla, California: 1975), p. 28.

2 For a more detailed discussion of the availability of tunas, see Dale G. Broderick, "An Industry Study: The Tuna Fishery," (unpublished Ph.D. dissertation, Columbia University, 1973), pp. 94-100, (hereinafter referred to as the Broderick Study).

3 U.S. Department of Interior, Report of the Secretary of Interior to the President and the Congress on Fresh or Frozen Yellowfin, Skipjack, and Bigeye Tuna, (Washington, D.C.: May 1958), 25, (hereinafter referred to as the DOI Report); and Broderick Study, p. 226.

4 DOI Survey, p. 113; and DOI Report, pp. 15-18.

5 The evidence is neatly summarized in the Broderick Study, Table 7: The Size and Capacity of the U.S. Tuna Fleet, p. 343; and Table 10: Estimated Landings from Eastern Tropical Pacific by California-based Baitboats and Purse-Seiners, p. 348.

tuna rush in to take the bait, feathered lures concealing barbless hooks were cast into the water using pole and line. In their desire to capture the bait, the tuna would take the lures. The fishermen standing on platforms or racks would then heave the tuna over the rail of the boat and onto the deck. Boats equipped with fishing racks outside the rails of the boat and with live-bait tanks were referred to as bait boats or tuna clippers.[1]

Another hook and line method is longline fishing. An extremely long line with baited hooks (attached at intervals) is lowered to a predetermined depth in the ocean and allowed to float with the currents for a number of hours. The length of the set may stretch out over 50 miles and reach a depth of 600 feet. This method is commonly used by the Japanese. It is most effective in areas (such as the Central Pacific) where tuna do not run in dense schools and tend to feed at considerable depths.[2]

Until the early 1960s, bait boats comprised the backbone of the U.S. tuna fleet. These large crafts ranged from 65 to 150 feet in length.[3] Table 10 shows the size distribution of the bait-boat fleet. Between 1947 and 1966, the weighted average carrying capacity of the fleet was 200 tons. The large boats were equipped with mechanical refrigeration and generally fished all year around. Until, at least, the early 1950's, bait boats were the most expensive commercial fishing craft in the world. The 1952 DOI Survey estimated the cost of a new bait boat as high as $500,000.[4] Catches made by bait boats unloaded to the docks of domestic processors and, more recently, to cold storage

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1 DOI Survey, p. 27 and p. 30.

2 Broderick Study, pp. 101-02; and DOI Survey, p. 28.

3 DOI Survey, p. 30.

4 DOI Survey, p. 31 and p. 234; and Emil L. deGraeve and James H. Forbes, Jr., The Impact of Imports on the United States Tuna Industry (Stanford Research Institute Project 1191, Prepared for the Tuna Industry Committee, Stanford, California, December 1954), p. 18, (hereinafter referred to as the Tuna Imports Study). The carrying capacity of these boats, however, was more than twice the industry average.

TABLE 10

SIZE AND CAPACITY OF BAIT-BOAT FLEET
(In Numbers and Tons)

Year	0-50 tons	51-100 tons	101-200 tons	201-300 tons	301-400 tons	Over 400 tons	Total No.	Capacity Tons
1932	18	14	38	11			81	9,950
1933	16	10	33	11			70	8,850
1934	11	8	30	12			61	8,375
1935	19	6	31	15	1		72	9,675
1936	22	7	32	13	1		75	9,475
1937	26	11	35	13	4		89	11,375
1938	25	14	38	12	4	2	95	12,775
1939	22	18	36	15	4	2	97	13,450
1940	26	18	38	14	6	2	104	14,300
1941	26	19	33	15	6	2	101	13,875
1942	35	21	31	10	3	2	102	11,650
1943	26	26	25	3			80	7,100
1944	23	27	29	7			86	8,700
1945	30	35	37	13	3	1	119	13,725
1946	27	36	44	20	16	6	149	23,575
1947	23	38	53	37	19	6	176	30,275
1948	21	33	62	58	18	6	198	36,100
1949	19	28	64	67	20	7	205	39,425
1950	14	26	69	70	18	7	204	39,950
1951	15	25	77	78	20	10	225	45,300
1952	9	19	67	77	22	8	202	42,650
1953	7	17	57	74	23	12	190	42,550
1954	11	13	55	68	24	11	182	40,400
1955	12	12	45	63	28	11	172	39,000
1956	12	11	43	66	32	11	175	40,775
1957	11	11	43	60	35	10	170	39,800
1958	12	8	35	56	36	11	158	38,250
1959	13	8	31	46	33	10	141	33,625
1960	10	7	21	11	17	3	69	14,125
1961	11	4	17	1	11		44	7,725
1962	13	4	12	1	6		36	4,775
1963	13	4	11	2			30	2,775
1964	16	5	11	2	1		35	3,275
1965	21	7	12	3	1		44	3,950
1966	25	9	11	5	2		52	4,900
1967	21	9	10	4	2		46	4,400
1968	23	11	10	4	2		50	4,600
1969	17	12	9	4	1		43	4,025
1970	21	11	7	4	1		44	3,750
1971	24	12	8	4			48	3,770

Note: Approximate capacity calculated by multiplying mean value of each class size by number of vessels in class, i.e., 25, 75, 150, 250, 350. Capacity of the largest vessel size obtained by multiplying number of vessels by 500.

Primary Source: 1932-1954

Bell M. Snimada and Milner B. Schaefer, "A Study of Changes in Fishing Effort, Abundance, and Yield for Yellowfin and Skipjack Tuna in the Eastern Tropical Pacific," Bulletin Inter-American Tropical Tuna Commission, Vol. 1, No. 7 (1956), p. 406.

TABLE 10--Continued

1947-1957

Richard Marasco, The Organization of the California Tuna Industry: An Economic Analysis of the Relations Between Market Performance and Conservation in the Fisheries, Working Paper No. 45, U.S. Department of Interior, Bureau of Commercial Fisheries, Division of Economic Research, March 1970, p. 29.

1957-1971

Inter-American Tropical Tuna Commission, Annual Reports of the Inter-American Tropical Tuna Commission, 1957-1971.

Secondary
Source: Broderick Study, Appendix Table 8, p.344.

facilities or foreign ports and then transshipped to domestic processors.

C. The Early Purse-Seine Technology

The purse-seine method involves the use of a long wall of netting to encircle a school of tuna so that it can be brailed (lifted) aboard the boat. The netting is suspended from floats and held vertical by weights. The early purse-seine vessels employed relatively large nets measuring approximately 1800 feet long and 180 feet deep.[1] Upon sighting a surface school of fish, a small motor boat (or skiff) with one end of the net attached acts as an anchor while the purse seiner circles the school, paying out the net at the same time. When the seiner completely encircles the tuna, a purse line (running through metal rings attached to the lower edge of the net) is drawn in until the bottom edge of the net is closed and the tuna are trapped. Portions of the net are taken aboard the boat until the fish are drawn near the side of the boat. The tuna are then scooped out of the purse seine with power operated dip nets.[2]

Until the late 1950s, fishermen who experimented with nets as an alternative to the labor-intensive hook-and-line method encountered two major problems.[3] First, the material available to construct the nets severely limited its size and durability. Second, the weight of the net in the water together with the weight of the catch presented a difficult task of retrieving the net after each set. Consequently, bait boats were considered to be substantially more efficient than the early purse seiners.

Most of these seiners were extremely adaptable and did not fish tuna on a full-time basis. Many of the early seiners also

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1 DOI Survey, p. 28.

2 For a more detailed account of the purse-seining process, see Michael K. Orbach, Hunters, Seamen and Entrepreneurs: The Tuna Seinermen of San Diego, (Berkeley and Los Angeles: University of California Press, 1977), Chapter II; and Richard L. McNeely, "Purse Seine Revolution in Tuna Fishing," Pacific Fisherman, LIX (June 1961), pp. 27-58.

3 Orbach, p. 4.

fished for pilchard (sardines), salmon, and herring.[1] These boats could also employ the hook-and-line, live-bait technology to fish skipjack, yellowfin, and albacore.[2]

Throughout the early history of the U.S. tuna industry, purse seiners were generally smaller than bait boats. Although these boats ranged from 90 to 120 feet in length,[3] their carrying capacities were significantly smaller than bait boats. Table 11 shows that until 1960, the size distribution of purse seiners was dominated by the number of boats in the smaller size classes of 51-100 tons and 101-200 tons. In contrast, the number of bait boats in the larger size classes of 201-300 tons and 301-400 tons was significant. (See Table 10.) The dominance of the bait-boat fleet is even more apparent when measured in terms of capacity rather than in numbers. Until 1960, bait boats accounted for over 75 percent of total capacity of the entire U.S. tuna fleet (Table 12).

D. Contracting in the Bait-Boat Period (1946-1966)

During the bait-boat period, captains tended to wholly own their boats. Processors[4] preferred not to hold a financial interest in the fleet. A 1952 Survey by the American Tunaboat Association, for example, found that only 10 of 159 bait boats registered with the U.S. Customs (San Diego) had mortgages held by processors.[5] In the few instances where a processor might wholly own a boat, it was usually a case where the captain defaulted on a loan extended by the processor and the processor

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1 DOI Survey, p. 30 and pp. 182-93; and J.W. Adams and Robert Hamlisch, Report on Monopolistic Controls in the Tuna Industry, Bureau of Industrial Economics, FTC, (December 31, 1952), pp. 19-26, (hereinafter referred to as the FTC Report).

2 DOI Survey , pp. 182-83.

3 FTC Report, p. 14; and Tuna Imports Study, p. 18.

4 Recall that the term processors refers to U.S. processors. For emphasis, the term domestic or U.S. processors is sometimes used. All other processors will be referred to explicitly (e.g., foreign, European, or Japanese processors).

5 U.S. Congress, Senate Committee on Finance, Tuna Imports Hearings, before the Committee on Finance, Senate, on H.R. 5693, 82d Cong., 2d. session, 1952, 399 (hereinafter referred to as the Tuna Hearings).

TABLE 11

SIZE AND CAPACITY OF PURSE-SEINE FLEET
(In Numbers and Tons)

Year	0-50 tons	51-100 tons	101-200 tons	201-300 tons	301-400 tons	Over 400 tons	Total No.	Capacity Tons
1932	5	22	1				28	1,925
1933	4	21	1				26	1,825
1934		7	2				9	825
1935		7	2				9	825
1936		18	2				20	1,650
1937		23	8	1			32	3,175
1938		6	1				7	600
1939		17	3				20	1,725
1940	3	50	21	1			75	7,225
1941	2	33	16	1			52	5,175
1942	1	15	5				21	1,900
1943	2	27	7				36	3,125
1944	2	23	9				34	3,125
1945	5	28	17				50	4,775
1946	3	37	27				67	6,900
1947	3	43	38				84	9,000
1948		41	45	2	1		89	10,675
1949		35	40	3	1		79	9,725
1950	1	28	35	3			67	8,125
1951		32	43	3			78	9,600
1952		23	39	2			64	8,075
1953		23	39	2			64	8,075
1954		19	49	1			69	9,025
1955		14	47	2			63	8,600
1956		12	50	2			64	8,900
1957		9	39	2			50	7,025
1958		8	34	2			44	6,200
1959	1	5	39	6	2		53	8,450
1960		4	43	23	12		82	16,700
1961		3	48	34	22	7	114	27,125
1962			33	37	24	9	103	27,100
1963			32	33	30	16	111	31,550
1964			29	34	28	20	111	34,650
1965			27	35	28	21	111	35,200
1966			22	32	28	20	102	35,100
1967			22	30	25	24	101	36,350
1968			22	28	24	30	104	39,700
1969			19	28	23	44	114	49,093
1970			17	24	21	56	118	56,184
1971			15	19	17	71	122	69,790

Note: Approximate capacity calculated by multiplying mean value of each class size by number of vessels in class, i.e., 25, 75, 150, 250, 350. Capacity of the largest vessel size obtained by multiplying number of vessels by 500 tons in 1961-63, by 600 tons in 1964-65, and by 700 tons in 1966-68. Actual capacity used for 1969-1971 per Inter-American Tropical Tuna Commission Annual Reports, 1969-70.

Table 11--Continued

Primary Source: <u>1932-1954</u>

See Table 1, p. 407.

<u>1947-1957</u>

See Table 1, p. 30.

<u>1957-1971</u>

See Table 1.

Secondary Source: Broderick Study, Appendix Table 9, p. 346.

TABLE 12

SIZE AND CAPACITY OF UNITED STATES TUNA FLEET
(In Numbers and Tons)

Year	Bait Boats[a] No.	Bait Boats[a] Capacity	Purse Seiners[b] No.	Purse Seiners[b] Capacity	Approximate Total No.	Approximate Total Capacity
1932	81	9,950	28	1,925	109	11,875
1933	70	8,850	26	1,825	96	10,675
1934	61	8,375	9	825	70	9,200
1935	72	9,675	9	825	81	10,500
1936	75	9,475	20	1,650	95	11,125
1937	89	11,375	32	3,175	121	14,550
1938	95	12,775	7	600	102	13,375
1939	97	13,450	20	1,725	117	15,175
1940	104	14,300	75	7,225	179	21,525
1941	101	13,875	52	5,175	153	19,050
1942	102	11,650	21	1,900	123	13,550
1943	80	7,100	36	3,125	116	10,225
1944	86	8,700	34	3,125	120	11,825
1945	119	13,725	50	4,775	169	18,500
1946	149	23,575	67	6,900	216	30,475
1947	176	30,275	84	9,000	260	39,275
1948	198	36,100	89	10,675	287	46,775
1949	205	39,425	79	9,725	284	49,150
1950	204	39,950	67	8,125	271	48,075
1951	225	45,300	78	9,600	303	54,900
1952	202	42,650	64	8,075	266	50,725
1953	190	42,550	64	8,075	254	50,625
1954	182	40,400	69	9,025	251	49,425
1955	172	39,000	63	8,600	235	47,600
1956	175	40,775	64	8,900	239	49,675
1957	170	39,800	50	7,025	220	46,825
1958	158	38,250	44	6,200	202	44,450
1959	141	33,625	53	8,450	194	42,075
1960	69	14,125	82	16,700	151	30,825
1961	44	7,725	114	27,125	158	34,850
1962	36	4,775	103	27,100	139	31,875
1963	30	2,775	111	31,550	141	34,325
1964	35	3,275	111	34,650	146	37,925
1965	44	3,950	111	35,200	155	39,150
1966	52	4,900	102	35,100	154	40,000
1967	46	4,400	101	36,350	147	40,750
1968	50	4,600	104	39,700	154	44,300
1969	43	4,025	114	49,093	157	53,118
1970	44	3,750	118	56,184	162	59,934
1971	48	3,770	122	69,790	170	73,560

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[a] Source: Table 10.

[b] Source: Table 11.

repossessed the boat until another buyer could be found.[1] Such evidence supports the claim that processors preferred to deal with independent fishermen who assumed all the responsibilities of the harvesting operation.

Captains[2] contracted with processors for delivery of the tuna catch. The major provisions of the contract included the following:

(a) exclusive delivery of the catch to the processor,

(b) determination of the tuna price,

(c) limits, if any, on the quantity delivered, and

(d) services to be provided by the processor such as financial, accounting, and legal.[3]

The reason for exclusive dealing contracts, according to some industry sources, was to assure an adequate and dependable supply of tuna for efficient operation of the canneries.[4] From the viewpoint of the captain, these contracts assure that the catch will be purchased regardless of supply conditions, provide additional security to banks on vessel mortgages, and create an incentive for processors to extend ancillary services to captains (e.g., financial, accounting, and legal services). A joint benefit to captains and processors is that search and negotiation costs are reduced. An alternative explanation for exclusive dealing which considers the costs of marketing tuna is developed in Chapter II of the text.

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1 FTC Report, pp. 16-19.

2 The term captain refers to the vessel owner and operator unless otherwise indicated.

3 FTC Report, pp. 19-26; Forbes, Stevenson and Co., Feasibility Study: A Tuna Transshipment Plant in San Diego and Other Ocean-Oriented Facilities (Project No. 07-6-09121, Items I and II Prepared for the Economic Development Administration, U.S. Department of Commerce, Washington, D.C.: June 25, 1968), Chapter IV, pp. 4-5, (hereinafter referred to as the Forbes-Stevenson Study); and Richard J. Marasco, "The Organization of the California Tuna Industry: An Economic Analysis of the Relations between Market Performance and Conservation in the Fisheries" (unpublished Ph.D. dissertation, University of California at Berkeley, 1970), Chapter II, pp. 12-17, (hereinafter referred to as the Marasco Study).

4 Tuna Hearings, p. 351 and p. 353.

The bait-boat fleet has tried a number of alternative approaches to determine the (contract) price of tuna. From, at least, 1950 to 1954, prices were established on an annual basis by negotiations between processors and boatowners or the boatowner's cooperative, the American Tunaboat Association.[1] Processors were free to contract with any captain at the predetermined price. From the viewpoint of the captain, the weaknesses with this system were twofold. First, imported tuna was sometimes available at prices below the U.S. contract price (for domestic tuna) and processors would attempt to renegotiate the contract price. Thus, the contract price was not certain. Second, purchase volume was not fixed. During times of relatively cheap imports, processors could limit the production of the domestic fleet by issuing "tie-up" orders,[2] prolonging annual contract negotiations, or delaying vessel unloadings. In effect, the pricing in this early period was equivalent to an (ex post) posted price, payable to captains upon their return to port. In fact, annual price negotiations were abandoned in 1955 and 1956 in favor of posted prices set by the individual processors.[3] Table 13 shows that the monthly movements in prices are similar under the annual price system (1954) and the posted price system (1955 and 1956). The downward trend in annual prices reflects the increasing reliance on deliveries of foreign tuna by domestic processors.[4]

An auction system of determining the ex post price of tuna ready for immediate processing was first attempted in 1957.[5] The auction was conducted by the American Tunaboat Association (ATA).

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1 A good summary is provided by the DOI Report, pp. 43-48; and the Forbes-Stevenson Study, Chapter IV, pp. 1-6. The ATA was formed in 1923 (Marasco Study, p. 12).

2 A tie-up order is a contractual right to detain a boat in port and prohibit it from unloading and/or returning to the fishing grounds.

3 Forbes-Stevenson Study, p. IV-2.

4 The pattern of imported deliveries of tuna to the U.S. is shown in Table 14, p. 116, infra.

5 Forbes-Stevenson Study, p. IV-2; and DOI Report, Table 6, NOTE, p. 46.

TABLE 13

UNITED STATES: MONTHLY EX-VESSEL PRICE QUOTATIONS FOR TUNA AT CALIFORNIA PORTS, 1954-57
(In Dollars per Short Ton)

Year	Month	Yellowfin	Skipjack	Albacore	Bluefin
1954:	January	350	310	410	340
	February	350	310	-	340
	March	350	310	-	340
	April	350	310	-	340
	May	350	310	-	340
	June	350	310	-	340
	July	350	310	410	340
	August	350	310	410	350
	September	330	290	410	330
	October	330	290	410	330
	November	330	290	410	330
	December	330	290	410	330
1955:	January	310	270	-	310
	February	310	270	-	310
	March	310	270	-	310
	April	310	270	-	310
	May	310	270	-	310
	June	310	270	-	310
	July	310	270	350	300
	August	310	270	310	300
	September	310	270	330	260
	October	310	270	330	260
	November	270	230	330	260
	December	270	230	330	260
1956:	January	270	230	330	260
	February	270	230	330	260
	March	270	230	-	280
	April	270	230	-	280
	May	270	230	-	280
	June	270	230	-	280
	July	270	230	350	280
	August	270	230	375	260
	September	270	230	375	260
	October	270	230	300	260
	November	270	230	300	260
	December	270	230	300	260
1957:	January	270	230	300	260
	February	270	230	-	260
	March	270	230	-	260
	April	270	230	-	260
	May	270	230	-	260
	June	270	230	-	260
	July	270	230	300	260
	August	270[a]	230[a]	280	240
	September[b]	230	190	280	240
	October[b]	254	224	300	240
	November[b]	264	220	300	260
	December[b]	262	224	300	-

continued

TABLE 13--Continued

[a] On August 22, the yellowfin price dropped to $230 per ton, and the skipjack price to $190. About 8,500 tons of yellowfin and skipjack were sold at these prices.

[b] Based on preliminary reports.

Note: Quoted prices are not weighted average, but represent prices at which most of the landings were sold.

Source: Market News Service, Bureau of Commerical Fisheries.

Cargoes were auctioned on a boat-by-boat basis, in the order in which they returned to port. Since most boats were under supply contracts and ruled ineligible to participate, the auction was unable to influence the market price of domestic tuna. As in the earlier period, posted prices prevailed, and the downward trend in prices continued throughout 1957 (Table 13). The auction was suspended in 1959 and posted prices were in effect for the next four years. The auction was reestablished in 1963 but proved ineffective. In 1967, for example, only 17 percent of the fleet's annual harvest was sold through the auction.[1] With the contracted boats excluded from the auction, there remained too few boats to lend strength or market relevance to the procedure.

The attempt by captains to secure minimum volume guarantees and to avoid unloading delays appears to be a response to competition by foreign harvesters to supply U.S. processors. Tuna imports became significant in the early 1950s and by 1960 accounted for nearly 50 percent of the total tuna requirements of processors (See Table 14). Unloading delays and tie-up orders were particularly significant between 1955-57 and 1964-66.[2] Table 14 shows, however, that both of these periods are associated with a substantial increase in foreign tuna deliveries to U.S. processors.[3] Moreover, the unloading delays in the latter period primarily affected boats selling through the auction.[4] These boats had no supply contracts with processors and therefore were likely to receive a lower unloading priority than contract boats. Nevertheless, from the perspective of the captain, such delays sometimes appeared arbitrary and tended to increase three types of harvesting costs: (1) the costs of "rejects" (i.e., fish unsuitable for canning), (2) refrigeration

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1 Forbes-Stevenson Study, p. IV-2.

2 DOI Report, pp. 44-47 and p. 52; Forbes-Stevenson Study, p. III-17; and U.S. Department of Interior, Fish and Wildlife Service, Market News Service, California Fisheries, by V. J. Samson, annual issues: 1951-71.

3 See also, Marasco Study, pp. 13-14; and Tuna Imports Study, p. 8.

4 Forbes-Stevenson Study, Table 11, Chapter III, p. 18.

TABLE 14

U.S. AND IMPORTED DELIVERIES OF TUNA
(Thousands of Pounds, Round Weight)

Year	U.S. Deliveries			Imported Deliveries	
	Total U.S.	So. Calif. (%)	Puerto Rico (%)	Total Imported	Imported / U.S.+Imported (%)
1950	391,454	-----	-----	43,538	10.0
1951	318,912	-----	-----	59,126	15.6
1952	322,694	-----	-----	65,511	16.9
1953	302,804	-----	-----	96,120	24.1
1954	346,419	98.2	1.8	127,830	27.0
1955	291,873	96.7	3.3	164,022	36.0
1956	355,202	96.6	3.4	152,941	30.1
1957	323,284	94.3	5.7	189,153	36.9
1958	344,884	95.2	4.8	263,171	43.3
1959	307,999	92.8	7.2	312,154	50.3
1960	319,113	93.4	6.6	304,927	48.9
1961	356,854	91.3	8.7	269,165	43.0
1962	340,947	91.6	8.4	364,528	51.7
1963	358,644	89.7	10.3	320,910	47.2
1964	354,222	86.3	13.7	379,242	51.7
1965	373,471	85.4	14.6	378,637	50.3
1966	333,870	80.6	19.4	449,840	57.4
1967	426,250	77.0	23.0	387,142	47.6
1968	401,528	73.2	26.8	422,108	51.2
1969	421,152	77.1	22.9	414,450	49.6
1970	478,346	82.3	17.7	464,585	49.3
1971	474,916	72.9	27.1	506,602	51.6
1972	534,700	72.4	27.6	764,784	58.8
1973	519,063	66.8	33.2	816,739	61.1
1974	557,231	70.4	29.6	838,889	60.1
1975	568,249	68.8	31.2	516,735	47.6
1976	659,852	73.6	26.4	641,121	49.3
1977	468,895	73.6	26.4	670,072	58.8

Source: U.S. Department of Commerce, NOAA, NMFS, Fisheries of the United States, annual volumes.

costs at a rate of $150/day for a 200 ton bait boat, and (3) the opportunity cost of additional days away from the fishing grounds (for some seasons, this cost is estimated at the market value of one full trip).[1]

The length of the fishing contract has varied over the bait-boat period. In the early 1950's, contracts were generally for 3 to 5 years.[2] More recently, bait-boat contracts appear to be longer in term (e.g., 7-10 years). Most contracts also provide that the contract will remain in force either for (1) as long as the captain of the boat remains indebted to the processor or (2) a specific number of years, whichever is longer.[3]

E. Domestic Tuna Processors

A tuna processing facility or cannery generally consists of fish receiving and unloading stations, cleaning tables, cookers, packaging machines, labeling machines, warehouse space, and trucking docks. Throughout the bait-boat period, processors lacked the capability of freezing raw tuna.[4] This storage function was provided by the larger bait boats which were equipped with mechanical refrigeration and freezing systems. Since the processor could only receive thawed tuna, the timing of the off-loading was critical. Any delay in unloading increased the likelihood that the catch would deteriorate in the holds of the boat. It was not until the modern purse-seiner period that processors constructed in-plant freezer capacity to hold an inventory of tuna to assure a more continuous rate of canned tuna production throughout the year. Canning machines were also added by the larger processors.

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1 DOI Report, p. 52; Forbes-Stevenson Study, p. III-17 and p. III-26; and U.S. Department of Commerce, NOAA, NMFS, California Fisheries Trends and Review for 1956, by V.J. Samson, p. 4.

2 FTC Report, p. 22.

3 Contracts subpoenaed in FTC industry-wide tuna investigation. See, for example, document numbers BE 3-1 and BE 3-2; and Forbes-Stevenson Study, p. III-4 and p. III-5.

4 Forbes-Stevenson Study, p. II-4.

Southern California was traditionally the home base of the processor. This is because the tuna fleet located in Southern California to maintain access to a major tuna fishery--the Eastern Tropical Pacific Ocean. Throughout most of the bait-boat period, the domestic catch of yellowfin and skipjack was delivered to three major California processors: Van Camp, French Sardine (later acquired by H.J. Heinz), and Westgate-Sun Harbor.[1] An important shift began in the late 1960s when processors started to invest heavily in Puerto Rico. Now, Puerto Rico and Southern California serve as the home ports for the U.S. tuna industry.

F. The Procurement of U.S. and Foreign Tuna by U.S. Processors

The marketing of U.S. tuna is a relatively simple process. The catch of yellowfin and skipjack is frozen or refrigerated on board the boat. It appears that U.S. captains perform a minimal amount of sorting or categorizing of tuna by specie, condition (i.e., whole, gilled and gutted, loins, fillets, etc.), size, and defect (e.g., smashed, broken, or bruised). The major types of sorting are (1) to remove all nontuna species from the catch (e.g., sharks, mahimahi, wahoo, and triggerfish) and (2) to remove tuna which are under the legal size limit (i.e., skipjack under 4 pounds and yellowfin under 7.5 pounds). The remaining tuna are believed to be further sorted only to minimize damage in the storage wells of the boat until delivery to the cannery. The larger tunas, for example, are generally placed in the bottom of the wells to avoid crushing the smaller tunas. Thus, domestic harvests are delivered to the processor as "run-of-the-catch" which includes tuna of all sizes and species.[2]

The captain begins to thaw his catch two days prior to the expected date of unloading.[3] At the receiving dock, the fish are

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1 DOI Report, p. 14; and FTC Report, pp. 8-12.

2 DOI Report, pp. 35-36. Detailed accounts of the early and modern purse-seine methods make no mention of additional types of sorting. See, for example, McNeely, pp. 27-58 and Orbach, Chapter II; and California Fisheries, 1969 and 1971.

3 Forbes-Stevenson Study, Chapter III, pp. 7-8.

loaded manually into cannery buckets or nets and hoisted into a hopper scale for weighing and for the first visual inspection. The weighed fish are transported into the plant by a conveyor system. Fish that are thawed sufficiently are processed immediately. Fish that require further thawing are put into thawing tanks. The bulk of the catch, however, is processed as it is transported into the plant. The rate of unloading is therefore constrained by the processing rate. Consequently, it generally takes two full days to off-load a boat.[1] The processor has the right to reject fish at three points in the canning process: upon receipt, after pre-cooking, and after canning.[2] Rejects and damaged fish are deducted by the processor from the gross value of the catch.[3]

Before describing the procurement of foreign tuna, it will be useful to distinguish between the tuna export market and local foreign tuna markets.[4] Foreign sources of tuna include (foreign) trading companies and foreign boatowners willing to transship deliveries to the U.S.[5] Japanese trading companies such as Mitsubishi International Corporation (MIC) have joint venture tuna vessel operations. Competition among these foreign sources to export tuna and competititon among U.S. processors and other foreign buyers to procure foreign-landed tuna determine a price in the tuna export market. The export market is closely related to local foreign tuna markets because boatowners supplying trading companies have the option of supplying the local markets.

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1 Ibid., p. III-8.

2 Ibid., p. III-12.

3 DOI Report, p. 35.

4 The following discription of foreign tuna markets relies heavily on recent interviews with two industry sources: Masamichi Ito, Manager, Marine Products, Food Division, Mitsubishi International Corporation; and Sunee C. Sonu, editor of the Foreign Fishery Information Release, U.S. Department of Commerce, NMFS. The Foreign Fishery Information Release is a weekly newsletter which includes reports on foreign tuna prices, harvests, and current events.

5 The Nicholson Act prohibits a foreign-flag fishing vessel from off-loading its catch in a U.S. port. R.S. §4311, September 2, 1950, c. 842, 64 Stat. 577.

Thus, boatowners act to arbitrage the two prices. In addition, trading companies, acting through agents licensed to trade on the local market, can acquire additional tuna in local markets to meet the demand for tuna exports. Thus, an increase in the demand by U.S. processors for foreign tuna is likely to raise the export price of tuna. From the viewpoint of local fishermen, the higher export price leads them to reduce deliveries to local tuna markets and increase deliveries to the trading company. The higher export price may also increase the demand of trading companies for local tuna and thereby raise prices in some of the local foreign markets. Both effects on price are reinforcing and tend to make prices in the local and export markets sensitive to one another.[1]

Tuna in foreign local markets are sold through a competitive auction.[2] Sellers in the auction are local fishermen. Buyers at the auction are mainly local tuna canners and fresh fish dealers.[3] Purchasers must have licenses, and the number of these licenses are regulated. Apparently, local trading companies and U.S. processors are not eligible for licenses to trade in these markets. With the exception of yellowfin, the species traded in the canned tuna markets are not preferred in the local fresh tuna markets. Bluefin and bigeye, for example, are highly valued in fresh tuna markets and have sold for as high as $1.55 per pound ($3,100/ton) and $1.97 per pound ($3,940/ton), respectively, to

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[1] Technically, U.S. processors can buy indirectly on local foreign markets via a licensed agent as do trading companies. This is almost never done, however, because it is too costly for U.S. processors to enforce claims for rejected fish or for other quality problems. Instead, processors establish a long-term relationship with a trading company. Starkist, Van Camp, and Bumble Bee have offices in Tokyo and maintain contact with local trading companies.

[2] The role of fishermen's cooperatives in the marketing of Japanese fish harvests in competitive auctions is described in National Federation of Fisheries Co-Operative Associations, <u>Fisheries Co-Operative Movement in Japan</u>, (Tokyo, Japan: July 1972); see especially "Joint Marketing by Fishermen's Cooperative," by Mr. A. Niwa, pp. 63-68.

[3] In recent years, separate auctions have been conducted for fresh tuna and for tuna to be canned.

be used for sashimi and steaks.[1] Although the exact relationship between local canned tuna and fresh tuna markets is presently unknown, it is clear that these markets are extremely price sensitive to one another.

For canned tuna, the largest skipjack auction in the Orient is Yaizu, Japan. The next largest is in the Philippines. The tuna are sorted by specie (about six categories) and by weight (at least four categories for skipjack and five categories for yellowfin). As an example, a foreign catch of skipjack ranging in size from 4.4 to 11 pounds, was priced by a 1976 Yaizu auction as follows:

Size	April 12	April 13	April 14
0-3.2	$617-632	$617-629	$626-632
3.3-5.4	620-626	623-632	629-653
5.5-9.8	656-665	665-680	665-696
9.9-13.2		786	

The prices shown are f.o.b. prices quoted in U.S. dollars per short ton.[2] Delivered U.S. skipjack prices were as follows:[3]

under 4 lbs.	$513-523.20
4 lbs. & over	540-545

Thus, foreign prices of skipjack were more than $100/ton higher than U.S. prices. The total delivered price of foreign skipjack is even higher because transportation costs of at least $75/ton must be added to the Japanese f.o.b. price.[4]

Additional sorting is believed to occur in foreign yellowfin markets. Relative to skipjack, yellowfin is more commonly exported in various stages or conditions of processing (e.g., whole, gilled and gutted, loins, discs, and dressed with tail). Since the early 1950s yellowfin began to be exported to the U.S.

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1 U.S. Department of Commerce, NOAA, NMFS, Foreign Fishery Information Release No. 67-36, Supplement to Market News Report, October 30, 1967, compiled by Sunee C. Sonu; and Broderick Study, p. 186.

2 Foreign Fishery Information Release No. 76-7, May 5, 1976.

3 U.S. Department of Commerce, NOAA, NMFS, Fishery Market News Report, P-46, April 20, 1977 (contains 1976 data).

4 DOI Report, p. 74; and Broderick Study, p. 201.

in two cooked conditions: cooked loins (i.e., fillets ready to can after thawing and shaping) and cooked discs (i.e., pre-shaped, frozen, and ready to insert into the can).[1] In addition, U.S. processors continue to order significant amounts of yellowfin in the whole (or round) condition.

Foreign tuna deliveries are also subject to double handling.[2] Local harvesters generally deliver their catches to local tuna markets.[3] If a trading company places an order in the local market via a licensed agent, the catch is delivered to the trading company who inspects the fish and then off-loads it into inventory or onto a transshipment vessel for export. Once at the U.S. processor's dock, foreign deliveries are subject to the same unloading, inspection, and weighing procedures as U.S. deliveries. Consequently, foreign deliveries incur additional handling, inspection, and storage costs relative to U.S. catches which directly off-load at the processor's dock.

G. Compensation to Crew

Tuna fishermen receive a share of the net revenues from each harvest. They are not paid a fixed wage rate. To illustrate, the shares on a 16 man crew may be distributed as follows:[4]

Number	Rank	Share
1	captain	3.5
1	engineer	2.0
1	navigator	1.25
1	deck boss	1.25
12	crewman	12.0
16		20.0

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1 DOI Report, p. 63.

2 Broderick Study, pp. 200-01.

3 Japanese harvesters operating in overseas based tuna fisheries (such as in the Phillipines, Taiwan, Chile, and Panama) transship their catches to Japan or to a local foreign tuna market. See, Robert M. Roesti, "Economic Analysis of Factors Underlying Pricing in Southern California Tuna Canning Industry," (unpublished Ph.D. dissertation, University of Southern California, 1960), pp. 66-67.

4 Anthony J. Collura, "Purse Seining and the San Diego Based Tuna Fleet," (July 1978), p. 10, (Typewritten); hereinafter referred to as the Collura Report.

Trip expenses (i.e., fuel, oil, bait, and minor items such as salt, ammonia and foreign port charges) are first deducted from the gross revenues of a catch.[1] Fish rejects, if any, are also deducted from gross revenues. The resulting net revenue is split between the boatowner and the crew. The percentage split is determined through collective bargaining agreements between the boatowner and the fishermen's union(s).[2] Assuming net revenues of $200,000, a total crew share of 55 percent, and a 16 man crew with individual shares as indicated above, the total payment to crew would be $110,000 (= .55 x $200,000) and each regular crewman would earn $5,500 (= $110,000 divided by 20 shares) on the one trip.

The captain receives earnings as a crew member and may receive a bonus.[3] The captain also expects to receive an annual return on his equity interest in the boat. All fixed costs (including depreciation, interest on vessel mortgages, and insurance) are paid out of the boatowner's share.

A decreasing percentage of the net revenues of the vessel is being allocated to the crew. One study in the early 1950s estimated that the crew averaged between 50-70 percent of net revenues.[4] A study of the modern bait-boat period (1962-1965) suggests that the crew receives approximately 51-56 percent of net revenues.[5] A more recent study of purse-seine vessels (1974) by Virginia Flagg provides data which show that the crew is

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1 Tuna Imports Study, p. 20; and Marasco Study, p. 47.

2 Ibid.

3 U.S. Department of Commerce, NOAA, NMFS, Revenues, Costs and Return from Vessel Operation in Major U.S. Fisheries, by Bruno G. Noetzel, (Washington, D.C.: February 1977); and U.S. Department of Commerce, NOAA, NMFS, Tuna 1947-72: Basic Economic Indicators, Current Fishery Statistics No. 6130, (Washington, D.C.: June 1973), p. 2.

4 Tuna Import Study, p. 20.

5 Based on data reported in Tuna 1947-72: Basic Economic Indicators," p. 3.

allocated roughly 33-50 percent of net revenue.[1] The reduced share to the crew may simply reflect a reduction in variable costs which are shared by the boatowner and crew (i.e., trip expenses) and an increase in (unshared) fixed costs that are paid by the boatowner. For example, bait, pole, and line are being replaced by net, skiff, and power block as bait boats are being converted to the purse-seine method of fishing (1959-63) and as newly constructed purse seiners are entering the U.S. tuna fleet (1967-76).[2]

H. Restrictions on Tuna Imports

With minor exceptions, no foreign flag fishing vessel can deliver its catch to any U.S. port, including Puerto Rico (but excluding American Samoa and Guam). The general prohibition under the Nicholson Act (46 U.S.C. 251) reads:

> "Vessels of twenty tons and upward, enrolled in pursuance of title 50 of the Revised Statutes, and having a license in force, as required by such title 50, and no others, shall be deemed vessels of the United States entitled to the privileges of vessels employed in the coasting trade or fisheries. Except as otherwise provided by treaty or convention to which the United States is a party, no foreign-flag vessel shall, whether documented as a cargo vessel or otherwise, land in a port of the United States its catch of fish taken on board such vessels on the high seas of fish products processed therefrom, or any fish or fish products taken on board such vessel on the high seas from a vessel engaged in fishing operations or in the processing of fish or fish products." R.S. §4311, Sept. 2, 1950, ch. 842, 64 Stat. 577 (emphasis added).

The U.S. Customs Services advises that it is aware of no treaty or convention with respect to tuna which provides for any exception to the general prohibition.[3] Two minor exceptions to the

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1 Based on data compiled by Virginia G. Flagg, "Landings, Costs, and Revenue: Analysis of the Eastern Tropical Pacific Tuna Purse Seine Fleet (1974): Preliminary Report," cited in U.S. Department of Commerce, NOAA, NMFS, Further Analysis of the Estimated 1976 Financial Condition of the American Purse Seine Fleet, prepared by Phyllis D. Altrogge, (January 1976), Appendix II, pp. 16-26.

2 The introduction of the modern purse-seine vessel is described infra, pp. 125-28.

3 Letter from J.P. Tebeau, Director, Carriers, Drawback and Bonds Division, Department of the Treasury, U.S. Customs Service, to Steven C. Tator, Investigator, FTC, dated February 13, 1978.

Act are: (1) fish landed in the Virgin Islands for immediate consumption and (2) distress landings of foreign fish that are likely to spoil before reaching a foreign port.

Since 1956, the importation of canned tuna has been regulated by highly restrictive tariffs. A 35 percent _ad valorem_ tariff on canned tuna packed in oil has eliminated the incentive to import this type of tuna pack. The tariff structure on imported canned tuna packed in water has been as follows:

1956-67	at 12.5% _ad valorem_
1968	11.0
1969	10.0
1970	8.5
1971	7.0
1972-83	6.0

Beginning in 1970, if the quantity of canned imports in water exceeded 20 percent of the previous year's domestic pack, the tariff was double.[1] Consequently, canned tuna in water is rarely imported in quantities over the 20 percent quota.

The U.S. tariffs have been able to restrict imported canned tuna to under 15 percent of the U.S. supply of tuna. Since 1972, two years after the 20 percent quota was instituted, imported canned tuna fell to under 10 percent of the U.S. supply (see Table 15). Nevertheless, foreign sources of raw tuna have accounted for approximately 50 percent of U.S. processors' tuna requirements since 1959 (Table 14, p. 116). Thus, the foreign supply of (raw) tuna is likely to exert a significant influence on the U.S. price of canned tuna despite the tariffs on imported canned tuna.

I. The Technological Change in Fishing

The conversion of bait boats to purse seiners and the construction of modern purse-seine vessels reflect a number of technological improvements.[2] Many of the bait boats built before World War II were of wooden construction. Bait boats entering

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1 _Fisheries of the United States_; See, for example, volume 1980, p. 55.

2 See, for example, Orbach, Chapters I and II; and McNeely, pp. 27-58.

TABLE 15

PERCENTAGE OF U.S. SUPPLY OF CANNED TUNA
FROM IMPORTED CANNED TUNA
(Quantity in Thousands of Pounds)

Year	Imported Canned Tuna[a]	Percent
1963	57,494	15.0
1964	54,647	13.5
1965	50,961	12.4
1966	61,560	13.5
1967	65,321	14.4
1968	67,173	14.5
1969	73,116	15.5
1970	72,262	14.2
1971	59,842	12.0
1972	56,513	8.4
1973	38,626	5.7
1974	52,746	7.4
1975	51,671	8.9
1976	58,893	8.9
1977	34,631	5.9
1978	51,782	6.8
1979	53,703	8.0
1980	63,553	9.6

[a] White and light-meat combined.

Source: Fisheries of the United States.

the fleet in the post-World War II period were of steel construction. Steel construction not only increased the durability of the boat, it enabled boats to enlarge their carrying capacity and to expand their cruising range. Improved systems of communication and the manufacture and distribution of boat parts and supplies facilitated the repair of tuna boats in most parts of the world.

Fishermen who experimented with nets in the early 1950s encountered two major problems: (1) the material used to construct nets was not sufficiently weather resistant and tended to deteriorate too quickly, and (2) retrieving the net after each set, especially with a large catch or in high winds, was laborious, time consuming, and dangerous. Both of these problems were resolved in the late 1950s with the introduction of nylon nets and a hydraulic device called a Puretic powerblock. Nylon was sufficiently strong to resist deterioration from the salt water and to enable the construction of substantially longer nets. The modern purse seines (nets) measured approximately 2400-3000 feet in length and 240-300 feet in depth compared to the early seines which measured 1800 feet by 240 feet.[1] The Puretic powerblock is a large rubber roller on the end of a long boom. It is used to retrieve portions of the net after a school of tuna have been captured. As the net is taken in, the tuna are confined to a smaller area within the net and are drawn close to the side of the vessel. In this position, the tuna are sufficiently dense to be brailled (lifted) aboard with the use of smaller dip nets which can scoop 1-2 tons of fish at a time. The fish are dumped into a hopper for sorting and then channeled into one of the storage wells below the (working) deck. The modern seining method utilizes a number of power winches to control various cables to quickly position the net, to lift the dip net, and to release and dock the skiff (a specially designed motor

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[1] Broderick Study, p. 103; and DOI Survey, p. 28.

boat which assists in setting and retrieving the seine). The Puretic powerblock, however, is considered to be the major innovation in the modern seining process.

Between 1958 and 1963, larger bait boats were converted to the new fishing technology. It was not until 1967 that newly constructed purse-seine vessels entered the U.S. tuna fleet on a significant scale. (See Table 1, p. 23). It is on this basis that 1967 is considered to mark the beginning of the modern purse-seiner period. The impact of the new technology on the carrying capacity and composition of the fleet is discussed in Chapter II (pp. 22-24).

J. Joint Ownership, Processor Second Mortgages and Loan Guarantees in the Modern Purse-Seiner Period

In contrast to the bait-boat period, processors began to take ownership interests, to hold second mortgages, and to provide vessel guarantees on the modern purse-seine vessels. Until about the mid-1970s, some processors apparently preferred to hold large equity interests in seiners while other processors provided a combination of second mortgages, vessel guarantees, and long-term fishing contracts.

A substitution between equity and a second mortgage plus guarantee was evident in the early purse-seiner period. This substitution is more pronounced the larger the vessel size. Vessels in the smallest size class (under 650 tons) reflect a trade-off between processor equity in the vessel and long-term fishing contracts. That is, processors who choose not to hold an equity interest in the vessel tend to enter into somewhat longer term (e.g., 5 year) fishing contracts with the vessel owner. Second mortgages and guarantees are seldom offered to the smaller vessels. Medium size vessels (650-999 tons) tend to obtain either longer term (e.g., 10 year) contracts plus second mortgages from the processor, or a larger equity interest held by the processor (up to 50 percent). Processors typically provide the largest purse seiners (over 1,000 tons) with either long-term fishing contracts, second mortgages, and guarantees on the first mortgage, or take approximately a 50 percent ownership interest in the vessel. A comparison of Table 16 (for the smallest size class) and Table 17 (for the largest size class) shows that the larger the vessel, the greater the processor assets committed to the harvesting operation.[1] The equity-second mortgage plus guarantee trade-off is most evident for vessels with over 1,000 tons of carrying capacity (Table 17).[2]

By 1977, however, processors generally held some equity interest in vessels under contract, regardless of vessel size. Processors who held a relatively small equity in a vessel also provided a second mortgage and guaranteed the first (mortgage). This commitment of processor assets to the harvesting stage is most evident for the largest vessel size. (See Table 18). Thus, in contrast to the early years of the modern purse-seiner period, some minimum equity interest in the vessel appeared to be required on the part of the processor. Second mortgages and guarantees were extended by some processors to minimize their equity interest in the vessel.

K. <u>The Empty Boat Auction System of Pricing</u>

In April 1967, the American Tuna Sales Association (ATSA), a marketing cooperative, was established to assume the sales responsibilities for the domestic tuna fleet, with the exception of those vessels wholly owned by processors.[3] Before 1968, processors bid upon catches as they arrived in port. This apparently put some harvesters at a disadvantage since their catch was subject to deterioration in the holds of their vessels while they were negotiating prices. Since 1968, the price of domestic tuna has been determined by the ATSA auction prior to the vessel's departure to the fishing grounds. This new method of pricing is referred to as the "empty boat" or ATSA auction.

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1 The data for vessels in the intermediate size class (650-999) is provided in Table 9, p. 77, *supra*. The 1972 data is used because it is the earliest data available in the modern purse-seiner period.

2 The substitution is identifiable, although weaker, for intermediate size vessels (Table 9, p. 77, *supra*) and nonexistent for the smaller size vessels (Table 16). It is on this basis that the substitution is said to vary directly with vessel size.

3 Forbes-Stevenson Study, p. IV-3; and Marasco Study, p. 17.

TABLE 16

PROCESSOR ASSETS COMMITTED TO THE U.S. PURSE-SEINE FLEET, 1972 (Vessels with Less Than 650 Ton Capacity)

	Capacity (tons)	Equity (%)	Contract (years)	Mortgage (2nd)	Guarantee on Vessel Mortgage
1	540	11	1		
2	540	11	1		
3	540	11	1		
4	540	100			✓
5	400[a]	22			
6	400[a]	61			
7	400[a]	75			
8	300[a]	100			
9	200[a]	80			
10	200[a]	100			
11	200[a]	40			
12	200[a]	100			
13	200[a]	25			
14	200[a]	25			
15	200[a]	30			
16	540		7		
17	540		7		
18	500		5		
19	500		5		
20	500		5		
21	500		5		
22	500		5		
23	500		5		
24	500		5		
25	400		5		
26	400[a]		5		
27	400[a]		5		
28	300[a]		5		
29	300		3		
30	300[a]		5	(first)	
31	200[a]			✓	

[a] Rounded to nearest common capacity to preserve the confidentiality of the source documents.

Source: Compiled from certificates of ownership, fishing contracts, and mortgage agreements subpoenaed in FTC industry-wide tuna investigation.

TABLE 17

PROCESSOR ASSETS COMMITTED TO THE
U.S. PURSE-SEINE FLEET, 1972
(Vessels with at Least 1,000 Ton Capacity)

	Capacity (tons)	Equity (%)	Contract (years)	Mortgage (2nd)	Guarantee on Vessel Mortgage
1	1400[a]	60			
2	1400	60			
3	1400	55			✓
4	1400	55			✓
5	1400	60			✓
6	1400[a]	11			
7	1100[b]	11	1		
8	1100	55			
9	1100	51			✓
10	1100	60		✓	✓
11	1000[a]	10	10		
12	1000	51			
13	1000	60			
14	1000	100			
15	1400[a]		10	✓	
16	1400		15	✓	✓
17	1100		10	✓	✓
18	1100		5	✓	✓
19	1100		10	✓	
20	1100		15	✓	✓
21	1100		8	✓	✓
22	1100		15	✓	✓
23	1100		15	✓	✓
24	1100[b]		5		
25	1100[b]		5		
26	1100		15	✓	✓

[a] Rounded to nearest common capacity to preserve the confidentiality of the source documents.

[b] File may be incomplete.

Source: See Table 16.

TABLE 18

PROCESSOR ASSETS COMMITTED TO THE U.S. PURSE-SEINE FLEET, 1977 (Vessels with at Least 1,000 Ton Capacity)

	Capacity (tons)	Equity (%)	Contract (years)	Mortgage (2nd)	Guarantee on Vessel Mortgage
1	1400[a]	60	1		
2	1400	41			
3	1400	31			
4	1400	26			
5	1400	26			
6	1400[a]	100			
7	1200	100			
8	1200	20			
9	1200	24	1		
10	1200	24	1		
11	1200	50	1	✓	✓
12	1200	50	1	✓	✓
13	1200	50	1	✓	✓
14	1200	50			✓
15	1200	50	1	(first)	
16	1200	33		✓	✓
17	1200	50	1		✓
18	1200	50			✓
19	1200	50	1	✓	✓
20	1200	100			
21	1200	100			
22	1200[a]	50	8	✓	✓
23	1100	55			
24	1100	51			✓
25	1100	100			
26	1100	25	1	✓	✓
27	1100	100			
28	1100	100			
29	1100	25	1	✓	✓
30	1100	50	1	✓	✓
31	1100	50			✓
32	1100	100			
33	1100	100			
34	1100	100			
35	1100	100			
36	1100	100			
37	1000[a]	100			
38	1000[a]	100			
39	1000	50	1		✓
40	1000	60			
41	1000	100			
42	1000	60	10		
43	1400[a]		1	✓	✓
44	1400		1	(first)	
45	1400		5	✓	✓
46	1200		1	✓	
47	1100		1	✓	
48	1100		1	✓	✓
49	1100[b]		8		
50	1100[b]		8		
51	1100[b]		8		
52	1100[b]		8		
53	1100[b]		5		
54	1000[b]		1		✓

continued

TABLE 18--Continued

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[a] Rounded to nearest common capacity to preserve the confidentiality of the source documents.

[b] File may be incomplete.

Source: See Table 16.

Contractual arrangements between ATSA member vessels and processors prevent ATSA from representing its entire membership as a single group in price negotiations with processors. Since processors secure exclusive rights to the season's catch of most member vessels before the ATSA auction begins each January, ATSA has no power to offer a processor additional vessels in exchange for a higher bid (price). The ATSA bargaining agent merely represents each member on an individual basis.

Although the mechanics of the ATSA auction has varied during the 1967-75 period,[1] the following rules were generally invoked by ATSA (representing individual member's vessels) and processors:

(1) the catch of each tuna vessel on its next trip is auctioned in the order in which the vessel arrived into port on its current trip,

(2) processors can pass an opportunity to bid on a vessel that has an ongoing relationship with another processor,

(3) if ATSA rejects a processor's bid on a vessel, that vessel remains in port and the next vessel in order is auctioned,

(4) once ATSA accepts a bid, that bid becomes the price offered retroactively to all previously auctioned vessels still in port,

(5) no variations in bids based upon weight or individual fish,[2]

(6) no vessel departs for the fishing grounds until the vessel in order before it accepts a bid, and

(7) the vessel must depart within 3 days after it accepts a bid.

Since all but a few of the older, smaller vessels were associated with particular canners, the ATSA auction did not function as a competitive auction. No processor would attempt to bid away the catch of a vessel which had an ongoing relationship with another processor. Thus, the auction did not ration the tuna catch among the highest bidding processors. This rationing

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1 See, for example, California Fisheries, 1971, p. VII.

2 That is, tuna is to be sold as "run-of-the-catch" (without sorting); see supra, pp. 118.

function appears to be accomplished through competitive contracting for fishing contracts. What the ATSA auction does accomplish, however, is to determine the (contract) price of tuna before the vessel departs for the fishing grounds.

In 1975, led by the reluctance of some processors to be associated with the appearance of group buying or buyer's price agreements, the auction evolved into a system of bargaining. Instead of convening in one room, ATSA began to contact each individual processor for his bid. ATSA represented individual groups of vessels which were under contract to each canner. ATSA held meetings with canners separately and bargained for a price for all vessels under contract to the canner. This acknowledged that ATSA had no control over determining who received the fish. The only negotiable issue for ATSA was price.

L. Demurrage Fees

Throughout the bait-boat period, captains complained about the unnecessary delays in vessel off-loadings.[1] In the mid-1960s, unloading times for some vessels ranged from a low of 3 days to a high of 33 days. Available evidence suggests, however, that these delays primarily affected noncontract vessels. That is, vessel owners who preferred not to sign a fishing contract with a processor were more likely to be subject to delays in unloading. Nevertheless, the ability of processors to delay vessel off-loadings is unquestionable. The data for the 1964-66 period is reported in Table 19. Recall that boats selling in the auction during this period could not be under a supply contract to a processor.[2]

Another institutional change in the modern purse-seiner period is that processors became liable for delays in vessel off-loadings. Beginning in 1968, the ATSA was permitted to charge the processor a demurrage fee if the vessel was not unloaded within 10 days after returning to port.[3] The fee is

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1 California Fisheries: 1951-66.

2 See, supra, pp. 115-17.

3 Forbes-Stevenson Study, p. IV-3; and Marasco, Study, p. 17.

TABLE 19

AVERAGE UNLOADING TIME FOR TUNA VESSELS
SELLING BY AUCTION, OCTOBER, 1964 TO SEPTEMBER, 1966

Auction Date		Days to Completion of Unloading
Month	Year	
October	1964	25
November	1964	28
December	1964	33
January	1965	18
February	1965	10
March	1965	7
April	1965	5
May	1965	4
June	1965	4
July	1965	12
August	1965	24
September	1965	29
October	1965	14
November	1965	6
December	1965	3
January	1966	3
February	1966	3
March	1966	5
April	1966	14
May	1966	16
June	1966	14
July	1966	7
August	1966	4
September	1966	4
Average for 24-month period		12

Source: American Tunaboat Association, San Diego.

$1/ton for any fish remaining in the vessel's hold at the end of each day, after the ten day grace period.[1] The demurrage fee on a modern purse seiner could be substantial: on a fully loaded seiner (1000 tons), the fee would be $1000/day.

M. The Observed Price Gap

Under normal market conditions, the local foreign price of tuna is typically above the domestic price.[2] Documents subpoenaed during the FTC industry-wide tuna investigation indicated a skipjack (delivered) price differential of approximately $95/ton (= $589/ton - $494/ton) over the 1972-77 period. This estimate may be biased downward for two reasons: (1) tuna imports by one major processor were deleted due to the lack of comparable data; if this processor tended to make more purchases in periods of short supply relative to other processors, our estimate of the foreign price would be too low, and (2) the data on foreign prices include deliveries other than from the local foreign markets; since purchases from the local foreign market are the most expensive source of foreign tuna, data which aggregates across all types of foreign deliveries (e.g., individual foreign boatowners who transship tuna to U.S. processors) will reduce the foreign price estimate. One industry procurement officer estimates a price gap of about $175/ton (= $655/ton - $480/ton) between the foreign and ATSA prices of skipjack over the 1975-80 period. Assuming the two estimates provide the lower and upper bounds around the true observed price differential, we average the two estimates to yield an observed price gap of about $135/ton. However, it is certain that this "observed" price differential is not the "effective" price differential.

We are aware of two adjustments that must be made to the ATSA price before arriving at the price that is effectively paid for domestic skipjack. Similarly, one adjustment must also be made to the foreign price to determine the effective price paid

1 ATSA, "American Tuna Sales Association Rules of Conduct of Tuna Auction," (January 22, 1968), Rule 6, p. 2 (Typewritten).

2 See, for example, supra, pp. 121.

for foreign skipjack. Instead of offsetting one another, two of the three adjustments serve to narrow the actual price gap.

The first adjustment to the domestic tuna price accounts for the fact that over 80 percent of the domestic harvesters are given some payment in addition to the ATSA price.[1] Most harvesters receive the ATSA price plus some combination of the following nonprice payments:

1. Trip advances averaging $250,000 that are interest-free for each three month trip; these trip advances typically take the form of guaranty letters to back up purchases for services or supplies made by a harvester when in foreign ports; assuming a annual catch of 2,500 tons, 3 trips per season or 9 months use of the funds, and an 8 percent interest rate,[2] the cost to the processor is estimated at $6/ton (= $250,000 x 9/12 x .08 divided by 2,500 tons);

2. Management fees (of $30,000 per year[3]) paid to captains of vessels in which processors have an equity interest; given a 2,500 ton catch per season, the cost of management fees paid on average are roughly $12/ton;

3. Guaranty of vessel mortgage obligation or direct financing; assuming that the processor provides about a 10 percent downpayment at an opportunity cost of 8 percent, the foregone interest income to processors who provide the downpayment on an $6 million vessel[4] loan is about $19/ton (= .10 x $6 million x .08 ÷ 2500 tons).

4. Various port services; such as parts, service, and unloading crews at dockside;

5. Outright purchases of licenses and other operating expense items (e.g., freight, storage, insurance on the catch, port charges, and government duties); and

6. Occasional partial payment of transshipment fees.

Items 4, 5, and 6 are extremely difficult to quantify and are simply assumed to average $20/ton. On average, these nonprice

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[1] The price differential will be narrowed since the foreign price does not warrant a similar adjustment for nonprice payments. See, for example, document number BE 2-1, part 6.

[2] Based on yields on 3-5 year U.S. Treasury Securities over the 1972-77 period; Economic Report of the President (U.S. Government Printing Office, Washington: 1979), p. 258.

[3] A limit of $36,000 per year (for 1974 and 1975) has been assigned to the largest purse seiners in Revenues, Costs and Return from Vessel Operation in Major U.S. Fisheries, by Bruno G. Noetzel, p. 4 and p. 19.

[4] Collura Report, p. 9.

benefits cost the processor roughly $57/ton, which narrows our estimate of the foreign - domestic price gap to about $78/ton (= $135 - $57).

The second adjustment to the domestic tuna price allows for the fact that efficient vessel owners are given large bonuses because they consistently deliver larger seasonal catches. Because the owners are reluctant to discuss the size or frequency of these side payments, we are unable to quantify them. A NMFS study, however, has estimated that such bonuses (or captain's commissions) averaged $23,183 for a sample of six purse seiners in the 1969 tuna fleet. Since the annual harvest per vessel averaged 2,780 tons, the cost of bonuses paid by processors is approximately $10 per ton (in 1972 prices).[1] Using this estimate, the adjusted price gap is narrowed to $68/ton (= $78 - $10).[2]

Lastly, one adjustment must be made to the <u>foreign</u> tuna price. Because processors have argued that semi-processed foreign tuna is cheaper to process than domestically supplied tuna,[3] FTC accountants have examined the differences between in-plant processing costs which vary with the condition, specie,

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1 <u>Tuna 1947-72: Basic Economic Indicators</u>, p. 2.

The consumer price index for total services (1967=100) was used to convert the $8.34 per ton figure (initially computed in 1969 dollars) into 1972 dollars ($8.34 ÷ 113.8 x 135.9 = $9.96). See, <u>Economic Report of the President, 1976</u>, p. 222.

2 A third possible adjustment recognizes that fishing contracts may lower the risk to harvesters that is associated with price and quantity uncertainty. For example, during the infrequent years of a market glut, the ATSA price actually exceeds the foreign price. Yet, processors accept the entire catch of each contract vessel. On the other hand, fishing contracts may also lower the risk to processors, since their marketing channels and production lines are less costly to operate when the source of raw tuna is steady and reliable. Since domestic harvesters appear to have fewer sales prospects in foreign markets than processors have buying opportunities in those markets, it seems that any risk abating value of fishing contracts is greater for domestic harvesters than processors. If this is so, the net effect of compensating for the risk-reduction value of contracts, if any, is to increase the effective domestic price, thereby narrowing the price differential. Unfortunately, we are unable to estimate the magnitude of this effect.

3 See, for example, document numbers BE 5-8, pp. 44-46; and BE 2-1.

and source of raw tuna.[1] They found that imported semi-processed yellowfin was cheaper to process than its domestic unprocessed counterpart. They also found, however, that unprocessed foreign yellowfin and skipjack were both more expensive to process than their domestic equivalents. To determine which processing differential was most relevant, we turned to our statistical compilations of tuna deliveries which showed that 80 percent of all foreign deliveries are unprocessed skipjack and yellowfin. We concluded that the processing cost adjustment to the observed price gap should be based on unprocessed skipjack since it is by far the predominant imported condition and specie. The accountants have found that foreign skipjack is approximately $10/ton more expensive to process.[2] Accordingly, the $68/ton estimate of the adjusted price gap should be increased to $78/ton to reflect this higher estimate of the effective foreign tuna price.

In brief, then, we are confident that the observed gap between the ATSA and foreign prices of skipjack is about $135 ton, but we are unable to fully identify the "effective" gap remaining after all necessary adjustments are made. The most that can be said in this regard is that the observed price gap is probably narrowed on balance by at least $57/ton (= $57 + $10 - $10), which suggests that the effective gap is something less than $78/ton (= $135 - $57). This translates into a finished goods cost differential of approximately $1.56 per case (or 3.3 cents per can) of canned tuna. This cost difference appears to be significant since it represents about 3.6 percent

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1 Includes an outside CPA firm hired as a consultant to assist in the FTC industry-wide tuna investigation.

2 For example, using 1972-77 data for one processor, the accountants estimate that unprocessed foreign skipjack is worth about $12/ton less than domestic skipjack. Further, unprocessed skipjack accounted for 75 percent of tuna imported by the processor during this period.

of the wholesale price of a standard case of tuna (Chunk Light Tuna, 48 cans, 6 1/2 ounces per can).[1]

N. The Yellowfin Regulatory Zone

The Inter-American Tropical Tuna Commission (IATTC), established in 1950, was comprised of 8 member nations in 1976: Canada, Costa Rica, France, Japan, Mexico, Nicaragua, Panama, and the United States.[2] The IATTC's function is to (1) study tropical tunas and other fish caught by tuna fishing vessels, and (2) recommend joint conservation measures to maintain the species around maximum sustainable yield.

In 1966, the IATTC established a harvesting quota which limits the yellowfin tuna harvest in an area known as the Commission's Yellowfin Regulatory Area (CYRA).[3] The CYRA extends from the southwest tip of the Baja California Peninsula to Northern Chile and from the mainland of the Americas to a distance of several hundred miles at sea.[4] This area is one of the two most productive yellowfin fisheries in the world.[5] The IATTC quota applies to the combined harvest of all member nations on a first-come, first-serve basis. The IATTC does not set quotas for each member country. Special allocations (e.g., to a developing country) are initially deducted from the total international quota.

The quota regulations substantially influence fishing strategies during the open season. When the international quota for the calendar year is reached, the CYRA is closed. All

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1 Based on a conversion factor of 50 cases of canned tuna per ton of skipjack and a wholesale price of $43 per standard case.

2 Inter-American Tropical Tuna Commission, Organization, Functions, and Achievements of the Inter-American Tropical Tuna Commission, p. 1, hereinafter referred to as the IATTC Report).

3 IATTC Report, p. 2 and p. 24.

4 Marasco Study, pp. 4-5. The area covered by the IATTC convention is more technically described in IATTC, Establishment, Structure, Functions and Activities of International Fisheries Bodies, by J. E. Carroz, FAO Fisheries Technical Paper No. 58 (Rome, September 1965), pp. 1-2 and Appendix II.

5 Yearbook of Fishery Statistics, Food and Agricultural Organization of the United Nations, annual volumes.

vessels in port on the closure date are allowed to make one last trip within the CYRA (known as the "last free trip") if they depart within 30 days.[1] The incentive, therefore, is to fish quickly early in the season and return to port just prior to the expected close of the CYRA. The introduction of the quota regulations is associated with a considerable amount of U.S. vessel construction, perhaps to counter the earlier season closings and to take advantage of the last free trip. New construction, primarily of large purse-seine vessels, has expanded the U.S. fleet from about 40,000 tons of catch capacity to about 118,000 tons over the period from 1967 to 1975.[2]

According to the National Marine Fisheries Service, U.S. fishermen fishing for yellowfin tuna in the Eastern Tropical Pacific have been subjected to inequitable treatment relative to foreign fishermen. While the U.S. government strictly enforces the IATTC recommendations, none of the foreign governments whose fishermen harvest yellowfin within the CYRA have adequate regulations or enforcement procedures to insure that the international quota is observed. This inequity is significant because the quantity of yellowfin tuna taken during the closed season is estimated by the IATTC and is used in determining the annual quota for the following year. During the 1966-73 period, the proportion of the final catch obtained after the closure date by regulated vessels (plus special allocations and 15 percent incidental catch) increased from 5 to 20 percent.[3]

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1 IATTC Report, p. 27.

2 Table 12, supra, p. 110; and U.S. Comptroller General, Report to the Congress by the Comptroller General of the United States, The U.S. Fishing Industry -- Present Conditions and Future of Marine Fisheries, Volume II, Publication No. CED-76-130-A (Washington, D.C.: December 23, 1976), Appendix III, p. 257; and U.S. Tuna Purse Seine Fleet Summary (1957-August 1977), American Tunaboat Association, document number BE 2-2.

The construction of modern purse seiners also represented a cost effective means for U.S. harvesters to compete with rising tuna imports and for U.S. processors to reduce their reliance on imported tuna. (See Table 14, supra, p. 116).

3 IATTC Report, p. 27.

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