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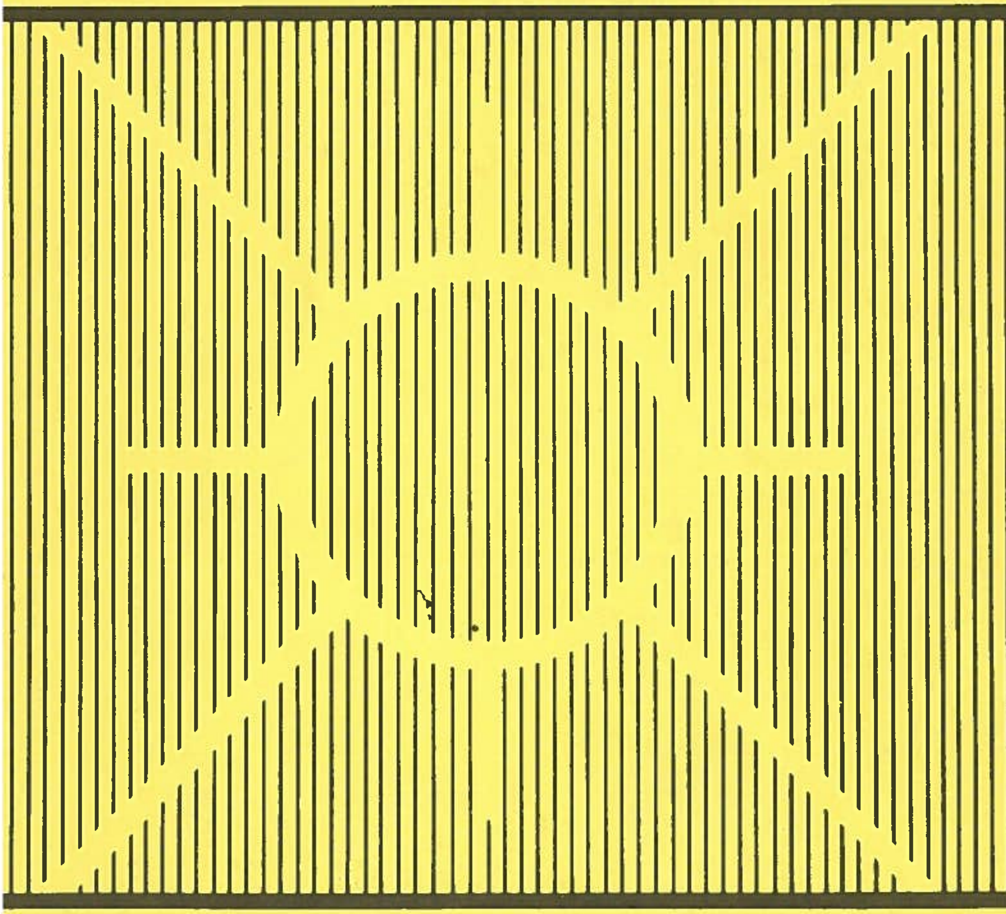

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COOPERATIVES AND MARKETING ORDERS

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INTRODUCTION

In numerous agricultural industries, a cooperative with a high market share coexists with a marketing order containing provisions with price enhancing effects. The coexistence does not seem accidental. Cooperatives were in many instances instrumental in the introduction of marketing orders. In fact, we may view some orders as regulated imitations of plans which cooperatives would have liked to operate independently had they been able to do so without great cost. Marketing orders have for the most part operated to the advantage of cooperatives by deriving industry-wide benefits. In addition, cooperatives have sometimes been able to manipulate the structure or use of an order to their private benefit, with a cost to non-cooperative members of the industry.

Our paper discusses some hindrances to a cooperative's attaining market power on its own. We stress, however, that we believe that a cooperative could still acquire private market power in the absence of a market order and that it may be able to supplement the market power endowed by an order with private market power. We will delineate a cooperative's reasons for desiring a classified pricing system, a term we use broadly to cover quantity allocation schemes as well. We will review briefly the history of the establishment of a few orders and the important role cooperatives played in that process. (We do not wish to imply that the USDA automatically accepts any and all requests for market power under marketing orders; there are examples to the contrary.) We will analyze the impact of marketing orders involving classified pricing, their impact on producer income and wealth, their social cost, and their distributional effects. We will address the argument that orders are necessary to stabilize markets. Our examples are drawn primarily from the milk and citrus industries.

A producing organization in any market would like to earn monopoly profits. In the commonly discussed case of an industry with few producers, the attempt to earn monopoly profits is manifested by quantity restriction to raise price. In contrast, since an agricultural industry is usually characterized by a large number of

*The authors are from the Federal Trade Commission, Cornell University and the U.S. Department of Justice, respectively. Alison and Robert Masson structured the arguments and supplied the citrus and milk examples. The model was developed in earlier papers by Robert Masson. Harris did the estimation of the social costs of the lemon industry.

This paper represents only our personal views. It is not intended to be, and should not be construed as, representative of the views of any other member of the Federal Trade Commission or Department of Justice staffs or of individual Federal Trade Commissioners.

producers, the likelihood is great that individual decision-makers will choose not to be bound by an agreement to restrict output. A collusive pricing scheme involving limitation of quantity will be too difficult to enforce. Moreover, the Capper-Volstead Act, which gives agricultural cooperatives some limited protection against anti-trust prosecution, does not provide immunity if a cooperative restricts the quantity produced. What an agricultural cooperative can do instead is to seek to maximize producer rents (e.g., raising land values by raising farm prices.) Rents will be higher if demand can be shifted out to a higher level. If demand is higher, both price and quantity will be higher, in contrast to the monopolistic quantity restriction case where price is higher but quantity lower. One means of effecting an upward and outward shift in demand for agricultural products is through price supports. Another way of accomplishing the equivalent of an increase in demand is through classified pricing or market allocation. Cooperatives may independently seek to segregate submarkets for their products so as to maintain a multiple price system, i.e., practice price discrimination. The price discrimination raises the average revenue, which to farmers appears as effective demand,[1] for any level of total supply. As we shall discuss, a binding cartel which government sanctions prevent from breaking down is far preferable. A marketing order is an example of such a government sanction.

PRICE DISCRIMINATION FOR RENT MAXIMIZATION

Price discrimination is a method of developing monopoly power for a group when individual producers cannot be restricted in the quantity they produce. This is the very situation in which an agricultural cooperative finds itself. (Cooperatives could restrict the quantity sold by destroying some of the quantity produced but with a few exceptions they do not.) In the absence of price discrimination, e.g., in competition, a homogenous commodity will sell for the same price regardless of the end use to which it is put. If demand curves differ in the two uses, the identity of the prices implies that marginal revenues differ between the submarkets defined by use. Therefore, for any fixed quantity, the conflict can increase total revenue by shifting some quantity out of the low marginal revenue market into the high marginal revenue market.[2] Thus with price discrimination average revenue—a weighted average of the prices charged in the separate use markets—will be higher than in the competitive situation where prices are the same in the different use markets. A higher average revenue will induce expansion of production by current producers and entry of new producers. The expanded supply will cause price to fall somewhat; the price increase caused by the introduction of the price discrimination scheme will be less in the long run than in the short run. A new long-run equilibrium will evolve. There will eventually be neither further pressure on price nor any incentive to expand the supply. This state will be reached when the short-run supply curve intersects the new average revenue curve at the same price and quantity as the long-run supply curve's intersection with the average revenue curve. The new equilibrium will be brought about by the fall in average revenue caused by an increasingly large supply. Also, the marginal cost of units of added production will generally be higher. These processes lead to a new equilibrium rather than a perpetual expansion of output. In the new equilibrium, quantity will be higher *and* price will be higher, unless the supply curve is horizontal.[3]

At the higher long-run equilibrium price specialized resources become more valuable. For example, if a particular crop can be grown only in a certain locale because of soil and climate, land value will rise as the crop's price rises. The prices of specialized inputs will be bid up as additional producers seek to enter production and as producers switch their land from other crops to this. As was explained by Ricardo in his *Principles of Political Economy and Taxation* [29], higher returns due to higher crop prices will be capitalized into the value of land and other resources in short supply. Land, fixed in supply, will accrue rents. A farmer who owns his land of course receives these rents along with earnings from his labor, entrepreneurship and owned capital equipment. The supply of some of these other resources can be expanded in a few years but not immediately. Such resources accrue "quasi-rents" for the interim period, during which prices are even higher than in the subsequent long-run equilibrium. One example is orange trees in the bearing stage; another is entrepreneurship.[4]

Free entry dictates that in the long run producers will not earn excess profits. However, producers will enjoy an increase in wealth, measured by the higher value of the productive assets they own.[5] The increased wealth will be reflected in higher income streams for those participants who own land (or other specialized inputs) at the time the regulation is put into effect. They will realize a windfall gain whenever they sell their land. The "second generation" of producers – those who purchase land after the regulation is in effect – will not gain since the price they pay for the land reflects the fully capitalized value of the benefits of the regulation. Rents will not be reflected in farm worker wages (including the implicit wage an owner-producer pays himself) since labor, even skilled labor, is not in fixed supply in the long run.

Original owners, then, benefit from the introduction of a classified pricing plan through both rents and quasi-rents. The plan would be profitable for them even if supply adjustment were sufficiently easy and equilibration sufficiently rapid that they earned no quasi-rents. Original owners still would be richer by the rents accruing to resources which are scarce even in the long run. Similarly, even if no resources were truly scarce in the long run and owners earned no rents, the program would benefit them as long as they earned quasi-rents for some time. Therefore, even if the long-run supply curve were horizontal and the long-run equilibrium price were equal to the price prevailing before classified pricing, producers would still choose to institute such a scheme because of benefits to be gained for a limited period. However, even though the benefits accruing to farmers from instituting a classified pricing scheme may be transitory, the social costs and high consumer prices become embedded in perpetuity and are not similarly eroded. We elaborate this argument below.

EARLY CLASSIFIED PRICING BY MILK AND CITRUS COOPERATIVES

The introduction of classified pricing, or price discrimination, benefits producers. Recognizing this, cooperatives started in the early 20th Century to implement classified pricing programs. Two examples are the milk and Western citrus industries.[6]

Before the Second World War, milk markets were geographically very narrow due both to high transport costs and to poor sanitary conditions prior to the introduction of general refrigeration and pasteurization practices. The localization of markets was reflected in monopsony power by distributors in some of the milk markets. In response, farmers joined together into bargaining cooperatives to establish market power. This bargaining power at first aimed at charging a high flat price for milk. The flat pricing structure was, however, highly unstable particularly after milk production started to rise in response to higher prices. The market power alternative was classified pricing. Although classified pricing initially appeared in some markets starting about 1898, the first full-scale successful classified pricing scheme started in the Boston milk market in 1918. By 1929 there were at least 15 milk markets with classified pricing, and by 1933, the first year of government-sanctioned pricing programs, the number had risen to 30. The ability to charge classified prices was clearly associated with the existence of sizable bargaining co-ops, not atomistic markets [11, Chapter 2].

The dominant cooperative in the Western citrus industry during the 1920's and 1930's was the predecessor of Sunkist Growers, Inc., then named the California Fruit Growers Exchange. Its market share in lemons was around 90 percent in the 1920's. The Exchange system worked by allocating fruit between two markets, the fresh market and the processing market. This created a classified pricing system in effect, since the object and the effect was to make the price for fresh fruit diverge from the price for processing fruit. In about 1923, the Exchange established an informal prorate system for lemons which regulated fresh lemon shipments from week to week. Shippers agreed to ship the amount of fresh lemons assigned to them in each week. After about 10 years of regulating the timing of total co-op lemon shipments the cooperative began also to require diversion of some lemons to processing plants in order to restrict total annual fresh lemon sales. This was the real beginning of the classified marketing system in lemons. By diverting some lemons from the fresh market into the processing market, the fresh market price was raised and overall grower returns were increased [30, p. 37; 36, p. 16; 31, p. 576].

These examples show cooperatives undertaking their own private classified pricing schemes. But whenever a group attempts to exercise market power, it must face the problem of "free riders." Free riders are sellers outside the cartel who take advantage of the cartel's activities without bearing any of the costs. In the case of classified pricing, the cooperative elevates the price in the one market (and thereby the average price over all markets) at the cost of restricting the quantity in that market and having to sell a greater quantity in a lower price market. Every producer individually would like to have all other industry members restrict sales to raise price in one market while he takes advantage of their restraint and sells all his output in that high price market. This hurts the cooperative's efforts in two ways. First, it lowers the price in the high price market by increasing the supply sold there. Second, and this is unique to cooperatives, as cooperative members defect in order to free ride, the total quantity and market share controlled by the cooperative declines, making it progressively more difficult and costly for the co-op to achieve the same price results in the selected market. The co-op has to face the likelihood that all non-co-op output will be directed to the high-price market. Therefore, to achieve any given price in this market with its depleted market share, the co-op must withhold a continually greater proportion of total crop from the restricted market. This, of course, further widens the gap between the returns available to free riders and to the members of the co-op, thus accelerating the defection trend. The incentive for free riding increases as a higher proportion of total output is diverted by the co-op to the secondary market. The greater the total output, the greater the proportion that will have to be diverted to maintain a given level of returns. Prevention of free riding, both by co-op members who defect and by additional producers who enter the industry under the price umbrella maintained by the co-op, is a primary goal of the cooperative.

Sunkist's experience with its voluntary prorate shows clearly a cooperative's troubles with free riding. Non-members had a marketing advantage because they did not have to bear a proportional share of the diversion of lemons to processing, where returns were lower. As the proportion of crop diverted by the co-op to the low-return market grew, so did the non-members' relative advantage. Average industry returns were raised by the prorate. This (along with other factors, including demand increases) induced expanded production; total output rose from about 10 million cartons in the early 1920's to about 25 million cartons by about 1940. The larger crop led the Exchange to divert more and more lemons to processing to maintain its returns. The proportion diverted rose from about 10 percent of the total crop in the early 1920's to about 20 percent by the late 1930's. By 1940 diversions were up to 32 percent. The Exchange's market share consequently fell from a high of 92 percent in 1939 to 82 percent in 1941 [30, Appendix tables 2, 3, 4; 31].

INSTITUTION OF GOVERNMENTALLY-ENFORCED CLASSIFIED PRICING

Cooperatives have tried private policing to discourage free riding. Economic predation and outright violence have both occurred in the milk industry. A more thorough, less costly, and legal means of preventing free riders is the invocation of governmental regulation. The police power of the state is used to enforce the coherence of an industry cartel. This is what the milk and Western citrus cooperatives sought in the form of marketing orders made possible under legislation of the 1930's.

The 1930's Depression and the subsequent collapse of milk prices led to strong pressures on milk cooperatives' classified pricing. Cooperatives pushed for farm legislation to help maintain their positions. In 1933, the Agricultural Adjustment Act was passed. The act had broad provisions giving the Secretary of Agriculture wide latitude in employing methods to help farmers. This broad discretionary power partially reflected the lack of consensus between co-ops at the time.

The first official, federally mandated classified pricing occurred as a result of the actions of PMA, the dominant milk co-op in the Chicago market. PMA, along with the milk dealers in Chicago, worked out a classified pricing scheme for approval by the Secretary of Agriculture and submitted it to the Secretary on the day the 1933 Act was passed. In a period of days the Secretary had approved PMA's "marketing license," which established classified pricing and which was binding on both members and non-members. PMA's Chicago license was the basic model for most of the 14 other milk licenses granted by the end of 1933 [2].

Through the 1930's the Act ran through several legal battles. Parts of the 1933 Act were voided. Subsequently the Agricultural Marketing Agreement Act of 1937 was passed, in which the federal legislative basis for classified pricing was solidified.

The development of the milk orders was unique in that there were many orders, each with different provisions reflecting the different marketing conditions in the different markets. However, one of the primary "marketing conditions" in any market is whether there is a dominant co-op, and what the interests of the co-op are. As a procedural matter, the USDA seldom if ever initiates an order hearing. It does permit or encourage the dominant co-op to submit a proposal for regulation (MAP 1976). The resulting regulation is likely to reflect closely the goals of the co-op, even though the USDA may modify some provisions rather than rubber-stamp every proposal.

Federal milk orders currently cover about two-thirds of total U.S. Grade A milk production. Federal and state orders combined cover virtually all Grade A milk in the U.S. Both state and federal milk orders use classified pricing. The mechanism utilized by the federal orders essentially sets the price for Class I milk (for fluid uses) at a fixed differential above the Class II price (milk for manufacturing uses, such as butter and cheese.) The Class II price is established by reference to an open market for manufacturing milk in the northern Minnesota-Wisconsin area, with government purchases used to support this price at a minimum level specified by Congress. Dairy farmers are paid a "blend price," which is an average of the Class I and Class II prices in the particular marketing order, weighted by the overall proportional class utilizations in that order.[7]

Similarly, the Exchange/Sunkist sought a federal marketing order for lemons. As the President of the Exchange said in 1938:

> As long as only 20 percent of the crop had to be sent to products, Exchange growers could carry the whole load . . . The time has come when Exchange growers cannot continue to take the entire burden. The surplus has become too large.[8]

In 1941 the federal lemon marketing order was instituted. It essentially converted the Exchange's voluntary prorate system into a program legally binding on the whole industry. The Exchange's market share of over 80 percent gave it voting control over the form of the regulation (subject to approval of the Secretary of Agriculture). After the burden of the prorate was spread to the whole industry, the Exchange's market share rebounded to 87 percent and remained stable for some time [30].

The regulatory history was different in oranges. The Exchange had a lower market share—nearer 70 percent—and could not operate a stringent prorate on its own. The Exchange did persuade other industry members to join in a voluntary industry-wide prorate system in 1932 and 1933. The cooperative sought a governmentally sanctioned program, first under state and then under federal legislation. A federal marketing order for Western oranges went into effect in 1942, making the system desired by the Exchange compulsory for the whole industry. The second cooperative (Mutual Orange Distributors, now Pure Gold) opposed the compulsory diversion formalized by the prorate, and some independent marketers also opposed the order. Again, the Exchange's 70 percent market share was enough to guarantee a positive result in the grower referendum [30, Appendix tables 2 and 3].

There is no doubt that the intended purpose of both the milk and the citrus orders is to increase rents for producer-owners. Indeed, in a 1937 USDA publication, Gaumnitz and Reed explicitly analyzed the cooperative rent maximization process which was only then evolving into a system of milk orders.[9] Although dairy farm rents are raised substantially by the classified pricing regulation, rents are not maximized; the USDA has elected to hold price levels below the rent maximizing levels. This can be inferred from the estimated elasticities of demand for Class I and Class II-III milk.[10] Demand for Class I milk is inelastic and Class I revenues could be increased further by raising the Class I price and selling less milk for fluid use; Class II demand is elastic and revenues could be increased further by lowering that price and selling more in that market. Thus at current supply levels total revenue could be increased by shifting additional milk from Class I to Class II usage. That the USDA has set the Class I price such that demand, at that price, is inelastic indicates a policy of holding down the price for fluid milk and a deliberate choice of not maximizing rents.

The citrus orders, on the other hand, appear to be operated closer to the rent-maximizing solution. Certainly statements by the industry committees are explicit about the purpose. For example, the 1969-1970 annual report of the Valencia Orange Administrative Committee states:

> Valencia Order No. 908 as amended, like all marketing orders wherein supplies are regulated, is designed to aid growers in achieving maximum returns . . . The basic means used to aid in maximizing returns is control of the volume of fresh orange shipped weekly.[11]

A very clear statement of the procedure for maximizing returns is found in a written presentation by the California-Arizona Citrus League (CACL) to the Cost of Living Council in February 1974 on the operation of the Navel Orange Marketing Order:

> There has been developed through study of economic analysis of 17 years of navel marketing results, a regression equation which forecasts with remarkable and proven accuracy the level of regulated shipments which will produce the maximum on-tree dollars for a given crop with a table of numbers, derived from the estimated demand curves.

The statement goes on to demonstrate how an analyst chooses the quantity to maximize estimated total revenue. The method is equivalent in its effect to finding the quantities for the various submarkets at which marginal revenues are equilibrated.[12]

Further, preliminary estimates of demand for fresh lemons and for lemon products[13] indicate that the elasticities of demand at the prevailing prices—reflecting quantity allocation decisions of the industry committee—are consistent with the revenue maximization hypothesis; that is, marginal revenues are (approximately) equated.[14]

SOCIAL COSTS OF CLASSIFIED PRICING

For producers, the short-term purpose and apparent effect of classified pricing is to increase their returns. But a broader assessment of the orders' effects leads us to the conclusion that the social costs of the orders are great.

A neoclassical model of classified pricing indicates three major costs of regulation: the costs of running the system, the cost due to misallocation between markets, and the costs of induced excess production. To show this, we extend the model used by Gaumnitz and Reed [11] and develop it in two stages. Our second figure below will represent their model exactly except that our secondary market (processed products) demand curve is not infinitely elastic. Also, we interpret not only the area of economic rent but the social cost areas as well. They also represent the full monopoly solution (i.e., the farmer income/rent-maximizing solution) whereas we show one solution (only) where rents are not fully maximized. Our solution shows how to derive the appropriate social cost estimates whether or not the system is administered to maximize rents, by estimating prices, quantities, and elasticities.

We assume that raw product demand for Class I use (e.g., fluid milk or fresh citrus) is inelastic, and for processed use it is elastic. [15] We first show a solution where supply is perfectly inelastic. To avoid complex modeling, we assume that the order determines a Class I price and lets the Class II price for processing be market-determined. [16] The model thus becomes representative of a snapshot of equilibrium at a point in time. There is no loss of generality in this method of analyzing long-run static equilibria. [17]

Farmers receive a blend price based on averaging total receipts over the total supply. This price, P_b, is shown as a function of total quantity by the curve showing average revenue (AR) to the farmer. It is defined as:

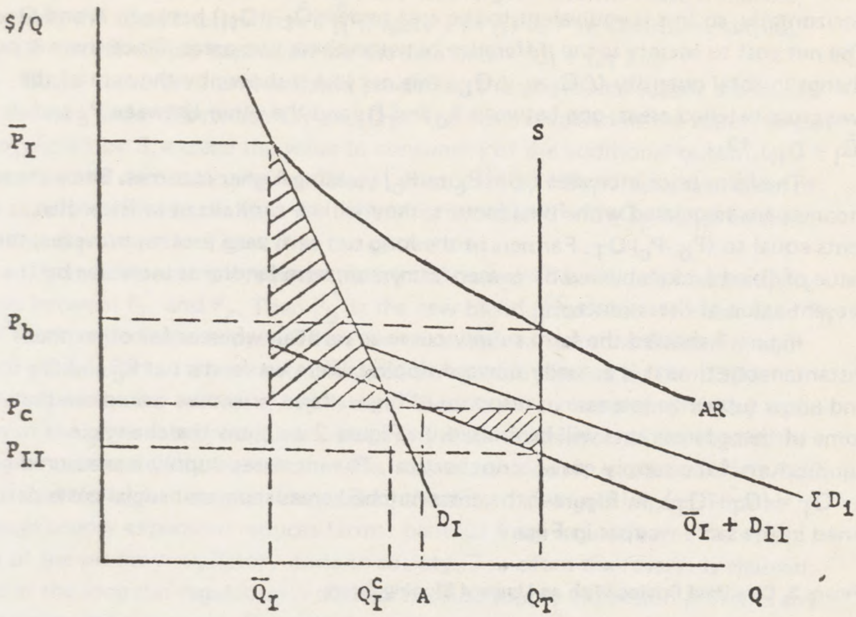
$$P_b = \frac{\bar{P}_I \bar{Q}_I + P_{II} Q_{II}}{Q_T}$$

where: P_i is the i^{th} use class' price. The bar over P_I indicates that it is fixed by regulation or (as in citrus) is determined by a fixed $\bar{Q}_I$.

Q_i is the i^{th} use class' quantity. The bar over Q_I indicates that $\bar{P}_I$ determines Q_I or (as in citrus) is set directly by regulation.

Q_T is the total quantity, which is equal to $(\bar{Q}_I + Q_{II})$.

Figure 1. Classified Pricing With Perfectly Inelastic Supply



The curve ΣD_i shows the total demand curve in a competitive equilibrium, the sum of the Class I (D_I) and Class II (D_{II}) demands. The curve ($\bar{Q}_I + D_{II}$) shows the price paid by buyers for all units in excess of $\bar{Q}_I$. Competitive Q_I is Q_I^c. Point A is derived by construction on the $\bar{Q}_I + D_{II}$ demand curve so that $(A - \bar{Q}_I)$ represents the competitive Q_{II}, at the competitive price, P_c. Thus the regulation-induced change in the Class I quantity is $\Delta Q_I = (\bar{Q}_I - Q_I^c)$ and the change in the Class II quantity is $\Delta Q_{II} = (Q_T - A)$. Obviously $\Delta Q_I = -\Delta Q_{II}$.

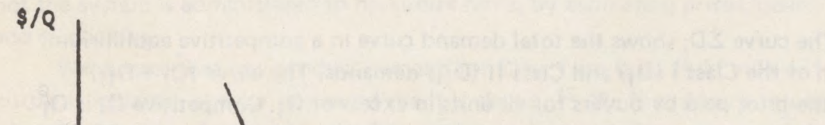
We begin by calculating the total welfare effect of classified pricing and then break it into its consumer and producer components.[18] For the calculation of total (net) social cost we eliminate transfers from one group to another; distributional effects are an important but separate issue, discussed in Section VIII below. Transfers arise in two ways in the current analysis. One type of transfer is between producers and consumers. (In fact, the use of a vertical supply curve means that the only way the production sector enters the social analysis is by receiving transfers since the introduction of price discrimination leads to no change in output and thus no change in production cost.) Transfers will also occur between Class I and Class II consumers. To set aside for now the issue of all transfers, we suggest a simplifying assumption equivalent to the following scenario. Let all transactions take place in a competitive market and then by fiat declare that Class I purchasers must relinquish ΔQ_I and give this amount to Class II purchasers. This assumption preserves all real effects although transfers are not accounted for.

The reduced consumption of Class I product causes consumer surplus losses of the area under D_I between $\bar{Q}_I^{c}$. The benefit to consumers from expanded Class II consumption is the areas under the Class II demand curve between the initial and final Class II quantities. In our graph the Class II demand curve has been shifted horizontally, so this is equivalent to the area under $(\bar{Q}_I + D_{II})$ between A and Q_T. The net cost to society is the difference between these two areas. Since there is no change in total quantity $(\Delta Q_I = - \Delta Q_{II})$ this net loss is shown by the sum of the two cross-hatched areas, one between P_c and D_I and the other between P_c and $(\bar{Q}_I + D_{II})$.[19]

The farm price increases from P_c to P_b, yielding higher incomes. Since these incomes are associated with fixed factors, they will be capitalized as Ricardian rents equal to $(P_b - P_c)\, Q_T$. Farmers in the long run earn zero profits; however, the value of fixed factors owned by owner-farmers or farm landlords increases by the present value of these rents.[20]

Figure 1 showed the farm supply curve as vertical, whereas for other than instantaneous time it is actually upward sloping. Were we to start at P_c and Q_T and allow supply to increase in response to higher farm prices we would see that some of these farm rents will be eroded. In Figure 2 we show the change in equilibrium if the supply curve is not vertical. The increased supply is measured by $Q_T = (Q_T - Q_T)$. In Figure 2 the cross-hatched areas represent social costs defined in the same way, as in Figure 1.

Figure 2. Classified Pricing With an Upward Sloping Curve



Again, to calculate directly all social costs net of transfers, we assume the same scenario. A supply expansion of $Q_T = Q_T - Q_T$ is declared by fiat with the additional supply being given to Class II consumers.

By assumption, all of the increased supply goes into the Class II market, dropping the Class II price from P_{II}^{0} (Figure 1's P_{II}) to P'_{II}. Consumer surplus gains from the supply expansion are the area under $(\bar{Q}_I + Q_T$ and $Q_T^{'}$. Social resources (farm costs) in producing this additional supply are shown by the area under S between Q_T and $Q_T^{'}$. The costs involved in the supply expansion, shown by S, exceed the value to consumers of the additional output, as shown by the demand curve for Class II products $(\bar{Q}_I + D_{II})$. Net social costs of the supply expansion are thus the difference between S and $(\bar{Q}_I + D_{II})$ between Q_T and $Q_T^{'}$ shown in Figure 2 as the dotted area.

Farm rents now are represented by the trapezoid to the left of the supply curve between $P_b^{'}$ and P_c. Then $P_b^{'}$ is the new blend price which is lower than P_b due to expanded total supply. These are rents derived from the Gaumnitz and Reed model. Part of these rents are taxed away from farmers by the USDA to help pay for the system of regulation. These taxes are supplemented by a portion of the general tax revenues to pay for the administration of the regulatory programs. It can easily be seen that the more elastic supply is, the lower are farm rents and the higher are social costs (i.e., the dotted area gets larger.) Thus although supply expansion reduces farmer benefits from regulation, it increases one of the primary regulatory costs to society. Too often the reverse is claimed: that in the long run regulation is costless because supply expansion prevents any permanent price increase. Resource waste due to overproduction should not be set aside so lightly.

ESTIMATING THE SOCIAL COST OF REGULATION

We have estimated these social costs for the milk and lemon industries. The methodology used in deriving the deadweight loss and producer rent estimates is presented in the Appendix and for the milk estimates in fuller detail in Ippolito and Masson [18].

The cost of administering these regulations is substantial. For the administration of the state and federal milk orders, for example, farmers are assessed about $.04 per hundredweight of milk. Based on this figure, total operating expenses are about $34 million a year. In addition, there are governmental administrative costs, such as for most of the USDA's Dairy Division and parts of the Economic Research Service, paid out of general revenues; the cost of lobbying to influence the system; and private costs of proving compliance. The citrus orders similarly are costly to operate. For example, lemon growers were assessed in 1973-74 $.023 per carton of lemons subject to regulation; the total operating fund was about $284,000.[21] Here too the figure does not include expenditures out of the general revenues such as the cost of the USDA administrators' time.

The wide divergence of the Class I and Class II prices is in itself clear evidence of significant social cost due to misallocation between uses. Price divergence is evidence of misallocation only if the product in the various uses is homogeneous. Some lemons used in processing are clearly inappropriate for fresh shipment and would sell for a lower price. However, we believe that even more than the marginal units sent to the fresh market or to processing are homogeneous:

that some fresh-quality lemons are used in processing. Since prices are set by marginal conditions the divergence of prices is evidence of misallocation. In the upper Midwest in 1973 regulated Class I milk prices were about $1.26 per hundredweight above the Class II price of about $6.15. The difference between these prices increased considerably with distance from the upper Midwest (in the area east of the Rockies). In lemons the (equivalent on-tree) fresh prices received by growers were $5.30 and $7.31 per carton for the 1972-73 and 1973-74 growing seasons. These were considerably above the prices for processing fruit of $0.72 and $0.70.[22]

There is also social loss due to overexpansion of output in response to the inflated blend price. The additional production goes mostly into the secondary use —butter and cheese for milk, juice and peel products for citrus. As noted, the costs of overproduction reflect the excess of marginal production cost over the marginal value (price) of the product. That these industries are indeed characterized by overproduction is indicated by the industries' own terms for product allocated to the secondary market. Class II use of milk is termed "surplus disposal." Citrus industry statements have frequently described fruit destined for processing as "eliminated fruit." For example, in 1971, 27 percent of the total cranberry crop was either dumped, used for charity, used for experimental purposes, not utilized or set aside under provisions of the Cranberry Marketing Order [35]. The apparent magnitude of the excess production is increased as the price discrimination program dumps a supracompetitive quantity ($Q_T' - Q_T$ in figure 2) into the secondary market.

THE ESTIMATES

By using estimates of supply and demand curves we can calculate the rent and social cost effects of a classified pricing system as represented graphically in Figure 2. Calculation of the deadweight social losses due to both misallocation and overproduction yields estimates of $26 million per year in the milk market and $2 million per year in the lemon markets. When we add in the direct costs of operating the regulations, we estimate total social costs to be about $60 million per year for all regulated milk markets and $2.3 million per year in lemons. (The social cost of the milk price support program would be in addition. These estimates were based on a year (1973) when price support purchases were low. In other years the cost of the federal order system also includes the social cost of the additional burden of the price support system caused by induced overproduction.) We have not estimated social costs for the much larger Western orange industry which is subject to comparable regulation.

We have also estimated the rents farmers receive because of these programs. The estimate of deadweight loss in the milk markets is associated with an estimate of Grade A producer rents transferred from consumers on the order of roughly $200 million per annum. (Of course, total *consumer* costs are equal to the sum of these rents plus the deadweight losses.) For an idea of how this translates into farm returns, we can divide the total by the number of farms. This yields an estimate of about $750 per farm per year. To get a rough idea of the distribution of returns, we can divide the total by the number of cows in the United States, arriving at a figure of $16.50 per cow. Thus a thirty-head farm would receive about $500 per year and a one hundred-head farm about $1,650 per year.

We consider these estimates to be conservative in view of the conservatively biased assumptions made in the course of the estimating process. For instance, Class I and Class II prices are assumed to come close to convergence in the upper Midwest but for outlying surplus production areas the assumption is maintained that their Class I prices will still be equal to the upper Midwest price plus freight, and well above the Class II price. If in fact outlying areas continue to produce milk in excess of Class I needs, and some can be expected to do so, their Class I and Class II prices would be expected to move even closer together, and our methodology underestimates the true decline in the Class I price there. The methodology is more fully discussed in Ippolito and Masson [18].

For lemons, estimates of the long-run supply function are crude at best. (See Appendix.) For this reason we present our social cost estimates for a wide range of supply elasticities. Differences in supply elasticity turn out to have little impact on the magnitude of social costs, but estimates of rents are highly sensitive to the supply elasticity. The cause, as discussed above, is that social costs are imbedded in the pricing system whereas rents can be eroded by supply expansion. In the following table we present our estimates of social costs, total farm rents, and rents per acre of lemon-producing land using four different assumed elasticities of supply.

Table 1. Social Costs and Private Benefits of Lemon Regulation

Supply Elasticity	Total Consumer Costs	Total Farm Rents	Farm Rents Per Acre	Deadweight Social Costs
	(Million)	(Million)		(Million)
0.5	$6.2	$4.2	$62.95	$1.99
1.0	4.6	2.5	37.12	2.07
2.0	3.5	1.4	20.80	2.13
4.0	3.0	.8	11.53	2.17

Deadweight social costs are equal to total consumer costs less the partially offsetting gain of farmers. Our estimates also demonstrate the proposition stated above, that the more elastic the supply curve, the lower the farm rents and the greater the social costs.

From the theoretical model we can see that regulation-induced supply expansion is socially costly. In theory this means that if the order in some way builds in a restriction on supply expansion, the social costs of the system may be lower and farm rents greater. However, supply restrictions may raise social costs if they deter efficiency improvements. In particular, if output or marketing rights are tied to individual farms or acres, production is prevented from shifting to new areas should technology or the relative prices of inputs change. For example, the cranberry marketing order permits a grower to sell a percentage of his production on specified acres during an historical base period; increased yields and new bogs are thereby discouraged. [23] One effect is to hinder any shift of production from

Massachusetts to Wisconsin despite the fact that yields in Wisconsin are now potentially much higher. If quotas are not fully fungible and are instead tied to specific areas of land, production may not be channeled to more efficient land and the industry may be kept on a supply curve to the left of what is really possible. Even if the acreage regulations reduce social costs by diminishing the extent of overproduction the order would otherwise induce, they may also raise production costs enough to possibly offset the other gain.

DISTRIBUTION OF BENEFITS

The net effect of the milk and Western citrus marketing orders is negative for the economy as a whole. Gainers do not gain enough to offset the losses of the losers and therefore could not compensate the losers and still come out ahead. Public policy often is (and should be) concerned with the redistribution of benefits among participants in the economy. We therefore identify gainers and losers under these marketing orders and conclude that the pattern of distribution of benefits is contrary to goals expressed in much public policy, even perhaps the goals enunciated by Congress in AMAA.[24] The goals we have in mind are benefitting people with lower incomes and of aiding the small family farm in particular.

Producers gain at a cost to consumers. The size of the transfer from milk consumers to milk producers is estimated to be about $200 million per year, due to the classified pricing system alone.[25] Transfer of money from lemon consumers to help lemon growers also exceeds the rents earned by the growers.

Enhancement of farmers' income—which may instead be reflected in the capitalized value of farm assets—was an explicit goal of the AMAA and of much American agricultural policy. The overall purpose of raising farmers' incomes invites closer examination. During the 1930's, the economic position of farmers was especially bad. Since the AMAA was passed before the growth of very large corporate farming enterprises, Congress may have intended to help the small family farmer whose income was well below his urban counterpart's and to assure him a living income. During the 1950's these programs probably transferred income from consumers with generally higher incomes to producers with generally lower incomes. As recently as the late 1950's farm per capita income was only 50 percent of its urban counterpart. But it was improbable that farm incomes would remain substantially below urban incomes forever. Younger people making career choices have tended to move into occupations more lucrative than farming. As a consequence, the age distribution of farmers became weighted toward older ages (a trend only reversed in the last few years). As the older farmers who had been tied to the land continued to retire and were not replaced by young farmers, farm income started to rise relative to urban income. In the 1970's, per capita net farm income from all sources has nearly reached the level of urban income. It even exceeded the urban average in 1973.[26]

Currently classified pricing has the probable effect of taxing lower income people and subsidizing higher income people. First, the program effectively imposes a regressive tax on consumers, and, second, it benefits large farmers more than small farmers.

The income elasticity for fluid milk is low. For example the average expenditure on fluid milk of a family with an income of over $15,000 is only about two and a half times that of a family with income under $4,000 [4]. The average income of this higher income group is assuredly more than four times that of the lower group, but their milk consumption is only 2-1/2 times greater. In fact, there is evidence which seems to indicate that families with incomes around $16,700 tend to consume more milk than do similar families with yet higher incomes [32]. This means that poorer families pay a higher share of their income into the milk subsidies. If farmers' incomes were equal to the national average, then in terms of percentage of income the subsidy dollars would be putting the heaviest burden on people who on average are poorer than the recipients of the subsidy. And farm incomes are now nearly equal to urban incomes.

Do poorer consumers receive a disproportionate share of the benefit of lowered prices for manufactured milk products? This might offset some of the regressivity of the fluid milk "tax." But the evidence does not support this. According to Thraen and Buxton, the income elasticity for fluid milk is above the income elasticities of only a few of the twelve Class II products studied—for some ice creams, processed cheese, and canned milk. Buxton [4] shows the average family income of fluid milk consumers to be about equal to that of products consumers and that high Class I users are high Class II users.

Consumers are "taxed" regressively but the average farm income is still somewhat lower than the average urban income. We cannot conclude from these contradictory influences that subsidy dollars flow from poorer to richer until we recognize that the larger the farm (i.e., the greater a farmer's wealth), the more subsidy dollars the farmer receives. (Any increasing returns to scale magnify this effect in terms of net income.) The orders raise farm incomes by raising price. Therefore, the larger the quantity of output a farmer sells, the larger his benefit from the order. In general, if a farmer whose total dollar *sales* are $5,000 per year has his income augmented by $100, a farmer with sales of $100,000 will have his income augmented by about $2,000, and one with $500,000 will receive $10,000.

About 3 percent of total dairy farmers account for about 25 percent of total dairy output and thus receive about 25 percent of the subsidy dollars. [27] Whereas the most affluent 15 percent of dairy farmers receive about one-half the subsidy dollars, the most affluent 15 percent of the population pay only about 20 percent of the total burden.[28] And just as striking, the 45 percent smallest farms receive no more than 6 percent of the subsidy whereas the 48 percent poorest families pay 37 percent of these subsidy dollars. Thus, not only is the tax on the consumer regressive, but the benefits to farmers generally are captured by the more affluent farmers with incomes that exceed the national average.

Even if average farm income were only 70 percent of average urban income, the less affluent would be subsidizing the more affluent. In this case the poorest 45 percent of farmers would be as poor as about the poorest 30 percent of consumers. These farmers would be receiving 6 percent of the subsidy dollars, and these consumers alone would be paying closer to 19 percent of these dollars. [29] These consumers transfer income to farmers poorer than themselves but also to farmers better off. On the other end of the income distribution, the results are equally pronounced. Rich consumers pay little if any more than middle-income consumers, but the bulk of the subsidy dollars go to the richest (i.e., largest) farmers.

The distribution of dairy farm sizes may also be utilized to approximate how many subsidy dollars went to which group of farms. Buxton [4] estimates that if the fluid differential in the U.S. were lowered it would cost on average about $309 per year per farmer. If this can be used as a measure of subsidy per farm, then it can be seen that the most affluent 3.3 percent of farms receive a subsidy of about $2,230 per farm per annum, the next most affluent 12.2 percent receive about $678, and the smallest 44.8 percent receive only about $47 each.[30] At an interest rate of ten percent, applying the consol bond formula, the value of the 3.3 percent largest farms was enhanced by $22,300 and the value of the 45 percent smallest farms only $470. Also, these calculations are in terms of farms, not farmers. About 25 percent of dairy farm land is operated by non-owner farmers. The non-owning farmer will not benefit from the subsidy dollars. Because the subsidy makes dairy land more profitable, the landlords will receive the benefits of this from the subsidy through higher rents. Of the 25 percent of dairy land which is rented, almost all (90 percent) is not owned by farmers of any sort. Hence, potentially 22.5 percent (i.e., 25 percent of value times 90 percent non-farm owners) of the subsidy dollars do not even go to farmers.

One other effect which accentuates the overall result is the fact that another group of farmers, Grade B (or "ungraded") milk farmers, are hurt by the system. These are farmers who produce milk for manufacturing purposes only. Since the system creates a surplus of Grade A milk then used for manufacturing, the Grade B price is suppressed. Ippolito and Masson estimate Grade B farmers have had their prices suppressed by 40¢ per hundredweight by the regulations. And in general the Grade B farmer is on average poorer than his Grade A counterpart.

In sum, the system taxes poorer consumers proportionally more than richer consumers. The subsidy is paid more to richer farmers and non-owner landowners than to poorer farmers. Grade B farmers who are often relatively poor farmers are hurt by the system. A few decades ago, taking money from consumers and distributing the proceeds to practically any group of farmers resulted in the more affluent subsidizing the less affluent. But today, the system basically taxes those who are, on average, poorer to subsidize those who are, on average, richer. Given the regressiveness of the tax and the progressiveness of the subsidy, this conclusion would still be valid even if farmer income were lower than the national average.

USING ORDERS TO GAIN AT THE EXPENSE OF OTHER FARMERS[31]

Milk orders have often been used to protect one group of farmers from competition. The Lehigh Valley case struck down some codified protections by which co-ops were legally protected from "outside" competition. Other provisions still stand that ease marketing by a dominant co-op relative to independent competitors. Co-ops often have advantageous pooling provisions, because of regulation, suggested by them and codified by the USDA. For instance, in order for all of a handler's milk to qualify to receive the blend price, a certain proportion must be delivered to fluid bottlers. The minimum proportion is often lower for cooperatives than for proprietary handlers.

Co-ops have also manipulated the system to their private advantage. Milk pooling provisions intended to minimize noneconomic milk shipments were so utilized many times in the late 1960's and early 1970's. For instance, AMPI pooled on the Oklahoma milk order millions of pounds of Alma, Wisconsin milk which never left Wisconsin. The effect of this pooling was to drive down blend prices, hurt the incomes of non-members, and force the majority of these non-members out of the market. The evidence underlying these allegations is to be found in the economic report filed by the Justice Department in its case against AMPI [8]. By 1971 the USDA had compiled a listing of these manipulative cooperative actions and it took actions to ameliorate the problem by changing pooling provisions. They discovered at least one instance where AMPI, having to ship milk for pooling to drive down the blend price, did not even ship the milk. Instead AMPI simply reported the milk as shipped. Even these USDA actions did not stop this "pool loading." The South Texas pool was still being loaded in 1974 just prior to the consent decree signed between AMPI and the Department of Justice. In the case of the South Texas pool loading, milk could be pooled on South Texas or North Texas simply by the changing of a computer program in one AMPI plant. AMPI arranged this computer program to pool milk on South Texas where it faced strong competition. This manipulation of computer cards is alleged to have cost AMPI more than $25,000 in most of the months between 1971 and 1974, but it made its South Texas competition pay dearly. These shifting poolings cost non-AMPI members money and created yo-yoing prices and competitive collapses hardly consistent with any concept of "orderly marketing."

Another tactic used was the voting out of orders. An AMPI predecessor voted out the Chicago order due to provisions that led to outside competition. Later a new Chicago order was devised and voted in which reduced those problems. AMPI also voted out the South Texas order, allegedly to injure a competitor. By virtue of order regulations this competitor's primary buyer would have become regulated on the North Texas order instead, damaging its competitive stance and hence its milk purchases from AMPI's competitor. Litigation led to a temporary stay of the order suspension and AMPI subsequently backed down.

Another co-op, Dairymen Inc., voted out the Mississippi federal order. Later they decided to reinstitute regulation. According to allegations of one of DI's competitors [21], DI proposed a set of new provisions which were turned down by the USDA. MAP alleges that although the USDA turned down this first proposal it then spent time and taxpayer money to negotiate a mutually acceptable proposal with DI. This in itself appears to be reasonable. MAP's allegations, however, go on to say that they too had alternative proposals, but the USDA did not take these proposals into account, did not consult with them, and despite knowing they had an alternative position left them in a position in which their proposals never saw the light of day. If, as MAP alleges, this led to DI benefiting to the detriment of MAP, there is another questionable distributive effect of the orders. USDA's decision may reflect the greatest good for the greatest number, but it may reflect a dominant co-op bias. The DI matter is still in litigation.[32]

Milk regulations have distributional implications even between regulated producers. At least, in the case of pool loading the order system was manipulated by co-ops to take money from non-member producers. The results could only be characterized as "disorderly" and "inequitable" marketing practices. The USDA did take actions to reduce the problem, but only after a few years and several farm exits or co-optings by the cooperative as the pool loading continued. Private manipulation of the public system resulted in effects we feel must be seen as inconsistent with the goals and objectives of regulation.

STABILIZATION[33]

We have analyzed classified pricing as a monopoly device and have concluded that the net social impact is negative and that the distribution of benefits may be contrary to some commonly discussed standards of equity. Proponents of marketing orders counter by saying that attendant (price) stabilization increases economic efficiency. Price fluctuations may lead to inefficiency if producers are risk-averse in that they will produce too little of a crop with highly variable returns rather than suffer large losses sometimes, even if such large losses are on average matched by large windfalls in other time periods. Despite some validity in this argument, we suggest that to some extent the claims about stabilization benefits are rote claims to make an income-enhancing program appear more politically desirable. First, not all stabilization is economically desirable; reducing predictable fluctuations will force the market away from an efficient adjustment. Second, some elements of order operations are destabilizing. Third, some opportunities to increase (desirable) stabilization are ignored in the orders. Fourth, there may be less costly ways to achieve the full social benefits of stabilization.

We do not argue that stabilization benefits are entirely absent from marketing orders and their operations. (Nor do we pretend to cover the whole range of issues about stabilization.) Rather, we wish to clear away some of the exaggerated and therefore obfuscating claims about the stabilization benefits of marketing orders.

Reduction of unpredictable price fluctuations may be socially desirable, but in general stabilization of predictable cycles is not. For example, milk production has a natural biological annual cycle (and demand cycle counter to the production cycle) such that milk supply is large in the spring and small in the fall. Oranges of a single variety all ripen during the same month and can then be stored on the tree for several months. Demand for fresh lemons is traditionally higher during the summer months. These are clear and predictable cycles. Growers and marketers can plan accordingly. Farmers equate marginal production costs of shifting output from one time to another time (e.g., by storage, by choosing a fruit variety which will mature especially early, etc.) to the price differential between these two time periods. The price differentials they face will properly account for temporal cost differences due to variations in utilization of plant capacity. Consumers likewise equate marginal rates of substitution (MRS) between the agricultural commodity and intertemporally fungible commodities (including money). An economically desirable price cycle evolves reflecting societal evaluation of the timing of supplies. The marginal rate of transformation (MRT) between time periods is equated to the MRS between time periods, by equating the price ratio between time periods to

MRT = MRS. This model presupposes perfect information and anticipations of price cycles, and perfect capital markets.[34]

Suppose it were decided to diminish the spread between the high price for milk in the fall and the low price in the spring. The fall price can be reduced only if fall production is expanded.[35] One way this can be done is by raising total supply, which will happen only in response to a higher average annual price. But divergence from the market's adaptation to seasonal cost and demand variation would push the marginal value of milk to the consumer below marginal production costs, which would rise. That is, consumers' MRS between milk and other commodities would fall while the MRT of producing milk rather than other commodities would rise. A second way to reduce price variability is to expand fall production at the cost of spring production. This will happen only if the price differential is widened—the opposite of the desired result. Again, the result is undesirable in that the MRT of spring milk for fall milk would rise above consumers' MRS. The marginal cost of fall production would exceed its marginal value while the marginal cost of spring production would fall short of its marginal value. Either of these "stabilization" schemes would cause consumer losses because of intertemporal misallocation. Producer gain would be less than consumer loss as the system diverges from the economically efficient price cycle. (A model exactly analogous to Figure 2 would demonstrate this for the use of classified pricing to alter intertemporal price relationships.)

Cycles may be predictable even as to magnitude for the industry as a whole while remaining obscure to an individual price-taking producer. Interannual industry patterns described by cobweb models may be (relatively) predictable to an outside analyst but occur because outcomes are inaccurately predicted by individual producers. Another simple example involves the regular Christmas upsurge in demand for oranges. The navel orange industry attempts through flow-to-market regulation to increase its shipments then by just the right amount. In the absence of industry-wide regulation, an individual producer too can plan to increase shipments for the predictable demand upsurge. However, he cannot predict the outcome for his own increased shipments with exactness since he does not know the shipments of his competitors. Overshipping by individuals might lead to a "glut" and the glut to subsequent market "deterioration." This can be viewed as an externality and thus there is a possibility that the market will not deal with fluctuations in an optimal manner.

Many changes have occurred since this argument for regulation was advanced and the force of the argument as applied to current conditions is considerably reduced. Individual citrus shippers are much more able to know and predict market conditions. Formerly most fresh fruit was shipped to auction and thus the price received was often a surprise. Now, however, most sales are made with a firm FOB price negotiated before the fruit is shipped. Telecommunications and more rapid transport have reduced the information lag and a great deal of current market information is made available through government and private publications. Buyers as well as sellers must have learned about generally predictable patterns, including the possibility of gluts at certain times of the year, and both have incentives to prevent such results. Buyers must wish to avoid market "deterioration" with excess fruit rotting on the display tables and may hold back on purchases accordingly. Sellers will wish to hold some fruit back rather than sell at glut-depressed prices. Given probable economies of scale in information gathering and dissemination, the presence of large (cooperative) shippers and large buyers may lead to coordination to avoid overshipments and certainly permits more rapid information flows and consequent behavioral adjustments, lessening the peril for any individual shipper. There may still be some cobweb-like overreactions set off by uncoordinated (competitive) responses to market signals but even individual price-takers will recognize repeated patterns and, given up-to-date market information, will modify their behavior somewhat.

In the dairy industry also, the causes of severe instability which gave rise to the concern and legislation of the 1920's and 1930's no longer exist to the same degree. In milk marketing, instability in that period was due in part to private monopolistic classified pricing accompanied by free riding. [25]. The cure for that is antitrust enforcement such as the recent dairy cooperative cases brought by the U.S. Department of Justice. Other preregulation problems derived from market insulation, essentially eradicated by rapid refrigerated transport, and from monopsonistic practices which farmers found difficult to resist because of the high cost of knowing the correct weights and quality of the milk they had for sale. At the least, the argument that stabilization is needed because individual producers lack market power and good information is overdrawn.

Predictable cycles and efficient markets are not incompatible. However, even predictable cycles are subject to stochastic perturbations which can give rise to inefficiencies in combination with either cobweb-like reactions or producer risk aversion. Even when regular patterns are identified (e.g., French and Bressler "The Lemon Cycle" [10]), the functions estimated by economists are averages whereas any one crop a year is subject to unpredictable influences, such as weather. For example, if capital markets do not work perfectly, an overcontraction (as in an interannual cobweb) may involve the removal of specialized assets from the industry which may be too expensive to put back in place at a later time.

Only if classified pricing counteracts unpredictable price fluctuations can its economic efficiency benefits be defended.[36] But one effect of classified pricing is that it makes a market more likely to be unstable in the face of shocks. Consider first markets which would in the absence of regulation always have some product going to the secondary market. Figures 1 and 2 show that at low prices, i.e., if some product is used in the secondary market, the average revenue curve resulting from classified pricing is "steeper" than the aggregated demand curve. Classified pricing makes the "effective demand curve" more inelastic in that price range. A shock from the supply side will cause a larger jump in price than in the absence of regulation. If the industry is subject to cobweb-like fluctuations, these will be magnified, not damped.

A second case is a market which always produces too little for the primary use. Since such a market continually has to import some fluid milk, for example, from excess production areas, this area's Class I price will be equal to the price of milk in these surplus markets plus transportation. Price fluctuations will be related to those in the surplus markets, and surplus markets' prices are less stable under regulation. For this second case too, classified pricing introduces a price destabilizing effect.

The third case is a market which would sometimes but not always produce enough product for some to go into Class II uses. Of the three cases, this one is the best candidate for stabilization policies. Without regulation, prices would fluctuate between a high import price and a low Class II price. Classified pricing may diminish price fluctuations. The goal would be to increase the likelihood of product going to Class II as well as Class I uses, i.e., to keep off the steep section of the ΣD_i curve. This requires increasing the total quantity by increasing the differential between (the expected values of) P_I and P_{II}.

But the claim for the beneficial effect of classified pricing is overdrawn. The inefficient production patterns caused by risk aversion are not cured. In order to reduce price fluctuations and consequent underproduction due to risk aversion, the market is led to higher total production (via a higher average revenue). But this reduction in risk is only partial and is not costless. Even if production is expanded to the level which risk-neutral producers would have chosen (without classified pricing), the loss due to risk aversion is not eliminated. Risk-averse producers must be paid more than risk-neutral producers for any given level of production; the same quantity of output is achieved but at higher cost.[37]

Another claim for the beneficial effect of classified pricing is overdrawn. One outcome deemed undesirable—insufficient milk for Class I uses—is unlikely in any event. The fear expressed is that very low prices in one period may lead to "over-exit" of producers and very high prices in the next period, as in a cobweb process. But as long as the system as a whole produces ample milk, any local market will be able to import enough to satisfy its fluid needs. In fact, insufficient supply is not a genuine problem; Class I utilization averaged over all federal orders was only 64 percent in 1973. It has been estimated that in the absence of regulation total production would fall, but not by so much as to cause a drastic change in average Class I utilization [18]. Therefore, even though the argument is correct that there might be greater price instability and associated economic costs in the absence of regulation *if* the system as a whole were to provide insufficient milk to satisfy fluid demand in all markets, the latter condition is not likely. The argument loses force accordingly.[38]

We have argued that in some cases marketing orders introduce a (price) destabilizing influence. In addition, order programs are not being used to stabilize as much as they could, which suggests that stabilization is a subsidiary purpose. A classified pricing scheme which is used to maximize rents in both good (small output - high price) and bad years is not being used to stabilize prices as much as possible. If rents are maximized during good years, the decline of farm income in bad years will necessarily exceed the income decline that would have occurred in a competitive market. (As explained above, this is because ΣD_i is flatter than AR.)

Even those concerns claimed to be paramount in some orders appear to take second place to other concerns. For example, the primary task of the citrus orders is supposed to be to control the weekly flow to market to prevent "gluts and famines". However, the first decision considered at the start of the season is the total "optimal" quantity to be shipped during the whole season. While the nominally most important concern—intraseasonal shipping or price patterns—is addressed, annual revenue maximization takes precedence.[39]

Finally, the full social benefits of price stabilization might well be achieved at lower cost than through marketing orders as currently operated. Because divergence from the competitive solution $P_I = P_{II}$, as under price discrimination, is socially costly, the closer a stabilizing scheme can come to equating the two prices, in an expected value sense, the greater will be the total social benefit. Setting the expected value of P_I equal to the expected value of P_{II} implies that, to stabilize prices, P_I be held above P_{II} in what would otherwise be unexpectedly low price periods and below P_{II} in what would otherwise be unexpectedly high price periods. For many agricultural commodities, with inelastic demand, an impact on price has an impact on income in the same direction. In contrast, we observe P_I held always above P_{II}. If stabilization were the goal, the income enhancing effects of the system would be used only during periods of depressed income. Instead, the goal of income enhancement is pursued continuously. Since (as shown in Figure 2) income enhancing programs for producers have a negative net social value, it is clear that stabilization alone could be achieved at lower social cost.

Secondly, even if classified pricing can be used to stabilize the third type of market discussed on page 207, the size of a $(P_I - P_{II})$ differential justifiable for stabilization purposes is limited. Any $(P_I - P_{II})$ differential greater than necessary for the stabilization is socially inefficient. The stabilization goal cannot be called on as a blanket excuse for a $(P_I - P_{II})$ differential regardless of size.

Classified pricing is not the only possibility for combatting the undesirable effects of predictable price fluctuations. The best stabilization program would be a commodities futures market or government purchase *and sale* of the product. For markets which always produce a Class II product or those which always must rely on imports from such markets, a futures market for Class II products is sufficient to achieve this goal, and futures markets for butter and frozen concentrated orange juice, for example, do exist. However, for a market which produces Class II only part of the year, a futures market for either Class I or for raw product is required to achieve stabilization. Unless government is better able to predict future equilibria than can private commodities traders, or government transactions costs are lower, a futures market will be more efficient than government intervention in that it allows farmers with different risk preferences to act differently by either transferring or accepting the transfer of risk from other farmers. A voluntary price insurance scheme could also be devised.

In general, then, we identify three patterns which would characterize any classified pricing scheme intended to stabilize a market by counteracting risk aversion or by minimizing cobweb cycles. These are:

a. No attempt to counteract the predictable elements of the natural seasonal consumer and farm price cycles.
b. Either P_I sometimes higher and sometimes lower than P_{II}, or Q_{II} actually occasionally virtually equal to zero.
c. P_I raised when there is unexpectedly large total supply or low Class I demand, and P_I lowered during periods of short supply or high Class I demand.

Since we have seldom, if ever, observed a marketing order with classified pricing which matches these conditions, we conclude that marketing orders do not have stabilization as a primary goal and are not designed for the maximum stabilizing effect. We raise one further and crucial issue about stabilization: is it desirable? We have already noted that the reduction of predictable price fluctuations is not socially beneficial. We further suggest that there is no clear evidence that counteracting random fluctuations is beneficial either. Some simple models show that with linear demand and supply functions, commodities which can be stored, and risk neutrality, price stabilization does produce a social benefit.[40] The benefit derives, however, from assuming that the government can better predict future prices than can private arbitrage. These models show, contrary to many proponents' claims, consumers are hurt by stabilization, when the disturbance is on the supply side, as is usually true in agriculture, unless producers compensate them with some of their gains. Moreover, more sophisticated models yield fewer general conclusions about total social benefit or cost, and much less about the distribution of the gains. Economic theory does not support a simple conclusion that stabilization is beneficial. Moreover, stabilization might be an additional cost because it is beneficial in counteracting the symptom of underproduction due to risk aversion, without removing the cause itself. That is, since classified pricing raises the average price received by producers and thus induces overproduction, further inducements to produce may only worsen the degree of overproduction and increase social costs.

CONCLUSION

Cooperatives were instrumental in obtaining the laws that have made federal regulation possible. They have also been instrumental in the institution and planning of the various individual orders which emerged. The classified sales systems of regulations were modeled after the actions of co-ops which attempted to use private monopoly power but were beset with competition from so called "free riders." The regulations codified market power schemes and considerably reduced the free rider problem—the forces of competition.

At the time these programs were first instituted as emergency measures during the Depression, farmers' incomes were significantly depressed and several farm markets were in turmoil. This turmoil could be reduced by fettering the forces of competition. This also led to higher farm prices, mitigating against the over exit of farmers which would have resulted in a cobweb-like dynamic overshooting problem when the Depression ended. The programs at that time and even until the 1960's generally transferred money from consumers who were on average richer to farmers who were on average poorer.

Classified sales always cause static efficiency losses. During the Depression, however, dynamic gains may have offset these losses, and the equity of transferring money from richer to poorer led to several other types of "make-work" income transfer schemes as well. The co-ops could at that time marshall powerful arguments for this type of regulation.

Since then co-ops have proposed more and more orders. Much of the Grade A milk supply was not regulated even by 1950; it is virtually all regulated today. The instability problems have been greatly reduced by improvements in production and marketing technologies. The form of regulation found today certainly establishes price differences between use class far in excess of those required for market stability and are often not even run in a fashion consistent with a stability goal. The western citrus orders are run by industry marketing committees whose statements on how they arrive at marketable quantities clearly indicate a goal of income maximizing. A program run in this fashion is inconsistent with the concept of increased stability due to regulation.

In contrast to their regulation of lemons, the USDA has not permitted Grade A milk farmers to operate close to the full monopoly power solution. But milk prices are still demonstrably above what they would be if the goal were to minimize dynamic stability problems at least cost to society from monopoly pricing.

The income levels of farmers have also been shifting over the years. Consumer subsidy dollars are generally flowing from poorer consumers to richer farmers, in sharp contrast to depression days and even up to the 1960's. Monopoly milk co-ops have emerged which, unsatisfied with the level of monopoly profits available directly through the order system, have established even higher monopoly prices and then manipulated and circumvented the intentions of order provisions to eliminate competitors. Antitrust cases and USDA actions have been partially successful in reducing or eliminating monopoly power developed by co-ops which has added to their legal monopoly power granted by cartel-like regulation. But the time has come to recognize that even regulated monopoly power is harmful and should be reduced or eliminated. Today's efficient marketing co-ops can well serve their industry and society without having to resort to either legalized regulated monopoly power or illegal private monopolization.

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NOTES

[1] The average revenue curve used in this analysis is not in all ways the same as a demand curve. As viewed by producers, however, it operates exactly like a demand curve by indicating how much total product will be purchased by consumers at any given farm price even when the price in one use market is held constant. The market equilibrium is determined by the intersection of the average revenue (effective demand) curve with the supply curve.

[2] Generally economists refer to raising price in the less elastic market and lowering it in the more elastic market to effect price discrimination. In some agricultural industries quantity cannot be restricted and therefore the relevant portion of the demand curve is not restricted to where the elasticity is equal to or greater than one. Then an ambiguity arises. It is still true that price is raised in the market which is least elastic at the competitive price. However if the monopoly equilibrium involves demand elasticities less than one, the market in which price is elevated has more elastic demand than the price-depressed market at this price discrimination equilibrium. The proof is simple. Rent maximization implies that marginal revenues be equated. Let the subscript 1 represent the less elastic market *defined at the competitive price,* i.e., at the competitive equilibrium, $n_1 < n_2$. Here and in the following proof n_1 and n_2 are defined as the absolute values of the respective demand elas-

ticities. Then the rent maximizing solution has $P_1 > P_2$ and:

$MR_1 = MR_2$, which implies that $P_1 (1-\frac{1}{n_1}) = P_2 (1-\frac{1}{n_2})$

Thus: $(1-\frac{1}{n_1}) \gtrless (1-\frac{1}{n_2})$ if and only if $(1-\frac{1}{n_i}) \lessgtr 0$

So at the monopoly equilibrium, the initially less elastic market (i.e., less elastic at competitive prices) is still the less elastic market only if both elasticities are less than one. More generally,

$n_1 \gtrless n_2$ if and only if $n_i \lessgtr 1$.

In the standard monopoly case where the monopolist can control output, monopolistic price discrimination occurs only at prices where $n_i > 0$. If in a market where total supply can be controlled demand is observed to be inelastic, it can be inferred that the price is not the monopoly price. However, in a market where quantity cannot be controlled, the full monopoly price is in some instances consistent with inelasticity in each and every use market. Some markets discussed in this paper appear to display this odd result.

3 This model of monopoly power where total supply cannot be restricted was analyzed by Gaumnitz and Reed in 1937 [11, pp. 123-126]. (See footnote 8.) This seems often to pass unrecognized as monopolistic price discrimination by some agricultural economists. For instance, in commenting on this model as applied to milk orders, Ronald Knutson [19] attacks our work by stating that it is "advocacy . . . not based on scientific procedures." The key thrust of his conclusion is that monopoly power does not exist and cannot exist because the power to control the level of production does not exist.

4 Entrepreneurial ability affects the productivity of land but returns to the two factors can be separated conceptually. Rent on land equals the difference between its value in its present use and its value in its best alternative use in the long run, e.g., its value for the best advantaged alternative owner. An owner-producer may receive, in addition to this, an interim quasi-rent (positive or negative) because the supply of entrepreneurship is not at a long-term equilibrium level.

5 Some farm lands are earning farm revenues at a rate below the normal rate of return, which they could earn if the land were developed in conjunction with expanding urbanization. Consider land that would be optimally exploited by development ten years hence. If this land were to remain fallow for that period, owning the land for speculation would be marginally profitable at some price of land, p*. If during the interim the land can be used to generate farm revenues in excess of variable costs (even if below full costs including a rate of return based on the land price paid), then the land will be worth p* plus the capitalized value of farm revenues net of variable costs. The returns to speculative land holdings are increased by regulation which raises farm product prices, and rents accrue even when the land's value is primarily based on its prospective development value.

6 Although we cite the milk and Western citrus orders in particular, numerous other federal orders similarly utilize classified pricing. In general this is accomplished through regulation of quantity. Dates, prunes, raisins, walnuts, filberts, almonds, cranberries and red tart cherries all control the allocation of the crop among submarkets although the specific devices which are used differ from order to order.

7 Variants of this basic model exist, but they all involve some such blending of returns.

8 C. C. Teague as quoted in Smith [31].

9 Noting that the industry would find it more profitable to operate with a classified pricing curve (equivalent to our average revenue curve) and that excess returns could be earned, they presented a model solved for rent maximization. However, I chose not to discuss the rent-maximizing solution fully because they believed that the USDA would not allow "arbitrary pricing," i.e., prices set to raise rents rather than just high enough to satisfy peak daily and seasonal demands. "Arbitrary" prices were defined as any prices which yielded a supply in any market in excess of peak seasonal and daily demand, for example, an excess of Grade A milk above the level used for Class I purposes. They believed that no monopolistic exploitation would in fact occur because higher prices would lead to increased production ". . . making it necessary [for the USDA] to adjust prices so that the arbitrary element is removed." Their conclusion that classified pricing would not lead to monopoly costs rests not on market processes but relies rather on appropriate policy decisions.

10 Class II-III demand for the regulated orders is elastic partly due to the supply response of unregulated Grade B milk such that total supply of milk for manufacturing uses is relatively large. The demand for regulated Class II milk is determined by the total demand for manufactured milk products minus the portion of that demand fulfilled by Grade B supplies. A change in the price of Class II milk induces a change in the quantity of Grade B milk produced in the following way. When the Class II price is increased, total consumption of manufactured milk products falls. This consumption response decreases the quantity demanded of Grade B milk at any price, and Grade B milk production falls by an amount determined by the Grade B supply curve. (See also the Appendix.)

11 As quoted in A. Masson [22]. Perhaps in response to consumer activism, by 1971-72 the wording of the objectives had been changed: "the orderly marketing of Valencia oranges, consistent with the best interests of producers and consumers alike" was the newly stated objective. Note as well that the Committee states this as the primary objective of all orders which have supply restrictions.

12 The material in this paragraph comes from A. Masson [22]. CACL is an industry-wide trade association which operates in close conjunction with Sunkist and Sunkist personnel.

13 See Appendix.

14 The estimates are reproduced in the Appendix. They are consistent also with a policy which falls slightly short of rent maximization but are far from consistent with the competitive outcome.

15 The same analysis applied for inelastic Class II demand, as in lemons, or even when the secondary market is product disposal, as in cranberries and the now extinct California Peach Order.

16 If the price is influenced by support purchases, the Class II demand may be effectively infinitely elastic. Our model is more general than this, with the infinite elasticity solution a special case.

17 The average revenue curve depicted would not remain invariant to supply shifts. As total quantity changes, the Class I price (or quantity) is revised. However, this average revenue curve does represent the average revenues that would exist were the market in equilibrium at these prices.

18 Our method of calculating social cost is equivalent to the usual method which is to calculate all consumer and producer gains and losses by type and then cancel out some gains against losses in order to remove transfers from the system and to evaluate net changes. The standard technique is to calculate (a) the trapezoid to the left of D_I between P_I and P_c as a Class I consumer surplus loss, and (b) the trapezoid between Q_I and $(Q_I + D_{II})$ and between P_c and P_{II} as a Class II consumer surplus gain. Producers gain the rectangle to the left of S between P_b and P_c, which because P_b is a weighted average of Class I and Class II prices is the same as (c) the rectangle between P_I and P_c to the left of Q_I less (d) the rectangle between P_c and P_{II} and between $\bar{Q}_I$ and Q_T. The rectangle (c) is part of trapezoid (a) and the transfer is netted out in the calculation of social loss. The trapezoid (b) is a part of rectangle (d) and is offsetting in the same way. When transfers are offset in this way the net social cost is equal to the sum of the areas cross-hatched in Figure 1.

19 Actually, consumer surplus models should use income-compensated demand curves to account properly for both income and substitution effects. Transfers would have a second-order effect on the measure of social cost as they enter through the income effect. However, we note that use of the market demand curve is conventional practice. Also, these techniques are equivalent if, as is approximately true, the income elasticity of demand is zero.

20 These come from part of the Class I transfers as shown in footnote 17.

21 Lemon Administrative Committee, 1973-74 Annual Report, p. 3. The operating fund is estimated by multiplying the assessment rate by the total number of cartons of lemons shipped to the regulated (domestic fresh) market.

22 On-tree prices are calculated by subtracting from the FOB-packinghouse price the costs of picking, hauling and packing the fruit. For California-Arizona oranges, the on-tree price for oranges going to processing has often been negative according to USDA figures; for examples, \$-.85 and \$-.87 per carton for navels in Arizona and California, respectively,

in 1973-74. A negative on-tree price implies an even more negative return to the grower when cultivating costs are accounted for. In terms of the theoretical model we presented, negative returns in the processing market are consistent with producer rent maximization when the marginal revenues in the primary market are negative because of inelastic demand and are equated to the marginal revenue in the disposal or surplus market. Milk price data are from USDA, Agricultural Marketing Service, Federal Milk Order Market Statistics, 1973 Annual Summary. Lemon price data are taken from Record Sheet-Prices Received by Farmers, USDA, Agricultural Marketing Service, Crop Reporting Board, provided by Mr. Barrowman, USDA.

23 This provision may not be invoked every year. However, its potential use will discourage new entry and may do this so successfully that it never has actually to be invoked. The order would in fact be restrictive even though its non-implementation would give the false appearance of non-restrictiveness.

24 For a more detailed explanation of the relationship between the orders as currently constituted and the goals of the AMAA, see Masson and Eisenstat [24].

25 Dairy farmers necessarily spend some of these rents in maintaining the system, as discussed above. The total transfer is higher when the orders' effects on cooperative monopolization and the effective prohibition on reconstituted milk are counted [14].

26 In 1959 farm per capita disposable personal income from all sources was 48.7 percent of its urban counterpart. It surpassed 50 percent the following year and 60 percent three years later. Since 1965 it has not fallen below 60 percent, since 1968 it has not fallen below 70 percent, and since 1972 it has not fallen below 80 percent. However, 1973 and 1974 are the only reported years above 90%. [35; p. 470].

The reported figures are not sufficient to verify whether lemon or milk farmers have similar incomes to farmers as a whole. In the following discussion we assume that they do.

27 Calculations of the dairy farm income distribution were based on USDA (1975).

28 The calculations of the consumer burden distribution comes from the index of consumption from Buxton [4], and the U.S. income distribution in *Statistical Abstract of the United States* [38], p. 328.

29 Same sources as cited in footnotes 26 and 27.

30 Our own estimates are higher, on the order of $666 [18].

31 The references to milk co-ops in the following section except where noted are discussed in Eisenstat, Masson, and Roddy [8].

32 As argued in Masson and Eisenstat [25] the USDA may be well within its allowed administrative discretion in this and other actions. Our concern is not about violation of the law but rather about the way the USDA chooses to use its discretion.

33 These arguments may be found in more detail in Masson and Eisenstat [25].

34 I.E., a capital market characterized by a single interest rate and no credit rationing. If this is not the situation, and capital markets are imperfect (as is likely), risk aversion would probably affect production decisions. Cf. Masson [23].

35 Given unchanged demand conditions. The only other alternative is a price change by fiat, which would create a disequilibrium.

To increase fall production might entail great cost increases (e.g., for freshening.) Indeed, seasonal cost differentials must be the reason why a deliberate stabilization *policy* would have to be considered. Otherwise, a market in intertemporal equilibrium would not itself change to a higher level of fall production.

36 Even then, if dampening of the predictable cycle occurs as a consequence, there is some offsetting social cost.

37 See Chayat, Forker and Padberg.

38 This argument may be found in more detail in Masson and Eisenstat [24] and Masson and Eisenstat [25].

39 After studying the functioning of the California-Arizona orange orders, Rausser [28] hypothesized a lexicographic utility function for the committees where profit and price stability took fourth place to equity, price parity, and seasonal fresh domestic quantity goals.

40 E.G., Turnovsky [33].

APPENDIX

The estimates presented for the social costs of the milk orders are detailed in Ippolito and Masson [18]. These estimates were based on a compilation of many published elasticity estimates including (Boehm and Babb [3], Thraen and Buxton [32], Barlett [1]; George and King [12]; Cheng, Courtney and Schmitz [6]; and Halverson [15]). The estimates were generally consistent with one another. From these we derived our assumptions for demand elasticities. The fluid demand elasticity at the farm level was assumed to fall in the range of -.12 to -.34 with a "best" (e.g., median) estimate of -.23. Farm level demand elasticity was derived from final market elasticities adjusted to the farm level by deducting the processing margin from the demand function before calculating the elasticity. Farm level manufactured product demand elasticities were estimated to range about -.20 to -.26. However, the actual Class II demand curve facing regulated markets is a residual demand curve based on the total demand curve net of the supply of Grade B milk. The estimates on milk supply elasticities indicated milk supply elasticities in the range of .4 to .9. By weighting these elasticities by market quantities to find the elasticity of the residual demand for regulated Class II milk at the farm level, we arrived at an elasticity range of -.97 to -1.75 with a best estimate of -1.36. For Grade A regulated production we used supply elasticities of .4 to .9 with a best estimate of .65. As with the lemon estimates presented in text, the social cost estimates were shown to be relatively insensitive to the specified elasticities, with the rent estimates somewhat more volatile.

We estimated the demand curves for lemons ourselves and compared our estimates with published estimates.[1] Estimates were made for both the fresh market and the processed market. The fresh market was defined as consisting of lemons which were sold as fresh in either the domestic market or the export market. Prices for lemons exported fresh are generally so close to the prices for fresh lemons marketed domestically that the two markets are typically combined for price reporting purposes. The processed market includes all lemons which were sold for processing uses.[2]

First we estimated the fresh demand curves. The short-run estimation results are:

$$TRF(T) = 8150 - 438.9\,CRF + 0.51\,INC$$
$$(7.64)\quad(-1.96)\qquad(3.09)$$

$R^2 = .54$

$F(2, 20) = 11.70$

Durbin-Watson = 2.13

(t - statistics are shown in parentheses)

where:

TRF(T) = quantity of lemons which are sold for fresh in time T (in 1000's of boxes)

CRF = on-tree price per box received by producers for lemons for fresh (1967 dollars)

INC = national income (1967 dollars)

Using a technique demonstrated by Nerlove,[3] we computed a long-run demand curve. The long-run demand curve estimation results are:

$$TFR(T) = 7881 + 0.047\ TRF\ (T\text{-}1)$$
$$(8.42) \qquad (0.60)$$
$$-\ 335.8\ CRF + 0.41\ INC$$
$$(1.69) \qquad (3.50)$$

$R^2 = .50$

$F(3, 20) = 6.72$

Durbin-Watson = 1.26[4]

The estimates used data for the 1949-50 season through the 1973-74 season. Since we used a linear demand curve, we estimated the demand elasticity at the mean values of the independent variables. Elasticity is estimated to be about -0.18 in the short-run and -0.14 in the long-run.

Next we estimated the processed product demand curve. The short-run results are:

$$PRC = 4330 - 1032.4\ CPROC + 0.50\ INC$$
$$(4.28) \quad (-2.25)$$

$R^2 = 0.38$

$F(2, 20) = 6.13$

Durbin-Watson = 2.12

(t — statistics are shown in parentheses)

where:

PRC = quantity of lemons which are sold for processing (in 100's boxes)

CPROC = on-tree-price per box received by producers (1967 dollars)

INC = national income (1967 dollars)

The long-run results were:

$$PRC(T) = 5583 - 0.39\ PRC\ (T\text{-}1)$$
$$(4.15) \quad (2.14)$$
$$-\ 1458.1\ CRPOC + 0.76\ INC$$
$$(2.82) \qquad (3.33$$

$R^2 = .45$

$F(3, 20) = 5.51$

Durbin-Watson = 1.76

Again evaluating at the means we arrive at a short-run elasticity of -0.09 and a long-run elasticity of -0.09. The short-run curves were not statistically different from the long-run curves, and the following results are presented using the short-run estimates. The marginal revenues in the fresh market evaluated at the mean are $-18.78 per box, and in the processed market they are about $-5.82 per box. These two marginal revenues differ by less than one standard error and are thus consistent with, but do not prove, monopoly rent maximization.

The demand curve estimates are relatively crude but they compare favorably with other demand curve estimates for lemons for earlier time periods. For instance, Sidney Hoos [17] estimated the own-price elasticity of fresh lemons to be -0.23 and the own-price elasticity of processed lemons to be -0.10. Roy Smith [31] notes that several other authors [Fisher 9, Kuznets and Klein 20, Wellman and Braun 39] also concluded that the demand for fresh domestic lemons was inelastic. French and Bressler's [10] demand estimates, when combined with data for that period, yield an elasticity estimate of -0.7 for the fresh market. This is higher than the others. Using it would raise our estimate of social costs substantially. If we apply Hoos' estimates to the period of our study, we see that marginal revenues in the fresh and processed are equated within one standard error of the estimates.[5]

We have applied our demand estimates to a model using different supply elasticities between 0.5 and 4.0. While there are few studies of lemon supply with which to compare this, the range does cover the range of estimates from studies of similar crops. Joel Hamilton's study [16] of selected California fruit and nut crops found long-run supply elasticities between 0.849 and 3.202 for the eight crops whose estimates were significant. Similarly, looking at vegetables, Nervelo and Addison [27] found long-run supply elasticities between 0.48 and 4.4 for nine of eleven major vegetables studied. Last, two studies of aggregate agricultural supply provide elasticity estimates between 1.20 and 1.79. Griliches (1959) found the long-run aggregate supply elasticity to be between 1.20 and 1.32. Tweeten and Quance (1969) found it to equal 1.79. They also estimated the aggregate supply elasticity for crops to be 1.56.

NOTES

1 Data provided by USDA, Crop Reporting Board, SRS, Fruit and Vegetable Division.

2 Confirmed by Max Cain, California Crop and Livestock Reporting Service.

3 Nerlove [26] has shown that "dynamic models of consumer or producer models . . . can be used to obtain estimates of long-run elasticities without explicit introduction of distributed lags." A short-run adjustment equation (containing a lagged quantity term) is combined with a long-run demand function and the resulting relationship can be estimated since it includes only observable variables, one of which is a lagged quantity.

4 Since the Durbin-Watson statistic indicates that serial correlation may be a problem, the equation was reestimated using the Cochrane-Orcutt procedure. The result was substantially the same. With a lagged dependent variable these results are suspect as well. However, we accept this estimate for a "ballpark figure" since it is similar to those in previous studies and since our final results were relatively insensitive to these elasticity estimates.

Since the long-run processed market estimations have a Durbin-Watson statistic of 1.76, the existence of serial correlation was rechecked there using a procedure developed by Durbin [7]. This procedure confirmed the non-existence of serial correlation in the estimation of the processed market demand curve.

5 Using Hoos' estimates, marginal revenues evaluated at mean values are $-13.06 in the fresh market and $-5.04 in the processed market. These are close to our estimates of $-18.78 and $-5.82 noted above.