Price Discrimination or Price Stabilization: Debating with Models of U.S. Dairy Policy

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Two views on U.S. dairy policy are, first, that it is an instance of the "capture" theory of economic regulation -- that it serves the interests of dairy producers at the expense of consumers and taxpayers by raising dairy product prices -- and second, that dairy policy is an instance of governmental action to correct market failure -- that dairy policy serves the joint interests of producers, consumers, and taxpayers. This paper discusses several analytical issues which have been important in the debate between these views.

Marketing Orders

Classified pricing of milk was first established on a continuing basis in a few milk markets at the end of World War I, and expanded rapidly as a feature of cooperative bargaining in the late 1920's and early 1930's (Gaumnitz and Reed). Economists, in trying to understand the causes and implications of this phenomenon, turned to the then emerging theories of imperfect competition. Consequently, there is substantial space given to abstract models in the earliest studies (Cassels; Gaumnitz and Reed). The model on which Kwoka and his successors (see AAEA for full citations) base their analyses of social costs of milk marketing orders is similar to the one originally presented by Sorenson and Cassels in 1936. The model is essentially Robinsonian price discrimination, with the twist that the discriminating entity is not a monopolist but an organized

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producer group, a cooperative, which may be bargaining on its own (Cassels) or under the aegis of a federal marketing order (Harris). In either case the producers do not exercise supply control, so that if they are viewed as a cartel, it is a cartel with free entry. A cartel with free entry has the same industry equilibrium as monopolistic competition, characterized by absence of monopoly rents in the usual sense. However, producers' surplus is increased as long as some farmer-owned production inputs are not perfectly elastic in supply. The reason is that price discrimination increases the farm price received for any given quantity marketed and thus has the same effect as a rightward shift in total demand.

Classified pricing and price stabilization. Historically, dairy policy discussion has emphasized "disorderly marketing" (FMOSC). For this concept to be usable in economic analysis, it is necessary to specify disorder in terms that have a specific economic meaning. The most obvious candidate is some measure of price variability or variability in farmers' returns. But prices and returns can vary without being disorderly. Prices and returns can even vary randomly, unpredictably, without being an indicator of disorderly marketing. In practice, the definition of disorder has been implicitly created in regulatory proceedings, when a finding of disorder is relevant to the establishment of a marketing order. The record indicates that disorder results from strategic behavior by middlemen or "handlers" of milk. But disorder is not just a matter of imperfect competition in the marketing sector, either. It is the

exercise of handlers' market power in ways that both lead to variability in farmers' returns and make farmers worse off. This is my definition. It suggests a remedy -- the negation of handlers' market power -- but raises many questions calling for more precision and analysis.

Classified pricing under marketing orders has also been put forth as a remedy for instability not linked to market power, resulting from short term fluctuations in milk production as contrasted to a stable but inelastic short-run demand for fluid milk. A similar situation with respect to annual production of grains leads to carry-over stocks as a stabilization device. Fluid milk of course is highly perishable. But storage is possible in the form of manufactured dairy products. So what is special about milk that requires classified pricing for stabilization? It is not the perishability of milk, nor its continuous production: these merely shorten the time over which stabilization mechanisms must operate. The crucial difference is the irreversibility of storage of milk in the form of some manufactured products. If you make cheese from milk when supplies are large, you cannot subsequently pull milk out of storage by making milk from cheese when supplies are short. In this situation excess capacity, a "reserve pool" of fluid-eligible milk, serves as insurance against a shortfall in fluid milk production. So long as it is more costly to produce fluid-eligible than manufacturing milk, producers of reserve milk must be compensated for these extra costs even when their milk is used for manufacturing purposes. This provides a rationale for

pricing fluid eligible milk above manufacturing milk by even more than the production-cost differential.

Dairy economists have tended to suppose that this characteristic of the dairy industry implies that classified pricing is a socially efficient arrangement that would arise spontaneously in a bargaining situation between milk producers and handlers. Indeed, as Gaumnitz and Reed (1937) and Cassels (1937) document, classified pricing has arisen in such bargaining when cooperatives act as bargaining agents for producers. Yet the price discrimination model of marketing orders, in all its versions in the literature, presumes that in the absence of classified pricing under marketing orders, fluid eligible and manufacturing milk prices would differ only by production cost differences. This happens because the standard model is a static, non-spatial, deterministic model. This is a key point in some critiques of the price discrimination model, e.g., "the model of an unregulated milk market has a basic flaw in its structure because it fails to incorporate the requirement of a significant reserve of milk in excess of consumption needed to meet fluctuations in fluid milk demand" (Levedahl, p. 626).

On the other hand, in assessing this criticism we should ask if a reserve pool is really necessary. Without a reserve pool, a rising class I price would ration fluid-use milk in periods of short supply, as with fresh fruits and vegetables. Presumably this is not efficient and is not observed because the expected cost of holding a reserve of grade A production capacity is less than the expected gains from having this milk avail-

able when needed. So the reserve pool is not necessary, but is efficient.

However it is not clear that classified pricing is necessary or the most efficient way to solve the incentive problem of maintaining the reserve pool. As an alternative there could be contractual arrangements for transportation-cost subsidies or other special contracts specifically with grade A fringe producers, presuming that the reserve producers are spatially identifiable, as in the useful model of Buxton. Another alternative, explored by Hammond, Buxton, and Thraen (1979), is to use reconstituted milk as the source of reserve milk, thus unlinking classified pricing from the reserve pool issue. This is especially interesting because the storability of powdered milk means that the dairy stabilization issue turns out after all to be analytically analogous to grain price stabilization -- the one-way milk-to-cheese conversion does not of course hold for powder.

Moreover, even if classified pricing is indeed the efficient form of contracting, this does not seem fundamentally damaging to the price discrimination model. What it means is that in considering the fluid/manufacturing milk price differential in an unregulated market, we should add to the grade A/grade B production cost differential an additional amount for maintaining the grade A reserve pool. This should be a quite small amount in most cases (see AAEA for more detailed discussion).

Imperfect Competition in Milk Marketing. Lying behind the social-cost assessments of marketing orders is a presumption of competition in pricing. This is not to say that dairy marketing firms are an instance of perfect or atomistic competition, which they obviously are not. The presumption is rather that two propositions hold: 1) returns above (risk-adjusted) returns available in the economy at large attract investment or entry, leading to the disappearance of any "excess profits" in milk handling; 2) the "law of one price", that equivalent commodities are expected not to sell for different prices (else arbitragers can profit by buying at the low price and selling at the high price).

Confidence in the latter proposition is what leads to the prediction that in an unregulated milk market the price of a particular gallon of milk at a particular location and time will be the same regardless of its end use. This is not the case under marketing orders; and the key observation indicating that marketing orders are what maintains the situation is the continual effort by the administrators to prevent the arbitrage that would otherwise occur -- regulation of flow of fluid milk in and out of order areas and particular rules for reconstituted milk.

The first proposition, that we would not expect excess profits among milk handlers absent federal marketing orders, is controversial. Debate on this topic has been pushed furthest with reference to Justice Department and FTC cases against dairy marketing cooperatives on anti-trust grounds. Many agricultural economists seem to agree with one critic's statement that "equa-

ting AMPI with Standard Oil or U.S. Steel is ridiculous" (Blakley; see also Christ; and Cook, Blakley, and Berry). But it is not ridiculous, for the following reasons. First, the trend of research findings in industrial organization is toward minimizing the scope for monopoly power when entry is unrestricted. This applies even to very highly concentrated industries; and it is not just an academic point. Witness the dropping of the Justice Department's anti-trust case against IBM or the deregulation of airline fares.[1] Dangers are seen to be more serious when governmental regulation can restrict the behavior of actual or potential competitors. In short, AMPI backed by marketing orders is quite plausibly seen as not only the equal of but superior to U.S. Steel in market power.

The other side of this coin is that cooperatives and marketing orders also do not restrict entry into milk production. But this does not of course mean that farmers are unable to benefit from these institutions. A price discriminating cartel with free entry increases producers' rents as all versions of the basic model show.

Aggregation of markets under marketing orders. The role of rents means that the elasticity of supply of milk is a key parameter in studies of marketing order effects. However, the use of a U.S. aggregate supply elasticity is questionable. Extension of the standard model of a marketing order to cover a system of marketing orders involves aggregation that can lead to quite misleading results. For example, a marketing order will increase the price in the order area, compared to no order; but

a system of marketing orders can decrease the average price in all areas taken together. That is not just a theoretical possibility is shown by the estimate of Dahlgran (1980) that the U.S. average farm price of milk has been reduced by marketing orders.

Figure 1 presents an example to illustrate the aggregation problem. For simplicity ignore grade A/B cost differences and suppose that milk for all uses receives the same price in the absence of marketing orders. Market 1 is a high-cost area where only fluid milk is produced initially, and manufactured dairy products are imported from other markets. The introduction of a marketing order increases the fluid milk price to P_1^* with excess milk now going for manufactured products whose price is given by the market for milk brought in from other regions. This increases the blend price, shifting the effective demand curve to D_b. However, long-run supply in market 1 is highly elastic (even though costs are relatively high) because at the margin producers simply bring in new herds, feed, laborers, etc., at almost constant cost. Therefore, the introduction of the marketing order increases production from Q_0 to Q_1 but does not appreciably increase the long-run equilibrium farm price in market 1. In market 2, milk is produced only for manufacturing use. The marketing order in market 1 results in more milk being produced for manufacturing purposes there, and reduces the demand for milk from market 2 as from D_2 to D_2'. Hence the farm price in market 2 falls (assuming we begin above the support-price level P_s). The result for average farm prices and output

in the two markets aggregated is larger output and a lower price.[2]

This result occurs if: a) the supply curves in high-cost marketing-order areas are sufficiently more elastic than in the no-order and manufacturing milk areas, and b) there is a large enough quantity of milk in the manufacturing area. The result does not require that any area be solely grade B, but only that the ratio of fluid to manufacturing uses of milk be sufficiently different in different markets and that shipments of milk or milk products between them occurs.

The general point is that the existence of classified prices under marketing orders renders incoherent the concept of a U.S. aggregate supply curve of milk. Dahlgran is correct to attempt regionally specific supply functions. But he goes too far in disaggregation by estimating separate grade A and grade B supply functions for a given region. For example, if we estimate the supply of grade A milk in a region where grade B milk is also produced holding the price of grade B milk constant, we should see a very elastic function as soon as the price of grade A milk rises significantly because the grade B producers will convert to grade A production. Therefore, we need a quasi-general equilibrium supply function in which the grade B producers' price is allowed to move together with the grade A producers' price. But once we do this, permitting the conversion of producers, the relevant supply function is for all milk in a region in response to the linked price (index) of grade A and grade B milk. Consequently it is hard to be confident in

Dahlgran's findings of different grade A and grade B supply elasticities in the same region.

Probably it is such difficulties that have led some of the most comprehensive studies of marketing order effects to mostly abandon econometrics and rely on simulation of spatial equilibrium models constructed from cost and technical data. The main problems with this approach are that the economic behavioral relationships are too largely constructed rather than being data based and validated; and without the usual statistical tests it is too easy to maintain an unwarranted optimism about one's model.

Dairy Price Supports

An analytical assessment of dairy price supports can begin with the simplest supply/demand model. Consider the three (calendar) year period 1981-83. USDA acquisition of dairy products ("removals") accounted for the use of raw milk that averaged 10.9 percent all milk sold by farmers during the period (USDA, 1984a, p. 18). Taking this percentage as excess supply at the supported milk price, with the appropriate supply and demand elasticities we can estimate what price would have been in the absence of the support program. Unfortunately, despite many efforts at estimation there is no consensus on the elasticity values. In a fairly straightforward policy model, Nelson (1982) used estimates of .35 for an aggregate demand elasticity, and .1 for a short-run supply elasticity. This implies a short-run price effect of a 10.9/(.1+.35) = 24 percent decline.

Why isn't the simple approach sufficient? The main reasons are: 1) classified pricing means we have to consider the demand responses of fluid milk and manufactured product consumption separately; 2) as discussed above an aggregate supply elasticity is not well defined and we need regionally specific estimates; 3) because of the durability of investment in equipment and the biological constraints on investment in cows, milk supply functions are not well defined unless length of run is closely specified and, for a given length of run, the age composition of the dairy cattle population is taken into account; 4) the percentage removal overstates excess supply at the support price because some USDA commodities are given away or sold back to consumers, hence reducing commercial demand; 5) excess supply is understated by removals because import quotas restrict dairy product supplies from abroad, hence increasing U.S. commercial demand. However, models attempting to take one or more of these problems into account quickly become complex and unwieldy. In USDA (1984b) a review of the literature concludes that real milk prices 15 to 20 percent below the 1983 support level would be necessary to equate supply and demand. The studies cited are all roughly consistent with such an estimate, although they differ greatly in time period covered and econometric specification.

A quite different result is obtained by Thraen and Hammond (1983). They introduce the idea, which others have discussed but not estimated in dairy supply, that farmers are risk averse and therefore will produce more at a given price if that price is less uncertain. Their surprising result is that a phase-out of

price supports, by increasing instability, shifts the supply function of milk to the left so far that the manufacturing milk price rises over the long term in the absence of price supports (as opposed to the short-run 15-20 percent price decline just cited). This long-run result is possible, but implausible. Suppose that it takes a 20 percent higher milk price to keep farmers producing under no stabilization than with a stable price at the support level. If purchased inputs account for half of normal costs, the other half being income to farm-owned resources, the 20 percent higher price means 40 percent higher farm incomes (assuming purchased input prices are given), i.e., a 40 percent risk premium is required. An approximate linkage between the risk premium and the coefficient of relative risk aversion is (Newbery and Stiglitz, p. 73):

$$p/\bar{y} \simeq \tfrac{1}{2} R \sigma_y^2$$

where $p/\bar{y}$ is the .40 just calculated, R is the relative risk aversion coefficient, and σ_y is the coefficient of variation of income. Identifying σ_y with σ_p, that is, ignoring quantity risk, the squared coefficient of variation of price in the data of Thraen and Hammond (p. 44) is roughly .2 under price supports and .3 with a rapid phaseout of price supports in 1950-78. Therefore, the 40 percent risk premium is necessary to compensate for an increase of .1 in σ_y, which implies a value of R = 8. This implies substantially more aversion to risk than found in most empirical studies (see the review in Newbery and Stiglitz, Ch. 7).

Conclusion

The literature on dairy programs is revealing on an important subject: the claims of economists as producers of scientific policy analysis. Researchers on dairy policy have arrived at quite different conclusions not correlated with any stated differences in the authors' values, preferences, or any clear disagreement on basic facts about pricing, quantities, costs, structure of production, and so forth. The disagreement is in theories or models of the industry. This turns out to be crucial in the interpretation and implications drawn from observed facts.

Writers who begin with the price discrimination model have already determined a critical assessment of marketing orders. Writers who begin with the model of monopsonistic handlers or disorderly marketing have already determined a favorable disposition to marketing orders or other countervailing institutions. Kessel (1967) and Dobson and Buxton (1977) are notable for attempting direct comparisons of markets with and without orders in which the answer is not prejudged by the model chosen. They did not find compelling evidence on marketing order effects. The lack of a "smoking gun" is probably what has led other analysts down more roundabout paths. Examination of the models and arguments to be found in this work indicates that analysts holding both the price discrimination and price stabilization views have exhibited more confidence in their models, and hence in their general conclusions, than available evidence warrants. The price stabilization argument that dairy policy

has provided net social benefits is on even shakier ground in that proponents have not provided well constructed models and arguments incorporating what we observe in dairy markets to the extent the price discrimination school has. But the returns are not all in yet and probably will not be until a large-scale long-term experiment without marketing orders or price supports is carried out.

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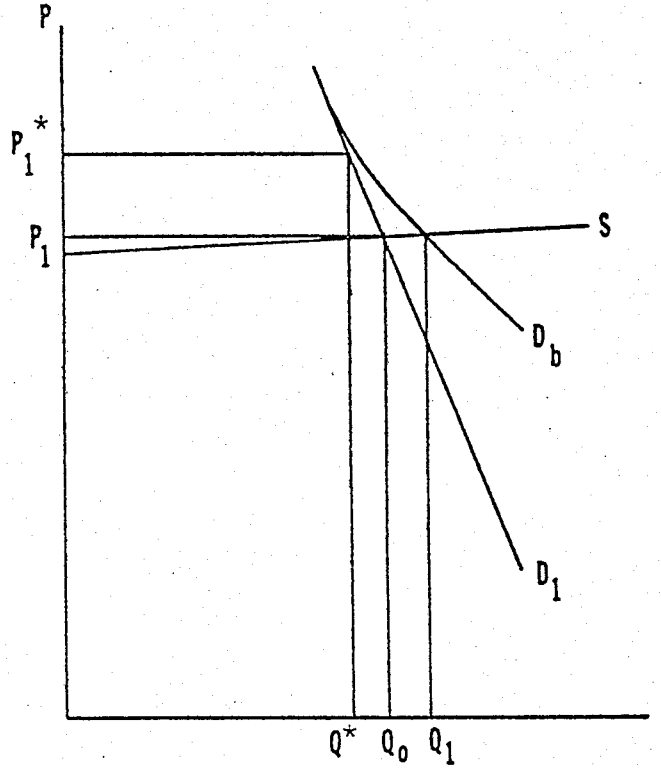
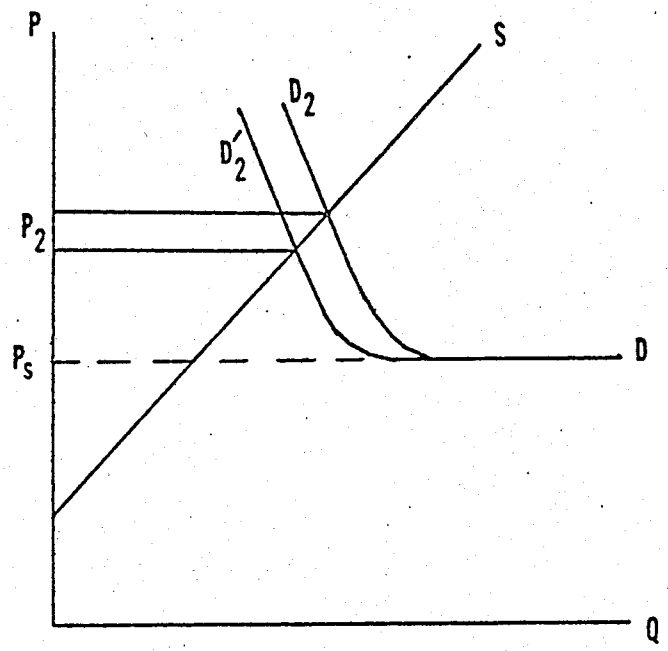
[1] On the economics of the winning argument in the IBM case, see Fisher, et. al (1983). For a generalization of entry-based thinking, see Baumol, Panzar, and Willig (1982). It might be suggested that testimony of these authors should be discounted because they have been paid consultants for anti-trust defendants. In the case of dairy policy, this argument cuts the other way; the main attackers of cooperatives and marketing orders have been employees of the general public in FTC and Justice while the defenders tend to have been in positions in USDA and Land Grant Universities more sensitive to special interests. But I believe this is a weak argument in either case.

[2] Simultaneous equilibrium in the two markets requires that the lower price in market 2 cause a reduction in the prices of manufactured products in market 1. This implies that D_b will not be so far to the right of D_1 as we would have calculated ignoring the shift in D_2. Thus, D_b should be derived from a total or quasi-general equilibrium demand curve for manufacturing milk in market 1.



Market 1



Market 2

Figure 1. A marketing order in market 1 reduces the average price of markets 1 and 2, and increases aggregate output.