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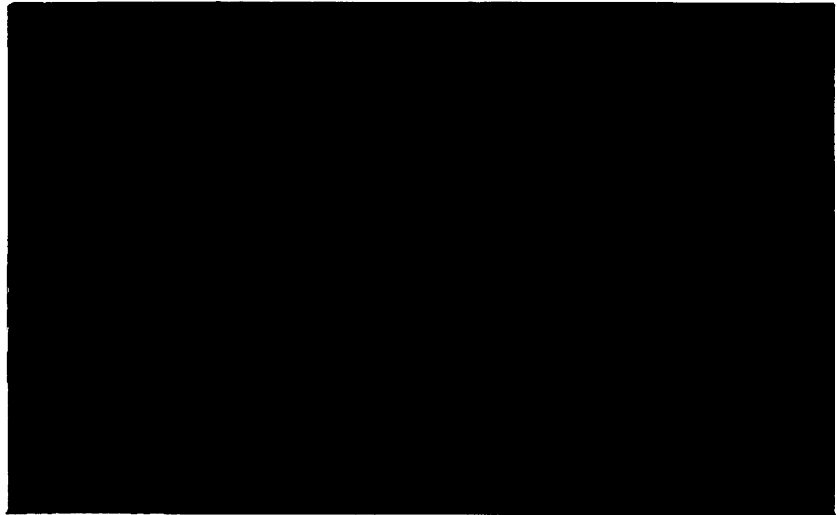
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Revisiting Minimum-Quality Standards

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Revisiting Minimum-Quality Standards

Gresham's Law has taught generations of economists the importance of symmetric information about product quality. The observation that "the bad drives out the good" assumes implicitly that the good and bad are indistinguishable by at least one party at the time of exchange. Akerlof's original demonstration that markets can collapse in the face of asymmetric information about product quality forcefully highlights Gresham's observation.

One highly visible response to asymmetric information about product quality is the imposition of minimum-quality standards and or licensing arrangements. Many professions, for example, routinely require practitioners to pass state examinations. Much of the fruit and vegetables marketed and consumed in the United States are subject to minimum-quality provisions enforced by federal law under the federal marketing order system. Drugs are subjected to a rigorous testing process before they can be legally marketed in the United States.

Presumably, the economic purpose of these minimum-quality standards is to remove some of the inefficiencies associated with the presence of asymmetric information about product quality. Leland showed that under appropriate circumstances minimum-quality standards can be desirable in the absence of symmetric information about product quality. Leland's paper thus provides a formal economic rationale for minimum-quality standards. This paper revisits the issue of minimum-quality standards. In an alternative model of quality uncertainty, minimum-quality standards are shown to conflict with the revelation principle's truth-telling requirements. Thus, minimum-quality standards in that model cannot be a component of the constrained Paretian solution outcome.

In what follows, we introduce a production and exchange model characterized by asymmetric information about product quality. The basic result of the paper is then demonstrated and briefly contrasted with Leland's result. The last section concludes

The Model

Consider the market for a commodity, for concreteness sake refer to the commodity as oranges, where at the time of exchange asymmetric information exists between the buyers and sellers (producers) about product quality. Producers know the quality of oranges that they are selling, buyers do not. Oranges are an experience good which must be consumed to determine product quality. Moreover, quality *ex post* is not verifiable to any third party responsible for enforcing exchange contracts. There are N discrete orange qualities with indexes chosen so that the higher the index the higher the quality of the orange. Each producer is capable of producing only a single quality of orange. One producer cannot produce, for example, both good and bad oranges. For simplicity we assume that only one producer of each orange quality exists. (This assumption is easily relaxed and is not central to any of the results that follow.) The production of oranges of quality k is characterized by the differentiable cost function $y_k \rightarrow C_k(y_k)$ where y_k is the quantity of quality k oranges produced. Each C_k ($k=1,2,\dots,N$) is strictly increasing and strictly convex. Moreover, the following single-crossing property (SCP) is satisfied

$$(SCP) \quad j > k \Leftrightarrow C'_j(y) > C'_k(y)$$

where primes denote derivatives.

The social value of a k -quality orange is denoted m_j where

$$j > k \Leftrightarrow m_j > m_k$$

Following Guesnerie and Seade, the discrete nature of the problem allows us to consider only the "corners" of the remuneration schedule for orange growers. Letting the remuneration awarded to a type- k orange producer be given by r_k , attention can be restricted to (r_k, y_k) pairs for $k = 1, 2, \dots, N$. By the revelation principle (Harris and Townsend; Myerson; DasGupta et al.), the social optimization problem in the presence of asymmetric information about product quality is to choose (r_k, y_k) ($k = 1, 2, \dots, N$) to

$$\max \sum_k m_k y_k - C_k(y_k)$$

subject to

$$r_k - C_k(y_k) \geq r_j - C_k(y_j),$$

for all k and j .

Minimum-quality standards imply that certain low-quality varieties of the product are excluded from the market. Formally,

Definition: A minimum-quality standard exists if there is a $k < N$ such that $y_j = 0$ for all $j \leq k$.

Minimum-quality standards do not imply that producers of low-quality fruit receive no remuneration. Rather, they just cannot sell any of their product on the market. So long as there are no fixed costs (or all producers face the same fixed costs), any producers subject to a minimum-quality standard must all have the same remuneration. In short, producers subject to minimum-quality standards are bunched (Guesnerie and Seade).

A well-known consequence of truthtelling and the revelation principle for a model of this sort is summarized by:

Lemma (Cooper; Weymark): Truthtelling requires that the remuneration-quantity schedule satisfy

$$i \geq k \Leftrightarrow y_k \leq y_i.$$

Versions of the lemma have been derived in numerous papers (Cooper; Guesnerie and Seade; Weymark). The lemma manifests the fact that the requirements for truthtelling in the presence of a SCP always involve monotonicity of the action schedule. In the current context, producers of high-quality product convey the quality of their product by producing less than low-quality producers. Although, this monotonicity result is well-known, its consequences in the current model are particularly striking.

Our main result is the following:

Result: If the socially efficient optimum in the presence of asymmetric information involves positive production of any quality production, the imposition of minimum-quality standards is not efficient.

The proof of the result is straightforward. The constrained-efficient problem as defined above has only one set of constraints, i.e., those imposed by the truthtelling requirement through the revelation principle. If the information asymmetry exists at the time of exchange, these constraints must be satisfied. However, the lemma shows that satisfying truthtelling requires the quantity schedule to decline with quality. That is, the lowest quality producers produce and sell

the most oranges. If, minimum-quality standards are imposed, the requirements for truth-telling would then require that none of any higher quality orange be produced and sold. The only way that minimum-quality standards can be consistent with truth-telling and positive production of some quality of orange is if minimum-quality standards are imposed as an *additional* constraint to the social optimization problem. Of necessity, it follows that the social optimum achievable with both minimum-quality standards and the requirements for truth-telling can never exceed that achieved with only the constraints required for truth-telling. Hence, the socially efficient solution can never involve minimum-quality standards in the present model.

In interpreting the Result several things should be kept in mind: Most importantly, the Result is very robust to society's valuation of the product. This point is forcefully highlighted by considering the following example. Suppose, there exists a subset of the quality indexes, say $\Omega = \{1, 2, \dots, k\}$, such that $j \in \Omega$ implies

$$m_j < C'_j(0).$$

With symmetric information, no oranges with quality indexes belonging to Ω would be produced because social valuation of a single orange of these qualities is less than the initial marginal cost of production.

With asymmetric information, social optimality requires some production of Ω oranges if anything is to be produced at all. This apparently paradoxical result emerges from the limitations that asymmetric information places upon equilibrium outcomes. Because quality is both costly to produce and nonverifiable, quality must be reflected in the amount produced and sold. High-quality producers screen themselves from low-quality producers by accepting lower production levels. Invoking minimum-quality standards upsets this natural sorting mechanism.

for the very highest quality producers. Therefore, even given the presence of quality levels satisfying the last inequality, the *best achievable* outcome in the presence of asymmetric information requires production of what for lack of a better term may be referred to as "rotten oranges."

Leland's Result

Leland showed that under appropriate circumstances licensing arrangements or minimum-quality standards can improve social welfare. While not directly contradictory to the result here, Leland's results do merit a brief discussion. Leland's model differs from the current in two important ways: Leland's sellers only sell a single unit of the commodity; and Leland's sellers can affect the quality of the product that they sell by incurring greater costs. Because Leland's producers only sell a single unit of the commodity, his model automatically precludes quantity produced and sold as an indicator of product quality.

The fact that Leland's producers can affect product quality by incurring greater cost implies that the situations modelled are fundamentally different. Here, the asymmetric information problem may be classed following Arrow as *hidden information*. Leland's analysis is more appropriately classed as *hidden action*. There the problem is of monitoring what producers have actually done, and it turns out that society can be made better off by truncating the range of possible actions by producers thus decreasing the probability of a bad outcome for consumers. Here, the problem is to determine the producer's type, and thus of the quality of the product. Eliminating certain products entirely from the market only interferes with the discrimination process that would emerge in equilibrium.

Which characterization of the quality problem is more appropriate is an empirical matter. Certainly lack of information about product quality is a problem in markets where producers sell more than one unit of the commodity. That would militate in favor of the current model. But just as certainly in most practical instances producers have some ability, even if only at the margin, to affect product quality by incurring costs. That militates in favor of the Leland representation. What the current results do show is that where quantity and quality are both variable, sound economic reasons exist to question whether minimum-quality standards are socially preferable.

Conclusion

This paper has revisited the issue of minimum-quality standards raised by Leland. In a model that characterizes asymmetric information about product quality as a hidden-information problem, it is shown that minimum-quality standards are not socially efficient.

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