REFERENCES


LEMONS MODELS OF PROFESSIONAL LABOR MARKETS RECONSIDERED

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INTRODUCTION

In the markets for professional services, such as law, accounting, and medicine, a consumer has difficulty identifying the quality of service before, and in many cases, even after purchase. This indicates that any model of professional service markets must address problems of asymmetric information. One potential information problem is adverse selection. This means that product quality is exogenous to the seller and, consequently, not subject to seller's choice, nor observed by consumers. Since professional services are commodities that are strictly tied to the workers who render them, service quality is equivalent to the quality or talent of a worker. Thus, the adverse selection problem in professional service markets translates into the same problem in professional labor markets.

The goal of this paper is to reexamine the nature of equilibrium in pure lemons models, including Akerlof (1970), Wilson (1980), Ross (1993), and Leland (1979). Leland (1979) is still considered to be the standard model of professional service markets and provides the most compelling rationale for professional licensure. Here I develop a model which explicitly derives the demand and supply for a product as a consequence of optimization behavior by heterogeneous consumers and quality differentiated sellers. Using this model, which captures the special properties of professional labor markets, I identify the conditions under which adverse selection will occur.

Asymmetric information alone guarantees neither adverse selection nor market collapse. Whether or not the market outcome entails adverse selection depends critically on the valuation of a product by consumers relative to the opportunity income of sellers and on the number of consumers relative to sellers. I also show that the equilibrium in pure lemons models is fragile and can involve market collapse when the supply of sellers is elastic with respect to price (wage). Since labor supply in any occupation is fairly elastic in the long run, these models imply unrealistically that occupational markets will collapse in the long run. Thus, pure lemons models do not provide an appropriate framework for the behavior of professional labor markets. I also point out that the equilibrium outcomes in pure lemons models are not consistent with the stylized facts in professional labor markets: the existence of large professional service firms such as law firms, accounting firms, and hospitals (or medical group practices) and a large dispersion of prices (or incomes of practitioners). Finally, I examine Leland's (1979) argument that professional licensing is a solution to the adverse selection problem, and concludes that this is not likely to be so in the long run.


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The paper is organized as follows. The next section provides a benchmark model with perfect matching between heterogeneous consumers and quality-differentiated practitioners when agents are symmetrically informed. I then examine the nature of equilibria in conventional lemons models. Whether or not the market outcome entails adverse selection is shown to depend on the demand structure as well as on the supply structure. I also argue that the standard rationale for occupational licensure loses much of its validity in the long run.

**BENCHMARK MODEL**

This section develops a benchmark model of symmetric information: Any practitioner's talent and the price he charges are costlessly observed by all other agents. Each practitioner invests in human capital before entering the market, and consequently supplies a service of a fixed quality equal to his own talent, denoted by \( q \), which takes value between 0 and \( q_e \). Consumers are risk neutral, and each consumer has a "case" such as a legal or medical problem which requires one unit of professional service. Professional services are usually not direct sources of utility; they are intermediate inputs into household "production" through which utility is produced. For example, legal and medical services are purchased because they facilitate the production of monetary wealth or health. These final outcomes of household production are often stochastic. Let \( X \) denote the uncertain final "output" which represents either a pecuniary (e.g., court award) or non-pecuniary (e.g., court decision regarding child custody, result of medical treatment, etc.) benefit. The "size" of a consumer's "case" is indexed by the best possible outcome of the consumer's production \( X \). By construction, \( X \) cannot be larger than \( \hat{X} \).

Let the probability that the final output is no greater than \( X \) when service of quality \( q \) is purchased be \( F_{x|q}(q, \hat{X}) \). The function \( F \) is assumed to be governed by the following properties. First, a higher quality service first order stochastically dominates a lower one: \( F_1 < 0 \). That is, a better outcome is expected when a higher quality practitioner is hired. For example, a consumer knows that a better lawyer or doctor increases the chance of winning a law suit or being cured. Second, the marginal return to higher quality decreases as quality increases; \( F_{2|q} > 0 \). For example, the expected benefit from hiring a lawyer increases when a better lawyer is hired, but the incremental benefit declines as the lawyer quality increases. Third, the marginal return to higher quality is greater for a bigger "case": \( F_{2|q} > 0 \). For example, a patient with a heart disease believes that the chance of survival increases significantly when a better doctor is hired, while a person with a common cold does not expect as significant a return to increased quality of service.

For a given price schedule \( p(q) \), the problem facing a consumer is to choose service quality to maximize his net expected utility given by:

\[
\frac{\hat{X}}{p(q)} - F_{x(q)} - \int_0^{q_e} F_{x|q}(q, \hat{X}) q \, dq
\]

The first order (interior) condition is

\[
p(q^*) = \int_0^{q_e} F_{x|q}(q^*, \hat{X}) q \, dq
\]

which equates the marginal cost of hiring a higher quality practitioner and the increase in benefit from so doing. A simple comparative static analysis shows that a consumer with a larger "case" patronizes a practitioner of higher quality. Consistent with the long-run labor supply to any occupation, I assume that the supply of practitioners is perfectly elastic with respect to price. Since a practitioner supplies his service only if the market price is no smaller than his opportunity income, competition among practitioners implies that the market price of a certain quality equals the opportunity income of a practitioner possessing that quality. Then, using the hedonic price framework of Rosen (1974), it can be verified that consumers with larger "cases" are matched with practitioners of higher quality in the market equilibrium.

**ASYMMETRIC INFORMATION, ADVERSE SELECTION, AND LICENSING**

**The Lemons Model**

This section examines the nature of equilibrium in markets where service providers know their own quality, while consumers cannot observe quality of practitioners at any cost. As in conventional lemons models, the following two assumptions are essential to derive a sensible equilibrium. First, the distribution of quality of potential suppliers (\( G(q) \)) and their opportunity income (\( A(q) \)) are fixed exogenously. Second, consumers know the distribution of quality of potential suppliers and the average quality of the service supplied in the market \( q \) but do not know the quality of any particular practitioner.

Any market characterized by these assumptions will have a single-price equilibrium because quality cannot be distinguished by consumers. Since a practitioner supplies a service only if price is no smaller than the opportunity income, the highest-quality practitioners who are actually participating in the market \( q \), are those for whom opportunity income equals the market price \( p(q) \).
The net expected utility of a consumer is

\[ V(E[V(q)]) - p, \]

where

\[ V = \left( \int_0^q \int_0^{P(X;q,R)} dP(X;q,R) \right) \]

is the expected benefit for a consumer who has to choose a service randomly from one of the pooled practitioners with a given level of average quality. A consumer purchases a unit of service only if the price is no greater than the expected benefit. Note that the expected benefit increases with the size of a "case" and the average quality of practitioners. Thus, all the consumers whose "cases" are larger than the smallest "case" in the market, the one for which the expected benefit equals the market price, will purchase services. The quantity demanded is then a function of price, for a given distribution of consumers with various "case" sizes.

This demand curve can be upward sloping for some ranges of price. Obviously, the demand is more likely to rise with price when the probability density function of quality is very dense around the highest quality available in the market, so that a small increase in price causes a large increase in the average quality. Consider, as an example a case in which there are many potential lawyers whose quality is slightly higher than the highest quality lawyer currently available. A small increase in price will attract these higher quality lawyers into the market, substantially raising the average quality of lawyers. The consequential increase of expected benefit for consumers will also be substantial, and may exceed the increase in price. In such a case, an increase in price will be associated with additional consumers participating in the market (greater demand). Demand has increased not because the price has gone up, but because the average quality of lawyers, thus expected outcome, has increased relative to the price.

The (Walrasian) market equilibrium is attained at the price that equates the quantity supplied to the quantity demanded. This equilibrium condition can be used for comparative static analysis. For example, an exogenous increase in the number of potential consumers results in an increase in the market price, which in turn increases the highest quality and average quality, as well as the quantity supplied. Similarly, an exogenous increase in the number of practitioners lowers the market price and average quality, and increases the volume of trade. The effects of the changes in the parameter values of the distribution functions of the size of "case" and practitioner quality can be analyzed in a similar manner. For example, a rightward shift of the probability density function of the "case" size (due to an increase in wealth among consumers) has effects similar to the exogenous increase in the size of consumer population.

The Nature of Equilibrium

Since the equilibrium price in an asymmetrically informed market is necessarily higher than the lowest possible price in a fully informed market, the number of consumers participating in the market is always smaller. Consequently, for a given structure of demand, the volume of trade in an asymmetrically informed market is smaller, too. However, the highest quality service supplied in a market with asymmetric information is not necessarily lower than in a fully informed market. Suppose that the net benefit of patronizing a practitioner under asymmetric information is positive for any consumer when price equals the opportunity income of the highest quality practitioner in a fully informed market. Suppose further that the quantity demanded is greater than the quantity supplied at the price. The market price will then be pushed up, and consequently, practitioners of higher quality than those in a fully informed market will be attracted.

The reason for this surprising result is as follows. Reflecting the long-run labor supply in an occupational labor market, the supply in a fully informed market was assumed to be perfectly elastic along the opportunity income curve. Consumers reap all the gains from trade by choosing q which maximize their utility, without paying any attention to other consumers. In contrast, the assumption of fixed quality distribution is essential in deriving an equilibrium in asymmetrically informed markets. In these markets, a consumer's bidding action has a negative external effect on other consumers by raising the price. Provided that the number of practitioners relative to the number of consumers is small enough, as in the case when the demand for practitioner services is very elastic, the market price will be pushed up until all the potential practitioners are attracted into the market. In this case, the highest quality supplied can be higher in the market with asymmetric information. This shows that asymmetric information alone does not necessarily lead to adverse selection. Indeed, whether or not the market outcome entails adverse selection depends on the number of potential buyers relative to potential sellers, as well as on the consumers' valuation of the product relative to the opportunity income of sellers.

Do pure lemons models provide an appropriate framework for analyzing the behavior of professional labor markets? They do not provide any explanation for the existence of multi-practitioner professional service firms. Furthermore, they are not consistent with the well-documented dispersion of prices and income in these markets. Finally, and most importantly, they do not provide an accurate depiction of the accrual of rent to the market participants. In particular, since a single price prevails in the equilibrium of pure lemons models, the lowest quality practitioners get the biggest rent, which is not consistent with standard ability rents commonly observed in these markets. Consequently, without the assumption of pre-fixed supply, the market will collapse because the lowest quality practitioners will continue entering the market (and bid down the price) until the quality distribution degenerates to zero quality. Since the labor supply in an occupational market is elastic in the long run, this last point shows that the lemons model of Leland (1979), which is still considered to be the standard model of professional service markets, loses its validity in the long run. It also demonstrates that it is not the asymmetric information but the elastic supply of sellers that causes the market to collapse.
Does Licensure Prevent Adverse Selection?

Professional licensure is among the devices which aim to alleviate the problems arising from asymmetric information in professional service markets. If a professional worker has a reasonable idea of his own ability and the amount of human capital he acquires is highly correlated with that ability, licensing schemes, which establish minimum-quality standards, can be interpreted as devices to prevent adverse selection. In Leland [1979], for example, an occupational licensing authority enforces such standards at \( q^* \), prohibiting the practitioners with lower-than-minimum quality from practicing. This obviously increases the price, the minimal quality, and the average quality of practitioners supplied in the market, as long as the labor supply is fixed exogenously.

However, the licensing requirement cannot be a cure for adverse selection when the supply of potential practitioners is elastic. This is because, as pointed out earlier, the practitioners possessing the same quality as the quality standards receive the biggest rent and keep entering the market. Consequently, the price will fall until the market collapses at \( q^- \). Thus, the minimum-quality standards only guarantee that the quality of practitioners will just meet the standards. This suggests that the standard rationale for occupational licensure [Leland, 1979] is not tenable in the long run.

Discussion

Given that professional licensure is not effective in solving the adverse selection problem, why does this institution continue to exist? In Shapiro [1996], occupational licensure is interpreted as a device which enforces minimum levels of human capital investment by professionals. Obviously, his argument is relevant only to pre-market investment. However, the argument does not provide a compelling justification for the institution because, as Friedman [1982] argues, certification would be sufficient for such purposes. This and the previous discussion indicate that interpreting occupational licensure as a solution to the problems arising from asymmetric information has limited scope. Furthermore, that the dispersion of earnings among professional workers is large suggests that markets can resolve the potential adverse selection problem through reputation formation, contractual arrangement, etc., without any intervention by a regulatory authority. The occupational licensure continues to exist probably because of the rent-seeking behavior of professional organizations. Suppose, for example, that the objective of these organizations is to maximize aggregate rents received by existing members. One way to achieve that goal is to limit the number of practitioners by raising the minimum-quality standards.

The paper has confined its scope to professional labor markets, but its main points can be applied to any market in which consumers are heterogeneous and uncertain about the quality of products, while the supply of a differentiated product is elastic. Yet the applicability of the analytical framework of this paper to other product markets depends critically on how product quality is determined. As noted earlier, professional labor markets are characterized by potential adverse selection because, once human capital investment is made, service quality is exogenous to the practitioner and, consequently, not chosen. In contrast, product quality in many other ordinary product markets is not exogenously given, and instead is subject to choice by suppliers. If such choice of product quality by suppliers is unobserved by consumers, a more relevant analytical framework for these markets would address the issue of opportunism by suppliers. For example, Klein and Leffler [1981] and Shapiro [1983] are concerned with market mechanisms that prevent deterioration of quality of products when quality is endogenously chosen by suppliers and is unobservable to consumers.

Concluding Remarks

This paper examines the nature of equilibrium in professional service markets under alternative informational structures. In the benchmark case in which consumers have full information about the quality of professional service, heterogeneous consumers and quality differentiated practitioners are perfectly matched in equilibrium. Consumers who value higher quality choose to patronize higher quality practitioners and pay higher prices, and there is no loss of efficiency. In contrast, in conventional lemons markets in which consumers and practitioners are asymmetrically informed, a single price prevails and the market equilibrium is contaminated by low quality practitioners. This equilibrium outcome is not consistent with the stylized facts in professional service markets, such as the existence of large professional service firms and price-quality dispersion. Furthermore, the lemons models break down when the labor supply is elastic. Since the labor supply to any occupational market is fairly elastic in the long run, it follows that those models do not provide an appropriate analytical framework for professional labor markets. The conventional lemons models also rationalize professional licensure on the grounds that it resolves adverse selection problems by raising the average quality of practitioners through truncation of the lower tail of the quality distribution. This rationalization loses much of its validity as well, because, in the long run, minimum quality standards only guarantee that the maximum quality of practitioners supplied in a market is determined at the level prescribed by the minimum standards.

Notes

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1. There are some search theoretic models, e.g., Hay and McKenna [1981] and Chun and Leland [1980], in which prices and/or qualities of products are uncertain to consumers. However, adverse selection problems are ignored in Chun and Leland, and another hidden action nor adverse selection problems are addressed in Hay and McKenna.

2. Of course, quality of a professional worker is determined endogenously by investment in human capital (as well as by innate ability), but cases such as an investment has been made the worker's quality is fixed. It is thus reasonable to assume that a worker provides services of a quality determined by the worker's own talent.
8. "Market collapse" also called a low-level equilibrium trap, refers to the case in which only the lowest quality service is supplied in equilibrium.

9. The variance of outcomes might also depend on quality. For example, the probability of attaining the best (worst) outcome can be close to 1 when a consumer hires the best (worst) practitioner, implying that the variance is close to zero for these extreme qualities. This aspect is ignored in the following analysis.

10. A consumer who purchases a legal service may choose a service strategically, taking account of the quality of the lawyer hired by an opponent. This aspect is ignored in equation (1).

11. The second-order condition is $F_p(q^* x^*, \tilde{X} - p^* q^*) < 0$. For given assumptions on $F$, this condition is clearly satisfied if the price schedule is not very concave.

12. More formally, $\alpha q^* 0 = \int F_p(q^* x^*, \tilde{X} - p^* q^*) = \frac{\alpha}{2} \int F_p(q^* x^*, \tilde{X} - p^* q^*) > 0$. The inequality is due to the second-order condition and the third assumption on $F$.

13. Note that when consumers observe the average quality, they also observe the highest quality because of the relationship $q = \frac{\alpha p(q)}{G(q)}$.

14. More formally, let $F$ be the number of potential consumers, $H$ be the distribution of consumers with various "case" sizes, and $E(p)$ be the consumer with the smallest "case" in the market when the price is $p$. The quantity demanded is $P \left( \frac{1}{H} \right)$ as long as the price is no greater than the expected benefit for a consumer with the largest "case", and $H$ otherwise.

15. See also Wilson [1980] and Stiglitz [1987] for other examples of upward sloping demand.

16. The quantity supplied in the market is given by $F_G(q)$, where $Q$ is the total number of potential suppliers, as long as the price is no smaller than the opportunity income of the lowest quality practitioners.

17. The equilibrium price may not be unique if demand is upward sloping. As a practical matter, however, Ross [1980] shows that multiple equilibria are extremely unlikely if the distribution of quality-differentiated suppliers follows some standard distribution.

18. The competitive statics framework is relevant here because this paper, as in other pure lemons models, does not deal with the reputation formation process which involves a dynamic problem.

19. The highest quality available in a fairly informed market may be higher than that in an asymmetrically informed market if the labor supply is fixed in both markets. The point is that factors other than asymmetric information play an important role in establishing market equilibria which entails adverse selection.

20. For example, more than half of all lawyers work in non-single-lawyer law firms as partners or associates. (U.S. Bureau of Census, 1984)

21. For example, the average cash and total compensation of partners in law firms of 2 - 8 lawyers was $66,678 in 1982, while the figure was $139,195 for partners in law firms of 75 or more. (Altman & Weil, Inc., 1982)

22. Here rent is the payment (price) over the opportunity income.

23. There can be a continuous distribution of prices and quality in other forms of market equilibria, with possible excess supply at some or all price ranges (Wilson, 1980; Wein, 1980). Such equilibria are still subject to the same criticism (except for the price-quality dispersion) offered in the above.

24. Ross [1984] proposes an alternative model in which large professional service firms are a solution to the adverse selection problem.