



## A Note on "Lemons" Markets with Quality Certification

W. Kip Viscusi

*The Bell Journal of Economics*, Vol. 9, No. 1. (Spring, 1978), pp. 277-279.

Stable URL:

<http://links.jstor.org/sici?sici=0361-915X%28197821%299%3A1%3C277%3AANO%22MW%3E2.0.CO%3B2-V>

*The Bell Journal of Economics* is currently published by The RAND Corporation.

---

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/about/terms.html>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at <http://www.jstor.org/journals/rand.html>.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

---

JSTOR is an independent not-for-profit organization dedicated to creating and preserving a digital archive of scholarly journals. For more information regarding JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

# A note on “lemons” markets with quality certification

**W. Kip Viscusi**

Assistant Professor of Economics  
Northwestern University

*In markets with qualitative uncertainty, pricing on the basis of average quality will be unattractive to participants whose products are above average in quality. This note examines the possibility of quality certification as an alternative to exit from the market in such situations. Examples dealing with labor market uncertainties illustrate the economic properties of the quality certification process, which unravels from the top down. The economic motivations and patterns of this form of price discrimination are similar to those encountered in standard “lemons” models.*

■ The seminal article by Akerlof (1970) considers a general class of situations in which qualitative uncertainty about a product combines with unraveling effects on individual behavior to influence the average quality of the products traded and sometimes the existence of the market for the good.<sup>1</sup> In this note, I introduce the possibility of quality certification in markets with qualitative uncertainty, and I investigate the nature of the subsequent unraveling process. For concreteness, I focus on the labor market situation in which workers must choose among potentially hazardous jobs. The analysis is equally applicable to product quality uncertainties. Unlike the standard instances of adverse selection, it is assumed that the individual rather than an insurance company bears the risk.

The following example illustrates the key features of the unraveling process. Suppose there are nine firms in an industry, each with a single job for workers. Each job offers a wage  $w_i$  and a probability  $p_i$  of a successful job outcome, such as remaining uninjured. The values of  $p_i$  are given by  $i/10$ , and only each firm  $i$  knows its true  $p_i$ . Workers and firms know the overall distribution of these probabilities, however, and assess the probability of success for all firms as being the average for the industry,  $\bar{p}$ , which equals 0.5 for the case being considered. To complete the model, assume that workers place a value of  $-1$  on an unfavorable job outcome and that they maximize expected payoffs, where the wage is paid irrespective of the job outcome. Alternative employment with a reward of 0.2 is available, and wages are set competitively.

---

Professors Kenneth Arrow, Richard Freeman, Richard Zeckhauser, and an anonymous referee provided helpful comments. Financial support was provided by the U.S. Department of Labor.

<sup>1</sup> Unraveling effects and group externalities also have been considered within the context of adverse selection (Arrow, 1970), tipping phenomena (Schelling, 1972a and 1972b), and marketing signaling (Spence, 1974a and 1974b).

In Akerlof's models, it was the average quality of used cars that determined their price and the average risk of insurance purchasers that determined the level of insurance premiums. Similarly, if workers cannot distinguish among the job risks at different firms, it is the industry-wide job risk that determines the wage rate. In the absence of any information transfer, workers will be employed in the industry at a wage  $w$  for each firm provided that

$$w + (1 - \bar{p})(-1) \geq 0.2, \text{ or } w \geq 0.7.$$

Setting the wage on the basis of average quality will not be equally attractive to all enterprises. All firms with above-average probabilities of successful job outcomes can lower their wage if they can alter worker's assessment in the direction of the enterprise-specific probability. For simplicity, suppose that at some cost each firm can convey the true probability  $p_i$  or alternatively can alter the individual's probability distribution so that its mean is  $p_i$ .<sup>2</sup> The firm with the most to gain is firm 9, which can lower its wage to 0.3. That firm will invest in quality certification so long as such certification does not cost more than 0.4.

After the characteristics of firm 9 are made known, workers' assessments of the average probability  $\bar{p}$  for the remaining eight firms in the industry will drop to 0.45, increasing the incentive of all firms with  $p_i > 0.45$  to reveal their true job characteristics. Firm 8 will have the greatest incentive to do so, and it will incur a cost of up to 0.35 to convey this information. The unraveling process continues until the information transfer costs exceed the benefits to the firm of revealing its enterprise-specific hazard.

Table 1 summarizes the market outcome. The equilibrium wage  $w_i$  paid by firm  $i$  with probability  $p_i$  of a successful outcome is given in column 3. Assuming that no lower-numbered firms have revealed the true job characteristics and that all higher-numbered firms have done so, each firm will be willing to incur a cost up to  $c_i$  (see the fourth column of Table 1) to provide accurate information about the job it offers. This amount decreases linearly as the unraveling process occurs. For a uniform quality certification cost across firms that exceeds 0.05, an equilibrium with partial information will result.

The unraveling process in quality certification closely resembles group behavior in "lemons"-type models of qualitative uncertainty. In each instance, enterprises or individuals at the above-average end of the quality spectrum successively distinguish themselves from the group in a process that unravels from the top down. The major difference is that instead of exiting from the market altogether, as in the case of good risks who forego insurance or used-car owners who do not trade in high-quality cars, enterprises invest in quality certification as a means of price discrimination.

Two aspects of the unraveling process are of particular interest. First, the certification process may involve important distributive effects. Although the total wage bill is the same when no information is provided and when perfect information is provided, in the latter case there is a redistribution from workers on less hazardous jobs to those on more hazardous positions. Enterprises are willing to incur quality certification costs up to a value of 1.8,

---

<sup>2</sup> The process of enterprises' learning their relative hazard and investing in credible forms of information transfer raises nontrivial market signaling problems. I shall neglect these issues to concentrate on the unraveling effects.

TABLE 1  
DATA FOR THE BASIC MODEL

FIRM	$p_i$	$w_i$	$c_i$	$c_i'$
9	0.9	0.3	0.4	0.44
8	0.8	0.4	0.35	0.45
7	0.7	0.5	0.3	—
6	0.6	0.6	0.25	—
5	0.5	0.7	0.2	—
4	0.4	0.8	0.15	—
3	0.3	0.9	0.1	0.1
2	0.2	1.0	0.05	0.05
1	0.1	1.1	0	0

which is a net efficiency loss in the model.<sup>3</sup> Introducing the possibility of investment in work quality, expansion of enterprises, and changes in production technique would introduce offsetting efficiency benefits, but in general the net efficiency effect would remain ambiguous.<sup>4</sup> The source of the potential efficiency loss is the fact that agents deciding whether or not to provide the information have a direct economic interest in its use.

A second interesting aspect of the unraveling process is that the incentive to provide information need not decline steadily as the unraveling process proceeds. If, for example, firms 4–7 were excluded from the market, the information transfer cost  $c_i'$  firms would be willing to incur would rise and then decline, as the last column of Table 1 indicates. The distribution of enterprise characteristics and worker preferences has an important influence on the nature and extent of the unraveling process.<sup>5</sup>

## References

- AKERLOF, G. A. "The Market for 'Lemons': Qualitative Uncertainty and the Market Mechanism." *Quarterly Journal of Economics*, Vol. 84, No. 3 (1970), pp. 488–500.
- ARROW, K. J. "The Organization of Economic Activity: Issues Pertinent to the Choice of Market Versus Nonmarket Allocation" in Joint Economic Committee, *The Analysis and Evaluation of Public Expenditures: The PPB System*, Vol. 1, Washington, D.C.: U.S. Government Printing Office, 1969, pp. 47–66.
- SHELLING, T. C. "Hockey Helmets, Concealed Weapons, and Daylight Savings." Discussion Paper No. 9, Public Policy Program, Harvard University, 1972a.
- . "The Process of Residential Segregation: Neighborhood Tipping" in A. Pascal, ed., *Racial Discrimination in Economic Life*, Lexington: D. C. Heath and Co., 1972b.
- SPENCE, A. M. "Competitive and Optimal Responses to Signals: An Analysis of Efficiency and Distribution." *Journal of Economic Theory*, Vol. 7, No. 3 (1974a) pp. 296–332.
- . *Market Signaling: Informational Transfer in Hiring and Related Screening Processes*. Cambridge: Harvard University Press, 1974b.

<sup>3</sup> Alternatively, if enterprises pay a certifying agent to verify and publicize their work quality levels, the information transfer cost might best be viewed as a transfer payment rather than as a net loss to society.

<sup>4</sup> Similar ambiguities arise for much the same reason in market signaling situations. See Appendix E of Spence (1974b).

<sup>5</sup> Suppose, for example, that the job risk is the risk of death, which is valued at 0. Life is valued at  $w$ , as before. Then the value of  $c_i$  in the nine-firm example described in Table 1 would steadily rise as the unraveling process proceeds.