

The Prize in Economic Sciences 2001

The Royal Swedish Academy of Sciences has decided to award the Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel, 2001, jointly to

GEORGE A. AKERLOF

University of California at Berkeley, USA,

A. MICHAEL SPENCE

Stanford University, USA, and

JOSEPH E. STIGLITZ

Columbia University, USA,

"for their analyses of markets with asymmetric information".

Markets with asymmetric information

Many markets are characterized by *asymmetric information*: actors on one side of the market have much better information than those on the other. Borrowers know more than lenders about their repayment prospects, managers and boards know more than shareholders about the firm's profitability, and prospective clients know more than insurance companies about their accident risk. During the 1970s, this year's Laureates laid the foundation for a general theory of markets with asymmetric information. Applications have been abundant, ranging from traditional agricultural markets to modern financial markets. The Laureates' contributions form the core of modern information economics.

George Akerlof demonstrated how a market where sellers have more information than buyers about product quality can contract into an *adverse selection* of low-quality products. He also pointed out that informational problems are commonplace and important. Akerlof's pioneering contribution thus showed how asymmetric information of borrowers and lenders may explain skyrocketing borrowing rates on local Third World markets; but it also dealt with the difficulties for the elderly to find individual medical insurance and with labour-market discrimination of minorities.

Michael Spence identified an important form of adjustment by individual market participants, where the better informed take costly actions in an attempt to improve on their market outcome by credibly transmitting information to the poorly informed. Spence showed when such *signaling* will actually work. While his own research emphasized education as a productivity signal in job markets, subsequent research has suggested many other applications, e.g., how firms may use dividends to signal their profitability to agents in the stock market.

The Prize amount: SEK 10 million, will be shared equally among the Laureates

More information: www.nobel.se

Press Officer: Eva Krutmeijer, phone +46 8 673 95 95, +46 709 84 66 38, evak@kva.se

Joseph Stiglitz clarified the opposite type of market adjustment, where poorly informed agents extract information from the better informed, such as the *screening* performed by insurance companies dividing customers into risk classes by offering a menu of contracts where higher deductibles can be exchanged for significantly lower premiums. In a number of contributions about different markets, Stiglitz has shown that asymmetric information can provide the key to understanding many observed market phenomena, including unemployment and credit rationing.

.....
GEORGE A. AKERLOF, 61 years, born 1940 in New Haven, Connecticut (US citizen). PhD from MIT 1966. Has held professorships at Indian Statistical Institute and London School of Economics. Since 1980 Goldman Professor of Economics at the University of California at Berkeley.
<http://emlab.berkeley.edu/users/akerlof/index.html>.

A. MICHAEL SPENCE, 58 years, born 1943 in Montclair, New Jersey (US citizen). PhD from Harvard 1972. Has held professorships at Harvard and the Graduate School of Business, Stanford and has also been Dean at both these universities.
<http://gobi.stanford.edu/facultybios/bio.asp?ID=156>.

JOSEPH E. STIGLITZ, 58 years, born 1943 in Gary, Indiana (US citizen). PhD from MIT 1967. Has held professorships at Yale, Princeton, Oxford and Stanford, and has been the Chief Economist of the World Bank. Since this year, Professor of Economics, Business and International Affairs at Columbia University.



The Prize in Economic Sciences 2001

*For more than two decades, the theory of markets with asymmetric information has been a vital and lively field of economic research. Today, models with imperfect information are indispensable instruments in the researcher's toolbox. Countless applications extend from traditional agricultural markets in developing countries to modern financial markets in developed economies. The foundations for this theory were established in the 1970s by three researchers: **GEORGE AKERLOF**, **MICHAEL SPENCE** and **JOSEPH STIGLITZ**. They receive the Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel, 2001, "for their analyses of markets with asymmetric information".*

Markets with Asymmetric Information

Why are interest rates often excessively high on local lending markets in Third World countries? Why do people who want to buy a good used car turn to a dealer rather than a private seller? Why does a firm pay dividends even if they are taxed more heavily than capital gains? Why is it advantageous for insurance companies to offer clients a menu of contracts where higher deductibles can be exchanged for lower premiums? Why do rich landowners not bear the entire harvest risk in contracts with poor tenants? These questions exemplify familiar – but seemingly different – phenomena, each of which has posed a challenge to economic theory. This year's Laureates proposed a common explanation and extended the theory when they argued the theory with the realistic assumption of asymmetric information: agents on one side of the market have much better information than those on the other side. Borrowers know more than the lender about their repayment prospects; the seller knows more than buyers about the quality of his car; the CEO and the board know more than the shareholders about the profitability of the firm; policyholders know more than the insurance company about their accident risk; and tenants know more than the landowner about their work effort and harvesting conditions.

More specifically, Akerlof showed that informational asymmetries can give rise to *adverse selection* on markets. Due to imperfect information on the part of lenders or prospective car buyers, borrowers with weak repayment prospects or sellers of low-quality cars crowd out everyone else from the market. Spence demonstrated that under certain conditions, well-informed agents can improve their market outcome by *signaling* their private information to poorly informed agents. The management of a firm can thus incur the additional tax cost of dividends to signal high profitability. Stiglitz showed that an uninformed agent can sometimes capture the information of a better-informed agent through *screening*, for example by providing choices from a menu of contracts for a particular transaction. Insurance companies are thus able to divide their clients into risk classes by offering different policies, where lower premiums can be exchanged for a higher deductible.

George Akerlof

Akerlof's 1970 essay, "The Market for Lemons" is the single most important study in the literature on economics of information. It has the typical features of a truly seminal contribution – it addresses a simple but profound and universal idea, with numerous implications and widespread applications.

Here Akerlof introduces the first formal analysis of markets with the informational problem known as *adverse selection*. He analyses a market for a good where the seller has more

information than the buyer regarding the quality of the product. This is exemplified by the market for used cars; “a lemon” – a colloquialism for a defective old car – is now a well-known metaphor in economists’ theoretical vocabulary. Akerlof shows that hypothetically, the information problem can either cause an entire market to collapse or contract it into an adverse selection of low-quality products.

Akerlof also pointed to the prevalence and importance of similar information asymmetries, especially in developing economies. One of his illustrative examples of adverse selection is drawn from credit markets in India in the 1960s, where local lenders charged interest rates that were twice as high as the rates in large cities. However, a middleman who borrows money in town and then lends it in the countryside, but does not know the borrowers’ creditworthiness, risks attracting borrowers with poor repayment prospects, thereby becoming liable to heavy losses. Other examples in Akerlof’s article include difficulties for the elderly to acquire individual health insurance and discrimination of minorities on the labor market.

A key insight in his “lemons paper” is that economic agents may have strong incentives to offset the adverse effects of information problems on market efficiency. Akerlof argues that many market institutions may be regarded as emerging from attempts to resolve problems due to asymmetric information. One such example is guarantees from car dealers; others include brands, chain stores, franchising and different types of contracts.

A timely example might further illustrate the idea that asymmetric information can generate adverse selection. At first, firms in a new sector – such as today’s IT sector – might seem identical to an uninformed bystander, while some “insiders” may have better information about the future profitability of such firms. Firms with lower than average profitability will therefore be overvalued and more inclined to finance new projects by issuing their own shares than high-profitability firms which are undervalued by the market. As a result, low-profitability firms tend to grow more rapidly and the stock market will initially be dominated by “lemons”. When uninformed investors eventually discover their mistake, share prices fall – the IT bubble bursts.

Apart from his research on asymmetric information, Akerlof has developed economic theory with insights from sociology and social anthropology. His most noteworthy contributions in this genre concern efficiency on labor markets. Akerlof points out that emotions such as reciprocity towards an employer or fairness towards colleagues can prompt wages to be set so high as to induce unemployment. He has also examined how social conventions such as the caste system may have unfavorable effects on economic efficiency. As a result of these studies, Akerlof’s research is also well known and influential in other social sciences.

Michael Spence

Spence asked how better informed individuals on a market can credibly transmit, “signal”, their information to less informed individuals, so as to avoid some of the problems associated with adverse selection. Signaling requires economic agents to take observable and costly measures to convince other agents of their ability or, more generally, of the value or quality of their products. Spence’s contribution was to develop and formalize this idea as well as to demonstrate and analyze its implications.

Spence’s pioneering essay from 1973 (based on his PhD thesis) deals with education as a signal of productivity on the labor market. A fundamental insight is that signaling cannot succeed unless the signaling cost differs sufficiently among the “senders”, i.e., job applicants. An employer cannot distinguish the more productive applicants from those who are less productive unless the former find it sufficiently less costly to acquire an education than the latter

choose a lower level of education. Spence also pointed to the possibility of different “expectations-based” equilibria for education and wages, where e. g. men and white receive a higher wage than women and black with the same productivity.

Subsequent research contains numerous applications which extend this theory and confirm the importance of signaling on different markets. This covers phenomena such as costly advertising or far-reaching guarantees as signals of productivity, aggressive price cuts as signals of market strength, delaying tactics in wage offers as a signal of bargaining power, financing by debt rather than by issuing new shares as a signal of profitability, and recession-generating monetary policy as a signal of uncompromising commitment to reduce stubbornly high inflation.

An early example in the literature concerns dividends. Why do firms pay dividends to their shareholders, knowing full well that they are subject to higher taxes (through double taxation) than capital gains? Retaining the profits within the firm would appear as a cheaper way to favor the shareholders through the capital gains of a higher share price. One possible answer is that dividends can act as a signal for favorable prospects. Firms with “insider information” about high profitability pay dividends because the market interprets this as good news and therefore pays a higher price for the share. The higher share price compensates shareholders for the extra tax they pay on the dividends.

In addition to his research on signaling, Spence was a forerunner in applying the results and insights of the 1996 economics laureates, Vickrey and Mirrlees, to the analysis of insurance markets. During the period 1975-1985, he was one of the pioneers in the wave of game-theory inspired work that clarified many aspects of strategic market behavior within the so-called new theory of industrial organization.

Joseph Stiglitz

One of Stiglitz’s classical papers, coauthored with Michael Rothschild, formally demonstrated how information problems can be dealt with on insurance markets where the companies do not have information on the risk situation of individual clients. This work is an obvious complement to Akerlof’s and Spence’s analyses by examining what actions uninformed agents can take on a market with asymmetric information. Rothschild and Stiglitz show that the insurance company (the uninformed party) can give its clients (the informed party) effective incentives to “reveal” information on their risk situation through so-called *screening*. In an equilibrium with screening, insurance companies distinguish between different risk classes among their policyholders by offering them to choose from a menu of alternative contracts where lower premiums can be exchanged for higher deductibles.

Stiglitz and his numerous coauthors have time and again substantiated that economic models may be quite misleading if they disregard informational asymmetries. Their common message has been that in the perspective of asymmetric information, many markets take on a completely different guise, as do the conclusions regarding appropriate forms of public-sector regulation. Stiglitz has analyzed the implications of asymmetric information in many different contexts, varying from unemployment to the design of an optimal tax system. Several of his essays have become important stepping stones for further research.

One example is Stiglitz’s work with Andrew Weiss on credit markets with asymmetric information. Stiglitz and Weiss show that in order to reduce losses from bad loans, it may be optimal for bankers to ration the volume of loans instead of raising the lending rate. Since credit rationing is so common, these insights were important steps towards a more realistic theory of credit markets. They have also had a substantial impact in the domains of corporate finance,

monetary theory and macroeconomics.

In collaboration with Sanford Grossman, Stiglitz analyzed efficiency on financial markets. Their key result is known as the Grossman-Stiglitz paradox: if a market were informationally efficient, i.e., all relevant information is reflected in market prices, then no single agent would have sufficient incentive to acquire the information on which prices are based.

Stiglitz is also one of the founders of modern development economics. He has shown that asymmetric information and economic incentives are not merely academic abstractions, but highly concrete phenomena with far-reaching explanatory value in the analysis of institutions and market conditions in developing economies. One of his first studies of information problems dealt with sharecropping, an ancient, though still common, form of contracting. A sharecropping contract stipulates that the harvest should be divided between a landowner and his tenant in fixed shares (usually half each). Since the landowner is usually richer than the tenant, it would seem advantageous to both parties to let the landowner bear the entire risk. But such a contract would not give the tenant strong enough incentives to cultivate the land efficiently. Considering the landowner's inferior information about harvest conditions and the tenant's work effort, sharecropping is in fact the optimal solution for both parties.

Joseph Stiglitz's many contributions have transformed the way economists think about the working of markets. Together with the fundamental contributions by George Akerlof and Michael Spence, they make up the core of the modern economics of information.

FURTHER READING

- Akerlof, G. (1970), "The Market for Lemons: Quality Uncertainty and the Market Mechanism", *Quarterly Journal of Economics* 84, 488-500
- Riley, J. (2001), "Silver Signals: Twenty-Five Years of Screening and Signaling", *Journal of Economics Literature* 39, 432-478
- Rothschild, M. and J. Stiglitz (1976), "Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information", *Quarterly Journal of Economics* 90, 629-649
- Spence, M. (1973), "Job Market Signaling", *Quarterly Journal of Economics* 87, 355-374
- Stiglitz J. (1997), *Economics*, 2nd edition, W.W. Norton (New York)

THE LAUREATES

GEORGE AKERLOF

Economics Department
University of California
549 Evans Hall #3880
Berkeley, CA 94720-3880
USA

<http://emlab.berkeley.edu/users/akerlof/index.html>

PhD from MIT 1966. Has held professorships at Indian Statistical Institute and London School of Economics. Since 1980 Goldman Professor of Economics at the University of California at Berkeley.

MICHAEL SPENCE

Stanford Business School
518 Memorial Way
Stanford University
Stanford, CA 94305-5015
USA

<http://gobi.stanford.edu/facultybios/bio.asp?ID=156>.

PhD from Harvard 1972. Has held professorships at Harvard and the Graduate School of Business, Stanford and has also been Dean at both these universities.

JOSEPH STIGLITZ

Economics Department
Columbia University
1022 International Affairs Building
420 West 118th Street
New York, NY 10027
USA

PhD from MIT 1967. Has held professorships at Yale, Princeton, Oxford and Stanford, and has been the Chief Economist of the World Bank. Since this year, Professor of Economics, Business and International Affairs at Columbia University.