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The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 1969-2007

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Introduction

In conjunction with its tercentenary celebrations in 1968, Sveriges Riksbank (the central bank of Sweden) instituted a new award, "The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel" on the basis of an economic commitment by the bank in perpetuity. The award is given by the Royal Swedish Academy of Sciences according to the same principles as for the Nobel Prizes that have been awarded since 1901.

The procedures for selecting the laureates are also the same. Each year the Academy receives some 200-300 nominations, usually covering a little more than one hundred nominees. (Unsolicited suggestions from persons who have not been asked to submit nominations are not considered.) The Economics Prize Selection Committee of the Academy (with five to eight members) commissions expert studies of the most prominent candidates, sometimes by Swedish experts but usually by foreigners. The Prize Committee presents its award proposal to the Social Science Class of the Academy (Class IX) in the form of a report, with an extensive survey of the main candidates that are considered for a

prize. The report motivates the proposal and includes all the solicited expert studies. On the basis of this material the class suggests a laureate (or a shared prize between two or, at most, three laureates) regularly following the committee's proposal. Finally the entire Academy meets to take the final award decision, usually in October.

What criteria have guided the awards so far? And what have been the main problems when selecting the laureates?

It is useful to start a discussion of these issues with a rough classification of the various types of economics prize awards given so far. It should be kept in mind, however, that all such classifications are rather arbitrary since the multidimensional nature of scientific contributions makes it difficult to avoid overlaps.

A Classification of Prizes for the First 38 Years

General Equilibrium Theory

Obvious examples of this type of award are the prizes to Paul Samuelson (1970) for having "developed static and dynamic economic theory"; to Kenneth Arrow and John Hicks (1972) for "their pioneering contributions to general economic equilibrium theory and welfare theory"; to Gerard Debreu (1983) for "his rigorous reformulation of the theory of general equilibrium"; and to Maurice Allais (1988) "for his pioneering contributions to the theory of markets and efficient utilization of resources". (See the table at the end of the article for an attempt to classify the awards into various fields of research.)

Contributions in this category have dealt largely with the analytical structures of theoretical economic models, often highlighting the formal similarity of these structures, and clarifying the conditions for consistency, equilibrium, stability and efficiency of the economic system. Often, these contributions also have included important comparative static experiments, i.e., analyses of how

equilibrium positions change in response to changes in various exogenous factors (parameters).

It is largely due to the above-mentioned theorists that general equilibrium theory has become the basic approach in theoretical economic analysis. For instance, Hicks formulated conditions for multimarket stability, and extended the applicability of the static method of analysis to several periods. He also initiated rigorous dynamic analysis of capital accumulation. Because it was deeply anchored in microeconomic theories of the behavior of individual consumers and firms, the models developed by Hicks offered far better ways to study the consequences of changes in various parameters than did earlier general equilibrium models (such as Léon Walras' general equilibrium system of equations). Hicks also presented a celebrated aggregate general equilibrium model with four markets – commodities, labor, credit and money – the so-called IS-LM model.

Samuelson's work was not only a continuation of the contributions by Hicks; it also represented a discontinuity, i.e., a break-through, in terms of analytical sophistication. This is recognized in the prize citation, which declares that Samuelson "actively contributed to raising the level of analysis in economic science". It is hardly an exaggeration to say that he single-handedly rewrote considerable parts of central economic theory: microeconomic theory, static and dynamic, partial and general equilibrium theory, as well as welfare-economics. By extracting interesting inferences from simple mathematically formulated models, exploiting effectively the second-order conditions of maximization procedures, he derived results which still today rank among the classical theorems of economics.

Arrow's and Debreu's main contributions to general equilibrium theory were to achieve greater generality by applying more powerful mathematical methods, such as the theory of convex sets. The generality allowed them to define the concept of a good so broadly that the same theory may be used not only in static equilibrium analysis but also in analysis of the spatial distribution of production

and consumption activities, intertemporal analysis and the analysis of decision-making under uncertainty. Arrow also highlighted the difficulties of deriving social welfare functions from individual preferences – Arrow’s so called “impossibility theorem”.

Maurice Allais' contributions, made largely in the 1940s, have great similarities both with Paul Samuelson's (contemporaneous) work and Arrow's and Debreu's (later) contributions. A special feature of Allais' work is that he describes the economy’s path to equilibrium as a process by which competition removes all “surpluses” in firms. Allais' analysis also covers the case where returns to scale in production give rise to natural monopolies. His contributions thereby laid the foundation for a school of Post-War French economists who analyzed the conditions for an efficient use of resources in large public monopolies (such as Electricité de France and SNCF, the state railway system,). Allais also anticipated parts of the modern theory of economic growth.

Macroeconomics

Numerous prizes have been given to macroeconomics, i.e., that branch of economic analysis that explains the behavior of the national economy as a whole in terms of a number of broad aggregates, such as private consumption, investment, exports, imports, government spending on goods and services, etc. Some of the awarded contributions in this field concern sectors (“submodels”) of national economies, while others deal with an entire national economy.

An award in macroeconomics that refers both to special sectors and to the entire national economy is the 1976 prize to Milton Friedman. The prize citation referred to his contributions to “consumption analysis, monetary history and theory.” Milton Friedman's book *A Theory of the Consumption Function* in 1957 is a successful attempt to combine formal theory and its empirical application for a specific sector of the economy. His extensive empirical study of the monetary history of the United States (together with Anna Schwartz) may be regarded as an example of rather “pure” empirical research, even though the

study clearly was based on a theoretical framework emphasizing a monetary interpretation of macroeconomic fluctuations.

Franco Modigliani (awarded in 1985) developed two important building blocks in macroeconomic models, namely submodels of private consumption and the financial sector. In particular, in his life-cycle theory of saving Modigliani studied the consequences for household saving of changes in demography and economic growth. Together with Merton Miller he also laid the foundation for the field “corporate finance”. The Modigliani-Miller theorem states the conditions under which the value of a firm in the stock market is influenced (or not influenced) by the dividend policy of the firm, and the way the firm finances its investment, e.g., via equity capital or borrowing.

The prize to James Tobin (1981) is another example of an award for theoretical contributions concerning specific sectors of a national economy – the award being given for his analysis of “financial markets and their relation to expenditure decisions, employment, production and prices.” Tobin’s way of modeling interactions between financial and real sectors quickly became an integrated part of macroeconomic models for national economies, with an important role played by the relation between the market value of a capital asset and its reproduction costs – the so-called “Tobin's q ”. Adding the stock of real assets – land, buildings, inventories and claims on raw materials – Tobin's portfolio model also becomes the natural analytical tool with which to analyze direct effects on product prices of changes in the supply of money.

The shared prize to James Meade and Bertil Ohlin (1977) for their contribution to “the theory of international trade and international capital movement” is another example of a contribution concerning a specific sector of a national economy: the sector of foreign transactions. In the case of Ohlin, the award referred to his development of a theory of international and interregional trade, designed to explain both the causes and the consequences of trade – known as the Heckscher-Ohlin model. Ohlin showed that the trade patterns of individual countries depend on their proportions of available factors of production (capital

and labor), and that international trade tends to equalize the returns to these factors among countries. James Meade analyzed trade policy in a world with various market distortions, hence anticipating the theory of “second best” allocations of resources. He was also a pioneer in the field the theory of open-economy macroeconomics. Of particular importance was Meade's analysis of the relation between internal and external balance, and the relation between targets and instruments of economic policy.

However, the foundations for today's theory of open-economy macroeconomics were constructed by Robert Mundell, the so-called Mundell-Fleming model. We may say that Mundell introduced foreign trade and capital movements into Hick's IS-LM model for a closed economy. He showed that the effects of monetary and fiscal policy hinge crucially on the degree of international capital mobility. He also demonstrated the far-reaching importance of the exchange rate regime: under a floating exchange rate, monetary policy becomes powerful and fiscal policy tends to become rather powerless, whereas the opposite is true under a fixed exchange rate. The analysis was inspired by David Hume's classic mechanism of international price adjustment focusing on monetary factors and changes in stock variables. Mundell is also pioneer in the analysis of optimum currency areas, which deals with the advantages and disadvantages for countries of relinquishing their monetary sovereignty in favor of a common currency.

Lawrence Klein (awarded in 1980) also made important contributions to macro-economic research – in this case for entire national economies and even the interaction among several national economies. The prize citation emphasized “the creation of econometric models and their application to the analysis of economic fluctuations and economic policies.” One of Klein's main achievements was to analyze the effects of economic policies by way of statistical model simulation. He also made important contributions in developing forecasting techniques. His analysis originally ran in the framework of Keynesian-type macro-theories, but his models tended to become more eclectic over time. They also became more and more detailed, ultimately covering more than one hundred estimated equations.

Robert Lucas, awarded the prize in 1995, has also furthered macroeconomic model building in a fundamental way. In particular, he has emphasized the role of expectations in macroeconomic analysis. He is particularly renowned for developing the consequences of "rational expectations" among economic agents, according to which these exploit all available information and do not make *systematic* expectational mistakes. Lucas also analyzed the consequences for the macroeconomy of changes in the "economic policy regime", i.e., the way government and central bank policies respond to changes in the economy. In particular, he has shown how conventionally statistically estimated macroeconomic behavior functions for the private sector may become unreliable after a change in the policy regime – the so-called "Lucas Critique" of traditional macroeconometric estimations. He has also suggested ways of avoiding this problem.

While the awards to macroeconomics discussed above referred to contributions concerning short-term macroeconomic fluctuations, Robert Solow was rewarded (in 1987) for his contributions to the theory of long-term macroeconomic growth. His main contribution was to build a mathematical model (in the form of a simple differential equation) describing how the process of capital accumulation generates rising productivity. The capital intensity of production – the volume of capital per worker – is determined by the prices of capital and labor. Due to diminishing return to capital, the economy in this model will in the long run approach a situation where labor-productivity growth is driven only by technological progress. Solow also developed a model of economic growth in which new technology was embedded in newly produced capital goods, the so-called "vintage model" of economic growth. Based on his theoretical models, Solow also pioneered in empirical research on the determinants of economic growth – so-called "growth accounting".

The shared prize to Arthur Lewis and Theodore Schultz (in 1979) also referred to economic growth, though at a less abstract level than the work by Solow. The prize citation referred to their research on "economic development with particular consideration of the problems of developing countries". The award to

Lewis recognized particularly his two long-term growth models for less developed countries – emphasizing the consequences for economic growth of an elastic supply of labor, and the determinants of the terms of trade for countries that export tropical products. The award to Schultz honored his analysis of the role of investment in human capital for economic development, particularly in agriculture. Both Lewis and Schultz were concerned with combining their theoretical reasoning with empirical data, though they used the traditional expository techniques of economic history rather than formalized statistical or econometric testing techniques. Schultz emphasized the apparent efficiency in the agricultural sector in less developed countries, considering existing constraints with respect to resources and knowledge available in these countries. Lewis instead focused on the tensions between a large and stagnant agricultural sector, with a low marginal product of labor, and a dynamic industrial (“capitalist”) sector, which is sometimes in the nature of an economic enclave.

Finn Kydland and Edward Prescott, awarded the economics price in 2004, further developed the insights of Robert Lucas and Robert Solow. In particular, they showed that economic policies are often plagued by problems of *time consistency*. More specifically, if economic policy makers are not able to commit their policy measures in advance to a specific policy rule, later on they will often, in fact, not pursue the policy which they initially regarded as the best one. For instance, national economies may become trapped in high inflation even though price stability is the stated objective of monetary policy. Kydland and Prescott’s contribution has made the issue of the credibility and political feasibility of economic policy a main issue in economic research. Another result of this contribution is a shift of the discussion of economic policy away from isolated policy measures towards the institutional setup of policy making. Kydland and Prescott have also combined the analysis of short-term macroeconomic fluctuations with analysis of long-term economic growth – two research areas that were earlier regarded as separate fields. In particular, they emphasized the role of productivity disturbances (“supply shocks”) not only when analyzing economic growth, but also in studies of short-term macro-

economic fluctuations. Subsequent studies by other scholars have integrated this insight with the role of shifts in aggregate demand, and price- and wage-rigidities, when explaining short-term and long-term economic development.

In 2006, Edmund Phelps was awarded another prize in macroeconomics. We may say that he supplied a number of important, previous missing pieces to the macroeconomic puzzle. In particular, he deepened our understanding of the relation between short-run and long-run effects of economic policy. Phelps was the first economist who in a rigorous way challenged the view that there was a stable tradeoff between inflation and unemployment, the so-called Phillips curve. He showed that the long-run rate of unemployment is not affected by aggregate demand management and inflation but only by the structure, and hence the functioning of the labor market.

Phelps also highlighted inter-temporal trade-offs in the case of policies determining the rate of capital formation. However, he also showed under what circumstances all generations may gain from changes in the saving rate. In this context, Phelps clarified the importance of human capital for the diffusion of new technology and, hence, for economic growth.

Microeconomics

A number of awards have also been given for contributions in microeconomic theory, dealing with decision-making by individual households and firms, and the allocation of resources among different uses and production sectors in the economy. One example is the prize to George Stigler (1982) for his studies of “industrial structures, functioning of markets and causes and effects of public regulation” He also analyzed how economic regulations, in reality, are conducted by politicians and public-sector administrators. He showed, for instance, that regulators often become dominated by those that are supposed to be regulated – so called “regulatory capture”. In a similar vein as Friedman, Stigler represents a pronounced positivist tradition, emphasizing analytical simplicity and the importance of empirical application.

Stigler was also one of the pioneers in the field of "information economics", introducing information costs explicitly in his analysis. Other prizes have also been given to this field. James Mirrlees and William Vickrey (award in 1996) made pioneering work about the consequences of various limitations in information of individuals, including "information asymmetries" among economic agents. It turns out that such information asymmetries are of great importance for the functioning of markets such as insurance and credit markets. Mirrlees also did fundamental work on the consequences for taxation of asymmetric information between the government and private agents. Vickrey's clarified the properties of various types of auctions. His insights have been crucial for developing efficiently functioning auctions of rights to broadcast, landing permits at airports, television rights as well as sales of government assets ("privatization").

A more general theory of asymmetric information was developed by George Akerlof, Michael Spence and Joseph Stiglitz. George Akerlof studied markets where sellers of products have more information than buyers about product quality. He showed that low-quality products may squeeze out high-quality products in such markets, and that prices of high-quality products may suffer as a result. The analysis helps explain, for instance, extremely high borrowing rates in poor countries and the difficulties for broad markets for health-care insurance to emerge. Michael Spence and Joseph Stiglitz analyzed various types of spontaneous adjustment mechanisms in such markets. Spence showed how better informed agents may improve the market outcome by taking costly actions for the purpose of transmitting information to poorly informed agents. Important examples of such "signaling" are education as a signal of individual productivity in labor markets, and dividend payments to signal high profitability of individual firms. Stiglitz instead analyzed the role of "screening" in markets with asymmetric information. Important examples are attempts by insurance companies to partition contracts into risk classes, hence offering different types of contracts among which customers can choose. Stiglitz has also shown how a number of market phenomena may be explained by the theory of asymmetric information, important examples being unemployment, credit rationing and

sharecropping contracts in the agricultural sector in some developing countries.

The role of information asymmetries has been further analyzed by theorists studying alternative allocation mechanisms. This approach has several roots. One is Leonid Hurwicz, who defined allocation mechanisms as a game in which the participants act as if they send messages to each other, or to a hypothetical “message center”. Hurwicz also emphasized the importance that an allocation mechanism is “incentive compatible” in the sense that the predicted, or desired, outcome is consistent with all agents’ economic incentives to act. Other important roots of the theory of mechanism design are James Mirrlees’ optimization analysis and William Vickrey’s analysis of auction markets.

A number of authors, in particular, Roger Myerson and Eric Maskin, have generalized and developed the insights of Hurwicz, Mirrlees and Vickrey. Through a calculation algorithm denoted the “revelation principle”, they have simplified the analysis of alternative allocation mechanisms. Generally speaking, this mechanism states that the researcher can restrict the attention to a subset of hypothetical mechanisms, denoted “direct mechanisms” that satisfy the condition of incentive compatibility. Roger Myerson has applied the method, for instance, to auction markets and regulation. Since one and the same mechanism in some cases turns out to generate several different equilibria (“multiple equilibria”), the task remains to develop methods to find an optimum equilibrium. Eric Maskin has developed analytic tools for this purpose, what he calls “implementation theory”. He has also clarified the importance of monotonicity of the preference ordering among individuals when trying to generate efficient allocation mechanisms. These various contributions to the theory of allocation mechanisms by Hurwicz, Myerson and Maskin are the background for their joint reward in 2007.

Though financial economics relies on similar analytical techniques as traditional microeconomics, over time it has become a field of its own, with a huge expansion during the last two decades. As mentioned above, Tobin and Modigliani constructed important financial building blocks to macroeconomic theory.

However, the field financial economics is today build mainly on foundations laid in the 1950s and 1960s by Harry Markowitz, Merton Miller and William Sharpe (jointly awarded in 1990). While Markowitz' contribution was to construct a microtheory of portfolio management of individual wealth holders, Merton and Sharpe developed equilibrium analysis in financial markets. More specifically, Sharpe developed a general theory for the pricing of financial assets. Miller made important contributions in the field of corporate finance (to begin with, partly in cooperation with Frances Modigliani). In particular, Miller clarified which factors determine share prices and capital costs of firms.

Subsequently, Robert Merton and Myron Scholes were given the prize (in 1997) for their analysis of price formation of so-called derivative instruments such as options, which are claims on underlying financial instruments including shares and foreign exchange. (The late Fisher Black, cooperating with Scholes, was also instrumental for this achievement.) These contributions were a necessary condition for the subsequent development of today's huge markets for various types of derivative instruments. These markets have increased the possibility for individual agents to choose adequate risk levels according to their own preference, regardless of whether they choose low or high exposure to risk.

Interdisciplinary research

Several prizes have also been awarded scholars who have widened the domain of economic analysis to new areas. James Buchanan got his prize (in 1986) for his research on the boundary between economics and political science, or more specifically, "for his development of the contractual and constitutional basis for the theory of economic and political decision-making". This research made him one of the founding fathers of the "public choice" school, which analyzes the driving forces behind political decisions and tries to endogenize political behavior in models of national economies. Rather than looking at politicians as individuals that are supposed to take care of the "general good" in society, the public choice school assumes that politicians are motivated by considerations

similar to those explaining the behavior of other agents, including the strive for personal benefit and a desire for power.

Gary Becker (awarded in 1992) has instead worked on the borderline between economics and sociology, in particular in his research about the family. For instance, he has studied the household's role as a combined producer and consumer of goods and services. He has, however, not only analyzed the "economic" behavior of families – labor supply, consumption, household production and household saving – but also behavior that has not earlier been much considered by economists, such as education, marriage, childbirth, and divorce. He has both shown how economic considerations influence choice in these areas, and analyzed "social interaction" between individuals outside the market system, reflected in the prize citation: "for having extended the domain of microeconomic analysis to a wide range of human behavior and interaction, including nonmarket behavior". Becker's influence today extends far outside economics, in particular to the so-called "rational choice" school in sociology.

Ronald Coase (awarded in 1991) has instead made important contributions on the borderline between economics, law and organization. In particular, he showed which factors determine the size of firms. He also clarified the condition under which voluntary contracts between private agents can resolve problems with "external effects" of production, an important example being pollution. These contributions are reflected in the prize citation: "for his discovery and clarification of the significance of transaction costs and property rights for the institutional structure and functioning of the economy". Coase's concept of transaction costs has become an important foundation for the theory of contracts and for the whole field "law and economics".

The prize to Herbert Simon (in 1978) may also be regarded as an interdisciplinary award. The prize citation referred to his research on "the decision-making process within economic organizations." In particular, Simon challenged some basic building blocks of microeconomic theory, in particular, the maximization principle and the assumption about full ("unbounded") rationality. On the basis of both empirical evidence and psychological theory,

Simon argues that decision-makers usually do not try to choose a "best" alternative, as assumed in traditional microeconomic theory, but that they are content with a "satisfactory" outcome, i.e. they try to find acceptable solutions to acute problems. This has made Herbert Simon a main contributor in the field administrative (management) science.

Simon Kuznets (1971) has instead made empirical research on the borderline between economics and history, reflected in the prize citation "for his empirically founded interpretation of economic growth." This prize is an example of an award for inductive rather than deductive analysis. Kuznets' ambition was to make empirical generalizations from data interpreted with a minimum of formal models and without relying on complex statistical techniques. Important examples include the celebrated "Kuznets's curve" of the U-shaped relation between GDP and income inequality, as well as his findings that the long-run average propensity to consume out of income tends to be constant in time-series data, whereas it tends to be fall in cross-section data. More generally, Kuznets has exploited data for very long periods of time to extract regularities, in particular, by characterizing economic growth and the distribution of income in different nations at different times.

The prize to Robert Fogel and Douglass North (in 1993) is another award on the boundary between economics and history. The Academy cited them "for having renewed research in economic history by applying economic theory and quantitative methods in order to explain economic and institutional change". Fogel's main contributions have been to clarify the role of the railways for the development of the national economy in the United States, and the economic role of slavery. By comparing the factual development with a counterfactual benchmark, Fogel concluded that previous studies of economic growth in the United States had vastly overestimated the importance of railways. He also concluded that slavery was not abolished because of falling profitability of the slave system, but rather because of humanitarian considerations. Douglass North has shed new light on the economic development in Europe and the United States before and in connection with the industrial revolution, including the roles of sea transport and changes in the pattern of regional specialization

and interregional trade. He has also been a pioneer in analyzing the role of institutions, such as property rights, for economic development, as well as the importance of different types of transaction costs. In these fields he developed and applied the ideas initially launched by Ronald Coase.

Research on the borderline between economics and philosophy was honored with the prize to Amartya Sen (in 1998) “for his contributions to welfare economics”. Sen scrutinized the philosophical foundations of collective decisions and welfare evaluations, including problems of evaluating the distribution of income and wealth. He has also constructed influential indices to measure income distribution and poverty. Sen has also analyzed the determinants and consequences of starvation in a number of less developed countries. These empirical studies of actual famines show that reduced aggregate supply of food has not always been the most important factor for starvation catastrophes, which, in some cases, have instead been caused by redistribution of income to the disadvantage of the poor.

The award to Friedrich von Hayek and Gunnar Myrdal (in 1974), too, had a strong interdisciplinary flavor. While their early contributions on business cycles and monetary phenomena in the 1930s comprised quite abstract (though non-mathematical) economic-theory structures, their works from the early 1940s instead deal with the interrelations between economic, social and political processes. Hayek is perhaps known among economists mainly for emphasizing the information and incentive content of the price system. However, he has given particular attention to the importance for individual behavior of the institutional framework for economic decisions, including the political constitution and the legal rules that define contracts and property rights. In these fields, Hayek’s work parallels the work by Buchanan and Coase. Hayek has also emphasized the importance of “spontaneous” social order by contrast to planned institutional designs.

Gunnar Myrdal has combined economic analysis with a broad sociological perspective in order to show how social, economic and political forces interact, often generating vicious or virtuous circles. In fact, Myrdal has described his

methods of analysis of “mutual causation” as a generalization of Knut Wicksell’s “cumulative process” in monetary theory. The most important example is Myrdal’s study of the “Negro Problem” in the United States in his book *An American Dilemma* (1944). This work not only influenced social science research. It also played an important part in the political discussion on segregation and integration of ethnic groups in various countries. The Supreme Court in the United States referred to Myrdal’s book when outlawing segregation. Myrdal applied a similarly approach with “mutual causation” in his subsequent work on poverty and economic development in South Asia.

In recent years, economic analysis has been increasingly influenced by research in psychology. The award of the economics prize to Daniel Kahneman in 2002 is a reflection of this development. Daniel Kahneman, in cooperation with Amos Tversky (dead in 1996) has made particularly important contributions to decision-making under uncertainty. They have also shown how individuals’ specific perceptions of alternatives systematically influence their choice, and how the exact “framing” of those alternatives are important for their choice. Kahneman and Tversky also developed an alternative to the traditional theory of choice under uncertainty, “prospect theory”.

New Methods of Economic Analysis

Though several of the awards discussed above could perhaps partly be regarded as “method awards,” there are more clear-cut examples. One case in point is the joint prize to Ragnar Frisch and Jan Tinbergen (the very first award in 1969) for their pioneering work on econometric model building, i.e., the integration of economic theory and statistical methods. The prize citation was “for having developed and applied dynamic models for the analysis of economic processes”. While Frisch developed general methods of dynamic and econometric analysis, Tinbergen pioneered in applying such methods empirically. Tinbergen’s main achievement was to make rigorous statistical tests of the realism of alternative business cycle theories. Frisch and Tinbergen were also instrumental in developing a formalized theory of the relation between instru-

ments and targets of economic policy – a contribution paralleling Meade's analysis of similar issues. Frisch and Tinbergen gave these theories a form that was favorable for empirical quantification and statistical testing. Frisch based his analysis partly on a system of national accounts for Norway, the so-called "oekosirk system" (income and expenditure flows), while Tinbergen pursued much of his empirical policy analysis in the context of econometric macro models for the Netherlands.

The prize to Frisch's countryman Trygve Haavelmo (in 1989) honored further development of Frisch's work. More precisely Trygve Haavelmo was awarded "for his clarification of the probability theory foundations of econometrics and his analysis of simultaneous economic structures". Haavelmo showed how methodology of mathematical statistics could be applied to draw stringent conclusions about complex economic relations from a random sample of empirical observations. These methods could then be used to estimate relations derived from economic theories and to test these theories. He also showed that misleading interpretations of partial relations between economic variables due to interdependencies can be avoided if these relations are estimated simultaneously.

Another important breakthrough in econometrics was achieved by James Heckman's and Daniel McFadden's development of new methods in empirical analysis of individual and household behavior – microeconometrics. Their contributions (awarded in 2000) have greatly improved the possibilities to analyze data about large groups of individual agents – households as well as firms. Heckman has developed methods to avoid biased statistical estimates in situations when the analyzed sample of data is non-random – the well-known Heckman correction (the Heckit method). Such situations often occur when only some agents, often with characteristics that are unobservable to the researcher, do not appear in the sample. Important examples are studies of wage formation and the return on education, since individuals who do not work and do not have the type of education that is studied are often not included in the sample.

Mc Fadden has developed methods to analyze the choice by individual agents among a limited (finite) number of alternatives, so-called discrete choice. Important examples are the choice of profession, occupation, residence and means of transportation. A seminal contribution by Mc Fadden is his so-called conditional logit analysis. The method utilizes not only observable facts about characteristics associated with individual agents and information about each available alternative choice. Unobservable differences among individuals and among alternatives are also exploited; they are represented by random error terms.

While Heckman and McFadden mainly dealt with microeconometrics, i.e. statistical analysis of the behavior of individual agents, Robert Engle and Clive Granger, rewarded in 2003, have developed and applied statistical methods for studying the developing over time of markets and entire national economies. In particular, they have analyzed data in the form of time series, i.e., chronological sequences of numerical observations. Engle developed methods to study the volatility properties of many time series in economics, for instance in financial markets. In particular, he applied the concept of “autoregressive conditional heteroskedasticity” (ARCH) for this purpose. His method could, in particular, clarify market developments where turbulent periods, with large fluctuations, are followed by calmer periods, with modest fluctuations. Granger has instead developed and applied new statistical methods, based on so-called “cointegration”, to differentiate between, and combine the analysis of, short-term fluctuations and long-term trends. This is a particularly difficult task when temporary disturbances, say in aggregate production, has long-lasting effects (i.e., when time series reflect a “stochastic trend”). Such, so-called “non-stationary”, time series were difficult to analyze properly before Granger’s contributions, which partly was made in cooperation with Engle. Today, cointegration is a central aspect in time series analysis in economics.

Another example of an award for important methodological developments is the prize to Wassily Leontief (in 1973) “for the development of the input-output method.” This methodology highlights the interdependencies between different

sectors of the economy in quantitative form. The analysis is also well suited to an analysis of the short-term effects of shocks in one sector on other sectors of the economic system. The candidacy of Leontief was greatly enhanced by the fact that he also pioneered in applying his method to empirical data. There is a parallel between Tinbergen's contribution to make macroeconomic theory empirically operational and Leontief's inter-industry analysis.

The prize to Richard Stone (in 1984) for "having made fundamental contributions to the development of systems of national accounts" similarly awarded important new methods. It is hard to think about empirical analysis in macroeconomics today without comprehensive systems of national accounts. General equilibrium theory, as formulated by Arrow and Debreu, has created a general *theoretical* system helping us grasp the idea of the interaction of billions of economic transactions in millions of different markets. Without the modern system of national accounts, however, we could not obtain an *empirical registration* of these transactions in comprehensive aggregates. The idea of national accounts harks back over several centuries, and theoretical and empirical work on national accounts flourished in the 1930s, as reflected in the works by Ragnar Frisch, Erik Lindahl, Colin Clark and Simon Kuznets. But Richard Stone was the leading architect of the modern *system* of national accounts, which married the principles of macroeconomic bookkeeping and aggregate macroeconomic models. Leontief-style input-output tables also became a useful component of this type of work.

These methodological prizes referred to advances in empirical analysis. Methodological contributions in theory have also been awarded. One example is the shared prize to Tjalling Koopmans and Leonid Kantorovich (in 1975). Kantorovich defined, as early as 1939, the concept of efficient resource use in individual enterprises, and later developed similar efficiency conditions for the economy as a whole. He also demonstrated the theoretical connection between the allocation of resources and the price system, both at a certain point of time and in a growing economy. Koopmans' so-called activity analysis, in a similar vein, clarified the correspondence between efficiency in production and existence of a system of "accounting prices." Both showed how the theoretical

possibility of decentralized decision making in a planned economy is connected with the existence of an efficient price system, including a uniform accounting price of capital on which to base investment decisions. This analysis was, in fact, closely related to the earlier discussed achievements in general equilibrium theory by Arrow and Debreu. Though both laureates have also made important contributions to the mathematical technique of linear programming, this was not what they were honored for; instead they received the prize for enriching our understanding of basic economic issues in normative allocative theory by applying new tools of analysis.

One of the most important theoretical methods developments in recent decades is game theory. While John von Neumann and Oskar Morgenstern made pioneering work in this field already in the late 1940s by, the analytical breakthrough was spawned by John Harsanyi, John Nash and Reinhard Selten, who were awarded (in 1994) “for their pioneering analysis of equilibrium in the theory of non-cooperative games”. John Nash introduced the distinction between cooperative games, in which binding agreements can be made, and non-cooperative games, where binding agreements are not feasible. Nash also developed an equilibrium concept for predicting the outcome of non-cooperative games that later came to be called the Nash equilibrium.

Reinhard Selten was the first to refine the Nash equilibrium concept for analyzing dynamic strategic interaction among different agents and to apply these refinements in the analyses of competition with only few sellers. These refinements made it possible to exclude a number of theoretically possible but unstable or irrelevant equilibria. John Harsanyi showed how games can be rigorously analyzed in the case of incomplete information. In this way he provided a theoretical foundation for predicting the outcome of strategic interaction between agents imperfectly informed, for instance, about the objectives of other individuals. Hence, Harsanyi gave an important impetus to further development in the field of information economics, after the pioneering work by Stigler, Vickrey and Mirrlees.

Another prize in game theory was awarded to Robert Aumann and Thomas Schelling in 2005. While Aumann was awarded for theoretical work, Schelling was awarded for his creative application of game theory to important social, political and economic problems. There is, however, a common denominator for the contributions by these scholars, since both analyzed conflict and cooperation through game-theoretic methods. Robert Aumann was the first to make a comprehensive formal analysis of so-called infinitely repeated games, emphasizing what types of outcomes can be upheld over time in the context of long-run economic relations. His analysis has been applied, for instance, to price wars among firms and trade wars among nations. By this analytical approach, it also becomes easier to understand the emergence of institutions such as merchant builds, institutions for wage negotiations and international trade agreements.

By applying game theory to a broad range of society problems Thomas Schelling has helped make game theory a unifying framework for the social sciences. For instance, Schelling showed that an agent may strengthen its position in bargaining by overtly worsening its own options, and that the capacity to retaliate can be more useful than the ability to resist attack. He also showed how under certain circumstances uncertainty about retaliation creates a more powerful situation in bargaining than certainty about retaliation. His analysis of strategic commitments has turned out to explain a wide range of phenomena, from competitive strategies of firms to the delegation of political decision power to administrative agencies.

Like meteorology, economics has traditionally been a non-experimental discipline. This has changed to some extent by the emergence, and expansion, of laboratory experiments in economics. Vernon Smith, who shared the 2002 prize with Kahneman, has developed methods for laboratory experiments in economics, which has helped our understanding of economic behavior. He also found that the prices that emerged via the interaction of sellers and buyers in laboratory experiments often were very close to the market prices predicted by traditional demand-supply theory, even though the agents in the experiments lacked the information and analytical tools required to calculate in advance the

price predicted by theory. He has also clarified how prices of specific products are influenced by the institutional framework in particular markets, such as different types of auction markets.

Problems and Difficulties

What are then the main problems and difficulties in choosing laureates in economics? It may be useful to discuss this issue in connection with four questions: (a) How should “economics” be interpreted in the context of the awards? (b) What criteria should be used when judging whether a candidate merits a prize? (c) In what order should worthy candidates be selected? (d) When and for what reason should prizes be shared?

The Scope of Economics

The Prize Committee, and the Academy, has decided to give wide interpretation to the term “economic sciences,” so that prizes may be awarded to scholars making important scientific contributions also in neighboring disciplines, in so far as these concern economic issues. In other words, “interdisciplinary research” has been regarded as important. Indeed, as mentioned above, several awards have been given for contributions on the borderline between economics, political science, sociology and history.

Scholars with traditional training in economics have increasingly been “trespassing” into neighboring territory by applying the methods of economic theory and econometrics to problems not previously analyzed much by economists. These various trespassing tendencies have led George Stigler (1984), as well as other economists, to talk about economics as “The Imperial Science.” It is also true, however, that research in other social sciences has recently influenced research in economics. An important example is the

application of research in empirical psychology to economics, for instance as a result of contributions by Kahneman and Tversky.

Though the Academy, and its selection committee, has followed the same general principles as applied to the prizes in the natural sciences, i.e., to award specific contributions, the degree of "specificity" of the awards has varied considerably. Examples of prizes with high specificity are the awards to Wassily Leontief and to contributions to econometric methods, as well as the prizes to game theory and financial economics. Other prizes are characterized by quite small degrees of specificity, such as the prizes to Paul Samuelson, Milton Friedman, Friedrich von Hayek, Gunnar Myrdal and Amartya Sen. In the case of Paul Samuelson, reference was made to his contribution to "raising the level of analysis in economic science". The prize citation to Milton Friedman mentioned his contributions to consumption analysis and to monetary history and theory as well as "his demonstration of the complexity of stabilization policy." The latter referred to Friedman's stress on how time lags, conflicts of goals, uncertainty and endogenous expectations among economic agents greatly complicate stabilization policy. In the prize citation for Gunnar Myrdal and Friedrich von Hayek the Academy mentions both their "pioneering work in the theory of money and economic fluctuations" and "their penetrating analysis of the interdependence of economic, social and institutional phenomena." In the case of Amartya Sen, much of the contributions referred to his clarification of the philosophical foundations of economics. Moreover, his empirical studies of starvation in a number of poor countries integrated political and sociological factors with more narrowly economic ones. Simon Kuznets was awarded for his lifetime contributions to the empirical analyses of economic development. Thus, the Academy has awarded not only narrowly defined specific contributions but also clusters of such contributions, including lifetime achievements if these consist of major contributions to economic science, widely interpreted.

Criteria for Awards

Prizes have been awarded for a specific contribution (such as new analytical methods in finance and econometrics), two or several specific contributions (such as the prizes to Friedman and Modigliani) and for life-time contributions (such as the prize to Samuelson, Kuznetz and Allais). Life-time contributions have dominated, although the classification is ambiguous since life-time contributions may have consisted of specific themes (such as in the case of Leontief). When considering what should be regarded as a “worthy” contribution, it is probably correct to say that the selection committee has looked, in particular, at the *originality* of the contribution, its scientific and practical *importance*, and its *impact* on scientific work. To provide shoulders on which other scholars can stand, and thus climb higher, has been regarded as an important contribution. To some extent, the committee has also considered the impact on society at large, including the impact on public policy.

An issue is whether the contributions by a scholar should be treated as gross or net. In other words, should the prize awarding authority make deductions for “bad” (low-quality) research? It is obvious that no such deductions have been made. Moreover, how does one deal with people who, in addition to their scholarly work, have participated in the political debate with policy recommendations which sometimes may reflect strong ideological commitments. Friedman, Hayek, Myrdal, Tinbergen, Tobin, Modigliani, and Solow are obvious examples. In conformity with the basic idea of the prize as a scientific award, such activities have been neglected.

When deciding who should be regarded as worthy of a prize, the scrutiny of time has helped the committee considerably. Because the prize was initiated as late as 1969, time has sorted out worthy candidates, for whom the risk of “premature fame” is minimal. During the first decade of the economics prize, the committee largely had the task of working with a heavy backlog of rather obvious candidates. Indeed, some of the honored contributions were made several decades ago, even as far back as the thirties, examples being the awards to Frisch, Tinbergen, Hicks, Ohlin and Kantorovich.

Moreover, it usually takes a longer time in economics (and social sciences in general) than in the natural sciences to find out if a new contribution is *solid* or if it is just a fad. In other words, it is important to wait for scrutiny, criticism and repeated tests of the quality and relevance of a contribution. The reason is not only that economic behavior, like human behavior in general, is complex but also that it varies over time and place. This is partly because individuals learn from previous experience, which may make empirically estimated behavior patterns unstable. Thus, new results may turn out to be relevant only to a transient conjuncture of circumstances, having much less generality than was supposed at first. Another reason to be particularly careful is that relevant empirical tests usually take time to pursue, partly because such tests usually rely on non-experimental data. It is, however, noticeable that laboratory experiments have become much more usual in recent decades, largely thanks to the influence of results in experimental psychology and the development and application of methods in experimental economics.

What, then, have been the main criteria for choosing the order of worthy candidates? There is an unavoidable subjectivity and arbitrariness in this choice. Two dominant criteria seem to have been: (i) to give early prizes to particularly important contributions, and (ii) to adhere to a pluralist view of economic research, by shifting over the years between candidates in different fields, using different methods of analysis, and reflecting different views of the world. There has also been (iii) a tendency to give prizes in chronological order of discovery.

When trying to define a prize-worthy contribution, the selection committee has not relied much on quantitative indicators such as the number of nominations or the frequency of citations, even though the prizewinners usually rank very high on both accounts. Indeed, there are a number of exceptions of prizewinners who have received quite few nominations and who also rank quite low in citation indices, pronounced examples being Kantorovich, Stone, Haavelmo, Allais, Meade and Ohlin (though the Heckscher-Ohlin model is frequently referred to in the literature). There are also some economists who consistently rank very high on citation indices, but who have not received prizes.

Sharing of Prizes

Another important issue is when, and how, awards should be shared. According to the rules laid down for the Nobel prizes, the prize can be shared among a maximum of three persons. A shared Nobel Prize is just as honorable as a single prize, and each laureate has to be worthy of the prize alone.

For receiving a shared award, there has to be some “common denominator” of the laureates. Shared awards in economics have been given *either* when the contributions are the results of actual cooperative work, *or* when the contributors are so closely related that a sharing is important to demonstrate the connection and to be “fair” to contributors. So far, sixteen prizes out of thirty-nine have been shared, which is somewhat less frequent than in the natural sciences during the last three decades.

The prize-awarding authority has interpreted the common denominator of shared prizes in economics in different ways for different awards. For instance, the contributions of Ragnar Frisch and Jan Tinbergen were strongly linked by intellectual influence, in particular from the older laureate (Frisch) to the younger. The shared prize between John R. Hicks and Kenneth Arrow also reflected the work of two different generations working in the same field, more specifically in general equilibrium and welfare theory. In the words of the press release of the Academy, Hicks “initiated” a profound transformation of general equilibrium theory, while Arrow “provided it with fresh nourishment.” The prize in game theory was also an award to two generations of contributions, with Nash being a pioneer and Harsanyi and Selten making Nash's concepts of non-cooperative game theory more applicable. The prize shared between Hurwicz, Maskin and Myerson follows a similar pattern.

The prize shared between Tjalling Koopmans and Leonid Kantorovich reflected instead similarity of mutually *independent* contributions in the field of normative economic theory, or more specifically a normative theory of the optimum allocation of resources. The shared prizes in the theory of information

economics to Vickrey and Mirrlees, the shared prize in economic psychology and experimental economics to Kahneman and Smith, and the shared price in game theory to Aumann and Schelling were of a similar nature.

The prize sharing between Hayek and Myrdal was, again, of a different nature. Both were pioneers in macro and monetary analysis in the thirties – the Austrian School and the Stockholm School, respectively. They both used the concepts of aggregate savings and investment to explain macroeconomic fluctuations. Both later broadened the scope of economic analysis, by emphasizing the institutional, legal, political and ideological framework of economic and social processes. The fact that they are often regarded as political “antipoles” did not bother the committee, since the prize is a purely scientific award. This is probably the shared award for which the common denominator of the laureates’ achievements was the smallest.

Some shared prices have instead been awards for complementary contributions. The common denominator for the shared prize to Bertil Ohlin and James Meade was their analysis of international trade and capital movements. The contributions of Arthur Lewis and Theodore Schultz were also largely complementary. The common denominator is that their research has dealt with long-term economic development for less developed countries. Another complementary price was the shared award between Fogel and North, which was designed to honor the two most important pioneers in “new” economic history, in which modern tools of economic and statistical analysis is applied to issues in economic history.

The shared prize to Markowitz, Miller and Sharpe was also an award for complementary contributions, in this case in financial economics, though the latter two had the advantage of standing on the shoulders of Markowitz. The prize to Merton and Scholes may be regarded as a “follow up” of this prize, since they (with the late Fisher Black) developed a theory of price formation for one specific type of important financial asset, namely “derivative financial instruments”, such as options and futures. This is one of the clearest cases of a

“joint” contribution in the sense that the laureates cooperated in the research that led to their achievement. The prizes to Heckman and McFadden, as well as to Engle and Granger, in econometrics were also shared for complementary contributions. The same holds for the shared prize to Akerlof, Spence and Stiglitz, who together, although working separately, created a unified approach to an important area in information economics (situations of asymmetric information).

Do the Prizes Reflect New Trends in Economic Analysis?

The awards that have been made so far obviously reflect some characteristic features of economic analysis during the last half-century. First of all, the awards clearly reflect the dominant role of the United States in economic research during this period. Out of 58 laureates, 40 (approximately 69 percent) have been United States citizens. However, although all of these had been working in the United States for a long time, it may be worth noting that some of them – Leontief, Koopmans, Debreu, Harsanyi and Kahneman – were born and largely trained in other countries. Moreover, more than 70 percent of the laureates worked at US universities when they received the awards. The only other countries that have received prizes (as defined by citizenship) are the United Kingdom (7 awards), Norway (3 awards), Sweden (2 awards), France, Germany, India, Israel, the Netherlands and the Soviet Union (one each). The universities where faculty members have received more than a single award are Chicago: 10 awards; Berkeley: 5; Harvard, Cambridge, Princeton and Columbia: 4; MIT and Stanford: 3; and Oslo, Yale, New York University and George Mason University: 2 awards.

Turning to the content of the awarded contributions, the emphasis on deductive rather than inductive methods in economic analysis shows up strongly. The increased role of mathematical formalization is also strongly reflected in the awards, important examples being the prizes to Samuelson, Hicks, Arrow, Koopmans, Kantorovich, Debreu, Allais, as well as the laureates in mechanism design, financial economics and game theory.

Another characteristic trend in economics during the second half of the 20th century is the growing importance of quantitative methods including systematic statistical testing or estimation, i.e., econometrics. This development is reflected notably in the awards to Frisch, Tinbergen, Leontief, Klein, Stone, Heckman, McFadden, Engle, Granger, Kydland and Prescott, and Phelps. Indeed, the huge volume of quantitative research during the last decade, often involving large masses of data, would hardly have been possible without the development of analytical techniques such as econometrics, input-output analysis, programming, as well as the development of powerful computers.

The awards also illustrate the important role of macroeconomics during the postwar period, (in particular, Friedman, Klein, Tobin, Modigliani, Solow, Lucas, Kydland and Prescott, and Phelps). New ways of looking at the economic system have also been recognized by the awarding authority, as reflected in the awards to economics of information, human capital and game theory as well as the role of economic institutions.

A final but difficult question: Has the selection committee viewed the award as a chance to influence the direction of new research in economics? The answer is “no” in the sense that the committee has tried to be broad and pluralistic of outlook in its decisions about awards, and to emphasize the multidimensional nature of economic research. Somewhat paradoxically, such an eclectic approach could, of course, be regarded in itself as a way to influence views about fruitful research, by recognizing research fields and methods that may not for the moment be in the focus of interest. It may also be argued that the prize-awarding authority has demonstrated that there are many different ways to advance a science like economics: rigorous deductive theorizing, whether by way of verbal or mathematical techniques; the development and application of new concepts and methods of analysis; rigorous empirical testing of existing hypotheses, as well as less formalized confrontation of various hypotheses with empirical fact; or “simply” profound observation and nonformalized innovative thinking about economic issues.

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Year	Laureate	Field	Prize Citation
1969	Ragnar Frisch Oslo University Jan Tinbergen The Netherland School of Economics	Econometrics	For having developed and applied dynamic models for the analysis of economic processes
1970	Paul A. Samuelson Massachusetts Institute of Technology	Partial and General Equilibrium Theory	For the scientific work through which he has developed static and dynamic economic theory and actively contributed to raising the level of analysis in economic science
1971	Simon Kuznetz Harvard University	Economic Growth and Economic History	For his empirically founded interpretation of economic growth which has led to new and deepened insight into the economic and social structure and process of development
1972	John R. Hicks Oxford University Kenneth J. Arrow Harvard University	General Equilibrium Theory	For their pioneering contributions to general equilibrium theory and welfare theory
1973	Wassily Leontief Harvard University	Input-Output Analysis	For the development of the input-output method and for its application to important economic problems

1974	Gunnar Myrdal University of Stockholm Friedrich von Hayek University of Freiburg	Macroeconomics and Institutional Economics	For their pioneering work in the theory of money and economic fluctuations and for their penetrating analysis of the interdependence of economic, social and institutional phenomena
1975	Leonid Kantorovich Academy of Sciences, Moscow Tjalling C. Koopmans Yale University	Theory of Optimum Allocation of Resources	For their contributions to the theory of optimum allocation of resources
1976	Milton Friedman University of Chicago	Macroeconomics	For his achievements in the fields of consumption analysis, monetary history and theory and for his demonstration of the complexity of stabilization policy
1977	Bertil Ohlin Stockholm School of Economics James Meade Cambridge University	International Economics	For their pathbreaking contribution to the theory of international trade and international capital movements
1978	Herbert A. Simon Carnegie-Mellon University	Administrative (Management) Science	For his pioneering research into the decision-making process within economic organizations
1979	Theodore W. Schultz University of Chicago Arthur Lewis Princeton University	Development Economics	For their pioneering research into economic development, with particular consideration of the problems of developing countries

1980	Lawrence R. Klein University of Pennsylvania	Macroeconometrics	For the creation of econometric models and their application to the analysis of economic fluctuations and economic policies
1981	James Tobin Yale University	Macroeconomics	For his analysis of financial markets and their relations to expenditure decisions, employment, production and prices
1982	George J. Stigler University of Chicago	Industrial Organization	For his seminal studies of industrial structure, functioning of markets and causes and effects of public regulation
1983	Gerhard Debreu University of California, Berkeley	General Equilibrium Theory	For having incorporated new analytical methods into economic theory and for his rigorous reformulation of the theory of general equilibrium
1984	Richard Stone Cambridge University	National Income Accounting	For having made fundamental contributions to the development of systems of national accounts and hence greatly improved the basis for empirical economic analysis
1985	Franco Modigliani Massachusetts Institute of Technology	Macroeconomics	For his pioneering analyses of saving and of financial markets
1986	James Buchanan George Mason University	Public Finance	For his development of the contractual and constitutional bases for the theory of economic and political decision-making

1987	Robert M. Solow Massachusetts Institute of Technology	Economic Growth Theory	For his contributions to the theory of economic growth
1988	Maurice Allais Ecole National Supérieure des Mines de Paris	Partial and General Equilibrium Theory	For his pioneering contributions to the theory of markets and efficient utilization of resources
1989	Trygve Haavelmo Oslo University	Econometrics	For his clarification of the probability theory foundation of econometrics and his analyses of simultaneous economic structures
1990	Harry Markowitz City University of New York Merton Miller University of Chicago William Sharpe Stanford University	Financial Economics	For their pioneering work in the theory of financial economics
1991	Ronald Coase University of Chicago	Theory of Institutions	For his discovery and clarification of the significance of transaction costs and property rights for the institutional structure and functioning of the economy
1992	Gary S. Becker University of Chicago	Microeconomics and Economic Sociology	For having extended the domain of microeconomic analysis to a wide range of human behavior and interaction, including nonmarket behavior

1993	Robert W. Fogel University of Chicago Douglass C. North Washington University, St. Louis	Economic History	For having renewed research in economic history by applying economic theory and quantitative methods in order to explain economic and institutional change
1994	John C. Harsanyi University of California Berkeley John F. Nash Princeton University Reinhard Selten Rheinische Friedrich-Wilhelms-Universität, Bonn	Game Theory	For their pioneering analysis of equilibria in the theory of non-cooperative games
1995	Robert E. Lucas, Jr. University of Chicago	Macroeconomics	For having developed and applied the hypothesis of rational expectations, and thereby having transformed macroeconomic analysis and deepened our understanding of economic policy
1996	James A. Mirrlees Cambridge University William Vickrey Columbia University	Economics of Information	For their fundamental contributions to the economic theory of incentives under asymmetric information
1997	Robert C. Merton Harvard University Myron S. Scholes Stanford University	Financial Economics	For a new method to determine the value of derivatives

1998	Amartya Sen Cambridge University	Welfare Economics	For his contributions to welfare economics
1999	Robert A. Mundell Columbia University	International Macroeconomics	For his analysis of monetary and fiscal policy under different exchange rate regimes and his analysis of optimum currency areas
2000	James Heckman University of Chicago Daniel L. McFadden University of California, Berkeley	Econometrics	To James Heckman for his development of theory and methods for analyzing selective samples and to Daniel McFadden for his development of theory and methods for analyzing discrete choice
2001	George A. Akerlof University of California A. Michael Spence Stanford University Joseph E. Stiglitz Columbia University	Economics of information	For their analyzes of markets with asymmetric information
2002	Daniel Kahneman Princeton University Vernon L. Smith George Mason University	Economic psychology and experimental economics	For having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty For having established laboratory experiments as a tool in empirical economic analysis, especially in the study of alternative market mechanisms

2003	<p>Robert F. Engle New York University</p> <p>Clive W. J. Granger University of California</p>	Econometrics	<p>For methods of analyzing economic time series with time-varying volatility (ARCH)</p> <p>For methods of analyzing economic time series with common trends (cointegration)</p>
2004	<p>Finn E. Kydland Carnegie Mellon University</p> <p>Edward C. Prescott Arizona State University</p>	Macroeconomics	For their contributions to dynamic macroeconomics: the time consistency of economic policy and the driving forces behind business cycles
2005	<p>Robert J. Aumann Hebrew University of Jerusalem</p> <p>Thomas C. Schelling University of Maryland</p>	Game Theory	For having enhanced our understanding of conflict and cooperation through game-theory analysis
2006	Edmund S. Phelps Columbia University	Macroeconomics	For his analysis of intertemporal tradeoffs in macroeconomic policy
2007	<p>Leonid Hurwicz University of Minnesota</p> <p>Eric S. Maskin Princeton University</p> <p>Roger B. Myerson University of Chicago</p>	Microeconomics	For having laid the foundations of mechanism design theory