

## ACADEMIC BACKGROUND OF NOBEL LAUREATES AND THEIR MAIN CONTRIBUTION TO ECONOMIC SCIENCE<sup>3</sup>

*This paper examines how Nobel laureates' academic backgrounds relate to their economic contributions. The study covers laureates in Economics from 1969 to 2023 and reveals that 49% of laureates studied Economics at the undergraduate level, while the remaining 51% pursued other sciences. Moreover, 79% of laureates obtained their doctoral degrees in Economics and 21% in other sciences. The data also includes a breakdown of laureates' primary contributions in various fields of Economics, with the majority contributing to Macroeconomics (29%), followed by Microeconomics (15%) and Finance (14%), New Methods of Economic Analysis (19%), and General Equilibrium Theory (6%). The results further demonstrate that 17% of laureates have contributed to interdisciplinary research, establishing links between Economics and other sciences such as Psychology, History, Sociology, Philosophy, Politics, Law, and Organizational Sciences. This approach is a result of the diverse educational backgrounds of Nobel laureates.*

*Keywords: Nobel Laureates; Economics; Background Education; Contributions*

*JEL: A1; A2; B3*

### 1. Introduction

The Nobel Prize has been awarded for contributions that benefit humanity since 1901. Nobel Prizes have been awarded in sciences such as Medicine, Chemistry, Physics, Physiology, Literature, and Peace. Economics started in 1969 and follows the same nomination and selection process as other sciences (The Sveriges Riksbank Prize in Economic Science, 2023).

From 1901 to 2023, there have been 621 Nobel Prize awards for all sciences, including Economics. In total, 970 laureates and 30 organizations were awarded the Prize. Some laureates and organizations have received the Prize more than once, resulting in 965 Nobel laureates and 27 organizations. Between 1969 and 2023, 55 prizes were awarded in Economic Sciences, totalling 93 laureates (The Sveriges Riksbank Prize in Economic Science, 2023).

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<sup>1</sup> Florentina Xhelili, Professor, University of Prishtina, Faculty of Economics, e-mail: florentina.xhelili@uni-pr.edu

<sup>2</sup> Rahmije Topxhiu, Professor, University of Prishtina, Faculty of Economics, e-mail: rahmije.topxhiu@uni-pr.edu

<sup>3</sup> This paper should be cited as: Xhelili-Krasniqi, F., Mustafa-Topxhiu, R. (2024). *Academic Background of Nobel Laureates and Their Main Contribution to Economic Science. – Economic Studies (Ikonomicheski Izsledvania)*, 33(5), pp. 186-202.

**Table 1. The Nobel Prizes for all sciences (1901-2023)**

Nobel Prize	Number of prizes	Number of laureates	Awarded to one laureate	Shared by two laureates	Shared by three laureates
Physics	117	225	47	32	38
Chemistry	115	194	63	25	27
Medicine	114	227	40	35	39
Literature	116	120	112	4	-
Peace	104	111+30	70	31	3
Economic sciences	55	93	26	20	9
Total:	621	1000	358	147	116

Source: The Sveriges Riksbank Prize, Nobel Prize facts: <https://www.nobelprize.org/prizes/facts/nobel-prize-facts> [Accessed October 22, 2023].

A Nobel Prize can be shared between two or three laureates when their contributions are closely related or result from cooperation between them (Lindbeck, 1999; Boettke et al., 2011). In Economic Sciences, 26 prizes have been given to one laureate, two laureates have shared 20 prizes, and nine prizes have been shared between three laureates (The Sveriges Riksbank Prize in Economic Science, 2023).

The Nobel laureates of Economic Sciences have different viewpoints and contributions from various schools of economic thought. These viewpoints help lighten the global economy's debates and problems at different times. Previous research has given us a good understanding of the career paths that lead to their success (Chan, Torgler, 2015).

Many studies and research suggest that Economics is becoming more interdisciplinary and less distinct than other fields (Angrist et al., 2020). Nobel laureates have conducted interdisciplinary research, connecting Economic Science with other sciences such as Psychology, History, Sociology, Philosophy, Politics, Law, and Organizational Studies. This approach results from the diverse educational backgrounds of Nobel laureates in Economics.

The remainder of this paper analyzes the academic backgrounds and the main contributions of Nobel laureates in Economics. Section 2 below includes the literature review, and Section 3 includes the methodology and data sources. Section 4 is divided into two parts. The first part presents the results of the data analysis related to the academic backgrounds of Nobel laureates in Economics, including their undergraduate and doctoral majors of study. The second part focuses on their main contributions to various economic fields, such as Macroeconomics, Microeconomics, Finance, Theory of General Equilibrium, New Models of Economic Analysis, and Interdisciplinary Research. Finally, the paper concludes with a summary of its findings.

## 2. Literature Review

Nobel Prize laureates have achieved the highest recognition in academia, representing the limits of human knowledge and understanding (Chan & Torgler, 2015). Researchers have analyzed and categorized Nobel Prize winners' contributions, some of which are presented below.

Weinberg and Galenson (2005) categorized Nobel laureates in Economics based on their creativity life cycle. They classified Nobel laureates as experimental and conceptual: moderate conceptual and extreme conceptual. This method of categorizing Nobel laureates is based on a quantitative approach. Conceptual innovators solve problems using abstract principles and deductive reasoning, while experimental economists gather knowledge through experience and inductive reasoning. According to research, 75% of the most exceptional conceptual laureates published their best work within the first decade of their careers (Weinberg & Galenson, 2005).

Many researchers in the field of Economics have compared the age at which individuals reach their peak performance. Jones, Reedy, and Weinberg (2014) found a correlation between age and the most significant scientific output of Nobel Prize Winners in Economics. Their research suggests that the peak of scientific output for laureates usually occurs in middle age. They also found that laureates tend to achieve a significant creative output in their late 30s or 40s, with a gradual decline in later years (Jones et al., 2014).

Regarding the age at which Nobel economists received their Prize, 48% received it between ages 60-69, 35% at 70 or older, and 17% under 60.

**Table 2. Age at Nomination of Economics Nobel Laureates (1969-2023)**

	Less than 60	Between 60 and 69	70 and more	Total
Frequency	16	45	32	93
Percent	17	48	35	100

*Source: Authors' contribution based on Biographical data (The Sveriges Riksbank Prize in Economic Science, 2023; Britannica, 2023)*

Boettke, Fink, and Smith (2011) presented a new way of categorizing Nobel laureates in Economics. They differentiate between Mainline and Mainstream economists. Mainline economists view economics as a science of exchange, while Mainstream economists view it as a science of choice. The study found that between 1970 and 2007, Mainline economists had a more significant impact than Mainstream economists (Boettke et al., 2011).

(Karier, 2010) classified Nobel Laureates into different groups, such as behaviourists, free market economists, and Keynesians. Meanwhile, Lindbeck (1999) divided the contributions of economic Nobel laureates into five fields from 1969 to 1998. These include General Equilibrium Theory, Macroeconomics, Microeconomics, Interdisciplinary Studies, and New Methods of Economic Analysis (Lindbeck, 1999).

The intersection of disciplines refers to the learning experience in the education of individuals and teamwork (Li et al., 2021). Molina, Iñiguez, Ruiz, and Tarancón (2020) conducted a network analysis of Nobel laureates. They amassed data from all Web of Science in Economics papers, identifying at least one author who won the Nobel Prize in Economics between 1969 and 2016. Deaton, Tirole, Arrow, and Stiglitz emerged as leaders based on the total output of their respective networks among laureates in Economics (Molina et al., 2020). The knowledge gained during academic studies significantly impacts one's future career (Chan & Torgler, 2015). Nobel Prize laureates often approach problems from unique perspectives or utilize skills and materials from other fields to solve them (Ghosh, 2013).

Therefore, it is crucial to examine the educational backgrounds of Nobel laureates in Economics to understand how their previous education shapes their future success and recognition. The educational backgrounds of Nobel laureates in Economics typically involve training in Mathematics, Physics, Statistics, or other sciences (Root-Bernstein & Root-Bernstein, 2022).

The use of mathematics and statistics has significantly impacted Economics, leading to interdisciplinary research and the integration of Economic Science with other fields (Chan & Torgler, 2012; Chan & Torgler, 2015). However, as Lebaron (2006, p.95) points out, “Statisticians and mathematicians continue to receive the Nobel Prize, and some of them, such as statistician Clive W. Granger 2003, emphasize in the Nobel lecture that they are not economists” (Lebaron, 2006).

To effectively integrate knowledge from different disciplines, it is necessary to develop interdisciplinary skills, practices, and methodologies (Päivi et al., 2012). Recognizing that the economy is an open system, a pluralistic, political economy understanding is necessary rather than relying solely on economists (Neves, 2017).

Truc, Santerre, Gingras, and Claveau (2020) examined the interdisciplinary aspect of Economics since the 1950s. They analyzed economics journals on the Web of Science. They found that Economics is becoming more open and less inward-looking, contrasting with previous citation studies that suggested Economics is more isolated than other social sciences (Fourcade et al., 2015).

According to Angrist et al. (2020), Economics is becoming increasingly interdisciplinary and valuable for other fields. They have analyzed 17 academic disciplines, each represented by approximately 50 journals. They attribute this shift to a greater focus on empirical research and a growing interest in other areas of study within the field of Economics (Angrist & Pischke, 2010). As a result, economics research is becoming more appealing to scholars in other disciplines (Angrist et al., 2020).

Sharma (2021) suggests that the human mind is naturally inclined toward acquiring interdisciplinary knowledge, which is crucial for scientific progress. Integrating various fields of knowledge is vital for our future and provides hope for progress (Sharma, 2013).

### **3. Materials and methods**

#### *3.1. Data*

Information regarding the educational backgrounds of Nobel laureates in Economics and their main contributions to Economics was gathered primarily from their biographies on The Nobel Prize's official website. Additionally, encyclopedia resources like Britannica, monographs, and books about Nobel prize winners were consulted. Various scientific journals were also used as sources for research and analysis.

The database contains detailed information about each Nobel laureate, including their name, date of birth, nationality, year of receiving the award, age at the time of winning, notable work by fields, prize motivation, affiliation during the award, undergraduate and doctoral

majors of study, year and country of study, university, prize share, and gender. It is important to note that some awardees did not obtain a master's degree or have no information available, so the master's degree is not included to avoid confusion.

To better analyze their notable work, we have divided it into five categories based on the categorization done by Lindbeck (1999). These categories include Macroeconomics, Microeconomics, General equilibrium, New Methods of Economic Analysis, and Interdisciplinary Research. The contribution of Nobel laureates in Finance has also been added as a separate category, considering its importance for both macroeconomics and microeconomics.

However, it is essential to note that it can be challenging to categorize the contributions of Nobel Laureates in Economics as they may have contributed to multiple scientific fields. Therefore, our classification is based on the main field they contributed.

Our analysis of the economics includes 93 laureates, as the award is given annually. During the data processing related to the laureates' doctorates, we took into consideration that two of them had received honorary doctorates from different universities.

### *3.2. Methods*

This paper analyzes the academic background of Nobel laureates in Economics from 1969 to 2023. Only undergraduate and Ph.D. degrees are considered as part of their educational backgrounds. Additionally, we presented the contributions for which they were awarded the Nobel Prize, classified by economics fields. It will emphasize the crucial role of interdisciplinary connections between economics and other sciences, especially for laureates with interdisciplinary educational backgrounds.

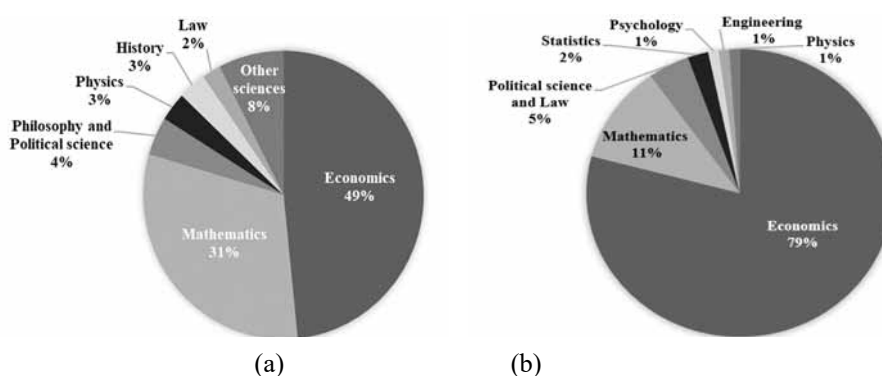
The study will seek to answer several key questions, including What educational paths have economic sciences laureates pursued? How has their educational background reflected their contributions to economics? In which fields of the economy have the Nobel laureates of economics made significant contributions? How has their educational background influenced interdisciplinary connections between economics and other sciences?

## **4. Results and discussion**

### *4.1. Statistics of educational background*

The majority of Nobel laureates who have been awarded the Nobel Prize in Economics did not complete their undergraduate studies in Economics. Figure 1(a) shows that 51% of laureates studied other sciences during their undergraduate education (Philosophy and Political science, Physics, History, and Law). Meanwhile, in other sciences (8%) graduated in Econometrics, Social studies, Psychology, Electrical Engineering, Agriculture, Pharmacology, and Romance languages.

**Figure 1. The proportion of different subjects in the educational backgrounds of Nobel prize laureates of economics (a) Undergraduate majors (b) The doctoral majors**



Source: Authors' contribution based on Biographical data (*The Sveriges Riksbank Prize in Economic Science, 2023; Britannica, 2023*)

Figure 1(b) shows that 79% of Nobel laureates in economics hold a doctoral degree in Economics, while the remaining 21% have a doctorate in other sciences. Two laureates, Leonid Hurwicz and John Hicks, received honorary doctorates from different universities.

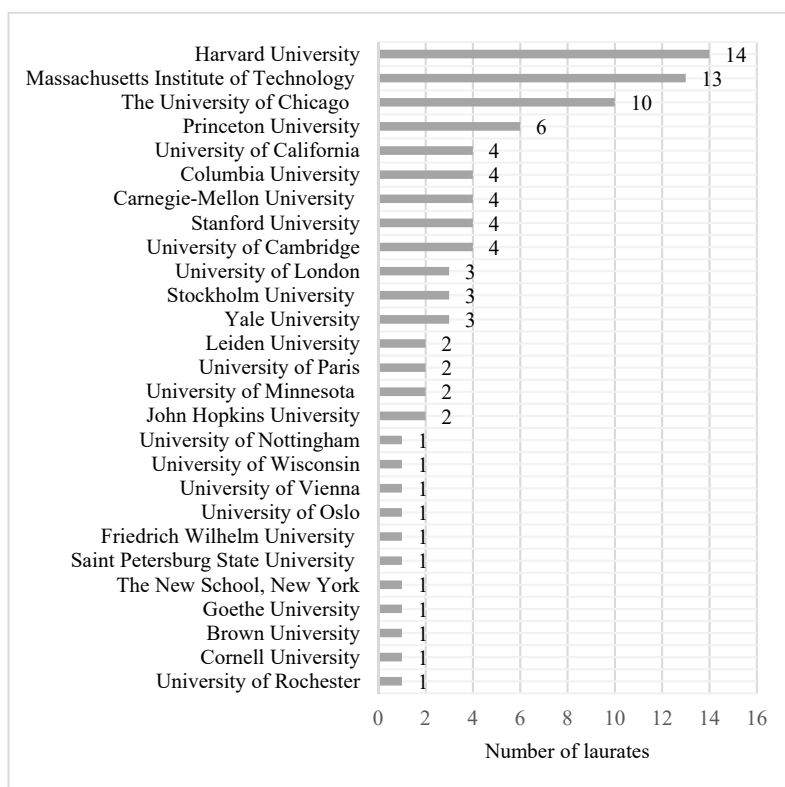
Also, two of the Nobel laureates have a doctorate in political science, and one has a doctorate in law and political science (Hayek obtained his law degree in 1921 and his political science degree in 1923 from the University of Vienna).

Of the 91 Nobel Laureates, 47% completed university studies and obtained a doctorate in Economics. Meanwhile, 33% of the Nobel laureates who completed university studies in other sciences also received a doctorate in Economics. Only 2% of the laureates who studied Economics obtained doctorates in other sciences, while 18% completed university studies and also obtained doctorates in other sciences.

The Nobel laureates of economic sciences have completed their doctorates in the following universities (Figure 2).

For instance, three Nobel Prize winners in economics with interdisciplinary backgrounds are Elinor Ostrom, who earned a bachelor's degree (1954), a master's degree (1962), and a Ph.D. (1965) in Political Science, University of California, Los Angeles; Daniel Kahneman who studied Psychology, Hebrew University, Jerusalem (B.A., 1954) and University of California, Berkeley (Ph.D., 1961) and Herbert A. Simon graduated (1936) and earned a doctorate (1943) from the University of Chicago (Britannica, 2023).

**Figure 2. Ranking of universities according to the number of laureates where they received doctorates (1969-2023)**



*Source: Authors' contribution based on Biographical data (The Sveriges Riksbank Prize in Economic Science, 2023; Britannica, 2023)*

Names of Laureates and earliest year of doctorate by universities are presented in Table 3.

The other universities in which a Nobel laureate received a doctorate are the University of Rochester (Richard H. Thaler, 1974), Cornell University (Robert F. Engle III, 1969), Brown University (Guido W. Imbens, 1991), Goethe University (Reinhard Selten, 1961), The New School formerly New School for Social Research, New York (Franco Modigliani, 1944), Saint Petersburg State University formerly Leningrad State University (Leonid Vitaliyevich Kantorovich, 1930), Friedrich Wilhelm University (Wassily Leontief, 1928), University of Vienna (Friedrich August von Hayek, 1923), University of Wisconsin (Theodore W. Schultz, 1930), University of Nottingham (Clive W.J. Granger, 1959) and University of Oslo (Ragnar Frisch 1926). Trygve Haavelmo delivered his doctoral dissertation, “The Probability Approach in Econometrics in 1941 at Harvard University. Also, he had two doctorates from the University of Oslo (Britannica, 2023).

**Table 3. Names and earliest year of doctorate by universities**

Universities	Laureates (Year of doctorate)
Harvard University	Paul A. Samuelson (1941), Trygve Haavelmo (1941), James Tobin (1947), Thomas C. Schelling (1951), Robert M. Solow (1951), Vernon L. Smith (1955), Robert B. Wilson (1963), Christopher A. Sims (1968), Thomas J. Sargent (1968), A. Michael Spence (1972), Eric S. Maskin (1976), Roger B. Myerson (1976), Abhijit Banerjee (1988), and Michael Kremer (1992).
Massachusetts Institute of Technology (MIT)	Lawrence R. Klein (1944), Robert J. Aumann (1955), Robert A. Mundell (1956), Peter A. Diamond (1963), George A. Akerlof (1966), William D. Nordhaus (1967), Joseph E. Stiglitz (1967), Robert C. Merton (1970), Robert J. Shiller (1972), Paul Krugman (1977), Ben S. Bernanke (1979), Jean Tirole (1981), and Esther Duflo (1999).
University of Chicago	George J. Stigler (1938), Herbert A. Simon (1943), James M. Buchanan Jr. (1948), Harry M. Markowitz (1954), Gary S. Becker (1955), Robert E. Lucas Jr. (1964), Eugene F. Fama (1964), Myron S. Scholes (1970), Claudia Goldin (1972) and Paul M. Romer (1983),
Princeton University	John F. Nash Jr. (1950), Lloyd S. Shapley (1953), James J. Heckman (1971), Oliver Hart (1974), David Card (1983), and Joshua D. Angrist (1989).
University of California	Douglass C. North (1952), Daniel Kahneman (1961), William F. Sharpe (1961), and Elinor Ostrom (1965).
Columbia University	Simon Kuznets (1926), Milton Friedman (1946), William Vickrey (1947), and Kenneth J. Arrow (1951).
Carnegie – Mellon University	Oliver E. Williamson (1963), Edward C. Prescott (1967), Dale T. Mortensen (1967), and Finn E. Kydland (1973).
Stanford University	John C. Harsanyi (1959), Alvin E. Roth (1974), Bengt Holmström (1978), and Paul R. Milgrom (1979).
University of Cambridge	Richard Stone (1957), Amartya Sen (1959), James A. Mirrlees (1963), and Angus Deaton (1974).
University of London	Sir Arthur Lewis (1940), Ronald H. Coase (1951), and Christopher A. Pissarides (1973).
Stockholm University	Bertil Ohlin (1924), James E. Meade (1924), and Gunnar Myrdal (1927).
Yale University	Edmund S. Phelps (1959), Philip Dybvig (1979), and Douglas W. Diamond (1980).
Leiden University	Jan Tinbergen (1929) and Tjalling C. Koopmans (1936).
University of Paris	Gerard Debreu (1956) and Maurice Allais (1949).
University of Minnesota	Daniel L. McFadden (1962) and Lars Peter Hansen (1978).
John Hopkins University	Merton H. Miller (1952) and Robert W. Fogel (1963)

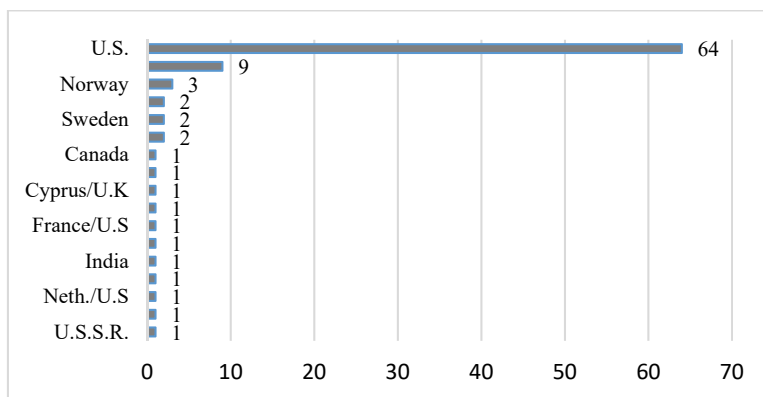
*Source: Authors' contribution based on Biographical data (The Sveriges Riksbank Prize in Economic Science, 2023; Britannica, 2023)*

Figure 3 shows the number of laureates by nationality or citizenship at the time they received the Nobel Prize.

From the data presented, it can be observed that most of the economic science laureates by nationality or citizenship at the time they received the Nobel Prize were from the U.S.



**Figure 3. Number of laureates by nationality when they received the Nobel Prize**



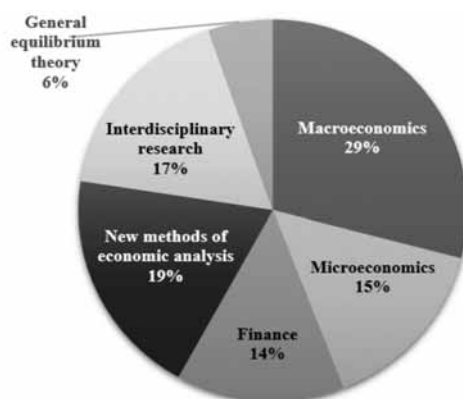
Source: Authors' contribution based on Biographical data ( (Britannica, 2023).

#### 4.2. Statistics by fields

Since many have contributed to multiple areas, it is challenging to classify Laureates' contributions in Economic Science by fields (1969-2023). Therefore, the classification is based on their main contributions.

The contribution of economics Nobel laureates according to the main fields of study (%) is presented in Figure 4.

**Figure 4. The contribution of Laureates in economics according to the main fields of study (%)**



Source: Authors' contribution based on Biographical data (The Sveriges Riksbank Prize in Economic Science, 2023; Britannica, 2023)

Most Nobel laureates have contributed to Macroeconomics (29%), followed by Microeconomics (15%) and Finance (14%), New Methods of Economic Analysis (19%), Interdisciplinary Research (17%), and General Equilibrium Theory (6%).

Below is a presentation of their contributions for which they were awarded the Nobel Prize, classified by fields and year of award.

#### 4.2.1. The main contributions of laureates to Macroeconomics

In macroeconomics, Nobel laureates analyze and explain the state and progress of the national economy, including private consumption, investments, exports, imports, expenditures for goods and services, and others (Pano & Angjeli, 2003).

In this field, Nobel laureates in Economics have made the following contributions.

**Table 4. The main contribution of laureates to Macroeconomics (1969-2023)**

Year of Nobel Prize	Laureates	Main contributions
1976	Milton Friedman	Analyzing monetary history and theory, consumption analysis, and demonstration of the complexity of stabilization policy.
1977	James E. Meade and Bertil Ohlin	Development of the theory of International trade.
1979	Arthur Lewis and Theodore Schultz	Economic development research of developing countries.
1980	Lawrence Klein	Creation and application of econometric models to the analysis of economic fluctuations and economic policies.
1987	Robert Sollow	Theory of economic growth.
1995	Robert Lucas	Applying and developing the hypothesis of rational expectations.
1999	Robert Mundell	Analysis of the monetary and fiscal policy under different exchange rate regimes and the optimum currency areas.
2004	Finn E. Kydland and Edward C. Prescott	Analysis of the Dynamic Macroeconomics: The time consistency of economic policy and the driving forces behind business cycles.
2006	Edmund S. Phelps	Analysis of intertemporal tradeoffs in macroeconomic policy.
2008	Paul Krugman	Analysis of trade patterns and location of economic activity.
2010	Peter A. Diamond, Dale T. Mortensen and Christopher A. Pissarides	Analysis of markets with search frictions (dynamics of unemployment).
2011	Thomas J.Sargent and Christopher A. Sims	Empirical research on cause and effect in the macroeconomy.
2015	Angus Deaton	Integration of climate change into the long-run macroeconomic analysis;
2018	William D. Nordhaus Paul M. Romer	Integration of technological innovations into long-run macroeconomic analysis.
2019	Abhijit Banerjee, Esther Duflo, and Michael Kremer	Application of the experimental approach to alleviating global poverty.
2021	David Card, Joshua D. Angrist, and Guido W. Imbens	Empirical contribution to Labor economics; Methodological contributions to the analysis of causal relationships.

Source: Authors' contribution based on Biographical data (*The Sveriges Riksbank Prize in Economic Science, 2023; Britannica, 2023; Lindbeck, 1999; Xhelili, 2012*)

#### 4.2.2. The main contributions of laureates to Microeconomics

The contributions of Nobel laureates have enriched Microeconomics, particularly in analyzing firm and individual decision-making, allocation of resources, public sector role, state regulation, market structures, asymmetric information, auctions, contracts, and mechanism design (Pano & Angjeli, 2003).

In this field, Nobel laureates in Economics have made the following contributions:

**Table 5. The main contribution of laureates to Microeconomics (1969-2023)**

Year of Nobel Prize	Laureates	Main contributions
1982	George Stigler	Industrial structures and functioning of markets, and public regulation (Industrial organization)
1996	James Mirrleee and William Vickrey	The theory of incentives under asymmetric information
2001	Joseph E. Stiglitz, A. Michael Spence, and George A. Akerlof	Analyses of markets with asymmetric information
2007	Leonid Hurwicz, Eric, S. Maskin, and Roger, B. Myerson	Mechanism design theory
2014	Jean Tirole	Analysis of market power and regulation
2016	Oliver Hart and Bengt Holmström	Contract theory.
2020	Paul R. Milgrom and Robert B. Wilson	Auction theory and inventions of new auction formats

*Source: Authors' contribution based on Biographical data (The Sveriges Riksbank Prize in Economic Science, 2023; Britannica, 2023; Lindbeck, 1999; Xhelili, 2012)*

#### 4.2.3. The main contributions of laureates to Finance

Finance is a crucial aspect of both macroeconomics and microeconomics. Over the years, several Nobel laureates have made significant contributions to the field of Finance through their research in areas such as portfolio selection theory, analysis of household savings and financial markets, financial markets and investment decision-making, methods for determining the value of stock options and other derivatives, empirical analysis of asset prices and research on banks and financial crises.

In this field, Nobel laureates in Economics have made the following contributions:

**Table 6. The main contribution of laureates to Finance (1969-2023)**

Year of Nobel Prize	Laureates	Main contributions
1981	James Tobin	Analysis of financial markets
1985	Franco Modigliani	Analyses of saving and financial markets
1990	Harry Markowitz, Merton Miller, and William Sharpe	The theory of financial economics (MICRO)
1997	Robert C. Merton and Myron S. Scholes	Method for determining the value of stock options and other derivatives (MICRO)
2013	Eugene F. Fama, Lars Peter Hansen, and Robert J. Shiller	Empirical analysis of asset prices (financial markets)
2022	Ben S. Bernanke, Douglas W. Diamond, and Philip Dybvig	Research on banks and financial crises

*Source: Authors' contribution based on Biographical data (The Sveriges Riksbank Prize in Economic Science, 2023; Britannica, 2023)*

#### 4.2.4. The main contributions of laureates to the General Equilibrium Theory

The Nobel laureates in economics have significantly transformed the Theory of General Equilibrium, making it one of the most important creations for the theoretical and practical analysis of the economy as a whole and the effective allocation of resources.

In this field, Nobel laureates in economics have made the following contributions:

**Table 7. The main contribution of laureates to General Equilibrium Theory (1969-2023)**

Year of Nobel Prize	Laureates	Main contributions
1970	Paul A. Samuelson	Development of the static and dynamic economic theory (Partial and General Equilibrium Theory).
1972	John R. Hicks and Kenneth J. Arrow	General economic equilibrium theory and welfare theory.
1983	Gerard Debreu	Reformulation of general equilibrium theory and application of new analytical methods into economic theory.
1988	Maurice Allais	Efficient utilization of resources and theory of markets.

*Source: Authors' contribution based on Biographical data (The Sveriges Riksbank Prize in Economic Science, 2023; Britannica, 2023; Lindbeck, 1999; Xhelili, 2012)*

#### 4.2.5. The main contributions of laureates to the New Methods of Economic Analysis

Mathematical and statistical methods, econometrics, linear programming, and new methods for economic analysis characterized the second half of the twentieth century. The importance of mathematical techniques is reflected in awards like Samuelson, Hicks, Arrow, Koopmans, Kantorovich, Debreu, Allais, Phelps, and others. The Nobel Prize has recognized the importance of quantitative methods such as statistical testing and estimation, with laureates including Frisch, Tinbergen, Leontief, Heckman, and McFadden, among others (Ghosh, 2013).

In this field, Nobel laureates in economics have made the following contributions:

**Table 8. The main contribution of laureates to the New Methods of Economic Analysis (1969-2023)**

Year of Nobel Prize	Laureates	Main contributions
1969	Jan Tinbergen and Ragnar Frisch	Application of the dynamic models to analyzing economic processes (Macroeconometrics).
1973	Wassily Leontief	Development and application of the input-output method to economic problems.
1975	Leonid Vitaliyevich Kantorovich and Tjalling C. Koopmans	Development of the theory of the optimum allocation of resources.
1984	Richard Stone	Development of systems of national accounts and improvement of the basis for empirical economic analysis.
1989	Tyrgve Haavelmo	Clarification of the probability theory foundations of econometrics and analyses of simultaneous economic structures (Econometrics).
1994	John C. Harsanyi, John F. Nash Jr. and Reinhard Selten	Analysis of equilibria in the theory of non-cooperative games.

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Year of Nobel Prize	Laureates	Main contributions
2000	James Heckman and Daniel L. McFadden	Theory and methods for analyzing selective samples (Microeconometrics).
2003	Robert F. Engle Clive W.J. Granger	Methods of analyzing economic time series with time-varying volatility (Econometrics) Methods of analyzing economic time series with common trends-Cointegration (Econometrics).
2005	Robert J. Aumann and Thomas C. Schelling	Conflict and cooperation through game-theory analysis.
2012	Alvin E. Roth and Lloyd S. Shapley	The practice of market design and the theory of stable allocations.

Source: Authors' contribution based on Biographical data (*The Sveriges Riksbank Prize in Economic Science, 2023; Britannica, 2023; Lindbeck, 1999; Xhelili, 2012*)

#### 4.2.6. The main contributions of laureates to Interdisciplinary Research

Laureates contributed to interdisciplinary research, connecting Economics with Psychology, Sociology, History, Organizational Science, Politics, and Philosophy.

*Economics with Psychological Science* – According to Herbert Simon, decision-makers typically aim for a satisfactory solution rather than the best possible outcome assumed by traditional Microeconomic Theory (The Sveriges Riksbank Prize in Economic Science, 2023). Richard Thaler studies Behavioral Economics, Finance, and the Psychology of decision-making (Walgreen, 2023). According to Thaler, human behavior and perception are as critical to financial trends as the principles of supply and demand (Argys, 2017).

*Economics with Sociological Science* – Becker is known for his studies and analysis of human capital, family economics, gender, and racial discrimination (Xhelili, 2018). He examined social interactions outside the market system, and his influence extends to the Rational Choice school of Sociology (Lindbeck, 1999; Science, 2023).

*Economics with Historical Science* – Kuznets aimed to derive empirical generalizations without relying on complex statistical techniques (Lindbeck, 1999). Kuznets has used long-range data to identify economic growth and income distribution patterns in different nations and times (Pano & Angjeli, 2003). Claudia Goldin has contributed to economic history and labour economics. She has studied social and economic factors that have determined the extent of women's participation in the workforce and the wage gap between women and men from the late 18th century to the present (Britannica, 2023).

*Economics with Law and Organizational Science* – Douglas North, Ronald Coase, Elinor Ostrom, and Oliver Williamson contributed significantly to Institutional Theory (Ménard & Shirley, 2014). Williamson did not choose Economics as his career as an undergraduate but instead discovered his interests as he moved from one field to another, ultimately combining Economics with Organization Theory and Contract Law (Williamson, 2014).

*Economics with Political Science* – James McGill Buchanan is considered a founding father of the Public Choice Theory. He analyses the driving forces behind political decisions in models of national economies. His research in Public Finance has significantly contributed

to the combination of Economics and Political science (Pano & Angjeli, 2003; Lindbeck, 1999).

*Economics with Philosophical Science* – Amartya Sen analyzed the philosophical foundations of collective decisions and welfare evaluations, including income and wealth distribution. Additionally, he created influential indicators for measuring poverty and income inequality. (Lindbeck, 1999; Pano & Angjeli, 2003; The Sveriges Riksbank Prize in Economic Science, 2023).

Nobel laureates who have integrated Economic Science with other sciences include:

**Table 9. Nobel laureates who bridge Economics with other sciences**

Connection with other sciences	Year of Nobel Prize	Laureates	Contributions
Economics with Psychological Science	1978	Herbert A. Simon	Research on the decision-making process within economic organizations.
	2002	Daniel Kahneman	Integrating psychological research into economic science concerning human judgment and decision-making under uncertainty.
		Vernon L. Smith	Application of the laboratory experiments as a tool in empirical economic analysis.
	2017	Richard H. Thaler	Development of behavioural economics.
Economics with Sociological Science	1974	Friedrich August von Hayek and Gunnar Myrdal	Analysis of the money and economic fluctuations theory and the interdependence of economic, social, and institutional phenomena.
	1992	Gary S. Becker	Development of the microeconomics, including nonmarket behaviour.
Economics with Historical Science	1971	Simon Kuznets	Empirically interpretation of economic growth.
	1993	Robert W. Fogel and Douglass C. North	Applying economic theory and quantitative methods to explain economic and institutional change.
	2023	Claudia Goldin	Research on women's labour market outcomes.
Economics with Law and Organizational Science	1991	Ronald H. Coase	Discovery and clarification of the significance of transaction costs and property rights for the institutional structure and functioning of the economy.
	2009	Elinor Ostrom and Oliver E. Williamson	Analysis of economic governance within the boundaries of the firm.
Economics with Political Science	1986	James McGill Buchanan	Development of the contractual and constitutional bases for economic and political decision-making theory.
Economics with Philosophical Science	1998	Amartya Sen	Development of the welfare economics.

*Source: Authors' contribution based on Biographical data (The Sveriges Riksbank Prize in Economic Science, 2023; Lindbeck, 1999; Britannica, 2023; Xhelili, 2012)*

The Nobel Prize demonstrates how brilliant ideas, science, and hard work can positively impact the world (The Sveriges Riksbank Prize, 2017). Universities play a crucial role in fostering effective academic cultures that enable researchers to pursue knowledge for their sake and shape our worldview (Altbach & DeLaquil, 2022). Teachers are crucial in promoting this (The Sveriges Riksbank Prize, 2017).

## **5. Conclusion**

This paper analyzes the academic background of Nobel laureates in Economics from 1969 to 2023. Additionally, the paper examines laureates' contributions to Economics and classifies them by economics fields, emphasizing their contribution to interdisciplinary connections between economics and other sciences.

In the analysis of the background education of laureates, only undergraduate and PhD degrees are considered part of their educational backgrounds. The analysis results show that most Nobel laureates who have received the Nobel Prize in Economics did not major in Economics during their undergraduate studies. Instead, they studied other sciences, such as Philosophy and Political Science, Physics, History, and Law, and other sciences. Most Nobel laureates in Economics hold a doctorate in Economics, while some have doctorates in other sciences.

The Nobel Prize Winners in Economics belong to various schools of economic thought, so their opinions, views, proposals, and suggestions have contributed not only to the solution of specific problems but also to the development of economic science in general.

Researchers have categorized these contributions in different ways. One of them is the categorization of laureates' main contributions by fields of study, which include General Equilibrium Theory, Macroeconomics, Microeconomics, Interdisciplinary Studies, and New Methods of Economic Analysis. This paper uses the classification above but also consists of the main contributions of Nobel laureates in Finance as a separate category, recognizing their significance for macro and microeconomics.

The results of the analysis of the laureates' main contributions by fields show that most of them have contributed to Macroeconomics, followed by Microeconomics and Finance, New Methods of Economic Analysis, Interdisciplinary research, and General Equilibrium Theory.

The topic that has attracted attention in the last quarter of a century has been behavioural economics, which analyzes both the psychological and social factors that influence individuals' decision-making. Some awards are the Nobel Prize for George Akerlof and Daniel Kahneman, Elinor Ostrom, Robert Shiller, and Richard Thaler. Next are the Nobel laureates who have addressed poverty issues, such as Amartya Sen, Abhijit Banerjee, Esther Duflo, and Michael Kremer. Other laureates have analyzed real-world problems, such as George Akerlof, Paul Milgrom, Robert Wilson, Ben Bernanke, David Card, and this year's Nobel laureate, Claudia Goldin.

Nobel laureates' contributions to Interdisciplinary research have bridged Economics with other sciences, such as Psychology, History, Sociology, Philosophy, Politics, Law, and Organizational Sciences. This approach results from the diverse educational backgrounds of Nobel laureates in Economics.

Economics is becoming more interdisciplinary, and integrating various fields of knowledge is essential for future progress.

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