

# ADAPTIVE DECISION-MAKING UNDER ECONOMIC UNCERTAINTY

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**Abstract:** *Contemporary economies are characterized by a high degree of uncertainty arising from the complexity of economic processes, rapid technological change, and limited predictability of future developments. In such an environment, traditional models of rational decision-making based on complete information and well-defined probabilities become increasingly insufficient, which creates a need for more adaptive approaches to economic behavior. This paper analyzes the theoretical mechanisms through which economic uncertainty influences the behavior of economic agents and the efficiency of decision-making processes. It focuses on how individuals and firms adjust their strategies under uncertainty through flexibility, expectation formation, and adaptive behavioral patterns. Particular attention is devoted to the role of institutions and innovations in mitigating the adverse effects of uncertainty. Innovations enhance the adaptability and efficiency of economic actors, while stable institutional frameworks provide predictability, legal security, and trust in economic relations. Their interaction represents a key mechanism for strengthening resilience in modern economic systems. The main contribution of the paper lies in integrating contemporary theoretical perspectives on uncertainty, decision-making, institutions, and innovation into a unified analytical framework, emphasizing the importance of a systemic approach to understanding economic behavior under conditions of heightened uncertainty..*

**Key words:** *economic uncertainty, decision-making, decision theory, rationality, contemporary economy*

**JEL classification:** *D81, D83, O31, O32*

## 1. INTRODUCTION

Decision-making represents a central process in the functioning of every economic system, as

economic agents allocate limited resources on a daily basis in order to achieve their objectives. Traditional economic theory is based on the assumption of rational behavior, according to which economic actors make decisions based on complete information and clearly defined preferences. This approach enables precise modeling of economic processes and the prediction of economic outcomes. However, the contemporary economy increasingly departs from these idealized assumptions, primarily due to the presence of a high degree of economic uncertainty, which complicates the prediction of future events and significantly influences the behavior of economic agents.

Recent research highlights that the level of economic uncertainty has increased significantly over recent years due to globalization, rapid technological change, and frequent economic and financial shocks (Bloom, 2014; Baker et al., 2016). These developments have challenged traditional economic models and emphasized the need for more flexible and adaptive approaches to decision-making.

Economic uncertainty refers to situations in which the future outcomes of economic decisions are unknown and cannot be reliably quantified. Unlike risk, which can be expressed through probabilities and statistical models, uncertainty is characterized by the absence of sufficiently reliable information, leading to increased complexity and insecurity in the decision-making process. Contemporary economists emphasize that uncertainty may arise from various factors, including technological change, market globalization, changes in the institutional framework, fluctuations in supply and demand, as well as unpredictable macroeconomic shocks.

In this context, modern literature increasingly distinguishes between measurable risk and fundamental uncertainty, emphasizing that many economic decisions occur in environments where

probabilities cannot be accurately determined, which limits the applicability of standard quantitative models.

Conditions of economic uncertainty exert multiple effects on the behavior of economic agents. Individuals and firms often adopt more cautious strategies by reducing long-term investments, postponing decisions, or increasing their preference for savings and liquid assets. Such behavioral changes may have cumulative effects on economic growth, productivity, and overall economic stability. Consequently, understanding decision-making mechanisms under conditions of uncertainty becomes crucial for improving theoretical models and designing effective economic policies.

Despite a growing body of literature on uncertainty, there is still a need for a more integrated theoretical perspective that connects decision-making behavior with institutional and innovation-based responses to uncertainty.

The aim of this paper is to analyze the relationship between economic uncertainty and decision-making, with a particular focus on the role of institutions and innovations in enhancing adaptability and resilience. The main contribution of the paper lies in providing a structured synthesis of these interrelated factors within a unified analytical framework.

## **2. CHARACTERISTICS AND SOURCES OF UNCERTAINTY**

Economic uncertainty represents a condition in which agents – whether individuals or firms – lack sufficient information or reliable predictions regarding future developments and the outcomes of their decisions. It manifests itself in the inability to plan activities precisely, forecast revenues and costs, and assess changes in the economic environment. Contemporary research emphasizes that uncertainty is not only a consequence of insufficient information, but also a structural characteristic of modern economies shaped by complexity, rapid technological change, and global interdependence (Bloom, 2014).

The degree of uncertainty increases with the number of possible options and choices available to economic agents. A known future occurs only in rare situations and refers to a type of future in which, through the application of logical extrapolation of past trends, a particular outcome can be predicted with a high degree of certainty (Dženopoljac, 2010). A future characterized by a larger number of options entails a higher level of uncertainty, as neither prior experience nor existing knowledge provides sufficient confidence in decision-making. In such circumstances, both

individuals and organizations must incorporate flexibility and adaptability into their behavior. When options become virtually unlimited, confronting the future becomes particularly demanding, and uncertainty reaches its highest level. Under these conditions, successful decision-making depends not only on forecasting and planning but also on the ability to adapt and to employ flexible or real options.

Unlike situations in which outcome probabilities are available, uncertainty is characterized by the absence of reliable quantitative data, which significantly complicates economic decision-making. In contemporary economic systems, uncertainty is present at all levels – from the behavior of individuals and firms to state-level macroeconomic policies – while additional market and macroeconomic instability further complicates decisions related to investment, resource allocation, and business stability. Empirical findings suggest that in such environments economic agents increasingly rely on heuristics, expectations, and adaptive strategies rather than strictly rational calculations (Gigerenzer and Gaissmaier, 2011).

Economic uncertainty influences the behavior of economic agents through multiple channels. Recent research shows that uncertainty shocks can significantly affect both microeconomic decisions and macroeconomic outcomes, particularly by reducing investment and delaying economic recovery (Baker et al., 2016). At the individual level, uncertainty leads to increased caution, reduced consumption, and a higher propensity to save, which has direct consequences for aggregate demand. At the firm level, uncertainty may result in postponed investments, reduced planned production, or diversification of activities aimed at minimizing potential losses. Under conditions of heightened uncertainty, firms further reassess resource allocation, the sustainability of business models, and exposure to market changes, thereby increasing the complexity of decision-making strategies. Moreover, prolonged or intense uncertainty can affect strategic decisions, including innovation planning, market entry, and business restructuring.

In the contemporary economic environment, understanding the nature and consequences of economic uncertainty becomes crucial for designing policies that enable adaptation and resilience among economic agents. A clear definition of uncertainty allows researchers and decision-makers to systematically identify challenges, plan strategies, and mitigate negative effects on economic processes.

Economic uncertainty arises from various factors that shape the behavior of economic agents and influence the functioning of economic systems. Understanding these sources enables a more precise assessment of the challenges faced by individuals, firms, and institutions and provides a foundation for adequate planning and adaptation of decision-making strategies. In modern economies, the main sources of uncertainty can be categorized into four groups: macroeconomic factors, technological change and innovation, market and competitive dynamics, and the institutional and regulatory framework. Sudden market instability and changes in economic conditions further increase the complexity of decision-making.

Macroeconomic factors, including inflation, business cycles, and monetary and fiscal policy, represent significant sources of uncertainty. Inflation, particularly when volatile, complicates the assessment of the real value of income and costs, thereby affecting consumption and investment planning. Cyclical fluctuations generate unpredictable periods of expansion and contraction, increasing uncertainty regarding income, employment, and firm profitability. Monetary and fiscal measures further complicate the forecasting of economic trends, as economic agents cannot always reliably assess the direction and intensity of such policy changes.

Rapid technological change and innovation in production and markets constitute a key source of uncertainty in the contemporary economy. Firms must continuously improve or renew their products and services if they are to maintain or expand their market share and remain competitive (Radosavljević and Grdović, 2018). Accelerated technological development can alter firms' competitive advantages, require adjustments in business processes, and generate unpredictable shifts in demand for products and services. Although innovations are often drivers of growth and productivity, they simultaneously introduce instability by complicating long-term investment planning and the assessment of future resource values. The emergence of new technologies may also result in disruptive market changes, requiring rapid adaptation and flexible decision-making strategies.

Global markets and competitive pressures further increase the level of uncertainty. Fluctuations in supply and demand, changes in raw material prices, and unpredictable competitive responses make market forecasting complex and risky. Economic globalization implies that developments in one country or region can have immediate effects on others, creating chain reactions of uncertainty. In such an environment, economic agents often rely on diversification strategies,

short-term planning, and continuous market monitoring in order to mitigate potential negative consequences.

Institutional and regulatory uncertainty arises from changes in legislation, administrative procedures, and public policies. Ambiguous rules, frequent regulatory changes, and complex bureaucratic processes hinder business operations and planning, particularly in sectors dependent on public policy and permits. A stable institutional framework with clearly defined rules and procedures reduces uncertainty, whereas legal and administrative instability may lead to delayed investments, increased operational costs, and reduced competitiveness.

Managing economic uncertainty requires a comprehensive and integrated understanding of all these sources. A combination of macroeconomic monitoring, technological adaptation, strategic market analysis, and stable institutional frameworks enables economic agents to mitigate the negative effects of uncertainty and make higher-quality decisions.

### **3. ECONOMIC DECISION-MAKING UNDER UNCERTAINTY**

In the modern economy, uncertainty represents a fundamental factor shaping the decision-making process at all levels – from individuals and enterprises to institutions and public policies. When economic agents lack reliable information about future developments, they face constraints in assessing the outcomes of their decisions, which significantly alters typical behavioral patterns. The absence of a unified decision-making model further increases uncertainty, resulting in varying risk-taking propensities among economic actors depending on their subjective perception of specific external factors (Petrović, Stefanović and Marković, 2017).

In such an environment, decisions cannot rely solely on expected values or known probabilities, as these quantitative indicators often fail to reflect the true complexity and unpredictability of market changes. Instead, decision-making becomes dynamic and adaptive, requiring continuous reassessment of available information and environmental conditions. Economic agents must constantly monitor changes in the economic environment and adjust their strategies in response to unexpected developments.

Flexibility in decision-making implies the ability to modify existing plans, reallocate resources, and apply alternative strategies in order to reduce potential negative effects of uncertainty. This approach not only minimizes losses but also enables the identification of new opportunities

emerging in uncertain and rapidly changing environments. Therefore, understanding the impact of uncertainty on decision-making is essential for analyzing economic behavior and designing policies that improve system resilience and adaptability.

Uncertainty in the economic environment strongly influences the behavior of individuals and households. Faced with unpredictable changes in income, prices, and employment conditions, individuals tend to adopt more cautious consumption and saving behavior. This caution is driven by the need to maintain financial security and build precautionary savings that can buffer unexpected shocks such as inflation, job loss, or increased living costs. Empirical evidence confirms that uncertainty increases precautionary savings and reduces current consumption, particularly during periods of economic instability (Baker et al., 2016).

One of the most common responses is the postponement of major purchases and long-term investments. Individuals often prefer safer assets and more liquid forms of savings over riskier investment options. While such behavior is rational at the individual level, it has broader macroeconomic implications, as reduced consumption directly lowers aggregate demand. Behavioral research also indicates that individuals tend to overweight potential losses relative to gains, which further strengthens cautious decision-making under uncertainty.

Reduced aggregate demand during periods of high uncertainty can lead to slower economic activity, lower production, and increased market instability. This demonstrates the strong link between individual decision-making and macroeconomic outcomes, as collective behavior can amplify the effects of uncertainty on the overall economy. For this reason, understanding these behavioral patterns is important for designing economic policies aimed at stabilizing consumption and supporting economic activity.

Enterprises facing uncertainty adjust their strategies in order to maintain stability and reduce exposure to risk. A common response is the postponement or restructuring of investment activities, especially in long-term projects with uncertain returns. Such decisions allow firms to preserve flexibility and respond more effectively to changes in the business environment. Empirical studies confirm that investment activity declines significantly during periods of high uncertainty (Bloom, 2014).

The environment in which a firm operates is itself a source of uncertainty and has a strong influence on all aspects of business activity. Therefore,

interaction with the external environment and access to resources represent key elements in maintaining stable conditions for continuous operation (Nadoveza and Pešić, 2014).

Firms also frequently adopt diversification strategies in terms of products, markets, and activities. This reduces dependence on a single segment and increases resilience to changes in demand or competition. Diversification may include the development of new products, entry into new markets, or expansion of service portfolios, all of which enhance the firm's ability to adapt to uncertain conditions.

For long-term survival, firms must continuously adapt to environmental changes or, where possible, reduce uncertainty through improved planning and resource stability. Strategic analysis of the environment is therefore essential, although it becomes more difficult when external conditions change frequently. Easier access to production factors and markets facilitates analysis, while restrictions increase complexity in decision-making processes (Milosavljević, 2007).

Continuous monitoring of technological, market, and regulatory changes is also a key component of decision-making. Firms must track innovations, price fluctuations, consumer preferences, and policy changes in order to adjust strategies in a timely manner and identify new opportunities. This proactive approach reduces risk exposure and improves responsiveness to unexpected changes.

In addition, firms must balance short-term operational stability with long-term strategic goals. While maintaining current performance is essential, firms must also preserve their capacity for future growth and competitiveness. This requires strategic flexibility, continuous reassessment of objectives, and adaptive planning.

As uncertainty increases, the importance of forecasting and planning also grows. In stable environments, firms can focus primarily on operational efficiency, while long-term planning is less critical. However, in uncertain environments, past experience becomes less reliable, and strategic planning oriented toward adaptation becomes essential (Đuričin and Janošević, 2005).

In contemporary research on decision-making under uncertainty, formal models such as Markov decision processes and partially observable Markov decision processes are used to represent sequential decision problems under stochastic conditions (Badings et al., 2023). However, these models primarily capture risk-based uncertainty, while deeper forms of ambiguity remain difficult to formalize.

At the macroeconomic level, the combined responses of individuals and firms generate systemic effects that influence overall economic dynamics. Reduced consumption and delayed investments slow down economic growth and increase market instability. These effects are not isolated but interconnected, reinforcing the overall impact of uncertainty on the economy.

In this context, institutional stability and public policies play a crucial role in reducing uncertainty and supporting decision-making. Governments and institutions provide regulatory frameworks, policies, and mechanisms that reduce unpredictability and improve the transparency of economic processes. Stable institutions enhance predictability, improve planning capabilities, and increase overall system resilience under uncertainty.

#### **4. THE ROLE OF INNOVATIONS AND THE INSTITUTIONAL FRAMEWORK IN MITIGATING UNCERTAINTY**

One of the central questions in innovation management concerns strategic decision-making in the development of new products, services, and processes, aligning an organization's capabilities with the opportunities present in its environment in order to achieve long-term business objectives. In the modern economy, organizational and technological innovations represent a key instrument for reducing the negative effects of economic uncertainty. Technological advancements enable companies to optimize production and business processes, increasing efficiency and reducing costs, which directly contributes to stability in unpredictable market conditions. Rapid technological changes also facilitate faster adaptation to shifts in demand, competition, and market trends, thereby reducing firms' vulnerability to unexpected shocks.

Recent literature emphasizes that digital transformation, automation, artificial intelligence, and data-driven decision-making further strengthen firms' ability to operate under uncertainty by improving information processing, forecasting accuracy, and responsiveness to environmental changes (Szukits and Móricz, 2024; Bondac et al., 2026).

Organizational innovations, which include changes in management practices, corporate structure, communication systems, and business processes, also significantly enhance resilience to uncertainty. A flexible and adaptive organizational structure enables faster decision-making, more efficient allocation of resources, and improved coordination under changing economic conditions. For example, the adoption of agile management methods, decentralization of decision-making, and

integration of digital tools into business operations allow firms to respond more effectively to unpredictable market developments.

When technological and organizational innovations are combined, they generate a synergistic effect that strengthens a firm's ability to anticipate, manage, and mitigate risks. This synergy not only reduces operational vulnerability but also enables the identification of new business opportunities that emerge in uncertain environments. For this reason, innovation management is closely linked to strategic decision-making aimed at aligning internal capabilities with external opportunities in order to achieve long-term competitiveness (Gligović and Bugar, 2018). Empirical evidence also suggests that firms with higher levels of innovation tend to demonstrate greater resilience during periods of economic instability.

A stable and predictable institutional framework is another key factor in mitigating economic uncertainty. Clear rules, regulations, and standards allow economic actors to plan their activities with greater confidence, reducing the risk of unexpected changes that may affect business operations, investments, and consumer behavior. Transparency in regulatory processes and consistency in policy implementation strengthen trust among economic agents and improve overall market efficiency.

Institutional stability is reflected in several key dimensions: legal certainty, predictable fiscal and monetary policies, clearly defined contractual rules, and consistent enforcement of regulations. These elements reduce uncertainty by limiting arbitrary changes in the economic environment and ensuring a stable framework for decision-making. The importance of institutions becomes especially evident during periods of crisis, when a stable institutional structure enables faster adjustment and reduces the negative impact of economic shocks. Empirical studies in institutional economics confirm that higher institutional quality is associated with lower volatility and stronger long-term economic performance.

The combination of a stable institutional framework and well-defined market rules contributes to the development of trust among economic actors, which is essential for long-term planning and efficient resource allocation. In this way, institutions function not only as regulatory mechanisms but also as factors that directly enhance the resilience and stability of the economic system under uncertainty.

The interaction between innovations and institutions represents a key mechanism for strengthening economic resilience. While innovations increase the adaptive capacity of firms

and individuals by enabling them to respond to changes and exploit new opportunities, institutions provide the necessary stability, predictability, and legal framework for market functioning. Together, they create an environment in which economic agents can operate with reduced risk and greater flexibility.

Innovations alone may improve adaptability, but without institutional support their effectiveness is often limited. For example, technological progress requires legal protection of intellectual property, effective regulation of markets, and enforcement of fair competition rules. Conversely, institutions that actively support innovation through subsidies, tax incentives, and regulatory frameworks further enhance firms' ability to adapt and reduce uncertainty-related risks.

The synergy between innovations and institutions allows not only for short-term adjustment to shocks but also for long-term economic stability. Firms are able to plan investments with greater confidence, while institutions reduce market volatility by ensuring consistent and predictable rules. This interaction contributes to sustainable economic growth, stronger adaptability, and increased resilience of the entire economic system.

Modern economic policies play a crucial role in managing uncertainty, but they also face significant challenges in a rapidly changing global environment. A key objective of such policies is to establish a stable institutional framework that ensures predictability and security while simultaneously encouraging innovation and economic flexibility. Fiscal, monetary, and regulatory policies must therefore balance responsiveness to shocks with consistency in order to maintain credibility and market confidence.

The challenges of contemporary economic policy arise from technological progress, globalization, and frequent economic shocks. Changes in demand, fluctuations in commodity prices, geopolitical risks, and financial instability require policies that can adjust quickly and effectively. At the same time, inconsistent or overly interventionist policies may increase uncertainty and reduce trust among economic agents.

The effectiveness of modern economic policies depends largely on their ability to integrate innovation support and institutional stability into a coherent framework. Policies that promote research and development, digital transformation, education, and technological adoption strengthen the adaptive capacity of the economy. At the same time, institutional reforms that improve transparency, strengthen legal certainty, and ensure consistent enforcement create a stable environment in which innovation can develop effectively.

In this context, economic policy must strike a balance between promoting growth, supporting innovation, and maintaining stability. The combination of flexible policy responses and a predictable institutional framework is essential for reducing uncertainty and strengthening the resilience of economic actors and the economic system as a whole.

## CONCLUSION

Economic uncertainty significantly shapes the behavior of individuals, firms, and institutions, leading to increased caution, postponed investments, and diversification of activities.

These behavioral adjustments directly influence aggregate demand, economic growth, and overall market stability, which highlights the importance of flexible and adaptive decision-making strategies in contemporary economic systems. In this sense, uncertainty should be understood not as a temporary deviation, but as a persistent structural characteristic of modern economies shaped by technological change, globalization, and institutional dynamics.

The analysis in this paper shows that decision-making under uncertainty departs from the assumptions of traditional rational models, as economic agents often rely on incomplete information, expectations, and adaptive mechanisms. Consequently, economic behavior becomes increasingly dynamic and context-dependent, with outcomes strongly influenced by changing environmental conditions rather than fixed predictive models.

Technological and organizational innovations, together with a stable institutional framework, represent key mechanisms for mitigating the negative effects of uncertainty.

They enable faster adaptation, improved efficiency, and identification of new opportunities, while simultaneously increasing predictability, trust, and overall system stability. These factors also strengthen the capacity of economic agents to respond to shocks and maintain continuity of economic activity in volatile environments.

Effective economic policies must therefore ensure a balance between promoting innovation and preserving institutional stability. Such an approach creates a framework that supports rational decision-making and strengthens the resilience of economic actors.

Ultimately, the long-term sustainability of modern economic systems depends on the continuous coordination between innovation capacity, institutional quality, and adaptive economic behavior.

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