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INTERNATIONAL INNOVATION AND TECHNOLOGY TRANSFER AND ITS ROLE IN THE TRANSITION TOWARD INNOVATIVE AND SUSTAINABLE DEVELOPMENT OF THE BULGARIAN ECONOMY

AUTHOR'S ABSTRACT

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The dissertation consists of 234 pages, including an introduction, three chapters, a conclusion, a bibliography, lists of abbreviations used, tables and figures, and statistical sources. The bibliography contains 307 sources (including books, articles, periodical and non-periodical statistical and other publications, reports, studies and sources available on the Internet), of which 54 by Bulgarian authors, 98 institutional documents, 34 by analytical organizations and think tanks, 122 by foreign authors. Separately, 12 statistical sources were used. 5 publications have been made on the topic of the dissertation.

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I. GENERAL CHARACTERISTICS OF THE DISSERTATION

1. Relevance of the study

The relevance of the dissertation research stems from accelerated global transformations in technological development, deepening geopolitical instability, and the growing strategic importance of innovation as a key driver of long-term economic growth. In the context of a dynamically changing global environment, International Innovation and Technology Transfer (IITT) is increasingly recognized as a central instrument for the adaptation of national economies to the new realities of digital and green transformation. Bulgaria, as a small open economy and a country undergoing sustainable convergence with average European levels of development, is particularly sensitive to global technological and geopolitical shifts. These developments fundamentally shape its opportunities for modernization, competitiveness, and integration into global value chains.

The relevance of the study is further reinforced by the expanding scientific and policy consensus on the role of innovation in the structural transformation of economies. The award of the 2025 Nobel Prize in Economic Sciences to Joel Mokyr, Philippe Aghion, and Peter Howitt underscored the importance of innovation-driven growth and mechanisms of creative destruction as foundations of sustainable development. The awardees' scientific contributions clearly demonstrate that the introduction of new technologies is a key determinant of productivity growth and competitiveness—a logic that lies at the core of the present study. In this context, IITT acquires not only economic but also strategic significance as a mechanism for accelerated technological renewal in countries with limited domestic innovation capacity.

The past decade has been marked by significant global shocks, including the COVID-19 pandemic, disruptions in global supply chains, and the war in Ukraine. These developments have intensified the demand for sustainable technological solutions, while simultaneously contributing to a decline in innovation activity across Europe. This decline has been driven by the redirection of public resources toward crisis management measures and a slowdown in private investment. The European Innovation Scoreboard (2022 - 2024) reports a deterioration in several key indicators of innovation capacity within the EU, with particularly pronounced effects on countries such as Bulgaria, whose innovation ecosystem remains structurally vulnerable.

Within this global environment, Bulgaria finds itself at a critical stage of economic development. On the one hand, it is an open economy characterized by limited R&D resources and underdeveloped innovation structures; on the other, it is fully integrated into the European

Union and exposed to intensive European technological flows and development instruments. Indicators of innovation performance and scientific capacity consistently place Bulgaria among the group of "Emerging Innovators," ranking it among the lowest-performing EU Member States. R&D expenditure amounts to approximately one third of the EU average; the number of researchers and participation in high-technology industries remain persistently low; and the share of high-technology exports continues to be limited. These structural deficits highlight the need for targeted international technology transfer as a central instrument for modernization.

At the same time, the Bulgarian economy faces substantial challenges related to the green transition. The country has inherited a carbon-intensive and energy-intensive industrial structure, which complicates compliance with European climate objectives. This further reinforces the need for the accelerated deployment of advanced technologies in energy, industry, and agriculture—sectors that play a decisive role in the structural transformation of the economy.

Taken together, these factors underscore the high strategic importance of IITT for Bulgaria. The country lacks sufficient internal innovation and development capacity to achieve the required technological transformation through domestic resources alone. Consequently, the effective absorption of external technologies—through partnerships, foreign investment, international scientific programs, and participation in global innovation networks—constitutes a key prerequisite for national competitiveness and sustainable economic growth.

Against this backdrop, the present study is highly relevant, as it systematizes contemporary trends in international technology transfer, analyzes the global and European frameworks, assesses national opportunities and constraints, and proposes scientifically grounded solutions aimed at enhancing innovation capacity and accelerating the structural transformation of the Bulgarian economy.

2. Object and subject of the study

The object of the scientific study is the system of factors, interdependencies, and conditions that determine international innovation and technology transfer, understood as an economic and institutional process within the functioning of the Bulgarian economy. The analysis of this object is conducted through the prism of the institutional, economic, and strategic environment in which the country participates in international technological exchange, as well as the effects that this process generates on competitiveness, structural transformation, and the sustainable development of the national economy.

The subject of the research comprises the mechanisms, instruments, and management approaches through which international innovation and technology transfer is formed,

governed, and assessed as a strategic tool for enhancing national competitiveness, accelerating economic transformation, and achieving structural modernization of the Bulgarian economy in the context of a changing European and global environment.

In recent years, the rapid development of artificial intelligence (AI) has further intensified the dynamics of change in the forms and mechanisms of international technology transfer. These new manifestations and characteristics increasingly exceed existing regulatory frameworks at the national, European, and global levels. Given the structurally transformative impact of new technologies and innovations - both within the European Union and globally - significant shifts are occurring in regulatory regimes governing international technology exchange, giving rise to new challenges for open economies such as Bulgaria.

Addressing the difficulties and risks associated with Bulgaria's participation in international technology transfer requires systematic research into emerging trends in critical technologies and innovations, particularly in the context of intensifying international competition. This competition extends beyond international trade to encompass the strategic management of domestic and foreign investment aimed at the deployment of new technologies and innovative solutions. In recent years, rapid technological advances in the fields of security and defense, as well as increasing restrictions on access to such technologies, have assumed a central role in global geopolitics. The redrawing of geopolitical boundaries and the escalation of military and resource-related tensions further complicate the nature, instruments, and determinants of international innovation and technology transfer.

A comparative analysis of the experience of various countries in implementing international technology transfer makes it possible to identify key opportunities and prerequisites for fostering close and long-term partnerships between science and the real economy. Such partnerships represent a fundamental condition for the effective implementation of international innovation and technology transfer, given the inherently multidisciplinary character of the process.

3. Research thesis

The accelerated transformation of the global technological environment, the growing fragmentation of international markets, and intensified competition for access to strategic technologies create new constraints and opportunities for national economies. Bulgaria is characterized by limited innovation capacity, insufficient research infrastructure, and slow adaptation to leading technological trends, which undermines its ability to participate independently in global value chains with high added value. Under these conditions, international innovation and technology transfer emerges as a key mechanism for accelerating technological

catch-up, modernizing production structures, and building national capacity for sustainable economic growth.

The research thesis of the dissertation asserts that strategically managed international innovation and technology transfer constitutes a decisive factor in the structural transformation of the Bulgarian economy. It enables the integration of external technological solutions, the development of domestic competencies, the strengthening of the scientific and institutional environment, and the achievement of long-term competitiveness in the context of global instability.

The hypotheses derived from the logic of this theoretical proposition are as follows:

Hypothesis 1:

Geopolitical and economic changes are restructuring global technology flows, and the effectiveness of international innovation and technology transfer (IITT) in Bulgaria depends on the country's capacity to adapt to this dynamic environment.

Hypothesis 2:

The global technological transition creates specific opportunities for the Bulgarian economy, which can be realized through the accelerated absorption of external innovations in strategically significant sectors.

Hypothesis 3:

Existing structural constraints—including low levels of R&D expenditure, insufficient investment, and institutional fragmentation—position international innovation and technology transfer as a necessary instrument for transforming the country's economic profile.

Hypothesis 4:

The positive effects of IITT are realized only in the presence of coordinated state policy, a stable institutional framework, and integrated interaction among science, business, and public institutions.

Hypothesis 5:

The scientifically grounded adaptation and upgrading of transferred technologies create the conditions for Bulgaria to develop its own innovation potential and to evolve from a technology recipient into an active producer and exporter of innovative solutions.

4. Goals and objectives of the study

The aim of the dissertation is to analyze and conceptualize the International Innovation and Technology Transfer (IITT) as a strategically managed process and instrument for accelerating economic transformation, enhancing competitiveness, and supporting the sustainable development of the Bulgarian economy in the context of European integration and a dynamically

changing global environment.

A secondary, application-oriented objective of the study is the development of a conceptual and analytical framework for the evaluation and strategic management of IITT in Bulgaria, including a model for identifying and monitoring its multiplier economic, institutional, and technological effects.

The achievement of the stated objective is pursued through the completion of the following **research tasks**:

1. **To systematize and analyze the leading theoretical concepts, models, and approaches in the international literature** related to international innovation and technology transfer, innovation diffusion, absorptive capacity, and multiplier effects.

2. **To analyze the historical and contemporary experience of Bulgaria, as well as selected international cases, in the implementation of various IITT models,** with particular emphasis on institutional configurations and economic effects.

3. **To conduct a comparative analysis of the innovation environment and IITT practices across the EU-27,** assessing Bulgaria's position, its structural deficits, and its potential comparative advantages.

4. **To examine the national institutional, regulatory, and strategic framework** defining the conditions for Bulgaria's effective participation in international innovation and technology transfer.

5. **To assess the state of the Bulgarian economy in the context of the sustainable transition,** with the aim of identifying key sectoral opportunities, constraints, and prerequisites for technological transformation.

6. **To develop an analytical model for assessing the effects of IITT - the Ripple Effect Model (REM)** - allowing for the tracking of both direct and indirect impacts on the economic and institutional environment.

7. **To formulate a strategic roadmap for the implementation of IITT in Bulgaria,** structured in successive phases and including clearly defined priorities, stakeholders, indicators, and expected outcomes.

8. **To identify the main barriers and risks to the effective implementation of IITT** and to formulate evidence-based recommendations for improving public policy and the institutional framework.

5. Scope of the study

The scope of the dissertation research encompasses a multi-layered system of economic, institutional, technological, and historical parameters through which the role of International Innovation and Technology Transfer (IITT) in the sustainable development of the Bulgarian economy is examined. The study adopts both national and international perspectives, analyzing the interactions between global trends, European policies, and national structural characteristics.

At the international level, the scope includes a comparative analysis of the innovation systems of the EU-27 countries, the dynamics of technology transfer mechanisms, participation in global value chains, models of technological catch-up, and the strategic approaches of countries with differing institutional traditions. Historical and contemporary examples from the experience of the USSR, Japan, South Korea, the United States, and other countries are analyzed in order to outline distinct models of institutional capacity, technological adaptation, and industrial policy.

At the national level, the analysis covers the state of the Bulgarian economy following its accession to the European Union, with a focus on innovation capacity, research and development activity, human capital, the institutional framework, management practices, and participation in transnational innovation flows. Particular attention is devoted to key sectors with potential for sustainable growth, including energy, agriculture, industrial production, and high-technology services.

The temporal scope of the study extends from the beginning of the transition to a market economy to 2024, tracing long-term structural dependencies, stages of institutional development, and the effects of European integration processes. For part of the quantitative and comparative analyses, the most recent data available from international and national statistical sources—covering information up to 2024 - have been employed.

The scope of the research also includes an analysis of the impact of major global crisis phenomena—the 2008 financial crisis, the COVID-19 pandemic, the energy crisis, and the geopolitical tensions of the 2020s—on technology transfer processes, innovation policies, and the adaptive capacity of the Bulgarian economy. These factors allow for an assessment of the resilience and responsiveness of the national economy under conditions of systemic shocks.

Within the framework of the dissertation, a model for assessing the multiplier impact of IITT has been developed, along with a strategic roadmap structured in successive stages (preparation, pilot implementation, and scaling). Together, these instruments outline realistic mechanisms for the practical application of IITT under the specific economic and institutional

conditions of Bulgaria.

6. Research methodology

In order to achieve the stated objective and accomplish the research tasks of the dissertation, an integrated methodological approach is employed, combining theoretical, comparative, and empirical methods.

A theoretical–methodological approach is applied to systematize the core concepts of international innovation and technology transfer, innovation systems, institutional economics, and models of technological growth. The methods of analysis, synthesis, induction, and deduction are used to derive generalizations and to formulate the conceptual framework of the study.

A comparative analysis of Bulgaria's position relative to the EU-27 countries is conducted on the basis of key indicators related to innovation capacity, production structures, the institutional environment, and participation in international technology flows. The comparative approach also incorporates historical examples from other countries in order to evaluate different models of industrial policy and technology transfer.

The historical–logical method is employed to trace institutional evolution, structural dependencies, and long-term trends shaping the development of the national innovation system.

The study makes use of empirical and statistical data from international and national sources to assess innovation dynamics, human capital, research activity, and sectoral characteristics of the Bulgarian economy. Graphical and tabular methods are applied to visualize the results.

A model for assessing the multiplier impact of International Innovation and Technology Transfer (IITT) is developed, structuring the interactions among participants in the innovation ecosystem and serving as the analytical foundation for the formulation of the strategic roadmap for the implementation of IITT in Bulgaria.

7. Structure of the dissertation

The dissertation is structured in the following logical sequence: an introduction, three chapters, a conclusion, a list of references, and a list of statistical sources.

The introduction presents the relevance of the research, its object and subject, the research thesis, and the hypotheses formulated to test it. It also defines the main objective and the derived research tasks, the methodology of the study, and its scope.

The first chapter is devoted to the theoretical and conceptual foundations of international

innovation and technology transfer, examining the principal theoretical paradigms, including innovation systems, endogenous growth theory, spillover effects, institutional economics, and techno-nationalist policies.

The second chapter examines the state and specific characteristics of the Bulgarian economy within the context of the European innovation environment. A comparative analysis is conducted with the EU-27 countries based on key indicators of innovation capacity, research and development activity, institutional effectiveness, and participation in global technology value chains. National and regional policies, the regulatory framework, and institutional constraints influencing IITT processes are assessed.

The third chapter proposes a model for the strategic implementation of IITT in Bulgaria, grounded in an analysis of economic, institutional, and governance-related prerequisites. A multiplier impact model is developed to describe the interactions among participants in the innovation ecosystem. In addition, a strategic roadmap is presented, structured in three phases - preparation, pilot implementation, and scaling - with clearly defined steps, stakeholders, and expected outcomes.

The conclusion synthesizes the main findings of the study, formulates the key conclusions, and substantiates the validity of the research thesis and hypotheses.

At the end of the dissertation, a list of the literature used and a list of statistical sources supporting the empirical and comparative analyses are provided.

II. CONTENTS OF THE DISSERTATION

III. EXTENDED SUMMARY OF THE DISSERTATION

INTRODUCTION

In the introduction of the dissertation, the relevance of the research topic, conditioned by accelerated global technological changes, geo-economic transformations and the need to build a sustainable model of development of the Bulgarian economy, is argued. The object and subject of the study are defined, with a focus on the mechanisms, institutional logic and economic effects of International Innovation and Technology Transfer (IITT). The scope of the dissertation is outlined, combining theoretical research, international comparisons, institutional analysis and the development of applied models for transfer management.

The research thesis is formulated, which considers IITT as a strategic tool for accelerated technological modernization, structural transformation and increasing the competitiveness of Bulgaria. On this basis, hypotheses are derived regarding the influence of the global environment, national innovation capacity, institutional coordination and the country's ability to adapt and upgrade external technologies. The hypotheses are systematically tested within the study through theoretical analysis, comparative evaluations and empirical observations.

In the introduction, the main goal and specific tasks of the dissertation are formulated. These include clarifying the theoretical foundations of the transfer, analyzing the Bulgarian innovation environment, assessing the institutional prerequisites and developing a model for strategic management of IITT. The research tools used are presented, including critical analysis of scientific theories, comparative methods, institutional and structural analysis, as well as conceptual modeling through the developed Ripple Effect Model (REM). The sources used are described—academic publications, international reports, European strategic documents and national normative acts.

CHAPTER III. THEORETICAL AND METHODOLOGICAL PREREQUISITES AND ANALYTICAL FOUNDATIONS OF THE STUDY

Chapter One establishes the conceptual, theoretical, and methodological foundations of the dissertation by defining the analytical framework through which International Innovation and Technology Transfer (IITT) and its role in the sustainable development of the Bulgarian economy are examined. The chapter performs a critical analytical function: it systematizes the diverse theoretical traditions through which technology transfer is conceptualized, explained, and evaluated, and it delineates the analytical horizon that enables the construction of an integrated model in the subsequent chapters.

Given the inherently interdisciplinary nature of IITT, the theoretical review integrates approaches from economic theory, innovation systems, institutional economics, industrial policy, and international economics. These perspectives are brought together within a unified strategic framework specifically adapted to the characteristics of a small open economy such as Bulgaria.

The theoretical foundation begins with the innovation dynamics articulated by Joseph Schumpeter, whose concept of creative destruction positions technological progress as a central driver of economic development. Schumpeter's analysis of the relationship between technological change, entrepreneurship, and structural transformation provides the initial analytical premise of the study: technology transfer is not a mechanical act of transmission, but a process of recombination that reshapes production structures, market positions, and strategic capabilities.

Building on this foundation, the chapter traces the evolution from the neoclassical growth model of Robert Solow[1], in which technological progress is an exogenous factor, to endogenous growth models of Paul Romer[2], Robert Lucas[3] and Mankiw-Romer-Weil (N. Gregory Mankiw - David Romer - David Weil)[4], which place knowledge accumulation, human capital, and research activity at the core of the growth process. Within this framework, Chapter One establishes the link between international technology transfer and economic dynamics, demonstrating how external technological impulses can accelerate productivity growth in economies with limited domestic scientific capacity.

Particular attention is devoted to the concept of spillover effects, initially formulated by Zvi

[1] Solow, R. (1956, 1957). *A Contribution to the Theory of Economic Growth*
[2] Romer, P. (1986, 1990). *Endogenous Technological Change*
[3] Lucas, R. (1988). *On the Mechanics of Economic Development*.
[4] Mankiw, N.G., Romer, D., Weil, D. (1992). *A Contribution to the Empirics of Economic Growth*

Griliches5 and further developed by David Coe & Elhanan Helpman6. This body of work explains how accumulated knowledge functions as a productive factor capable of generating long-term structural transformations while simultaneously diffusing across national boundaries. This leads to a core analytical proposition of the dissertation: IITT operates as a structural mechanism of growth rather than merely a collection of operational transfer channels.

The theoretical analysis is further expanded through the contributions of evolutionary economics, which offers a different perspective on the understanding of technological change. In the tradition of Richard Nelson and Sidney Winter, Giovanni Dosi, and Keith Pavitt, innovation is not interpreted as a series of isolated events, but as a process that follows technological paradigms, trajectories, and cumulative paths. This approach is particularly important for the study of International Innovation and Technology Transfer (IITT), as it demonstrates that the ability of an economy to absorb external technologies depends on existing technological competencies, organizational practices, institutional routines, and accumulated historical inertia. This argues for the need for an interdisciplinary review that takes into account both classical growth patterns and dynamic, evolutionary mechanisms that explain the actual behavior of innovation systems.

In the subsequent logical part of the chapter, the focus shifts to the theory of innovation systems, which conceptualizes innovation as the result of interaction among firms, research organizations, universities, and public institutions. The foundational contributions of Christopher Freeman[7], Bengt-Ake Lundvall[8], and Richard Nelson[9] are examined, as these authors interpret innovation as an outcome of the interaction between institutions, business, academia, and public policy. The concept of Triple Helix, developed by Henry Etzkowitz & Loet Leydesdorff[10], is of particular significance, as it outlines the tripartite model of cooperation through which technology transfer effectively operates in modern economies. Against this background, central importance is attributed to the idea of absorptive capacity[11], formulated by Wesley Cohen & Daniel Levinthal's idea, understood as the ability of economic and institutional structures to absorb, adapt and further develop external knowledge. It is precisely this concept that becomes a key analytical element of the dissertation: technology transfer is not an automatic process, but one that requires the presence of institutional and organizational prerequisites enabling the transformation of external technologies into sustainable production and innovation outcomes.

[5] Griliches, Z. (1992). *The Search for R&D Spillovers*.
[6] Coe, D., Helpman, E. (1995). *International R&D Spillovers*.
[7] Freeman, C. (1987). *Technology Policy and Economic Performance*.
[8] Lundvall, B.-Å. (1992). *National Systems of Innovation*.
[9] Nelson, R. (1993). *National Innovation Systems*
[10] Etzkowitz, H., Leydesdorff, L. (2000). *Triple Helix of University–Industry–Government Relations*.
[11] Cohen, W., Levinthal, D. (1990). *Absorptive Capacity*.

Chapter One also includes a detailed review of the literature examining international technology transfer in the context of globalization, global production networks, and international investment flows. The analysis covers models of vertical and horizontal technology transfer, the role of foreign direct investment, transfer through global value chains (GVCs), and mechanisms of research and innovation cooperation[12]. In this context, the contributions of Wolfgang Keller[13], Beata Javorcik[14], Kamal Saggi[15] and Keith Maskus[16] are examined. The review reveals an important characteristic of the existing literature: much of the research analyzes International Innovation and Technology Transfer (IITT) in a fragmented manner—either through isolated transfer channels or through sector-specific case studies—without proposing an integrated conceptual framework that links technology flows to the institutional structure and strategic objectives of national economies.

Within the framework of the literature analysis, special attention is devoted to the Bulgarian research tradition in the fields of innovation, international economics, and industrial policy. Bulgarian academic sources consistently identify structural weaknesses in innovation policy, fragmented institutional capacity, and an insufficient ability of the economy to absorb external technological impulses. As a result, a clear scientific gap emerges: there is no integrated model that unifies theories of economic growth, innovation systems, and the institutional specificities of Bulgaria within a single conceptual framework of international technology transfer.

A significant part of the analysis is dedicated specifically to Bulgarian literature. It demonstrates that national studies are predominantly oriented toward individual elements of innovation policy, macroeconomic aspects of growth, or analyses of foreign direct investment, while rarely examining technology transfer as a complex mechanism for structural modernization.

Within Bulgarian academic research, the works of Rositsa Chobanova[17] stand out for their analysis of the national innovation system and the role of public policies in shaping innovation dynamics. Important contributions are also made by Teodora Georgieva[18], whose research focuses on the definition and classification of technologies, as well as by Ivan Hristov - Daniela

[12] Radosevic, S. (1999). *International Technology Transfer*.
[13] Keller, W. (2004). *International Technology Diffusion*.
[14] Javorcik, B. (2004). *FDI Spillovers and Technology Transfer*.
[15] Saggi, K. (2002). *Trade, FDI and Technology Transfer*.
[16] Maskus, K. (2004). *IPR and Technology Transfer*.
[17] Chobanova, R. (2004). Innovation of the national economy. Sofia: Academic Publishing House "Prof. M. Drinov"; Chobanova, R. (2013). Science, Technology and Innovation: Development, Financing and Policies in Bulgaria. Sofia: Acad. Ed. "Prof. M. Drinov"; Chobanova, R. (2016). Innovation System and Sustainable Development in Bulgaria. Sofia: BAS
[18] Georgieva, T. (2016). *Technology transfer*.

Marinova[19], along with other authors examining industrial policy in Bulgaria. While these studies provide valuable empirical observations and conceptual interpretations, they rarely propose an integrated model that connects international technology transfer with institutional structures, innovation mechanisms, and the national strategy for sustainable development. It is precisely this gap that justifies the contribution-oriented nature of the present dissertation—namely, the need for a systematic conceptualization of IITT as a strategic tool for the sustainable development of the Bulgarian economy.

There are no integrated models that examine IITT simultaneously through institutional, economic, managerial, and strategic perspectives. Despite the existence of valuable individual studies, Bulgarian academic literature rarely analyzes technology transfer as a structural mechanism for national development.

The theoretical review is further expanded through an analysis of historical models that illustrate different institutional approaches to technological catch-up. In this regard, the experiences of Japan and South Korea, as well as the historical periods of industrialization and technology transfer in the USSR during 1928 - 1937 and 1966 - 1975, are of particular importance. These examples lay the groundwork for the comparative analysis in the subsequent chapters and substantiate the argument that Bulgaria requires a complex, context-sensitive model rather than a mechanical replication of foreign practices.

On the basis of this analysis, Chapter One plays a critical role in the overall structure of the dissertation. It demonstrates that international literature tends to focus either on individual transfer channels or on sectoral case studies, while Bulgarian literature is characterized by institutional fragmentation and the absence of comprehensive analytical models. Consequently, the dissertation substantiates the need for the development of a multidisciplinary framework that integrates international theoretical approaches with Bulgaria's specific national context. This conceptual contribution forms the foundation of the Ripple Effect Model (REM) developed in Chapter Three, as well as of the strategic roadmap proposed as a practically applicable model for action.

As a result of this extensive theoretical, institutional, and literature-based review, Chapter One reaches its central contribution: the formulation of an interdisciplinary, systematically structured framework that conceptualizes IITT as a multidimensional process involving the interaction of internal and external technological impulses, institutional structures, industrial policies, and market mechanisms. This framework fulfills a dual function. On the one hand, it

[19] Hristov, I. & Marinova, D. (2019). Innovation and Technology Transfer in Bulgaria. Sofia: UNWE

systematizes existing scientific knowledge; on the other hand, it clearly identifies deficiencies in the literature, including the absence of models applicable to small open economies with limited scientific and production capacity. These deficiencies motivate the development of the dissertation's analytical methodology and define its internal logic: Chapter One provides the theoretical foundation, Chapter Two offers empirical and comparative validation under Bulgarian conditions, and Chapter Three develops an applied strategic model and a national roadmap for IITT as an instrument for accelerated and sustainable development.

CHAPTER II. BULGARIA IN THE INNOVATION ENVIRONMENT OF THE EU AND THE WORLD

Chapter Two of the dissertation constitutes the central empirical and comparative component of the research, through which the theoretical framework developed in Chapter One is confronted with the actual structural, institutional, and sectoral characteristics of the Bulgarian economy. The chapter performs a key analytical function: it assesses the extent to which Bulgaria possesses the necessary prerequisites for effective International Innovation and Technology Transfer (IITT) and identifies the specific constraints that account for the low efficiency of transfer processes. Through a systematically structured situational analysis, institutional assessment, and international benchmarking, Chapter Two provides the empirical basis for the verification of the research hypotheses and for the development of the strategic model presented in the subsequent chapter.

At the outset of the chapter, Bulgaria's position within the European Innovation Union is examined on the basis of key indicators derived from the European Innovation Scoreboard, the Digital Economy and Society Index (DESI), Eurostat, and data on participation in European research programmes. The Bulgarian economy consistently ranks among the group of *Emerging Innovators*, with levels of innovation performance reaching approximately 60 - 62% of the EU average. Research and development expenditure remains below 1% of GDP, patenting and scientific publication activity is limited, and participation in Horizon Europe, the EIC Accelerator, and other high-technology programmes remains significantly below that of countries with comparable economic characteristics. These empirical findings confirm the theoretical assumption formulated in Chapter One that the effectiveness of technology transfer is strongly dependent on the structural capacity and maturity of the national innovation system.

The subsequent analytical section focuses on the institutional environment, which plays a decisive role in shaping the economy's ability to absorb external technologies. Chapter Two compares Bulgaria's national innovation policies with the European strategic framework, including the European Research Area (ERA), the New European Innovation Agenda, the STEP framework, and the Smart Specialisation Strategy (RIS3). The analysis demonstrates that Bulgaria's institutional architecture is highly fragmented, characterized by overlapping competences across ministries and agencies, weak coordination between scientific organizations and industry, limited effectiveness of technology transfer infrastructures (such as technology parks, incubators, and transfer offices), and the absence of sustainable mechanisms for cross-border scientific cooperation. These findings substantiate the hypothesis that institutional barriers represent one of the most significant constraints on the effectiveness of IITT in Bulgaria.

At the sectoral level, the chapter analyzes the structural characteristics of the Bulgarian economy and their role in the integration of external innovations. Empirical data indicate the dominance of low-technology and medium-technology industries, both in terms of value added and exports, while high-technology sectors - such as ICT, biotechnology, new materials, automation, and green technologies—occupy a relatively limited share. This confirms the theoretical proposition formulated in Chapter One that technology transfer is most effective in the presence of industrial cores capable of reproducing, adapting, and further developing external technologies. By contrast, Bulgaria continues to operate under conditions of structural imbalance, which constrain the impact of external technological impulses.

A particularly important contribution of Chapter Two is the analysis of Bulgaria's positioning within global and European value chains. The results demonstrate that the country is predominantly integrated into low-margin manufacturing operations, while segments associated with high value added—such as design, research, engineering, and advanced manufacturing—remain insufficiently developed. This structural positioning differs substantially from the models discussed in Chapter One, according to which integration into global value chains represents one of the most effective channels for technological catch-up. The Bulgarian case confirms the dissertation's hypothesis that participation in international trade alone does not lead to sustainable International Innovation and Technology Transfer (IITT) in the absence of adequate economic and institutional capacity to replicate and internalize the transferred technologies.

In order to assess Bulgaria's position within the broader European transformation process, the chapter also includes a comparative analysis with selected Central and Eastern European countries, namely the Czech Republic, Slovakia, Poland, Hungary, Slovenia, Estonia, and Lithuania. The analysis shows that these countries have leveraged EU membership and European funding instruments to strengthen their industrial cores, whereas Bulgaria continues to register limited results and to maintain a heterogeneous and weakly coordinated innovation policy. This comparative perspective serves a dual purpose: it confirms the theoretical assumptions outlined in Chapter One regarding the decisive role of institutional and structural factors, and it substantiates the need for strategic restructuring, which is developed in Chapter Three.

Finally, Chapter Two systematizes the key constraints identified in the empirical analysis and formulates the logic underlying the necessary transition toward a strategic model of IITT. The main limitations include insufficient research capacity; weak interaction between science and industry; fragmented policy frameworks; a mismatch between RIS3 priorities and the actual industrial profile of the economy; low levels of integration into European innovation formats;

limited absorptive capacity at the firm level; and restricted participation in technology-intensive segments of global value chains. Taken together, these findings directly confirm the dissertation's hypotheses that IITT in Bulgaria is constrained by a combination of structural, institutional, and sectoral factors, which require comprehensive and systemic transformation.

In this way, Chapter Two fulfills its primary research function: it examines the theoretical expectations formulated in Chapter One, provides an empirical foundation for strategic modelling, and substantiates the need for an integrated national framework for International Innovation and Technology Transfer (IITT), which is developed in Chapter Three.

CHAPTER III. STRATEGIC APPROACHES TO IITT: MODELS, EFFECTS AND NATIONAL PERSPECTIVE

Chapter Three represents the final and applied–analytical stage in the overall logic of the dissertation, in which the theoretical concepts developed in Chapter One and the empirical results obtained in Chapter Two are transformed into a comprehensive strategic model for the management of International Innovation and Technology Transfer (IITT) in Bulgaria. While the first chapter formulates the conceptual and theoretical apparatus and the second evaluates the actual institutional, sectoral, and structural environment, the third chapter performs a synthesizing and applied interpretative role. It structures a governance framework aimed at describing and proposing a systemic mechanism for changing the way in which the Bulgarian economy absorbs, adapts, and reproduces external technologies.

At the beginning of the chapter, a multiplier impact model of IITT - the Ripple Effect Model (REM) - is developed, which illustrates how external technological impulses are translated into internal production, innovation, and institutional outcomes. The model integrates the theory of spillover effects, the concept of absorptive capacity, and the logic of innovation systems discussed in Chapter One, and contrasts them with the empirical constraints identified in Chapter Two. In doing so, it demonstrates that technology transfer in Bulgaria, in its current form, is limited not by a lack of external technological sources, but by a structural inability to transform them into sustainable results. The model thus serves as an analytical instrument for substantiating the need for structural, rather than purely instrumental, change.

On the basis of this model, a strategic roadmap for IITT is developed, structured in three phases - preparation, pilot implementation, and scaling. The roadmap constitutes one of the main contributions of the dissertation, as it proposes a comprehensive management sequence that brings together state institutions, research organizations, universities, industrial enterprises, international partners, and regional structures within a unified strategic architecture. Each phase includes clearly defined objectives, coordination mechanisms, requirements for institutional and scientific capacity, and performance measurement indicators. In this way, the third chapter not only formulates models but also operationalizes their implementation within the national context.

A key element of the chapter is the historical and international comparative analysis, which is included not as a retrospective description, but as a tool for validating the analytical model. Through an examination of the industrialization strategies of Japan and South Korea, two key phases of industrial development and technology transfer in the USSR (1928 - 1937 and 1966 - 1975), as well as contemporary policy approaches in the United States and the European Union, the analysis demonstrates how different institutional configurations generate different

dynamics of technology transfer mechanisms. The main conclusions of this analysis are threefold: first, successful IITT requires institutional coherence and strategic coordination; second, transfer mechanisms are effective only when supported by industrial cores capable of replicating and developing technologies; and third, historical models show that technology transfer represents a strategic dependency rather than an automatic outcome of economic openness. It is precisely these dependencies that underpin the proposed model and substantiate its applicability under Bulgarian conditions.

Chapter Three also plays a critical analytical role within the structure of the dissertation. It demonstrates how the empirical findings of Chapter Two - low absorptive capacity, fragmented institutional structures, and structural imbalances - are transformed into parameters of a strategic model that reflects the international theoretical assumptions outlined in Chapter One. In this sense, Chapter Three is not merely a concluding section, but a logical link between theoretical hypotheses and their empirical validation.

In its final part, the chapter formulates recommendations for the establishment of an integrated national framework for IITT. These recommendations are structured in accordance with the logic of the model and the roadmap, emphasizing the need to strengthen institutional coordination, develop cross-border scientific partnerships, define industrial priorities, modernize innovation infrastructure, adapt the regulatory framework, and establish a sustainable mechanism for monitoring and evaluating technology transfer processes. Through these recommendations, the contributions of the three chapters - theoretical, empirical, and strategic - are brought together, demonstrating that effective IITT can be transformed into a key instrument for accelerated economic growth and sustainable modernization of the Bulgarian economy.

Within the overall structure of the dissertation, Chapter Three fulfills the function of an applied scientific conclusion that translates theoretical models and empirical diagnosis into strategic management decisions. Its contribution is twofold: first, it confirms the hypotheses formulated in the study through the logic of the model and institutional analysis; second, it offers a practical and actionable framework that can be utilized by public institutions, research organizations, and industrial actors. It is through this dual role that the chapter builds upon the internal logic of the dissertation and substantiates the scientific and practical significance of the research.

CONCLUSION

The conclusion of the dissertation synthesizes the main analytical results and findings of the study devoted to International Innovation and Technology Transfer (IITT) as a strategic mechanism for the economic transformation of Bulgaria. The research examines IITT in the context of accelerated global technological change, growing geo-economic uncertainty, and increasingly restrictive conditions for cross-border technological exchange, which place small and open economies under pressure to pursue purposeful and institutionally managed development strategies.

The analysis conducted in the dissertation leads to the explicit conclusion that the global economy is entering a new stage characterized by a gradual departure from the classical model of globalization and a transition toward a fragmented geo-economic order. The rise of techno-nationalism, the strategic reconfiguration of global value chains, and the politicization of technological exchange fundamentally alter the conditions under which international innovation and technology transfer operates. In this new environment, IITT ceases to function as a universal and automatic channel of development and instead becomes a selective and strategically managed process, dependent on institutional capacity, public policy frameworks, and long-term economic positioning.

The dissertation argues that international innovation and technology transfer constitutes a central mechanism for technological catch-up and structural modernization, particularly for economies with limited domestic innovation capacity and fragmented institutional systems. It demonstrates that the effectiveness of IITT is not determined by the volume of technologies absorbed, but by the quality of the institutional environment, managerial capacity, and the ability to strategically plan, coordinate, and adapt transfer processes. Domestic research and development, while a necessary component, is insufficient on its own to generate accelerated technological convergence, which is why IITT has emerged as a structural function of national economic policy.

In response to the evolving geo-economic environment, a major contribution of the dissertation is the development of an original analytical framework - the Ripple Effect Model (REM). Through this model, international innovation and technology transfer is examined as a multi-layered and cross-sectoral process that generates primary, secondary, and tertiary effects on industrial renewal, human capital formation, research activity, institutional quality, and long-term economic sustainability. The model enables IITT to be conceptualized not as an incidental exchange between individual economic actors, but as a purposeful, sector-wide process with cumulative and long-term developmental effects.

On the basis of the Ripple Effect Model (REM), a national roadmap for the strategic management of International Innovation and Technology Transfer (IITT) for the period 2025–2040 has been developed. The roadmap structures transfer processes into successive phases of preparation, implementation, adaptation, and scaling. It introduces mechanisms for institutional coordination, monitoring, and policy adaptation, thereby transforming international technology transfer into an instrument of active public governance rather than a result of spontaneous market processes.

The study confirms the formulated research thesis that strategically managed international innovation and technology transfer constitutes a decisive instrument for the economic transformation of Bulgaria. The analytical results demonstrate that IITT can accelerate the transition toward an economy with higher added value, improve institutional performance, and strengthen national competitiveness, but only in the presence of coherent state policy, stable institutional structures, and a long-term strategic horizon.

Despite the increasing restrictions on global technology exchange, the dissertation substantiates that the development of national expertise and managerial capacity in the field of international innovation and technology transfer represents an independent source of added value. This form of capacity enables participation in global technological processes not only as a recipient of technologies, but also as a provider of managed transfer solutions, organizational models, and institutional know-how that can be capitalized in international markets.

In summary, the dissertation contributes both to the advancement of theoretical approaches to international innovation and technology transfer and to the practical design of strategic frameworks for national economic policy. The study offers analytically grounded instruments for the targeted management of IITT and establishes a sustainable foundation for future research and policy development aimed at the long-term technological modernization and economic sustainability of Bulgaria within a changing global economic order.

IV. REFERENCE FOR CONTRIBUTIONS TO THE DISSERTATION

The contributions of the dissertation are articulated in three main directions: theoretical–academic, empirical–analytical, and scientific–applied.

I. Scientific contributions

1. **A comprehensive theoretical-conceptual model as** a systemic economic function has been developed, interpreting transfer as a two-way process of adaptation and innovation upgrade with institutional, technological and human dimensions.
2. **The concept of ripple effect of IITT is substantiated**, revealing the expanding impact of transfer on economic complexity, institutional environment and sustainable development.
3. **Historical models of IITT, including different phases of industrial development, are systematized and theoretically summarized**, with particular emphasis on the role of institutional capacity.

II. Empirical and analytical contributions

4. **A comparative analysis of international and national IITT models has been carried out,** identifying key dependencies between institutional coordination, human capital, innovation infrastructure, and transfer efficiency.
5. **Structural constraints and unrealized opportunities in the Bulgarian economy** related to institutional architecture, regional innovation ecosystems, and participation in European technology networks have been identified.

III. Applied contributions

6. **An integrated conceptual and analytical framework for strategic management of IITT in Bulgaria has been developed,** combining a multiplier impact assessment model (REM), an institutional coordination logic and a strategic implementation roadmap.
7. **A management toolkit for the strategic and operational management of IITT has been proposed,** including mechanisms for capacity building, technology selection, adaptation, and protection.
8. **A model for Bulgaria's transformation from a passive recipient into an active participant and exporter of innovative solutions,** with long-term effects on competitiveness and sustainable economic growth, has been formulated.

V. LIST OF PUBLICATIONS RELATED TO THE DISSERTATION AND PARTICIPATION IN COMPETITIONS AND PROJECTS

1. Stoilov, S. (2020). *Strategic cooperation between science and business in the transfer of innovation and technology: a factor for sustainable development*. In: Economic Science, Education and the Real Economy: Development and Interactions in the Digital Age. Proceedings of the Jubilee International Scientific Conference Dedicated to the 100th Anniversary of the Founding of the University of Economics – Varna, Volume I. Varna: Science and Economics Publishing House, University of Economics – Varna, pp. 555–566. ISBN: 978-954-21-1020-0. **Available at link here**
2. Stoilov, S. S. (2020). *The potential of Bulgaria and the Western Balkans to serve as a global center for innovations and international technology transfer*. KNOWLEDGE – International Journal, Vol. 43, No. 1, pp. 81–88. Skopje: Institute of Knowledge Management. ISSN 2545-4439 (print), ISSN 1857-923X (online). Достъпно на link тук.
3. Stoilov, S. (2024). *Projected economic burdens for the private sector in the implementation of the green transition.* In: Economic Development and Policies: Realities and Prospects. National and European Challenges of the Transition to a Green Economy. Sofia: Publishing House of the Bulgarian Academy of Sciences "Prof. Marin Drinov", pp. 211–219. ISBN: 978-619-245-407-4. Available at link.
4. Bobeva, D., Nestorov, N., Pavlov, A., **Stoilov, S.** (2024). Evaluation of the economic impact of a country's accession to the Schengen Area – the case of Bulgaria. *Economic Thought*, 69(2), 139–163. Достъпно на link.
5. Stoilov, S. (2025). The multiplier effect of international technology transfer and diffusion of sustainable growth in the economy. In: *Investments in the Future – 2025*. Proceedings of the Fifteenth International Scientific Conference. Varna: Varna Scientific and Technical Unions, pp. 129–138. ISSN 1314-3719.

VI. DECLARATION OF ORIGINALITY

In connection with the procedure for acquiring the educational and scientific degree "Doctor" in the scientific specialty "International Economics", I declare that:

1. The results and contributions in the dissertation on "The International Transfer of New Technologies and Its Role in the Transition to Innovative and Sustainable Development of the Bulgarian Economy" are original and are not borrowed from research and publications in which the author has no participation.

2. The results that have been obtained, described and/or published by other authors are duly and thoroughly cited in the bibliography.

INTERNATIONAL INNOVATION AND TECHNOLOGY TRANSFER AND ITS ROLE IN THE TRANSITION TOWARD INNOVATIVE AND SUSTAINABLE DEVELOPMENT OF THE BULGARIAN ECONOMY

SIMEON STOILOV STOILOV

Abstract:
The dissertation is dedicated to the analysis and assessment of current trends in the contemporary evolution of the international innovation and technology transfer (IITT) and its role as a tool for sustainable and innovative economic development of Bulgaria. Based on the analysis of global trends of technological acceleration, geopolitical transformations and institutional challenges, the study substantiates the theoretical and methodological approaches to innovative development as a prerequisite for understanding the changes in technological transfer in the global economy in conditions of economic uncertainty. The research traces the principal theoretical concepts of technology transfer, including innovation diffusion, absorptive capacity, and the multiplier effects of transferred technologies on the economic and institutional environment. The second part examines Bulgaria's innovation ecosystem in comparison with that of the EU member states, emphasizing the strategic, institutional, and regulatory deficiencies that constrain national performance. In its final part, the dissertation develops an original analytical framework – the Ripple Effect Model (REM) – designed to assess the multidimensional impacts of IITT. It also presents a national roadmap for the strategic governance of technology transfer for the period 2025 – 2040, outlining specific policy measures to strengthen institutional coordination and integration into global innovation value chains. The dissertation concludes that IITT holds significant potential to accelerate Bulgaria's sustainable transition through improved governance, enhanced institutional synergy, and the adaptation of global technologies to national development priorities.