

Transfer of Knowledge and Technology: The Case of Albania

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ABSTRACT

A transfer of knowledge and technology is a process of dissemination of scientific research outcomes and technological advancements to the economy. This paper's purpose is to assess a current state of knowledge and technology transfer in the Albanian economy at a macroeconomic level. To achieve this goal, several objectives are outlined: the presentation of theories concerning the transfer of knowledge and technology and the state of this process in Albania during a transition period. To achieve the objectives, statistical data from the Institute of Statistics, the Ministry of Agriculture, and the like, were used. The data were analyzed while applying a method of descriptive statistical analysis. In 2023, the funds allocated by the Government for scientific research amounted to 0.08% of the GDP, but it was still low if compared to the Government's objective. So, it is concluded that the Government's vision is limited and does not fully consider an innovation potential in the strategic sectors. Thus, the Government must identify the most important sectors in which the improvements in technology and innovation can have an impact on the restructuralization of Albanian economy, create a complete and harmonious corpus of statistical data, increase the fund for scientific research, and improve a legal framework of this process.

Keywords: knowledge, technology, transfer, innovation agriculture

INTRODUCTION

Technology transfer is a process of transmission of scientific research results to the market and society. A transfer of technology is a complex process. Scientific research may achieve good results, but this is insufficient for a successful technology transfer. The process of technology transfer begins with the discovery of new technologies in research institutions and continues with the process of evaluation and

protection of these technologies. The next steps are marketing, possible license agreements, and the development of products based on technical inventions.

The process of transferring technology and information has a historical course. Thus, Adam Smith determined that the most important factors of economic development are land, labor,

and capital. Joseph Schumpeter is considered to be the founder when it comes to the recognition and of the role and impact of technology on the economic development. At the beginning of the 20th century, he identified the two other factors that influence the economic development—namely, technology and entrepreneurship. The author Robert Solow, a Nobel Prize laureate, published the growth theory in 1956–57. He emphasized that the investments in machinery cannot be a source of growth in a long term, because the only source of growth in a long term is technological change. His conclusions continue to be current and surprising. Also, at the beginning of the 21st century, the author Peter Drucker identified knowledge as the most important factor of economic development. He emphasized that knowledge is the input and output of an economic activity. This fact is also stressed by other authors, such as Dahlman and Aubert (2001). However, there are also authors who emphasize the problems and difficulties encountered in a process of knowledge and technology transfer. These authors are Love et al. (2001), Watson (2002), Denison et al. (2004), and the like.

The process of knowledge and technology transfer in Albania is mainly managed by the National Agency for Scientific Research and Innovation. The data show a low level of technology and information transfer process in Albania. Thus, in 2021, the funds for scientific research amounted to 0.03% of the GDP, these funds amounted to 0.05% of the GDP in 2022, while they amounted to 0.08%

in 2023. However, these figures are still low if compared to the Government's objective that these funds should amount to 1% of the GDP in 2030. The Albanian Government spent only €3.6 per capita on scientific research in 2022. This figure is seventy-two times lesser than the EU governments' average, for these governments spend €258 for scientific research from their public funds. Although the agricultural and agribusiness sector has a significant contribution to the GDP, a process of transferring knowledge and innovation in the agricultural sector is currently limited due to an insufficient funding and a lack of capacity. There is a small number of advisors (specifically, there is only one specialist per 1,700 farmers) who have a weak financial motivation. A budget for the extension services in Albania has been consistently limited. In 1995, the public budget for extension amounted to US\$ 0.8 million, of which 75% was allocated to the salaries. A budgetary dynamic concerning research, information, and consulting manifested a downward trend till 2015, while thereafter the dynamics was increasing. In the conditions of Albania, the spaces for the application of smart agriculture are more limited due to the profile of agricultural farms, as well as because of their limited sizes. *But, regardless of this, the experimentation with the new, smart agricultural technologies has begun, such as the use of the GPS, satellite images, agricultural landmapping, mapping, and the like.*

MATERIAL AND METHODS

In order to evaluate the process of technology and information transfer in Albania, secondary statistical data provided by the institutions

that deal this problem were used, specifically the data from the Institute of Statistics and the Ministry of Agriculture, as well as the data

from the papers which studied this process. The analysis was conducted applying a quantitative method. Data processing was carried out via descriptive statistical analysis such as graphs, tables, and summaries, as well as via inferential statistical techniques. Due to a fact that there was no complete corpus of data for this process, it was impossible to hypothesize and determine a relationship between the variables, so an econometric analysis could be performed. For this reason, the relevant institutions were tasked with the completion of data on knowledge and information-transfer process.

When the Government implements this recommendation, it will be possible to expand this study with the econometric methods, because, as it is known, a data analysis applying an econometric method is more in-depth than with a descriptive statistical-analysis method. Also, a theoretical analysis of the problem was conducted, with an aim to present and compare various theoretical perspectives.

RESULTS AND DISCUSSION

The Significance of Technology and Information-Transfer Process

Technology transfer is a process of transmission of results of scientific and technological research to the market and society. This transfer is a complex process. While scientific research may yield promising results, that alone is insufficient for a successful technology transfer. Many non-scientific and non-technological factors, along with various actors, play a crucial role therein. A technology-transfer process begins with a discovery of new technologies by research institutions and continues with the evaluation and protection of these technologies. Subsequent steps include marketing, licensing agreements, and product development based on technical inventions.

Financial returns from these products' development can then be reinvested in further research.

The most prominent institution for expertise in technology transfer is the Competence Center for Technology Transfer (CC TT), established by the European Commission in 2018. This institution provides guidance on the technology-transfer policies for the Member States and individual research institutions. The CC TT offers services in three related areas:

- technology-transfer capacity building
- technology-transfer financing
- innovation ecosystem design

History of Knowledge and Technology-Transfer Process

A process of knowledge and technology transfer has been developed within specific

economic and social contexts. Technological advancements in recent decades have

significantly transformed global exchange processes. However, this evolution has historical roots. Adam Smith, for example, identified land, labor, and capital as the primary factors of economic development. Later, in the early 20th century, Joseph Schumpeter added two other key factors: technology and entrepreneurship. Schumpeter is widely recognized for highlighting the role and impact of technology in economic progress. Nobel laureate Robert Solow further advanced this discussion in his growth theory, published between 1956–57. His conclusions, which remain influential today, stated that the investments in machinery alone cannot drive a long-term growth; rather, technological change is the key driver of a sustained economic expansion. In the early 21st century, Peter Drucker emphasized knowledge as the most crucial factor for economic development, asserting that knowledge serves as both the input and the output of an economic activity.

When it comes to a definition of knowledge-based economies, multiple descriptions have emerged:

- OECD (1996): “We define knowledge-based economies as economies that are based directly on the production, distribution, and use of knowledge and information.”
- UK Department of Trade and Industry

(1998): “A knowledge-driven economy is one in which the generation and utilization of knowledge plays a key role in wealth creation.”

- World Bank (1998): “For the country’s leading the global economy, knowledge has become more important than resources, emerging as the most significant factor in living standards. Today, economies that are more technologically advanced are increasingly oriented toward knowledge.”

On the other hand, literature also highlights the challenges and difficulties in knowledge and technology transfer. Love et al. (2001) noted that the adoption of new technological systems, while offering positive benefits, also faces resistance due to a reluctance to change. In this context, Watson (2002) emphasized that a cultural change requires strategic planning. Denison et al. (2004) further pointed out that culture is often shaped by a value system of the founder or owner (manager). This balance between a technological advancement and cultural adaptation highlights a complex dynamic in knowledge and technology transfer, underlining a need for a strategic foresight and consideration of both the innovation and organizational culture (Hoti, 2016).

Knowledge and Technology Transfer in Albania

The process of knowledge and technology transfer in Albania is primarily managed by the National Agency for Scientific Research and Innovation. Over the past thirty years, Albania’s main competitive advantage has

been its low labor costs, which have driven the economy. As a result, technology and innovation development have not been a central focus for institutions. However, with a recent rise in wages, many industries are now

facing challenges while struggling to remain competitive, and some are at risk of bankruptcy (European Commission 2022a). The data on a technology and information-transfer process in Albania show that the country is still at a low level of development in this area. The European Commission issued a report for 2021–21, which highlights Albania's efforts in the chapter entitled "Science and Scientific Research." While progress was made in 2021, the report points out that an interaction between business and scientific researchers in Albania remains weak. For instance, only 18% of companies in Albania invested in research and development during this period. Additionally, in 2021, the funds allocated for scientific research accounted for just 0.03% of the GDP, which is insufficient to strengthen a relationship between business and scientific research. The Government has been urged to take action to address this issue. By 2022, the funds for innovation and R&D will be increased slightly to 0.05% of the GDP (European Commission Report, 2021). In comparison, within the Western Balkans region, Serbia's figure of 0.97% leads in terms

of scientific research funding relative to the GDP, while Bosnia and Herzegovina and North Macedonia allocate 0.19 and 0.37% of the GDP, respectively (Monitor Journal 2023).

In Albania, the funds for scientific research in 2023 amounted to 0.08% of the GDP. However, this indicator remains low when compared to the Government's objective increase it to 1% of the GDP by 2030. To achieve this goal, the European Commission's report outlines the following tasks for Albania in relation to a scientific research, (European Commission 2022):

- increase investment in scientific research, in line with the Government's commitments and the new priorities of the European Research Area
- approve and finalize the Smart Specialization Strategy and the Scientific Research Act
- develop a unified set of reliable data and statistics for science and technology

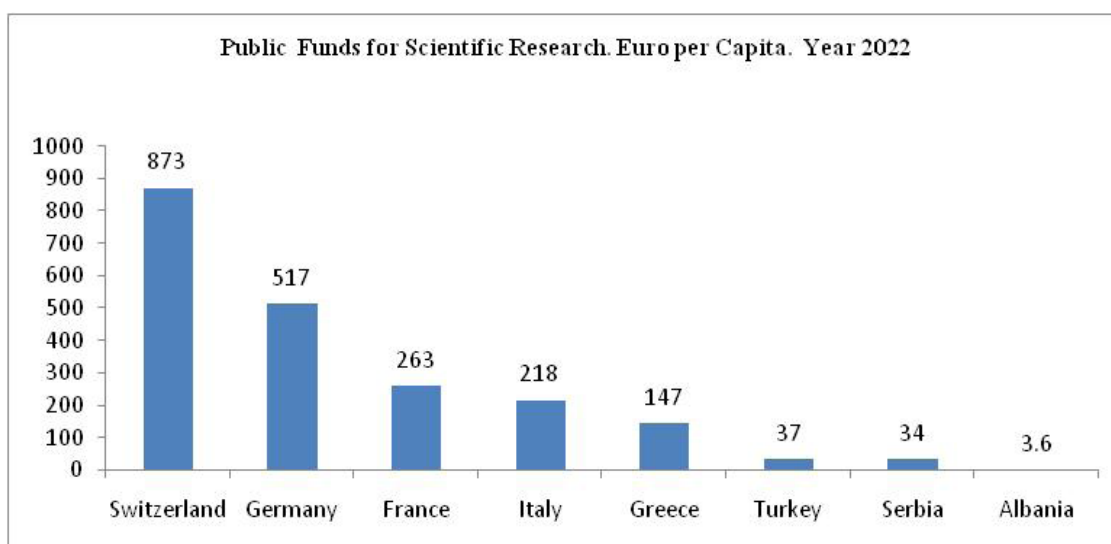


Figure 1. Public Funds for Scientific Research per Capita in 2022.

Source: National Strategy for Scientific Research: Technology and Innovation.2023-2030 (2023).

Some nongovernmental organizations in Albania have criticized a current process of technology and information transfer. For example, the organization Civic Attitude pointed out that the Albanian Government spent only €3.6 per capita on scientific research in 2022 (Kryeziu, 2024). This figure is seventy-two times lesser than the average spending of the EU governments, which allocate €258 per capita to scientific research from public funds. Civic Attitude calls on the Parliament, media, society, and businesses to work together to ensure that scientific research in Albania will not be controlled by politics, but that it will be instead driven by scientific researchers and for the benefit of the Albanian people. These data are presented in Figure 1.

The most significant document concerning the process of technology and information transfer in Albania is the Draft of the National Strategy for Scientific Research, Technology, and Innovation, 2023–2030, approved in 2023 (Albanian Government 2023). This document outlines a legal and institutional framework for knowledge and technology transfer, policy goals, and specific objectives for each goal, as well as Albania's performance in both national and international scientific research programs. The vision set forth in this document is as follows: "By 2030, Albania will provide quality scientific research for sustainable socio-economic development, aligned with international and European standards, based on new scientific knowledge, and the development of technology and innovation."

To achieve this vision, several key goals are defined:

Goal 1: Increasing the efficiency and sustainability of the system that supports scientific research in the fields of natural,

engineering, medical, agricultural, social, and human sciences.

Goal 2: Creating a supportive environment for the interaction and transfer of technologies, enabling collaboration between the research community, the economy, innovation sectors, and public institutions.

Goal 3: Promoting a culture of science and innovation in education, ensuring an academic approach that emphasizes research practices and projects.

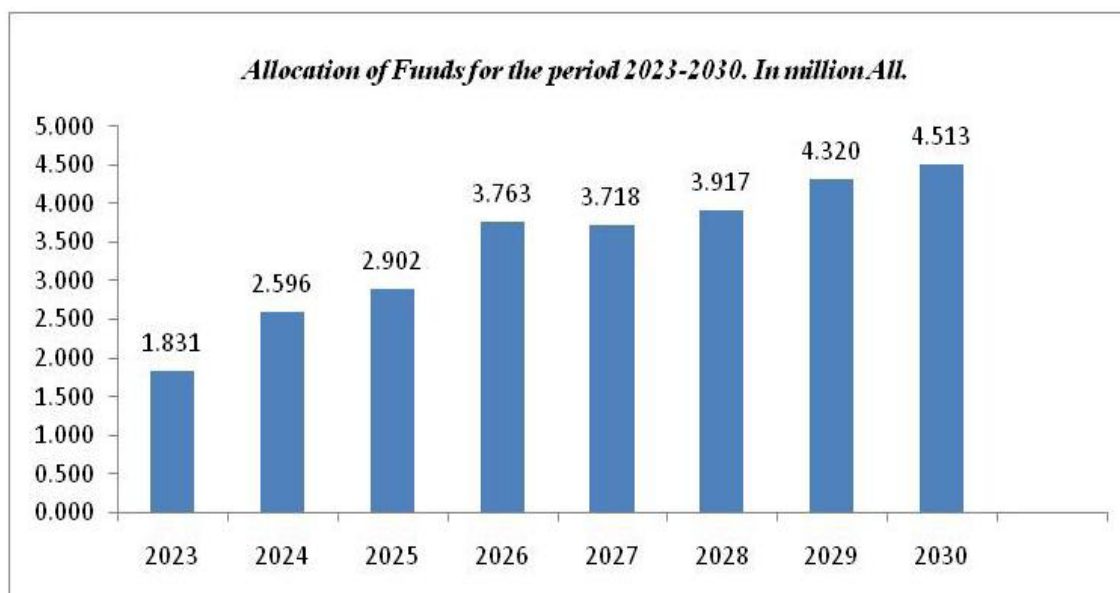


Figure 2. Allocation of Funds for the 2023–30 Period 2023-2030 (in millions)

Source: National Strategy for Scientific Research: Technology and Innovation 2023-2030 (2023).

The document outlines the funds that will be allocated for scientific research from 2023 to 2030. As shown in Figure 2, these funds are projected to follow an upward trend, with a goal of reaching 1% of the GDP in financing by the end of the period.

Knowledge and Technology Transfer Process in the Agriculture Sector

Although the agricultural and agribusiness sector significantly contribute to Albania's GDP, it is characterized by a predominance of small-sized farms with a low productivity.

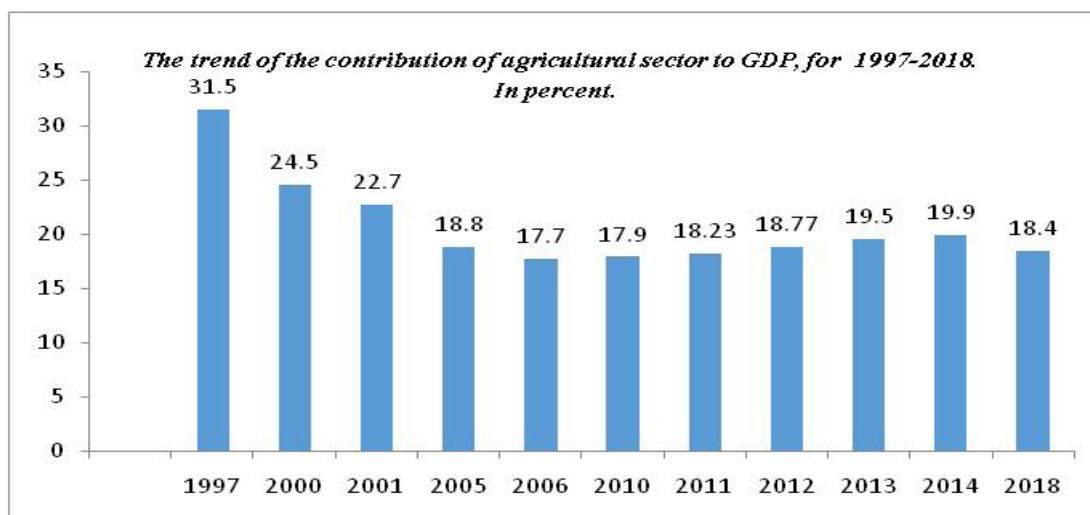


Figure 3. The trend of the contribution of agriculture to GDP from 1997-2018.

Source: Osmani, *Time to Learn from Mistakes and Failures* (2021).

Thus, the indicator of agricultural sector's contribution to the GDP presents a downward trend but not very significantly, since the contribution was almost stagnant from 2005 to 2018. So, the agricultural sector's contribution to the GDP is considerable (cf. Fig. 3).

Limited market knowledge, minimal management experience, and a lack of cooperation prevent the producers from increasing production levels and improving competitiveness. In this context, cooperation in agriculture offers a solution to strengthen the economic power of the small-sized Albanian farmers. It allows them to benefit from economies of scale and to enhance research capacities. Moreover, an increased cooperation enables a vertical integration of farmers within the agrifood chain, allowing them to consolidate the processes such as storage, processing, marketing, and sales of agricultural products. The transfer of agricultural technology and information plays a crucial role in increasing the level of cooperation within the sector. An

institutional framework for knowledge and innovation transfer in agriculture is structured as follows:

At the university level, agricultural education is provided by the Agricultural University of Tirana and the Faculty of Agriculture in Korça. The Agricultural University of Tirana is the only university specializing in undergraduate and postgraduate studies, research, training, and extension in agriculture and food processing. In relation to this problem, the agricultural expert Tatiana Dishnica points out that a Government's 2005 decision to close the scientific research institutes and transfer scientific research only to universities was hasty (2022). The National Agricultural Advisory Service, a part of the Ministry of Agriculture and Rural Development, provides information, advice, and training to the farmers. It operates through four extension agencies, organizationally based on a territorial division.

Centers for the Transfer of Agricultural Technologies are specialized in agricultural products and are responsible for conducting an applied research in various agricultural fields.

Agricultural policies related to technology and information transfer have evolved over the years. The first extension policy, drafted in 1995, offered free advisory services to the farmers. In 1996, the extension service became a part of the Research and Extension Directorate under the Ministry of Agriculture and Food. Two impact studies conducted in 1996 and 1999 showed that the extension services helped improve agricultural production and product quality. A new extension policy was drafted in 1998, proposing a mix of public and semi-private services, with a long-term goal of transitioning to a fully private service model, or to a “full cost recovery (Osmani, 2021).

In 2022, the Ministry of Agriculture and Rural Development introduced the Strategy for Agriculture, Rural Development, and Fisheries, 2021–2027 (Ministry of Agriculture and Rural Development 2020). The key focus of this document is implementing the European Commission’s directive to develop an Agricultural Knowledge and Innovation System (AKIS). This system encompasses all stakeholders and organizations (e.g., farmers, cooperatives, researchers, businesses,

NGOs, etc.) with a shared interest in applying knowledge and innovation in agriculture and related sectors. However, the development of Albania’s agricultural knowledge and innovation system faces challenges due to an insufficient funding and limited capacity. The number of agricultural advisors is low, and they lack financial incentives. These advisors operate independently, what reduces their effectiveness in disseminating the information about new technologies and limiting an efficient use of research funds in the sector. Services rendered to the remote mountain areas are particularly inadequate (Albania Investment Council 2021). In 1995, the public budget for extension services amounted US\$0.8 million, with 75% thereof being allocated to the salaries. After a downward trend until 2015, the research, information, and consulting budget has seen an upward trend. Despite these challenges, Albania has initiated the adoption of smart agricultural technologies. The agricultural expert Ilir Kapaj notes that the technologies such as environmental sensors, drones, GPS, and solar panels are being introduced in specific sectors, although the opportunities for a “smart” agriculture are limited due to the farm profiles and their sizes. For example, sensors are used in greenhouses and fruit-tree plantations, while solar panels are used by apple farmers in the Korça region (Economy, 2024).

CONCLUSION

Despite an increased focus on technology and innovation, the Government’s vision remains limited and does not fully account for the potential of innovation in strategic economic sectors. It is the Government’s responsibility to identify the most crucial sectors where improvements in technology and innovation can contribute to the restructuring

of the Albanian economy.

There is currently a lack of comprehensive and harmonized information, as well as of statistical data, on the development of technology and innovation and the main actors involved in this process. The European Commission has tasked the Albanian Government with establishing a

unified and complete system of statistical data to address this gap.

Although the Government's plans predict that investments in scientific research, technology, and innovation will reach 1% of the GDP, public incentives to encourage university involvement remain limited. Additionally, the Government's strategic documents for the 2023–30 period lack a clear outline of how this goal will be achieved.

A legal framework, though improved, still shows inconsistencies, and the Government must address them to create a more cohesive system. A weak connection between the universities and businesses is another critical issue, and efforts should be made to build stronger partnerships in a more coordinated

and structured manner.

The flaws in the advisory system also indicate that local social and economic factors were not adequately considered in the reform efforts, leading to the gaps in policy and legislation. The advisory service needs to be depoliticized and structured as an independent system, with all political parties contributing their technical expertise toward a common vision.

In light of these conclusions and recommendations, there is a need to re-examine the advisory-service model and introduce the new strategies and policies. These should aim to provide a stronger technical and financial support for the advisory services, as well as to enhance a connection between research and extension.

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Transfer znanja i tehnologije: slučaj Albanije

SAŽETAK

Transfer znanja i tehnologije je proces diseminacije rezultata znanstvenih istraživanja i tehnoloških dostignuća u gospodarstvu. Svrha ovog rada je procijeniti trenutno stanje prijenosa znanja i tehnologije u albanskom gospodarstvu s makroekonomskog aspekta. Kako bi se postigao ovaj cilj, istaknuta je prezentacija teorija o prijenosu znanja i tehnologije, kao i stanje ovog procesa u Albaniji tijekom tranzicijskog razdoblja. Za postizanje ciljeva korišteni su statistički podaci Zavoda za statistiku, Ministarstva poljoprivrede i dr. Podaci su obrađeni primjenom metode deskriptivne statističke analize. U 2023. godini sredstva koja je Vlada izdvajala za znanstvena istraživanja iznosila su 0,08% BDP-a, ali su još uvijek niska u odnosu na Vladin cilj. Dakle, zaključuje se da je Vladina vizija ograničena i ne razmatra u potpunosti inovacijski potencijal u strateškim sektorima. Stoga Vlada mora identificirati najvažnije sektore u kojima poboljšanja u tehnologiji i inovacijama mogu utjecati na restrukturiranje albanskog gospodarstva, stvoriti cjelovit i skladan korpus statističkih podataka, povećati fond za znanstvena istraživanja i poboljšati pravni okvir ovog procesa.

Ključne riječi: znanje, tehnologija, transfer, inovacijska poljoprivreda