FINANCIAL DEVELOPMENT AND INNOVATION IN THE CONTEXT OF A HUMAN-CENTERED GROWTH MODEL

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Abstract: *Currently, the world is witnessing the emergence of a human-centered model of economic development. The principles of human-oriented approach are applied in business management and in developing state development strategies, which makes it possible to use the growth potential of the economy to achieve the ultimate goals of society – improving the well-being and quality of life of the population. The central element of the human-centred development model is innovation and scientific and technical policy. It's the effective implementation depends on the financial conditions of development of the state and the effectiveness of mechanisms of financial stimulation of technological innovation. In this context, the purpose of the article is to study the impact of financial development on innovation and economic growth. The methods used in the study are analysis, synthesis, comparison, generalisation, econometric modelling.*
The paper discusses the essence of financial development and the functions that the financial sector performs in the economy. The main channels of influence of financial development on innovation and economic growth are described: channels of capital accumulation and investment, innovation and R&D, structural and technological changes and economic complexity. Based on international data for 2015 – 2021, the relationship between financial development, innovation and economic growth is investigated using econometric methods. A quantitative assessment of the impact of financial development on economic growth through the action of the main channels of the transmission mechanism is obtained. The existence of a close positive relationship between finance and innovation and growth is confirmed.

Keywords: *human-centered model, innovation, financial development, investment, structural and technological changes, economic complexity, economic growth.*

JEL Classification: *E44.*

INTRODUCTION

The increasing complexity of economic processes, the growing turbulence of economic dynamics, and global uncertainty pose new and complex challenges for economic policymakers. These include the need to reduce economic divergence between countries, solve environmental end social problems, reduce the risks of demographic development, and fully satisfy human needs and interests. These problems can be solved within the framework of a new paradigm of economic development, with humans at the center.

The concept of a human-centered economic model involves creating conditions for the full harmonious development of each person and solving the problems of specific people (issues of well-being, leisure, self-realization) (*Esposito, Roos, 2023*). The human-centered development paradigm focuses on creating conditions for the harmonious inclusive development of a person, saving and continuous reproduction of human capital, increasing well-being, maintaining the size and health of the population. It helps reduce the risks potentially associated with the fourth industrial revolution and the accelerated digital transformation of society and the economy.

The central element of the human-oriented development model is the innovation and scientific and technical policy. On the one hand, it creates conditions for the implementation of the creative and intellectual potential of people, the generation and dissemination of technological innovations in the

economy, which are the key driver of productivity growth. On the other hand, through the introduction of labor-saving technologies, including artificial intelligence systems, robotics, automation, digitalization, it helps to free up labor resources and move them to fast-growing high-income industries and advanced manufacturing sectors, creates demand for human capital, new skills and competencies in the economy, promotes progressive structural and technological transformations and the achievement of the ultimate goals of society - improving the well-being and quality of life of the population.

The effectiveness of scientific, technical and innovation policy is determined by the action of a wide range of factors. However, the key factor determining the possibilities of innovative and technological development of the state is the sufficiency and availability of financial resources in the economy, as well as the effectiveness of mechanisms for financial stimulation of scientific, technical and innovation activities. In this context, the purpose of the article is to study the impact of conditions of financial development conditions on innovation and growth, which will allow developing macro-financial policy measures from the point of view of their influence on the potential for economic development in long term.

THE RELATIONSHIP BETWEEN FINANCIAL DEVELOPMENT AND INNOVATION: MAIN CHANNELS

The development of the financial sector is a powerful factor in the development of the economy and the increase of its investment opportunities, stimulation of scientific and innovative potential and technological changes in the economy. A wide layer of scientific foreign and domestic economic literature is devoted to this problem. Financial development in the scientific literature is considered from different angles – usually from the standpoint of structural and functional transformations of the financial sector and financial innovations (*Levine, 2004*) or institutional changes in the economy (*Rajan, Zingales, 2001*). In the most general terms, financial development is considered as a multidimensional process, which is defined as a combination of a depth (size and liquidity of markets), access (ability of individuals and companies to access financial services), and efficiency (ability of institutions to provide financial services at low sustainable revenues, and the level of activity of capital markets) (Figure 1) (*Svirydzenka, 2016*).

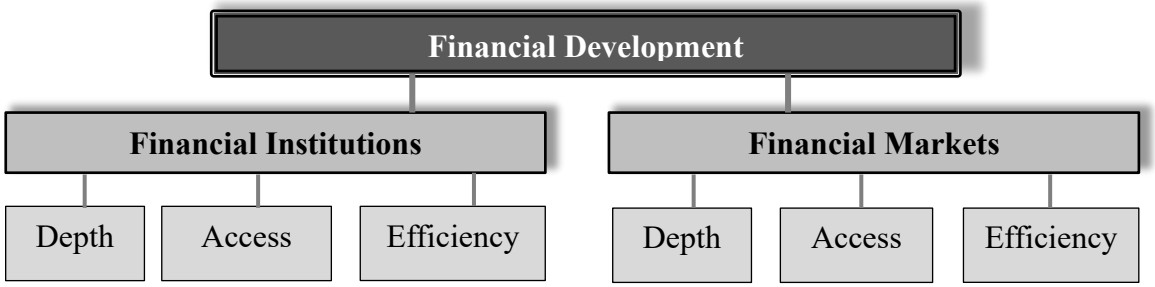

Figure 1. Components of financial development
Source: (Svirydzenka, 2016; IMF Database)

Modern economic research demonstrates the exceptional role of the financial sector in generating long-term investment resources and increasing aggregate productivity at the macro level, including as a result of the development of technological innovations.

Financial development, accompanied by an increase in the financial depth of the economy, an increase in its saturation with money and various financial instruments, contributes to (I) the accumulation of capital, which helps to soften financial constraints for innovation and investment; (II) allows for the accumulation of a significant volume of savings in economic sectors and, on this basis, increases the availability of capital for business entities; (III) helps to reduce information asymmetry and transaction costs, thereby stimulating innovative entrepreneurial activity; (IV) initiates the growth of investments, facilitates their distribution between industries and sectors of the

economy, which allows for an increase in financing of knowledge-intensive and technological industries; (V) due to the selection of highly profitable and innovative projects by banks and monitoring the effectiveness of their implementation, it helps to reduce and diversify possible investment risks. In addition, (VI) financial innovations, driven by the intensive development of the financial intermediation sector, expand the variety of financial instruments and contribute to the activation of innovative and technological activities dependent on access to long-term financial resources (*Levine, 2004; Krinichansky, Annenskaya, 2022*).

The analysis of the relationships between financial development, innovations and growth allowed us to identify the following main channels that mediate the system of their interactions. The main channel describing the impact of financial development on economic growth is the ***channel of capital accumulation and investment***, which directly affects GDP as a component of aggregate demand, which leads to an increase in business activity due to a) a decrease in the cost and an increase in the volume of debt financing, b) an increase in the efficiency of inter-sectoral allocation of capital and investment and c) the creation of conditions for the formation of venture financing institutions.

The second important channel is ***the channel of innovation and technology development***, the action of which is widely presented in the literature (Atsu, Adams, 2023; Law, Lee, Singh, 2018). In general, it is described as follows: financial development directly affects the possibilities of innovative and technological development by easing budget constraints and increasing the scale of financing for R&D, which, in turn, directly determines the dynamics of total factor productivity and long-term growth rates of the economy.

At the same time, financial development stimulates ***the development of the high-tech export-oriented sector*** (production of capital-intensive investment equipment), the production of which requires significant amounts of external financing; as well as ***the development of the entrepreneurship sector***, the emergence of new fast-growing companies that depend on the financial conditions of development, the volume of lending to the economy, etc.

In addition, financial development, which is accompanied by an increase in investment and technological innovation, triggers ***structural and technological changes*** in the economy that cause an ***increase in economic complexity***. Economic complexity reflects the ability of the economy to accumulate knowledge, know-how and reproduce them in the production and export of diverse and technologically complex goods, which helps to enhance the synergistic effects of the spread of technology and innovation in the economy, stimulating long-term rates of economic growth. These relationships are described through the channels of influence of financial development on economic growth (Figure 2).

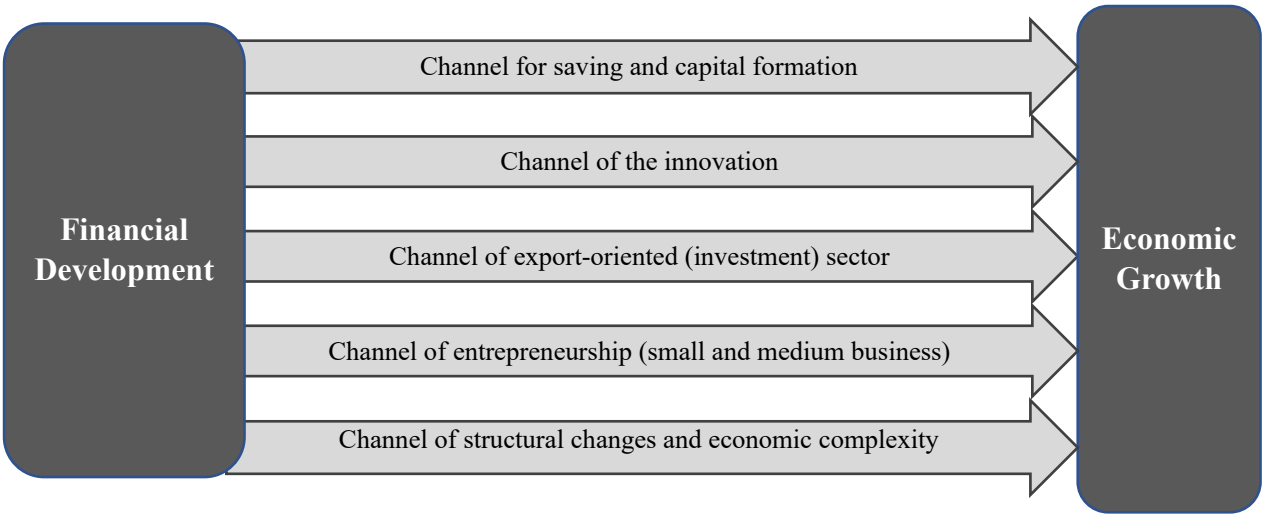

Figure 2. Channels of influence of financial development on economic growth
Source: own work

EVALUATION THE IMPACT OF FINANCIAL DEVELOPMENT ON INNOVATION AND ECONOMIC GROWTH

To identify the significance and reliability of the channels describing the impact of financial development on economic growth, we carried out a quantitative assessment of the relationships discussed above using econometric modeling methods. In particular, we tested the impact of financial development and parameters of the financial structure (markets and institutions) on the channel of capital accumulation and investment; the innovation channel, for which two variables were used – the Global Innovation Index and domestic expenditures R&D; the small and medium entrepreneurs channel, expressed through the number of new business registrations; the high-tech development channel, which is described through the share of high-tech exports in the total volume of manufacturing exports; the channel of structural and technological changes, represented by the Economic Complexity index; and the channel of total factor productivity, expressed through the impact of financial development on GDP.

The study used international data averaged for 2015 – 2021 for 115 developed and developing countries. The description and designation of the variables, as well as the source of information are given in Table 1.

Table 1. Variables used in modeling the relationship between financial development and economic growth

Variable	**Description**	Source
GDP	GDP per capita, constant 2015 dollars US	World Bank
FDI	Financial Development Index	IMF
KRED	Domestic credit to private sector, % of GDP	World Bank
KAP	Market capitalization of listed domestic companies, % of GDP	World Bank
GFCF	Gross capital formation per capita, constant 2015 dollars US	World Bank
GII	Global Innovation Index	World Intellectual Property Organization
RD	Research and development expenditure, % of GDP	World Bank
SME	New business density (new registrations per 1 000 peoples ages 15 – 64)	World Bank
EXP	High-technology export, % of manufactured export	World Bank
ECI	Economic Complexity Index	The Atlas of Economic Complexity of Harvard Growth Lab's

Source: own work

The two-step least squares method was used to estimate the models, which, as studies show, is relevant for assessing the dependencies between financial and economic development. The time series were pre-logarithmized, which allows us to interpret the results as elasticity coefficients. The estimation results are presented in Table 2.

Table 2. Results of estimation of models of the impact of financial development on economic growth

Variable	Characteristics and assessment of the models						
	ln GCFC	**ln GII**	**ln RD**	**ln EXP**	**ln SME**	**ln ECI**	**ln GDP**
ln FDI	1,689***	0,428***	1,436***	0,891***	1,337***	0,01***	1,756***
Std. Err	(0,128)	(0,03)	(0,136)	(0,156)	(0,166)	(0,001)	(0,104)
R^2	0,61	0,65	0,52	0,23	0,37	0,52	0,72
ln KRED	1,224***	0,329***	1,085***	0,71***	1,145***	0,008***	1,282***
Std. Err	(0,141)	(0,03)	(0,139)	(0,142)	(0,148)	(0,001)	(0,123)
R^2	0,41	0,52	0,38	0,184	0,36	0,414	0,49
ln KAP	0,388***	0,107***	0,301***	0,315**	0,261**	0,003***	0,39***
Std. Err	(0,101)	(0,023)	(0,078)	(0,101)	(0,108)	(0,000)	(0,092)
R^2	0,168	0,23	0,178	0,114	0,073	0,159	0,494

*Note: *** $p < 0,01$, ** $p < 0,05$, * $p < 0,1$*
Source: own work

The results of the assessment allow us to draw the following conclusions. The financial development index is an important and statistically significant variable that influences capital accumulation, innovation growth, SME and technology sector development, structural transformations and TFP. Financial development has the most significant impact on investment formation (elasticity coefficient is 1.689), domestic R&D expenditures (1.436), new enterprise "birth" processes (1.337) and economic growth (1.756). The impact of financial structure parameters, represented through the domestic private sector credit variable to describe the financial intermediary segment (banking system), as well as the securities market capitalization variable, which allows us to assess the degree of development of the market-oriented segment, was assessed separately. The study shows that the financial depth of the economy has a positive statistically significant impact on the operation of the main channels, primarily investments (1.224), innovations (1.085), entrepreneurship (1.145) and the export-oriented technology sector (0.71), but the degree of this impact is somewhat less than that of the financial development index.

The impact of the market-oriented segment on the parameters of innovation and economic development, despite the confirmed statistically positive relationship, is expectedly less significant compared to the influence of the banking sector. This is mainly due to the fact that stock markets are not a critically important condition for economic and innovative development: their role in the economy increases gradually, as the state develops economically and the quality of institutions improves.

CONCLUSIONS

Thus, financial development is an important factor in the formation and development of a human-centered growth model. Financial development affects economic growth through the savings and capital accumulation channel; the channel of innovations; the development channel of small and medium enterprises and the export-oriented sector producing investment equipment; the channel of structural transformations and economic complexity. To assess the significance and reliability of the channels, we built paired regressions on cross-country data for 2015–2021. The evaluation results showed that financial development has a statistically significant positive effect on innovation and economic growth. The most significant impact of financial development is noted on the channel of savings, research and development, and the small and medium entrepreneurship channel. These

findings allow us to reasonably develop economic policy measures aimed at stimulating innovation and economic growth.

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