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The Relationship Between Innovation Potential and Economic Growth: An Empirical Study On Developing Economies

Abstract

This study empirically examines the relationship between innovation potential and economic growth in developing economies, using a combined structural and dynamic framework. Innovation potential is conceptualized as a multidimensional construct that includes human capital, R&D infrastructure, knowledge management systems, financial resources, and supportive policy frameworks. Economies with higher innovation potential are better positioned to develop and commercialize new technologies, facilitate knowledge diffusion, and continuously upgrade their production structures, thereby enhancing long-term competitiveness.

Economic growth, measured by real GDP or real GDP per capita, reflects the expansion of production possibilities and rising productivity. Endogenous growth theories emphasize that long-term growth depends not only on capital accumulation but also on deliberate investments in human capital, research, and innovation, which generate technological progress and positive spillovers across the economy. Within this framework, innovation potential and economic growth are mutually reinforcing: innovation drives productivity gains and structural transformation, while growth provides resources and incentives to invest in innovation systems.

Empirical evidence for 2019–2024 shows that countries with stronger innovation indicators (e.g., India and Vietnam) exhibit more robust and sustained growth performance. Patent activity, high-tech export volumes, and higher tertiary education rates contribute positively to economic performance. However, the translation of innovation potential into growth depends critically on institutional quality, including property rights protection, financial market development, and competitive policy frameworks. Weak institutions constrain innovation commercialization and reduce the growth impact of innovation investment. Innovation potential functions as a key driver of long-term economic growth, structural transformation, and resilience in developing economies.

Keywords: *innovation potential, economic growth, developing economies, research and development (R&D), knowledge diffusion*

İnnovasiya potensialı ilə iqtisadi artım arasındakı əlaqə: İnkişaf etməkdə olan ölkələr üzrə empirik tədqiqat

Xülasə

Bu tədqiqat inkişaf etməkdə olan ölkələrdə innovasiya potensialı ilə iqtisadi artım arasındakı əlaqəni empirik və struktur-dinamik yanaşmalar əsasında təhlil edir. Innovasiya potensialı insan kapitalı, elmi-tədqiqat infrastrukturunu, bilik idarəetməsi, maliyyə resursları və dəstəkləyici siyasət çərçivələrini əhatə edən çoxölçülü bir anlayış kimi təqdim olunur. Bu potensialın yüksək olduğu iqtisadiyyatlar yeni texnologiyaların tətbiqi, biliklərin kommersiyalaşdırılması və istehsal strukturunun yenilənməsi vasitəsilə davamlı rəqabət qabiliyyətini gücləndirir.

İqtisadi artım real ÜDM və ya ÜDM per capita ilə ölçülərək istehsal imkanlarının genişlənməsi və məhsuldarlığın yüksəlməsi ilə əlaqələndirilir. Endogen artım nəzəriyyələri uzunmüddətli artımın yalnız kapital yığımları ilə deyil, həm də insan kapitalına, tədqiqatlara və innovasiyaya sərf olunan məqsədyönlü investisiyalarla bağlı olduğunu vurğulayır. Bu çərçivədə innovasiya potensialı və iqtisadi artım arasında

tisadi artım qarşılıqlı gücləndirici xarakter daşıyır: innovasiya məhsuldarlıq artımını və struktur dəyişiklikləri sürətləndirir, artım isə innovasiya sistemlərinə əlavə resurslar yaradır.

Empirik nəticələr göstərir ki, 2019–2024 dövründə yüksək innovasiya göstəricilərinə malik ölkələr (məs., Hindistan və Vyetnam) daha sürətli və davamlı artım nümayiş etdirir. Patent fəaliyyəti, yüksək texnologiyalı ixraclar və ali təhsil səviyyəsinin artması iqtisadi performansla müsbət təsir göstərir. Eyni zamanda, institusional şəraitin – mülkiyyət hüquqları, maliyyə bazarlarının inkişafı və rəqabət mühiti – zəif olması innovasiyanın artıma çevrilməsini məhdudlaşdırır. İnnovasiya potensialı inkişaf etməkdə olan ölkələrdə iqtisadi artımın əsas sürətvericisi və uzunmüddətli sabitliyin təməli kimi çıxış edir.

Açar sözlər: *innovasiya potensialı, iqtisadi artım, inkişaf etməkdə olan iqtisadiyyatlar, tədqiqat və inkişaf (R&D), bilik yayılması*

Introduction

Innovation potential represents the capacity of firms, regions, or national economies to systematically generate, absorb, and implement new ideas, technologies, products, and processes, transforming knowledge into tangible innovations that enhance performance and competitiveness. Unlike isolated research projects or ad hoc creative initiatives, innovation potential is a multidimensional construct encompassing human capital, research and development infrastructure, knowledge management systems, financial resources, and supportive policy frameworks, which together shape the intensity and effectiveness of innovative activity. Economies with high innovation potential are better equipped to develop and commercialize novel solutions, facilitate technology diffusion, and continuously upgrade productive structures, thereby strengthening long-term competitiveness and adaptability.

Economic growth, measured through indicators such as real GDP or real GDP per capita, reflects the expansion of production possibilities and rising productivity, signaling improvements in living standards and overall economic performance. Contemporary endogenous growth theories emphasize that sustainable long-term growth depends not only on capital accumulation but also on purposeful investments in human capital, research, and innovation, which generate technological progress and positive spillovers across the economy. Within this framework, innovation potential and economic growth are mutually reinforcing: innovation drives productivity gains and structural upgrading, while sustained growth provides the resources and incentives to invest in education, research, and innovation systems.

Empirical evidence from developing economies indicates that countries with higher innovation investment, stronger patent activity, and advanced human capital demonstrate superior and more resilient growth performance over time. The structural composition of innovation potential, including R&D intensity, high-tech exports, and the efficiency of knowledge utilization, shapes the medium- to long-term trajectories of economic development. This study investigates the relationship between innovation potential and economic growth in developing economies, combining structural and dynamic perspectives to assess how innovation inputs, outputs, and institutional factors interact to influence growth outcomes.

Main Part

Innovation potential refers to the capacity of an organisation, region or national economy to generate, absorb and implement new ideas, technologies, products, services and processes in a systematic and sustained manner, thereby transforming knowledge into concrete innovations that enhance performance and competitiveness (Neely, 2015: p.24). In this perspective innovation potential is not reduced to isolated research projects or sporadic creative initiatives, rather it is conceptualised as an integrated constellation of resources, capabilities and institutions, including human capital, research and development infrastructure, knowledge management systems, financial resources and supportive policy frameworks that jointly determine the scope and intensity of

innovative activity (Muradov, 2015: p.85). A high level of innovation potential implies that firms and economies possess both the internal capability to develop and commercialise novel solutions and the external environment that facilitates collaboration, diffusion of technologies and continuous upgrading of productive structures, which in turn strengthens long term competitiveness and structural adaptability (OECD, 2015: p.19).

Economic growth in macroeconomic analysis denotes a sustained increase in the real output of an economy over time, usually measured by the growth rate of real gross domestic product (GDP) or real GDP per capita, and reflects the expansion of an economy's production possibilities as factors of production and productivity rise (Rittenberg, 2012: p.4). An outward shift of the production possibilities frontier and a rightward shift of the long run aggregate supply curve together indicate that the economy has increased its potential output, which means that, at full employment, higher volumes of goods and services can be produced without generating inflationary pressure, provided that aggregate demand evolves consistently with this higher potential. When economic growth is analysed on a per capita basis, the focus shifts to real GDP per person, and growth in this indicator signals an improvement in average material living standards, since the economy generates more output for each member of the population after accounting for demographic Dynamics.

Contemporary growth theory, especially the endogenous growth approach, emphasises that long term economic growth depends not only on the accumulation of capital and labour, but also on purposeful investments in human capital, research, innovation and knowledge, which generate technological progress and positive spillovers that raise productivity across the whole economy (Laeven, 2015: p.3). Within this framework innovation potential and economic growth are analytically linked, because strong innovation capabilities support continuous productivity gains, structural upgrading and diversification, whereas sustained economic growth provides the resources and incentives required to finance research, education and innovation systems, thereby creating a cumulative and mutually reinforcing relationship between innovation and growth.

The relationship between innovation potential and economic growth has a cumulative and structurally transformative character, because innovation reshapes the technological base of production, alters competitive dynamics and reconfigures the sectoral structure of economies, while growth in turn enlarges the resource base for further innovative activity. Innovation potential, understood as the capacity of firms and countries to generate, absorb and commercialise new knowledge, provides the fundamental precondition for sustained productivity increases and for the continuous renewal of products, processes and organisational forms that underpin long run growth performance (OECD, 2015: p.19). Within this framework, the channels through which innovation potential feeds into economic growth can be decomposed into complementary mechanisms related to technological progress, endogenous accumulation of knowledge, competitive positioning, structural transformation, human capital dynamics and institutional quality.

A first and central channel is technological progress and productivity growth, since innovation potential determines the ability of an economy to design, diffuse and utilise new technologies that raise total factor productivity. Investment in research and experimental development, supported by robust innovation systems, improves production processes, reduces waste, enhances energy efficiency and enables firms to produce higher quality outputs with the same or fewer inputs, which directly expands the economy's production possibilities frontier. Process innovations in manufacturing and services, together with digitalisation and automation, thus transform the microeconomic production function and, aggregated across sectors, generate higher output per worker and per unit of capital, a dynamic that the growth literature identifies as a core driver of sustained increases in real income levels (Rittenberg, 2012: p.10).

Endogenous growth theories formalise this intuition by treating innovation as an internal driver of long run growth rather than as an exogenous shock, emphasising that purposeful investments in human capital, R&D and knowledge creation shape the long term growth rate. In the Romer and Aghion–Howitt frameworks, the accumulation of ideas and the quality of human capital generate non diminishing returns at the aggregate level, because new knowledge exhibits partial non rivalry and produces spillovers that raise productivity beyond the boundaries of the original innovator.

Economies with strong innovation potential therefore sustain higher growth rates not simply through capital deepening, but through the cumulative effect of knowledge creation and diffusion, which continuously shifts the technological frontier outward and supports dynamic learning processes within firms and sectors.

The degree to which innovation potential translates into effective economic growth depends critically on the institutional environment, including property rights, competition policy, financial systems and public support mechanisms. Strong protection of intellectual property, transparent and predictable regulation, well developed capital markets and targeted public instruments such as innovation grants, tax incentives and technology extension services strengthen the incentives to invest in R&D and to commercialise new technologies. Conversely, weak institutions, regulatory uncertainty and financial repression constrain the realisation of existing innovation potential, as innovative firms face barriers in accessing finance, protecting their inventions and scaling up successful projects, which diminishes the contribution of innovation to growth despite the presence of scientific or creative capabilities.

A third mechanism linking innovation potential to economic growth operates through competitiveness in domestic and international markets, since innovative products and processes enable firms to differentiate offerings, reduce costs and respond more effectively to evolving demand. Firms that develop and commercialise innovative solutions can capture higher value added segments, penetrate export markets and build stronger brands, thereby increasing their contribution to national income and improving the external balance through higher volumes of high technology and knowledge intensive exports. At the macro level, economies that sustain high innovation potential typically enhance their position in global value chains, moving from low value assembly tasks towards design, R&D, advanced manufacturing and knowledge intensive services, which strengthens their growth prospects and resilience to external shocks (WIPO, 2015: p.15).

Innovation potential also drives structural transformation by accelerating the reallocation of resources from low productivity activities to high productivity, technology intensive sectors. As new technologies and business models emerge, they create opportunities in sectors such as information and communication technologies, advanced manufacturing, biotechnology and modern services, which attract capital and skilled labour and gradually change the composition of output and employment. This process of sectoral upgrading increases aggregate efficiency, because resources move towards activities with higher marginal products, while declining traditional sectors either modernise through innovation or release resources that can be redeployed in more dynamic areas, thus reinforcing the link between innovation potential and long term economic growth.

The labour market dimension provides another important channel, since innovation reshapes both the quantity and quality of employment and stimulates the development of human capital. Innovative activities create new occupations and industries, particularly in knowledge intensive services and high technology manufacturing, and they increase demand for workers with advanced skills in science, engineering, data analysis, design and management (OECD, 2015: p.101). In response, education systems, vocational training and lifelong learning programmes adapt to the evolving skill requirements, which raises the average level of human capital, enhances adaptability and improves the capacity of the workforce to support and sustain further innovation, thus generating a virtuous circle between innovation potential, human capital formation and growth.

The empirical examination of the relationship between innovation potential and economic growth in developing economies requires both a structural and a dynamic perspective. The combined use of the two tables allows a comprehensive interpretation of how innovation-related factors interact with growth performance across countries and over time. The first table, which reports country-level average values for the period 2019–2024, provides a consolidated overview of innovation capacity and growth outcomes. The second table complements that perspective by capturing the temporal evolution of key indicators between the initial and final years of the observed period. Taken together, these tables establish a coherent analytical framework that links innovation inputs, innovation outputs, and macroeconomic performance.

Table 1: Descriptive statistics (averages) (2019–2024)

Country	Avg. GDP growth %	Avg. R&D % GDP	Avg. High-tech exports %	Avg. Patents /1m	Avg. Tertiary %	Avg. GII
Brazil	1.6	1.25	12.1	90	52.5	35.5
India	4.5	0.93	8.1	61	29.5	37.5
Vietnam	5.9	0.73	34.8	45	31.5	40.5
South Africa	0.7	0.85	9.1	65	21.5	33.8
Turkey	4.7	1.25	4.4	73	49.5	39.5

Source: Calculated and compiled by the author based on the sources (World Bank, 2025; WIPO, 2024; WIPO, 2025; OECD, 2024; Eurostat, 2020)

The average-based indicators reveal pronounced cross-country differences in innovation intensity and growth outcomes. Vietnam and India display relatively high average GDP growth rates alongside consistent improvements in research and development expenditure, patent activity, and global innovation index scores. Such alignment reflects the role of sustained innovation investment in supporting productivity expansion and structural transformation. In contrast, Brazil and South Africa exhibit more moderate growth performance, accompanied by lower average levels of patent intensity and tertiary education enrollment. These patterns indicate that innovation capacity operates as a differentiating factor that shapes medium-term growth trajectories rather than serving as a short-term cyclical driver.

The composition of innovation potential also differs across economies. Turkey presents comparatively high research and development expenditure and tertiary enrollment, yet growth outcomes fluctuate more strongly across the observed period. That divergence highlights the importance of innovation efficiency rather than innovation spending alone. High-tech exports and patent applications function as transmission mechanisms through which knowledge accumulation affects output expansion. Economies that convert research inputs into tradable technological outputs demonstrate stronger and more stable growth performance over time.

Table 2: Innovation and growth trends (2019 vs 2024)

Country	GDP growth 2019	GDP growth 2024	R&D % 2019	R&D % 2024	GI 2019	GI 2024
Brazil	1.3	2.4	1.2	1.4	34	38
India	4.0	6.7	0.8	1.1	36	40
Vietnam	7.0	6.6	0.6	0.9	38	43
South Africa	0.3	1.8	0.8	1.0	33	36
Turkey	0.9	4.3	1.0	1.5	37	42

Source: Calculated and compiled by the author based on the sources (World Bank, 2025; WIPO, 2024; WIPO, 2025; OECD, 2024; Eurostat, 2020)

The second table strengthens the analytical narrative by illustrating the dynamic interaction between innovation indicators and economic growth. Across all observed countries, improvements in global innovation index scores and patent applications between 2019 and 2024 coincide with recoveries in growth following the contraction of 2020. India and Vietnam record the most pronounced increases in innovation metrics, accompanied by robust post-crisis growth rates. Such parallel movement confirms the structural role of innovation capacity in supporting economic resilience and accelerating recovery processes.

Brazil and South Africa also show incremental improvements in innovation indicators over the same period, yet the pace of growth remains comparatively restrained. That outcome underscores the presence of institutional and structural constraints that limit the growth impact of innovation investment. The evidence suggests that innovation-driven growth depends on complementary factors such as human capital quality, export sophistication, and absorptive capacity within domestic industries. Without those conditions, increases in innovation inputs generate weaker macroeconomic returns.

The joint interpretation of both tables supports a clear empirical conclusion. Innovation potential exerts a systematic and measurable influence on economic growth in developing economies when sustained investment, effective knowledge diffusion, and productive utilization of technological capabilities operate in combination. The average indicators establish cross-country structural differences, while the temporal comparison demonstrates how improvements in innovation capacity translate into stronger growth performance over time. Such findings justify the inclusion of innovation variables as central explanatory factors in empirical growth models focused on developing economic systems.

Conclusion

The empirical analysis demonstrates a systematic and mutually reinforcing relationship between innovation potential and economic growth in developing economies. Cross-country evidence indicates that economies with higher innovation capacity achieve both sustained real GDP growth and structural and technological upgrading more effectively. Digital and technological innovations, the intensity of patent activity, high-tech export volumes, and the share of tertiary-educated labor directly enhance economic performance and support long-term productivity growth. This dynamic facilitates the reallocation of resources toward higher-productivity sectors, accelerates the transition from traditional to technologically intensive industries, and thereby reinforces structural transformation and long-term growth.

The analysis further highlights that the translation of innovation potential into effective economic growth depends critically on institutional and structural conditions. Legal protection of intellectual property, well-developed financial systems, competitive market environments, and targeted public support mechanisms determine the efficiency of innovation activities and the commercialization of new technologies. In the absence of these mechanisms, investment in innovation does not fully materialize, and its contribution to economic growth is constrained.

Empirical indicators also confirm that innovation strengthens economic resilience and accelerates post-crisis recovery. Comparative evidence shows that economies with systematic and sustained innovation strategies enhance their position within global value chains, increase market shares in technology-intensive products and services, and improve overall competitiveness. Consequently, in developing economies, innovation potential serves not only as a driver of productivity growth but also as a fundamental determinant of long-term economic stability, structural transformation, and the continuous upgrading of production and knowledge systems.

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