# The nexus between domestic investment and economic growth in MENA countries; Do Patents matter?

Ben Yedder, Nadia and El Weriemmi, Malek and Bakari, Sayef

Graduate College of Commerce of Tunis (ESCT). University of Manouba Tunisia., Research Unit "Enterprise Economy Environment", Higher Institute of management, University of Gabes, Tunisia., LIEI, Faculty of Economic Sciences and Management of Tunis, University of Tunis El Manar, Tunisia., Faculty of Legal, Economic and Management Sciences of Jendouba, University of Jendouba, Tunisia.

2023

# The nexus between domestic investment and economic growth in MENA countries; Do Patents matter?

**Nadia Ben Yedder**

Graduate College of Commerce of Tunis (ESCT). University of Manouba Tunisia.

Email: Ben.yedder.nadia.90@gmail.com

**Malek El Weriemmi**

Research Unit "Enterprise Economy Environment"

Higher Institute of management, University of Gabes, Tunisia.

Email: Malek.el-weriemmi@laposte.net

**Sayef Bakari**

LIEI, Faculty of Economic Sciences and Management of Tunis, University of Tunis El Manar, Tunisia.

Faculty of Legal, Economic and Management Sciences of Jendouba, University of Jendouba, Tunisia.

Email: bakari.sayef@yahoo.fr

**Abstract**

In this paper, we try to search the effect of patents on the relationship between domestic investment and economic growth. Data for MENA countries over the period 1998 – 2022 are applied for panel data analysis. Empirical analysis validates that domestic investment impact positively on economic growth. However, patents don't have any incidence on economic growth. Also, the outcome of domestic investment on economic growth attests to be not influenced by Patent.

**Keywords:** Domestic Investment, Economic Growth, Patents, MENA Countries, Panel Data Analysis

**JEL Classification:** O31; O32; O38; O47; O50

## 1. Introduction

Domestic investments play a crucial role in the economic growth of a country. They help stimulate demand create jobs increase productivity and foster innovation. In fact, domestic investments have a multiplier effect on the economy as they increase the demand for goods and services. When companies invest in new facilities, equipment and technologies, this creates employment opportunities and stimulates consumption, which encourages other companies to invest in turn. In addition, domestic investments allow companies to improve their efficiency and productivity through the adoption of new technologies, the modernization of equipment and the improvement of infrastructure. This leads to more efficient use of resources, increased output per worker and increased competitiveness in international markets. Otherwise, domestic investments contribute to improving public infrastructure such as roads, bridges, ports and telecommunications networks. Quality infrastructure promotes trade facilitates travel and stimulates foreign investment, which has a positive impact on economic growth. In fact, several recent empirical works have shown that domestic investments have favorable effects on the improvement of economic growth. Among these studies, we can cite Adams (2009), Tang et al (2008), Choe (2003), Ghazali (2010), Mohamed et al (2013), Ilegbinosa et al (2015), Ullah et al (2014), Miao et al (2021), Emmanuel and Kehinde (2018), Lautier and Moreaub (2012), Bayar (2014), Ndikumana and Verick (2008), Güngör and Ringim (2017), Al-Sadig (2013), Tran and Hoang (2019), Abu and Karim (2016), Tawiri (2010), Younsi et al (2021), Chakraborty and Mukherjee (2012)Bakari (2022a), Bakari et al (2020a), Bakari and Mabrouki (2017), Bakari and Tiba (2022), Bakari (2017a), Bakari (2021a), Bakari et al (2021b), Bakari et al (2022a), Bakari and Tiba (2019) and Bakari (2021b).

Patents protect technological inventions and encourage them to be developed and commercialized. They offer inventors a period of exclusivity to exploit their inventions, which encourages them to invest in the research and development of new technologies. This fosters innovation and stimulates creativity within the economy. Additionally, patents provide legal protection to inventors by allowing them to exclude others from using the manufacture or sale of their invention for a specified period. This gives inventors a competitive edge and encourages them to invest in their idea. Investors are also more inclined to finance projects that are protected by patents as this gives them legal certainty and the possibility of making long-term profits. Otherwise, patents also protect the intellectual property rights of inventors by preventing other economic actors from commercializing or using their inventions without their consent. This promotes fair competition by avoiding product plagiarism or counterfeiting. Companies are

encouraged to develop unique innovations and constantly improve their products to remain competitive in the market. Similarly, innovation and the economic valuation of patents stimulate economic growth by promoting job creation. When a company develops an innovative technology, it can create new markets and new jobs to support the production, marketing and management of this technology. Patents also facilitate technology transfer between companies which can foster increased collaboration and the development of commercial partnerships which has a positive impact on the economy. Moreover, countries that place importance on invention patents become more attractive for foreign investment. International companies, especially technology-focused ones, are attracted by strong intellectual property regulatory regimes that ensure the protection of their innovations. This encourages foreign direct investment and facilitates the transfer of knowledge and technology between countries which promotes global economic growth. In fact, several recent empirical works have shown that patents have favorable effects on improving economic growth. Among these studies, we can cite Thompson and Rushing (1999), Iwaisako and Futagami (2013), Blind et al (2022), Ferreira et al (2020), Alexiou et al (2016), Mabrouki (2017), Mabrouki (2022), Bulus and Bakirtas (2021), Bilbao-Osorio and Rodríguez-Pose (2004), Hasan and Tucci (2010), Mabrouki (2018a), Mabrouki (2018b), Lin et al (2021), Mabrouki (2019), Saito (2017), Dereli (2019), Ben Youssef (2020), Pece et al (2015), Bakari (2022b) and Bakari (2019a).

In the other direction, the interaction between domestic investments and patents can play an important role in the economic growth of a country. First, domestic investments in research and development (R&D) can foster the creation of new inventions and technological discoveries. These inventions can be patented to protect intellectual property rights and encourage companies to invest more in innovation. In addition, invention patents grant temporary exclusivity to inventors to exploit their innovation. This can encourage competition between companies as they seek to develop new technologies to compete in the market. Healthy competition can drive productivity, efficiency and innovation which contributes to economic growth. Similarly, invention patents can also play a role in attracting foreign investment. Foreign companies may be attracted by the advantages of intellectual property and the possibilities of marketing their inventions. Foreign direct investment can bring in additional capital, technology and knowledge which can stimulate economic growth. Also, when invention patents expire the technical knowledge, they contain may become publicly available. This allows for dissemination of knowledge and wider use of inventions. Businesses and individuals can then leverage this knowledge to develop new product or service ideas that contribute to

economic growth. On the other hand, invention patents provide legal protection against unauthorized use or appropriation by other market players. This can reassure investors and encourage them to invest more in long-term research and innovation projects. This increased protection can improve the stability and security of investments thereby promoting economic growth.

In MENA countries the situation of domestic investments and patents can vary from one country to another. However, there are some common trends that can be observed in the region. In many MENA countries domestic investment has traditionally been limited due to factors such as low investor confidence restrictive regulations corruption and political uncertainty. However, in recent years many countries have undertaken reforms to stimulate domestic investment. Measures have been taken to improve the business climate facilitate administrative procedures reduce regulatory obstacles and encourage entrepreneurship. Some economies in the region such as the United Arab Emirates and Saudi Arabia have seen significant growth in domestic investment, particularly in sectors such as technology, renewable energy and real estate. The situation of invention patents also varies from country to country in the MENA region. In some countries the systems for the protection of intellectual property rights and the registration of patents are well developed and offer solid protection to inventors. These countries have well-established patent offices and a culture of innovation supported by supportive government policies. The United Arab Emirates, Israel and Turkey are examples of countries in the region that have established strong patent systems. However, in other countries in the region, patent systems are less developed, which can limit the protection of intellectual property rights and discourage innovation. Some countries also have challenges in enforcing intellectual property rights which can deter potential inventors from filing patents. Overall, there is a growing awareness in the MENA region of the importance of domestic investment and innovation to drive economic growth. Governments and economic actors increasingly recognize the importance of creating an environment conducive to investment, the protection of intellectual property rights and the promotion of innovation in order to foster economic growth and the diversification of the economies of the region.

Examining the impact of domestic investments and patents on economic growth in MENA (Middle East and North Africa) countries is of great importance due to several key factors. First of all, domestic investments are considered as an essential driver of economic growth in the MENA region. Domestic investment generates jobs stimulates domestic demand promotes innovation and improves the skills of the labor force. In MENA countries where unemployment

is often high, domestic investment can create employment opportunities, reduce import dependency, and promote economic diversification. Moreover, invention patents are a key indicator of technological innovation and can play a significant role in economic growth. Patents protect intellectual property rights and encourage companies to invest in research and development. Technological innovation can improve productivity boost competitiveness and allow companies to differentiate themselves in the global market. In the context of MENA countries where innovation is often seen as a challenge, the promotion and protection of patents can encourage the creation of technological enterprises, the transfer of technology and the adoption of advanced technologies. In addition, examining the impact of domestic investment and patents in MENA countries is important to attract foreign investment. Foreign investors generally seek stable economic environments that are predictable and conducive to innovation. An increase in domestic investments and invention patents can signal a favorable business climate, an ability to absorb new technologies and an openness to collaboration with foreign partners.

In this work, we search if the interlinkage terms for domestic investment and patents contribute to economic growth. This paper checks the idea that the impact of domestic investment on economic growth is influenced by patents. parallelly, we check the idea that the impact of patents on economic growth is influenced by domestic investment. We execute cross-country panel data analysis using World Development Indicator (WDI) data. In Section 2, we format a growth equation and empirical methodology. Section 3 covers empirical results. Section 5 conclude our work.

## 2. Empirical methodology

As we mentioned that the objective of this work is to examine the role of invention patents in the impact of domestic investments on economic growth in the case of MENA countries. In another way, we will examine the impact of the interaction between domestic investments and patents on economic growth in the case of MENA countries. In fact, our database covers 18 countries and a period from 1998 to 2022. Table 1 presents the variables and their abbreviations that will be used in our estimation. We set up a GDP-growth equation as in Romer (1990), Barro (2003), Rahman and Mamun (2016), Ozturk and Al-Mulali (2015), Fosu (1990), Al-Mulali et al. (2014), Huang et al (2008), Tumwebaze and Ijjo (2015).:

$$DY_{it} = \beta_0 + \beta_1 FD_{it} + \beta_2 X_{it} + \beta_3 FDI_{it} + \beta_4 GGF_{it} + \beta_5 M_{it} + \beta_6 DIN_{it} + \beta_7 DP_{it} + \beta_8 DDI_{t-1}$$
$$+ \beta_9 DPAR_{t-1} + \beta_{10} DDI_{t-1} * DPAR_{t-1} + w_i + u_t + v_{it}$$

Where:

- $w_i$ is a country effect,

- $u_t$ is a year effect,

- $v_{it}$ is independent and identically distributed error.

- $DDI_{t-1} * DPAR_{t-1}$ is the interaction between domestic investment and patents

Before introducing the empirical balances and the evaluation of the performances, certain preliminary tests of the data are usually appreciated as very essential. For this reason, the table of descriptive statistics is one of the preliminary tests of the implementation of data that provides certain preliminary terms or information concerning the appropriate nature of the compressed variables. Table 2 denotes the descriptive statistics of all the variables included in our empirical evaluation. According to Table 2, all the variables have a probability of refusal of approximately less than 5%. This means that all the variables are in a state of being estimated in the case of panel data. In addition, the standard deviation of the variables takes into account the fluctuation and volatility of the statistics during the period of investigation. All given variables are positively skewed. The overall skewness and Kurtosis coefficients indicate that the variables follow the normal distribution. For all the variables, the maximum and the minimum show us the existence of several evolutions and variations between them.

### 3. Empirical results

In this section, we present our empirical results. In fact, we will examine the nature of correlation between the variables included in our model first which will be presented in table n°3. Next, we will apply estimates based on the following empirical models such as Panel OLS, Panel OLS (Fixed Effect), Panel OLS (Random Effect), Panel GMM, Panel GMM (Fixed Effect), Panel GMM (Random Effect), Panel GLM, Panel 2SLS, Panel 2SLS (Fixed Effect), Panel 2SLS (Random Effect) and Panel RLS which will be presented in table n°4. Table 3 tells us that there is a positive correlation between domestic investment and economic growth, a positive correlation between patents and economic growth, and a positive correlation between domestic investment and patents. invention. Table 4 shows the results of the estimation of the

panel data models. In fact, all models denote virtually the same results. We have noticed that domestic investments 'DDI' have a positive effect on economic growth 'DY'. On the other hand, patents 'DPAR' have no effect on economic growth 'DY'. Similarly, the interaction between domestic investment and patents 'DDI*DPAR' has no effect on economic growth 'DY'. In fact, there are several works like John (2016), Kentor (1998), Yuliana et al (2019), Ramirez and Nazmi (2003), Ali, G (2015), Purba et al (2019), Kanu et al (2014), Stupnikova and Sukhadolets (2019), Ajose and Oyedokun (2018), Hussin and Saidin (2012), Kesar et al (2023), Zahir and Rehman (2019), Abbas et al (2020), Qayyum and Zaman (2019), Aslan and Altinoz (2021), Oluwatobi and Ogunrinola (2011), Iheanacho (2017), Soytas and Sari (2009), Apergis and Payne (2010), Adhikary (2011), Yasmeen et al (2021), Bakari et al (2020b), Bakari et al (2021b), Bakari and El Weriemmi (2022), Bakari et al (2019), Bakari (2020), Bakari (2016), Bakari (2017b), Bakari (2019b), Bakari et al (2018a), Fakraoui and Bakari (2019), Bakari (2017c), Bakari et al (2018b) who found that domestic investments have adverse effects on economic growth. In addition, there is another category of works which have also confirmed that invention patents also have adverse effects on economic growth. Among these works, we can cite Bilbao-Osorio and Rodríguez-Pose (2004), Niwa (2018), Cook (2014), Feser et al (2008), Fagerberj (1987), Bakari (2022c), Bakari et al (2022b).

## 4. Conclusions

Examining the impact of domestic investments and patents on economic growth in MENA countries is of great importance because of their potential to create jobs stimulate innovation diversify the economy and attract foreign investment. These factors are critical to fostering sustainable economic development and prosperity in the MENA region. We hypothesized that the domestic investment strengthens the positive or the negative effect of patents on economic growth in MENA countries during the period 1998 - 2022. Empirical results indicate that domestic investment has a positive effect on economic growth, but Patents do not have any effect on economic growth. Also, the interaction terms of patent and domestic investment proved to be positive and not significant, which mean that the effect of patent on economic growth does not affect by the domestic investment and the effect of the domestic investment on economic growth does not affect by patent.

Several factors may contribute to the lack of effect of cooperation between domestic investment and patents on economic growth in countries in the Middle East and North Africa (MENA) region. The first factor is that countries in the MENA region can often suffer from institutional

weaknesses, particularly in terms of governance and the protection of intellectual property rights. This can make it difficult for companies to exploit their patents and fully benefit from their R&D investments. The second factor is that MENA countries may lack adequate infrastructure to conduct effective research and development activities. Lack of funding for laboratories equipped with technical skills and collaboration between universities and companies can hinder progress in technological innovation. Third, cooperation between the public and private sectors is essential to foster technological innovation and economic growth. However, in many countries in the MENA region there may be a lack of trust and communication between these two sectors which limits opportunities for collaboration and hinders the development and commercialization of patented inventions. The fourth factor is that countries in the MENA region may face a shortage of qualified human resources in the field of research and development. A lack of specialized technical and scientific skills can hamper the ability of companies to fully exploit invention patents and turn R&D investments into tangible innovations. The last factor is that countries in the MENA region can be relatively isolated from global research and innovation networks, which limits opportunities for international collaborations and access to the latest technological advances. This can hamper the ability of companies to remain competitive in the global marketplace and fully exploit their patents.

MENA (Middle East and North Africa) countries can improve the role of domestic investments and patents for stimulating economic growth by implementing several recommendations. First, governments can put in place policies that incentivize domestic investors to invest in strategic projects and industries. This can be achieved through tax incentives, reductions in bureaucratic hurdles and looser regulations to encourage domestic investment. Second, MENA countries should improve access to finance for entrepreneurs and SMEs to facilitate innovation and job creation. This can be achieved by establishing specific financing mechanisms such as venture capital funds and banks specialized in financing innovative companies. Third, governments must invest more in research and development to promote innovation and invention. This can be achieved by increasing public spending on R&D by establishing public-private partnerships to foster collaboration between universities, businesses and research centers and by providing tax incentives to encourage businesses to invest in R&D. Fourth, MENA countries should put in place more efficient systems for registering and protecting patents. This will help foster innovation by protecting the intellectual property rights of inventors and encouraging investment in research and development. Fifth, it is important to promote collaboration between universities and industry in order to facilitate the transfer of knowledge and the

commercialization of innovations. Governments can encourage the creation of partnerships between universities and businesses, support the creation of applied research centers focused on the needs of industry and offer tax incentives for companies that collaborate with universities in the development of innovative technologies.

By implementing these recommendations, MENA countries can improve their ability to innovate, create added value and stimulate their economic growth. This will reduce dependence on natural resources to create more jobs and improve the competitiveness of their economies on the international scene. It should be remembered that challenges and opportunities may vary from country to country in the MENA region. Some countries have succeeded in promoting innovation and economic growth through targeted policies and investments in R&D, institutional reforms and better integration into international research networks. However, in general, the factors mentioned above may contribute to the weak correlation between cooperation between domestic investments and patents and economic growth in the countries of the MENA region.

## References

Abbas, Q., Nurunnabi, M., Alfakhri, Y., Khan, W., Hussain, A., & Iqbal, W. (2020). The role of fixed capital formation, renewable and non-renewable energy in economic growth and carbon emission: a case study of Belt and Road Initiative project. Environmental Science and Pollution Research, 27, 45476-45486.

Abu, N., & Karim, M. Z. A. (2016). The relationships between foreign direct investment, domestic savings, domestic investment, and economic growth: The case of Sub-Saharan Africa. Society and Economy, 38(2), 193-217.

Adams, S. (2009). Foreign direct investment, domestic investment, and economic growth in Sub-Saharan Africa. Journal of policy modeling, 31(6), 939-949.

Adhikary, B. K. (2011). FDI, trade openness, capital formation, and economic growth in Bangladesh: a linkage analysis. International Journal of Business and Management, 6(1), 16.

Ajose, K., & Oyedokun, G. E. (2018). Capital formation and economic growth in Nigeria. Accounting and taxation review, 2(2), 131-142.

Alexiou, C., Nellis, J., & Papageorgiadis, N. (2016). The effect of patent enforcement strength

and FDI on economic growth. Multinational Business Review, 24(4), 334-353.

Ali, G. U. L. Z. A. R. (2015). Gross fixed capital formation & economic growth of Pakistan. Journal of Research in Humanities, Arts and Literature Applied, 1(2), 21-30.

Al-Mulali, U., Fereidouni, H. G., & Lee, J. Y. (2014). Electricity consumption from renewable and non-renewable sources and economic growth: Evidence from Latin American countries. Renewable and Sustainable Energy Reviews, 30, 290-298.

Al-Sadig, A. (2013). The effects of foreign direct investment on private domestic investment: evidence from developing countries. Empirical Economics, 44(3), 1267-1275.

Apergis, N., & Payne, J. E. (2010). Renewable energy consumption and economic growth: evidence from a panel of OECD countries. Energy policy, 38(1), 656-660.

Aslan, A., & Altinoz, B. (2021). The impact of natural resources and gross capital formation on economic growth in the context of globalization: evidence from developing countries on the continent of Europe, Asia, Africa, and America. Environmental Science and Pollution Research, 28, 33794-33805.

Bakari, S. (2016). Does Domestic Investment Produce Economic Growth in Canada: Empirical Analysis Based on Correlation, Cointegration and Causality (No. 75966). University Library of Munich, Germany.

Bakari, S. (2017). The impact of olive oil exports on economic growth: Empirical analysis from Tunisia. BİLTÜRK Journal of Economics and Related Studies, 2(3), 441-458.

Bakari, S. (2017). The Impact of Vegetables Exports on Economic Growth in Tunisia. Economic Research Guardian, 7(2), 72-87.

Bakari, S. (2017). The Nexus between Export, Import, Domestic Investment and Economic Growth in Japan (No. 76110). University Library of Munich, Germany.

Bakari, S. (2019). If France Continues This Strategy, Taxes Will Destroy Domestic Investment and Economic Growth. Journal of Smart Economic Growth, 4(1), 31-45.

Bakari, S. (2019). Innovation and Economic Growth: Does Internet Matter?. BİLTÜRK Journal of Economics and Related Studies, 3(2), 109-116.

Bakari, S. (2020). Domestic Investment and Economic Growth in Tunisia: Causality, Trends and Challenges. Scholars' Press.

Bakari, S. (2021). Are Domestic Investments in Spain a Source of Economic Growth? (No. 105526). University Library of Munich, Germany.

Bakari, S. (2021). The Nexus Between Domestic Investment and Economic Growth in G7 Countries. Does Internet Matter?. Journal of Applied Economic Sciences (JAES), 16(72), 238-243.

Bakari, S. (2022). The impact of digitalization and patent on economic growth in Romania. Journal of Research, Innovation and Technologies, 1(1 (1)), 49-61.

Bakari, S. (2022). The Impact of Natural resources, CO2 Emission, Energy use, Domestic Investment, Innovation, Trade and Digitalization on Economic growth: Evidence from 52 African Countries (No. 114323). University Library of Munich, Germany.

Bakari, S. (2022). The Nexus between Domestic Investment and Economic Growth in Developed Countries: Do Exports matter? (No. 114394). University Library of Munich, Germany.

Bakari, S., & El Weriemmi, M. (2022). Causality between Domestic Investment and Economic Growth in Arab Countries (No. 113077). University Library of Munich, Germany.

Bakari, S., & Mabrouki, M. (2017). The effect of agricultural exports on economic growth in South-Eastern Europe: An empirical investigation using panel data. Journal of Smart Economic Growth, 2(4), 49-64.

Bakari, S., & Tiba, S. (2019). Long run and Short run Macroeconomics Determinants of Economic Growth in the USA: Cointegration and VECM Analysis (No. 96618). University Library of Munich, Germany.

Bakari, S., & Tiba, S. (2022). Determinants of economic growth: The case of the United States of America. Journal of Developing Economies, 7(1), 29-44.

Bakari, S., Ahmadi, A., & Tiba, S. (2020). The Nexus among Domestic Investment, Taxation, and Economic Growth in Germany: Cointegration and Vector Error Correction Model Analysis. Journal of Smart Economic Growth, 5(1), 37-47.

Bakari, S., El Weriemmi, M., & Mabrouki, M. (2022). The Impact of Digitalization and Trade Openness on Economic Growth: New Evidence from Richest Asian Countries (No. 113816). University Library of Munich, Germany.

Bakari, S., Fakraoui, N., & Mabrouki, M. (2020). The Contribution of Domestic Investment, Exports and Imports on Economic Growth: A Case Study of Peru (No. 99041). University Library of Munich, Germany.

Bakari, S., Fakraoui, N., & Tiba, S. (2021). Domestic Investment, Export, Import and Economic Growth in Brazil: An Application of Vector Error Correction Model. Journal of Smart Economic Growth, 6(1), 31-48.

Bakari, S., Mabrouki, M., & Elmakki, A. (2018). The nexus between industrial exports and economic growth in Tunisia: Empirical analysis. Journal of Smart Economic Growth, 3(2), 31-53.

Bakari, S., Mabrouki, M., & Othmani, A. (2018). The six linkages between foreign direct investment, domestic investment, exports, imports, labor force and economic growth: new empirical and policy analysis from Nigeria. Journal of Smart Economic Growth, 3(1), 25-43.

Bakari, S., Othmani, A., & Mabrouki, M. (2021). Pollution and economic growth: a new vision for the tunisian economy. Journal of Smart Economic Growth, 6(2), 1-17.

Bakari, S., Tiba, S., & Fakraoui, N. (2019). Does Domestic Investment Contribute to Economic Growth in Uruguay? What did the Empirical Facts Say?. Journal of smart economic growth, 4(2), 53-69.

Bakari, S., Tiba, S., & Mabrouki, M. (2022). An Exploratory Study of the Causality between Internet Use, Innovation, and Economic Growth in Tunisia: An indispensable Case Analysis. Journal of Economics and Financial Analysis, 6(1), 1-18.

Barro, R. J. (2003). Determinants of economic growth in a panel of countries. Annals of economics and finance, 4, 231-274.

Bayar, Y. (2014). Effects of foreign direct investment inflows and domestic investment on economic growth: Evidence from Turkey. International Journal of Economics and Finance, 6(4), 69-78.

Ben Youssef, S. (2020). Non-resident and resident patents, renewable and fossil energy, pollution, and economic growth in the USA. Environmental Science and Pollution Research, 27(32), 40795-40810.

Bilbao-Osorio, B., & Rodríguez-Pose, A. (2004). From R&D to innovation and economic growth in the EU. Growth and Change, 35(4), 434-455.

Bilbao-Osorio, B., & Rodríguez-Pose, A. (2004). From R&D to innovation and economic growth in the EU. Growth and Change, 35(4), 434-455.

Blind, K., Ramel, F., & Rochell, C. (2022). The influence of standards and patents on long-term economic growth. The Journal of Technology Transfer, 47(4), 979-999.

Bulus, G. C., & Bakirtas, I. (2021). Patent, utility model, and economic growth. Innovation, Catch-up and Sustainable Development: A Schumpeterian Perspective, 309-335.

Chakraborty, D., & Mukherjee, J. (2012). Is there any relationship between foreign direct investment, domestic investment and economic growth in India? A time series analysis. Review of Market Integration, 4(3), 309-337.

Choe, J. I. (2003). Do foreign direct investment and gross domestic investment promote economic growth?. Review of development economics, 7(1), 44-57.

Cook, L. D. (2014). Violence and economic activity: evidence from African American patents, 1870–1940. Journal of Economic Growth, 19, 221-257.

Dereli, D. D. (2019). The relationship between high-technology exports, patent and economic growth in Turkey (1990-2015). Journal of Business Economics and Finance, 8(3), 173-180.

Emmanuel, O. G., & Kehinde, A. J. O. S. E. (2018). Domestic investment and economy growth in Nigeria: An empirical investigation. International Journal of Business and Social Science, 9(2), 130-138.

Fagerberg, J. (1987). A technology gap approach to why growth rates differ. Research policy, 16(2-4), 87-99.

Fakraoui, N., & Bakari, S. (2019). Tie Among Domestic Investment, Exports and Economic Growth: Empirical Analysis From India. Journal of Smart Economic Growth, 4(1), 1-15.

Ferreira, J. J., Fernandes, C. I., & Ferreira, F. A. (2020). Technology transfer, climate change mitigation, and environmental patent impact on sustainability and economic growth: A comparison of European countries. Technological Forecasting and Social Change, 150, 119770.

Feser, E., Renski, H., & Goldstein, H. (2008). Clusters and economic development outcomes: An analysis of the link between clustering and industry growth. Economic Development Quarterly, 22(4), 324-344.

Fosu, A. K. (1990). Export composition and the impact of exports on economic growth of developing economies. Economics Letters, 34(1), 67-71.

Ghazali, A. (2010). Analyzing the relationship between foreign direct investment domestic investment and economic growth for Pakistan. International Research Journal of Finance and Economics, 47(1), 123-131.

Güngör, H., & Ringim, S. H. (2017). Linkage between foreign direct investment, domestic investment and economic growth: evidence from Nigeria. International Journal of Economics and Financial Issues, 7(3), 97-104.

Hasan, I., & Tucci, C. L. (2010). The innovation–economic growth nexus: Global evidence. Research policy, 39(10), 1264-1276.

Huang, B. N., Hwang, M. J., & Yang, C. W. (2008). Causal relationship between energy consumption and GDP growth revisited: a dynamic panel data approach. Ecological economics, 67(1), 41-54.

Hussin, F., & Saidin, N. (2012). Economic growth in ASEAN-4 countries: a panel data analysis. International Journal of Economics and Finance, 4(9), 119-129.

Iheanacho, E. (2017). Long-Run Dynamics of Economic Growth, Gross Fixed Capital Formation And Financial Sector Development: An ARDL Analysis. Journal Of Finance, Banking and Investment, 4(1), 197-213.

Ilegbinosa, I. A., Micheal, A., & Watson, S. I. (2015). Domestic investment and economic growth in Nigeria from 1970-2013: An econometric analysis. Canadian Social Science, 11(6), 70-79.

Iwaisako, T., & Futagami, K. (2013). Patent protection, capital accumulation, and economic

growth. Economic Theory, 52, 631-668.

John, E. I. (2016). Effect of foreign direct investment on economic growth in Nigeria. European Business & Management, 2(2), 40-46.

Kanu, S. I., Ozurumba, B. A., & Anyanwu, F. A. (2014). Capital expenditures and gross fixed capital formation in Nigeria. Journal of Economics and Sustainable development, the International Institute for Science, Technology and Education (IISTE).

Kentor, J. (1998). The long-term effects of foreign investment dependence on economic growth, 1940–1990. American Journal of Sociology, 103(4), 1024-1046.

Kesar, A., Bandi, K., Jena, P. K., & Yadav, M. P. (2023). Dynamics of governance, gross capital formation, and growth: Evidence from Brazil, Russia, India, China, and South Africa. Journal of Public Affairs, 23(1), e2831.

Lautier, M., & Moreaub, F. (2012). Domestic investment and FDI in developing countries: the missing link. Journal of economic development, 37(3), 1.

Lin, X., Zhao, Y., Ahmad, M., Ahmed, Z., Rjoub, H., & Adebayo, T. S. (2021). Linking innovative human capital, economic growth, and CO2 emissions: an empirical study based on Chinese provincial panel data. International journal of environmental research and public health, 18(16), 8503.

Mabrouki, M. (2017). Brevet d'invention et croissance économique: une analyse dans le cadre de l'économie tunisienne durant la période 1970-2010. University Library of Munich, Germany.

Mabrouki, M. (2018a). Determination Of Optimal Patent Length In Favor Of Innovation And Growth. Journal of Smart Economic Growth, 3(1), 57-75.

Mabrouki, M. (2018b). Supporting economic growth through innovation: How does human capital influence the rate of growth. Economics Bulletin, AccessEcon, 38(2), 957-972.

Mabrouki, M. (2019). The Swedish economy is doing well thanks to innovation: an analysis from ARDL approach (No. 102367). University Library of Munich, Germany.

Mabrouki, M. (2022). Patent, education, human capital, and economic growth in Scandinavian countries: A dynamic panel CS-ARDL analysis. Journal of the Knowledge Economy, 1-16.

Miao, M., Borojo, D. G., Yushi, J., & Desalegn, T. A. (2021). The impacts of Chinese FDI on domestic investment and economic growth for Africa. Cogent Business & Management, 8(1), 1886472.

Mohamed, M. R., Singh, K. S. J., & Liew, C. Y. (2013). Impact of foreign direct investment & domestic investment on economic growth of Malaysia. Malaysian Journal of Economic Studies, 50(1), 21-35.

Ndikumana, L., & Verick, S. (2008). The linkages between FDI and domestic investment: Unravelling the developmental impact of foreign investment in Sub-Saharan Africa. Development Policy Review, 26(6), 713-726.

Niwa, S. (2018). Effects of a blocking patent on R&D with endogenous survival activities. Journal of Economics, 125, 263-277.

Oluwatobi, S. O., & Ogunrinola, I. O. (2011). Government expenditure on human capital development: Implications for economic growth in Nigeria. Journal of sustainable development, 4(3), 72.

Ozturk, I., & Al-Mulali, U. (2015). Natural gas consumption and economic growth nexus: Panel data analysis for GCC countries. Renewable and Sustainable Energy Reviews, 51, 998-1003.

Pece, A. M., Simona, O. E. O., & Salisteanu, F. (2015). Innovation and economic growth: An empirical analysis for CEE countries. Procedia Economics and Finance, 26, 461-467.

Positive effect of Patent

Purba, B., Masbar, R., Maipita, I., & Jamal, A. (2019, May). The effect of capital expenditure and gross fixed capital formation on income disparity in West Coast Region of North Sumatera. In IOP Conference Series: Earth and Environmental Science (Vol. 260, No. 1, p. 012022). IOP Publishing.

Qayyum, A., & Zaman, K. (2019). Dynamic linkages between international trade, gross fixed capital formation, total labor force and economic growth: empirical evidence from Pakistan. Acta Universitatis Danubius. Œconomica, 15(1).

Rahman, M. M., & Mamun, S. A. K. (2016). Energy use, international trade and economic growth nexus in Australia: New evidence from an extended growth model. Renewable and

Sustainable Energy Reviews, 64, 806-816.

Ramirez, M. D., & Nazmi, N. (2003). Public investment and economic growth in Latin America: An empirical test. Review of Development Economics, 7(1), 115-126.

Romer, P. M. 1990. "Endogenous Technological Change." Journal of Political Economy 98 (5, Part 2): SS71–SS102. doi:10.1086/261725.

Saito, Y. (2017). Effects of patent protection on economic growth and welfare in a two-R&D-sector economy. Economic modelling, 62, 124-129.

Soytas, U., & Sari, R. (2009). Energy consumption, economic growth, and carbon emissions: challenges faced by an EU candidate member. Ecological economics, 68(6), 1667-1675.

Stupnikova, E., & Sukhadolets, T. (2019). Construction sector role in gross fixed capital formation: Empirical data from Russia. Economies, 7(2), 42.

Tang, S., Selvanathan, E. A., & Selvanathan, S. (2008). Foreign direct investment, domestic investment and economic growth in China: A time series analysis. World Economy, 31(10), 1292-1309.

Tawiri, N. (2010, August). Domestic investment as a drive of economic growth in Libya. In International Conference on Applied Economics, ICOAE (pp. 759-767).

Thompson, M. A., & Rushing, F. W. (1999). An empirical analysis of the impact of patent protection on economic growth: an extension. Journal of Economic Development, 24(1), 67-76.

Tran, H. T. T., & Hoang, H. T. (2019). An investigation into the impacts of fdi, domestic investment capital, human resources, and trained workers on economic growth in vietnam. In Beyond Traditional Probabilistic Methods in Economics 2 (pp. 940-951). Springer International Publishing.

Tumwebaze, H. K., & Ijjo, A. T. (2015). Regional economic integration and economic growth in the COMESA region, 1980–2010. African Development Review, 27(1), 67-77.

Ullah, I., Shah, M., & Khan, F. U. (2014). Domestic investment, foreign direct investment, and economic growth nexus: A case of Pakistan. Economics Research International, 2014.

Yasmeen, H., Tan, Q., Zameer, H., Vo, X. V., & Shahbaz, M. (2021). Discovering the relationship between natural resources, energy consumption, gross capital formation with economic growth: can lower financial openness change the curse into blessing. Resources Policy, 71, 102013.

Younsi, M., Bechtini, M., & Khemili, H. (2021). The effects of foreign aid, foreign direct investment and domestic investment on economic growth in African countries: Nonlinearities and complementarities. African Development Review, 33(1), 55-66.

Yuliana, S., Bashir, A., & Rohima, S. (2019). The effect of investment toward economic growth in the local economy. Jurnal Ekonomi dan Studi Pembangunan, 11(1), 28-39.

Zahir, S., & Rehman, Z. (2019). Linkage between Gross Fixed Capital Formation, Trade Deficit and exchange Rate on Economic Growth (Case Study of Pakistan). Journal of Managerial Sciences, 13(4).

**Tables.**

**Table n°1: The description of the variables**

| No | Abbreviation | Variables | Description | Sources |
|---|---|---|---|---|
| 1 | FD | Financial development | Broad money (% of GDP) | World Bank Indicators |
| 2 | X | Exports | Exports of goods and services (% of GDP) | World Bank Indicators |
| 3 | FDI | Foreign direct investment | Foreign direct investment, net inflows (% of GDP) | World Bank Indicators |
| 4 | DY | Economic growth | GDP growth (annual %) | World Bank Indicators |
| 5 | GGF | Governance | General government final consumption expenditure (% of GDP) | World Bank Indicators |
| 6 | DDI | Domestic investments | Gross fixed capital formation (annual % growth) | World Bank Indicators |
| 7 | M | Imports | Imports of goods and services (% of GDP) | World Bank Indicators |
| 8 | DIN | Inflation | Inflation, consumer prices (annual %) | World Bank Indicators |
| 9 | DPAR | Patent | Patent applications, residents (annual % growth) | World Bank Indicators |
| 10 | DP | Population | Population growth (annual %) | World Bank Indicators |

*Source: Built by authors*

**Table n°2: Statistics descriptives**

| | DY | DDI | DPAR | DIN | X | M | GGF | DP | FDI | FD |
|---|---|---|---|---|---|---|---|---|---|---|
| **Mean** | 3.350272 | 4.501363 | 0.151865 | 5.388063 | 39.52423 | 37.19915 | 15.58104 | 1.808629 | 1.933629 | 73.17415 |
| **Median** | 3.542708 | 4.866261 | 0.095758 | 3.152376 | 33.38782 | 32.09799 | 15.51967 | 1.597091 | 1.581987 | 68.91101 |
| **Maximum** | 11.24206 | 47.16340 | 2.000000 | 36.60304 | 104.8048 | 87.06775 | 29.32164 | 9.971970 | 11.45597 | 247.2416 |
| **Minimum** | -12.03679 | -65.42245 | -0.531915 | -3.846154 | 10.34546 | 15.59339 | 7.285561 | 0.779087 | -2.148548 | 35.47193 |
| **Std. Dev.** | 3.157395 | 12.16579 | 0.375351 | 6.704254 | 22.30466 | 15.84643 | 4.430259 | 1.049671 | 1.888653 | 29.69192 |
| **Skewness** | -1.326435 | -1.117660 | 1.792098 | 2.056256 | 1.597378 | 1.098980 | 0.686704 | 4.073438 | 1.675616 | 3.022834 |
| **Kurtosis** | 7.670572 | 11.68603 | 9.091935 | 7.959449 | 4.928855 | 3.579273 | 3.145505 | 29.63223 | 8.460759 | 18.12926 |
| **Jarque-Bera** | 158.6858 | 442.4405 | 274.7698 | 228.2989 | 76.59818 | 28.41625 | 10.49083 | 4266.059 | 225.7785 | 1459.945 |
| **Probability** | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000001 | 0.005272 | 0.000000 | 0.000000 | 0.000000 |
| **Sum** | 442.2359 | 594.1799 | 20.04619 | 711.2243 | 5217.199 | 4910.287 | 2056.697 | 238.7390 | 255.2390 | 9658.987 |
| **Sum Sq. Dev.** | 1305.958 | 19388.85 | 18.45640 | 5888.060 | 65172.23 | 32895.32 | 2571.163 | 144.3369 | 467.2783 | 115490.9 |
| **Observations** | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

*Source: Authors' calculations using Eviews 12 software*

**Table n°3: Correlation analysis**

| | DY | DDI | DPAR | DIN | X | M | GGF | DP | FDI | FD |
|---|---|---|---|---|---|---|---|---|---|---|
| **DY** | 1.000000 | | | | | | | | | |
| **DDI** | 0.550286 | 1.000000 | | | | | | | | |
| **DPAR** | 0.011228 | 0.070401 | 1.000000 | | | | | | | |
| **DIN** | 0.067705 | 0.024383 | 0.009882 | 1.000000 | | | | | | |
| **X** | 0.063149 | 0.062085 | 0.133866 | -0.358066 | 1.000000 | | | | | |
| **M** | -0.020605 | -0.044406 | 0.089791 | -0.382416 | 0.805736 | 1.000000 | | | | |
| **GGF** | -0.186057 | -0.021733 | -0.066357 | -0.413313 | 0.033998 | 0.065669 | 1.000000 | | | |
| **DP** | -0.012763 | 0.048328 | -0.071482 | -0.063257 | -0.104668 | -0.088448 | 0.129119 | 1.000000 | | |
| **FDI** | 0.160308 | 0.179694 | 0.042312 | -0.096841 | 0.390603 | 0.549393 | -0.062542 | 0.061101 | 1.000000 | |
| **FD** | -0.149758 | -0.138975 | -0.125880 | -0.254551 | -0.057124 | 0.293298 | -0.068938 | 0.289514 | 0.286971 | 1.000000 |

## Table n°4: Panel Estimation Models

| Variable | Panel OLS | Panel OLS (Fixed Effect) | Panel OLS (Random Effect) | Panel GMM | Panel GMM (Fixed Effect) | Panel GMM (Random Effect) | Panel GLM | Panel 2SLS | Panel 2SLS (Fixed Effect) | Panel 2SLS (Random Effect) | Panel RLS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DDI | 0.134099** | 0.090971** | 0.122288** | 0.236036*** | 0.070268*** | 0.081813*** | 0.134099** | 0.236036** | 0.070268** | 0.081813** | 0.079524*** |
| DPAR | -0.436923 | -0.984742 | -0.613980 | -3.544589 | 0.303410 | 0.069619 | -0.436923 | -3.544589 | 0.303410 | 0.069619 | -0.754523 |
| DIN | -0.032285** | -0.085997** | -0.050412** | -0.079413** | -0.127029* | -0.126463* | -0.032285** | -0.079413** | -0.127029** | -0.126463** | -0.072565** |
| X | -0.006383 | -0.012727 | -0.009301 | -0.051383 | -0.044999 | -0.046124 | -0.006383 | -0.051383 | -0.044999 | -0.046124 | -0.017397 |
| M | 0.005326 | -0.003086 | 0.003395 | 0.078239 | 0.047735 | 0.050131 | 0.005326 | 0.078239 | 0.047735 | 0.050131 | 0.021087 |
| GGF | -0.153707** | -0.175964** | -0.162547*** | -0.190046** | -0.195639** | -0.198599** | -0.153707** | -0.190046** | -0.195639** | -0.198599** | -0.185729** |
| DP | 0.061725 | -0.088230 | 0.012867 | -0.035696 | -0.223070 | -0.217349 | 0.061725 | -0.035696 | -0.223070 | -0.217349 | -0.004099 |
| FDI | 0.164412 | 0.259861 | 0.199180 | -0.131571 | 0.114080 | 0.097250 | 0.164412 | -0.131571 | 0.114080 | 0.097250 | 0.156592 |
| FD | -0.017385 | -0.018466 | -0.018430 | -0.019415 | -0.010184 | -0.011093 | -0.017385 | -0.019415 | -0.010184 | -0.011093 | -0.015620 |
| DDI*DPAR | -0.010658 | 0.050269 | 0.006984 | 0.373228 | 0.496127 | 0.489898 | -0.010658 | 0.373228 | 0.496127 | 0.489898 | 0.064170 |

*** ; ** and * denote significances at 1% , 5% and 10% levels respectively
OLS : Ordinary Least Squares
GMM : Generalized Method of Moments
GLM : Generalized Linear Model
2SLS : Two-Stage Least Squares
RLS : Recursive Least Squares

*Source: Authors' calculations using Eviews 12 software*