SPATIAL LINKAGE BETWEEN QUALITY OF INSTITUTION, NATURAL RESOURCES MANAGEMENT WITH GDP PER CAPITA IN D8 COUNTRIES (DURBIN MODEL IN PANEL DATA)

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Abstract

Suitable economic growth has always been one of the priorities of any economic system. Meanwhile, economists have tried to achieve this goal by determining the factors affecting economic growth. At first, the main emphasis was on the physical capital and labor force, and the natural resources management. However, institutional factors, including natural resource management, emerged as a determinant of economic growth. In this regard, in this paper, the effect of institutions and management of natural economic resources on GDP per capita as a proxy for economic growth have been investigated by applying spatial regression models and Durbin model in the D8 countries during the period of 1996-2019. The empirical results of model estimation showed a positive and significant effect of natural resource management on economic growth of these countries. Moreover, the effect of physical capital, human capital, foreign investment accumulation and natural resources on economic growth is positive and significant. In addition, the effect of neighborhood and spillover impact of institutional quality on the economic growth has been confirmed in D8 countries.

Keywords: GDP Per Capita, Institutions Quality, Natural Resource Management, D8 Countries.

JEL classification: C23, O47, I25

1. Introduction

A crucial subject for theoretical and empirical studies is the extent to which determinants of economic growth play in different countries, meanwhile the economic grow this essential to maintain and improve the international competiveness of a country. Although economic growth has been widely studied, the traditional economic theories lack a framework explaining the differences in economic systems between countries beyond human capital, physical capital, labor, technology, and natural resources. Recent studies in institutional economics has arisen as an attempt to provide a framework investigating those residual differences. High institutional quality has been debated as an economic growth momentum by incentivizing economic activities such as consumption and investment improving efficiency allocating resources more efficiently protecting property rights and supporting freedom of choice. Achieving higher economic growth rates and per capita incomes is one of the primary targets of all economic systems and the desirable point of all the efforts that are made to regulate the economic affairs of societies. Given the changes in economic growth rate and its importance in economic systems, economists have been trying to formulate different theories of economic growth, so as to provide a comprehensive insight into the differences between economic growth and per capita income among countries around the world and to provide a comprehensive explanation of these differences over the years and long-term between

countries of the world. Therefore, several factors are proposed as determinants of economic growth. For example, a study by Mankiw et al. (1986) showed that the long-term economic growth rate is not highly correlated with the country's initial income level and low physical capital accumulation is not the only factor of low economic growth in countries, but also some other factors such as the stability of macroeconomic space and institutional factors accelerate economic growth (Lucas, 1988). Investment security is an institutionalized framework of social, political and legal conditions that gains the confidence of investors to develop investment and start a new business.

A secure economic environment is closely related to a stable macroeconomic environment, stability in policies and laws, efficiency and effectiveness of government and the governance of law and regulations (Parkhideh and Tajik, 2011). The basis of economic security is the belief in the effect of economic uncertainty on people's livelihoods. This belief has a logical consequence: because the economic threat of individuals in a society leads to unexpected economic damage due to the inefficiency of their economic activities. Due to the effect of this issue on all aspects of society, economic security in recent years has been the subject of research in various fields of humanities such as economics, political science, social psychology and sociology. In an insecure economic environment, due to the increase in investment costs, the amount of investment in projects that require long-term investment decreases, and in such circumstances, the context of growth of investment in brokerage as well as smuggled imports is provided. In addition, the appropriate level of economic growth and development to enjoy its benefits, including higher income, less poverty and inequality, and consequently greater welfare, is the goal of more economic and social programs of different societies.

Development experts suggest different definitions of development. Sen (1983) expresses development as an increase in the merits and abilities of individuals. Myrdal (1975) sees development as the movement of a social system forward. Todaro also sees development as a process in which the three axes of livelihood, self-esteem, and freedom are improved (Todaro & Smith, 2012). In the studies, several factors are introduced as factors affecting development. [1] One of these factors that has received special attention among development researchers and policy makers in recent years is the discussion of institutions and development. North (1990) defines institutions as rules of the game or constraints imposed by mankind to regulate human interactions. According to this definition, institutions cause the structuring of incentives in political, economic and social exchanges, and their most important function is to reduce uncertainty and exchange costs in various activities of societies. As Acemoglu et al. (2014) state, institutions affect development by influencing the total productivity of the factors of production, improving human capital and physical capital. These effects are such that Engerman & Sokoloff (1997 and 2011) attribute the different development paths of the American countries over the past hundred years to the initial conditions of these countries to benefit from institutional variables. But is the causality only from institutions to development, or can development also affect institutions? In most researches on the relationship between institutions and development, only the causality of institutions to development is examined and the effect of institutions on development through channels such as increasing the total productivity of factors of production, improving human capital and physical capital, reducing uncertainty and transaction costs and improving social capital are investigated.

After explaining the importance of favorable economic growth and the need to pay attention to the institutional index and improving natural resource management, the question arises as what could be the effect of the institutional index of governance and improving natural resource management on economic growth in the D8 countries [2] during 1996-2019. For this purpose, in the second part, a review of literature and in the third part, the research methodology and statistical databases have been presented. The fourth section presents the empirical results and finally the fifth section presents the conclusions and policy implications.

[1] For further reading about the factors affecting the development refer to Todaro & Smith (2012) and Hunt (1989).

[2] . Turkey, Iran, Egypt, Nigeria, Pakistan, Bangladesh, Indonesia & Malaysia

2. Review of literature

In this section, a theoretical framework and empirical review of the relationship between institutional quality and natural resource management with economic growth and the most important empirical studies have been reviewed in following sections.

2.1. Theoretical framework

New economic growth theories emphasize the effect of political and economic institutions as well as governance on production and economic growth. Acemoglu & Robinson (2012) "The Origins of Power, Prosperity and Poverty", introduce numerous examples from different periods of history along with numerous evidences and documents, in all of which, inappropriate decision by leaders is seen as a common point. It is clear that it should be found that what has brought these leaders and the decision-making system to this point. According to Acemoglu & Robinson (2012), the performance of these institutions and the correctness or inaccuracy of their performance ultimately leads to the emergence of a class of elites and political, social, economic, military and other decision makers whose sum and estimation of their decisions will lead the society in a certain direction and improve economic growth and per capita income. Now, if this is the right and appropriate direction for society and the world at that time, society will succeed in its economic goals, including economic growth and improved per capita income. If not, we can assume that it will lead to decline and downfall. Acemaoglu & Robinson emphasize that improperly functioning societies will turn into unsuccessful governments, but something can be done about it. There can be governments with infrastructure and law and order where people can work and earn with confidence and rely on public services, but there is no political will to do so. There is no need for the military to implement such plans; what is needed is an efficient and capable administrative system to lay the institutional foundations of the markets. In sum, it can be said that in traditional growth models, countries and even technologies were assumed to be the same. These models attributed the root of the difference between the investment rate and economic growth in different countries to the savings rate and the growth rate of factors of production. In the second stage, economists tried to minimize the unexplained waste growth by controlling the model over other factors, such as human capital, the degree of development of the financial sector, the importance and quality of macroeconomic policies in different countries (Sharif Azadeh & Hosseinzadeh Bahreini, 2003). In this way, even the difference in technology performance in different countries and regions was considered; yet the unexplained waste was significant. In the third stage, researchers focused on non-economic factors affecting investment and economic growth. Considering non-economic factors, including institutions, as another source of countries' heterogeneity, raised the question of what the relationship is between institutions in general and political and social institutions in particular with economic growth and per capita income. In this regard, Ranani (1997, p. 16) states that contrary to popular belief that the realization of economic growth either requires the governmentalization of the economy or requires the marketization of the economy, the new institutionalized economy believes that the economy should be the optimal combination of the market and non-market institutions; Or in classical terms, a combination of market, program, and tradition; Or, in the words of institutionalists, a combination of market, government, and enterprise (in the sense of an orderly, purposeful, and hierarchical institutional set). But these institution sets, must be combined in such a way as to minimize not only exchange costs (in private contracts between economic agents) and free riding (in collective decisions) (which is necessary for market allocation efficiency), but also improve other function indicators, such as security, distributive justice, compassion, freedom, etc. (superior efficiency). Acemoglu et al. (2002) also believe that deep differences between countries in transition, crises and growth practices have institutional reasons, and poor macroeconomic performance and deviations in macroeconomic policies are signs of this institutional disease.

Researchers describe six characteristics and components for governance and institutional indicators, which has been reported in the following section:

1- Transparency and accountability: This component includes awareness, understanding and the ability of the citizens of the country to participate in government elections, freedom of expression, freedom of parties and associations, as well as freedom of the media. In any

society where its members have a greater role in decision-making, due to the accountability of elected officials to the people and the active presence of the people in social and economic activities, we can expect that society from a higher level of development. Besides, developed countries, are countries where people participate freely in social and economic activities and have a higher level of social capital[3](Putnam, 1993; Frey, 2003; Przeworski et al. (2008); Tridico (2013)).

2. Political stability and non-violence: Awareness of the possibility that the government may become unstable or overthrown against the constitution or by using violent means, including politically motivated violence (like war or coup d'etat) and terrorism. Inclusive economic development in the long run requires a stable and secure environment in order to form a proportionate and optimal formation of economic activities; in other words, it can be said that political stability is one of the requirements for improving macroeconomic indicators and removing economic barriers (Gisselquist, 2012). In environments that do not have the necessary political stability and in which military conflicts take place, due to the loss of resources and rising investment risks and costs, return on investment is reduced and the motivation of economic actors to implement economic activity in these environments will be reduced and this will reduce investment and slow down the development process (Campos & Nugent, 2000; Campos & Karanasos, 2007; Gurgul & Lach, 2012; and Aisen & Veiga, 2013).

3- The effectiveness of the government: Awareness of the quality of public services, the quality of civil services and the degree of freedom and independence of these services from political pressures, the quality of regulation, formulation and implementation of policies, as well as the validity of government commitment to such policies is placed in this component. In the 1980s and 1990s, when the Washington Consensus was one of the dominant theories in economic circles, there was more emphasis on market functioning and less role was considered for the government in the development process, but with market failure in some cases, especially poverty reduction, and inequality, development theories tended to support the role of government in development, in particular, the emphasis on the role of government in supporting the creation of human capital, public health, technology transfer and support for policies based on sustainable development. Gennaioli et al. (2011) and Aderemi (2014) emphasize the positive effect of human capital on development. Bloom et al. (2004), Bloom & Canning (2005) and Ashraf et al. (2008) emphasize the positive effect of health on development.

4. Regulatory quality of regulations: This indicator includes awareness of the government's ability to formulate and implement transparent policies, as well as regulations that promote licensing and private sector development. Having clear rules and incentives for economic activity will reduce costs by making the future more predictable for economic actors, and this will attract more investment and move the development process forward. On the other hand, institutions and laws that reduce the motivation of economic activities by slowing down costs and delaying economic activities, lead to a slowdown in the development process (Borrman et al., 2006 and Lee, 2008). Clear and efficient rules can also facilitate the development process by increasing trade and, consequently, trade and technology transfer (Freund and Bolaky, 2008; and Silberberger, 2015).

5. Judicial security: This indicator of understanding and awareness shows the extent to which economic factors affect the laws of society, especially the quality of the implementation of contracts, property rights, police and courts, as well as the likelihood of crime and violence, confidence, perseverance and loyalty. Economic agents can safely make new investments or expand existing investments when they are confident of legal protection of their property rights and benefits. [4] When each individual is concerned about the seizure of his or her rights by others, his or her motivation to engage in economic activity will diminish,

[3] It should be noted that it's not only countries with democracy that are of a higher level of development; and countries such as China, Taiwan and South Korea are also of a good level of development while they do not have a democratic government. For further reading in this field see Reuschemeyer et al (1992), Acemoglu et al. (2006), Acemoglu & Robinson (2008).

[4] It should be noted that legal supports of the property rights and specifically, intellectual property rights, should not be in a way that creates monopoly for some people. For further reading in this regard, see the Chang (2001, 2011) paper.

and this will lead to delay in the development process (Acemoglu et al., 2001; Zak, 2002; and La Porta et al., 2008).

6. Corruption control: It includes understanding whether public power has been exercised in the provision of private interests, as well as the seizure of power by political elites and the private interests of politicians. The existence of corruption can have a negative effect on development by reducing the motivation of economic actors to engage in productive works, diverting resources to low-yield activities, and reducing the incentive to increase capital types (D'Agostino et al., 2012; Srithongkul & Pastpipatkul, 2013; Boicos, 2013; and Baxamusa & Jalal, 2014).

Greif (2006) defines institutions as a system of laws, beliefs, norms, and organizations that form an order of social behaviors. The institutions of each society are different from the other. The main issue in the field of economic growth of countries is not the quality of one or more specific institutions but the method of creating order in society. How to create order affects institutional quality and, consequently, economic growth (Fatehi Dabanloo et al., 2017). In addition, the relationship between the abundance of natural resources and economic growth and development can be explained through the effect of the abundance of natural resources on economic policies. The richer countries are in natural resources, the weaker macro-policies last longer and the less pressure there is to achieve industrial maturity.

2.2. Empirical studies

In this section, the most similar empirical studies on the effect of institutional factors and natural resources on economic growth and macroeconomic variables have been reviewed.

Singh and Pardhan (2020) empirically examines the impact of institutional quality on economic performance in South Asia for the period 2002 to 2016. The empirical results revealed that institutional quality has a positive impact on economic performance in the long-run whereas, governance indicators such as control of corruption, government effectiveness and political stability are vital for better economic performance in South Asian countries.

Alexiou et al (2020) by using of panel co-integrating method like FMOLS have been tested the long-run relationship between institutional quality and economic growth in 27 post socialist economies over the period from 1996 to 2016. They founded that in the long- run, economic growth is positively associated with the rule of law and voice and accountability. In the short run, regulatory quality retains a positive effect, but voice and accountability demonstrate a puzzling negative effect on economic growth that merits further analysis

Myakshin & Petrov (2019) employed the balanced score card method for evaluating the investment attractiveness of a region. In performing this study, we were governed by the current theories of institutional economics, region's economy, and the theory of investment, the latter viewing the investment attractiveness through the prism of investment efforts. The results and conclusions of this study may serve as the basis for elaborating the region-level investment promotion strategies.

Hisamoglu (2018) examined the effect of institutions and economic growth in Turkey during the period -1987-2016. This period is chosen as a stimulus for improving institutional quality due to Turkey's move towards EU membership. The results of this study, while emphasizing the important role of institutions on Turkey's economic growth, show that the effect of the quality of laws and bureaucracy, as well as the management of social conflicts and political tensions has had a greater effect on Turkey's economic growth than other institutional indicators.

Melnikova et al (2017) investigated issue of the development of electronic government and electronic democracy in Russia in terms of fostering the public need for the everyday use of electronic services. The authors draw the conclusion about effective manipulation being possible only if the process of cultivating specific mindsets to shape and drive human behavior has an all-encompassing nature.

Gallyamova & Miftakhov (2017) stated that institutional regulation of the regional banking system is proceeding along the path of putting together regional financial-industrial clusters, participants in which are eligible for the long-term use of the resources available. What is open to question is the degree to which the regulator's standards and requirements are

differentiated depending on the specificity of the region's economy and the bank's sectoral specialization.

Flachaire et al. (2016) evaluated the effect of economic and political institutions on the economic growth process in 79 selected developing and developed countries during the period 1975-2012. This study shows that political institutions do not have a direct effect on economic growth rate and the improvement of political institutions by stimulating other factors affecting economic growth such as business environment, increased investment in human capital and physical capital are drivers of economic growth.

Duran (2015) by using of nonparametric convergence regressions has investigated the nonlinear regional income divergence in 67 provinces of Turkey during the 1975-2000. He find that the relationship between initial income and growth takes a inverted-U shape which means that the very low-income and high-income group of provinces experience a slow growth pattern compared to middle-income group.

Siddiqui and Ahmed (2013) examined the effect of institutions on economic growth in 29 selected countries of the world during 2002-2006. In this study, the index of Institutionalized social Technologies, policy and institutional law, Institutional and Policy Rents, Political rents, Risk Reduction Index and World Governance Indicator is used to introduce the effect of institutions. In this study, by pointing out that the undeniable importance of institutions on economic growth has been accepted, it examines the intensity of the effect of various institutions on economic growth. In this study, which uses the dynamic panel method and generalized moments, the results show that institutions have a positive and significant effect on economic growth. The results of this study also indicate that the effect of policy-making index on long-term economic growth is more than other institutional indicators, while the effect of risk-reducing institutions has been meaningless even in some cases.

Law et al. (2013) examine the effect of institutions on economic growth and development using the panel data approach and Granger causality analysis method for 60 selected developing and developed countries during 1996-2008. In this study, the governance index and the International Country Risk Guide (ICRG) was used to show the status of institutions in each country. The results of this study show that there is a two-way causal relationship between institutions and economic growth. The results also show that the patterns of causality between institutions and economic performance are different at different income levels. In countries with higher average per capita incomes, better quality institutions boost economic growth, and in countries with lower average per capita incomes, economic growth leads to improved institution quality.

Putterman (2013) examined the effect of social institutions and capacities on economic growth in different parts of the world and at different times after the Industrial Revolution so far. The results of this study show that one of the reasons why some countries experienced rapid economic growth is the development and increase of social capacities of countries by improving the quality of institutions.

Hossain & Miyata (2012) by applying OLS regression evaluated the relationship between environmental sustainability, energy use and economic growth in the Toyohashi city of Japan. The results of their findings show that manufacturing and trading sector of the economy are causing expansionary pressure on use of combustion energy. The study also finds that contribution of technology to reduce use of energy in production side of the economy yet a dormant factor.

Dias & Tebaldi (2012) investigated the nexus between human capital and institutions with economic growth using the data panel approach and the generalized torque method for more than 50 selected countries during 1965-2005. The results of the model estimate show that improving the quality of institutions improves the accumulation of human capital, reduces income inequality and accelerates the movement in the historical direction of development. The results of this study also emphasize that strong infrastructure and structural institutions that are necessary for economic growth affect the long-term economic performance of countries, while in the short term, they have little effect on economic growth. Also, the effect of political institutions on productivity and long-term economic growth is meaningless. On the other hand, the intensity of the effect of institutions on economic growth in developing countries is greater than in developed countries.

Arezki and Van der Pleog (2010) examine the role of natural resources on per capita income in two groups of countries with good and bad economic policies and the effective role of law in the economy. The results show that dependence on natural resources has a negative and significant effect on per capita income, especially in countries where the role of law in the economy is weak or where poor economic policies are applied.

Huynh and Jacho- Chávez (2009) nonparametric examine the effect of good governance on the economic growth of 125 countries (classified into 5 groups: Western Europe, Eastern Europe, Latin America and the Caribbean, Asia and Africa) during 1996-2006. The results show that only the three indicators of the right to comment and accountability, political stability and the ruling of law of the six indicators of governance effect on economic growth and the three other indicators of corruption control, government effectiveness and regulatory power have no effect on economic growth. Empirical evidence also shows that the right to comment and accountability, political stability and the ruling of law have a non-linear effect on economic growth and this is due to the heterogeneity of these indicators among countries, regions and times. The results of this study indicate that changes to improve the governance index can be more effective on economic growth than other economic reforms.

Aidt et al. (2008) examined the effect of political accountability index as an indicator of corruption and also considering a tool variable to determine the level of governance on economic growth (growth rate per unit of GDP) in 84 countries, including the Islamic Republic of Iran from 2000 to 1970. The results show that the effect of corruption variable on economic growth depends on the existing ruling regime. When the quality of institutions or governance is high, corruption slows economic growth. But in a regime with low institutional quality or governance, the effect of corruption on economic growth is meaningless. On the other hand, the effect of corruption on economic growth is stronger in the short run than in the long run.

Gilbert's study (2003) examines the importance of good governance and the quality of institutions in achieving economic growth and development in different countries. In this study, using panel data from 1970-2000 for 102 developing countries; he concludes that there is a direct and significant relationship between quality indicators of regulation and government efficiency as a substitute for a good governance index and economic performance measured by per capita income growth rate. Studies by Baldassi et al. (2003), Hall et al. (1999), and Kangundu (2006) show a positive relationship between good governance and economic growth.

Despite extensive researches on the positive effect of good governance on economic growth, there are few studies that show an inverse relationship. For example, an important challenge to the positive effect of good governance on economic growth is related to the study of African countries by Sachs et al. (2004). In an empirical analysis, they show that differences in the economic performance and level of development of African countries cannot be explained by differences in the quality of governance. This issue can be interpreted in two ways: the most important reason for the negative relationship between governance and economic growth is the lack of attention to improving the governance components in African countries and the low average governance index in these countries. In other words, improving governance is not a priority in the economic policy of developing African countries. Another method is the existence of historical analyses on the African continent; because in the last fifty years, given the macroeconomic goals of these countries, to get rid of poverty and hunger and move towards relative prosperity, improving the governance components to achieve this has not been successful. Therefore, other African countries should refrain from upgrading the governance index.

In a book entitled “Democracy, Governance, and Economic Growth”, Kenak (2002) attempts to evaluate the effect of democracy on economic growth by establishing a relationship between democracy and governance. Therefore, it used statistics and information between selected developing countries during 1960-1990. The results of regression show a positive and significant effect between the status of institutions and the quality of governance. Thus, stronger democratic institutions influence governance and realize higher economic growth by reducing corruption and facilitating technological change.

Gradstein (2002) in a theoretical study expressed the relationship between economic growth and governance. By arguing this issue which is a vital aspect of this model that law

enforcement is costly when leading to better protection of property rights (and thus promoting growth) and requires resources that are only available in economies that are strong enough. Therefore, this analysis introduces two scenarios: one with minimal support for governance and low income and the other with full support for governance and high income. In both cases, improving the governance index promotes economic growth.

Komijani & Salatin (2008) examine the relationship between governance and economic growth between the two groups of member countries of the Organization for Economic Co-operation and Development (OECD) and the Organization of Petroleum Exporting Countries (OPEC) using the panel data method during (1996-2007). The results show that:

- There is a positive and significant relationship between the quality of governance index and economic growth in both groups.
- The rate of effectiveness of the governance quality index on economic growth in the OPEC countries is greater than in the OECD countries.
- The index of political stability in the group of OPEC member countries and the index of corruption control in the group of OECD member countries have the greatest effect on the rate of economic growth.

Jafari Samimi & Ekhtiari (2009) examined the relationship between economic growth and economic security, where Heritage Foundation was used to measure economic security in the countries which are a member of the Organization of Islamic Cooperation, relying on Iran during (1997-2005). The results show that economic security has a positive and significant effect on economic growth.

Komijani & Salatin (2010) have studied the effect of governance quality on economic growth using panel data in Iran and selected neighboring countries (Turkey and Pakistan) during 1996-2007. The results of the study show that the quality of governance in Iran is not favorable. The results of model estimation also show that the quality of governance index in all three countries has a positive and significant effect on economic growth rate. This index is more effective in Turkey than Iran and Pakistan.

Bashiri & Shaghaghi Shahri (2011) while explaining the mechanism of the relationship of good governance with reducing corruption and improving economic growth, in the form of a panel econometric model for the example of Southwest Asia countries during 1996-2007, examined the question of "Does implementing the good governance policy package leads to economic growth of countries?" In general, the results obtained from the estimation of the growth model emphasize the significant and direct relationship between the various components of the good governance index with the economic growth of the countries in the region.

Shahabadi & Pourjavan (2012) by stating the governance index as the main factor of economic development, dealt with the statistical analysis of governance indicators and some variables of social and economic development during 1996-2006 for 35 selected countries in Southeast Asia, West Asia, Latin America and Africa. Implicitly, the results of this study show that improvements in governance indicators (such as transparency and accountability, political stability, public service effectiveness, accurate regulatory regulation, judicial provision, and corruption control) in the countries under study, can have significant effects on improving development indicators such as per capita income, life expectancy, health and education, and unemployment rate, thus increasing social welfare.

Fatehi Dabanloo et al. (2017) examine the relationship between institutions and development in the Middle East during 1996-2014. Findings show that in oil-exporting and non-oil-exporting countries in the Middle East, there is a significant difference between the interaction of institutions and development.

According to the previous studies on the relationship between institutional quality indicators, governance indicators and economic growth in different developing and developed countries, researchers found that no direct research is conducted on the effect of institutional quality indicators and natural resource management on the economic growth of D8 countries using the effects of neighborhood of countries, hence, the difference between this paper in compared with previous studies is in presenting a new model and experimental modeling based on panel data using different models of spatial regression such as autoregressive, spatial Durbin and spatial error model during 1996-2020.

3. Methodology of research and model specification

In this research, the tools for collecting statistics and information are as follows:

- The data of average education of people aged 15 and over have been extracted from Barro and Lee database (2019).
- The data of natural resource governance and abundance as well as other variables used are extracted from the World Bank (2021) database.
- In order to extract the effects of space spillover and its spread in the countries of D_8 region, the proximity matrix in different states is used in Stata 16 software version 16 during 1996-2020.
- In order to estimate the model and extract the effects of spatial spillover in this study, different modes of spatial regression in the panel data model are used as follows and the appropriateness of each of these methods will be validated based on good fitting criteria such as Akaike information criterion and minimum square root of error. In other words, by estimating each of the following patterns, the effects of spatial spillover in error sentences, the intermittent value of the dependent variable or explanatory variables are tested, and in each case there will be effects of spatial spillover.

A. First-order spatial regression model

This model is the least used among space models; But it is most used in identifying spatial correlations among neighbors, because it uses only the product of the dependent variable in the standardized weight matrix[5].

$$\mathbf{y_{it}} = \boldsymbol{\rho} \sum_{\mathbf{j=1}}^{\mathbf{n}} \mathbf{W_{it}}\, \mathbf{y_{jt-1}} + \boldsymbol{\varepsilon_{it}} = \boldsymbol{\rho}\mathbf{W}\mathbf{y} + \boldsymbol{\varepsilon_{it}},\ \boldsymbol{\varepsilon_{it}} \sim \mathbf{N}(\mathbf{0}, \boldsymbol{\sigma}^{\mathbf{2}}) \quad (1)$$

ρ, W_{it} and ε_{it} are the spatial lag coefficient, the standardized weight matrix and the error term, respectively.

B. Mixed regression-self-regression model

This model describes the y-changes as a linear combination of adjacent areas such as autoregressive (AR) model and considers what is happening in adjacent areas to be important. In this regard, the maximum likelihood method is used to estimate the parameters of this model. The model is as follows:

$$\mathbf{y_{it}} = \boldsymbol{\rho} \sum_{\mathbf{j=1}}^{\mathbf{n}} \mathbf{W_{it}}\, \mathbf{y_{jt-1}} + \sum_{\mathbf{k=1}}^{\mathbf{k}} \boldsymbol{\beta_k}\, \mathbf{x_{ki}} + \boldsymbol{\varepsilon_{it}} = \boldsymbol{\rho}\mathbf{W}\mathbf{y} + \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon_{it}},\quad \boldsymbol{\varepsilon_{it}} \sim \mathbf{N}(\mathbf{0}, \boldsymbol{\sigma}^{\mathbf{2}}\mathbf{I_n}) \quad (2)$$

$y_{it} = \rho \sum_{j=1}^{n} W_{it}\, y_{jt} + \sum_{k=1}^{k} \beta_k\, x_{ki} + \varepsilon_{it} = \rho W y + X\beta + \varepsilon_{it} \varepsilon_{it} \sim N(0, \sigma^2 I_n) \rho$, W_{it} and ε_{it}, are the spatial lag coefficient, the standardized weight matrix, and the perturbation component, respectively.

C. Spatial error model

In this model, the dependent variable is affected by creating shock in adjacent and neighboring areas and is as follows:

$$\mathbf{y_{it}} = \sum_{\mathbf{k=1}}^{\mathbf{k}} \boldsymbol{\beta_k}\, \mathbf{x_{ki}} + \boldsymbol{\varepsilon_{it}} = \mathbf{X}\boldsymbol{\beta} + \mathbf{u_{it}} \quad (3)$$

$$u_{it} = \lambda W u_{it-1} + \varepsilon_{it}\ ,\ \varepsilon_{it} \sim N(0, \sigma^2 I_n)$$

D. General space model

This model includes both mixed regression and self-regression models and spatial error models and is as follows:

$$y_{it} = \rho W y_{jt-1} + X\beta + u_{it}\ ,\ u_{it} = \lambda W u_{it-1} + \varepsilon_{it}\ ,\ \varepsilon_{it} \sim N(0, \sigma^2 I_n) \quad (4)$$

To determine the spatial correlation, Moran and Wald tests with the null hypothesis of non-spatial correlation should be used. Also, the tests of Lagrange Multiplier Error (LMeror)

[5] This matrix if obtained by Kronecker product.

and Lagrange Multiplier Lag (LMlag) are used to detect spatial correlation in error term and spatial independence in the observation of dependent variables, respectively. If the null hypothesis of spatial non-correlation in the error term is rejected, the spatial error model is used; But in case both hypotheses are rejected as null, the general spatial model is used. In addition, to choose one of the models with pool data, panel data with fixed or random effect, likelihood ratio and Hausman tests are used. Null likelihood test hypothesis (1) is a model with pool data versus a fixed effect model hypothesis and null likelihood ratio test hypothesis (2) is a model with pool data versus a random effect model hypothesis. In addition, the null hypothesis of Hausman test is a model with a random effect as opposed to the hypothesis of a model with a fixed effect (Shakibaei et al., 2015: 14-15).

Given that the presentation of the model for each country or group of countries, should be done according to their economic, social and political structure, the following explains each of the variables in the model:

One of the important variables that exists in almost all equations of production and growth is the variable of physical capital accumulation. Investment is a major factor in economic development and in the general sense is all the costs that contribute to maintaining or increasing production capacity, as well as generating revenue (Furman and Hayes, 2004). In general, sustainable development is based on knowledge and technology, and the development of knowledge and technology is based on creativity and innovation. On the other hand, achieving scientific development requires increasing and integrating more resources, facilities and material facilities to educational and research activities. From the point of view of classical theory, capital accumulation is the key to economic development (Almasi and Sepahban Gharababa, 2009). In the neoclassical growth equation, capital and labor are the most important factors affecting domestic production. Landon-Lane and Robertson (a, b, 2003) and Iwaisako and Futagami (2013) have used this variable in their work.

Another variable in the growth equation is the human capital variable. Kuznets (1971) believed that the concept of capital – which includes only physical and commodity capital – is an incomplete concept. Therefore, both human capital and physical capital must be taken into account. In this regard, he says: the human capital of a developed industrial country is not the industrial tools and equipment of that country, rather, it is the accumulation of knowledge obtained from experiments and the work of learning of the people of that country to apply this knowledge (Sobhani, 1992).

Also, Schultz, the father of human capital theory, believed that the role of improving the quality of labor obtained through investment in human capital, as one of the determinants of production in traditional analysis of factors affecting on the economic growth is forgotten (Schultz, 1961). For this reason, a group of economists used production functions to estimate the surplus production generated by higher levels of education. They argued that increasing levels of education increased material production because the results of formal and non-formal education is hidden in additional skills and potential abilities of those in the labor market and human capital in production. As a result, the presence of these trained people increases the production capacity of the entire economy and ultimately, contributes to economic growth (Sadeghi and Emadzadeh, 2003). Polasek et al. (2010), Golejewska (2010), Sunde and Vischer (2011), and Neagu (2012) have used this variable in their studies.

The abundance of natural resources is another variable included in the growth equation. In contrast to theories that emphasize the positive role of natural resource abundance in the process of capital formation and economic growth, the resource curse theory proposed by Auty in 1993 points to the inverse relationship between natural resource abundance and economic growth and development (Asadi et al., 2013). This theory is based on the basic recognition that poor economies in terms of resources have performed better than rich economies in terms of resources, and also emphasizes the institutional and political effects of the abundance of natural resources (Usui, 1997). The negative relationship between natural resource abundance and growth performance is also explained by the effect of natural resource abundance on policy choice: The richer countries are in natural resources, firstly, the weaker macro-policies last longer. Secondly, there will be less pressure to reach rapid industrial maturity. Thirdly, rent-seeking groups become entrenched and ultimately more likely to slow down and become more irregular in economic growth (Auty, 1994). Cavacanti

et al. (2011), Fan et al. (2012) and Hamdi and Sbia (2013) have used this variable in their work.

Another variable in the equation is the accumulation of foreign investment flow variable. Accumulation of domestic capital as one of the basic prerequisites of the production process can be provided from internal or external sources. External finance as a complement to domestic savings, in addition to bridging the savings-investment gap, it is also a solution to the foreign exchange gap. The flow of foreign direct and indirect investment is mostly done by the private sector in the form of multinational corporations and is referred to as the private flow of capital (Shahabadi and Mahmoudi, 2006). Economists' theories about the flow of foreign direct investment and the factors affecting it are in two forms: First, the study of foreign direct investment as part of investment, as well as the theories of classical economics, recognize investment as one of the factors of economic growth. But in addition to preserving the historical role of investment, new economic theories recognizes knowledge, technology, and management practices – some of which can be acquired through foreign direct investment – to be effective on economic growth. The flow of foreign direct investment in addition to eliminating the shortage of capital in the host country, with two new growth factors, is of great importance in recent theories. Some economists have also explored the flow of foreign direct investment as part of international trade. In this approach, direct investment is subject to international regulation, known as Dunning's theory of foreign international production. The flow of foreign direct investment is a function of spatial positions (Frawsen and Josefsson, 2004). Arshad Khan and Ali Khan (2011), Tiwari and Mutascu (2011) and Baltabaev (2013) have used this variable in their studies.

It should be noted that in order to investigate the effect of improving natural resource management on economic growth, this is included in the equation by the product of two variables (governance) and natural resources. Also, when considering the improvement of natural resource management in the equation, the direct effects of each variable are not considered in the equation. According to the above and explaining the relationship between institutions and economic growth in the literature section, the equation considered in this section is as follows:

$$GGDP_{it} = C + \beta_1 K_{it} + \beta_2 HC_{it} + \beta_3 FDI_{it} + \beta_4 RES_{it} + \beta_5 INS_{it} + \beta_5 (RES_{it} * INS_{it}) + \varepsilon\_it$$

The variables used are as follows:

GGDP: per capita Income at the fixed prices of 2010

K: Fixed gross capital accumulation at the fixed prices of 2010

HC: Average years of study for people over 15 years old

FDI: Net accumulation of foreign investment inflows

RES: Total amounts from the sale of oil, gas, coal, minerals and forest as a percentage of domestic GDP

INS: Institutions. To represent this variable, the governance index provided by the World Bank is used. The sub-characteristics of governance are: 1- Transparency and accountability (this component measures the awareness, understanding and ability of the citizens of the country to participate in government elections, freedom of expression, freedom of parties and associations, as well as freedom of the media). 2. Political stability and non-violence (this component indicates awareness of the possibility that the government may be destabilized or overthrown in violation of the constitution or through violent means, including politically motivated violence (e.g., war or coup d'etat) and terrorism. 3- The effectiveness of the government (this component shows the awareness of the quality of public services, the quality of civil services and the degree of freedom and independence of these services from political pressures, the quality of regulation, formulation and implementation of policies, as well as the validity of government commitment to such policies). 4. The regulatory quality of regulations (this component includes awareness of the government's ability to formulate and implement transparent policies, as well as regulations that promote licensing and private sector development). 5. Judicial security (this component shows the understanding and awareness of the extent to which economic factors have confidence, perseverance and loyalty in the laws of society, especially the quality of execution of contracts, property rights, police and courts, as well as the possibility of crime and violence). 6. Corruption control (This component

increases the understanding of whether public power is exercised in the provision of private interests and is comprised of minor and general forms of corruption as well as the occupation of the state by political elites and the private interests of politicians).

The overall index is averaged over six indices. In the following, for a more detailed study, the six governance indicators are classified into three groups as follows:

A. The process by which those in power are selected, monitored and replaced. This section is obtained from the arithmetic mean of the two indicators of transparency and accountability and political stability without the presence of violence (V&P) [6].

B. The capacity and ability of the government to efficiently manage resources and implement sound policies. This section is obtained from the arithmetic mean of the two indicators of government effectiveness and quality of regulatory regulation (E&R) [7].

C) Respect of citizens and the government for the institutions that manage social and economic interactions between them. This part is obtained from the arithmetic mean of the two indicators of judicial security and corruption control (R&C) [8].

ε indicates the error component, i represents the country and t represents time. It is worth mentioning that in this research, using a different model approach in spatial regression, the model is estimated.

4. Empirical findings

In this section, the results of model estimation and interpretation of research findings are presented. The first step in estimating the model using the panel data method is the test of using the panel data approach versus the least squares method. After ensuring the method of using the panel data approach, it is necessary to test the spatial dependence between the countries or sections under study. The results of F-Limer test statistics have een presented in Table (1).

Table 1). Results of F-Limer test for the significance use of panel data method

Test Statistics	F Statistics	Probability Value (PV)
F-Limer Test	18.45	0.000

Source: Research Findings

The results of the above table revealed that the null hypothesis that the cumulative regression method is appropriate at a significant level of 1, 5 and 10% is rejected and therefore the panel data approach can be used. In the next step, it is necessary to test the spatial correlation between the disorder sentences.

Auto-correlation is related to the relationship between the values of error terms along the regression line. Strong correlation occurs when opposites of a variable – that are geographically close to each other – are related to each other, in other words, their changes occur systematically. If the effects or the values of the variables related to them are randomly distributed in space and there should be no relationship between them. Failure to pay attention to the spatial dependence of the data may lead to inconsistent and inefficient bias estimates. On the other hand, in order to use complex spatial patterns, their necessity must be considered. Based on Table (2) and the results of Moran test at a significance level of 1%, the existence of spatial correlation between model variables is confirmed.

Table (2). Moran Spatial Correlation Test

Explanation	Moran statistic	Significance level 5%
Spatial autocorrelation test	-8.95	0.000

Source: Research Calculations

The results of Moran spatial correlation test show that the value of Moran statistic is equal to -8.95 and the null hypothesis that there is no spatial autocorrelation between the errors at a significance level of 5%, is rejected and therefore different spatial regression methods can be used in panel data to estimate the pattern and analyze the findings. In the following, the effect

[6] Voice and political
[7] Regulatory and Effectiveness
[8] Rule and Corruption

of explanatory variables on the economic growth of the countries of the Middle East and North Africa in the form of space camera method will be studied. The reason for using the space camera method compared to other estimation methods such as spatial autocorrelation and spatial auto-regression is the significance of γ and θ coefficients. The results of the test of significance of these coefficients are presented in Table (3).

Table (3). The results of the test of significance of γ and θ coefficients in the space camera method

parameter	coefficient	probability value (PV)
0.007	0.056	Γ
0.05	0.084	Θ

Source: Author Calculations

The results of the above table show that the coefficients of both parameters γ and θ are significant at a significant level of 5% and therefore the space camera method can be used to estimate the model. The estimation results have been shown in Table (4):

Table (4). Results of model estimation by spatial camera method to examine the effect of institutions and natural resources variables on economic growth in D8 countries

Explanatory variables and Constant	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
C	1.64*	1.65*	1.77*	1.72*	1.6*	1.64*	1.65*	1.61*
K	0.16*	0.16*	0.14*	0.15*	0.15*	0.16*	0.16*	0.16*
HC	0.32*	0.30*	0.33*	0.30*	0.31*	0.30*	0.30*	0.30*
FDI	0.08*	0.059*	0.06*	0.05*	0.05*	0.05*	0.05*	0.06*
RES	0.05*		0.02*		0.02*		0.01**	
INS	0.12**							
RES*INS		0.02*						
V&P			0.12*					
RES*(V&P)				0.02*				
E&R					0.08***			
RES*(E&R)						0.02**		
R&C							-0.06	
RES*(R&C)								0.01***
$\bar{R}^2$	0.98	0.97	0.96	0.99	0.95	0.97	0.98	0.99

Source: Author Calculations

The results of the above table showed that in all estimated status, the effect of institutional variables (INS, V&P, E&R and R&C) on economic growth is positive and significant. This result is consistent with studies by Polterovich and Popov (2007), Huynh and Jacho-Chavez (2009), Ugur and Dasgupta (2011), and Kong (2011). Different aspects of governance through the following channels can have a positive effect on economic growth. 1- Improving the governance index gives investors the assurance that the laws will not change with the change of political leaders. This will stabilize investors' minds about not changing the conditions for investment planning, which will pave the way for increased economic growth; 2. In the absence of improving the governance index of activities such as the underground economy, bribery is a rent-seeking that leads to resources being diverted to unproductive activities. Therefore, improving the institutional governance index can increase economic growth through the optimal allocation of resources; 3. Improving the institutional governance index can pave the way for increased investment and consequently increase economic growth. This can be done by enacting laws that encourage economic actors to start or continue economic activities; 4- Improving the governance index can create confidence and peace of mind for all individuals, both domestic and foreign, by creating internal and external stability in the country because of the absence of internal and external conflicts. This can increase economic growth by increasing domestic investment and attracting foreign investment, as well as the absorption of advanced technologies in the production process; 5. The existence of an insecure economic environment can pave the way for the conversion of individuals' domestic assets to foreign assets and make the economy short of domestic resources, which results in reduced economic growth.

Also, the effect of abundance of natural resources (RES) on economic growth is positive and equal to 0.12. This result is consistent with the studies of Cavacanti et al. (2011), Fan et al. (2012) and Hamdi and Sbia (2013). This variable has two direct and indirect effects on economic growth. The direct effect is that the proceeds from the sale of natural resources are used as a source of funding for investment. The indirect effect is on the management of the sales of these resources. Examination of empirical studies on the effect of abundance of natural resources on economic growth shows a positive but small (as in this study) or even negative effect of this variable on economic growth. Researchers offer the following reasons:

- The posterior and anterior relations resulting from the export of primary goods to other economic sectors are weaker than those of the factory industry, so that the factory industries, unlike natural resources, leads to a more complete division of labor and improved standard of living. Thus, economic growth in countries with rich natural resources is slower.
- The abundance of natural resources has led to the prevalence of mismanagement of the economy by some governments, so that they do not use economic policies such as free trade, which improves the conditions for increasing per capita income. Therefore, some researchers consider the weakness of economic policy-making as the main reason for the poor performance of economies with natural resources (Gylfason (2001) and Sachs and Warner (2001)).
- Some economists have studied the effects of macroeconomics and changes in the structure of production as a result of a shock to the natural resources sector, known as the Dutch disease. However, this framework only explains the increase in the value of the domestic currency in the redeployment process without deriving from the long-term implications of economic growth. In the case of the Dutch disease, the increase in the value of the domestic currency due to the abundance of natural resources makes the export growth process vulnerable (Bravo-Ortega and Gregorio, 2002).

Therefore, natural resource exporting countries should improve the management of funds from the sale of point wealth, provide the ground for the expansion of the market of new factors of production and expansion of knowledge-based economy and conversion of non-renewable wealth into renewable wealth and endogenize economic growth.

As mentioned in the introduction of the model, in this study, the effect of improving natural resource management on per capita income is investigated. As shown in Table 4, this effect is positive and significant. This means that in countries with natural resources, if the institutional index of governance improves, the management of funds from the sale of natural resources will be well formed and the positive effects of these resources on economic growth will increase.

Another variable whose effect on economic growth is studied is the variable of physical capital accumulation. This variable is also the effect of physical capital accumulation (K) on per capita income and is positive and significant. This result is consistent with the research of Landon-Lane and Robertson (a, b 2003) and Iwaisako and Futagami (2013). This variable is one of the most important variables affecting economic growth and is always present in all models of economic growth from classical models to endogenous growth models. This variable can increase economic growth by providing the necessary facilities for new investments.

The human capital (HC) variable also has a positive and significant effect on the economic growth of the countries of the MENA region. This result is consistent with the studies of Polasek et al (2010), Golejewska (2010), Sunde and Vischer (2011) Neagu (2012). At first, economists only mentioned the accumulation of physical capital as a factor of production along with labor, but with the expansion of the concept of capital, human capital emerged as one of the most important types of capital and a factor of economic growth. This variable increases the productivity of human beings, improves the productivity of all factors of production and increases economic growth.

Another variable that has a positive and significant effect on economic growth is the accumulation of foreign capital inflow (FDI). This result is consistent with the works of Arshad Khan and Ali Khan (2011), Tiwari and Mutascu (2011) and Baltabaev (2013). Capital accumulation is always considered as one of the variables affecting production and economic growth that can be provided from domestic or foreign sources. At first, it was thought that foreign investment would be considered only for countries that have a low level of domestic

capital to provide investment projects, but with the passage of time and the use of foreign investment in industrialized and developed countries to provide financing of investment projects, this theory faded and later theories for the use of foreign investment were proposed. These theories include the introduction of technology and the transfer of knowledge and management to the countries hosting foreign investment. This is especially true in developing countries. Given that in these countries, production technology has a low level and is mainly imported, by attracting more foreign investment, in addition to financing projects, new production technology and modern management methods will also enter to these countries.

4.1. Investigating the effects of spatial spillover of institutions on economic growth

In order to test the significance of the effect of spatial spillover of institutions on the economic growth of the countries of the D8 region in the space camera method, the results are presented in Table (5):

Table (5). Investigating the effects of spatial spillover on the Economic Growth

Variable name	Coefficient	Probability value
W*INS	0.75	0.000

Source: Author Calculations

The results of the above table indicated that the effect of spatial spillover of institutions (W*INS) has had a positive and significant effect on economic growth in the D8 region. In other words, increasing and improving the institutional index leads to increased economic growth in the countries of this region.

5. Conclusion and policy implications

In this research, the effect of institutions and improving the management of natural resources on the economic growth of D8 region during 1996-2019 has been investigated using spatial regression models in panel data. In order to show the variables of institutions, the governance indicators provided by the World Bank were used. The results show that institutions have a positive and significant effect on the economic growth of the countries under study. Other variables, including accumulation of physical capital, human capital, net accumulation of foreign investment inflows and natural resources, have a positive and significant effect on economic growth. Improving natural resource management also has a positive and significant effect on per capita income. According to the results obtained in this study and in consistence with the competitiveness of the economy, moving towards a knowledge-based economy and having continuous and stable economic growth, the following suggestions are presented:

- Given the expected impact of institutional variables on the per capita income of the countries studied, it is suggested that the six indicators of institutions (transparency and accountability, political stability without violence, government effectiveness, regulatory quality of regulations, judicial provision and corruption control) be improved and promoted. This can be done by not changing economic policies in the event of a change of political leaders, adopting clear and efficient policies that pave the way for the economy to become more competitive.
- Given that many countries in D8 region have natural resources, it is suggested that the proceeds from the sale of these resources be used to improve the economic structure in order to convert non-renewable wealth into renewable wealth. This can be done by improving natural resource management and coordinating macroeconomic policies with education and research policies and innovation.
- Given the technological gap between the studied countries and developed countries, and that one of the ways to fill this gap is foreign investment, it is recommended to adopt appropriate policies to attract more capital in order to promote domestic technology and move towards a knowledge-based economy.
- Although, human capital improves the productivity of all factors of production and increases production. But if the demand for manpower does not grow in line with its supply, we will see little effect of this variable on macroeconomic variables. This is generally the case in countries with poor management of abundant natural resources. Because in these countries,

due to the income from the sale of oil wealth, less attention is paid to new factors of production that are based on knowledge (including human capital) and producers pay more attention to traditional factors of production (cheaper than new factors of production due to adopting inappropriate economic strategies). Therefore, it is necessary to pay serious attention to the expansion of the human capital market through the adoption of appropriate and coordinated policies towards macroeconomic supply and demand in order to achieve a knowledge-based economy in order to achieve continuous and stable economic growth.

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