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Freedom and Environmental Performance: Evidence from MENAT Countries

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Abstract

Environment quality and its determinants are one of the main challenges of the present and future of humanity and sustainable development is interpreted in the direction of preserving and improving the environment. In recent years, many studies have been conducted on the factors affecting environmental quality. One of the main topics that have been less considered in the related studies is the impact of governance on the quality of the environment. In this study, the impact of good governance components, including economic freedom, trade freedom, and political freedom, on the Environmental Performance Index (EPI) and its sub-indices including environmental health, ecosystem vitality, and climate change is investigated. The data required for statistical analysis are related to Middle East and North Africa region countries and Turkiye (MENAT) during 2000-2021. The panel data method was used to estimate the model and examine the relationship between the variables. The findings show that there is a positive and significant relationship between economic freedom and political freedom with the environmental performance index (EPI), and there is no significant relationship between trade freedom and EPI. In addition, the study found that economic freedom had a detrimental effect on ecosystem vitality and climate change, leading to negative impacts in these areas. However, it had a positive impact on environmental health, indicating that it contributed positively to this aspect. On the other hand, political freedom was observed to have a positive effect on the vitality of the ecosystem and climate change. However, it did not have a significant impact on the overall health of the environment, suggesting that its influence was more prominent in specific areas related to ecosystem vitality and climate change. The result of this research showed that economic freedom has led to more investment in the oil and gas sector of MENA countries, and therefore wastewater and gas emissions have had a negative impact on the vitality of the environment and climate change, but with the increase in production and sales of oil and Gas, per capita income of countries has increased, and environmental health has improved. Also, considering that political freedom among the MENA region has a lot of diversity, the results showed that the countries with more political freedom, through greater awareness of the society and more accountability of the governments and the establishment of environmental protection laws, had a positive impact on the environment. Of course, the environmental health index is more influenced by the economic situation and per capita production of countries and political freedom has little effect on it.

Keywords: Environmental performance, Economic freedom, Political freedom

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Introduction

One of the most important issues that have been investigated in recent decades is the quality of the environment. In fact, the environmental problems that have occurred in the past several decades and their effects on economic performance have been resulted in investigation of factors affecting the destruction of the environment (Rapsikevicius *et al.*, 2021; Olasky *et al.*, 2019; Pourali *et al.*, 2019). The longevity of general environmental indicators, which serve as markers for assessing environmental quality, typically does not extend beyond two decades. Prior to this period, many environmental analyses primarily focused on key indicators, such as CO2 levels, as well as the pollution of water and soil. About three decades ago, efforts to build an index that covers various aspects of the environment and can get a general view of the state of the environment at any point in time were put on the agenda of scientific institutions (Hsu and Zomer, 2016).

One of the most successful efforts in this field has been the design and calculation of the Environmental Performance Index (EPI) for different countries, which has been carried out by Yale and Columbia universities with the collaboration of the European Commission Research Center since 2000. By using 40 indicators in 11 different environmental fields, this index has been able to have one of the most comprehensive attitudes towards the categories of the environment performance. The purpose of calculating this index is to provide a quantitative measure for evaluating the environmental performance of different policies. This index is a weighted average of 22 performance indicators in 40 policy groups, including the environmental burden of diseases, air pollution (effects on human health), water pollution (effects on the ecosystem and effects on human health), water resources (effects on the ecosystem), biodiversity and animal and plant habitats, changes in forestry, changes in fishing, changes in agriculture, and changes in climate (Wolf *et al.*, 2022). The comprehensiveness of this index compared to CO_2 and SO_2 or air pollution levels or climate changes have helped to test the effects of different policies more accurately (Hsu and Zomer, 2016; Wolf *et al.*, 2022). After the introduction of EPI, finding the factors that affect this index and the performance of the environment has become important among the experts of various sciences and economists have also discussed the economic factors affecting EPI. Among the economic factors investigated, some influential variables exhibit complex and non-linear effects on the Environmental Performance Index (EPI). For instance, as per Kuznets' hypothesis, both Gross National Product (GNP) and per capita income tend to have a negative correlation with EPI at lower income levels, while at higher income levels, this correlation becomes positive. Additionally, variables like the share of the agriculture sector in Gross Domestic Product (GDP), the level of the Human Development Index (HDI), the ratio of urbanization, and energy consumption intensity can exert diverse effects on environmental quality under varying conditions. These effects may differ depending on specific contexts and circumstances. (Filimonova *et al.*, 2020; Lotfalipour *et al.*, 2010; Shahabadi *et al.*, 2017). However, one of the most important variables whose effects have been studied on various sectors, including the environment, is freedom. During the last decades, economists have examined freedom from different aspects and have shown the effects of its types such as political freedom (are included political rights and civil liberties), economic freedom (are included property rights, government integrity, government spending, business freedom, labor freedom, investment freedom, financial freedom, …), and trade freedom (a composite measure of the absence of tariff and non-tariff barriers that affect imports and exports of goods and services) on the quality of the environment and its different sectors (Rapsikevicius *et al.*, 2021; Carlsson and Lundström, 2003; Sart *et al.*, 2022).

Moreover, the effects of different types of freedom on the quality of the environment have not been investigated in detail and the effects of different types of freedom have been presented

in different countries and regions with sometimes inconsistent results and interpretations (Filimonova *et al*., 2020; Prathibha and Beck, 2018). Therefore, it is necessary to test the effect of different aspects of freedom on variables such as the environment in different regions and at different times so that the results are more reliable. In addition, although there have been studies on the relationship between various types of freedom, such as political freedom, economic freedom, and trade freedom, with environmental indicators, the impact of all aspects at the same time has been less discussed. In fact, considering the synergies that different freedoms have on each other, which is caused by the intellectual system governing different countries, the results can be more valid if they are examined at the same time.

The MENAT region (the countries of the Middle East and North Africa region including Algeria, Bahrain, Egypt, Iran, Jordan, Kuwait, Lebanon, Morocco, Oman, Qatar, Saudi Arabia, Tunisia, United Arab Emirates and Turkey) can be used as a model of the same structure and different attitudes due to some characteristics such as the relative possession of an ideological structure (Islam) and of course with different perceptions in the field of different freedoms; So, they are similar to each other in terms of the dependent variable. In addition, the presence of rich natural resources, especially oil resources, in these areas and different environmental effects, increases the need for environmental studies in this area (Farzanegan and Markwardt, 2018). For examples in 2018 the MENA region emitted 3.2 billion tonnes of carbon dioxide and produced 8.7% of global greenhouse gas emissions despite making up only 6% of the global population. These emissions are mostly from the energy sector, an integral component of these economies due to the extensive oil and natural gas reserves that are found within the region. Also this region is one of the most vulnerable to climate change. The impacts include increase in drought conditions, aridity, heatwaves and sea level rise (Global Carbon Atlas, 2020; Rana Alaa *et al*., 2017).

In this context, this study's significant contribution lies in its comprehensive examination of the impacts of various forms of economic, political, and trade freedoms, as assessed through indicators provided by international organizations, on the environmental performance of MENAT (Middle East, North Africa, and Turkey) countries, all in a single analysis. This research offers valuable insights to policymakers, enabling them to make informed decisions aimed at fostering a healthier and more sustainable environment. In fact, the main goal of this study is to investigate the effects of economic, political, and trade freedoms of the MENAT countries on the quality of their environmental performance.

According to the data structure and the goal of the study, the panel data approach has been chosen to investigate the research problem. Therefore, a review of the theoretical foundations of the research and a literature review will be carried out to determine the theoretical relationship between the independent variables of the research with EPI. Then by introducing the research variables, the structure of the research model is determined. Next, with appropriate tests, the optimal model is estimated, and the obtained results are analyzed.

While numerous studies have previously explored the individual effects of different types of freedom on environmental performance and climate change, this study seeks to contribute to the discourse by simultaneously analyzing the combined impact of various freedoms in the MENAT region. This region is particularly significant due to its involvement in various environmental issues. Moreover, this research extends its investigation to examine how these freedoms affect the sub-indexes of environmental performance, thus providing a more comprehensive understanding of their influence.

Literature review and theoretical background

Although many studies have been conducted in the field of the relationship between freedom and the environment in recent years, most of these studies have examined the impact of certain types of freedom on the specific indicators of the environment such as CO_2 emission, air pollution, and climate change. In the following, the impact of each type of freedom on the environment is discussed and some of the most important experimental studies conducted in this field are also mentioned.

Economic freedom is one of the types of freedom that significantly impacts environmental quality, and it has been the subject of investigation in numerous studies. The effects of economic freedom are often regarded as intermediary variables in economic theories, and they manifest their influence on the environment through various mechanisms. These mechanisms include the enhancement of income levels, income distribution, institutional quality, incentives, and overall efficiency. Consequently, economic freedom plays a pivotal role in shaping environmental outcomes and sustainability. (Carlsson and Lundström, 2002; Babaki and Elyaspour, 2021; Miller *et al*., 2022; Magnani, 2000; Bernauer and Koubi, 2013). Moreover, economic freedom is a combination of indicators of property rights, judicial quality, government honesty, the share of government spending in the economy, financial health, monetary freedom, labor market freedom, business freedom, financial freedom, commercial freedom, Investment freedom and financial freedom (Miller *et al*., 2022).

In the economic literature, various channels through which economic freedom impacts the environment have been examined. These channels are often categorized based on different dimensions of economic freedom and provide insights into how economic freedom can influence environmental outcomes. The first path is known as efficiency. Here, economic freedom leads to the creation of more efficient and competitive markets, and due to the more efficient use of resources, the quality of the environment improves (Carlsson and Lundström, 2002; Chang and Wang, 2012; Wood and Herzog, 2014; Rapsikevicius *et al*., 2021). Among these, we can mention more efficient use of energy resources, which leads to less emission of pollution. However, in the meantime, the importance of the general aspect of the environment and the external effects of production should not be neglected, and the importance of transparent environmental regulations should also be taken into consideration (Carlsson and Lundström, 2002).

The second chanel mentioned for the impact of economic freedom on the environment is the structure of property rights. In fact, in a free economic environment, the security of capital is provided, and property rights are recognized, so long-run investments like environmental investments increase because usually they are profitable in the long run. Therefore, the quality of the environment improves. Norton (1998) clearly shows the positive effect of property rights on the quality of the environment (Norton, 1998). In addition to the mentioned classical paths, a new path for the effect of economic freedom on the quality of the environment has recently been noticed in economic literature. It is stated that in a free economic and competitive environment, economic enterprises are looking for production methods with the lowest cost and the highest profitability and are constantly innovating for the optimal use of resources. This improvement in productivity leads to more efficient use of resources and reduces the pressure on the environment. While in the first path, the efficiency of the markets and the optimal use of resources are emphasized, this new path is based on the motivation of economic enterprises to increase efficiency according to recent developments in environmentally friendly technologies. In addition, in the recent decades, green and environmentally friendly technologies have grown significantly, which can lead to a higher quality of the environment (Berggren and Bjørnskov, 2021; Bjørnskov, 2020).

Some empirical studies also confirm the relationship between economic freedom and environmental quality. For example, Chang &

Wang (2012) investigated the effect of economic freedom and income on CO_2 emission using panel data approach and concluded that increasing freedoms (monetary freedom, trade freedom and financial freedom) after a certain level of income, decreases environmental pollution (Chang and Wang, 2012). Wood and Herzog (2014) also investigated the relationship between economic freedom and air quality and show that although this relationship is positive in the long run, in the short-run economic freedom may also have a negative effect on CO_2 emission (Wood and Herzog, 2014). Adesina and Mwamba (2019) using a panel model for 24 African countries during 1996 to 2013, show that increasing economic freedom (with sub-indices of trade freedom, business freedom, and financial freedom) increases the quality of the environment (Adesina and Mwamba, 2019). Babaki and Eliaspour (2021) also examined the relationship between economic freedom and CO_2 emissions in OPEC countries during 1996-2014 and concludes that economic freedom has a positive effect on the quality of the environment and reducing CO_2 emissions (Babaki and Eliaspour, 2021). One of the latest research projects in this field is the study of Rapsikevicius *et al*. (2021) about the impact of economic freedom on environmental quality in European countries. This research also confirms the complexity of the results in this field and the different effects of economic freedom on the quality of the environment. They propose an optimal level of economic freedom up to which the effects of freedom on the environment quality are positive (Rapsikevicius *et al*., 2021).

Political freedoms and the quality of governance have also been addressed by empirical works as driving force of environmental quality. Political and social freedoms and governance quality affect the environment through several channels, some of which are positive while others may affect adversely, and its final effect must be tested in different regions and times.

The first path for the positive effect of political freedom on the quality of the environment was proposed by some researchers such as Schultz and Crockett (1990) and Payne (1995), who consider freedom of information and political rights to increase awareness, especially environmental awareness, and this in turn leads to better environmental laws. Indeed, the free flow of information facilitated by political and social freedom plays a crucial role in increasing public awareness of environmental issues. Additionally, political freedom empowers citizens to choose their government representatives, who are responsible for addressing environmental concerns and responding to public sensitivities in this regard. In countries without political freedoms, information dissemination is often censored, making it difficult for information about environmental degradation to reach the community level. Furthermore, the absence of accountability and responsibility on the part of authorities in such environments regarding environmental destruction leaves citizens with limited power to effect change. They are unable to influence policies and procedures related to environmental preservation, as their ability to alter the situation is constrained (Schultz and Crockett, 1990; Payne, 1995). Also, in a free and democratic government, in terms of the rule of law, the authorities are forced to follow environmental laws and implement them, while in dictatorial countries, legal requirements are usually not met (Weiss and Jacobsen, 1999; Gleditsch and Bjorn, 2003).

In addition, in some studies, such as Congleton (1992), other paths are also mentioned for the impact of political freedom on the environment. He states that in the absence of political freedoms and with dictatorial governments, leaders show strong resistance to maintaining their systems and therefore may use many resources even inefficiently to put pressure on the people not to change their systems. In such cases, environmental laws are usually ignored (Congleton, 1992).

However, in contrast to the mentioned studies, there are also other studies that show that democracy not only does not lead to the improvement of the environmental quality but

may also accelerate the process of its destruction. For example, since the environment is a public good, when there are political freedoms, people may ignore the environment and put excessive use of resources on their agenda (Hardin, 1968). It is also stated that in democratic systems with political freedom, the financing of elections is usually done by capitalists who seek to maximize their profits as quickly as possible and due to the slow return of environmental investments, the environment and related laws usually are not prioritized. On the other hand, in free and democratic political systems, the priority of the governments is the concerns of the voters and when the livelihood level of the people in the society is not at an acceptable level, the economic needs are given a higher priority than the environment quality and therefore the quality of environment may even decrease (Jafariparvizkhanlou, 2020).

To empirically examine the above theories, several studies have been conducted, some of the most important of which are mentioned below. Li and Reuveny (2006) investigated the relationship between democracy and environmental degradation in 143 countries during 1961-1997 using the panel data method. They show that democracy has a negative effect on the processes of destruction of environmental indicators such as carbon dioxide emission, nitrogen dioxide emission, deforestation, land destruction and water pollution, and the increase of democracy leads to the improvement of the environment and its indicators (Li and Reuveny, 2006). Also, Bernauer and Koubi (2009) in the research titled "effects of political institutions on air quality" by examining 107 cities from 42 countries with the panel data method, concluded that democracy has a direct effect on air quality and government size plays the most important role (Bernauer and Koubi, 2009). Callejas (2010) also used panel data approach to investigate the relationship between democracy and CO2 emissions among Latin American countries and concluded that improving the state of democracy and expanding economic freedoms leads to improving the quality of the environment (Callejas, 2010).

Farzanegan and Markwardt (2012) also studied MENA countries using panel data method and concluded that the improvement of democratic conditions and the increase of political freedoms led to the improvement of the quality of the environment in these countries and freer institutions have had the greatest impact on its improvement (Farzanegan and Markwardt, 2012). Joshi and Beck (2018) show the impact of political and economic freedoms on the environment by dividing countries into developed (OECD) and underdeveloped (non-OECD). They conclude that none of the kinds of political freedoms affect CO_2 emissions (Joshi and Beck, 2018). In fact, as can be seen here, despite the fact that most studies show a positive relationship between political freedom and the quality of the environment, this relationship is not determined and requires more studies in different times and places.

Another type of freedom that affects environmental quality is trade freedom. It can also affect the quality of the environment in different aspects and ways, which are mentioned in the economic literature and are briefly discussed here.

One of the first channels discussed for the impact of trade freedom on the environment is the displacement hypothesis. According to this hypothesis, international free trade in terms of goods and capital causes the transfer of polluting industries from countries with restricting environmental laws to countries with weaker environmental laws. In fact, when a developing country becomes freer in terms of trade, the more pollution it will suffer as environmental policies become stricter in developed countries (Copeland and Taylor, 1995; Dinda, 2004; Harrison, 1996). The pollution haven hypothesis is also modeled by Copeland and Taylor (1994) in the same direction. This hypothesis states that weak environmental laws are the cause of comparative advantage for developing countries and multinational companies that produce environmentally polluting goods tend

to move the factories that produce these goods to developing countries with weak environmental laws. Obviously, this reduces the quality of the environment in developing countries with low per capita income (Copeland and Taylor, 1995; Dinda, 2004).

Here, another path that affects environmental quality is the race to the bottom. Based on this, relatively stricter laws in developed countries increase the relative costs of production in these countries compared to developing countries. Therefore, at least a few producers of polluting industries in developed countries have found the motivation to relocate and the transfer of capital abroad increases. The result of this is the motivation of the government to reduce environmental standards and reduce the quality of the environment (Mani and Wheeler, 1998).

Along with these paths, which have almost a contradictory effect (improving the quality of the environment in developed and high-income countries and reducing the quality of the environment in developing countries), there are also channels for the positive impact of free trade on the quality of the environment. For example, the diffusion of technology theory states that the diffusion of knowledge and the transfer of technology resulting from free trade can affect the quality of the environment in two ways. First, with the advancement of technology and its transfer, the production processes of goods will require smaller amounts of environmental inputs and less pollution will be released. Secondly, improving technology will lead to increased efficiency, productivity, waste recycling and reducing pollutants, which means a cleaner environment (Reppelin-Hill, 1999). As a summary of the role of trade freedom, it can be stated that there are generally two views in this field. The first view states that free trade can deteriorate the quality of the environment in various ways such as increasing the size of the economy, increasing the production of polluting goods and export-oriented policies that destroy resources (Adkins and Garbaccio, 2007; Lee and Roland-Holst, 1997). The second view believes that trade freedom through effects such as the diffusion of technology and more efficient use of resources lead to the improvement of the environment quality (Dinda, 2009; Antweiler *et al*., 2001). In addition to freedom and its sub-indices, other important variables such as per capita income and the human development index (HDI) also affect the quality of the environment which have been mentioned in the related literature (Stern, 2018; Pourali *et al.*, 2019; Zhang and Zhijie, 2022; Magnani, 2000; Bjørnskov, 2020).

The most important factor that has been examined in several studies is per capita income. This issue is discussed in the form of the inverted U curve or the Kuznets environmental curve. According to this theory, in the early stages of growth and low per capita incomes, priority is given to the process of industrialization and more production and employment, and low technology and not giving priority to the environment causes economic enterprises to be unable and unwilling to protect the environment. In this scenario, as per capita income increases, there is often a negative impact on environmental quality initially. However, in the subsequent stages of economic growth and further increases in per capita income, the environment begins to garner more attention and importance. At this stage, technological advancements tend to expand, environmental regulations become more stringent, and the awareness and sensitivity of society's citizens toward environmental issues increase. Consequently, economic growth and higher per capita income levels are associated with improvements in environmental quality. In recent years, numerous empirical studies have explored this subject using various approaches, shedding light on the complex relationship between economic development, income levels, and environmental outcomes (Filimonova *et al.*, 2020; Lotfalipour *et al.*, 2010; Shahabadi *et al*., 2017; Magnani, 2000; Bjørnskov, 2020; Dinda, 2004; Stern, 2018). In addition to GDP per capita, other indicators such as HDI, energy intensity, Percentage of people in the large cities, arable lands and agriculture, forestry and fishing value added are also considered as

control variables in the modeling framework. Increasing the level of education and life expectancy and as a result HDI has increased people's awareness and desire to live longer, which will also have a positive impact on the quality of the environment (Pourali *et al*., 2019; Zhang and Zhijie, 2022). But besides the theoretical justifications of each variable, the most important reason for using these variables is the positive correlation of these variables with the environmental performance index, and it is emphasized in the 2022 EPI report as well (Wolf *et al*., 2022).

Model

Study Design

In this study, the applied data relates to countries in the Middle East and North Africa region with Turkey (MENAT) include: (Algeria, Bahrain, Egypt, Iran, Jordan, Kuwait, Lebanon, Morocco, Oman, Qatar, Saudi Arabia, Tunisia, United Arab Emirates and Turkey) during 2000 to 2021 have been extracted through the relevant time series data. There are no complete data series in other countries of the region (such as Syria, Iraq, Palestine, Sudan, and Yemen). The environmental performance index data is extracted from the EPI website, which was prepared by the EPI research team at Yale University and Columbia University; The data of economic, political, and commercial freedoms were extracted from the website of the Heritage Foundation and the data of other variables were extracted from the website of the World Bank.

Based on theoretical foundations, the estimated model is as equation (1):

$$EPI = f(EF, TF, PF, GDP, GDP^2, Arableland, PLC, Exportindex, Agrivalue, Energy, HDI) \quad (1)$$

The independent variables include economic freedom (EF), trade freedom (TF), and political freedom (PF) and control variables include GDP per capita (constant 2015 in thousand dollars), arable land (% of land area), Percentage of people in the large cities (PLC), Export value index[1] (2015= 100), Agriculture, forestry and fishing value added (constant 2015 in billion dollars), Energy intensity (Energy) and human development index (HDI).

The environmental performance index (EPI) as a dependent variable is prepared based on various data and information. EPI is composed of two components, ecosystem vitality and environmental health, both of which comprise several sub-indexes. These indicators show the situation of different countries between 0 and 100 from the worst to the best. Table 1 shows the share of each of the mentioned indicators in the main EPI index.

Table 1- Environmental Performance Index

Ecosystem Vitality	0.6	Environmental Health	0.4
Climate Change	0.24	Air Quality	0.2
Biodiversity & Habitat	0.15	Sanitation & Drinking Water	0.16
Ecosystem Services	0.06	Lead exposure	0.02
Fisheries	0.06	Controlled solid waste	0.02
Pollution Emissions	0.03		
Agriculture	0.03		
Water Resources	0.03		

Source: EPI website

According to the Heritage Foundation report in 2020, Economic freedom based on 12 quantitative and qualitative factors that they are grouped into four broad categories, or pillars, of economic freedom:

1. Rule of Law (property rights,

1- Export values are the current value of exports (f.o.b.) converted to U.S. dollars and expressed as a percentage of the average for the base period 2015.

government integrity, and judicial effectiveness)

2. Government Size (government spending, tax burden, fiscal health)

3. Regulatory Efficiency (business freedom, labor freedom, monetary freedom)

4. Open Markets (commercial freedom, investment freedom, financial freedom)

Each of the twelve economic freedoms within these categories is graded on a scale of 0 to 100. A country's overall score is derived by averaging these twelve economic freedoms, with equal weight being given to each.

Political freedom is based on two qualitative factors: PR stands for political rights, CL stands for civil liberties, and Status refers to freedom status. PR and CL are measured on a one-to-seven scale, with one representing the highest degree of Freedom and seven the low. (Heritage Foundation 2020).

Data Collection

The descriptive characteristics of the series of environmental factors are shown in Table 2. In the case panel: the climate change index has improved since 2010 in most countries, while it has decreased in previous years; The index's mean is the least in Oman (14.4) and the greatest in Tunisia (44.3); for Iran, it stands at 34.1. The index's mean is the least in Morocco and Egypt (10.5), while the highest values are observed in the UAE, Qatar, and Kuwait (21.7); for Iran, it stands at 16.1. The mean ecosystem vitality index has remained stable, with no significant changes observed. Notably, this index's mean value is lowest in Oman (12.6), while the highest mean values are observed in Saudi Arabia and Egypt (22.4); for Iran, the mean stands at 20.6. And finally, the EPI is increasing with a gentle slope; the lowest mean is related to Morocco (27.1) and the highest to Kuwait and UAE (40.5); and about Iran (36.7). In general, the means and medians of these factors are less than 50 and thus in this region has not had a good situation in terms of environmental indicators. Also, the factor of climate change has the highest level of dispersion. The discrepancy can be attributed to the fact that some countries in the region export oil and gas, while others do not.

Table 2- Descriptive statistics of the Environmental factors

	Climate Change	Ecosystem Vitality	Environmental Health	EPI
Mean	31.33	30.95	43.14	35.83
Median	30.93	30.49	43.67	36.11
Maximum	59.08	49.52	59.12	52.39
Minimum	6.34	16.40	19.99	23.60
Std. Dev.	11.21	6.69	9.56	5.50

Source: research findings

The descriptive characteristics of the series of freedom factors are shown in Table 3. In the case panel: The index of economic freedom of countries has changed in a limited range; the lowest mean of this index is related to Iran (44.1) and the highest to Bahrain and UAE (72). With the exception of Iran, Morocco, and Tunisia, the trade freedom index experiences minor fluctuations. Iran's trade freedom index has decreased since 2005. The mean value of this index is observed to be the least in Tunisia and Iran (54.5), whereas the highest mean value is noted in Turkey and UAE (80.5). A lower political freedom index indicates that the state of political freedom is better in countries. According to the mean of this index, the political freedom situation of Turkey (3.9) is relatively good and the situation of Saudi Arabia (6.9) is not good. And the mean of political freedom index in Iran is (6).

In general, the means and medians of factors trade and economic freedom are more than 50 and for political freedom are more than 3.5. Therefore, economic freedom almost exists in these countries, but political freedom is limited. Also, trade freedom is more dispersed than economic freedom.

Table 3- Descriptive statistics of the Freedom factors

	Trade freedom	Economic freedom	Political freedom
Mean	71.01	61.46	5.29
Median	75.80	62.20	5.50
Maximum	86.60	77.70	7.00
Minimum	27.20	35.90	2.00
Std. Dev.	12.85	8.22	0.97

Source: research findings

Methods

In general, panel data models can be estimated using three different methods: (a) with a common constant; (b) allowing for fixed effects; and (c) allowing for random effects (Asteriou and Hall, 2021).

The common constant method (also called the pooled OLS method) of estimation presents results under the principal assumption that there are no differences among the data matrices of the cross-sectional dimension (*N*). In other words, the model estimates a common constant *a* for all cross-sections (common constant for countries).

$$Y_{it} = \alpha + \beta X_{it} + u_{it} \quad (2)$$

In the fixed effects method the constant is treated as group (section)-specific. This means that the model allows for different constants for each group (section). Thus, the model is similar to that in Equation (3):

$$Y_{it} = \alpha_i + \beta X_{it} + u_{it} \quad (3)$$

The fixed effects estimator is also known as the least squares dummy variable (LSDV) estimator because, to allow for different constants for each group, it includes a dummy variable for each group. Where the dummy variable is the one that allows us to take different group-specific estimates for each of the constants for each different section. To do this, the standard *F*-test can be used to check fixed effects against the simple common constant OLS method. The null hypothesis is that all the constants are the same (homogeneity), and that therefore the common constant method is applicable:

$$H_O: \alpha_1 = \alpha_2 = \cdots = \alpha_N \quad (4)$$

The *F*-statistic is:

$$F = \frac{(R_{FE}^2 - R_{CC}^2)/(N-1)}{(1-R_{FE}^2)/(NT-N-K)} \sim F(N-1, NT-N-k) \quad (5)$$

where R_{FE}^2 is the coefficient of determination of the fixed effects model and R_{CC}^2 is the coefficient of determination of the common constant model. If *F*-statistical is greater than *F*-critical we reject the null hypothesis.

An alternative method of estimating a model is the random effects model. The difference between the fixed effects and the random effects method is that the latter handles the constants for each section not as fixed but as random parameters. Hence the variability of the constant for each section comes from:

$$\alpha_i = \alpha + \vartheta_i \quad (6)$$

Where v_i is a zero mean standard random variable.

The random effects model therefore takes the following form:

$$Y_{it} = (\alpha + v_i) + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \beta_k X_{kit} + u_{it}\text{b} \quad (7)$$

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \beta_k X_{kit} + (v_i + u_{it})$$

The Hausman test is formulated to assist in making a choice between the fixed effects and random effects approaches. Hausman (1978) adapted a test based on the idea that under the hypothesis of no correlation, both OLS and GLS are consistent, but OLS is inefficient, while under the alternative OLS is consistent but GLS is not. More specifically, Hausman assumed that there are two estimators $\hat{\beta}_0$ and $\hat{\beta}_1$ of the parameter vector $\boldsymbol{\beta}$ and he added two hypothesis-testing procedures. Under H_O, both estimators are consistent but $\hat{\beta}_0$ is inefficient, and under H_a, $\hat{\beta}_0$ is consistent and efficient, but $\hat{\beta}_1$ is inconsistent. The Hausman test uses the following test statistic:

$$H = \left(\hat{\beta}^{FE} - \hat{\beta}^{RE}\right)' \left[var\left(\hat{\beta}^{FE}\right) - var\left(\hat{\beta}^{RE}\right)\right]^{-1} \left(\hat{\beta}^{FE} - \hat{\beta}^{RE}\right) \sim \chi^2(k) \quad (8)$$

If the value of the statistic is large, then the difference between the estimates is significant, so we reject the null hypothesis that the random effects model is consistent and use the fixed effects estimator. In contrast, a small value for the Hausman statistic implies that the random effects estimator is more appropriate.

Results and Discussion

Before estimating the effects of explanatory variables on dependent variable, some tests are necessary. First, to avoid any spurious regression problems, the Levin–Lin–Chu test is used for the stationary status of the variables. In Table 4, the results of Levin–Lin–Chu stationary tests for all variables are reported.

Table 4- The results of the Levin-Lin-Chu stationary test of variables

EPI	-3.84617	HDI	-3.95767
Climate Change	-2.94746	GDP per capita	-2.31476
Ecosystem Vitality	-2.77643	Energy intensity	-2.14671
Environmental Health	-6.92879	Export index	-1.40807
Trade freedom	-3.24249	Arable land	-1.67169
Economic freedom	-3.64791	Agriculture value added	-1.94055
Political freedom	-3.20266	People in the large cities	-6.81148

Source: research findings

The null hypothesis in the Levin–Lin–Chu test is that all panels (each time series) contain a unit root. According to the results of Table 2, all variables are stationary. Another important test is the collinearity test, which should not exist between explanatory variables. The results of the correlation between explanatory variables are reported in Table 5; it shows that there is no strong correlation between the explanatory variables and therefore there is no collinearity problem.

Table 5- Partial correlation between explanatory variables

EF	1.000									
TF	0.552	1.000								
PF	0.089	-0.055	1.000							
GDPPER	0.454	0.339	0.151	1.000						
ARABLELAND	-0.342	-0.208	-0.568	-0.368	1.000					
ENERGY	0.097	0.051	0.376	0.269	-0.466	1.000				
EXPORTINDEX	0.006	0.288	0.053	0.065	-0.103	0.120	1.000			
AGRIVALUE	-0.491	-0.127	-0.038	-0.333	0.504	-0.175	0.052	1.000		
PLC	0.264	0.287	-0.123	0.226	-0.282	0.072	-0.007	-0.296	1.000	
HDI	0.478	0.578	0.324	0.520	-0.441	0.471	0.335	-0.157	0.283	1.000

Source: research findings

Then, in order to determine the pool or panel regression model, first the model is estimated by assuming fixed effects for the cross-section and then by assuming random effects. The F and λ^2 statistics for the cross-sectional fixed effects test are reported in Table 6; the p-values of these statistics are less than 0.05, and therefore the null hypothesis is rejected, which means that there are cross-sectional fixed effects. Furthermore, the null hypothesis favoring random effects is rejected when considering the λ^2 statistic derived from the Hausman test. Consequently, the results of these tests indicate a preference for the fixed effects model over the random effects model.

Table 6- fixed and random effects test for the cross section

Model:	Effects Test	Statistic	d.f	Prob
Model(1)	Cross-section F	27.620	(13,283)	0.0000
dependent variable:	Cross-section Chi-square	252.329	13	0.0000
EPI	Cross-section random	75.206	11	0.0000
Model(2)	Cross-section F	25.910	(13,283)	0.0000
dependent variable:	Cross-section Chi-square	241.477	13	0.0000
Ecosystem Vitality	Cross-section random	80.212	11	0.0000
Model(3)	Cross-section F	114.348	(13,283)	0.0000
dependent variable:	Cross-section Chi-square	564.571	13	0.0000
Environmental Health	Cross-section random	58.187	11	0.0000
Model(4)	Cross-section F	12.539	(13,283)	0.0000
dependent variable:	Cross-section Chi-square	140.112	13	0.0000
Climate Change	Cross-section random	26.225	11	0.0060

Source: research findings

The heteroskedasticity and autocorrelation tests for cross-sections are two other important pretests that results are reported in Table 7. The null hypothesis of homoskedastic residuals is rejected and so the weighted least squares method is used to estimate the model. Also, null hypothesis for no cross-sectional dependence in residuals has been accepted.

Table 7- Heteroskedasticity and autocorrelation tests

Effects Test	Test	Statistic	Prob
(1) dependent variable: EPI	LR	102.469	0.0000
	Pesaran CD	1.383	0.1715
(2) dependent variable: Ecosystem Vitality	LR	125.317	0.0000
	Pesaran CD	1.215	0.2241
(3) dependent variable: Environmental Health	LR	256.134	0.0000
	Pesaran CD	-0.020	0.983
(4) dependent variable: Climate Change	LR	69.363	0.0000
	Pesaran CD	0.220	0.825

Source: research findings

In the literature review, the relationship between the environmental performance index (EPI) with economic freedom, trade freedom and political freedom was explained theoretically. In this section, the relationships between these variables are estimated empirically using the panel EGLS (Cross-section weights) method (Table 8).

Table 8- The relationship between freedom indices and EPI

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-16.79234	5.614745	-2.990757	0.0030
EF	0.076646	0.036299	2.111515	0.0356
TF	-0.012537	0.015937	-0.786669	0.4321
PF	-1.155912	0.240977	-4.796764	0.0000
GDPPER	-1.207823	0.182860	-6.605189	0.0000
GDPPER^2	0.009673	0.001761	5.493442	0.0000
ARABLELAND	1.421587	0.201828	7.043576	0.0000
ENERGY	-1.190653	0.182257	-6.532815	0.0000
EXPORTINDEX	-0.004576	0.004597	-0.995505	0.3203
AGRIVALUE	0.234323	0.043451	5.392817	0.0000
PLC	-0.117141	0.040479	-2.893843	0.0041
HDI	79.02078	5.922493	13.34249	0.0000
R-squared	0.876191	Mean dependent var		40.21629
Adjusted R-squared	0.865692	S.D. dependent var		11.80128
S.E. of regression	2.529768	Sum squared resid		1811.122
F-statistic	83.44944	Durbin-Watson stat		1.395140
Prob(F-statistic)	0.000000			

Source: research findings

The results of Table 8 show that the effect of variables EF, PF, HDI, GDPPER, $GDPPER^2$, ARABLELAND, ENERGY, AGRIVALUE, PLC, HDI are significant; versus TF and EXPORTINDEX are not significant. Furthermore, there is a negative relationship between PF and EPI. However increasing the amount PF means that the level of political freedom decreases. Therefore, there is a positive relationship between the level of political freedom and the environmental performance index. The positive effect of political freedom on environment quality was mentioned in other studies such as Schultz and Crockett (1990), Payne (1995), Bernauer and Koubi (2009), Callejas (2010) and Farzanegan and Markwardt (2018). They believe that information transparency and political rights increase people's environmental awareness and lead to the creation of strong laws to protect the environment. On the other hand, in a free society, legislators are forced to obey environmental laws and implement them. While in non-free societies, public interests are usually not considered (Weiss and Jacobsen, 1999), (Gleditsch and Bojren, 2003).

Also, according to Table 8, there is a positive and significant relationship between economic freedom and EPI. The existence of this relationship confirms that economic freedom leads to the creation of more efficient and competitive markets and the efficient allocation of resources, especially energy. Therefore, the quality of the environment increases with more economic freedom (Bjørnskov, 2020; Bernauer and Koubi, 2013; Carlsson and Lundström, 2002, Carlsson and Lundström, 2003).

The results of the test show that the GDPPER coefficient is positive, but the $GDPPER^2$ coefficient is negative. This means that the relationship between GDPPER and EPI is nonlinear and concave up; So that first the relationship between two variables is negative and then this relationship becomes positive. In other words, in the early stages of economic growth and development, governments destroy the country's environment by putting pressure on resources; And after achieving a high level of GDP per capita, they are forced to protect the environment under the pressure of the people, so EPI improves. This behavior of people is reminiscent of Maslow's Hierarchy of Needs theory. Arableland, Agrivalue and HDI have positive and significant effects on EPI; The percentage of arable land and the added value of the agricultural sector can be considered as indicators of the greenness of a country, and the increase of these indicators leads to more vitality of the environment and more EPI; Also, HDI's analysis says that increasing the level of education and life expectancy increases people's awareness and their desire to live longer and as a result increases EPI. In other words, the development process leads to an increase in EPI. ENERGY and PLC variables have a negative and significant effect on EPI. That means, the high percentage of urbanization and high intensity of energy consumption destroy the environment and reduces EPA. Considering that the EPI consists of two sub-indices of ecosystem vitality and environmental health, it seems to be useful to examine the effect of different variables on these two sub-indices of EPI. The findings are shown in Table 9.

Table 9- The relationship between freedom indicators with the two main parts of the EPI

	Ecosystem Vitality			environmental health		
Variable	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.
C	-17.33364	-2.020353	0.0443	-10.04794	-3.187619	0.0016
EF	-0.174396	-2.970772	0.0032	0.118307	5.280003	0.0000
TF	-0.030553	-1.379472	0.1688	0.027774	2.367326	0.0186
PF	-1.442733	-4.233040	0.0000	-0.464451	-2.969286	0.0032
GDPPER	-1.695221	-6.022341	0.0000	-0.765578	-8.642286	0.0000
GDPPER^2	0.012905	4.823034	0.0000	0.007271	8.002754	0.0000
ARABLELAND	1.783956	6.136939	0.0000	0.575283	3.954426	0.0001
ENERGY	-1.925284	-6.464283	0.0000	-0.130763	-1.409455	0.1598
EXPORTINDEX	-0.015763	-2.154678	0.0320	0.013688	5.734019	0.0000
AGRIVALUE	0.192201	2.750032	0.0063	0.335222	10.77642	0.0000
PLC	-0.152546	-2.323312	0.0209	0.034005	1.487019	0.1381
HDI	79.99291	9.030053	0.0000	78.70543	22.66482	0.0000
	R-squared		0.768181	R-squared		0.981429
	Adjusted R-squared		0.748521	Adjusted R-squared		0.979854
	F-statistic		39.07406	F-statistic		623.1675
	Prob(F-statistic)		0.000000	Prob(F-statistic)		0.000000
	Durbin-Watson stat		1.398999	Durbin-Watson stat		1.166517

Source: research findings

Comparing the coefficients of the variables in Tables 8 and 9 shows that the impact of PF, GDPPER, Arableland, Agrivalue and HDI variables on environmental health, ecosystem vitality and EPI Indicators are the same. However, there are some differences in other cases.

Political freedom has a positive and significant effect on both EPI and the ecosystem vitality index, but its effect on the index of environmental health is insignificant. Legal and social pressures for environmental protection increase in society with political freedom and it leads to improvement of the EPI and environmental vitality index, but the per capita income index is more important in improving the environmental health index. In some countries of the MENA region, such as the UAE, Saudi Arabia, and Qatar, which have high per capita income and low democracy, the environmental health index has a favorable situation.

Economic freedom index have a positive effect on the environmental health index, but it has a negative effect on the ecosystem vitality index. It seems that the economic growth resulting from economic freedom leads to the improvement of the health status of the society and the increase of the environmental health index; On the other hand, economic growth in the initial stages requires more use of natural resources; Over-harvesting of resources destroys the environment and reduces the vitality ecosystem index.

Trade freedom has a positive relationship with the environmental health index, but it has no significant relationship with the ecosystem vitality index. It is interpreted that trade freedom improves the living conditions and the health status of the society, but the effect of trade freedom on the vitality index of the ecosystem is neutralized by the mutual effects of export and import. In order to increase exports, resources are used inappropriately, and on the other hand, imports lead to the optimal allocation of resources, and it reduces the country's need to produce items that do not have an advantage.

Also, the findings of Table 9 show that percent of the population in the largest cities and energy intensity have a contradictory effect on the EPI; So that Increasing urbanization and energy availability improve environmental health (such as Access to comfort facilities and equipment, safe drinking water and municipal sewage system), But instead they disturb the ecosystem.

Climate change index is another important component of the EPI. In recent decades, the trend of climate change and the destructive consequences of this phenomenon on the planet has increased significantly. This incident has

led to the issue of climate change becoming an important concern for human society. The effect of explanatory variables on climate change index is reported in Table 10.

Table 10- The relationship between freedom indices and climate change

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-85.41610	14.99948	-5.694604	0.0000
EF	-0.273672	0.111626	-2.451686	0.0148
TF	-0.024835	0.041797	-0.594193	0.5529
PF	-2.619629	0.729369	-3.591639	0.0004
GDPPER	-1.428173	0.442175	-3.229882	0.0014
GDPPER^2	0.012296	0.004529	2.715083	0.0070
ARABLELAND	3.345552	0.562087	5.952022	0.0000
ENERGY	-1.660298	0.515555	-3.220408	0.0014
EXPORTINDEX	-0.073566	0.013106	-5.613338	0.0000
AGRIVALUE	0.274953	0.136838	2.009340	0.0455
PLC	-0.702250	0.127117	-5.524436	0.0000
HDI	131.8315	15.86835	8.307829	0.0000
R-squared	0.680745	Mean dependent var		36.43914
Adjusted R-squared	0.653670	S.D. dependent var		18.00642
S.E. of regression	7.566972	Sum squared resid		16204.32
F-statistic	25.14325	Durbin-Watson stat		1.375525
Prob(F-statistic)	0.000000			

Source: research findings

The findings show that the variables of political freedom, Arable land, Agrivalue and HDI have a positive and significant effect on climate change index. These findings are compatible with the studies of Callejas (2010), Rana Alaa *et al*. (2017), Filimonova *et al*. (2020) and Babaki and Elyaspour (2021). These relations are interpreted as follows: Increasing awareness, transparency, rule of law in society (through political freedom) reduces the negative external consequences of greenhouse gas emissions. The percentage of arable land and the agriculture value added are indicators for the greenness and mildness of the climate, which lead to the improvement of the quality of the climate. HDI index, education increases people's awareness and attention to health and the environment, and therefore they put pressure on the government to create laws and regulations to protect the environment. And finally in developed countries with high HDI, society is more sensitive to climate quality and therefore the pressure of public opinion leads to the prevention of high emissions of greenhouse gases. According to the model coefficients showed in Table 10, there is a negative and significant relationship between FE, GDP per capita, Energy intensity, Export index and PLC with climate change. These relationships can be interpreted as follows: Economic freedom tends to boost domestic production and attract foreign direct investment (FDI), thereby promoting economic development. However, in the specific context of this study area, FDI predominantly occurs in the oil and petrochemical industries. As a result, one negative consequence of this economic activity is an increase in air pollution and greenhouse gas emissions. Moreover, in line with the earlier discussion, the process of industrialization in developing countries often yields a paradoxical effect. This means that the shift from traditional production methods to modern ones leads to an increase in GDP per capita, urbanization, exports, and energy consumption. However, it also places significant pressure on natural resources, contributes to environmental degradation, and results in higher emissions of pollutants.

Conclusion

According to the theory, political, economic and commercial freedoms are factors affecting the environmental performance index (EPI). In this study, the relationships between variables were experimentally tested using data from 14 countries in the MENAT region during the years 2000-2020. To control other influencing

variables, variables of GDP per capita, Human Development Index, urban population ratio, export ratio, value added ratio of agricultural sector and energy intensity were entered into the model. And the final model was estimated by panel data method.

The results of the estimations show that political freedom has a positive and significant effect on EPI, ecosystem vitality and climate change index. However political freedom does not have a significant effect on the environmental health index. Therefore, the existence of political freedom in society causes the awareness and action of the society against the destruction of the environment, and it also increases the efficiency of environmental policies and regulations, and ultimately improves the quality of the environment and reduces pollution. In general, the existence of democracy leads to good governance, which can lead to the protection, maintenance, and preservation of the environment as a public good. However political freedom has no significant effect on improving environmental health. In this case, GDP per capita growth is a more important factor in improving health infrastructure such as safe drinking water and sewage system.

Moreover, the estimation results show that economic freedom has a positive and significant effect on EPI and environmental health index; and it has a negative and significant effect on the ecosystem vitality index and climate change index. Economic freedom leads to the development of businesses and GDP per capita growth, and according to Kuznets' theory, it improves the EPI and the environmental health index. However more economic growth due to the improvement of the business environment in competitive conditions may increase the use of resources significantly. Although it is expected that by creating a competitive environment, the consumption of resources especially energy, will be saved and used efficiently, but this does not happen because energy (through subsidies) is provided at prices much lower than the global prices in most countries of this region. Therefore, the necessity of saving and efficient allocation of fossil fuels is not felt less by consumers and producers. Also, economic freedom facilitates investment platforms for foreign investors, thus increasing foreign direct investment (FDI) in the country. However foreign investment is mostly done in the oil and gas sector and related industries because there are abundant reserves of oil and gas in MENA countries and ultimately through the creation of effluents and emissions of gases lead to water, soil and air pollution. Therefore, they degrade the indicators of ecosystem vitality and climate change. It seems that economic freedom has an improving effect on the previous indicators in developed countries through more efficient allocation of resources.

The study's findings indicate that there is no significant relationship between trade freedom and the Environmental Performance Index (EPI), ecosystem vitality, or climate change. However, a positive and significant relationship exists between trade freedom and the Environmental Health Index. From a theoretical standpoint, trade freedom is associated with several positive effects. It can lead to improved allocation of domestic resources, facilitate technology transfer, and promote the transition from older, polluting industries to cleaner ones. Consequently, this can contribute to an overall enhancement in environmental quality. However, it's worth noting that some argue that trade freedom might lead to the relocation of polluting industries from wealthier countries to host countries, potentially resulting in environmental harm to the latter. The statistical findings of this study suggest that trade freedom in MENA countries has not had a detrimental impact on the environment. It's important to consider that many countries in this region are both oil exporters and importers of various goods, and the level of foreign investment in their industrial sectors tends to be relatively low. Therefore, positive, and negative external consequences do not strongly affect the environment. But on the other hand, trade liberalization has improved the living conditions in these countries and therefore had a positive effect on the environmental health

index. Also, the findings show that some control variables have a significant effect on dependent variables. In particular, the theoretical relationship and causality between HDI and EPI have been investigated in several experimental studies. The findings of this study are consistent with the results of previous studies and confirm most of the results of previous studies. So that HDI has a positive and significant effect on EPI as well as on its parts (ecosystem vitality, environmental health and climate change). In contrast, the GDP per capita effect is not the same between different studies. It means that per capita GDP per capita has not had a significant effect on EPI and the vitality of the ecosystem, while it has a positive effect on environmental health and a negative effect on climate change. This situation is explained by the U-shaped effect of the Kuznets theory. In MENA countries (as developing countries), climate change is in the downward part of the curve and environmental health is in the upward part of the curve, and in this regard, EPI and ecosystem vitality are in the lower part of the U curve. Finally, the two variables of energy intensity and the ratio of exports to GDP per capita have a negative effect on the EPI and its parts (ecosystem vitality, environmental health, and climate change). This result is logical and compatible with theoretical foundations.

References

1. Adesina, K.S., & Mwamba, J.W.M. (2019). Does economic freedom matter for CO_2 emissions? Lessons from Africa. *The Journal of Developing Areas, 53(3).* https://doi.org/1353/jda.2019.0044
2. Adkins, L.G., & Garbaccio, R.F. (2007). *Coordinating global trade and environmental policy: The role of pre-existing distortions*. National Center for Environmental Economics, U.S. Environmental Protection Agency. Washington, D.C., United States.
3. Antweiler, W., Copeland, B.R., & Taylor, M.S. (2001). Is free trade good for the environment? *The American Economic Review, 91(4)*, 877-908.
4. Asteriou, D., & Hall Stephen, G. (2021). *Applied Econometrics*, Bloomsbury Publishing, Edition 4.
5. Babaki, R., & Elyaspour, B. (2021). The effect of economic freedom on environmental quality in OPEC countries (by using Panel-ARDL Approach). *Journal of Economics and Regional Development*, *27*(20): 74-100. (In Persian with English abstract). https://doi.org/10.22067/erd.2021.18828.0
6. Berggren, N., & Bjørnskov, Ch. (2021). *Academic Freedom, Institutions and Productivity*. Working Paper Series 1405, Research Institute of Industrial Economics.
7. Bernauer, Th., & Vally, K. (2013). Are bigger governments better providers of public goods? Evidence from Air Pollution. *Public Choice*, *156*(3/4), 593–609. (Available at http://www.jstor.org/stable/42003175).
8. Bjørnskov, Ch. (2020). *Economic freedom and the CO_2 Kuznets curve, IFN working paper*, o.1331, Research Institute of Industrial Economics (IFN), Stockholm.
9. Callejas, D.G. (2010). *Democracy and environmental quality in Latin America: A panel system of equations Approach,* 1995-2008, Borradores Departamento de Economía. No. 36.
10. Carlsson, F., & Lundström, S. (2002). Economic freedom and growth: decomposing the effects. *Public Choice*. *112*, 335–344. https://doi.org/10.1023/A:1019968525415
11. Carlsson, F., & Lundström, S. (2003). *The effects of economic and political freedom on CO_2 Emissions*. Working Papers in Economics no 29. (Available at https://gupea.ub.gu.se/bitstream/2077/2807/1/gunwpe0029v3.pdf)
12. Chang, Sh., & Wang, H. (2012). *Effects of economic freedom and income on CO_2*. 2nd International Conference on Management, Economics and Social Sciences, (ICMESS'2012), Bali.
13. Congleton, R.D. (1992). Political institutions and pollution control. *Review of Economics and*

Statistics, *74*, 412–421.
14. Copeland, B.R., & Taylor, M.S. (1995). Trade and environment: a partial synthesis. *American Journal of Agricultural Economics*, *77*, 765–771.
15. Dinda, S. (2004). Environmental Kuznets Curve Hypothesis: A Survey. *Ecological Economics, 49(*4), 431-455. https://doi.org/10.1016/j.ecolecon.2004.02.011
16. Dinda, S. (2009). *Environmental externality, knowledge accumulation based technology lead economic growth*. Working Paper April 15.
17. Farzanegan, M.R., & Markwardt, G. (2018). Development and pollution in the Middle East and North Africa: Democracy matters. *Journal of Policy Modeling*, *40*(2), 350-374. (In Persian with English abstract). https://doi.org/10.1016/j.jpolmod.2018.01.01
18. Filimonova, I.V., Provornaya, A.V., Komarova, E.A., Zemnukhova, M.V., & Mishenin. (2020). Influence of economic factors on the environment in countries with different levels of development, *Energy Reports*, *6*(1), 27-31. https://doi.org/10.1016/j.egyr.2019.08.013
19. Gleditsch, N.P., & Bjorn, O.S. (2003). *Democracy and the environment*. In Human Security and the Environment: International Comparisons. Edited by Edward Paper and Michael Redclift. London: Elgar.
20. Global Carbon Atlas, CO_2 Emissions. (2020). (www.globalcarbonatlas.org. Retrieved 2020-04-10)
21. Hardin, G. (1968). The tragedy of the commons, *Science, 162*, 1243–1248.
22. Harrison, A. (1996). Openness and growth: a time-series, cross country analysis for developing countries. *Journal of Development Economics*, *48*, 419–447.
23. Hsu, A., & Zomer, A. (2016). *Environmental performance index*. In Wiley Stats Ref: Statistics Reference Online (eds N. Balakrishnan, T. Colton, B. Everitt, W. Piegorsch, F. Ruggeri and J.L. Teugels). https://doi.org/10.1002/9781118445112.stat03789.pub2
24. Jafariparvizkhanlou, K. (2020). The impact of political and economic freedom on CO_2 emission and EKC in Neighbor Countries of IRAN. *Journal of Environmental Science Studies*, *5*(2), 2504-2512. (In Persian with English abstract)
25. Joshi, P., & Beck, K. (2018). Democracy and carbon dioxide emissions: assessing the interactions of political and economic freedom and the environmental Kuznets curve. *Energy Research & Social Science*, *39*, 46–54. https://doi.org/10.1016/j.erss.2017.10.020
26. Lee, H., & Roland-Holst, D. (1997). The environment and Welfare implication of trade and tax policy. *Journal of Development Economics*, *52*(1), 65-82.
27. Li, Q., & Reuveny, R. (2006). Democracy and environmental degradation. *International Studies Quarterly*, *50*(4), 935–956.
28. Lotfalipour, M.R., Falahi, M.A., & Ashena, M. (2010). Economic growth, CO_2 emissions, and fossil fuels consumption in Iran. *Energy*, 35, 5115-5120. (In Persian with English abstract). http://dx.doi.org/10.1016/j.energy.2010.08.004
29. Magnani, E. (2000). The environmental Kuznets curve, environmental protection policy and income distribution. *Ecological Economics, 32*(3), 431-443. https://doi.org/10.1016/S0921-8009(99)00115-9
30. Mani, M., & Wheeler, D. (1998). In search of pollution havens? Dirty industry in the world economy: 1960– 1995. *Journal of Environment and Development, 7*(3), 215–247.
31. Miller, T., Kim, A., Roberts, B., & James, M. (2022). Index of Economic Freedom, the heritage foundation. (Available at https://www.heritage.org/index/pdf/2022/book/2022_IndexOfEconomicFreedom_FINAL.pdf)
32. Norton, W. (1998). *Property rights, the environment, and economic well-being*. In Who Owns the Environment? Peter J. Hill and Roger E. Meiners. Lanham, MD: Rowman & Littlefield, pp. 37–54.
33. Olasky, S., Kling, C., Levin, S., Carpenter, S., Daily, G., Ehrlich, P., Heal, G., & Lubchenco, J.

(2019). Role of economics in analyzing the environment and sustainable development. *Proceedings of the National Academy of Sciences*, *116*, *5233-5238*. https://doi.org/10.1073/pnas.1901616116

34. Payne, R. (1995). Freedom and the Environment. *Journal of Democracy*, *6*, 41–55.
35. Pourali, A., Falahi, M.A., & Naji Meydani, A.A. (2019). The study of human development dimensions (education, health, and welfare) effects on environmental performance index. *Environmental Education and Sustainable Development*, *8*(1), 9-22. (In Persian with English abstract). https://doi.org/10.30473/ee.2019.6322
36. Pourali, A., Falahi, M.A., & Naji Meidani, A.A. (2019). The effects of good governance and political-civil liberties indices on environmental performance index (EPI): An analysis of 101 countries worldwide. *Journal of Economics and Regional Development*, *26*(17): 63-94. https://doi.org/10.22067/erd. v26i17.69596. (In Persian with English abstract)
37. Alaa Abbass, R., Kumar, P., & El-Gendy, A. (2017). An overview of monitoring and reduction strategies for health and climate change related emissions in the Middle East and North Africa Region. *Atmospheric Environment*, *175*, 33-43. https://doi.org/10.1016/j.atmosenv.2017.11.061
38. Rapsikevicius, J., Bruneckiene, J., Lukauskas, M., & Mikalonis, S. (2021). The impact of economic freedom on economic and environmental performance: evidence from European countries. *Sustainability*, *13*, *2380*. https://doi.org/10.3390/su13042380
39. Reppelin-Hill, V. (1999). Trade and environment: an empirical analysis of the technology effect in the steel industry. *Journal of Environmental Economics and Management*, *38*, 283–301.
40. Sart, G., Bayar, Y., Danilina, M., & Sezgin, FH. (2022). Economic freedom, education and CO_2 emissions: A causality Analysis for EU Member States. *International Journal Environ Res Public Health*, *19*(13): *8061*. https://doi.org/10.3390/ijerph19138061
41. Schultz, C.B., & Crockett, T.R. (1990). Economic development, democratization, and environmental protection in Eastern Europe. *Boston College Environmental Affairs Law Review, 18*, 53–84.
42. Shahabadi, A., Samari, H., & Nemati, M. (2017). The factors affecting environmental performance index (EPI) in selected OPEC countries. *Iranian Economic Review*, *21*(3): 457-467. (In Persian with English abstract). https://doi.org/10.22059/ier.2017.62925
43. Stern, D.I. (2018). The environmental Kuznets curve, Reference Module in Earth systems and environmental sciences, Elsevier. https://doi.org/10.1016/B978-0-12-409548-9.09278-2
44. Weiss, E.B., & Jacobsen, H.K. (1999). Getting countries to comply with international agreements. *Environment*, *41*, 16–23.
45. Wolf, M.J., Emerson, J.W., Esty, D.C., de Sherbinin, A., & Wendling, Z.A. (2022). *Environmental performance index*. New Haven, CT: Yale Center for Environmental Law & Policy. epi.yale.edu.
46. Wood, J., & Herzog, I. (2014). *Economic freedom and air quality*. Fraser Institute, Vancouver, Canada, April. Available at SSRN: https://ssrn.com/abstract=2539809
47. Zhang, Y., & Wu, Z. (2022). Environmental performance and human development for sustainability: Towards to a new Environmental Human Index. *Science of the Total Environment*, *838*(4), *156491*. https://doi.org/10.1016/j.scitotenv.2022.156491

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آزادی و عملکرد زیست محیطی: شواهد از کشورهای MENAT

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چکیده

کیفیت محیطزیست و عوامل تعیین کننده آن یکی از چالش‌های اصلی حال و آینده بشریت است و توسعه پایدار در راستای حفظ و بهبود محیطزیست تفسیر می‌شود. در سال‌های اخیر مطالعات زیادی در مورد عوامل موثر بر کیفیت محیطی انجام شده است. یکی از موضوعات اصلی که در مطالعات مرتبط کمتر مورد توجه قرار گرفته است، تأثیر حاکمیت بر کیفیت محیطزیست است. در این مطالعه تأثیر مؤلفه‌های حکمرانی خوب شامل آزادی اقتصادی، آزادی تجاری و آزادی سیاسی بر شاخص عملکرد زیست‌محیطی (EPI) و زیرشاخص‌های آن شامل سلامت محیط، سرزندگی اکوسیستم و تغییرات آب و هوایی بررسی می‌شود. داده‌های مورد نیاز برای تجزیه و تحلیل آماری مربوط به کشورهای منطقه خاورمیانه و شمال آفریقا و ترکیه (MENAT) طی سال‌های ۲۰۰۰-۲۰۲۱ می‌باشد. برای برآورد مدل و بررسی رابطه بین متغیرها از روش داده‌های پانل استفاده شده است. یافته‌ها نشان می‌دهد که بین آزادی اقتصادی و آزادی سیاسی با شاخص عملکرد محیطی (EPI) رابطه مثبت و معناداری وجود دارد و بین آزادی تجاری و EPI رابطه معناداری وجود ندارد. همچنین مشخص شد که آزادی اقتصادی تأثیر منفی بر سرزندگی اکوسیستم و تغییرات آب و هوایی دارد، اما تأثیر مثبتی بر سلامت محیطزیست داشته است. همچنین آزادی سیاسی بر سرزندگی اکوسیستم و تغییرات اقلیمی تأثیر مثبت دارد، اما تأثیر قابل توجهی بر سلامت محیطزیست ندارد. نتایج این تحقیق نشان داد که آزادی اقتصادی منجر به سرمایه‌گذاری بیشتر در بخش نفت و گاز کشورهای مذکور شده است و بنابراین انتشار فاضلاب و گاز تاثیر منفی بر حیات محیطزیست و تغییرات آب و هوایی داشته است، اما با افزایش تولید و فروش نفت و گاز، درآمد سرانه کشورها افزایش یافته و بهداشت محیط بهبود یافته است. همچنین با توجه به اینکه آزادی سیاسی در میان منطقه خاورمیانه و شمال آفریقا از تنوع زیادی برخوردار است، نتایج نشان داد که کشورهای دارای آزادی سیاسی بیشتر، از طریق آگاهی بیشتر جامعه و پاسخگویی بیشتر دولت‌ها و وضع قوانین حفاظت از محیط زیست، از وضعیت محیط زیست بهتری برخوردار بوده‌اند. البته شاخص بهداشت محیط بیشتر تحت تأثیر وضعیت اقتصادی و تولید سرانه کشورهاست و آزادی سیاسی تأثیر چندانی بر آن ندارد.

واژه‌های کلیدی: آزادی اقتصادی، آزادی سیاسی، عملکرد زیست محیطی

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