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# Measuring The Effects of Learning's Intensity and Scale Economies in Health Sector Cost of World Countries

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## Extended abstract

### 1- Introduction

Learnig by doing which has a central place in economy, refer to the concept that worker's ability and skills increase over time due to the repetition of a particular task, and this causes the cost of each level of production to decrease over time. This concept was introduced by Arrow to explain the effects of innovation and technological change, and as a stimulus for endogenous economic growth and development. According to him, learning in productive activities and the accumulation of gross investment is a catalyst for the experience (levitt, et al., 2013). This discussion emerged in Wright's research, at the time planners were looking for a way to predict the cost of building ships and aircraft. In Wright's study, the learning process is reported as an asymmetric relation between the average cost of production and congestion production, and this process is achieved when the workforce repeats an activity over time, and by doing it repeatedly, its skill and ability increase. This leads to higher efficiency and the identification of a predictable pattern for cost reduction in each sector (Glock, et al., 2019).

In modern economic analysis, the learning process is classified into individual and organizational learning and a distinction is made between intra- and extra-organizational learning. In the individual learning process, in which individuals acquire the necessary skills and abilities through experience, the experience will be a by-product or joint product of the production of goods and services and is achieved by investing in labor, training programs, and research and development (R & D) projects. This process can create external savings by sharing learning and developing knowledge to other sectors

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while improving workers' performance and saving on production costs (Jaber, 2016).

## 2- Theoretical Framework

The literature on the process of learning and economies of scale, which has always been considered in psychological, management, economic, and medical research, is based on the principle that people learn, through education and gaining experience and knowledge, how to have a better performance at a lower cost by saving time or increasing production (Nembehard, et al., 2019). Lucas defines this concept to explain the increase in the return on disembodid capital in human resources and believes that learning by doing is as effective as academic education in the formation of human capital (Levitt, et al., 2013). Plaza and Rohlf have argued that learning and knowledge development is a kind of intra-sectoral investment that will reduce production costs and induce economic growth because learning is essential with the increased investment in new machinery to use advanced and innovative technology, which in turn will increase productivity and reduce production costs (Plaza & Rohlf, 2008). Currently, the learning process is measured and evaluated using the learning curve as an efficient tool to show the development of employee's performance through experience. This curve is widely used in production planning, forecasting, cost estimation, and budgeting of organizations and sub-sectors (Ferioli, et.al., 2009).

## 3- Methodology

The present study evaluated two static and dynamic aspects of cost advantage in health sectors of world countries. Thus, this study was a descriptive-analytical study that employed panel data regression. It should be noted that to develop an econometric model by default, costs were minimized according to the Cobb-Douglas production function and by replacing the input demand in the cost equation, the cost function fitting the Cobb-Douglas production function was obtained (Bahk& Gort., 1993). Moreover, to estimate the model developed based on the average cost data of the health sector, the number of people who received the minimum health services and the cumulative population of people from the beginning of the period to year t-1 was calculated based on the data from the World Bank database. the sample included 187 world countries. In fact, this study sought to evaluate the effect of economies of scale and learning in the health sector, it needed a well-organized model to distinguish the effects of learning and returns to scale from their effects on the cost of each unit of production. Thus, the Cobb- Douglas exponential production function with three variable inputs was used to extract the dual cost function and integrate its production function with the learning curve.

## 4- Results & Discussion

The results indicated that, economies of scale have been achieved in the health sectors of the world counties and it has been completely exhausted. Beacase, in the world countries the production coefficient is insignificant, so the return to scale was constant and close to one. In addition to, the learning process has been realized at a rate of 0.46. This implies that by increasing the number of people receiving the minimum health care, it is possible to reduce costs significantly in the health care sector. Also, With the development of knowledge and increasing experience in nearly 60% of countries, it is still possible to take advantage of economies of learning.

## 5- Conclusions & Suggestions

Learning and economies of scale rates are two static and dynamic aspects of cost advantage, and they are different in world countries. However, in these countries,

both components play an effective role in reducing costs. Nevertheless, the role of economies of scale in reducing costs is almost constant, but the economies of learning played the important role in reducing expenditures in the health sector. So, the effects of economies of scale and learning can play a key role in reducing costs in world countries.

In this study, it is recommended to expand human capital learning through the development of physicians and health services personnel training, providing the staff participation in specialized programs.

It is suggested to implement training programs for treatment managers and to employ committed managers with higher knowledge and expertise, to participate in international conferences, and to prepare programs to improve the skills and abilities of different departments of the medical staff.

**Key Words**: Learning-by-doing Curve, Scale Economies, Healthcare, Knowledge Density, Experience.
**JEL Classification:** I11, L10, D49

**References**

[1] Bahk, B. H., & Gort, M. (1993). *Decomposing Learning by Doing in New Plants*. Journal of Political Economy, 101(4), 561-583.

[2] Ferioli, F., Schoots, K., & Van Der Zwaan, B. C. (2009). *Use and Limitations of Learning Curves for Energy Technology Policy: A Component-Learning Hypothesis.* Energy policy, 37(7), 2525-2535.

[3] Glock, C. H., Grosse, E. H., Jaber, M. Y., & Smunt, T. L. (2019). *Applications of Learning Curves in Production and Operations Management: A Systematic Literature Review*. Computers & Industrial Engineering, 131, 422-441.

[4] Jaber, M. Y. (2016). *Learning Curves: Theory, Models, and Applications*: CRC Press.

[5] Levitt, S. D., List, J. A., & Syverson, C. (2013). *Toward an Understanding of Learning by Doing: Evidence from an Automobile Assembly Plant.* Journal of Political Economy, 121(4), 643-681.

[6] Nembhard, D. A., & Sun, Y. (2019). *A Symbolic Genetic Programming Approach for Identifying Models of Learning-by-Doing.* Computers & Industrial Engineering, 131, 524-533.

[7] Plaza, M., & Rohlf, K. (2008). *Learning and Performance In ERP Implementation Projects: A Learning-Curve Model for Analyzing and Managing Consulting Costs.* International journal of production economics, 115(1), 72-85.

# Estimation of the Trade Potential of Ceramic and Glass Products in Iran and CIS (Based on the Gravity Model)

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**Extended Abstract**

**1- Introduction**

An overview of the main suppliers of important imported goods in the CIS group shows that Iran is one of the main producers of ceramic products and glass products in the growing market of this region due to its comparative advantage and Iranian companies have a large capacity to meet the needs of CIS countries. In this regard, the present article analyzes the factors affecting the trade of ceramic products and glass products by HS codes as described in HS68, HS69 and HS70 in CIS trade partners (which includes the Republic of Azerbaijan, Armenia, Russia, Kyrgyzstan and Kazakhstan). The data covers the 2009-2019 period, and a panel data model is estimated by using methods of ordinary least squares, fixed effects and random effects.

**2- Theoretical Framework**

After the end of World War II, international trade grew faster, so that in recent years the world trade has grown largely faster than world production. Meanwhile, the share of developed countries in trade has been growing more than the total trade. Analysis of trade flows between countries showed that the exports with an emphasis on industrial goods is increasing in all countries. As trade growth increased, various models were introduced to explain business flows, the most practical of which was the Gravity model, which is widely used in international trade to explain business flows, to determine business potential, and to examine the effects of integration on Bilateral trade, etc. The gravity model is a simple model for analyzing bilateral business flows between geographic entities. In the 1980s, gravity models showed that economic growth, productivity, human capital, and economic freedom were

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among the factors influencing trade. They also showed that trade is affected by factors such as conditions in the origin country, economic scale, differences in the stock of factors of production or technology.

**3- Methodology**

The general form of the gravity model is:

$$T_{ijt} = f(Y_{it}, Y_{jt}, Z_{ijt}, u_{ijt})$$

Where Tijt is the trade volume of ceramic products and glass products from country i to country j, yit is the GDP of the exporting country, Yjt is the GDP of the importer country, Zijt denotes variables affecting the flow of trade such as distance between countries (in kilometers), trade imbalances, etc., uijt is a random disturbance term iid (normally and independently distributed). In order to facilitate the estimation, the above model was linearized as follows. $\beta, \gamma, \delta$ represent elasticities. The logarithmic form of the formulated gravity model is:

$$\ln T_{ijt} = \alpha + \beta \ln Y_{it} + \gamma \ln Y_{jt} + \sum_{k=1}^{2} \delta_{tk} \ln Z_{ijtk} + u_{ijt}$$

$$i = 1,\ldots,m;\ j = 1,\ldots,n;\ t = 1,\ldots,\Theta,\ k = 1,\ldots,2$$

where Tijt is the trade volume of ceramic products and glass products of country i to country j. yit is the GDP of the exporter country. This variable represents the size of the economy of the exporting countries. yjt is the GDP of the importer country. This variable represents the size of the economy of the importer country. $Z1_{ij}$ is the degree of trade imbalance between the exporting country and the importing countries:

$$Z1_{ij} = \frac{|x_{ijt} - m_{ijt}|}{(x_{ijt} + m_{ijt})}$$

Where ( $x_{ijt}$) export (import) of country i to (from) country j at time t. $Z2_{ij}$ is the distance between the exporter country and the importer country and $u_{ijt}$ represents the random disturbance term iid (normally and independently distributed ).

**4- Results & Discussion**

The model is estimated by conventional least squares method, fixed effects and random effects by commodity groups HS68 (ceramic products, glassware and glass products), HS69 (ceramic products) and HS70 (glassware and glass products), for CIS countries, by using STATA14 software. the estimation results are presented in the following three tables.

**Table1. Results of gravity model estimation for HS68 group by different panel methods**

| variable | *Method* | | | | | |
|---|---|---|---|---|---|---|
| | *OLS* | | *FE* | | *RE* | |
| | *Coef.* | *SE* | *Coef.* | *SE* | *Coef.* | *SE* |
| $\ln(Y_i)$ | 1.58 | 0.33 | 1.33 | 0.33 | 1.94 | 0.34 |
| $\ln(Y_j)$ | 1.45 | 0.34 | 1.23 | 0.33 | 1.94 | 0.26 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\ln(Z1)$ | 0.06- | 0.04 | 0.02- | 0.04 | 0.03- | 0.03 |
| $\ln(Z2)$ | 0.17- | 0.04 | 0.16- | 0.04 | 0.16- | 0.04 |
| *Constant* | 0.07- | 0.04 | 0.05 | 0.03 | 0.02- | 0.03 |

**Table2. Results of gravity model estimation for HS69 group by different panel methods**

| variable | *Method* | | | | | |
|---|---|---|---|---|---|---|
| | *OLS* | | *FE* | | *RE* | |
| | *Coef.* | *SE* | *Coef.* | *SE* | *Coef.* | *SE* |
| $\ln(Y_i)$ | 0.53 | 0.09 | ۰.۵۵ | 0.13 | 0.56 | 0.12 |
| $\ln(Y_j)$ | 1.23 | 0.33 | 1.32 | 0.24 | 1.44 | 0.26 |
| $\ln(Z1)$ | -0.16 | 0.04 | -0.24 | 0.04 | -0.21 | 0.04 |
| $\ln(Z2)$ | -0.23 | 0.04 | -0.24 | 0.06 | -0.23 | 0.06 |
| *Constant* | -0.03 | 0.03 | 0.03 | 0.03 | -0.04 | 0.04 |

**Table3. Results of gravity model estimation for HS70 group by different panel methods**

| variable | *Method* | | | | | |
|---|---|---|---|---|---|---|
| | *OLS* | | *FE* | | *RE* | |
| | *Coef.* | *SE* | *Coef.* | *SE* | *Coef.* | *SE* |
| $\ln(Y_i)$ | 0.56 | 0.22 | 0.62 | 0.25 | 0.62 | 0.52 |
| $\ln(Y_j)$ | 1.22 | 0.16 | 1.14 | 0.33 | 1.31 | 0.32 |
| $\ln(Z1)$ | -0.12 | 0.04 | -0.15 | 0.04 | -0.22 | 0.04 |
| $\ln(Z2)$ | -0.02 | 0.04 | -0.16 | 0.04 | -0.04 | 0.04 |
| *Constant* | -0.07 | 0.03 | 0.05 | 0.03 | -0.04 | 0.03 |

## 5- Conclusions & Suggestions

To estimate the value of trade between countries, a differential gravity model of bilateral trade flows was formulated and estimated with panel data from 2009 to 2019 for each of the commodity groups HS68 (ceramic products, glass and glass products), HS69 (ceramic products) as well as HS70 (glass and glass products). The parameters were estimated with a large database by using ordinary least squares, fixed-effects and random-effects methods. For the three commodity groups, the results were stable across methods. For HS68, exports were elastic with respect to the gross domestic product (GDP) of exporters and importers GDP. For HS69, exports were inelastic with respect to the exporters GDP and elastic with respect to importers GDP. Exports of HS70 were inelastic with the exporters GDP and elastic with respect to the importers. Results show that geographical distance and trade imbalance is negative and significant; trade increases if the transportation costs decrease. We also introduce the economic dimension and income per-capita; these proxies confirm the positive effects in bilateral trade.

**Keywords:** Gravity Model, Ceramic products, Glass products, Commercial potential, International trade.

**JEL Classification:** $F_{10}, F_{13}, F_{15}$

**References**

[1] Anderson J E (1979), "A Theoretical Foundation for the Gravity Equation", theAmericanEconomic 69 (1), 106-116.

[2] Azarbayjani, K. & Karimi Hasanjeh, H. (2003). "Globalization, Economic Integration and the Most Appropriate Trade-Regional Arrangements for the Iranian Economy (Opportunities and Challenges)", Information Technology Center, University of Isfahan. (In Persian).

[3] Badinger, H. & Breuss F. (2008), "Trade and productivity: an industry perspective,"Empirica, 35, 213-231.

[4] Balassa, B. (1966), "Tariff Reductions and Trade in Manufactures among Industrial Countries", American Economic Review, 56(3), 466-473.

[5] Balassa, B, & Bauwens L. (1987), "Intra-Industry Specialization in Multi-Country and Multi-Idustry Framework", the Economic Journal, 923-939.

[6] Baltagi, B.H.; Egger, P., & Pfaffermayr, M.(2003), "A Generalized Design for Bilateral TradeFlow Models", Economics Letters, 80, 391-7.

[7] Bergstrand, H. (1985), "The Gravity Equation in International Trade: Some MicroeconomicFoundations and Empirical Evidence", Review of Economics and Statistics, 67(3), 474-481.

[8] Caves, E. (1981), "Intra-Industry Trade and Market Structure in Industrial Countries", OxfordEconomic Papers, 203-223.

[9] Clark, D, & Stanley, D. (2003), "Determinants of Intra- Industry Trade Between the UnitedStates and Industrial Nations", International Economic Journal 17 (3), 1-17.

[10] Deradorff, A (1998), "Determinants of Bilateral Trade: Does Gravity Work in NeoclassicalWorld?", NBER Chapters in The Regionalization of the World Economy, 7-32.

[11] Eichengreen, B, & Irwin D. (1998), "The Role of History in Bilateral Flows", TheRegionalization of the World Economy in Jeffrey A. Frankel (Ed), University of Chicago, Press.

[12] Egger, P.(2002), " An Econometric View on the Estimation of Gravity Models and theCalculation of Trade Potentials", World Economy, 25, 297-312.

[13] Evans, E., & Harrigan, J. (2005), "Distance Time, and Specialization: Learn Retailing inGeneral Equilibrium", American Economic Review 95 (1): 292-313.

[14] Fidrmuc, J. (2004), "The Endogeneity of the Optimum Currency Area Criteria, Intra-IndustryTrade, and EMU Enlargement", Contemporary

Economic Policy, 22(1), 1-12.
[15] Frankel, J. & Rose, A. (1998), "The Endogeneity of the Optimum Currency Area Criteria", the Economic Journal 108, 1009-1025.
[16] Gholami, Ali, (2006), Analysis of the effects of trade liberalization of the Islamic Republic of Iran with Muslim countries (implications of the model of gravity), Andisheh Sadegh Quarterly, Imam Sadegh University Research Center, Vol. 22, pp. 26-3. (In Persian).
[17] Grubel, H (1967)," Intra – Industry Specialisation and the Pattern of Trade ", Canadian Journalof Economics and Political Science, 33 (3), 374-388.
[18] Grubel, H (1970), "The Theory of Optimum Currency Areas", the Canadian Journal ofEconomics", 3(2), 318-324.
[19] Grossman, G, & Helpman, E. (2005), "A Protectionist Bias in Majoritarian Politics", Quarterly Journal of Economy 120, 139-1282.
[20] Gupta, R.; Gozgor, G., & Kaya, H. Effects of geopolitical risks on trade flows: evidence from the gravity model. Eurasian Econ Rev 9, 515–530 (2019). *https://doi.org/10.1007/s40822-018-0118-0*
[21] Jalaei, S.A. & Soleimani, S. (2006). "Iran's Trade Integration with ECO Member States: Application of an Attraction Model", Economic Research, No. 4. (In Persian).
[22] Helpman, E, and Krugman, P. (1985), "Market Structure and Foreign Trade", Brighton, UK: Harvester Wheatsheaf.
[23] Helpman, E. (1987), "Imperfect Competition and International Trade: Evidence from fourteenIndustrial Countries", Journal of Japononese International and International Economics, 1(1),62-81.
[24] Hummels, D. & Levinshon, J. (1995), "Monopolisitc Competition and International Trade: Reconsidering the Evidence", Quarterly Journal of Economics, 110 (3),736-799.
[25] Kuik, O.; Branger, F. & Quirion, P. (2019), "Competitive advantage in the renewable energy industry: Evidence from a gravity model", Renewable Energy, Vol. 131, pp. 472–481.
[26] Lucas, R. Jr. (1988), "On the Mechanics of Economic Development", Journal of MonetaryEconomics, 22 (1), 3-42.
[27] Leitão, N.C., & Faustino, H. (2010), "Portuguese Foreign Direct Investment Inflows: AnEmpirical Investigation", International Research Journal of Finance and Economics, 38, 190-197.
[28] Leitão, N.C.; Faustino, H., & Yoshida, Y. (2010), "Fragmentation Vertical Intra-Industry Trade, and Automobile Components", Economics Bulletin 30 (2), 1006-1015.
[29] Linder, S. B. (1961), "An Essay on Trade and Transformation", John Wiley, New York.
[30] Souri, A. (2014), Analysis of Factors Affecting Iran's Trade Convergence with Blocks of Selected Regions (Application of a Gravity Model), Quarterly

Journal of Economic Research, Fourteenth Year, No. 53, Summer 2014. (In Persian).

[31] Taybi, S.K. & Azarbayjani, K. (2001). "Study of trade potential between Iran and Ukraine: using the model of gravity", Business Research, No. 21. (In Persian).

[32] Taybi, S.K. & Moalemi, M. (2001). "Application of a Gravity Model: The Basis of Business Integration in Southeast Asian Nations", Information Technology Center, University of Isfahan. (In Persian).

[33] Kabir, M., & Salim, R. (2010), "Can Gravity Model Explain BIMSTEC'S Trade?", Journal ofEconomic Integration , 25(1), 144-166.

[34] Nicola Cantore & Charles Fang Chin Cheng. International trade of environmental goods in gravity models [J]. Journal of Environmental Management, 2018,223

[35] Krugman, P. (1993), "Geography and Trade", First MIT Press paperback edition.

[36] Pagoulatos, E., & Sorense, R. (1975), "Two-Way International Trade: Na EconometricAnalysis", Weltwirtschaftliches Archiv (3), 454-465.

[37] Papazolou, C.; Pentencost, J., & Marques, H. (2006), "Model Forecast of the Potential TradeEffects of EU Enlargement: Lessons from 2004 and Path-Dependency in Integration," WorldEconomy, 29, 1071-1089.

[38] Pöyhönen P (1963), "A Tentative Model for the Volume of Trade between Countries",Weltwirtschaftliches Archiv 90 (1): 93-99.

[39] Rauch, J. (1999), "Networks versus Markets in International Trade", Journal of International Economics, 48 (1), 7-35.

[40] Romer, D. (1986), "A Simple General Equilibrium Version of the Bamol-Tobin Model", TheQuarterly Journal of Economics, MIT Press, 101 (4), 663-685.

[41] Skabic, I. & Orlic, E. (2007), "Determinants of FDI in CEE and Western Balkman Countries (Is Accession to the EU important for Attracting FDI?)", Economic and Business Review, 9 (4),333-350.

[42] Serlenga, L. & Shin, Y. (2007), "Gravity Models of Intra-EU Trade: Application of the CCEP-HTEstimation in Heterogeneous Panels with Unobserved Common Time- Specific Factors", Journal of Applied Econometrics, 22, 361-381.

[43] Stone, J. & Lee, H. (1995), "Determinants of Intra-Industry Trade: A Longitudinal Cross-Country Analysis", Weltwirtschaftliches Archiv, 67-85.

[44] Tinbergen J (1962), "Shaping the World Economy". New York: The Twentieth Century FundInc.

[45] Toh, K. (1982), "A Cross- Section Analysis of Intra- Industry Trade in U.S ManufacturingIndustries", Weltwirtschaftliches Archiv (118), 281-301.

[46] Yavari, K. & Ashrafzadeh, S.H. (2005). "Economic integration of developing

countries; Application of Gravity Model with Integrated Data by GMM and Convergence Method ", Business Research Journal, No. 36. (In Persian).

**[47]** Yazdanparast, Z. Seifi; A. Fallahi, M.A. & Karimzadeh.M (2015), "Empirical Test of Leader Theory in Iran's Foreign Trade Model", Quarterly Journal of Economic Research and Policy, Volume 23, Number 76. (In Persian).

# Identification And Prioritizing Cultural Factors Affecting The Realization Of The Knowledge Based Economy In Kermanshah Province

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**Extended abstract**

**1- Introduction**

The realization of a knowledge-based economy requires appropriate cultural prerequisites. According to Stiglitz (Stiglit, 1999), one of the first and most important issues is to provide cultural prerequisites and realize the effective cultural factors in this regard . In fact, cultural factors are one of the most crucial factors and prerequisites for transforming the economy of Iran and Kermanshah province into a knowledge-based, dynamic, persistent, capable, and competitive economy in the country. Therefore, this study used an institutional theoretical framework to identify and prioritize cultural factors affecting the realization of a knowledge-based economy.

**2- Theoretical framework**

It is of high importance to have an appropriate institutional regime framework to facilitate interactions between different parts of the knowledge-based economy (Schiliro, 2012). The institutional regime consists of formal rules, informal (institutions) restrictions, and their executive characteristics (North,1996b). Informal institutions are the informal behavioral rules of society that are part of the culture.

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## 3- Methodology

The most important cultural indicators affecting the realization of the knowledge economy were investigated and selected by referring to the previous literature and upstream documents and interviews with 14 experts in the field. Then, pairwise comparison questionnaires were completed by 20 experts, and indicators were extracted by Expert Choice. Finally, the indicators were prioritized by hierarchical analysis.

## 4- Results & Discussion

According to the results of the study:

1. Education as one of the most important elements of the knowledge-based economy accounts for the first priority (28%) among the top 10 indicators. Hence, it is necessary to have a skilled and educated workforce to provide efficiency, learning, dissemination, and application of knowledge, which leads to increased productivity of factors of production as well as economic growth and development (Chen & Dahlman, 2005). Among the components of education, primary education (56%) is the most important grade, whereas secondary education accounts for 18%, which indicates the major role of primary education in the knowledge-based economy. In fact, basic education strengthens the foundations of human capital by training the skilled and experienced workforce, resulting in the realization of a knowledge-based economy by creation a scientism institution and social capital.

2. Rationality: To achieve development in the knowledge-based economy, it is necessary to refer to reason and thinking and strengthen the rational and scientific attitude of rationality in society, because the production of science and knowledge relies on thinking and a rational approach. This indicator (14%) accounts for the next priority after education in terms of impact on the realization of the knowledge-based economy in Kermanshah province. Among the dimensions of rationality indicator, the most important dimension is the position of science and knowledge (24%) and the most important component of the dimension is scientism (30%).

3.Skill of Thinking skill: Development is an internal issue, a collective phenomenon, and an important goal that requires the highest degree of coordination and participation. In other words, there must be coordination and consistency in the thoughts and ideas for coordinating peoples' actions (Sariolghalam, 2007, p. 56). Therefore, harmonizing the thoughts leads to harmony in the actions of individuals, flourishes creativity and innovation, and ultimately enables the achievement of the knowledge-based model. This indicator (9.6%) accounts for the third priority.

4. The fourth indicator is justice (8.6%) with judicial justice as the most important dimension of the justice indicator. Moreover, the most important component of the judicial justice dimension is the fair implementation of laws. Justice affects the realization of the knowledge-based economy in two ways: 1) by creation equal access for all to public facilities, in particular, educational and health facilities, and ultimately, the realization of human development, which is one of the main institutional contexts for achieving a knowledge-based economy, and 2) by establishing equal conditions for all in order to attend a fair competition.

5. The ethics indicator (8.1%) accounts for the fifth priority, with the political dimension with the meritocracy component in the transfer of responsibilities as the most important dimension of the indicator. According to Williamson's four-level analytical framework, many of the ethical values affecting the realization of the knowledge-based economy, such as the emergence of informal institutions produce

development at the first level. Informal institutions formed at the first level lead to the emergence of some rules at the second level. According to the rules of the second level, the proper management is accomplished at the society, and finally, the results obtained in the previous three levels lead to the realization of a knowledge-oriented society in the fourth level (Fathollahi et al., 2015).

6. Subjective culture (7.5%) and social order (7.4%) (the sixth and seventh priorities) play a role in the realization of this new production model. The most important component of subjective culture is the attitude towards learning science. Moreover, the most important dimension of the order indicator is legality and the most important component of the legality dimension is the remark for private property.

7. In addition, scientific independence (6.2%) and cultural interactions (6.2%) account for the same priority (the eighth and ninth priorities). However, the objective dimension of culture (4.6%) accounts for the last priority in terms of the effect on the realization of the knowledge-based economy so that mismatch rate of 2% also reflects consistency between the results.

## 5- Conclusions

In general, since culture, knowledge transfer, values, and other factors affecting behavior are defined from one generation to another through education and imitation, education by training skilled and capable people results in the development of rational attitude and changes in the attitude of people (North, 1990, p. 79). According to Max Weber, harmony in the attitude of individuals creates a kind of collective reason called rationality (Yeganeh & Labibi, 2011, p. 106). On the other hand, governing rationality in society leads to the establishment of social order and its stability.

**Keywords:** Knowledge, Culture, Institution, Knowledge Based Economy, AHP
**JEL Classification:** D8, Z1, B25, O3

**References (in Persian)**

[1] Javadi Yeganeh, M.R, & Labibi, M.M. (2011). The Sociological View toward Social Order in Metropolises (A Comparative Study of Tehran, London and Bombay) ***Iranian Social Development Studies***, *3* (3), 103-122. [In Persian].

[2] North, D.C. (1990). ***Institutions, Institutional Change, and Economic Performance***. (M.R. Moeini, Trans). Third Edition, Country Planning and Budget Organization, Tehran. [in Persian].

[3] Sariolghalam, M. (2007*).* ***Rationality and the Future of Iran's Development***. Fifth Edition, Center for Scientific Research and Strategic Studies of the Middle East, Tehran. [In Persian].

[4] Stiglitz, J. ( 1999). Public Policy For Knowledge Economy. (F. Momeni, & V. Ehsani. 2017, Trans.), ***Journal Strategic Studies of Public Policy***. 7(23), 209-235. [In Persian].

**References(in English)**

[1] Chen, D.H., & Dahlman, C. J (2005). The knowledge Economy, the KAM Methodology and World Bank Operations. ***World Bank Institute Working***

***Paper***, (37256).

[2] Fathollahi, J., Momeni, F., Elahi, N., & Najafi, S.M.S (2015). Appropriate Theoretical Framework for Understanding and Analyzing Economic Issues in Knowledge-based Economy . ***Journal of the Knowledge Economy***. *8*(3), PP: 957-976.

[3] **3**. North, D.C (1996b). Economic Performance through Time: The Limits to Knowledge. ***EconWPA Series Economic History***, 9612004.

[4] Schiliro, D (2012). Knowledge-based Economies and the Institutional Environment. ***Theoretical and Practical Research in Economic Fields*** (TPREF), 3(05), 42-50.

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# The Effect of Economic Freedom on Environmental Quality in OPEC Countries (by using Panel-ARDL Approach)

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**Expended Abstract:**

## 1. Introduction

Global warming has become one of the biggest environmental issues currently facing mankind. Among the six greenhouse gases, carbon dioxide ($Co_2$) contributes the most to the greenhouse effect and accounted for approximately 78% of total greenhouse gas emissions from fossil fuel combustion and industrialization from 1970 to 2010. It has become a common aspiration of all countries to reduce greenhouse gas emissions, such as $Co_2$ and realize a low-carbon circular economy (Liu et al., 2019).

The issue of climate change and global warming has become a great concern for the international community. The issue has also drawn the attention of many financial and economic researchers to empirically investigate the causes of climate change and global warming. However, many studies ignore the influence of economic freedom when investigation the determinants. This gap in the literature has motivated this study to examine the environmental impacts of economic freedom.

In fact, this paper intends to answer this question that whether economic freedom in OPEC member countries, including Iran, has a positive and significant effect on reducing carbon dioxide emissions (improving the quality of the environment). Therefore, the main purpose of this study is to investigate the effect of economic freedom on environmental quality in OPEC member countries during the period 1996-2014 by using the ARDL-panel model.

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## 2. Theoretical framework

Economic freedom is often mentioned as a crucial component for improving incentives, productive efforts and an effective resource use. If economic freedom is good or bad for the environment depends largely on how these factors in turn affect the environment. In fact, the main question is that how different economic freedom variables, that have been found to be important for economic growth, affect the environment.

The Figure (1) shows the channels of economic freedom impact on environmental quality.

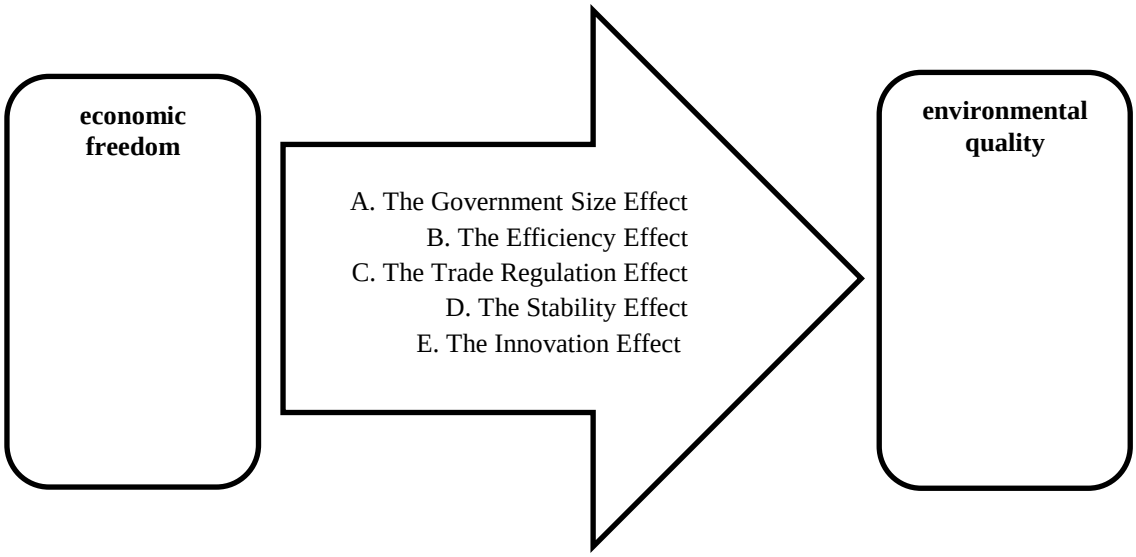


**Figure 1: Channels affecting economic freedom on environmental quality**
**Source: Research Classification**

## 3. Methodology

The main purpose of this study was to investigate the effect of economic freedom on environmental quality in eleven selected OPEC member countries (Iran, Algeria, Angola, Congo, Gabon, Kuwait, Libya, Nigeria, Saudi Arabia, UAE and Venezuela) during 1996-2014 by using the ARDL panel method.

The model of the paper to investigate the effect of economic freedom on $Co_2$ emissions (which has been used as an alternative variable to environmental quality) based on the Adesina & Mwamba (2019) study is as follows:

$$LCo_{2it} = \alpha_0 + \alpha_1 LEF_{it} + \alpha_2 LELC_{it} + \alpha_3 LGDP_{it} + \alpha_4 LGDP_{it}^2 + \alpha_5 LUP_{it} + u_i + v_{it} \quad (1)$$

Where $Co_2$ is logarithm of carbon dioxide emissions (tons per capita) in country i at time t; *LEF* economic freedom index logarithm; *LELC* per capita electricity logarithm (per kilowatt hour); *LGDP* per capita *GDP* logarithm (fixed price); *LUP* logarithm of urban population ratio (urban population as a percentage of total

population); $u_i$, Constant effects of time and $v_{it}$, residuals of the model. It is also intended to include $LGDP^2$ (quadratic logarithm of *GDP* per capita, at a fixed price) in the model for examination the confirmation or non-confirmation of the existence of the Kuznets curve in selected OPEC member countries. For economic freedom data, the Heritage Foundation's Economic Freedom Index is used, and data on other variables are extracted from the World Bank.

## 4. Results & Discussion

In this section, first, to check the presence of the unit root in the model variables, the unit root test is performed for the variables. Then the co-integration test is performed for a long-term relationship between the model variables and at the of end the results of the model estimation are presented.

According to the results, variables $LCo_2$ and *LUP* are integrated from zero order (*I(0)*) and *LGDP*, $LGDP^2$ and *LEP* are integrated from first order (*I(1)*). Also, the co-integration and consequently the long-run relationship between the model variables is confirmed.

Estimation of the model by using ARDL panel approach shows that all long-term coefficients of the research model are significant at the 5% level. In addition, the coefficient of $LGDP^2$ is 0.66, which indicates that the Kuznets curve is not established in selected OPEC countries. Also, the error correction term (ECT) is -0.7177, which shows that in each period, 71.77% of the imbalance error is corrected.

## 5. Conclusions & Suggestions

The results show that economic freedom has had a negative effect on $CO_2$ emissions in selected OPEC countries during the period of this study. This means that economic freedom improves the quality of the environment. Therefore, based on the findings of this study, it is recommended that the country specific environmental policies should be encouraged in order to succeed in the fight against greenhouse gas emissions or the spread of environmental destruction. Economic policymakers are also advised to put the country on the path of economic liberalization in order to benefit from the positive results of economic liberalization and breaking government monopolies, and to improve the quality of the country environment.

**Key Words:** Economic Freedom, Environmental Quality, Panel-ARDL.
**JEL Classification:** F41, Q51, C23.

## References

[1] Adesina, K. S., & Mwamba, J. W. M. (2019). Does Economic Freedom Matter for CO2 Emissions? Lessons from Africa. *The Journal of Developing Areas*, Tennessee State University College of Business, 53(3), Summer, DOI: 10.1353/jda.2019.0044

**[2]** Agheli, L., Sadeghi, H. & Osvar, A. (2014). Impact of Democracy on CO2 Emmissions. *Journal of Quantitative Economics*, Vol. 11, No. 2, pp 21-40.

(in Persion)
[3] Alam, S., Fatima, A., & Butt, M. S. (2007). Sustainable Development in Pakistan in the Context of Energy Consumption Demand and Environmental Degradation. *Journal of Asian Economics*, 18(5), 825-837.
[4] Antweiler, W., Copeland, B., & Taylor, M. S. (2001). Is Free Trade Good for the Environment? *American Economic Review*, 91(4): 877–908.
[5] Barghi oskoee, M. M., (2008). The Impact of Trade Liberalization on the Greenhouse Gases (CO2Emission) in EKC. *Journal of Economic Research*, Vol. 43, No. 1, pp. 1-21. (in Persion)
[6] Barghi oskoee, M. M., Fallahi, F., & Zhendeh Khatibi, S. (2012). The Effect of Manufacturing Products and Foreign Direct Investment on Co2 Emission in D8 Countries. *Economic Modeling*, Vol. 6, No. 4, pp. 93-109. (in Persion)
[7] Behbudi, D., Fallahi, F., & Barghi, E. (2010). The Economical and Social Factors Effecting on CO2 Emission in Iran. *Journal of Economic Research*, Vol. 45, No. 90, pp. 1-17. (in Persion)
[8] Bernauer, T., & Koubi, V. (2013). Are Bigger Governments Better Providers of Public Goods? Evidence from Air Pollution. *Public Choice*, 156 (3–4): 593–609.
[9] Bjørnskov, Ch .(2020), Economic Freedom and the CO2 Kuznets Curve. Available at SSRN: https://ssrn.com/abstract=3508271 or http://dx.doi.org/10.2139/ssrn.3508271
[10] Carlsson, F. and Lundström, S. (2000). Political and Economic Freedom and the Environment: The Case of CO2 Emissions. *Working papers in Economics.*
[11] Chang, Shu-Chen, & Wang, Hui-Ching. (2012). Effects of Economic Freedom and Income on CO2. *2nd International Conference on Management, Economics and Social Sciences (ICMESS'2012)*, Bali, Available at: psrcentre.org.
[12] Dasgupta, S., Hettige, H. & Wheeler, D. (2000). What Improves Environmental Compliance? Evidence from Mexican Industry. *Journal of Environmental Economics and Management*, Vol. 39, No.1, pp. 39–66.
[13] Dasgupta, S.; Laplante, B; Wang, H; & Wheeler, D. (2002). Confronting the Environmental Kuznets Curve. *Journal of Economic Perspectives*; Vol. 19, No. 1, pp. 147–168.
[14] Dinda, S. (2004). Environmental Kuznets Curve Hypothesis: A Survey. *Ecological Economics*. No. 49, pp. 431-455.
[15] Frankel, J. A., & Rose, A. K. (2002). Is Trade Good or Bad for the Environment? Sorting out the Causality. *NBER Working Paper*, No. 9201. National Bureau of Economic Research.
[16] Hilton H. and A, Levinson (1998). Factoring the Environmental Kuznets Curve: Evidence from Automotive Lead Emissions. *Journal of Environmental Economics and Management*, 35: 126-141.

[17] Hosseini Nasab, S. E., Paykari, S. (2012). Study of Economic Growth and Trade Relaxation on the Pollution of Environment. *Bimonthly Journal of Economic Issues and Policies*, Vol. 12, No. 9-10, pp. 61-82. (in Persion)
[18] Kuznets, Simon (1955). Economic Growth and Income Inequality. *American Economic Review* 45(1): 1–28.
[19] Liu J, Yang Q, Zhang Y, Sun W, Xu Y. (2019). Analysis of $CO_2$ Emissions in China's Manufacturing Industry Based on Extended Logarithmic Mean Division Index Decomposition. *Sustainability*. 11(1):226. https://doi.org/10.3390/su11010226
[20] Lopez, R. (1997). Environmental Externalities in Traditional Agriculture and the Impact of Trade Liberalization: The Case of Ghana. *Journal of Development Economics*, 53: 17-39.
[21] Magnani, E. (2000). The Environmental Kuznets Curve, Environmental Protection Policy and Income Distribution. *Ecological Economics*, 3: 431-443.
[22] Mohammadi, H. & Targari Seraji, M. (2013). Investigation of the Relationship between Economic Growth, Trade Openness and Environmental Pollution: A Review of Selected Countries in the Middle East. *Iranian Energy Economics Research*, Vol. 2, No. 6, pp. 183-207. (in Persion)
[23] Mousavi, S. N., (2015). The Effect of Trade Liberalization on the Quality of the Environment Evidence Developed and Developing Countries. *Iranian Journal of Agricultural Economics and Development Research*, Vol. 46, No. 3, pp. 623-632. (in Persion)
[24] Munashinge, M. and W. Cruz, 1995. Economywide Policies and the Environment. *World Bank Environment Paper* 10, the World Bank.
[25] Norton, Seth W. (1998). *Property Rights, the Environment, and Economic Well-Being. In Who Owns the Environment?* Ed. Peter J. Hill and Roger E. Meiners. Lanham, MD: Rowman & Littlefield, pp. 37–54.
[26] Pahlavani, M., Dahbashi, M., & Moradi, E. (2014). The Effect of Trade Expansion and Economic Growth on Environmental Quality in Iran. *Journal of Economic Research*, Vol. 4, No. 3, pp. 463-482. (in Persion)
[27] Panayotou, T., 1997. Demystifying the Environmental Kuznets Curve: Turning a Black Box into a Policy Tool. *Environment and Development Economics*, 2: 465-48.
[28] Posner, E. A. (1996). The Regulation of Groups: The Influence of Legal and Nonlegal Sanctions on Collective Action. *University of Chicago Law Review*, 63 (1): 133–197.
[29] Shahhosseini, S., Faridzad, A., Morovvat, H. (2017). Survey on Scale, Composition and Technical Effects of International Trade Pattern on Carbon Emission; Case Study of Selected Developing Oil-Exporting Countries. *Journal of Economic Research*, Vol. 17, No. 65, pp. 143-176. (in Persion)
[30] Stroup, R. L. (2003). Economic Freedom and Environmental Quality.

*Proceedings*, issue oct, pp. 73-90, Persistent link: https://EconPapers.repec.org/RePEc:fip:feddpr:y:2003:i:oct:p:73-90.

[31] Tarazkar, M. H., Kargar Dehbidi, N., & Bakhshoodeh, M. (2018). The Effects of Economic Development and Urbanization on Pollution Emissions in Iran. *Journal of Agricultural Economics Research*, Vol. 10, No. 38, pp. 155-174. (in Persion)

[32] Wood, j. & Herzog, I. (2014). Economic Freedom and Air Quality. *Fraser Institute*, Vancouver, Canada, April. Available at SSRN: https://ssrn.com/abstract=2539809

# Evaluation and Analyzing Entrepreneurial Ecosystem and Business Environment of Iran Provinces by PFB Approach

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**Extended Abstract**

**Introduction**

The aim of this study is the evaluation of entrepreneurship ecosystem of Iran provinces and its performance. In this regard, using Iran entrepreneurship ecosystem monitoring data, in 2019 which focused on institutional quality and individual dimensions of entrepreneurship ecosystem. Penalty for bottlenecked approach used to evaluate which pillars of entrepreneurship ecosystem in each province must be cared more. So then, in order to present a dynamic imagination of optimized allocation of policy making activities to maximize the values of business environment index and improving business environment of the provinces by PFB method introduced.

**Theoretical Framework**

Entrepreneurship development as a major policy for economic growth and Development identified and emphasized in literature (Acs 2008, Szerb et al., 2016, Baumol 2003). While entrepreneurship has gained quick and ardent acceptance from practitioners in the policy agenda since its appearance, entrepreneurship policy as a quasi-independent field apart from public and small business policy has just been emerging recently ( Acs – Szerb 2007; Lunstrom – Stevenson 2005). Improving the business environment index pillars in country by focus on the weakest pillar is a strategy of Penalty for Bottlencked Approach in this regard, the Global Entrepreneurship and Development Index (GEDI) methodology of Acs et al. (2013) utilized.

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**Methodology**

The penalty for bottleneck method which used in Global Entrepreneurship and Development Index (GEDI) methodology of Acs et al. (2013) identifies the weakest pillar ecosystem. So ecosystem performance will improve by identifying the bottleneck as weakest pillar and actions to improve it. Simulations of bottleneck measure the scale of improvement of business environment index accordingly.

**Discussion**

The simulated indices table of business environment components of provinces designed and findings indicates the necessity of concentration of policy making and present resources to improve the weakest pillars of each province. Mostly developed provinces including Isfahan, Razavi Khorasan, East Azerbaijan, Markazi, Mazandaran and Boushehr feel weakness in legal environment. While developing provinces including Alborz, Fars, Kordistan, Golestan, Hamedan, Ardebil and Chaharmalao bakhtiari indicates weakness in financial pillar. Also some other provinces report the cultural and educational environment pillar weakness including. Technology and innovation environment in industrial and trade hub provinces like Isfahan, Boushehr, Markazi and Hormozgan identified as superior pillar.

**Conclusion and Suggestions**

The provinces by demographic advantages including markets access, export market accesses and transmission infrastructure have geographical advantages. Based on data simulation conducted on entrepreneurship ecosystem pillars of provinces, findings illustrates due to access 11 percent improvement on entrepreneurship ecosystem index needs to future efforts as 16 percent in macroeconomic environment pillar, 15 percent in financial environment pillar, 18 percent in legal environment pillar.

**Key Words**: Entrepreneurial Ecosystem, Business Environment, Penalty for Bottlenecked, Entrepreneurship Ecosystem Bottlenecks
**JEL Classification:** O17, O43, G18, G28, E61,M21, L26

**References**

**[1]** Abdollahi, F., Mehrabani, F., & Basirat, M. (2013).,The Study of comparison impact of business environment on economic growth in Iran and OECD, The First National Conference on Vision of Iran Economy to approaching national Products protection. (In Persian) Acs,Z.J., Autio,E., & Szerb,L. (2014)., National systems of entrepreneurship: Measurement issues and policy implications. *Research Policy*, 43(3), 476–494

[2] Acs, Z.J, Szerb, L., Lloyd,A. (2017)., Global Entrepreneurship and Development Index 2017, *Springer International Publishing*

[3] Ashrafi,Y., & Faimifar,F. (2011)., The Investigation of business environment improvement Indices in Iran, *Monthly journal of Economic Problems and policies* (11),7-42. (In Persian)

[4] Bahrami, H., & Evans, S. (1995)., Flexible Re-Cycling and High-Technology Entrepreneurship, *California Management Review*,(37), 62-89.

[5] Baumol, William J, (2003)., what price economic growth, Organization for

Economic cooperation and development (OECD), economy report, world bank

[6] Behbodi,D., & Mamipor, A. (2013)., Business Environment and improving guide lines to achieve sustainable development (East Azerbaijan Province), The First National Conference on Sustainable Development by Improving Business Environment, Mashhad.( In Persian)

[7] Cohen, B. (2006)., Sustainable valley entrepreneurial ecosystems. *Business Strategy and the Environment*, 15(1), 1–14. http://doi.org/10.1002/bse.428

[8] Dubini, P. (1989)., the influence of motivations and environment on business start-ups: Some hints for public policies. *Journal of Business Venturing* (4) 11-26.

[9] Goldratt, E. M. (1994). *The goal: A process of ongoing improvement*, 2nd ed. Great Barrington, MA: North River Press.

[10] Ha, N.T.T, Hoa, L.B. (2018)., Evaluating Entrepreneurship Performance in Vietnam through the Global Entrepreneurship Development Index Approach, *Journal of Developmental Entrepreneurship*, 23(01).

[11] Ibrahim Haidar,J (2012). "The Impact of Business Regulatory Reforms on Economic Growth", The World Bank, Washington D. C., United States; Paris School of Economics, Paris, France and University of Paris, Pantheon Sorbonne, Paris, France, 12 (4), 25-40.

[12] Isenberg, D. (2010). How to start an entrepreneurial revolution, *Harvard Business Review*, www.hbr.org

[13] Isenberg, D. (2011). The entrepreneurship ecosystem strategy as a new paradigm for economic policy: principles for cultivating entrepreneurship. Presentation at the Institute of International and European Affairs, May 12, 2011, Dublin Ireland. Available on line at http://entrepreneurial-revolution.com.

[14] Isenberg, D., (2012). *Introducing the Babson entrepreneurship ecosystem project*, The Babson Global.1-28p

[15] Komlosi, E., Szerb, L., Acs, Z., & Ortega Argiles, R., (2015)., Quality-related regional differences in entrepreneurship based on the GEDI methodology: The Case of Hungry, *Acta Oeconomica* 65(3) 455-477.

[16] Miller, D., (1986), "Configurations of strategy and structure: towards a synthesis", *Strategic Management Journal*, 7(3). 233-249

[17] Miller D., (1996) Configurations revisited, *Strategic Management Journal* (17), 505–512.
Organisation For Economic Co-Operation And Development (OECD) (2008) *Handbook on Constructing Composite Indicators–Methodology and User Guide* (available at: http://composite-indicators.jrc.ec.europa.eu/Handook.htm)

[18] Moore, J. F., (1993) Predators & Prey: A New Ecology of Competition, *Harvard*
*Business Review*. 75 – 86.

[19] Naderi, N., Rostami, R., & Pazhohan, A., (2018), Analyzing Business

Environment Indices of Kermanshah Province in frame work of Resistive Economy, National Conference on Sustainable Development in Kermanshah, Razi University, Kermanshah.( In Persian)

[20] North, D.C., (2005)., *Understanding the Process of Economic Change*., Princeton University press

[21] Pennings, J.M., (1982)., the urban quality of life and entrepreneurship. Academy of Management Journal 25(1) 63-79

[22] Ramezani,M.& Khademi, A., (2015). Investigation to ordering the effective factors of business environment in south Khorasan by AHP, Second National Conference on Improving Business Environment, 34-63. (In Persian)

[23] Riyahi, P, Amiri, M., Sadeghi, S., & khodami, M (2016). Monitoring & improve Entrepreneurship system in Iran, First Report, The Current Situation by The GEI Index, Ministry of Cooperation, Employment and Social Welfare. (In Persian)

[24] Rodriguez-Pose, A. (2013), "Do Institutions Matter for Regional Development?", *Regional Studies* 47 (7), 1034–47.

[25] Sayah,A. 2016. Doctrine of 16 period of seasonal Evaluation of business environment in Iran during autumn 2010 – summer 2014, *Journal of Parliament and Strategies*, (85),5-32 (In Persian)

[26] Sakhdari, J. (2013)., Pathology of Business Environment in Razavi Khorasan Province and Improvement suggestions, the first conference on sustainable development by business environment Improvement, Chamber of Commerce , Razavi Khorasan Province. ( In Persian)

[27] Shane S. (2003)., A General Theory of Entrepreneurship: The Individual-opportunity Nexus, Edward Elgar Publishing.

[28] Spigel, B. (2015). *The relational organization of entrepreneurial ecosystems*. Entrepreneurship Theory and Practice, 41(1), 49-72

[29] Stam E, Spigel B (2016) *Entrepreneurial ecosystems and regional policy*. In: Sage handbook for entrepreneurship and small business. Sage, London

[30] Stam, F. C., & Spigel, B. (2016). *Entrepreneurial ecosystems*. USE Discussion paper series, 16(13).

[31] Stiglitz, J. (1999). Whither Reform? Ten Years of the Transition, Annual Bank Conference on Development Economics, World Bank,

[32] Szerb.L, É. Komlósi, Z. J. Ács, R. (2013). *Ortega-Argilés Measuring Regional Entrepreneurship in Hungary*. MEB 2013 – 11th International Conference on Management, Enterprise and Benchmarking 31 May - 1 June, 2013 Budapest, Hungary

[33] Szerb,L, Komlosi ,E and pager,B. (2016) Measuring Entrepreneurship and optimizing Entrepreneurship policy Efforts in the European union. CESifo DICE Report, *journal for institutional comparisons*. Volume 14(3) 8-23.

[34] Tol, R. S. J. & Yohe, G.W. (2006), 'A Review of the Stern Review', *World Economics*, 7(4), 233–250

[35] Vares, H., Parvandi,y., & Ghasemi, R. (2012), Improving Business

Environment to achieving Economic Visions: by using TOPSIS Antropi , *Journal of Business Management,* (11), 121-138.( In Persian)

[36] Van de Ven, A. (1993) The Development of an Infrastructure for Entrepreneurship. *Journal of Business Venturing,* (8) 211-230

[37] Yawo Atiase,V. Mahmood,S, Botchie,Y. (2017) "Developing entrepreneurship in Africa: investigating critical resource challenges", *Journal of Small Business and Enterprise Development* 25(4), 644-666.

[38] Ha., N.T.T & Hoa,L.B. (2018)., "Evaluating Entrepreneurship Performance In Vietnam Through The Global Entrepreneurship Development Index Approach," *Journal of Developmental Entrepreneurship* (JDE), World Scientific Publishing Co. Pte. Ltd., 23(01), pages 1-19.

# The Impacts of Climate Change on Value-Added Agriculture in the MENA Region

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**Extended abstract**

**1- Introduction**

Climate change on planet earth as a result of growing economies in recent decades has had many effects that could not be ignored agricultural wise. The agriculture sector is one of the main sectors influenced by climate change because of its role in providing nutrition, which in turn effects the economy of region. Some regions, including the Middle East and Northern Africa (MENA), are exposed to more severe climate change. Therefore, in this research, the effects of climate change on value-added agriculture in the MENA region countries are investigated.

**2-Theoretical framework**

In present theoretical and empirical evidence, several potential approaches have been proposed for the effects of climate change on economic growth. First, destruction of nature and ecosystems, storms, floods, drought, deaths, and extinction of endangered species resulting from extreme weather events cause serious damage to economic growth. On the other hand, resources required to counter the damaging effects of global warming reduce availability of resources needed to invest in physical infrastructures, R & D, and human capital. As a result, economic growth will shrink (Dell et al. 2012; Abidoye et.al 2015). Theoretically, the relationship between climate change and economic growth could be mentioned through both macroeconomic and microeconomic perspectives. From the macroeconomic perspective, this relationship affects the level of output, including agricultural yield and economic potential to increase growth by its impact on investments and

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institutional status. From the microeconomic perspective, this relationship includes an array of factors like cognitive and physical labor productivity, conflict, and health, all of which have wide economic implications (IPCC 2007; Abidoye et.al 2015). Specifically, the important classical ideas related to economic development are presented in studies of economists such as Marshall (1890) and Huntington (1915) who relate productivity to temperature (Dell et al. 2012).

**3- Methodology**

The purpose of this study is to analyze the impact of climate change on value-added agriculture in the MENA region countries .Thus, temperature and precipitation data

and value-added agriculture of 11 MENA countries during 2001-2016 was used here. This study employed Panel Data cointegration Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) models. Also, The Pedroni, Kao, and Westerlund cointegration tests confirmed existence of a long-run equilibrium relationship.

**4- Discussion**

The results indicate existence of a cointegrated long-term relationship between climate change and value-added agriculture. The value-added agriculture elasticity to climate change, gross fixed capital formation, employment and CO2 emission intensity are consistent with theoretical and empirical research types. Moreover, comparing the elasticity in both applied approaches shows that temperature changes had a negative and significant effect, and precipitation changes positively and significantly impacted the value-added agriculture variable. It implies that with a one percent increase in temperature and precipitation over the long term, value-added agriculture is changed in the FMOLS model at a rate of -0.28, 0.03 percent, and in the DOLS model -0.09, 0.02 percent, respectively.

**5- Conclusion and Suggestions**

One of the important and obvious consequences of climate change in agriculture is its impact on food security and the spread of poverty. Consideration of the vital role of agriculture in economic growth and development, and since climate change and global warming in the future can pose serious risks to reduce the Value-added Agriculture. Therefore, there is a need for an international policy to adopt strategies to mitigate or control climate change. This is not only for economic growth in the MENA countries but also for poverty reduction. Investment in sectors such as energy-efficient technologies, renewable energy, public transport, sustainable agriculture, Implementation of appropriate cultivation pattern, development of drought-tolerant crop varieties and sustainable management of natural resources are needed for the promotion of a green economy. While the green economy can reduce climate change, it can turn the pressures of climate change into an opportunity for sustainable agriculture, resulting in maximum production and the Value-added agriculture.

**Keywords**: Climate Change, Value-added agriculture, Panel cointegration
**JEL Classification:** $O_{54}$, Q10, $C_{33}$

**References (in Persian)**

[1] Alavirad, A., & Kanvar, R. (2014). The Impact of Energy Consumption on the

Value Added of sectors Economic, Agriculture, Industry and Services in Iran: Analysis Based on the Panel Co-Integration Approach. Journal of Agricultural Economics, 6 (3), 1-19. http://noo.rs/dK0cu. (In Persian)

[2] Ghaffari Esmaeili, M., Akbari, A., & Kashiri Kolaei, f. (2019). The Impact of Climate Change on Economic Growth of Agricultural Sector in Iran (Dynamic Computable General Equilibrium Model Approach). Journal of Economics and Agriculture Development, 32 (4), 333-342. (In Persian)

[3] Gojarati, D. (2004). Basics of econometrics. Translation Dr. Hamid Abrishami. Vol (2). Tehran: Tehran University. (In Persian)

[4] Khaleghi, S., Bazazan, F., & Madani, S. (2015). The effects of climate change on agricultural production and Iranian economy. Journal of Agricultural Economics Research, 7 (25), 113-135. (In Persian)

[5] Pishbahar, E., Bagheri, P., & Nasir Shoeibi, S. (2016). The Impact of precipitation on production, export and import of the OF the main items of foreign trade of agricultural products in IRAN: using Monte - Carlo simulation approach. Journal of Agricultural Economics, 10 (2), 29-47. (In Persian)

[6] Salmani, B., Panahi, H., & Jamshidi, A. (2014). The effect of shocks terrorism on attracting foreign direct investment in the MENA region. Journal of economy and regional development (knowledge and development), 8 (21), 180-205. https://www.civ ilica.com/Pa per-JR_ERD-JR_ERD-21-8_008. (In Persian)

[7] Soleimaninejad, S., Dourandish, A., & Nikoukar, A. (2016). Identification of economic and climatic factors affecting the agricultural sector in Iran. The 10th Blennial Conference of Iran's Agricultural Economics. (In Persian)

**References (in English)**

[1] Abidoye, B. O., & Odusola, A. F. (2015). ***Climate Change and Economic Growth in Africa: An Econometric Analysis.*** Journal of African Economies, Vol. 24, No. 2, pp: 277-301. https://doi.org/10.1093/ jae/eju033

[2] Abidoye, B. O., & Odusola, A. F. (2015). ***Climate Change and Economic Growth in Africa: An Econometric Analysis.*** Journal of African Economies, 24 (2), 277-301. https://doi.org/10.1093/jae/ eju033

[3] Ahsan, S., Ali, M. R., Osman, M. S., Rahman, M., Babar, M. J., Begum, S. A., Rahman, D. M., & Islam, K. R. (2011). ***Agricultural and environmental changes in Bangladesh in response to global warming.*** In: Lal R, Sivakumar MVK, Faiz SMA, Rahman AHMM, Islam KR (Eds.), Climate Change and Food Security in South Asia (pp: 119-134). Netherlands: Springer. DOI: 10.1007/978-90-481-9516-9_9

[4] Akram, N. (2013). ***Is climate change hindering the economic growth of Asian economies?.*** Asia-Pacific Development Journal, 19 (2), 1-18. https://doi.org/10.18356/cb96 1558-en

[5] Ali, S. N. (2012). ***Climate Change and Economic Growth in a Rain-Fed Economy: How Much Does Rainfall Variability Cost Ethiopia?***. Available at

SSRN: http://ssrn.com/abstract=201 82 33

[6] Angel, J. (2008). ***Potential impacts of climate change on water availability.*** Illinois State Water Survey, Institute of Natural Resource Sustainability, 12 (1), 397-409. http://www.sws.uiuc.e du /wsp/ climate/Climate Factors.asp

[7] Ayinde, O. E., Muchie, M., & Olatunji, G. B. (2011). ***Effect of Climate Change on Agricultural Productivity in Nigeria: A Co-integration Model Approach.*** Journal of Human Ecology, 35 (3), 189–94. DOI: 10.1080/09709274.2011.11906406

[8] Babatunde, M. A., & Adefabi, R. A. (2005). ***Long run relationship between education and economic growth in Nigeria: Evidence from the Johansen's cointegration approach.*** In regional conference on education in West Africa.

[9] Baltagi, B. (2008). ***Econometric analysis of panel data (Vol. 1).*** John Wiley & Sons. 366 pages.

[10] Barrios, S., Ouattara, O., & Strobl, E. (2008). ***Impact of Climatic Change on Agricultural Production: Is It different for Africa?.*** Food Policy, 33 (4), 287-298. https://doi.org/10.1016/j. foodpol .2008. 01.003

[11] Breusch, T. S., & Pagan, A. (1980). ***The Lagrange Multiplier Test and its Applications to Model Specification in Econometrics.*** Review of Economic Studies, 47 (1), 239-253.

[12] Cline, W. R. (1994). ***The costs and benefits of greenhouse abatement.*** A guide to policy analysis, paper presented to IEA/OECD Conference on The Economics of Climate Change, Organisation for Economic Cooperation and Development, Paris.

[13] Dell, M., Jones, B. F., & Olken, B. A. (2012). ***Temperature Shocks and Economic Growth: Evidence from the Last Half Century.*** American Economic Journal: Macroeconomics, 4 (3), 66–95. DOI: 10.33 86/w14132

[14] Dell, M., Jones, B. F., & Olken, B. A. (2008). ***Climate change and economic growth: evidence from the last half century.*** Working Paper, No. 14132. Cambridge, MA: National Bureau of Economic Research. DOI: 10.3386/w14132

[15] Bani-Domi. M. (2006). ***Trend Analysis of Temperatures and Precipitation in Jordan.*** Umm Al-Qura University Journal of Educational, Social Sciences & Humanities, 17 (1), 15-36.

[16] Eboli, F., Parrado, R., & Roson, R. (2010). ***Climate change feedback on economic growth: explorations with a dynamic general equilibrium model.*** Environment and Development Economics, 15 (5), 515-533.

[17] Elshennawy, A., Robinson, S., & Willenbockel, D. (2016). ***Climate change and economic growth: An intertemporal general equilibrium analysis for Egypt.*** Economic Modelling, 52, 681-689. DOI: 10.1016/j.e conmod.2015.10.008

[18] Fankhauser, S., and Tol, R. S. J. (2005). ***On Climate Change and Economic Growth.*** Resource and Energy Economics. 27 (1), 1–17. https://doi.org/10.1016/j.reseneeco.2004. 03.003

[19] Godfray, H. C., Beddington, J. R., Crute, I. R., Haddad, L., Lawernce, D., Muor, J. F., Pretty, J., Robinson, S., Thomas, S. M., & Toulmin, C. (2010). ***Food Security: The Challenge of Feeding 9 Billion People.*** Science, 327 (5967), 812-818. DOI: 10.1126/scien ce.1185383

[20] Gornall, J., Betts, R., Burke, E., Clark, R., Camp, J., Willett, K., & Wiltshire, A. (2010). ***Implications of Climate Change for Agricultural Productivity in the Early Twenty-First Century***. Philosophical Transactions of the Royal Society of Biological Sciences, 365 (1554), 2973–89. https://doi.org/10.1 qq09 8/rstb.2010.0158

[21] Hadero, T. (2014). ***The impact of climate change on economic growth: time series evidence from Ethiopia.*** Doctoral dissertation, Jimma University.

[22] Huntington, E. (1915). ***Civilization and Climate.*** New Haven, CT: Yale University Press,

[23] Im, K. S. Pesaran, M. H., & Shin, Y. (2003). ***Testing for unit roots in heterogeous panels.*** Journal of Econometrics, 115 (1), 53-74. https://doi.org/10.1016/S0304-4076 (03)00092-7

[24] IPCC. (2007). ***Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*** [Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K. B., Tignor, M., & Miller, H.L. (eds.)], Vol (1). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[25] Levin, A., Lin, C.F., & Chu, C.S. (2002). ***Unit root tests in panel data: asymptotic and finite sample Operues.*** Journal of econometrics. 108 (1), 1-24. http://www.sciencedirect.com/science/article/pii/S03 04-4076(01)00098-7

[26] Janjua, P.Z., Samad, G. & Khan, N. (2014). ***Climate Change and Wheat Production in Pakistan: autoregressive distributed lag approach.*** NJAS – Wageningen Journal of Life Sciences, 63, 13-19. https://doi.org/10.1016/j.njas.2013.11.002

[27] Jayatilleke, S. B., & Yiyong, C. (2014). ***The impact of climate on food crop productivity, food prices and food security in South Asia.*** Economic Analysis and Pplicy, 44 (4), 451-465. https://doi.org/10.10 16/j.eap.2014.09.005

[28] Kao, C. (1999). ***Spurious regression and residual- based tests for cointegration in panel data.*** Journal of Econometrics, 90 (1), 1-44. https://doi.org/10.1016/S0304-4076(98)0002 3-2

[29] Kao, C. & Chiang, M.H. (2000). ***On the estimation and inference of a cointegrated regression in panel data.*** Baltagi, B.H., Fomby, T.B. and Carter Hill, R. (Ed.) ***Nonstationary Panels, Panel Cointegration, and Dynamic Panels (Advances in Econometrics, Vol. 15)***. Emerald Group Publishing Limited, Bingley, 15, 179-222. https://doi.org/10.10 16/S0731-9053(00)15007-8

[30] Kharseh, M., Altorkkmany, L., Al-Khawaja, M. & Hassani, F. (2015). ***Analysis of the effect of global climate change on ground source heat pump***

***systems in different climate categories.*** Renewable Energy, 78, 219-225. DOI: 10.1016/j.renene.2015.01.017

[31] Mankiw, N. G., Romer, D., & Weil, D. N. (1992). ***A contribution to the empirics of economic growth.*** The Quarterly Journal of Economics, 107 (2), 407-437. https://www.js tor.org/stable/2118477

[32] Marshall, A. (1890). ***Principles of Economics.*** London: Macmillan and Co.

[33] Nordhaus, W. D. (1991). ***To slow or not to slow: the economics of the greenhouse effect.*** Economic Journal, 101 (407), 920-937. DOI: 10.2307/2233864

[34] Pearce, D.W., Cline, W.R., Achanta, A.N., Fankhauser, S., Pachauri, R.K., Tol, R.S.J. &Vellinga. P. (1996). ***The Social Costs of Climate Change: Greenhouse Damage and the Benefits of Control.*** Bruce, J.P., Lee, H. & Haites, E.F. (eds.) Climate Change 1995: Economic and Social Dimensions - Contribution of Working Group III to the Second Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge. pp :27 - 448 pages .

[35] Pedroni, P. (2000). ***Fully Modified OLS for heterogeneous cointegrated panels.*** In Nonstationary panels, panel cointegration, and dynamic panels, Emerald Group Publishing Limited, 15, 93-130. http://web.williams.edu/Economics/wp/pedron iaie

[36] Pedroni, P. (2004). ***Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis.*** Econometric theory, 20 (3), 597-625. https:// doi.org/ 10.1017 /S0266466604203073

[37] Pesaran, M.H. (2004). ***General Diagnostic Tests for Cross Section Dependence in Panel.*** IZA Discussion Paper No. 1240.

[38] Reilly, J. (1999). ***What does climate change mean for agriculture in developing countries? A comment on Mendelsohn and Dinar.*** The World Bank Research Observer, 14 (2), 295-305. https:// doi.org /10.1093/wbro/14.2.295.

[39] Romer, D. (2012). ***Advanced macroeconomics.*** Mcgraw-hill.

[40] Rosegrant, M., Ewing, M. Yohe, G. Burton, I. Huq, S. & Valmonte-Santos, R. (2008). ***Climate Change and Agriculture Threats and Opportunities.*** Federal Ministry for Economic Cooperation and Development, pp: 1–36. https://www.preventionweb.net/files/ 11890_gtzclimatechangeagriculture1

[41] Seo, S. N., & Mendelsohn, R. (2008). ***A Ricardian Analysis of the Impact of Climate Change on South American Farms.*** Chilean Journal of Agricultural Research, 68 (1), 69-79. https://ssrn.com/abs tract= 1372151

[42] Stock, J. H., & Watson, M. W. (1993). ***A simple estimator of cointegrating vectors in higher order integrated systems.*** Econometrica: Journal of the Econometric Society, pp: 783-820. https:// www.jstor.org/stable/2951763

[43] Tokunaga, S., Okiyama, M. & Ikegawa, M. (2015). ***Dynamic Panel Data***

***Analysis of the Impacts of Climate Change on Agricultural Production in Japan***. Japan Agricultural Research Quarterly, 49 (2), 149-157. DOI: 10.6090/jarq.49.149

[44] Tol, R. S. J. (1995). ***The damage costs of climate change toward more comprehensive calculations.*** Environmental and Resource Economics, 5 (4), 353-374. https://doi.org/10.1 007/BF00691574

[45] Westerlund, J. (2007). ***Testing For Error Correction in Panel Data.*** Oxford Bulletin of Economics and Statistics, 69 (6), 709-748. https://doi.org/10.1111/j.1468-0084.2007.00 477

[46] World Bank Group. (2014). ***Turn Down the Heat: Confronting the New Climate Normal***. Washington DC: World Bank. https://openknowledge.worldbank.org/handle/10986/20595

[47] Zaied, Y. B. (2013, December). ***Long Run Versus Short Run Analysis of Climate Change Impacts on Agriculture.*** In Economic Research Forum Working Papers (No. 808).

[48] Zhai, F., Lin, T., Byambadorj, E. (2009). ***A General Equilibrium Analysis of the Impact of Climate Change on Agriculture in the People's Republic of China.*** Asian Development Bank brief. https://mpra.ub.uni-muenchen.de/id/eprint/21127

[49] Zhai, F., & Zhuang, J. (2009). ***Agricultural Impact of Climate Change: A General Equilibrium Analysis with Special Reference to South East Asia.*** Asian Development Bank (ADBI) Working Paper Series No. 131. Available: http://www.adbi.org/workingpaper/200 9/02/23/2887

[50] Yu, W.H., Alam, M., Hassan, A., Khan, A.S., Ruane, A.C., Rosenzweig, C., Major, D.C. & Thurlow, J. (2010). ***Climate Change Risk and Food Security in Bangladesh Earth Scan.*** London.