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Investigating the Relationship between Economic Complexity and Income Inequality in Iran (Simultaneous Equations Approach)

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EXTENDED ABSTRACT

INTRODUCTION

One of the main features and key to the success of many countries in today's world is the use of knowledge in economic processes. Because knowledge is one of the most important components for determining long-term economic growth, investing in knowledge has increased the production capacity of other factors of production such as capital, natural resources and labor, and facilitates the efficient conversion of production inputs into production processes and new products. . This is doubly important in single-product economies, where most of their foreign exchange resources rely on the export of a limited number of products. Knowledge-based economies are less vulnerable to external shocks. In recent years, Iran's economy has suffered the most from external shocks due to the lack of attention to the knowledge-based economy, so that in 1391 with a decrease in oil revenues

from 112 billion dollars in 1390 to 63 billion dollars in 1391, Economic growth has been reported negatively and this trend has been repeated in 1393 and 1394. Therefore, one of the important implications for paying attention to the knowledge-based economy is paying attention to the sources of the economy's vulnerability to external shocks. There are several indicators for measuring the knowledge base of countries, one of which is economic complexity, as proposed by Hidlago and Hassman (2009). Economic complexity is a broader concept than the conventional view of economists on the role of each factor of production in economic activities, in that there is a link between the inputs of production that causes the surplus in the economy under the heading of knowledge and skills accumulated on a large scale Which increases diversity and skill in economic activities. Thus, the product of production represents the amount of knowledge and skills used in itself, and measuring the amount of skills and knowledge used in the production of goods is the main issue for economic complexity. If the production of a product requires a certain kind of knowledge and skill, then it can be concluded that the countries that produce those products also have the knowledge and skills required to produce it (Hidalgo & Hausmann, 2009), because the products of production In economics, it reflects the level of knowledge and practical skills in them. Economic complexity is related to the combination of a country's production and export products and indicates a set of capabilities to maintain and combine knowledge and skills. Obviously, societies that lack parts of this set of capabilities are doomed to fail in producing such complex products, so economic complexity is also indirectly a measure of the capabilities needed to produce an economy's products. Economic complexity, assuming that countries do not produce products unless they have the knowledge and skills to produce them, tries to calculate the accumulation of knowledge and skills hidden in the economy. (Shahmoradi & Chiniforans, 2017) Export competitiveness is one of the concepts that can Pave the way for economic complexity, export competitiveness means gaining the maximum share of global markets by taking advantage of the comparative advantage of producing domestic goods. According to Koehman's definition, competitiveness is the ability of an economy to maintain its position in international markets and increase its share of the operating market, so having a comparative advantage can lead to high competitiveness. But when it comes to economic complexity, there is a need for comparative advantage in many types of goods with less ubiquity. Therefore, export competitiveness leads to the complexity of the economy

when it has less basic conditions of diversity and inclusiveness. The importance of economic complexity is not limited to the ability to apply knowledge in the production process, but is much broader. One of these dimensions is the degree of dependence of an economy. Thus, the more diverse a country's export portfolio is and the more complex its goods, the more powerful it will be in international economic transactions and, in a better sense, the more economically resilient it will be. Conversely, if a country's export basket is more limited and the goods in it are all-encompassing, that country is more fragile in trade and, to put it better, less economically resilient (Cheshmi et al., 2014. Economic complexity, in addition to being one One of the most important sources of reducing the vulnerability of the economy is considered as a factor in changing the quality of economic growth. In this regard, the present study examines the relationship between income inequality and economic complexity.

METHODOLOGY
Based on the studies of Chu & Hoang (2020), Lee & Wang (2020), Lee & Vu (2019), Baiardi & Morana (2016) and Kavya (2020) & vijin, as well as the objectives of the present study, the relationship between income inequality and economic complexity Is examined in the form of simultaneous equations, so models (1) and (2) are used simultaneously:

(1)
$$ineq_t = \alpha_0 + \alpha_1 eci_t + \alpha_2 indus_t + \alpha_3 gdp_t + \alpha_4 gdp^2{}_t + \alpha_5 gov_t + \varepsilon_t$$
(2)
$$eci_t = \beta_0 + \beta_1 ineq_t + \beta_3 indus_t + \beta_4 gdp_t + \beta_6 fdi_t + \beta_7 hum_t + \varepsilon_i$$

In Equation (1), income inequality (ineq) is a function of economic complexity (eci), industrialization (indus), economic growth (gdp), squared of economic complexity (gdp2), and government size (gov). But in Equation (2), economic complexity is a function of income inequality, industrialization, GDP, foreign direct investment (fdi), and human capital (hum). In order to match the unit of variables, logarithmic conversion is used and the interpretation of the model is based on stretches. All statistical evidence of explanatory variables has been prepared from the Central Bank website and evidence related to economic complexity has been collected from the World Atlas website. The present study used statistical evidence from the Atlas site to obtain the complexity index.

FINDINGS

Finally, to investigate the possibility of a relationship between the two variables of income inequality and economic complexity, the Granger causality approach is used. Based on the results, there is a two-way relationship between the two variables, because the null hypothesis that there is no relationship between the two variables is rejected. And the probability value is less than 5%. Evidence from 3SLS model estimation shows that human capital has a positive and significant effect on economic complexity, so that the more human capital, in other words, education in the Iranian economy, the greater the economic complexity. The complexity of the economy means diversification and inclusiveness, and economies with a high degree of complexity will always experience the stability of foreign exchange and economic income. In order to increase the effect of human capital on economic complexity, the quality of the country's education system must increase significantly. The effect of GDP on economic complexity is positive and significant, one of the important implications for the positive effect of GDP on economic complexity is due to the effect of the domestic market, the main idea of the effect of the domestic market is that domestic market capacity Begin can act as a protector for new products. In other words, HME is a relatively higher correlation between a country's share of world total production than that country's share of global demand (Crozet & Trionfetti, 2008). From the perspective of the domestic market hypothesis, countries with larger domestic demand volumes have a better potential to compete in international markets, and thus economic complexity increases. The study of the effect of foreign direct investment on economic complexity shows that with the increase in foreign direct investment, the degree of economic complexity also increases, but this effect is not significant, because the share of foreign direct investment in the Iranian economy is very low and significantly There is no foundation in value-added sectors. Foreign direct investment in economies such as Iran Due to the diversity and gap between imported technology resulting from foreign direct investment and technology in the structure of the economy, any inflow of foreign investment provided that it is allocated to high value-added sectors, complexity Economic and export diversity is increasing. One of the important features for the Iranian economy is the high volume of exports based on petroleum products and its products. One of the main problems for foreign direct investment is its flight, so that foreign investment leaves the country with internal and external shocks, which will

lead to an economic crisis. Thus, the sustainability of foreign direct investment is the most important determinant of economic complexity. Industrialization is one of the factors that due to technology-based structures, has a high efficiency in production processes, and therefore has a significant role in creating economic complexity. Evidence from estimates shows that industrialization is the most important factor in increasing It is economic complexity, so that with the increase of industrialization by one percent, the amount of economic complexity increases by 0.075 percent. One of the most important features of the industrial sector is the abundance of technological innovation and the existence of high back and front links, which has led to the development of other sectors per unit in these sectors, leading to an increase in the index of economic complexity. In terms of factors affecting income inequality, economic growth first increases significantly in income inequality, and then with an increase in economic growth, income inequality decreases, which confirms the Kuznets curve hypothesis. Accordingly, income inequality increases first as economic growth increases, because the benefits of economic growth belong to limited groups, and then, as economic growth increases, income inequality increases because many people will enjoy the benefits of economic growth. Is reduced. The second factor affecting income inequality is economic complexity. The results show that with increasing economic complexity, income inequality decreases significantly, and this confirms that a high share of economic complexity in the country is due to product diversification. And diversification increases the enjoyment of a larger percentage of society due to economic complexity. Based on the evidence obtained, industrialization as an indicator of the ratio of value added of industrial sector to GDP has a negative and significant effect on income inequality, so that by increasing the value added ratio of industrial sector by one percent, the rate of income inequality to The size decreases by 0.281% and this effect is confirmed at the 5% error level. Caldor theory (1966) and its dimensions is a reason for the negative effect of industrialization on income inequality. According to Caldor theory (1966), industry is the engine of economic growth for three reasons. First, the industrial sector has a statically and dynamically increasing efficiency. Second, as the industrial sector develops, with the transfer of labor from those sectors, labor productivity in those sectors increases, and productivity in the economy as a whole and economic growth in general increases. Finally, the industrial sector is the leading sector in the economy due to having the most anterior and posterior connections. Therefore, the quality of economic growth is

timely The real picture in the economy is that the main focus is on the development of higher value-added sectors, because in this case, the effects of income overflow and benefits from industry owners to people in the lower social class will overflow and income distribution in society will be homogeneous. One of the important tasks of governments in the economy is to distribute revenue through a variety of policy tools. By investing in social overhead projects and economic infrastructure, governments seek to pave the way for private sector activity, thereby enabling the private sector to focus on value-added activities to improve revenue distribution. If governments can use their policy tools to use the maximum capacity of the economy to have higher output, it can improve revenue distribution. But when governments have difficulty meeting their current expenditures and do not have a significant share of the budget for development and infrastructure improvements, revenue distribution is expected to worsen. Evidence for the study shows that government size does not have a significant effect on income inequality. One of the most important reasons for the insignificance of government size effect on income inequality is due to the fact that government spending is not targeted to improve the country's infrastructure.

CONCLUSION
Surplus production can be identified as the economic complexity of each factor of production, and represents a degree of accumulation of knowledge and skills that leads to products with higher diversity and less pervasiveness. In fact, economic complexity assumes that countries have the ability to produce products that also have the required skills and knowledge, so economic complexity seeks to measure the accumulation of knowledge and skills hidden in the economy. Accordingly, countries with higher complexity, higher diversification and less inclusiveness in exports. In this way, they have the required knowledge and skills of most products and also export products that other countries are not able to export to global markets. The importance of economic complexity is not limited to the ability to apply knowledge in the production process and encompasses a much wider dimension. One of these dimensions is the effect on income inequality, which has been studied in limited studies. In this regard, the present study examines the relationship between income inequality and economic complexity using the evidence of Iran's economic statistics in the period 1374-1397 using the simultaneous equation approach. The results show that a two-way causality between income inequality and complexity There is an economy in Iran. In addition, studies show that increases in income

inequality lead to economic complexity and increases in economic complexity reduce income inequality. According to estimates, it reduces income inequality, but the existence of inequality complicates the economy, because the difference in income in higher-yielding activities than in lower-yielding activities motivates the production of high-tech products. On the difference between technology and innovation, leads to an increase in economic complexity. In addition, the technology-oriented nature of industrial activities compared to other economic sectors, adaptation to new technology and learning processes based on human capital and the effect of the domestic market on the development of GDP increase economic complexity. Also, the high back and front links of the industrial sector compared to other economic sectors have reduced income inequality. The results of the present article confirm Caldor's theory regarding the importance of the industrial sector in the economy, because on the one hand it increases economic complexity and economic growth and stability, and on the other hand it improves the quality of economic growth in the country.

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