Relationship Between Technological Innovation, Infrastructure and Industrial Growth in Iran

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Abstract

Industrial growth is a goal in developing countries and many factors are involved in it. Studies on the effect of infrastructure and innovation on industrial growth in different countries have had different results and so far its effect has not been investigated in Iran. In this study, we examined the empirical cointegration, long and short-run dynamics and relationships between technological innovation, infrastructure and industrial growth in Bangladesh over the period of of 2020 1980-. The ARDL Bounds Test methodology and ECM framework were applied. The obtained results confirmed the long-run relationship between the three variables of technological innovation, infrastructure and industrial growth in Iran. Technological innovation and infrastructure have positive and significant effects on Iran's industrial growth in the short and long term, but these effects have been small. The results obtained from this empirical analysis have important policy implications for Iran. Increasing research and development investments, investing in academic research, information and communication technology infrastructure, green technologies, importance to intellectual property rights and formulating an integrated policy for greater impact of technological innovations and infrastructure on industrial growth in increasing the effect of innovations. Technology and infrastructure will be effective on Iran's industrial growth.

Keywords: Technological Innovation-Infrastructure-Industrial Growth- ARDL Model.

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Introduction

Problem Statement: Despite the efforts made in the direction of developing innovative technology, Iran has lagged behind its competitors in the global competition of technological advances and industrial development in recent years. The main question of this article is what effect did technological innovations and infrastructures have on industrial development in Iran?

Purpose : This study has the following specific Purpose:

A) Analysis of short-run and long- run relationships of innovation and infrastructure on Iran's industrial growth.

b) Helping the subject literature in the field of formulation of national technological innovation policy, industrial policy and infrastructure policies to strengthen economic growth.

Reviewing the existing literature, we see that several researchers have used different variables of GDP, CO_2 emissions, energy consumption, development of the financial sector and income, inequality, trade openness. As far as the findings and reviews show, the relationship between technological innovation, infrastructure and industrial growth in Iran has not been investigated.

Background: A review of the literature on the subject indicates the positive effect of various types of infrastructure on economic growth, including: Hulten and Schwab (1991), Easterly and Rebelo (1993) Calderón and Servén (2004), Dollar *et al* (2005), Hulten and Isaksson (2007), Fedderke and Bogetić (2009), Dethier *et al* (2010), Fleisher *et al*. (2010), Pradhan and Bagchi (2015), Achour and Belloumi (2016), Chingoiro and Mbulawa (2016).

There are other studies that show negative or mixed results of different infrastructures on macroeconomic variables, including: Evans and Karas (1994), Gramlich (1994), Holtz-Eakin and Schwartz (1994), Ferreira and Issler (1995), Bougheas *et al* (2000), Brenneman and Kerf (2002), Okoh and Ebi (2013), German-Soto et al. (2017).

Most researchers have stated the positive effect of technology on economic growth and showed that different types of technology such as ICT, broadband, telecommunications, mobile telecommunications, mobile technology, financial openness, patents and innovation have a positive effect on economic growth. Among the research conducted by Hardy (1980), Stiroh (2002), Fabiani et al (2005), Garbacz and Thompson (2007), Gruber and Koutroumpis (2010), Vu (2011), Sassi and Goaied (2013), Chester et al. (2014), Sohag et al. (2015), Shahbaz et al. (2016), some researchers have expressed the negative or mixed effect of technology on economic growth, such as Lee et al. (2005), Ishida (2015), McCartney (2017).

Mousavi Jahromi and Ibadati Fard (2007) showed the strong relationship between investment in transportation infrastructure and private sector investment . Dai Karimzadeh et al. (2013) used the ARDL model and showed that in the short and long run, government investment in The transportation sector has had a positive and significant effect on the GDP.

Akbarian and Qaidi (2019) showed that in the long run, the effect of per capita labor investment in economic infrastructure on GDP is positive and per capita labor investment Work in communication infrastructure has the greatest impact and per capita investment in energy infrastructure has the least impact on the gross domestic product without oil per capita of Iran's workforce. In the short run, there is no significant relationship between economic growth without oil per capita of labor force and investment growth per capita of labor force in economic infrastructure.

Erfani et al (2012) concluded that the effect of information and communication technology on the growth of both groups is positive, but this effect is greater in developed countries.

Mehrgan et al (2012) found that in the long run, the relationship between the accumulation of human and physical capital on the economic growth of Iran is positive and significant, and in the long run, the accumulation of human capital has the greatest impact on the economic growth of Iran.

Methodology

In order to investigate the relationships between three important macroeconomic variables, technological innovation (TI), infrastructure (INF) and industrial development (IND) of Iran, data were extracted from the "Global Development Indicators" published by the World Bank. For industrial development (IND), industrial value added (constant 2015 US dollars) was used, industrial value added as a representative of Iran's industrial development according to the article of Rahman and Kashem (2015). For technological innovation (TI), the number of patent applications residents and the number of Patent applications, nonresidents is considered representative. For the infrastructure variable (INF) in this article, gross capital formation (constant 2015 US dollars) is used as a representative of infrastructure (INF) for Iran and time series data is entered in the form of logarithms.

In this study, the Cobb-Douglas production function in Solow's model (1956) is used to analyze the relationship between technological innovations, infrastructure and industrial growth in Iran. The Cobb-Douglas production function is widely used in economics to represent the relationship between inputs and outputs. There are various methods to test the existence of co-accumulation and short-run and long-run relationships between variables. In this article, ARDL bounds test method is used. The ARDL bounds test approach has superior features over conventional cointegration test methods.

Findings

The ARDL bounds tests, as well as additional cross-checking test, confirmed long run as well as short-run cointegration between the three variables in Iran. The obtained results indicate that infrastructure and technological innovations in the long-run and short-run have a positive and significant effect on industrial growth, which is consistent with the theoretical foundations and new growth models.

The positive sign of technological innovation coefficient indicates its positive effect on industrial growth. The government's investment in infrastructure, especially digital and ICT infrastructure, research and development, importance to intellectual property rights, support for patents and international innovations, and support for technological innovations of universities to enter the industry, increase technological innovation and its effects.The smallness of this coefficient in the short and long run indicates the small role of technological innovation on the industry so far. The low reserve of consumption of machinery due to inflation hinders the modernization and application of new technologies and causes the technology coefficient to be small. Creating the fields of competition in the domestic market and trying to increase the share in the global markets will increase the incentive to invest in technology. In order to improve the role of technology and infrastructure on Iran's industrial growth and to increase the role of the government, macro-policies in the field of technology and innovation should be codified quickly and the existing policies should be reviewed and necessary measures should be taken for improvement. The updated and improved technology innovation policy will not only reduce the cost of production but also accelerate the country's industrial growth. One of the major effects of technology on the environment will be, the promotion of green and clean technology in industries will improve the environmental quality of the country.

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