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Investigating the effect of financial development and internet penetration on the exports of Iran's provinces with a machine learning approach

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EXTENDED ABSTRACT

INTRODUCTION

The present research has investigated the effect of financial development and internet penetration on the export value of 29 provinces of Iran from 2006 to 2020 using Panel corrected standard error estimation and the Gaussian process regression machine learning model. Because the Internet penetration rate is different among different provincial levels, Internet users will have different effects on export growth among provinces. On the other hand, the development of the financial sector as one of the main factors in foreign trade and export growth has been studied and discussed. In previous studies, it was shown that the importance of the financial sector in promoting exports can be confirmed from three aspects. First, the positive effect of the level of the financial sector and foreign trade balance confirms the significance of financial development in economic growth and development. Second, the more financial services are developed as a part of production technology, the more they help promote foreign trade. Thirdly, the development of the financial sector can provide liquidity and increase the level of foreign financing required by exporters. Some other studies have not found any effect on the relationship between the financial sector and commercial exports, especially in developing countries. Despite the considerable attention paid to the relationship between the use of the Internet and financial development and exports, there are still some gaps in past studies. To cover this gap, the aim of this research is to answer the question of how much internet penetration and financial development affect the growth of exports in the provinces of Iran. According to the mentioned goal, the current research has three basic contributions in the existing literature about the relationship between the Internet, financial development and exports. The first is that the current

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research has investigated the effects of internet users and financial development on the promotion of the country's exports at the provincial level, the second is that it has been shown how this relationship exists, they change with different levels of development, and the third is that using machine learning models to predict the effects The use of the Internet and financial development have been used on the growth of exports.

METHODOLOGY

The stages of export value estimation according to the proposed machine learning algorithm include the selection of data input model, data pre-processing, data classification and machine learning algorithm. First, data has been collected for three sample cases. The first model represents the sample of all provinces, which is used in the algorithm to evaluate the effects of Internet use and financial development on export value, and the best model for predicting the effect of financial development and Internet use is determined. In the second stage, outliers removed and data normalized, and in the third stage, the data is divided into ten categories based on the method of cross validation, and then using machine learning algorithm to strengthen the valid regression model that can accurately predict the value of exports based on financial development and Internet is used. The dependent variable of the country's export value is equal to all the export value of goods except crude oil for 29 provinces of the country. Data values are obtained from the statistical yearbook of each province. The two independent variables of financial development and internet penetration are used as determinants of export growth in this study. Domestic credit provided by banks have been used as a ratio of GDP to measure financial development.

FINDINGS

The most important results of data analysis can be explained in four sections. First, the use of the Internet has a positive contribution to the country's export value in all provinces. Therefore, the first hypothesis based on the effect of financial development variables and internet penetration on the export growth of Iran's provinces is confirmed. Second, the use of the Internet in developed provinces has a greater impact on export growth, causing to a reduction in time and exchange costs to complete the business process. In less developed provinces, the use of the Internet does not have a significant contribution to the growth of exports. Therefore, it can be said that the Internet penetration rate on the export value depends on the level of development of the provinces, and the second hypothesis of the research that the effect of the Internet

penetration rate is different in different provinces of the country is confirmed. Thirdly, financial development has a significant and main contribution to the growth of exports in the provinces. Fourth, the machine learning model showed that financial development, gross domestic product, population and the Internet are the most important factors in predicting export growth in Iran's provinces.

CONCLUSION

According to the results obtained from the data, some solutions and practical policies are suggested to stimulate the growth of exports in the provinces of the country. First of all, although governments have invested significantly in the development of infrastructure since 2006 to improve and expand the level of technology and the Internet. But the use of internet in some provinces is still insufficient. Also, policymakers should strengthen infrastructure resources and support policies of the Internet sector for export growth. Policymakers should play an important role by establishing communication channels between exporters and importers and providing training on how to use these channels to facilitate access to international markets. Second, policymakers should pay more attention to business language for individuals and companies. Thirdly, by creating an environment with more opportunities for wealth creation in less developed provinces, policy makers should make more efforts in the direction of stability of growth opportunities and as a result the mobility of export growth. In other words, financial development in the country requires continuous improvement and the use of new methods. Therefore, politicians should work to improve flexibility and cooperation between the financial sector and exporters.

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