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Investigating the effect of productivity shock on structural changes and water transfer potential between Iran and neighboring countries

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EXTENDED ABSTRACT

INTRODUCTION

Due to the water shortage crisis, water resources and optimal consumption of these resources are of great significance. The effects of water scarcity on all countries are a global threat, and the issue of water has been considered regional and international cooperation. "water economy" refers to the set of water resources and consumer sectors that are related through physical capital (equipment, infrastructure) and social capital (institutions, norms and laws) (Zemel & Tsur2018). The transfer and redistribution of water is considered as reallocation of water. According to the United Nations World Water Development Report, three-quarters of jobs around the world depend on water, so water scarcity and lack of access to water may hamper economic growth in the coming years. Water is an important factor in the development of employment opportunities. According to Kuznets' study, Structural change includes a change in direction from agriculture to non-agricultural activities and then from industry to services. One of the most important factors in the movement of inputs between sectors is total factor productivity therefore, in this research, it has been determined to what extent the positive shock of productivity can be effective on the process of structural change. The article answer two questions. First, will there be structural changes in Iran despite the positive productivity shock? And second, is there a potential for water transfer between Iran and neighboring countries with the positive productivity shock?

METHODOLOGY

In this study, calculable general equilibrium models have been used. The data required to simulate the scenarios proposed in this research is taken from the ninth version of GTAP. This version includes the world economy with 140 countries or regions and 57 economic sectors. It is not possible to present all relationships and equations in one article. In addition to the GTAP database, IMPACT data has also been used. The IMPACT model is a hybrid model of water simulation and agricultural partial balance. According to the objectives of the research, the aggregation model has been changed and instead of 140 regions or countries, in one aggregation, Iran and other regions and in other aggregations Iran and neighboring countries (Pakistan, Turkey, Russia, Kazakhstan, UAE, Armenia, Azerbaijan, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia) are considered. 57 parts of the model have been changed to 13 parts and 5 production factors to 8 production factors, these changes are as follows. The sectors include: 1. Agriculture (rice, wheat, oilseeds) 2. Other crops (cereals, fruits, vegetables...) 3. husbandry 4. Forestry 5. Fisheries 6. Coal 7. Oil 8. Gas 9. Industry 10. Petrochemical 11. Electricity 12. Water 13. Services. Factors of production include: water, land, rainfed land, pasture land, skilled labor, unskilled labor, capital and natural resources. One of the most important factors affecting the demand input is productivity, so it has been tried to evaluate the effect of changing this variable in a computable general equilibrium model structure. Productivity shock is considered 0.6% according to the trend of changes in productivity and taking into account Iran's economic conditions, including sanctions and the international crisis such as Corona. Two scenarios are considered in this article. The first scenario of productivity shock for Iran and the second scenario of productivity shock for Iran and neighboring countries.

FINDINGS

First scenario: Productivity shock in Iran

The positive productivity shock 0.6% has no effect on the demand for agriculture and other crops. But on the other three agricultural sectors, the impact on input demand is positive. Oil and gas sectors reduce demand for water with productivity shock. The water demand of the industrial sector is more than all other sub-sectors. That is, with a productivity shock the industrial sector can demand more water, and considering its share of value added, it can be concluded that the transfer of water from agriculture to industry can be justified. The results showed that the productivity shock



reduces the average growth of skilled and non-skilled laborers in economic sectors, increasing the capital demand on average. Therefore, the defined shock provides a basis for structural changes in Iran. The productivity shock has increased production in most sectors, but notice that the shock in the sectors that have increased water demand has also increased production. But the important point is that the production growth of the industrial sector is much higher than the increase in the demand of this sector for water, which shows the importance of water in the industrial sector. The average comparison of production growth in agriculture and production growth in the industry and services sector is a confirmation of the transfer of water from the agriculture sector to the industry sector.

Second scenario: Productivity shock in Iran and neighboring countries

The effect of the productivity shock in the neighboring countries shows that the structural changes in these countries have a slower process than in Iran.

The results show that even though the economic sectors of bordering countries react to water demand, considering the size of the countries and the contribution of value added of the sectors in the GDP, the justification of water transfer is defensible. This issue can justify the longrun of moving water from neighboring countries to Iran. That is, if there is regional convergence that leads to an increase in productivity, it can provide the potential of transferring water from neighboring countries to Iran. However, to justify economic convergence, it is necessary to use other methods, including gravity models. But we must accept that economic convergence increases productivity. Therefore, the conditions of convergence between Iran and the bordering countries can provide the potential of moving water between these countries

CONCLUSION

In this research, the effect of the positive productivity on structural changes has been investigated. The results showed that the productivity shock reduces the average growth of skilled and non-skilled laborers in economic sectors, increasing the capital demand on average. Therefore, the defined shock provides a basis for structural changes in Iran. Also, the positive shock of productivity can affect the demand for water in the economic sector due to its effect on allocating resources in the economic sector. The results of the 0.6% productivity simulation model for Iran and the rest of the world showed that in the economic sector, structural changes occur through changes in demand

for labor and capital. This process occurs if economic growth is shaped by an unbalanced and unstable pattern. On the other hand, a model with a production efficiency of 0.6 percent has been simulated for Iran and neighboring countries. This simulation showed that due to various effects of this impulse on water demand in different economic sectors, there is the potential for water transfer between Iran and neighboring countries. Therefore, one of the appropriate strategies to achieve the optimal use of water is to investigate the possibility of transferring water between geographical borders. The specific policy suggestions of the research are that, firstly, because the productivity index plays a decisive role in the structural changes, therefore any effective step that can improve productivity has also managed structural changes. Secondly, moving towards water-centered economic convergence between Iran and bordering countries can help in the optimal allocation of water resources.

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پیوست : (علائم به کار رفته در پژوهش)

آب :Wtr

زمین‌های دیم :RfLand

زمین‌های قابل آبیاری :Lnd

نسبت بازدهی آبیاری به بازدهی دیم بخش z در منطقه r :YRj,

تقاضای نهاده i در صنعت z در منطقه r :qfeij,r

ترکیب زمین آبیاری و آب در صنعت z در منطقه r :qlwj,r

ترکیب سرمایه و انرژی در صنعت z در منطقه r :qkej,r

ترکیب انرژی (الکتریکی و غیرالکتریکی) در صنعت z در منطقه r :qenj,r

ارزش افزوده در صنعت z در منطقه r :qvaenj,r

تولید صنعت کالای i در منطقه r :qoi,r

تقاضا برای کالای i برای استفاده توسط z در منطقه r :qfi,j,r

ترکیب کالای غیر الکتریکی در صنعت z در منطقه r :qnelj,r

ترکیب انرژی غیر زغال سنگ در صنعت z در منطقه r :qncoalj,r

قیمت بنگاه برای نهاده i در صنعت z :pfeij,r

قیمت بنگاه برای ترکیب زمین قابل آبیاری و آب در صنعت z در منطقه r :plwj,r

قیمت بنگاه برای ترکیب سرمایه و انرژی در صنعت z در منطقه r :pkej,r

قیمت انرژی (الکتریکی و غیرالکتریکی) در صنعت z در منطقه r :penj,r

pfij,r: قیمت بنگاه برای کالای i برای استفاده در صنعت j در منطقه r
pvaenj,r: ارزش افزوده قیمت بنگاه در صنعت j در منطقه r
psi,r: قیمت عرضه کالای i در منطقه r
pnelj,r: قیمت کامپوزیت غیر الکتریکی در صنعت j منطقه r
pncoalj,r: قیمت کامپوزیت غیر ذغال سنگ در صنعت j منطقه r
afeij,r: عامل اصلی افزایش تغییرات فنی توسط صنعت j منطقه r
afij,r: تغییرات فنی ایجاد شده از ترکیب نهادهای واسطه‌ای
avai,r: افزایش ارزش افزوده تغییر فنی در بخش I منطقه r
aoj,r: خروجی افزایش تغییرات فنی در بخش j منطقه r
ELLWj,r: کشش جایگزینی بین زمین قابل آبیاری و آب در j
ELKEj,r: کشش جانشینی بین سرمایه و ترکیب انرژی در j
ESUBVAj: کشش جانشینی در ارزش افزوده تولید در j
ESUBTj: کشش جانشینی ترکیب نهادهای واسطه‌ای در تولید