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Factors Affecting Technological Unemployment and Its Implications for the Macroeconomic Outlook of Iran

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Abstract

Over the past decades, there have been widespread and significant technological changes in countries around the world. Developing countries, including Iran, have been witnessing the spread of technology in various parts of the economy, with several delays, along with technological advances in the world. Despite the benefits of technological advancement for the economy, its effects on unemployment are not obvious. On the one hand, technological advancement leads to the creation of new businesses and, on the other hand, destroys some of the old professions. The invention of new machinery and equipment reduces the need for labor in some parts because these tools and equipment perform more efficiently and quickly. If technological advances are appropriate to the structure of the labor market and are based on the needs of the country's economic activities, they can reduce unemployment in the country. On the other hand, if the expansion of technology does not fit into the needs and economic structure of the country, it can have a negative effect on employment. Accordingly, in this study, the effects of technological progress on the unemployment rate in Iran were evaluated using time series data during 1395-1353. In order to estimate the research model, the ARDL econometric methods were used. The empirical evidence from the estimation of research models shows that technological progress in the Iranian economy led to an increase in unemployment, as the country's economic structures did not fit into technological advancements.

Keywords: technological unemployment, total factor productivity, ICT.

JEL Classification: E66, J64, O47, O33.

1. Introduction

Over the past decades, there has been widespread and significant technological change in countries around the world. Developing countries, including Iran, have been witnessing the spread of technology in various parts of the economy, with several delays, along with technological advances in the world. Despite the benefits of technological advancement for the economy, its effects on unemployment are not obvious. On the one hand, technological advancement

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leads to the creation of new businesses and, on the other hand, destroys some of the old professions. The invention of new machinery and equipment reduces the need for labor in some parts because these tools and equipment performed more efficiently and quickly. If technological advances are appropriate to the structure of the labor market and are based on the needs of the country's economic activities, it can reduce unemployment in the country. On the other hand, if the expansion of technology does not fit into the needs and economic structure of the country, it can have a negative effect on employment.

Therefore, the main objective of this study is to examine whether technology changes affect unemployment rate in Iran. In addition, in this study we aim to analyze the mechanisms through which technological advances could affect the unemployment rate in Iran.

2. Method

Accordingly, in this study, the effects of technological progress on unemployment rate in Iran are evaluated using time series data during 1353-1395. In order to estimate the research model, the ARDL econometric methods were used.

In order to clarify the econometric model of unemployment rate in this study, the Feldman approach (2009) was used. In the present study, using the variables explaining the technology, Feldman Model is expanded as follows:

$$Ut = \beta 0 + \beta 1GDPt + \beta 2INFt + \beta 3Opent + \beta 4EDt + \beta 5FERt + \beta 6Techt + \beta 7oil + et \quad (1)$$

Where :

U: The unemployment rate

GDP: Economic growth.

INF: Inflation.

Open: Economic openness index.

ED: Education Indicator.

FER: Fertility rates.

Tech: Technology Indicator.

Oil: Oil revenues of the country.

Total Factor Productivity and the growth of mobile phone users are used to identify Tech Indicators in this study.

The Total Factor Productivity actually measures the improvement of the qualitative aspects of labor and capital inputs, as well as the efficiency of the combination. In this method, changes in technology are defined as a change in production minus the sum of the weighted inputs of labor and capital, which is

referred to as TFP (Solo, 1957). In other words, TFP is residual portion of total production changes that cannot be explained based on the input of labor and capital stock. TFP Can be calculated as follows:

$$\mathrm{TFP} = \frac{\mathrm{Y}}{\mathrm{K}^{\alpha}\mathrm{L}^{1-\alpha}} \qquad (2)$$

3. Results

The empirical evidence from the estimation of research models shows that; since the country's economic structures did not fit into technological changes, therefore technological changes in the Iranian economy led to an increase in unemployment. The results of estimating the effects of technology on unemployment rate using ARDL model, indicate that all variables (other than fertility rates) have a significant effect on the unemployment rate.

The long-term effects of the variables show that the variables of inflation, economic openness index, the growth of oil revenues and economic growth, have a significantly negative relationship with the unemployment rate in the country; in other words, an increase in these variables leads to lower unemployment rate in Iran. On the other hand, the variables of labor productivity, the growth of mobile phone users and higher education have a significantly positive effect on the unemployment rate. Therefore, here too, technological indicators have positive and significant effect on the unemployment rate in Iran.

4. Conclusion

The main conclusions based on the findings from the present study are listed as follows:

1- Empirical evidence from research estimates shows a negative correlation between inflation and unemployment in Iran. So, Phillips curve is applicable to Irananian economy, but it should be noted that the intensity of the relationship between these two variables is not as high as that provided by Philips.

2- Economic openness, as an indicator, had a significantly negative relationship with unemployment rate in Iran. So by increasing trade with foreign sector, unemployment rate would be reduced in Iran.

3- Increasing university education as one of the inputs of technology had a positive relationship with the unemployment rate in the country during the period of 1353-1393. In other words, with the increase in the number of university graduates, the unemployment rate in the country has increased. When the level of education

rises, the people will not be willing to accept any job and their mobility in the labor market will reduce.

4- Growth of mobile phone users as well as other indicators of technology has had a positive and significant effect on the unemployment rate in the country.

5- The productivity of labor force has had a positive and significant relationship with the unemployment rate in the country. By increasing labor productivity, fewer workers will be required to do a specific job, and this channel will lead to an increase in unemployment. Of course, if the increase in labor productivity does not increase the cost of manufacturing, the profitability of firms increases per unit of labor and their incentive to increase production capacity and use more of labor will increase. However, in most countries in the world, there are laws and regulations that prevent wages from complying with labor productivity. Among these rules, we can refer to the minimum wage laws.

6- Based on the research model, at a confidence level of 95 percent, the IDI index and the growth of mobile phone users as an indicator of the progress of communications and information technology, have a significantly positive effect on the unemployment rate in Iran. Therefore, with the advancement of communication and information technology, the number of jobs created has been less than the proportion of demolished businesses leading to an increase in unemployment. So, empirical evidence from the estimation of research models shows that technological progress in the Iranian economy leads to an increase in unemployment, as the country's economic structures did not fit into technological advancements.

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