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THE RELATIONSHIP BETWEEN PUBLIC INVESTMENT AND EMPLOYMENT IN TURKEY: A TODA-YAMAMOTO APPROACH

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Abstract

Public spending has significant economic effects and is crucial for countries' economic activities. It is employed as an effective fiscal policy instrument, impacting both the supply and demand sides of the economy. High unemployment poses a major macroeconomic challenge, affecting developed and developing countries with negative socioeconomic consequences. To address this, governments prioritise economic activity that boosts employment and creates various programs. Public spending, particularly in capital expenditure and public investment, is critical in expanding national economic activity and employment. However, the relationship between public spending and employment is still debated. This study investigates the causal relationship between public investment and employment in Turkey from 1992 to 2021. The Toda-Yamamoto causality test shows that public investment and employment have a bidirectional causality, demonstrating a feedback relationship between the two variables.

Keywords: public investment, employment, Turkey, Toda-Yamamoto causality

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1. INTRODUCTION

There has been discussion about the share of the public sector in the economy from the past to the present. Although some argue that the public sector's role in the economy should be limited, others claim that government intervention is necessary to combat challenges, including chronic stagnation, high unemployment rates, and unstable economic growth. However, it is also true that people's lives depend on the services supplied by the government (Onuoha and Agbede, 2019: 2). To meet their residents' needs in terms of economic and social life, developing countries frequently have to choose to meet these demands through public expenditures. Almost every country uses public spending as an effective fiscal policy tool to attain economic, social, and political goals. Yet, the degree of sensitivity to external shocks and government participation in local economies differs across countries and throughout time (Al-Faris et al., 2002: 1188).

Creating more jobs is one of a country's primary macroeconomic goals. Public spending is one of the government's most crucial fiscal policy tools to accomplish this goal. While increasing employment is the main goal of these policies, other goals include promoting economic growth and political stability. Keynes (1936) stated that government spending could promote growth by raising consumer spending and boosting employment, profits, and investment. At the same time, market regulation and effective resource allocation are considered ways for government involvement in the economy to lead to full employment. Keynes suggested that government spending should be done in a way that ensures the implementation of economic policies that encourage investment and income redistribution. (Kouassi, 2018).

There is a direct relationship between government spending and the rate of job creation in an economy. Therefore, government spending on economic and social infrastructure aims to indirectly create jobs in order to ensure economic growth and development. In this regard, state intervention is required to provide vital social and economic infrastructure facilities (roads, power supply, schools, rail, communications, hospitals, and so on) required for economic growth and development. Public spending also promotes infrastructure development by permitting investment in public projects and programmes, which develop productive sectors of the economy and create job possibilities. Last but not least, higher industrial production brought on by public investment in infrastructure development draws foreign direct investment and inevitably generates jobs for the labour force already in place (Ewubare and Maeba, 2018; Chinwendu, 2019: 2).

Policymakers and economists often have the opinion that raising public spending will have a beneficial effect on jobs. However, the outcome of an expansionary fiscal strategy in the form of an increase in public expenditure depends on a variety of factors, such as whether or not the nation is heavily indebted. In this context, a rise in public spending in countries with high debt burdens may have an adverse effect on employment (Feld, 2017). As a result, there may be cases where government spending does not result in the expected rise in employment. This

brings into question the effectiveness of fiscal policy. Blanchard (2003) contends that the impact of increased government expenditure is determined by how it is funded and the investment response. This suggests that if expenditures are financed through borrowing, interest rates may rise, resulting in a fall in private investment. Baxter and King (1993) distinguished between two forms of public expenditures and suggested that an increase in public investment has a significantly more significant economic impact than an increase in public purchases of goods and services (Abouelfarag and Qutb, 2021: 361).

Governments frequently use public spending as an effective policy instrument to enhance employment and economic growth. The study aims to determine whether public investment and employment in Turkey are causally related. From 1992 to 2021, the Toda-Yamamoto causality test is used to investigate the relationship between public investment and employment. The research is organised into five sections. First, the relationship between public spending and employment is discussed in the introduction. In the second section, the relevant studies from previous research are examined. The third and fourth sections include the data set, econometric method, and econometric results. Conclusions take place in the final section.

2. LITERATURE REVIEW

Academics keep arguing about the effect of public spending on employment. However, the results of research on this subject are still contradictory. Therefore, previous studies regarding the issue were reviewed in this part of the research. Table 1 gives a summary of the studies on the subject.

Tablo 1. Literature Review

Author	Country/Period	Method	Results
Yildirim and Sezgin (2003)	Turkey/1950-1997	ARDL	Military investment reduces employment
Onur (2004)	Turkey/1980-2002	OLS, Granger causality	Public fixed capital investments have an adverse effect on employment. Furthermore, there is unidirectional causality from government fixed capital investments to employment.
Göze Kaya et al. (2015)	Turkey/1990-2013	Regression, Granger causality	There is no relationship between employment and public investment
Kanca and Bayraktar (2015)	Turkey/1980-2013	Granger causality, OLS	There is no relationship between public investment and unemployment.
Sancar et al. (2016)	Turkey/2008-2013	Random effects	Public investment reduce unemployment in the TR8 region.
Topal (2017)	Turkey/2004-2016	ECM, ARDL-PMG	Public investment enhances employment in the long run.
Charles et al. (2018)	Nigeria/1980-2016	Johansen cointegration, Dynamic OLS	Investments in public education reduce unemployment, whereas investments in public health and other fields do not.
Anowor et al., (2019)	Nigeria/1980-2017	ECM	Public investment decreases unemployment
Bektaş (2020)	Turkey/1990-2017	Granger causality	There is unidirectional causality from the unemployment rate to public investment

Petrovic et al. (2021)	10 CEE countries/1999:Q1-2015:Q4	Panel data analysis	Public investment expansion has a significant beneficial effect on employment.

Note: ECM; Error correction model, ARDL; Autoregressive distributed lag, OLS; Ordinary least squares.

When the research in the literature is examined, it is determined that there are a few studies that investigate the relationship between public investment and employment. The findings of this research differ as well. This study adds to the existing literature by examining the relationship between public investment and employment in Turkey.

3. DATA AND ECONOMETRIC METHOD

The relationship between public investments (PI) and employment (EMP) in Turkey is investigated in the present research employing the Toda-Yamamoto (1995) causality test using annual data from 1992 to 2021. The share of public investment (% GDP) represents public investment, and the percentage of the employed population over the age of 15 represents employment. The public investment and employment variables were derived from the databases of the Strategy and Budget Directorate of the Presidency of the Republic of Turkey and the Turkish Statistical Institute, respectively.

The Granger causality test based on the Vector Autoregressive (VAR) system can be used with stationary variables. As a result, taking the difference of non-stationary variables at the level causes information loss. Such criteria are not necessary for the Toda-Yamamoto (1995) causality test. The results are reliable because there is no information lost when the variables are not taken into account. Another advantage of this test is that the cointegration relationship is not tested.

In the Toda-Yamamoto (1995) test based on the VAR system, the lag length (k) of the VAR model constructed using the level values of the variables is first established. Then, the maximum degree of integration (dmax), the highest level of stationarity of the variables, is determined and added to the lag length (k+dmax) and the model is solved. The Toda and Yamamoto (1995) test model, shown in Equations (1) and (2), was used to establish the causal link between PI and EMP.

$$EMP_t = \emptyset_0 + \sum_{i=1}^{k} \gamma_{1i} EMP + \sum_{i=k+1}^{k+d_{max}} \gamma_{2i} EMP_{t-i} + \sum_{i=1}^{k} \beta_{1i} PI_{t-i} + \sum_{i=k+1}^{k+d_{max}} \beta_{2i} PI_{t-i} + \varepsilon_{1t} \quad (1)$$

$$PI_t = \tau_0 + \sum_{i=1}^{k} \sigma_{1i} PI + \sum_{i=k+1}^{k+d_{max}} \sigma_{2i} PI_{t-i} + \sum_{i=1}^{k} \delta_{1i} EMP_{t-i} + \sum_{i=k+1}^{k+d_{max}} \delta_{2i} EMP_{t-i} + \varepsilon_{2t} \quad (2)$$

The MWALD test statistic examines the causal relationship between PI and EMP in equations (1) and (2). In equation (1), the null hypothesis H_0, $\beta_{1i}=0$, i=1,...,k, and $\delta_{1i}=0$, i=1,...,k, test whether there is a causality relationship from PI to EMP. Similarly, for Equation (2), the null hypothesis H_0 for the causality from EMP to PI is $\alpha_{1i}=0$, i=1,…,k and H_0: $\pi_{1i}=0$, i=1,…,k. The

k lags of the model are tested according to the MWALD test with X^2 distribution to determine the existence of a causal relationship. As a result, when the MWALD test is used to establish if the coefficients of the k lags are equal to zero as a group, if they are not equal to zero, the null hypotheses are rejected, and it is concluded that there is a causation relationship between the relevant variables.

4. RESULTS

This section presents the test findings for the presence of a causal relationship between PI and EMP.

4.1. Unit root test results

The Augmented Dickey-Fuller (ADF) test is used to run unit root tests on the PI and EMP variables, and the results are shown in Table 2.

Tablo 2. ADF Unit Root Test Results

Variables	ADF Test Statistics	
	Constant	**Constant-Trend**
EMP	-2.033 (0)	-1.625 (0)
PI	-2.913[c] (0)	-3.152 (0)
ΔEMP	-5.560[a] (0)	-5.492[a] (0)
ΔPI	-5.193[a] (0)	-5.209[a] (0)

Note: The values in parentheses indicate the optimal lag length chosen according to the SC (Schwarz Information Criterion). a and c denote the significance level at 1% and 10%, respectively. Δ denotes the first difference of the variables.

As demonstrated in Table 2, the EMP variable is stationary in the model with a constant and trend in the first difference. In contrast, the PI variable is stationary in the model with a constant and trend in the first difference at its level value. As a result, in the VAR system, dmax = 1.

4.2. Toda-Yamamoto (1995) causality test results

The lag length of the VAR model is first established in the Toda-Yamamoto (2015) test, and the results are shown in Table 3.

Tablo 3. Determination of Appropriate Lag Length with VAR Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-95.85392	NA	4.819894	7.248438	7.344426	7.276981
1	-69.12945	47.51016*	0.896940	5.565145	5.853109*	5.650771*
2	-64.90716	6.880782	0.888314*	5.548678*	6.028618	5.691389
3	-63.51804	2.057954	1.094768	5.742077	6.413992	5.941873

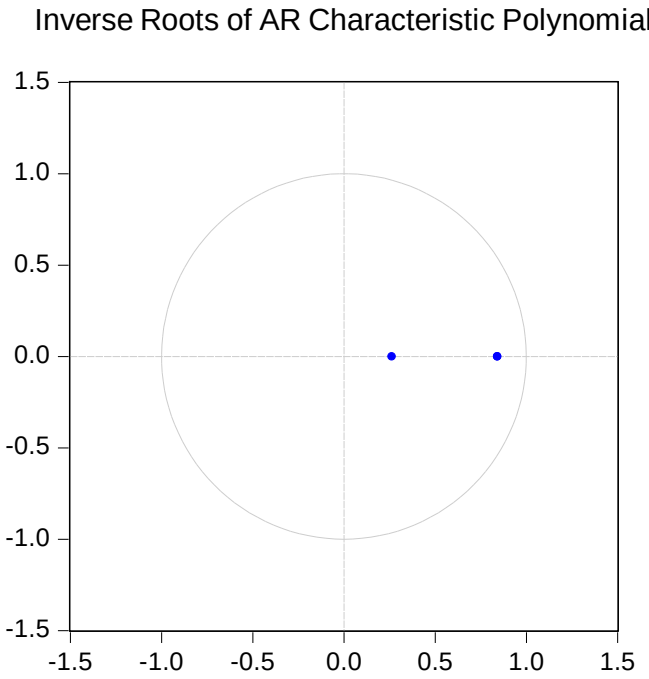
According to the LR (Sequential Modified LR Test Statistic), SC, HQ (Hannan-Quinn Information Criterion), and diagnostic test findings, the lag length of the VAR system is established as 1. The VAR system is calculated with a lag length of 1, and the LM test is used to identify the autocorrelation issue. The findings are shown in Table 3.

Tablo 4. Autocorrelation LM Test Results

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	3.879014	4	0.4226	0.989387	(4, 46.0)	0.4228
2	2.693573	4	0.6103	0.678317	(4, 46.0)	0.6105
3	3.647535	4	0.4558	0.928027	(4, 46.0)	0.4560
4	4.684397	4	0.3212	1.205247	(4, 46.0)	0.3215

There is no autocorrelation problem, according to the results in Table 4. Figure 1 shows the inverse roots of the AR characteristic polynomial of the VAR (1) system.

Figure 1. Inverse Roots of AR Characteristic Polynomial



The inverse roots of the VAR (1) system are determined to be within the unit circle. Thus the system achieves the stability criteria.

Table 5 presents the Toda and Yamamoto (2015) causality test results.

Tablo 5. Toda and Yamamoto (2015) Causality Test Results

Direction of Causality	**X^2 Test Statistics**	**Probability Value**	**Result**

$H_0=\beta_{11}=0$ There is no causality from PI to EMP.	0.093	0.0932	PI EMP
$H_0=\delta_{11}=0$ There is no causality from EMP to PI.	12.478	0.0020	EMP PI

Table 5 shows that the null hypothesis H_0, stating that there is no causality from PI to EMP, is statistically rejected at the 10% significance level, and a causal relationship between PI and EMP is proved. Similarly, at the 1% significance level, the null hypothesis H_0, which claims no causality from EMP to PI, is statistically rejected, and a causal relationship between EMP and PI is determined. As a result, the evidence of a bidirectional causal relationship between PI and EMP is determined.

5. CONCLUSIONS AND RECOMMENDATIONS

Governments frequently employ fiscal policy as a key tool to boost the economy and create jobs. In order to accomplish their economic, social, and political goals, governments frequently prefer to use public expenditures, one of the most significant fiscal policy tools. Public expenditures, in particular, are employed as a powerful financial tool to stimulate economic activity and ensure rapid economic growth rates. Unemployment causes adverse socioeconomic difficulties in many countries. Reducing unemployment, a macroeconomic challenge suffered at various levels in both developed and developing countries is one of these countries' primary macroeconomic objectives. Governments commonly use public spending to increase employment, which is an essential measure of the success of economic policy and one of their key goals. Also, there is a widespread belief that increasing government spending will increase employment. However, despite an increase in government spending on the economy, there have been instances where employment has decreased. Fiscal policies significantly impact public investment more than other public expenditures. Determining if public investments, which are one of the crucial elements of public spending and have a beneficial effect on output, generate employment in Turkey is the main objective of this study. This research aims to investigate the causal relationship between public investment and employment in the Turkish economy.

This study uses the Toda-Yamamoto causality test to investigate the relationship between public investment and employment from 1992 to 2021. The estimation of the Toda-Yamamoto causality test reveals that there is bidirectional causality between public investment and employment According to the empirical results, there is a feedback relationship between public investment and employment. In order to achieve the anticipated growth in employment, the state may successfully implement interventionist policies by boosting public investment and actively participating in this process. In addition, developing and using policies to focus public

funds on sectors with high production potential may have an employment-boosting effect. Additionally, initiatives to create more job possibilities will encourage the creation of new business ventures in the public sector.

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