

THE RATE OF UNEMPLOYMENT IN GREECE

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Annotation: Unemployment is one of the main factors of economic performance that indicates whether the people are ready to contribute to the economy by increasing the output. The high unemployment rate can lead to serious issues in both economics and society. There have been many studies to identify what factors affect unemployment in countries.

This paper will first discuss the studies conducted earlier on the factors influencing unemployment and their significance for several regions, and then the case of Greece will be analyzed together with empirical analysis and OLS assumptions. The conclusions are made according to the results of our analysis. The results obtained from our model can help us to identify what improvements can be made in the policymaking process.

Keywords: unemployment, empirical analysis, OLS assumptions, correlation, linear regression model.

Introduction: Unemployment is one of the main factors of economic performance that indicates whether the people are ready to contribute to the economy by increasing the output. The high unemployment rate can lead to serious issues in both economics and society. There have been many studies to identify what factors affect unemployment in countries. Some believe that the unemployment rate is today increasing due to depreciating human capital emerged from technology replacing some of the tasks made by human beings. Others claim that there are several reasons why there is always a fluctuation in the unemployment rate, such as economic growth, FDI, geography, education, and others. These determinants' significance can vary from country to country. Regarding Greece, the annual unemployment rate had a peak in 2013 (27.47%) and had been declining year by year, so in 2020 it reached 16.85%. (The World Bank, 2021). The rate of unemployment in Greece is relatively high than in most of the countries all over the world, therefore I am aimed to estimate which factors lead this rate.

This paper will first discuss the studies conducted earlier on the factors influencing unemployment and their significance for several regions, and then the case of Greece will be analyzed together with empirical analysis and OLS assumptions. The conclusions are made according to the results of our analysis. The results obtained from our model can help us to identify what improvements can be made in the policymaking process.

Literature review

There are several empirical studies done earlier to identify what factors determine the unemployment rate.

Gaber Abugamea in his study for the Ministry of Higher Education (2018) revealed the factors that impact unemployment in Palestine. The empirical study hypothesizes that there is a correlation between Gross Domestic Product variables as inflation, labor force, external trade, and the restrictions on labor movement and unemployment from 1997 to 2014 in Palestine. By implementing OLS (Ordinary least squares) regression analysis, the author proved that the factors used in this study are the main determiners of unemployment for the given country and period. It was found out that the only GDP had a negative correlation with unemployment significantly. Inflation, labor force, and the restrictions on labor movement have a positive influence on the unemployment rate in Palestine, however, external trade does not have a strong influence on unemployment. The author also gives some recommendations for the economy and unemployment rate of Palestine. First, the government should increase its expenditures as well as money circulation to achieve economic growth. Besides, due to the restrictions in Israel of movement of labor from Palestine, the authors suggest that people can work in the Arab market, thus resulting in the reduction of unemployment. The correlation between trade and economic growth should also be significant for the government to achieve a decrease in the unemployment rate. Some of these conclusions were made by Abiodun Folawewo and Oluwafemi Adeboje.

African Development Review in 2017 published the study of Abiodun Folawewo and Oluwafemi Adeboje examined what determined the unemployment rate in Economic Community West African States (ECOWAS) from 1991 to 2014. In comparison with the study of Gaber Abugamea, this article discussed how macroeconomic factors in the long-run impact unemployment by Johansen Fisher's test. As in the study discussed earlier, the growth in GDP and labor force has a significant effect on unemployment, by having a negative correlation between GDP growth and unemployment. Other factors discussed in the empirical analysis were population and Foreign Direct Investment (FDI) of the ECOWAS region. Also, the study proved that the theory of the Phillips curve does not hold for this region, as inflation positively affects unemployment as was also confirmed by the study of Umoru and Anyiwe (2013), which discussed various countries of West African States. These authors, Umoru and Anyiwe, put under the study the economy of Nigeria. Their results from empirical analysis illustrate that the correlation between unemployment and inflation is positive as was shown in 27 years period of the Nigerian economy. Their results were opposite of Philipps theory. As for Pakistan, the FDI, GDP rate, inflation consumer price are negatively correlated with unemployment from 1999 to 2000. (Arslan and Zaman, 2014). This study also used the model of OLS to determine the factors leading to the rise in unemployment rate and examined as well described the relationship between inflation and unemployment. The only independent variable that had a positive effect on unemployment in this research was population growth, which means that the increase in the number of people in the country will contribute the unemployment rate.

Abiodun Folawewo and Oluwafemi Adeboje also proved that in the region of ECOWAS foreign investment was mostly driven to spheres, which do not hire the big majority of labor. Additionally, there is a weak relationship between labor productivity and the unemployment rate of this region. Due to external debt, there was an expansion in labor market, therefore the study revealed its positive effect on the unemployment rate. The authors not only suggested that economic growth plays a vital role in regulating unemployment, but also good management of external debt to create employment in the region. In order to achieve less unemployment rates, inflation should be regulated by targeting policies.

Data description

The data for independent variables are obtained from World Bank from 1992 to 2019.

The linear regression model will help us to identify the significance of the factors used. According to the literature discussed earlier and the law of Arthur Okun, there is a relationship between Gross Domestic Product and the unemployment rate. Therefore, we include annual GDP per capita growth in percent in the model. Besides, the theory of the Philip curve describes inflation and unemployment rate, so we also check for the significance level of the annual inflation in consumer price in percent. In our model, we will also consider factors as FDI (annual percent of GDP) and Population growth, as these factors are discussed in the literature given above.

Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Unemployme~1	28	13.5125	6.562307	7.66	27.47
GDPpercapi~1	28	.7630253	3.658004	-8.997955	5.542361
Inflationc~u	28	4.598759	5.165301	-1.736037	19.45584
Laborforce~1	0				
Population~1	28	.1829963	.4655582	-.7251208	1.200353
log_FDI1	122,878	2.488596	.8361469	0	3.401197
log_Lab1	118,783	2.457132	.8327893	0	3.367296

Methodology.

In order to discuss which factors impact the unemployment rate in Greece, the ordinary least square (OLS) methods will be used in this study. The null and alternative hypothesis are set:

H0: There is no correlation between the unemployment rate and the independent variables.

Ha: There is correlation between the unemployment rate and the independent variables.

The linear model for the regression analysis looks like this:

$$\text{Unemployment rate} = \beta_0 + \beta_1 * \text{GDP per capita} + \beta_2 * \text{Inflation, consumer price} + \beta_3 * \ln(\text{FDI}) + \beta_4 * \ln(\text{Population growth}) + yx + u$$

β_0 indicates intercept, which shows the unemployment rate when independent factors are equal to 0. $\beta_1, \beta_2, \beta_3, \beta_4$ are coefficients of independent determinants in our model. These coefficients illustrate how significantly the unemployment rate will change, if there will be change in independent factors.

Regression analysis

To find out intercepts and coefficients, we run regression analysis.

(All regression analysis can be found in Appendix)

	Constant	GDP growth	Inflation	log(FDI)	Population growth	log(Labour force)
№ 1	14.011 1.203 0.000	-0.6544 0.3276 0.056				
№ 2	17.56 1.227 0.000	-0.598 0.252 0.025	-0.781 0.178 0.000			
№ 3	19.042 3.089 0.000	-0,594 0,255 0,029	-0,797 0,183 0,000	-0.579 1.104 0.605		
№ 4	15.222 1.585	0.114 0.149	0.429 0.167	-0.256 0.545	-17.192 1.973	

	0.000	0.453	0.017	0.642	0.000	
№ 5	29.009	-0.191	-0.526	-0.246	-11.566	-4.213
	3.068	0.124	0.231	0.388	1.824	0.8719
	0.000	0.137	0.033	0.533	0.000	0.000

Five regressions analysis have been conducted. The first row of results show coefficients, second standard error and third one p-values. First, the GDP growth and Unemployment rate were analyzed. The results indicate that there is not significant relationship between these variables, but if GDP growth will increase for 1 percent, the unemployment rate will decline for 0,6544. This shows that the variables are negatively correlated and proves Okun's Law. The second regression illustrates that there is significant correlation between unemployment and inflation rate, however it is opposite of Phillips curve as the correlation is positive. The third model shows that there is still significant correlation between inflation and unemployment, as well negative correlation with FDI. This may indicate that foreign investment is effectively used to employ more people. In fourth model, we can see that the significant relationship is between population growth and unemployment, also there is negative high correlation.

The last regression results:

Source	SS	df	MS	Number of obs	=	28
Model	1099.15975	5	219.831951	F(5, 22)	=	76.08
Residual	63.5647869	22	2.88930849	Prob > F	=	0.0000
				R-squared	=	0.9453
				Adj R-squared	=	0.9329
Total	1162.72454	27	43.0638719	Root MSE	=	1.6998

Unemploymen~1	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
GDPpercapit~1	-.1913236	.1240305	-1.54	0.137	-.4485471 .0659
Inflationco~u	-.5258078	.2308166	-2.28	0.033	-1.004492 -.0471234
log_FDI1	-.2462374	.3882989	-0.63	0.533	-1.05152 .5590452
Populationong~1	-11.56639	1.824829	-6.34	0.000	-15.35086 -7.78193
log_Lab1	-4.213303	.8719754	-4.83	0.000	-6.021669 -2.404936
_cons	29.00917	3.068234	9.45	0.000	22.64605 35.3723

The table above illustrates how all independent factors used in this study will build up an equation. As we can see from it, the significant independent variables are Population growth, Inflation rate and Labour force, as they have p-values higher than alpha. R squared, which illustrates how the variables explain each other in regression model, is equal to 94,53%. Therefore, our model with 28 observations can predict the future values of unemployment rate. Prob> F is more less than alpha (0,05), therefore we can conclude that the independent variables in our model can predict the unemployment rate by rejecting null hypothesis. The theory of Okun's law can be implied in Greece, as the GDP growth and unemployment rate are negatively correlated. This conclusion was also given by Gaber Abugamea in 2018. Inflation rate is also negatively correlated with our dependent variable and this suggests that Phillip curve can be implied in our model. As the study of Umoru and Anyiwe (2013) does not have the same results, we can conclude that the relationship between CPI and unemployment rate across countries varies.

Our model for determining unemployment rate from 1990 to 2018 concludes that there is high correlation between unemployment rate and factors as Population growth, Inflation rate and Labour

force. The study provides results, that can help to predict unemployment rate, but further analysis should be done. Longer period should be analyzed more independent variables as well.

Assumptions of OLS Regression

1. The linear regression model is linear in parameters.

(All scatter plots can be found in Appendix)

In statistics and in our model the equation is linear with intercept and coefficients multiplied by determinants and summed altogether. This assumption is also correct for our model as the linear parameters form equation, even if the is logarithmic function in variable. The scatter plots illustrate how the independent and dependent variables overall form linear equations.

2. There is no perfect collinearity between variables.

	Unempl~1	GDPper~1	Inflat~u	Popula~1	log_FDI1	log_Lab1
Unemployme~1	1.0000					
GDPpercapi~1	-0.3648	1.0000				
Inflationc~u	-0.6315	0.0509	1.0000			
Population~1	-0.9222	0.3649	0.8022	1.0000		
log_FDI1	0.0210	0.0216	-0.1654	-0.0894	1.0000	
log_Lab1	0.2047	-0.1163	-0.8129	-0.4914	0.1593	1.0000

From the table above we can see how each variable is correlated with another. 1 indicating perfect correlation and results, which tent to 1, as highly correlated. If we look at the correlation between unemployment and other variables, we can observe that Population growth has a negative high correlation, -0.922. This does not support the example of literature given above, as it suggests that if population numbers will increase, the unemployment rate will decrease. FDI correlation coefficient indicates that there is a low correlation (0.021) between it and the independent variable. The multi-collinearity test was also done:

. vif

Variable	VIF	1/VIF
Inflationc~u	13.28	0.075284
Population~1	6.74	0.148265
log_Lab1	5.07	0.197357
GDPpercapi~1	1.92	0.519858
log_FDI1	1.03	0.967237
Mean VIF	5.61	

The Stata results illustrate that there is no perfect collinearity and the OLS assumption is right.

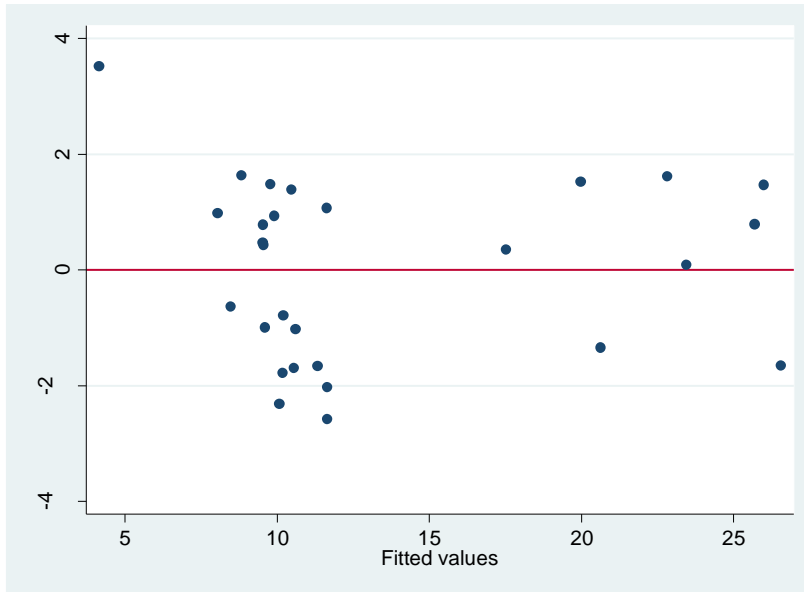
3. Independent variables do not correlate with error term (Exogeneity and endogeneity)

Third assumption suggests that there is no correlation between variables and error term. In order to identify the variables, error term should no be used, if it is not h case the issue of endogeneity appears.

4. Homoscedasticity

This point assumes that volatility of error terms is not correlated with independent variables in any periods. The “imtest” is test of White and “hettest” for Breusch-Pagan’s test. The plot and tables illustrate that there is no homogeneity. The null hypothesis can be rejected in this point also as

indicated by p-values.



```
. estat hettest
```

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of Unemploymenttotaloftotal

chi2(1)      =      1.05
Prob > chi2  =      0.3054
```

```
. estat imtest
```

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	24.89	20	0.2058
Skewness	10.88	5	0.0538
Kurtosis	2.53	1	0.1119
Total	38.29	26	0.0569

5. The Zero conditional mean

As mean of error term shows the relationship between not observed variables and independent variables of our model, the equation $E(u_t|X) = 0$ should be satisfied all the time.

6. Unbiased regression model.

The ovtest command illustrates whether model is unbiased.

```
. ovtest
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```
Ramsey RESET test using powers of the fitted values of Unemploymenttotaloftotal
Ho: model has no omitted variables
F(3, 19) =      6.04
Prob > F =      0.0046
```

This test shows us that the p-value should be rejected as it is less than alpha of 0,05.

7. Quantity of observations.

The observations are more than variables.

Conclusion. This study analyzed the macroeconomic determinants of unemployment in Greece between 1990 and 2018 years. It uses OLS econometric analysis to study the relationship between unemployment and the variables of GDP per capita, inflation, FDI, population and restrictions on labor movement. Empirical results show the variables of GDP, inflation, labor force, external trade, as a macroeconomic determinant, and restrictions on labor movement, as an institutional one, are main determinants of unemployment in Palestine. Whilst GDP impacted unemployment significantly with a negative effect, it is found inflation, labor force and labor force. The assumption which were checked in the afore-given section suggests that obtained results are error free.

The results indicate that unemployment rate and Population growth, Inflation rate and Labor force are significantly correlated. Meanwhile, it is found that GDP and FDI are not statistically significant in this model.

Appendix

Source	SS	df	MS	Number of obs	=	28
				F(1, 26)	=	3.99
Model	154.724208	1	154.724208	Prob > F	=	0.0563
Residual	1008.00033	26	38.7692436	R-squared	=	0.1331
				Adj R-squared	=	0.0997
Total	1162.72454	27	43.0638719	Root MSE	=	6.2265

Unemploymen~1	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
GDPpercapit~1	-.6544148	.3275802	-2.00	0.056	-1.327766	.0189359
_cons	14.01184	1.202951	11.65	0.000	11.53913	16.48454

Source	SS	df	MS	Number of obs	=	28
				F(2, 25)	=	13.00
Model	592.679015	2	296.339508	Prob > F	=	0.0001
Residual	570.045526	25	22.801821	R-squared	=	0.5097
				Adj R-squared	=	0.4705
Total	1162.72454	27	43.0638719	Root MSE	=	4.7751

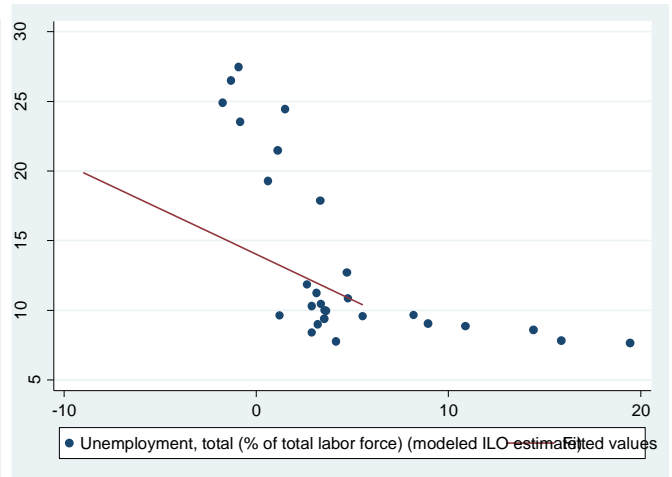
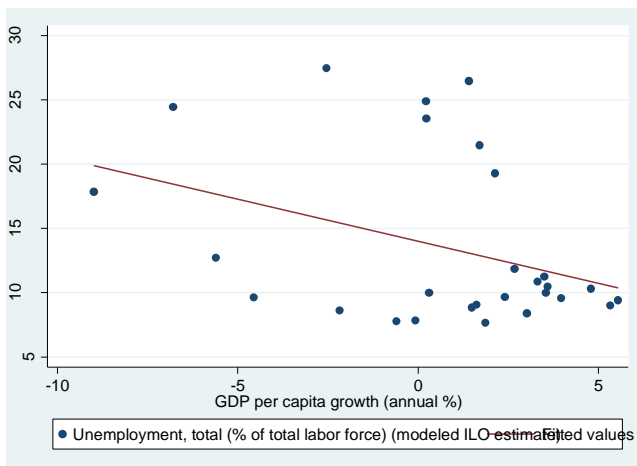
Unemploymen~1	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
GDPpercapit~1	-.5983048	.2515487	-2.38	0.025	-1.116379	-.0802307
Inflationco~u	-.7807291	.1781437	-4.38	0.000	-1.147623	-.4138353
_cons	17.55941	1.22733	14.31	0.000	15.03167	20.08714

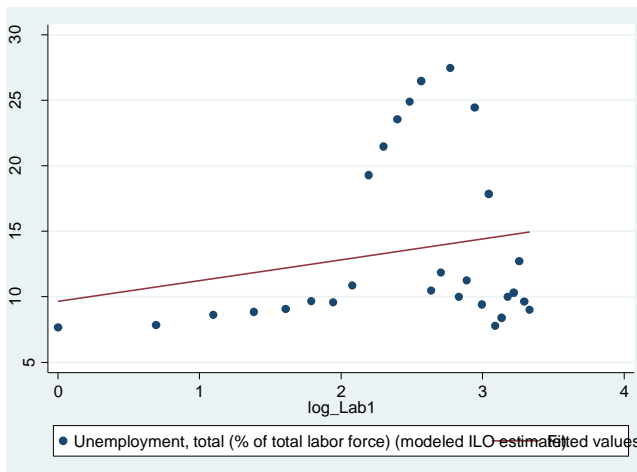
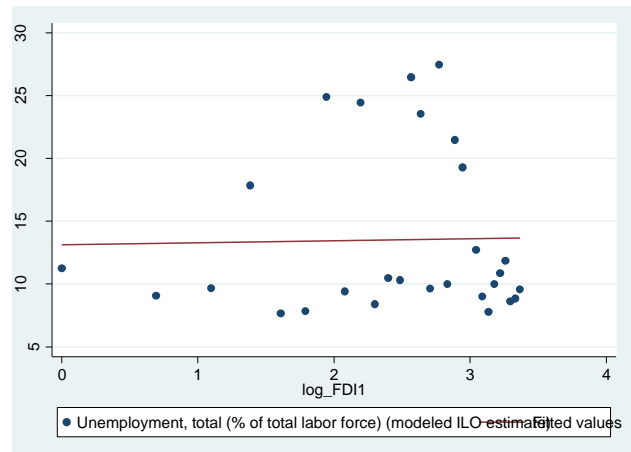
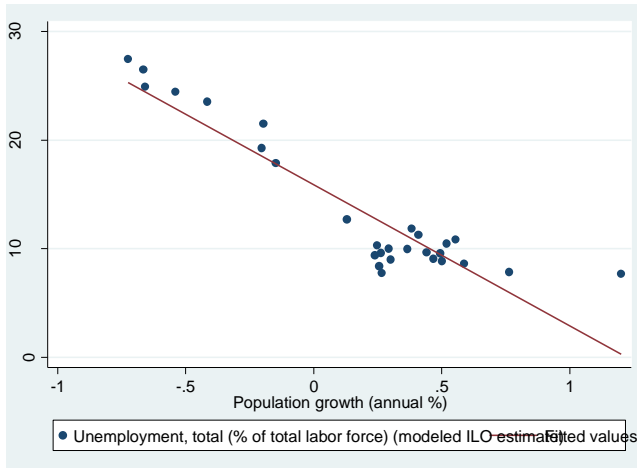
Source	SS	df	MS	Number of obs	=	28
Model	599.133852	3	199.711284	F(3, 24)	=	8.50
Residual	563.590689	24	23.4829454	Prob > F	=	0.0005
				R-squared	=	0.5153
				Adj R-squared	=	0.4547
Total	1162.72454	27	43.0638719	Root MSE	=	4.8459

Unemployem~1	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
GDPpercapit~1	-.5942175	.2553971	-2.33	0.029	-1.121331	-.0671038
Inflationco~u	-.7967578	.1833517	-4.35	0.000	-1.175177	-.4183385
log_FDI1	-.5790325	1.104426	-0.52	0.605	-2.858455	1.70039
_cons	19.04163	3.089337	6.16	0.000	12.66555	25.4177

Source	SS	df	MS	Number of obs	=	28
Model	1031.70218	4	257.925545	F(4, 23)	=	45.28
Residual	131.022361	23	5.6966244	Prob > F	=	0.0000
				R-squared	=	0.8873
				Adj R-squared	=	0.8677
Total	1162.72454	27	43.0638719	Root MSE	=	2.3868

Unemployem~1	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
GDPpercapit~1	.1144202	.1497881	0.76	0.453	-.1954402	.4242806
Inflationco~u	.4295768	.1672139	2.57	0.017	.0836686	.7754851
log_FDI1	-.2566341	.5452194	-0.47	0.642	-1.384506	.8712381
Populationg~1	-17.19241	1.972959	-8.71	0.000	-21.27378	-13.11103
_cons	15.22147	1.583485	9.61	0.000	11.94578	18.49716





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