

Employment and Labor Productivity: The Experiences of New EU Countries

Salih Barışık¹

Serdar Budak²

Türker Şimşek³

Özet

Bu çalışma, ekonomik büyüme ile istihdam arasındaki beklenen pozitif ilişkinin kaybolmasına neden olabilen istihdam ve işgücü verimliliği ilişkisini araştırmaktadır. Çalışmanın uygulama kısmında Avrupa Birliği'ne 2004 yılında giren dokuz ülkenin üzerinde istihdam, işgücü verimliliği, reel harcanabilir gelir ve işgücü maliyetleri ilişkisi panel veri analiziyle incelenmiştir.

Çalışmada Estonya, Kıbrıs, Letonya, Litvanya, Macaristan, Malta, Polonya, Slovenya ve Slovakya'nın istihdam, işgücü verimliliği, reel harcanabilir gelir ve işgücü maliyetleri verileri (2000:1-2012:4 dönemi) kullanılmıştır. Seriler mevsimsel etkiden arındırılmış bir şekilde elde edilmiştir. Analiz sonucunda işgücü verimliliği ve işgücü maliyetlerindeki bir artışın istihdam üzerinde negatif etkisi olduğu görülmektedir. Reel harcanabilir gelirin ise pozitif etkisi insanların geliri arttıkça yatırımların artacağı ve dolayısıyla istihdamı pozitif etkileyeceği şeklinde yorumlanabilir.

Anahtar Kelimeler: İstihdam, İşgücü Verimliliği, Panel Data
Jel Sınıflaması: E24, J24, C23

Abstract

This study investigates the relationship between employment and labor productivity which might lead the expected positive relationship between economic growth and employment to vanish. As for the study's practice part, the relationships between employment, labor productivity, real disposable income and labor cost of nine countries which joined European Union in 2004 were investigated using panel data analysis.

In the study, the data of employment, labor productivity, real disposable income and labor cost (2000:1-2012:4 period) of Estonia, Cyprus, Latvia, Hungary, Malta, Poland, Slovenia and Slovakia were used. The series were obtained by removing seasonal effects. As a result of the analysis, it is seen that the labor productivity has a negative effect on employment. This undermines the relationship between growth and employment. It is determined that the rise of labor costs has a foreseeable negative effect on employment. The situation that the increase in people's income increases the investments can be interpreted as the positive effect of real disposable income on employment.

Keywords: Employment, Labor Productivity, Panel Data
Jel Classification: E24, J24, C23

¹Gaziosmanpaşa Üniversitesi İktisadi ve İdari Bilimler Fakültesi 60150 Tokat/Türkiye e-mail: sbarisik70@yahoo.com

Tel: +90 356 252 16 16 / 2356

²Gaziosmanpaşa Üniversitesi Eğitim Fakültesi 60150 Tokat/Türkiye e-mail: serdar.budak@gop.edu.tr

Tel: +90 356 252 16 16 / 3448

³Gaziosmanpaşa Üniversitesi İktisadi ve İdari Bilimler Fakültesi 60150 Tokat/Türkiye e-mail: turker.simsek@gop.edu.tr

Tel: +90 356 252 16 16 / 2439

Introduction

Employment is one of the most important issues in macroeconomics. The increase in employment is an indicator of an increase in production and thereby in national income. While the increase in employment proportion leads an increase in production, the increase in production level doesn't necessarily sources from the increase in employment. An increase in the current labor productivity may lead an increase in production level. While the increase in productivity sourcing from the employees' producing more raises the production, the lack of demand equal to the level of the production decreases the labor productivity and increases the unemployment.

When the economy is considered as a whole, the potential unemployment decrease through the increase in productivity in economy makes sense. However, since the labor productivity can be ensured through the investments on technology, this investment has a possibility to decrease the employment. It is expected here that there should be differences between transfer of the abroad investments for labor productivity and providing these investments in domestic markets. Within the light of these opinions, the aim of this study is to investigate the relationship between the labor productivity and unemployment. It is decided to explain the labor as a relationship between the employment and productivity in accordance with the convenience of the data and the explanatoriness links of the variables.

As can be seen in the Literature section, while there is a consensus on the relationship between the labor productivity and employment, there are different views about the direction of the relation. While the study is built with the opinion that labor productivity effects the employment within the relationship between them, in the analysis, real labor costs and reel disposable income are included in the model since they are the key determinants of the employment. The study included the 9 new EU countries since it is thought that the impact of the technologies gained after the EU membership on the employment is a significant issue for Turkey as well during such a time that the full membership of Turkey is discussed. It is decided to use panel data method since this is a nine country study.

2. Productivity and Employment

Employment and Labor Productivity

There are three key problems in need of a solution in the science of economics. The first problem is related to the complete usage of the resources. This means full employment. Whereas the usage of scarce resources such as labor, land and capital is in fact called as employment, it leads the concept of employment to be generalized as employment of labor since the labor is related to the people and production is not possible without the labor. While the usage of scarce resources is the first step in economy, the effective use of the resources is the second one. The effective use of the resources depends on the productivity condition which means more production with the same resources. The third step is the use of more production factors to increase the production. Before the relationship between the employment and labor productivity, it is necessary to

explain the concepts of employment and productivity. In the general sense, employment is the inclusion of all production factors into the production while in a more specific sense, it can be defined as the labor supply of the production factors (Yıldırım, Karaman, Taşdemir, 2013). In this study, the concept of employment is addressed as the labor involved in the production.

2.1. Productivity

The history of the concept of productivity is based on the physiocrats, one of the most important economy schools. The productivity expressing the relationship between the output as a result of a production activity and input used for the production of this output means the power of production in short. The word productivity is derived from the Latin “*Producure*” (Aksu,1993). In other words, productivity is the use of resources effectively.

In his book named as “*Post-Capitalist Society*”, Drucker defines the productivity as a belief supporting today to be better than yesterday and tomorrow to be better than today (Drucker,1994:59). Productivity can be expressed as the use of novel techniques and methods and keeping pace with the changing conditions of economic life and the development of humanity.

Along with being expressed as proportional in the last century by the economists, productivity is a coefficient obtained by the outputs and the production factors used for getting these outputs in the production process. It can be formulated as $Productivity = Output / Input$ (Bakırcı, 2006).

It is divided into two categories as technical productivity and allocative productivity.

Technical Productivity: It can be defined as getting more outputs by using less inputs (Özcan, 1992: 29). A technically productive company achieves production above the production possibilities curve. On the other hand, Evans and his colleagues defines the technical productivity as the ability to achieve the maximum output from the input set (Evans and others, 2000). According to Arkış (1991) technical productivity is a concept making relations between the output and the input used in the production of this output and it can be expressed as the art of achieving more output by using less input. Briefly, technical productivity is the production of output at minimum cost.

Allocative Productivity: It is the competence to select the most appropriate input compound bearing the input cost in mind while obtaining the output on a specific level (White, Özcan 1996; Ömürgönülşen, 2003). Also known as the Pareto optimal resource allocation, the allocation productivity means not to worsen the individuals’ circumstances while bettering others’ (Tatar, 1994).

In the widest sense, productivity is the degree of performance by considering the factors such as quality, competence and fertility (Popov, 1967).

2.2. Employment and Unemployment

The concept of employment is generally considered as manpower or labor. The full employment means the usage of all manpower in production in a country at a specific time. Underemployment means not using the all manpower in production and creating of unemployment cases (Eyüboğlu,1998).

There are different opinions and views about full employment and underemployment in economics. According to the classical view, economy always reaches to full employment automatically. They bases this view on the Say's Law which is grounded on the notion that each supply constitutes its own demand. In other words, when the economy comes across an external shock, it reaches the full employment balance level automatically. In contrast with this view, according to Keynesian view, economy is on the underemployment balance and there are unemployed people looking for job but not finding inadvertently. Keynesians think that the most important reason of this situation is that the full employment is restricted with strict wages. According to orthodox monetarists, economy is on the full employment balance. However, although the economy has a balance in all economies, there is natural unemployment in full employment balance level (Bocutoğlu, 2012).

Unemployment is defined as the situation when the people willing to work cannot find jobs (Ünsal, 2007). It also can be described as the difference between the labor level and employment level. On the basis of this definition, unemployed person can be described as the person having strength and will to work at a level of current wage in the market but not finding an appropriate job (Zaim, 1997: 169,172;). Unemployment rate is the proportion of the people willing to work at a level of current wage in the market but not finding a job (Paya, 2013: 27; Fisher vd., 2006: 112). The unemployment rate is calculated by dividing the unemployed with employed ones and multiplication the result with one hundred. The unemployed ones are obtained by subtraction of employed ones from the labor (Gündoğan, 2004: 203). According to the International Labor Organization (ILO), people with no job but ready to work and looking for job are called as unemployed. The types of unemployment are classified as total and partial unemployment in literature. Total unemployment types are: cyclical unemployment, frictional unemployment, unemployment sourcing from growth inadequacy, technological unemployment, demographic unemployment; partial unemployment types are: seasonal unemployment and structural unemployment (Paya,2013).

2.3. The Relationship between the Productivity and Employment

The increase in productivity can be sourced from technological advancements as well as the developments not requiring technology such as learning or administrative advancements. The measure of labor productivity can be formulated as follows (Suiçmez, 2009);

Labor productivity = production / employment

According to this formula, it is expected to be an opposite relation between labor productivity and employment. However, the relationship between the labor productivity and employment is not clear in literature. To summarize, an output produced in manufacturing industry can be obtained with less labor thanks to the increase in labor productivity. This can result in unemployment. On the other hand, according to another approach, the profit and income increased by labor productivity leads to new investments and therefore, it can cause an increase in employment. Gali (1999) clarifies this point by stating that labor productivity can cause unemployment in the short term but it has a positive effect on labor demand in the long term. Which one of these two approaches is going to become reality cannot be determined.

3. Literature Summary

It is observed in literature that the studies are focusing on a country and industry branches in that country under the title of employment and productivity (growth, output, wages are some other variables used in some studies. Since our study covers nine countries and it uses panel data analysis, we focus on studies sampling more than one countries in this section.

Ark, Frankema and Duteweerd (2004) investigated the relationship between employment and productivity between 1988 and 2000 by using cross sections analysis. It involved 66 countries and found out a strong negative relationship between employment and productivity. In his study, Cavelaars (2005) conducted OLS method on employment and labor productivity in OECD countries between 1961-1980 and 1981-2000. As a result, he determined a negative relationship between employment and labor productivity and stated that this relationship was stronger in the short term.

In their study, McMorro, Pichelmann and Roeger (2005) conducted structural VAR analysis on EU and USA, but they concluded that there was no relationship between productivity increase and employment.

In his study, Yusof (2007) used time series analysis in order to determine the long term and dynamic relationship between employment and productivity in Organization of the Islamic Conference (OIC). In 6 of the 22 countries, a correlation between employment and productivity between 1960 and 2004 was determined, but there were no correlation in other countries. Gambardella, Mariani and Torrisi (2008) tried to find out the factors effecting patents, employment and labor by investigating variables such as technological ability, employment density and labor productivity in NUTS Regions in Europe. They argued that labor productivity was effected by regional impacts and employment by technological abilities.

In their study, Becker and Gordon (2008) performed analyses on 15 EU member countries with variables such as employment, productivity, product market regulations and union density using fixed effects and two-stage OLS methods. They determined a negative relationship between employment and productivity. Enflo (2011) tried to determine the unobservable regional variables

in 88 regions in EU countries between 1960 and 2000 using fixed institutions and national policies effects model. When the institutional effect of employment on productivity was investigated, it was argued that this effect was positive in the short term but negative on the long term.

4. Data Set

In this study, three months total employment, labor productivity, labor costs and real disposable income data within 2000:1-2012:4 period of Estonia, Cyprus, Latvia, Lithuania, Latvia, Hungary, Malta, Poland, Slovenia and Slovakia were used. The data were gathered from the databases of IMF, World Bank, Eurostat and OECD. The descriptive statistics of the data is presented in Table 1.

Table1: Descriptive Statistics

<i>Variables</i>	<i>Explanation</i>	<i>Average</i>	<i>Std.</i>
<i>Emp</i>	Total Employment	2976.507	4520.385
<i>Prod</i>	Labor Productivity	100.5728	11.81472
<i>Cost</i>	Labor Cost (2008=100)	81.91859	21.79662
<i>Inc</i>	Real Disposable Income (2005=100)	101.0767	14.56941

5. Econometric Method

In order to determine the relationship between the employment and productivity, firstly, the logarithm of relevant data were tried to be made linear and the following econometric model was created.

$$\Delta \log Emp_{it} = \alpha_0 + \alpha_1 \Delta \log Prod_{it} + \alpha_1 \log Inc_{it} + \alpha_2 \log Cost_{it} + \varepsilon_{it}$$

The symbol *i* stands for the countries while *t* stands for the time. α_0 stands for the constant term coefficient of the model and ε stands for error term.

5.1. Unit Root Test

Panel data consists of cross section and time series. For this reason, the data needs to be pegged to unit root test and according to the test result, they should be made stationary if needed. Maddala and Wu (1999) stated that Fischer type unit root test results in more successful outcomes than IPS test. Therefore, in this study, Im, Pesaran and Shin (2003) and Fischer type ADF tests were used as unit root test.

Table 2: Unit Root Test Results

H ₀ : there is unit root in each serial in the panel.				
IPS	Level		First Difference	
Variables	T Statistics I(0)	Probability (p) I(0)	T Statistics I(0)	Probability (p) I(0)
LProd	-0.6378	0.2618	-12.6474	0.0000
LEmp	0.1909	0.5757	-12.0934	0.0000
LCost	-3.7370	0.0001	-	-
LInc	-1.3705	0.0853	-	-
Fisher ADF	Level		First Difference	
Variables	T Statistics I(0)	Probability (p) I(0)	T Statistics I(0)	Probability (p) I(0)
LProd	22.0226	0.2310	399.1685	0.0000
LEmp	17.3731	0.4976	354.0843	0.0000
LCost	72.6853	0.0000	-	-
LInc	32.5054	0.0191	-	-

In Table 2, it is observed that productivity and employment variables aren't stationary according to IPS and Fischer ADF unit root test results but both of the variables become stationary in the first difference. It is seen that labor cost and real disposable income (at the 10% level) are stationary.

In their study, Beck and Katz (1995) argued that standard errors are not accurate in GLS estimation in the presence of serial correlation and heteroscedasticity problems. Based on mentioned study, "feasible generalized least squares" (FGLS) method which makes better estimation in the presence of serial correlation and heteroscedasticity was preferred. FGLS test was applied to the model and according to the results, it was observed that labor productivity and labor cost had a negative effect on employment while real disposable income had positive effect on employment.

5.2. Panel Data Analysis

In the study, in order to determine to use whether fixed effects or random effects in the estimation of panel data regression, Hausman test was used. Test results used in the determination of fixed effects or random effects models are presented in Table 4.

Table 3: Hausman Test Results

	chi ² (3)	Probability (p)
Hausman Test	15.10	0.0017

According to Hausman Test results, the h₀ hypothesis which is the difference between parameters aren't systematic was denied. Therefore, it was decided that fixed effects estimator was more effective.

Table 4: Fixed Effects Output

dependent variable: LEmpd1 explanatory variables	Coefficient	Standard error	T	P >T
LProdd1	-.1857748	.0514721	-3.61	0.000
LCost	-.037706	.0066216	-5.69	0.000
LInc	.057428	.0132879	4.32	0.000
Constant	-.0971625	.0399141	-2.43	0.015
sigma_u	.00452668			
sigma_e	.01804333			
Rho	.05921318			
F test	F (3,410)=13,27			Prob> F = 0.000
N	422			
Intragroup R²	0.0885			
Inter Groups R²	0.5666			
General R²	0.0572			
Corr (u_i, Xb)	-0.4093			
F test that allu_i=0	F(8, 410)=1.97			Prob> F = 0.0492
	chi²(9)		Probability (p)	
Wald Test	144.41		0.0000	
WooldridgeTest	F(1,8)=37.590		0.0003	

According to fixed effects model output results, labor productivity, labor cost and real disposable income variables are significant in explaining the dependent variable. It is observed that labor productivity and labor cost has negative effect on employment which is a dependent variable while real disposable income has positive effect. It is seen that F statistics with 3,410 degree of freedom which measure the significance of all independent variables on the dependent variable is significant. Unit effect (corr u-i, xb) illustrates the correlation coefficient between unit effect and independent variables; Sigma_u demonstrates the standard error of unit effect; Sigma_e shows the standard error of residual error; Rho demonstrates the proportion of unit error's variance in the variance of combined error.

Ftest that allu_i=0 f F(8, 410)=1.97 testes the unit effect's equity to zero and since its value is prob>F=0.0492, H₀ is denied. In other words, unit effects aren't equal to zero. This situation reveals the presence of unit effect in the model.

The presence of unit dimension in the panel data analysis can cause a heteroscedasticity problem in data set. The modified Wald test was used to determine whether there is a heteroscedasticity in the model or not.

According to the table, χ^2 value with 9 degree of freedom is present. As a result, null hypothesis is rejected and it is concluded that the heteroscedasticity is present in the model. The Wooldridge (2002) autocorrelation test was conducted to test the presence of autocorrelation in the model.

There are F statistics with (1,8) degree of freedom and probability value in the table. H_0 hypothesis was rejected for the Wooldridge Test which meant that there was no first rank autocorrelation. In other words, there was autocorrelation in the model.

It is necessary to use stronger estimation methods in the presence of heteroscedasticity and autocorrelation in the model. One of these methods, generalized least squares (GLS) has the ability to make more accurate estimations (Greene, 2000). In their study, Beck and Katz (1995) argued that the standard errors in the estimation of GLS weren't accurate in the presence of serial correlation and heteroscedasticity problems. Based on the mentioned study, feasible generalized least squares (FGLS) method was preferred which helps making more accurate estimations in the presence of serial correlation and heteroscedasticity.

Table 5: Feasible Generalized Least Squares (FGLS) Output

dependent variable: LEmpd1 explanatory variables	Coefficient	Standard error	Z	P>z
LProdd1	-.129361	.0512642	-2.52	0.012
LCost	-.0174575	.0059262	-2.95	0.003
LInc	.0269666	.011597	2.33	0.020
Constant	-.0447196	.0345049	-1.30	0.195
Wald chi²				11.82
Prob>chi				0.0080

In order to prevent the autocorrelation during the conduct of FGLS test to the model, the process of AR(1) was applied. As a result of FGLS test, it is observed that productivity, labor cost and real disposable income coefficients have a significant effect on employment dependent variable in the table.

Conclusion

The ultimate goal of each economy policy is to increase the national income; in other words, to trigger the economic growth. The full usage of scarce resources and productivity ability meaning the effective use of the resources are important in the economic growth. Labor use is the general expression for employment, which is the most important one of the production factors and without it, it impossible to produce. The increase of employment and labor productivity is the source of the increase in production.

Economic growth has a positive relationship between inflation and employment in the relationship between economic growth, inflation and unemployment which are the three issues of macroeconomics. In this direction, while it is expected for the increase in national income to lead an increase in employment or for employment to increase in national income, sometimes there

can be employment increase sourcing from the economic growth. The growth can be sourced from the increase in productivity. Moreover, it is possible for the labor productivity in economy to lead an increase in production but a decrease in employment. To analyze a situation like this, the effects of labor productivity and employment on each other was investigated in this study. There is no consensus on the direction of the relationship between labor productivity and employment in literature.

Total employment, labor productivity, labor costs and real disposable income data (2000:1-2012:4 period) of Estonia, Cyprus, Latvia, Hungary, Malta, Poland, Slovenia and Slovakia were used. The series were obtained by removing seasonal effects. In order to minimize the volatility of the series, their logarithm was taken and their stationarity was tested. Then, an analysis was performed on the data to determine whether to use fixed effects or random effects model. The model was determined to be a fixed effects model thanks to the Hausman test. Although the analysis results were significant, it was determined that there were autocorrelation and heteroscedasticity in the residual.

Along with the economic growth, labor productivity is another important indicator of employment. Although there are some views such as theory of New Classical Business Cycle Work which argues that an increase in productivity leads an increase in employment in the short term through some factors such as technological shock, it is seen in our study that labor productivity has a negative effect on employment in new 9 EU countries. The negative effect of an increase in labor cost on employment is a predictable result because as the labor cost increases, employment decreases. The results of our analyses reinforce this situation. The positive effect of real disposable income can be interpreted that as the income of people increases, investments increase, and thereby the employment is effected positively.

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