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The Determinants of Youth Unemployment: A Panel Data Analysis of OECD Countries

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Abstract

The aim of this study was to determine some of the key factors affecting youth employment from 2000-2015. Youth unemployment rate (YU) was the dependent variable while consumer price index (INF), domestic gross savings (GS), labor productivity (LP) and economic growth rate (GR) were the independent variables. Data from 31 OECD countries were obtained from World Bank (WB) and OECD databases. Panel Data Analysis was used to analyze the data. The results show that growth, inflation, and savings affect youth unemployment negatively while labor productivity affects youth employment positively. It is therefore concluded that growth, inflation, savings and labor productivity are among the key determinants of youth unemployment.

JEL classification: C33, E21, E23, E31, F43, O40.

Keywords: Youth Unemployment, Growth Rate, Inflation, Total Domestic Savings, Labor Productivity, Panel Data Analysis.

1. Introduction

As the boundaries of globalization have become uncertain, the international movement of labor and (un)employment have emerged as key global issues. Kokocak (2015) argues that globalization and information-based structural changes in the economy have positioned the competent and well-equipped person, and thereby the concept of human capital, at the center of the economy. Hence, human capital, which encompasses a well-trained and qualified workforce and includes factors such as knowledge, skills, ability, and level of education, has come to the forefront as a development strategy. Labor is therefore not just a production factor, it is also a strategic factor that determines plans and helps the development of other production factors. Exclusion of labor from the production system therefore results in serious social costs (Bell and Blanchflower, 2010) in addition to the costs of welfare-reduction (Murat and Sahin, 2011, p. 60).

Data for several countries show that the youth unemployment rate is approximately two to four times the adult unemployment rate (Torun and Arıca, 2011, p. 170; Sayın, 2012, p. 35; Marelli and Vakulenko, 2014, p. 3). This can lead to an increase in risky and anti-social behaviors among the young such as social alienation, suicide, high alcohol and cigarette consumption, and a tendency to engage in collective crime. This is extremely wasteful as young people are creative, dynamic and open to new ideas (Casson, 1979, p. 3; Morrell et al., 1998; Brewer, 2004, p. 13; Savci, 2007, p. 97; Coenjaerts et al., 2009, p. 120; Stuckler et al., 2009; Adak, 2010, p. 110-113; Sayin, 2011, p. 43; TSI, 2014, p. 26). The social and economic structure may, therefore, have undesirable negative effects.

In terms of age range, there are several different definitions of "youth" in the research literature. For example, young people are defined as those aged between 16-24

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in the United States and the United Kingdom whereas The International Labor Office (ILO) and European countries define the young labor force as consisting of people aged between 15-24 years. The Eurostat (The European Union Statistical Institute), on the other hand, describes the youth labor force as workers aged between 15-29 (TSI, 2015:3). In contrast, the OECD defines young unemployed people as those aged between 15-24 who do not work but are available for employment and have taken active steps to find work in the last four weeks. (OECD, 2016).

A worldwide review of youth unemployment rates, the overall number of unemployed young people and labor force participation rates (see Table 1), suggest that the youth unemployment rate is 13%, the number of young unemployed people totals approximately 71 million, and 46% of young people participate in the labor force. In regional terms, the highest youth unemployment rate (30.6%) can be found in Arab countries and the highest number of unemployed young people, 13.8 million, can be found in South Asia. Labor force participation is lowest in Arab countries where it stands at just 30.4% (ILO, 2016, pp. 6-16).

Table 1. Youth Unemployment Rates and Projections by Region

Region	Unemployment Rate (%)			Unemployed Youths (million)			Lab. For. Par. Rate (%)
	2015	2016	2017	2015	2016	2017	2016
World	12.9	13.1	13.1	70.5	71.0	71.0	45.8
Northern Africa	29.4	29.3	29.2	3.7	3.7	3.7	31.9
Sub-Saharan Africa	10.9	10.9	10.8	11.1	11.3	11.6	54.2
Latin America and the Caribbean	15.7	16.8	17.1	8.5	9.2	9.3	49.6
Northern America	11.8	11.5	11.7	3.0	2.9	2.9	52.7
Arab States	30.6	30.6	29.7	2.6	2.7	2.6	30.4
Eastern Asia	10.6	10.7	10.9	11.9	11.4	11.0	52.5
South-Eastern Asia and the Pacific	12.4	13.0	13.6	7.4	7.7	8.0	51.3
Southern Asia	10.9	10.9	10.9	13.7	13.8	13.9	37.2
Central and Western Asia	16.6	17.1	17.5	2.1	2.1	2.2	37.2
Eastern Europe	17.1	16.6	16.2	2.0	1.8	1.7	36.3
Northern, Southern and Western Europe	20.6	19.7	18.9	4.5	4.3	4.1	44.4

Source: ILO-World Employment Social Outlook.
http://www.ilo.org/wcmsp5/groups/public/dgreports/comm/publ/documents/publication/wcms_513739.pdf. Accessed: 22 October 2016.

Table 2 shows the youth unemployment rates in selected countries for the period 2005-2015.

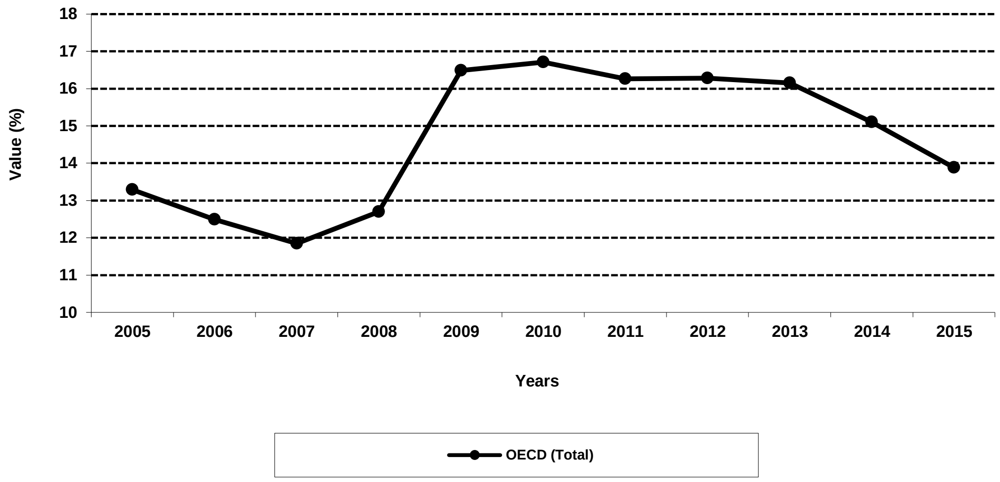
Table 2. Youth Unemployment Rates in Selected OECD Countries (%)

Years	OECD (Total)	EU-28	The USA	The United Kingdom	France	Germany	Turkey	Italy	Israel	Japan
2005	13.29	18.60	11.31	12.72	20.27	15.55	19.30	24.10	17.74	8.63
2006	12.49	17.30	10.50	13.88	21.35	13.75	16.48	21.75	18.20	7.99
2007	11.85	15.53	10.53	14.25	18.85	11.93	17.27	20.38	16.02	7.72
2008	12.70	15.63	12.82	14.97	18.30	10.57	18.48	21.23	12.62	7.28
Average	12.58	16.76	11.29	13.95	19.69	12.95	17.88	21.86	16.14	7.90
2009	16.49	19.93	17.57	19.10	22.98	11.25	22.85	25.32	14.55	9.17
2010	16.71	21.02	18.42	19.88	22.57	9.82	19.77	27.88	13.60	9.32
2011	16.26	21.68	17.28	21.25	21.98	8.53	16.73	29.07	11.57	8.19
2012	16.28	23.20	16.18	21.20	23.63	8.05	15.70	35.30	12.09	8.13
2013	16.15	23.65	15.52	20.65	24.00	7.80	16.95	40.00	10.50	6.81
2014	15.10	22.23	13.37	16.93	24.23	7.75	17.82	42.67	10.52	6.20
2015	13.88	20.35	11.60	14.63	24.68	7.25	18.52	40.33	9.24	5.58
Average	15.83	21.72	15.70	19.09	23.43	8.63	18.33	34.36	11.72	7.62

Source: OECD. https://data.oecd.org/unemp/youth-unemployment-rate.htm. Accessed: 20 October 2016
Note: Selected countries only are presented, as it was impossible to include all OECD countries

Over the last decade, the youth unemployment rate in OECD countries has fluctuated between 11-13% (average 13%) for the period 2005-2008 and between 15%-17% (average 16%) for the period 2009-2015 (Table 2). In the EU-28, the youth unemployment rate fluctuated between 16-19% (average 17%) for the period 2005-2008 and between 20%-24% (average 22%) for the period 2009-2015. Therefore, youth unemployment in the EU-28 was approximately 4% higher than OECD countries from 2005-2008 and 6% higher from 2009-2015.

Figure 1. Youth Unemployment Rate in OECD Countries



Taking into consideration the Global Financial Crisis and the Great Recession, the average rate was approximately 13% for the period 2005-2008 and approximately 16% for the period 2009-2015. Therefore, after the 2008 financial crisis, the youth unemployment rate rose significantly over the ensuing years (Figure 1). This is supported by other findings in the research literature (Scarpetta et al., 2010; O'Higgins, 2012; Choudhry et al., 2013; Bruno et al., 2017). It is therefore reasonable to conclude that the youth unemployment rate was greatly affected by the global financial crisis.

2. Determinants of Youth Unemployment: Literature Review

Okun's law states that, as the economy grows, the rate of employment will increase. Many researchers have therefore examined the effects of GDP on employment (e.g., Lee, 2000; Solow, 2000; Akhtar and Shahnaz, 2005; IMF, 2010; Kabaklarli et al., 2011; Bartolucci et al., 2011; Choudhry et al., 2013; Wajid and Kalil, 2013; Bayar, 2014; Abbas, 2014; Arslan and Zaman, 2014; Günaydın and Cetin, 2015; Bruno et al., 2017). A growing economy will therefore create employment (Logeay, 2001; Kreishan, 2011). Conversely, in periods of recession, the younger population are negatively affected by the decrease in demand (Bell and Blanchflower, 2011). This relationship is clearly shown in Figure 1. Additionally, in the light of Okun's Law, several researchers (e.g., Clark and Summers, 1982; Hess et al., 1994, O'Higgins, 1997) have argued that economic development is one of the main determinants of youth unemployment. Moreover, many research studies (Caporale, 2014:9; Bayrak and Tatli, 2016; Bruno et al., 2017) have concluded that GDP is a determinant of youth unemployment due to the negative relationship that clearly exists between GDP and youth unemployment. In this study, the annual GDP growth rate was therefore included as one of the determinants of youth unemployment.

The Philips Curve shows that there is a negative relationship between inflation and unemployment. Thus, a change in unemployment within an economy has a predictable effect on price inflation. The inverse relationship between unemployment and inflation can be depicted as a downward sloping, concave curve, with inflation on the Y-axis and unemployment on the X-axis. Increasing inflation decreases unemployment and vice versa (Friedman, 1977, p. 455). Several researchers (Kabaklarli et al., 2011; Maqbool et al., 2013, Arslan and Zaman, 2014) have examined the effects of inflation on employment using the Philips Curve. The consumer price index (CPI), which reflects inflation, was therefore included in this study as the second variable.

Ulgener (1991) asserts that factors of production affect economic growth both in terms of quantitative value and in terms of efficiency and productivity. If productivity increases, the subsequent increase in GDP growth will exceed that of total input. Thus, productivity is one of the most important drivers of economic development, social progress and higher living standards (Prokopenko, 2001, p.7). An increase in labor productivity may lead to a short-term decrease in labor demand. In the long term, however, increasing productivity will help create new job opportunities (Uzay, 2005, p. 61). Many researchers have examined the effects of labor productivity on employment (e.g., Linzert, 2001; Tripier, 2002; Saygili et al., 2001; Lentz and Mortensen, 2004; Pissarides and Vallanti, 2004, Pazarlioglu and Cevik, 2007; Ladu, 2005; Hall et al., 2008; Bocean et al., 2008; Korkmaz, 2010; Kabaklarlı et al., 2011; Turkyilmaz and Ozer, 2008; Parisi et al., 2015). Labor productivity was therefore included in the analysis as the third variable affecting youth unemployment.

According to classical theory, saving money is the main determinant of economic growth. Savings are equal to investments, and all savings turn into investments without any leakage (Marshall, 1920, p. 558). The Harrod-Domar model explains growth in terms of the level of savings, underpinning the claim that savings are a key element of economic growth (Meade, 1962, p. 8). Neoclassical Theory states that savings are equal to investments, and investments are therefore not independent of savings (Akyuz, 2009, p. 383). Tapsın (2011), for example, explored the causal relationship between savings, growth, and employment. The rate of saving has therefore been included in the analysis as one of the variables determining youth unemployment.

The youth unemployment problem has been considered from the perspective of supply and demand as well. On the one hand, youth unemployment is therefore a consequence of inadequate demand due to economic stagnation and periods of recession (Murat, 1995; Togan, 2008; Scarpetta et al., 2010; Torun and Arica, 2011). Minimum wage practices (Ghellap, 1998) or sided wage policies applied to young people (O'Higgins, 1997), along with employment protection legislation (EPL) practices (O'Higgins, 2012), increase youth unemployment by reducing the demand for a young labor force. Conversely, those who focus on the supply-side attribute a lack of quality in the young workforce as the main cause of youth unemployment (Icli, 2001; Muller, 2005). Furthermore, young people with low human capital and few skills, i.e. an education and level of quality unable to meet market requirements, are more likely to experience long-term unemployment, and perhaps social exclusion, than young people with higher levels of human capital and superior skills (Icli, 2001; Muller, 2005; OECD, 2005).

There are also other institutional variables and policies that serve as determinants of youth unemployment. For example, Nickell et al. (2005) argue that the unemployment benefit system, the system of wage determination, employment protection legislation (EPL), labor taxes, and barriers to labor mobility are all institutional variables that affect unemployment. In this context, effectively designed active labor market policies (ALMPs) can reduce unemployment by improving the efficiency of the job-matching process and by enhancing the work experience and skills of those who participate in them (Brandt et al., 2005). The key role that active labor market policies (ALMP) play in reducing unemployment has been empirically confirmed in several research studies (Scarpette, 1996; Nickell, 1997; Elmeskov et al., 1998; Choudhry et al., 2013; Bruno et al., 2017).

Fiori et al. (2007) note that both labor and product market reforms affect unemployment. Furthermore, Feldmann (2007) found that a higher level of economic freedom correlates with a decline in both unemployment and youth unemployment and that an increase in economic freedom was associated with a fall in youth unemployment.

Additional variables that affect youth unemployment are demographic variables. Thus, the percentage of young (or old) people in the population, the population density of the youth cohort, the age structure of youth, migration flows (Pissarides and McMaster, 1990), ethnicity and disability (O'Higgins, 1997) can all be considered important variables that determine unemployment.

The research question in this study was therefore: "Are economic growth, inflation, savings and labor productivity determinant variables of youth unemployment?". Following the results, the final section will conclude with some suggestions on how to reduce youth unemployment.

3. Methodology

In this section, the methods used to collect and analyze the data will be explained.

3.1. Data Set

To answer the research question, an analysis of annual data from 31 OECD countries was conducted, covering the period 2000-2015. Three countries (Germany, Chile, Mexico) were excluded from the analysis due to lack of data. The dependent variable was youth unemployment rate (YU) and the independent variables were annual GDP growth rate (GR), annual consumer price index (INF), annual ratio of gross savings (GS) to GDP and the annual growth rate of labor productivity (LP).

A summary of the dependent and independent variables is presented in Table 3.

Table 3: Description of Variables

Variables		Desciption of Variables	Sources
Dependent Variable	YU	Youth Unemployment Rate (%)	OECD*
Independent Variables	GR	Growth Rate of GDP	World Bank**
	INF	Inflation (Consumer Price Index) Rate (%)	World Bank**
	GS	Domestic Gross Savings (% of GDP)	OECD*
	LP	Growth of Labor Productivity	OECD*

** Percentage of Unemployed Youths (15-24 years) in Youth Labor Force.* https://data.oecd.org/unemp/youth-unemployment-rate.htm. *Accessed: 02.09.2016.*
*** World Bank (WB),* http://data.worldbank.org/indicator/NY.GNS.ICTR.ZS?end=2014&start*=2013. Accessed : 10.10.2016.*

3.2. Analysis Method

Panel data analysis was the analytical method employed in this study. Eviews 9 and Gauss 10 software programs were used to perform the analysis. Panel data analysis models can be illustrated using Equation 1 (Tatoglu, 2013, p. 37).

$$Y_{it} = \beta_{0it} + \sum_{k=1}^{K} \beta_{kit} X_{kit} + u_{it} \text{ i} = 1, \ldots \ldots, \text{N ve t} = 1, \ldots \ldots, \text{T} \quad (1)$$

In this equation, subscript "i" represents the units (cross section); subscript "t" represents time (time); βoit represents the constant term; βkit represents the Kx1 dimensional vector of parameters; Xkit represents the value of k, the independent variable for unit i at time t; and Yit represents the value of the dependent variable for unit i at time t. When estimating this model, it is assumed that the average error term is zero and that variance is constant and normally distributed (with a white noise process).

Three methods are used to estimate the pooled regression for both the cross-section and time series: Classical Model, Fixed Effects Model and Random Effects Model. They differ in terms of how the constant term is described.

In the Classical Model, the same constant term is used for all cross-section units in the pooled regression model. Thus, both constant and slope coefficients are consistent in terms of units and time. This model is shown in Equation 2.

$$Y_{it} = \beta_0 + \sum_{k=1}^{K} \beta_k X_{kit} + u_{it} \text{ i} = 1, \ldots \ldots, \text{N ve t} = 1, \ldots \ldots, \text{T} \quad (2)$$

In the Fixed Effects Model, a different constant term is used for each section while the slope coefficient remains the same. This model is shown in Equation 3.

$$Y_{it} = \beta_{0i} + \sum_{k=1}^{K} \beta_k X_{kit} + u_{it} \text{ i} = 1, \ldots \ldots, \text{N ve t} = 1, \ldots \ldots, \text{T} \quad (3)$$

In the Random Effects Model, differences in units are modeled into an error term (Greene, 2010, p. 360). To prevent the loss of a degree of freedom that is often encountered in Fixed Effects Models, changes by units, or by units and time, are included in the model as a component of error (Baltagi, 2005, p. 13). Because the unit effect is not constant in this type of model and is not within a constant parameter, it is included in the margin of error. The error term is given as θ_{it}, as shown in the panel data model in Equation 1.

In Equation 4, u_{it} indicates residual errors and φ_{it} indicates the unit error.

$$\theta_{it} = u_{it} + \varphi_{it} \quad (4)$$

Thus, the Random Effects Model can be illustrated as shown in Equation 5.

$$Y_{it} = \beta_{0i} + \sum_{k=1}^{K} \beta_{ki} X_{kit} + \theta_{it} \quad i = 1, \ldots\ldots, N \text{ ve } t = 1, \ldots\ldots, T \qquad (5)$$

Before testing the stability of the variables in the panel data, it is important to establish whether there is cross-section dependence between the units. If none exists, first generation unit root tests are used. Conversely, if cross-section dependence exists, more consistent results will be obtained when second generation unit root tests are used. The following cross-section dependence tests were therefore applied: CD_{LM1} (Breusch-Pagan, 1980), CD_{LM2} (Pesaran, 2004), CD_{LM} (Pesaran, 2004) and $CD_{LM\text{-}Adj}$ (Pesaran et.al., 2008) before conducting unit root tests. The existence of cross-section dependence was then confirmed. CADF-CIPS and PANIC (BOING) second generation unit root tests were therefore used to determine whether the variables were stationary. These showed that the series appeared to be stationary. Estimations were therefore made using the panel least squares method. Before estimating the models, F and Honda LM tests were conducted to clarify whether there were constant or random effects. A Hausman (1978) test was then applied to determine which of these effects were significant.

Furthermore, heteroscedasticity and autocorrelation sometimes lead to incorrect results. Therefore, following estimation of the model, LMh was used to test for heteroscedasticity (Greene, 2012) while LMp (Baltagi-Lee, 1995) and LMp* (Born-Breitung, 2011) were used to test for autocorrelation. Both problems were encountered in the model, and thus the model was estimated using resistant estimators.

4. Econometric Analysis and Results

The model used to determine the factors affecting young unemployment is shown in Equation 6.

$$YU_{it} = \alpha_i + \beta_1 GR_{i,t} + \beta_2 INF_{i,t} + \beta_3 GS_{i,t} + \beta_4 LP_{i,t} + \varepsilon_{i,t} \qquad (6)$$

It is important to test whether there is cross-section dependence between the units in the variables. This will clarify whether first-generation or second-generation tests need to be used to determine the stationarity of the series. The tests used to determine cross-section dependence in panel data analyses are as follows: CD_{LM} test (Pesaran, 2004), CD_{LM1} test (Breusch and Pagan, 1980) and CD_{LM2} test (Pesaran, 2004).

CD_{LM1} and CD_{LM2} tests are used when (T>N); namely, when the time dimension is bigger than the section dimension. In contrast, the CD_{LM} test is used when (N>T); namely, when the section number is higher than the time number (Hepaktan and Çınar, 2011, p. 142). The CD_{LM} test is also used when both N and T are large. However, this test results in deviations as individual averages are different from zero and the group average is zero. Peseran (2008) overcame this problem by using the $CD_{LM\text{-}Adj}$ test. Thus, this test is known as the deviation corrected $CD_{LM\text{-}Adj}$ test (Göçer et.al., 2012, p. 456). Therefore, cross-section dependence between the variables was determined by $CDLM_1$

(Breusch and Pagan, 1980), CD_{LM2} (Pesaran, 2004) and $CD_{LM\text{-}Adj}$ (Pesaran et. al., 2008) tests, the results of which are presented in Table 4.

The $CDLM_1$ and CD_{LM2} tests show there is cross-section dependence in all variables in the intercept and intercept/trend models. The $CD_{LM\text{-}Adj}$ test showed there is cross-section dependence in all variables apart from the INF variable, although the situation for each variable was different. Thus, second generation unit root tests were used to test the stationarity of series.

Table 4: Results of Tests for Cross-Section Dependence

Variables	CD_{LM1}		CD_{LM2}		$CD_{LM\text{-}Adj}$	
	Intercept	Intercept /Trendy	Intercept	Intercept/ Trendy	Intercept	Intercept / Trendy
YU	1219.802* (0.000)	1343.332* (0.000)	24.751* (0.000)	28.802* (0.000)	30.773* (0.000)	19.368 (0.000)
GR	675,043* (0,000)	787,068* (0,000)	6.883* (0,000)	10,561* (0,000)	3,485* (0,000)	7,034 (0,000)
INF	982,369* (0,000)	952,501* (0,000)	16,965* (0,000)	15,986* (0,000)	1,0697 (0.243)	1,194 (0,116)
GS	2138,231* (0,000)	2268,136* (0,000)	54,867* (0,000)	59,127* (0,000)	29.43* (0,000)	8.927* (0,000)
LP	1527,690* (0,000)	1503,876* (0,000)	34,847* (0,000)	34,066* (0,000)	29,395* (0,000)	10,121* (0,000)

*Note 1: * test values are significant at a= .01 level.*
Note 2: Optimal lag length assumed to be 1.
Note 3: CD_{LM1} (Breusch ve Pagan, 1980), CD_{LM2} (Pesaran, 2004), CD_{LM}-Adj (Peseran 2008).

Taking cross-section dependence into account, the stationarity of the variables was tested using CADF-CIPS and PANIC (BOING) tests, the results of which are presented in Table 5. However, the INF variables, which have no cross-section dependence according to the $CD_{LM\text{-}Adj}$ test, were tested by IPS, the results of which are given in a footnote[1].

[1] Because intercept and intercept/trendy models of the INF variable do not, according to the $CD_{LM\text{-}Adj}$ test, contain cross-section dependence, the stationarity of intercept and intercept/trendy models of the INF variable were estimated separately using the IPS test and this shows they are stationary with INF = -4,794 (0,000).

Table 5: Unit Root Test Results[2]

Variables	CADF-CIPS				PANIC (BOING)			
	Intercept		Intercept/Trendy		Intercept		Intercept/Trendy	
	Level	1st Difference	Level	1st Difference	Choi	MW	Choi	MW
YU	-1,935	-3.531*	-2,829*	-	2.442* (0,007)	89,192* (0,013)	6,342* (0,000)	132,619* (0,000)
GR	-2,572*	-	-2,628*	-	2,781* (0,003)	92.966* (0,007)	3,939* (0,000)	105,858* (0,000)
INF	-2,231*	-	-2,463*	-	5,289* (0,000)	120,892* (0,000)	5,759* (0,000)	126.128* (0,000)
GS	-2,565*		-2,506*	-	2,654* (0,004)	91.764* (0,008)	4.001* (0,0000)	106.551* (0,000)
LP	-2,094*	-	-2,683**	-	3,826* (0,000)	104,624* (0,000)	10,708* (0,000)	181.236* (0,000)
CADF Critical Values	%1: -2,23 %5: -2,11 %10: -2,03		%1: -2,73 %5: -2,61 %10: -2,54		Note: *, ** and *** denote series are stationary at α= .01, α= .05 and α= .10 significance levels, respectively. Maximum number of factors in PANIC test was assumed to be 2			

As Table 5 shows, the PANIC test demonstrates that all variables are stationary at the .01 significance level. Therefore, the least square method was used to estimate the model. In so doing, it is important to clarify the existence of constant and random effects in the model. Constant effects were tested by the F test and random effects by the LM test. Additionally, the Hausman test was used to determine which of these effects were significant. The results of the F, LM and Hausman tests for both models are presented in Table 6.

[2] Schwarz criterion has been used to determine the correct lag lengths. Lag length was decided as "1". CADF-CIPS critical values were taken from Table II (b) and Table II (c) in the Peseran (2007) study. The average CADF statistic was accepted as the CADF-CIPS statistic.

Table 6: F, LM and Hausman Test Results

Tests	Statistics	Probability
FBirim	42,563*	0,000
FZaman	7,740*	0,000
FBirim-Zaman	30,855*	0,000
LMBirim	40,440*	0,000
LMZaman	2,333*	0,009
LMBirim-Zaman	30,246*	0,000
Hausman	1,580	0,812

*Note: * denotes that series are stationary at a= .01 significance level.*

The F test shows that constant unit and time effects were significant at the .01 level (Table 6). Furthermore, the LM test shows that random unit and time effects of the model are significant at the .01 level (Table 6). Additionally, the Hausman test shows that it would be appropriate to use a random effect model. Thus, the model in this study has been estimated as a two-way random effect. The results that were obtained are presented in Table 7.

Table 7: Random Effects Regression Estimation Results

Variables	Coefficients	Standard Error	t- Statistics	Probability
GR	-0.774	0.156	-4.976	0.000*
INF	-0.186	0.083	-2.246	0.025**
GS	-0.575	0.059	-9.794	0.000*
LP	0.837	0.197	4.258	0.000
C	31.248	1.432	21.817	0.000*
	R2= 0,228 F= 36,355* F(Prob.) = 0.000			

*Note: *, ** represent that series are stationary at a= .01 and a= .05 significance level respectively.*

The results of the analysis show that GR, IN, and GS affect YU negatively while LP affects YU positively. However, models must not have heteroscedasticity and autocorrelation problems if the results are to be reliable. LMh, LMp and LMp* tests were therefore conducted to identify heteroscedasticity and autocorrelation in the models. The results are presented in Table 8.

Table 8: Heteroscedasticity and Autocorrelation Tests Results

Tests	Statistics	Probability
LMh	345,214*	0,000
LMp	1421,939*	0,000
LMp*	1116,098*	0,000

*Note: *, ** and *** denote that series are stationary at a= .01, a= .05 and a= .10 significance levels, respectively.*

The LMh test shows the presence of heteroscedasticity at a .01 significance level. The LMp and LMp* tests show autocorrelation at a .01 significance level. Thus, the models need to be estimated again using resistant estimators. A White Period resistant estimator was used to address both heteroscedasticity and autocorrelation problems. The results are presented in Table 9.

Table 9: Adjusted Random Effects Regression Estimation Results

Variables	Coefficients	Standard Error	t- Statistics	Probability
GR	-0.946	0.293	-3.236	0.001*
INF	-0.144	0.085	-1.692	0.091***
GS	-0.272	0.129	-2.104	0.036**
LP	0.706	0.222	3.179	0.002*
C	24.813	3.287	7.549	0.000*
	R^2= 0.518 F= 24,830* F(Prob.)= 0.000			

*Note: *, **, and *** denote that series are stationary at a=.01, a=.05 and a=.10 significance levels, respectively.*

The adjusted random effects regression estimation results show that growth rate (GR) affects the rate of youth unemployment negatively at a .01 significance level. An increase of 1% in the growth rate decreases the rate of youth unemployment by approximately 0.95%. This result is consistent with both economic expectations and studies conducted in the field (e.g., Valadkhani, 2003; Akhtar and Shahnaz, 2005; Kabaklarli et.al., 2011; Choudhry et al., 2012; Wajid and Kalil, 2013; Bayar, 2014; Abbas, 2014; Arslan and Zaman, 2014; Gunaydin and Cetin, 2015; Choudhry et al., 2013; Bruno et al., 2017).

There is also a negative relationship between inflation and youth unemployment at the .10 significance level. Therefore, the negative relationship that is assumed to exist between inflation and unemployment is consistent with youth unemployment. An increase of 1% in the rate of inflation decreases the rate of youth unemployment by approximately 0.14%. This result is consistent with both economic expectations and studies conducted in the field (e.g., Valadkhani 2003; Maqbool, et al., 2013; Arslan and Zaman, 2014).

Similarly, there is a significant and negative relationship between youth unemployment and gross savings at the .05 significance level. An increase of 1% in savings decreases the rate of youth unemployment by approximately 0.27%. This result is consistent with economic expectations. Moreover, a causal link between national savings and employment was determined by Tapşın (2011) when analyzing the relationship between savings, growth, and employment. Thus, these results are in accordance with those of Tapsın (2011).

A significant and positive relationship was observed between youth unemployment and labor productivity at the .01 significance level. An increase of 1% in labor productivity increases the rate of youth unemployment by approximately 0.71%. This result is consistent with both economic expectations and several research studies examining the relationships between employment and productivity (e.g., Tripier, 2002; Lentz and Mortensen, 2004; Kabaklarli et al., 2011; Parisi et al., 2015).

Given the significance of the model overall ($p < .001$), it is reasonable to assert that growth, inflation, savings, and productivity are among the key determinants of youth unemployment.

5. Conclusion and Discussion

In this study, several factors that affect youth unemployment have been analyzed using panel data analysis. The youth unemployment rate was used as the dependent variable, while growth rate, inflation, domestic savings, and labor productivity were used as independent variables. Data from 31 OECD countries for the period 2000-2015 were analyzed. Cross-section dependence was determined prior to testing the stationarity of variables. Second generation unit root tests were conducted to determine whether the series was stationary. Thereafter, constant and random effects of the model were then tested to determine the model. Consequently, the model was estimated using resistant estimators due to heteroscedasticity and autocorrelation problems.

The results show that growth rate, inflation, and gross savings affect youth unemployment negatively while labor productivity affects youth unemployment positively. Growth rate seemed to be the variable affecting youth unemployment most strongly.

According to the research literature, the youth unemployment rate in OECD countries is approximately 15% and, in the EU-28, 19.92%. It can therefore be concluded that youth unemployment is persistent over time.

Given the positive effect of growth on unemployment, it is recommended that employment-enhancing sustainable growth strategies be stimulated by decision makers to decrease youth unemployment.

Regarding the relationship between savings and investments, the implementation of public and private saving and investment incentive systems may make a positive contribution towards solving the youth unemployment problem.

6. Limitations and Future Implication

The data used in this study was limited to the period spanning 2000-2015. Additionally, data from only 31 OECD countries were included in the analysis. The data set could therefore be expanded in terms of the time covered and the number of countries included. These limitations should be taken into consideration before making any generalizations.

As the research literature has shown, different empirical studies employ various econometric models to determine the impacts of variables. Considering that the time effects of some variables can be observed in the next term; a dynamic model can be developed to measure the change in unemployment over time. In this way, the explanatory power of studies will be enhanced even further.

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