Impact of Global Recession on Selected OECD Countries: A Panel Data Analysis

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Abstract:

The tax burden on wages, profits, property, and goods or services has a serious impact on cross-country competiveness, something that, in turn, impinges strongly on the actual economy of common markets such as the European Union (EU). While the mobility of productive factors is directly related with country tax-regime differences, government budget funding from tax revenues and rates are the main fiscal policy tools.

This article analyzes the trends, similarities and differences between the tax regimes of European Monetary Union (EMU) for the period from 1995 to 2019. The methodologies we employ include time series analysis, regression analysis and multivariate cluster analysis. The data are mainly collected from the OECD database and tax revenue departments at country level. We argue that there are significant differences among the tax regimes of EU countries and that no policy has been implemented to ensure tax homogeneity across the EU, nor is there any likelihood of such. The anarchy in fiscal policy is an obstacle for the European Integration. Budget deficits have an impact on taxation and countries, invariably, manage the recent debt crisis by selecting different taxes as fiscal policy tools.

Our article presents the differences between tax regimes of EMU countries and shows that the level of economic growth affects the structure of taxes at work and alters the performance of different types of taxes; is also wishes to explain the factors that differentiate tax regimes by using multi dimensional criteria and variance analysis. Our work contributes to the debate toward a common tax regime between EU countries and our analysis is concentrated on this.

Key Words:

Global economic crisis, global recession, panel analysis, tax regime, common tax regime

JEL Classification:

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1. Introduction

In this study, firstly it is assessed occurrence of the crisis that began in last quarter of 2008 in USA housing market. Later it was focused on measures taken by Southern Europe Welfare States which are Turkey, Spain, Portugal, Italy and Greece over the period after crisis.

The crisis raised the uncertainty in world economy and caused unsteadiness at first financial markets later real markets. The crisis that started in the finance markets has taken the reel markets under effect with time. The recession started in developed countries has affected the developing countries which are already in critical levels. While the global developments were regressing, the countries were in consensus to take precautions together to struggle with the crisis in the world economy.

Turkey was affected from the crisis as many other developing and developed countries had been affected. We will firstly deal with the appearance and enlargement process of the crisis in the world, before we evaluate the effects of the crisis on Turkey. In this process Turkey took the packages as many other countries applied attention. Global recession in Turkey created negative impacts on mainly production concerning consumption, employment and investment. After the crisis, because of the recession and of TL's excessive valuableness in the amount of the speculative foreign capital income decreased, therefore total demand reduced and a big fall in importation was seen.

2. The global crisis and its effects on investment and unemployment in USA and Southern Europe welfare states

According to Fink (1986), Kash and Darling (1998), a crisis is referred to as an unplanned event emerging from the internal or external environment of an organization or country which can disrupt operations, threaten people physically and mentally, endanger the viability of entities no longer able to cope with the situation using normal managerial procedures.

The current global crisis originated in the USA financial market has been expanded in the EU from the beginning (Thalassinos, 2008; Thalassinos and Politis, 2011). Since this is the centre of a network that interlinks the national financial systems of almost all countries in the world, the crisis was spread very quickly.

According to Mishkin (2008), the current global financial crisis has many aspects in common with past global financial crises that have occurred throughout history. The current financial crisis has had three fundamental factors as in many previous crises. The first one is mismanagement of financial innovation, second one is an asset price

bubble that burst, and third one is deterioration of financial institution balance sheets.

World-shaking events market capitalism quietly and shifted much of the discredited central planning that was so dominant in the Third World. China which is a large segment of the erstwhile Third World replicated the wonderful economic export-oriented model and this so-called model is Asian Tigers. Besides this, thanks to China fairly well educated, low-cost workforces were joined with developed-world technology. It was protected by an increasing rule of law, so as to release explosive economic growth. So, real GDP growth of the developing world has been more than double since 2000.

Along with surge in competitive and low-priced exports from developing countries, particularly those to Europe and the U.S. flattened labor compensation in developed countries, and attenuated the rate of inflation expectations throughout the world by including those inflation expectations embedded in global long-term interest rates. Furthermore, there has been a significant decrease in global real interest rates which affect the all financial markets since beginning of the 1990. So this indicated that global saving intentions constantly had exceeded intentions to invest. Rate of consumption clearly could not keep up with the surge of income in the developing world and as a result, savings rate of the developed world increased from 24% of nominal GDP in 1999 to 33% in 2006 and the savings rate of the developed world went faster than its investment rate (Greenspan, 2007).

The subprime mortgage market underwent explosive growth between 2001 and 2006 years. All investors in order to get higher yields kept increasing their demand for private-label mortgage-backed securities (hereafter MBS), which also caused sharp increases in the subprime share of the mortgage market (from around 8 percent in 2001 to 20 percent in 2006) and in the securitized share of the subprime mortgage market (from 54 percent in 2001 to 75 percent in 2006). According to Apak and Aytaç (2009), unreal financial system created by securitization and insurance transactions reached 120 trillion dollars and 15-18 trillion dollars of it was generated by USA economy. This dramatic growth of the subprime mortgage market and quality of the market became worse dramatically (Demyanyk and Hemert, 2008). Rating companies have played a major role during the crisis period especially in the less developed economies (Thalassinos, Liapis and Thalassinos, 2013) while rumours in the Stock Exchanges have also affect the financial markets (Thalassinos, Maditinos and Paschalidis, 2012).

The fundamental factor creating the subprime mortgage crisis was the boom and bust cycle in housing prices. During the boom phase, rising prices encouraged lenders and investors to put ever more money at risk. The Credit Rate Agencies supported these investment decisions by posting ratings that undervalued the impact

that falling house prices could have on subprime mortgage defaults. Second factor that pronounced broadened the impact of the subprime crisis was behavior of institutional investors to become intense the riskiness of their subprime MBS portfolios by means of extremely high leverage and by means of extreme maturity mismatches in their funding. This strategy for investment will unfortunately be crisis-prone independent of the underlying securities now we can give two examples in order to confirm this. First one is that the U.S. Savings and Loan crisis of the 1980s arose from leveraged and maturity mismatched portfolios, although the underlying securities were prime mortgages with minor default risk. Second one is that the Long Term Capital Management crisis also arose from a leveraged and maturity mismatched portfolio, even through U.S. treasury bonds were a primary instrument (Jaffe, 2008).

Now that we focus on the economy particularly investment-unemployment structure of the some countries, Italy, Portugal, Greece and Spain, called Southern European Welfare Countries, were effected from crisis that have impacted all over the word.

Investments have gained importance over the past decade as the tool for accelerating growth and development of economies in transition. Many developing countries do not receive sufficient international investment because weak domestic policy frameworks discourage both foreign and domestic investment. This insufficiency has reached serious dimension due to the experienced global economic crisis.

Worldwide Foreign Direct Investment (FDI) flows have showed an impressive upward trend over the past two decades, which prompted the expansion of international production and the economies' globalization process (Santis and Vicarelli, 2007).

In 2008, according to the provisional data, published by UNCTAD, worldwide FDI fell 14,5% to 1,66 trillion dollars, due to the negative effects of the global financial crisis which has currently gripped economies. Due to global recession, the drop in company profits, the pessimistic prospects of the world economic growth in future, the diminution occurred in workforces, the decline in capital spending, all of which lead to a decrease in FDI (Invest in Spain, 2009).

When we examine economic situation of Spain, we see that residential construction is slowing sharply towards a level which is sustainable in the long run investors and consumers are also adjusting strongly to a marked deterioration in financial conditions in the wake of the international financial crisis, as well as to deteriorating job prospects (Economic Survey of Spain, 2008). According to the projection output may fall by 3,50 per cent in 2009 and by a further 0,25 per cent in 2010 before recovering at a slow rate in 2011. It is expected that the unemployment rate may peak close to 20% in 2010. Spain is one of the leading global economic powers: the

4th largest recipient of FDI among developed countries (World Investment Report, 2009).

FDI inflows to Spain increased sharply during 1980's as a result of entry into the European Economic Community. In 1994 the rate of investment inflows began to decline gradually, but recovered in 2000 in Spain. Six years following 2000 year saw a decline in FDI inflows. 2007 saw a sharp turn around of investment flows to Spain an increase. Gross foreign direct investment in Spain in 2008, according to the Ministry of Industry rose to 37,715 billion Euros, 0,4% more than the previous year. Net foreign direct investment reached to 34,543 billion Euros, 26,7% higher than in 2007. Specifically, disinvestment in 2008 decreased by 69,5%, reaching 3,113 billion uros, in contrast to 10,196 billion Euros in the previous year (Invest in Spain, 2009).

Greece, which is another Southern European Welfare Country, has been deep impact of financial crisis which shook the confidence of households and businesses, which are reining in spending. Moreover, persistent structural imbalances, which are illustrated by the poor state of public finances and the large current account deficit, limit room for policy manoeuvre, and the country's vulnerability to the crisis increased because of Greece's exposure to South–Eastern Europe (Economic Survey of Greece, 2009). Since the effects of the global crisis gradually spread to the Greek economy, real GDP of Greece contracted in 2009. According to the OECD report, the present progress in the external environment should help activity to pick up slowly, and growth could accelerate in 2011. Furthermore, in the report it was seen that gross fixed capital formation of Greece was 4.6, -7.4, and -15.5 respectively 2007, 2008, 2009 years. According to the OECD's expectation for 2010 year and 2011 year, gross fixed capital formation will be -6,3 and 4,6 respectively in Greece. Despite the global financial crisis, FDI inflows in Greece registered a serious increase in 2008. According to Bank of Greece data, gross inflows of funds from foreign investors reached 6.48 million Euros, while net inflows reached 3.46 million Euros (www.investingreece.gov.gr).

When we look at unemployment rate of Greece, we see that it will be an increase in 2010. In 2010 this figure is expected to be 10,4% while unemployment rate of Greece was 9,3% in 2009. It is also expected to be 10,4% in 2011 years (Economic Survey of Greece, 2009).

Portugal, which is another Southern European Welfare Country, kept growing in the second quarter of 2009, but according to the OECD report, this growth will remain subdued as private sector deleveraging constrains the recovery. Thus, unemployment isn't unlikely to increase to around 10% in 2010 (*Economic Outlook 86 Portugal,* 2009). Portugal received significant foreign direct investment in the past decade. EU Member States are the main sources of FDI, particularly Spain,

Germany, the United Kingdom and France. In the OECD's report, it was seen that gross fixed capital formation of Portugal was 3.1, -0.7, -13.6 respectively 2007, 2008, 2009 years. According to the OECD's expectation for 2010 year and 2011 year, gross fixed capital formation will be 0.4 and 2.9 respectively in Portugal. When we look at unemployment data of Portugal, we see that it was 9.2% in 2009 year. This figure will be reached to 10.1% by increasing at 9,7% in 2010.

According to the OECD report, although the recession started earlier in Italy then elsewhere, activity rebounded in the third quarter. With improved financial conditions, confidence has been rebuilt and domestic demand has been reinforced. Italian banks are exposed to low-risk products than those of other large countries, as originators but also as investors. The reason for this is partly in consequence of their conservative behavior and also of some regulatory and supervisory caution so banks have not closed or had not to be bailed out (Economic survey of Italy, 2009).In spite of some falls in wage costs, higher unit labor costs along with oil price upturn will keep within bounds the decline in inflation, while unemployment rises somewhat further. Italy was given high public debt but did not present a large – scale fiscal stimulus. The budget deficit, however, along with periodically weak revenues proceeds 5% of GDP and debt is expected to increase to 120% of GDP by 2011. Because of growth's picking up, significant fiscal consolidation efforts will be required from 2011 onwards (*Economic Outlook 86 Italy*, 2009).

When we look into the case of FDI of Italy, we can say that Italy is one of the most important countries in the world regarding FDI attraction. The privatization program led by the country and liberalization of the energy and telecommunications markets which offer interesting opportunities to investors, all of which lead to an increase in FDI of Italy. However, the foreign investment flow has slowed down in recent years and is expected to continue to decline over the next years due to the global financial crisis (http://www.egypt-import-export.com/en/country-profiles/italy/investing). FDI of Italy grew to $19,6 billion in 2005 and reached $39,2 billion in 2006. With this development, according to A.T. Kearney's 2007 Confidence Index, Italy was 5th largest recipient country of FDI in Europe (www.obeliskinvestmentproperty.com/ Italy). Gross fixed investment of Italy as percentage change from previous year was -12,6 in 2009. This figure is expected to be 0,6 and 4,0 respectively in 2010 and 2011 year (*Economic Outlook 86 Italy*, 2009).

3. The effects of the crisis on investment and unemployment in the Turkish economy

Labor is one of the most employed factors by obtaining the economic indicators. According to Doğan (1998), gross national product (GNP) of countries depends upon both employment and efficiency of labor factor. Labor is most important factor within GNP, because other production factors can not make any economic activity

without labor factor during realization production. An increase at a rate of employment in developing countries such as Turkey provides economic growth, because income enhances due to increase at a rate of investment. Increasing income raises consumption expenditures. Individuals due to increasing in their consumption expenditure firms also due to their increasing income pay too much tax. Because of this enlargement government getting more taxes makes an investment in the field of education, security, justice and medical. This provides economic growth. Key of economics growth is increase at not only a rate of employment but also investment.

Foreign direct investment is one of the most important ways in order to acquire advanced technology in developing countries. Foreign direct investments have serious impact in the process of advancement in the field of technology in developing countries. According to Findlay (1978), foreign direct investments increase rate of technologic advancement. This is supplied with the effect of advance technology which firms uses and management practice. According to Wang (1990), an increase in the level of knowledge which used in production is a function of direct foreign investments.

Lipsey and Kravis (1987) argue that the long-run relation exists between capital formation and growth rate providing efficiency use of investment by encouraging capital formation to occur next periods is support point of economy.

Table 1: Capital movements over 1980-2004 period in Turkey

Year	Total Capital Movements	Direct Investments	Portfolio İnvestments	Long-run Capital Movements	Short-run Capital Movements
	(net)				
1980	672	18	0	656	-2
1981	899	95	0	683	121
1982	280	55	0	127	98
1983	883	46	0	39	798
1984	73	113	0	612	-652
1985	1065	99	0	-513	1479
1986	2124	125	146	1041	812
1987	1891	106	282	1453	50
1988	-958	354	1178	-209	-2281
1989	780	663	1386	-685	-584
1990	4037	700	547	-210	3000
1991	-2397	783	623	-783	-3020
1992	3648	779	2411	-938	1396
1993	8903	622	3917	1370	2994
1994	-4257	559	1158	-784	-5190
1995	4565	772	237	-95	3635
1996	5483	612	570	1636	2665
1997	6969	554	1634	4788	-9

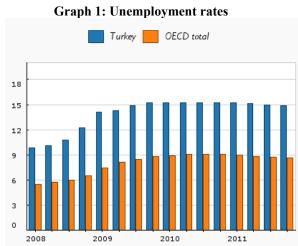| 1998 | -840 | 573 | -6711 | 3985 | 1313 |
1999	4935	138	3429	344	1024
2000	9610	112	1022	4276	4200
2001	-13882	2769	-4515	-1130	-11006
2002	2490	863	-555	2315	-133
2003	6363	1195	2565	-956	3559
2004	22660	1711	8070	6121	6758

Source: TCMB, www.tcmb.gov.tr

Table 1 shows capital movements over 1980-2004 periods in Turkish economy. According to Table 1, there had been increases in capital inflow except during the years those are consider as the Turkish economy in recession between 1980-2004. It seemed that there were increases at a rate of portfolio investment, long run capital movements and short run capital movements but there were serious decreases in crisis years.

Table 2: Domestic savings and fixed capital investments

Year	Domestic Savings	Fixed Capital Investments
1980	16,0	21,8
1981	18,3	19,8
1982	17,1	19,2
1983	16,5	20,1
1984	16,5	19,3
1985	18,9	20,1
1986	21,9	22,8
1987	23,9	24,6
1988	27,2	26,1
1989	22,1	22,5
1990	22,0	22,6
1991	21,4	23,7
1992	21,6	23,4
1993	22,7	26,3
1994	23,1	24,5
1995	22,1	24,0
1996	19,9	25,1
1997	21,3	26,3
1998	22,7	24,3
1999	21,2	22,1
2000	18,2	22,8
2001	17,5	19,0
2002	19,2	17,3
2003	19,3	16,1
2004	20,2	18,4

Source: DPT, www.dpt.gov.tr

Table 2 shows relation between domestic savings and fixed capital investments. According to Table 2, when domestic savings' rate fell, fix capital investment also fell and vice versa.

Graph 1: Unemployment rates

Source: OECD, www.oecd.org

Graph 1 shows us an ability to compare unemployment rate between Turkey and OECD countries. According to OECD's prediction for years 2010 and 2011, unemployment rate for both Turkey and OECD countries will increase. But this increase has reached stable position since last quarter of 2009

Table: 3 Gross fixed capital formation and unemployment rates, 2005-2008

		2005	**2006**	**2007**	**2008**
Gross Fixed Capital Formation		20	22,1	21,600	21,500
Unemployment Rates: Total		10,2	9,9	9,8	11

Source: OECD, www.oecd.org

Table 3 shows data of unemployment rates and gross fixed capital investment over period 2005-2008. Because of current economic crisis, fixed capital investment has decreased and unemployment rate has increased.

According to the TÜİK study, a total of 3,471,000 people were unemployed in 2009, which means an increase of 860,000 people compared to the previous year. The unemployment rate rose by three percentage points to 14 percent.

Table 4: Turkey: demand, output and prices

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	
	Current prices TRL billion	Percentage changes, volume (1998 prices)					
Private consumption	534,8	5,5	-0,1	-3,3	2,7	4,6	
Government consumption	93,5	6,5	1,9	1,6	1,7	5,0	
Gross fixed capital formation	169,0	3,1	-5,0	-21,3	4,1	9,7	
Final domestic demand	797,4	5,1	-0,8	-6,2	2,8	5,5	
Stockbuilding[1]	- 1,8	0,6	0,3	-2,8	2,5	0,0	
Total domestic demand	795,6	5,7	-0,6	-8,8	5,3	5,6	
Exports of goods and services	171,9	7,3	2,3	-7,5	4,5	8,8	
Imports of goods and services	209,2	10,7	-3,8	-19,2	8,7	12,8	
Net exports[1]	- 37,2	-1,3	1,5	3,6	-1,0	-1,0	
GDP at market prices	758,4	4,7	0,9	-6,5	3,7	4,6	
	_	6,2	11,7	6,5	5,5	5,6	
Consumer price index	_	8,8	10,4	6,3	5,7	5,3	
Private consumption deflator	_	6,6	10,3	5,6	5,6	5,4	
Unemployment rate	_	10,1	10,7	14,6	15,2	15,0	
Current account balance[2]	_	-5,9	-5,5	-1,9	-2,8	-3,3	

Source: OECD Economic Outlook 86 database.

Note: National accounts are based on official chain-linked data. This introduces a discrepancy in the identity between real demand components and GDP. For further details see *OECD Economic Outlook* Sources and Methods *(http://www.oecd.org/eco/sources-and-methods)*.
1. Contributions to changes in real GDP (percentage of real GDP in previous year), actual amount in the first column.
2. Percentage of GDP.

According to the Table 4 fixed capital investment decreased in the ratio of 5% compared to previous year. This decrease reached to -21, 3% by keeping declining. At the same period unemployment rate reached to 14,6% with an increase in the ratio of 36% in terms of previous year in 2009.

4.   Empirical methodology and results

We use to panel data analysis in this study. A longitudinal, or panel data set is one that follows a given sample of individuals over time, and thus provides multiple observations on each individual in the sample (Hsiao, 2003). Hsiao (2003) and Klevmarken (1989) list several benefits from using panel data. Some of these include the following:
- Controlling for individual heterogeneity.
- Panel data give more informative data, more variability, less collinearity among the variables, more degrees of freedom and more efficiency.

- Panel data are better able to identify and measure effects that are simply not detectable in pure cross-section or pure time-series data.
- Panel data models allow us to construct and test more complicated behavioral models than purely cross-section or time-series data.

Our central interest lies on testing whether the co-integration relation exists between unemployment level and the gross fixed capital formation (investment). The annual data covering the period of 1985-2008 for 19 OECD countries is used for empirical analysis. The countries consist of Turkey, Austria, Australia, Canada, Denmark, Finland, Germany, Greece, Ireland, Italy, Japan, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and United States. We obtain both unemployment level (UN) and Gross Fixed Capital Formation (GFCF) used as investment rate obtained from OECD database.

Primarily, it is necessary to determine whether the variables used in the study have cross-section dependency or not. We used Breusch and Pagan (1980) cross-section LM testing in order to investigate the presence of cross section dependency between the variables used. Since number of cross-section observation is smaller number of time series observation in our model, it is taken into accounted CDLM1 test of Pesaran (2004). CDLM1 test statistic is following as:

$$\text{CDLM1}= T.\sum_{i=1}^{N-1}\sum_{j=i+1}^{N} \hat{\rho}_{ij}^2 : \chi^2_{N.(N-1)/2}$$

where $\hat{\rho}_{ij}$ is correlation of coefficient across residuals obtained from each regression estimated by OLS estimator. As can be seen from Table 5, we can not reject to the none of cross-section dependency between GFCF and UN variables since the probability values of all CDLM test statistics are bigger than at 0,05 significance level. Hence, we use first generation panel unit root test instead of second generation panel unit root test considering cross section dependency.

Table 5: Results of Breusch and Pagan LM Testing

Test stat	t-stat	p-value
CD_{LM1}	183,390	0,244
CD_{LM2}	0,669	0,251
CD_{LM}	-0,829	0,203

After determined the none of cross-section dependency, it is necessary to determine if the variables used in the study are stationary or not. Therefore in the study Im, Pesaran and Shin (2003) (hereafter IPS), Fisher-type test proposed first by Maddala

and Wu (1999) (hereafter MW) then developed by Choi (2001), Levin, Lin and Chu (2002) (hereafter LLC), Hadri (2000)'s tests are performed as first generation tests. In general, type of panel unit root tests is based on the following regression:

$$\Delta Y_{i,t} = \beta_i . Y_{i,t-1} + Z_{i,t} . \gamma + u_{i,t} \tag{1}$$

Where:

$i = 1,2,\ldots,N$ is individual, for each individual

$T = 1,2,\ldots,T$ time series observations are available

$Z_{i,t}$ is deterministic component

$u_{i,t}$ is error term

The null hypothesis of this type is $\rho_i = 0$ for $\forall_i$. The first of first generation panel unit root tests is Levin, Lin and Chu (2002) (LLC thereafter) that allow for heterogeneity of individual deterministic effects and heterogeneous serial correlation structure of the error terms assuming homogeneous first order autoregressive parameters. They assume that both N and T tend to infinity but T increase at a faster rate, so N/T   0. They assume that each individual time series contains a unit root against the alternative hypothesis that each time series stationary. Thus, referring to the model (1), LLC assume homogeneous autoregressive coefficients between individual, i.e. $\beta_i = \beta$ for all I, and test the null hypothesis $H_o : \beta_i = \beta = 0$ against the alternative $H_A : \beta_i = \beta \wp 0$ for all i. The structure of the LLC analysis may be specified as follows:

$$\Delta Y_{i,t} = \alpha_i + \beta_i . Y_{i,t-1} + \delta_i . \tau + \sum_{j=1}^{pj} \phi_{ij} \Delta Y_{i,t-j} + u_{it} \qquad i = 1,\ldots, N \quad t = 1,\ldots,T \tag{2}$$

Where:

τ is trend

α_i is individual effects

$u_{i,t}$ is assumed to be independently distributed across individuals

LLC estimate to this regression using pooled OLS. In this regression deterministic components are an important source of heterogeneity since the coefficient of the lagged dependent variable is restricted to be homogeneous across all units in the panel (Barbieri, 2006). Other test, Im, Pesaran and Shin (2003) test allows for residual serial correlation and heterogeneity of the dynamics and error variances across units. Hypothesis of IPS may be specified as follows:

$$H_o : \beta_i = \beta = 0 \qquad H_A : \beta_i \wp 0 \quad \text{for all i}$$

The alternative hypothesis allows that for some (but not all) of individuals series to have unit roots. IPS compute separate unit root tests for the N cross-section units.

IPS defines their t-bar statistics as a simple average of the individual ADF statistics,

$$\bar{t} = \sum_{i=1}^{N} t_i \, / \, N$$

ti, for the null as:

It is assumed that ti are i.i.d and have finite mean and variance and E (t_i), Var (t_i) is computed using Monte-Carlo simulation technique. Other test Maddala and Wu (1999) consider deficiency of both the LLC and IPS frameworks and offer an alternative testing strategy (Barbieri, 2006). MW is based on a combination of the p-values of the test statistics for a unit root in each cross-sectional unit.

Hadri (2000) test permits an easy formulation for a residual based LM test of stationary. Hadri adopts the following components representation:

$$Y_{it} = Z'_{it} \cdot \gamma + r_{it} + \varepsilon_{it}$$

Where Zit is deterministic component,

rit is a random walk:

$$rit = ri,t-1 + uit$$

where uit: $iid(0, \sigma_u^2)$ and $\varepsilon_{i,t}$ is stationary process. Hypothesis of Hadri test is different from other first generation tests. The null of hypothesis of trend stationary corresponds to the hypothesis that the random walk equals zero. Further, this test allows the disturbance terms to be heteroscedastic across i. The results of unit root tests for UN and GFCF variables are summarized in Table 6 and Table 7.

Table 6: First generation unit root tests for UN

First Generation Tests	Test-statistic	Prob. Value
LLC	-1,85 (-6,71)	0,03 (0,00)
IPS	-1,42 (-8,11)	0,07 (0,00)
ADF-Fisher	48,16 (135,96)	0,12 (0,00)
PP-Fisher	26,53 (106,79)	0,91 (0,00)
Hadri Z-stat.	7,21 (-0,52)	0,00 (0,69)

Note: First difference of UN in parentheses.

Table 7: First generation unit root tests for GFCF

First Generation Tests	Test-statistic	Prob. Value
LLC	7,10 (-5,62)	1,00 (0,00)
IPS	8,98 (-7,36)	1,00 (0,00)
ADF-Fisher	7,26 (123,8)	1,00 (0,00)
PP-Fisher	9,65 (153,1)	1,00 (0,00)
Hadri Z-stat.	13,47 (0,36)	0,00 (0,00)

Note: First difference of GFCF in parentheses.

As can be seen from Table 6 and Table 7, both UN and GFCF with individual intercept are nonstationary variables 1% and 5% significance levels. When we look first differences of used variables, we say that these variables are stationary at first difference is called difference stationary.

If the presence of a unit root is detected in the variables, then it is necessary to check for the presence of a cointegrating relationship among the variables. There are two types of panel cointegration tests in the literature. The first is similar to the Engle and Granger (1987) framework which includes testing the stationarity of the residuals from a levels regression. The second panel cointegration test is based on multivariate cointegration technique proposed by Johansen (1988).

Pedroni (1999, 2004) and Kao (1999) extend the Engle-Granger (1987) cointegration test. Kao (1999) presents DF and ADF type tests fort he null hypothesis of no cointegration in panel data. Kao considers the special case where cointegration vectors are homogeneous between individuals. Thus the test don't allow for heterogeneity under alternative hypothesis. The DF type test from Kao follows the following model:

$$Y_{it} = \alpha_i + \beta . X_{it} + \varepsilon_{i,t}$$

(3)

Where:
i=1,…,N
t=1,…T

Both Y_{it} and X_{it} are random walks. It follows that under the null hypothesis of no cointegration, the residual series, $\varepsilon_{i,t}$, should be nonstationary. The ADF type test from Kao is based on the estimated residuals of the following equation:

$$\hat{\varepsilon}_{i,t} = \rho . \hat{\varepsilon}_{i,t-1} + \sum_{j=1}^{p} \varphi_j \Delta \hat{\varepsilon}_{i,t-j} + v_{itp}$$

Where:
$\hat{\varepsilon}_{i,t}$ is the estimated residual of equation (3)
p denotes number of the lags in ADF specification.
To test whether Y_{it} and X_{it} are cointegrated based on DF or ADF test statistics, the null and the alternative hypotheses can be written as $H_o : \rho = 1$, $H_A : \rho < 1$ respectively.

Pedroni (1999, 2004) proposes a residual-based test for he null of cointegration for dynamic panels with multiple regressors in which the short run dynamics and the long run slope coefficients are permitted to be heterogeneous across individuals. The

test allows for individual heterogeneous fixed effects and trend terms. Pedroni considers the use of seven residual-based panel cointegration statistics, four based on pooling the data along the within-dimension and three based on pooling along the between-dimension.

Johansen Fisher's panel cointegration test combines individual Johansen's cointegration trace tests and value tests. In Johansen's multivariate cointegration technique, trace statistic tests for at most r cointegrating vectors among a system of N>r time series, and the maximal eigen value statistic tests for exactly r cointegrating vectors against the alternative hypothesis of r+1 cointegrating vectors.

Johansen Fisher Panel Cointegration technique has an advantage when compared with Pedroni and Kao Panel Cointegration tests. It relaxes the assumption of a one cointegrating vector among the variables.

Tables 8, 9 and 10 show results obtained from various panel cointegration tests. Table 8 shows results obtained from Kao Cointegration Test. Lag is selected automatically 2 lags by AIC with a max lag of 8. We reject to the null of hypothesis of no cointegration relation between used variables at 5% significance level.

Table 8: Kao Residual Cointegration Test

	t-Statistic	Prob.
ADF	-2.217138	0.0133
Residual variance	4.96E+10	
HAC variance	7.23E+10	

Table 9 shows results obtained from Pedroni Cointegration Test for without trend model. It is reject to the null of hypothesis of no cointegration relation between used variables at 5% significance level in terms of Panel v-statistics and Panel ADF-statistics.

Table 9: Pedroni Residual Cointegration Test

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	3.797805	0.0001*	1.097118	0.1363
Panel rho-Statistic	-1.035422	0.1502	-0.035304	0.4859
Panel PP-Statistic	-0.676110	0.2495	-0.397201	0.3456
Panel ADF-Statistic	-2.676211	0.0037*	-3.985351	0.0000*

Note: * stands for the level of significance at 5%. Lag lengths are chosen by Akaike Information Criterion (AIC).

Table 10 presents results of Johansen Fisher Panel Cointegration Test for the model without trend but with intercept. Both trace test and max-Eigen test reject the null of hypothesis of zero cointegrating vector. The hypothesis that there is one cointegrating vector cannot be rejected. Thus we could conclude that there exists a cointegrating relationship between investment and unemployment level.

Table 10: Johansen Fisher Panel Cointegration Test

Hypothesized	Fisher Stat.*		Fisher Stat.*	
No. of CE(s)	(from trace test)	Prob.	(from max-eigen test)	Prob.
r=0	78.24	0.0001	79.18	0.0001
r=1	35.94	0.5650	35.94	0.5650

Note: * Probability values are computed using asymptotic Chi-square distribution. Lag length is selected as a 1 lag that is minus one of 2 lags obtained from Kao test.

5.   Conclusion

Globalization tendencies occurred as a result of technological innovations in recent years affect the fix capital investment as well as all other investments. Also, the fix capital investment to be thought to bring up more in the future is the most important factor for accelerating and expansions of globalization. Like in many developing countries, fix capital investment accompanied by the change of sectoral structure in Turkey is the fundamental element which determines economical growth. Fix capital investment has shown a very rapid development in many developing and developed countries.

After the global economic crisis, tendency of dwindling in general occurred in the world economy. In this process macro economic targets were based on increasing production and employment instead of providing economic stabilization. In that way economic growth was aimed. Global recession has created negative impacts on mainly consumption and production concerning consumption, employment and investment.

In this study, 19 OECD countries which include Turkey is selected by employing panel data in order to test long run relation investment and unemployment by using cointegration tests. Panel data were obtained by selecting annual unemployment level and fixed capital formation between 1985-2008 periods. Firstly, unit root tests are applied in order to test series' stationarities. After testing unit root of series, cointegration tests are applied. According to the results of panel cointegration tests used in study, we accept to presence of a long-run relation between unemployment level and investment in selected 19 OECD countries over 1985-2008 periods.

As can be seen from obtained empirical results, in order to get over the crisis with minimum governments must be focused on fixed capital formation. By using efficiently it, governments can struggle with unemployment problem triggered by the crisis.

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