

Taxation Systems in the EU: The Role of Economic Inte- gration and Global Financial Crisis

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Abstract

This study aims to scrutinize the change of public revenue systems of the EU-15 between 1980 and 2016. The share of consumption taxes in total tax revenues increases and this process have triggered higher tax burden on labor in most of the EU countries via indirect taxation. In this study I use panel data analysis, in order to analyze the impact of global financial crisis on depreciated tax revenues in most of the member states. Political integration and global financial crisis reduce national tax revenues and this revenue loss differs due to tax system asymmetries among member states. Although indirect taxation is an easy way of compensating revenue loss for indebted countries, this type of public finance damages stability of tax revenues in long run.

JEL-Codes: F150, H200, H300, H710, C230.

Keywords: taxation, panel data models, economic integration, fiscal policy.

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1. Introduction

EU regulations on national fiscal policies, such as European Semester, have affected public revenue systems of member states and have forced national states to comply their economic policies with this new economic framework. Tax harmonization efforts in the EU and reinforcement of EU's own public financial governance are the important components of economic governance after the financial crisis in the EU. In order to reduce the impact of financial crisis, especially the effect of asymmetric shocks, countries should achieve structural reforms and financial risks should be minimized by implementing a common sharing system within the EU such as an insurance mechanism or European Stability Fund. As a fundamental issue, taxation composes a substructure for EU's fiscal policy and the importance of revenue resources increase in times of financial crisis.

Aftermath of the Euro-zone debt crisis wake of the fiscal union and fiscal federalism debates has been pointed out in academic papers. Florin (2010) argues that fiscal federalism is a compatible process with EU's economic governance but considering that certain extend of centralization is a necessity for a full economic integration. There is a significant heterogeneity among member states and eliminating all these differences is not expected from EU's centralized fiscal policy. According to Vallée (2014), without being redesigned in the form of a single roof of EU's own resources, the current system of Monetary Union is not able to reach success. When creating Monetary Union, it is taken into consideration as a monetary policy oriented union; structural differences among countries such as different tax systems and the lack of a common fiscal policy institution are understood better with the Eurozone debt crisis. Evers (2015) concluded that fiscal transfers among member states would create consumption fluctuations however existence of a central fiscal authority would reduce these fluctuations and increase the effectiveness of risk sharing mechanism. As seen from the previous studies, centralization and coordination of fiscal policies in a Monetary Union will make the economy more resilient against financial crises.

Harmonization of tax policies within the EU is not only important to prevent member states from profit shifting but it is a necessity for a more stabilized and sustainable fiscal policy across Europe. Although tax policy is not seen as main reason of the Euro-

zone debt crisis, attaining a stable and inclusive tax policy is very important part of austerity packages which are suggested by international institutions after financial crisis. Norregaard et.al. (2014) analyze whether tax policy implications caused Eurozone debt crisis or not. Companies, using excess borrowing instead of own resources, finance their operations by increasing debt to equity ratio. That type of financing is a result of tax policy, which allows deducting interest payments of total debt. More borrowing rather than financing by equity decreases tax base of companies. Moreover, this tax rule increases private debt stock of countries and make countries more fragile against financial crisis.

In addition to corporate financial plans, the deductibility of mortgage interests by households also effected risk-taking decisions of individual income taxpayers before the financial crisis. Using tax havens in order to reduce tax base is another factor, which affects financial crisis indirectly. All these impacts have changed financial environment negatively but still taxation was not the main driver of financial crisis (Alworth and Arachi, 2012).

Taxation has played a secondary role in creating global financial crisis. However, the impact of crisis on tax policies and tax revenues was significant. Regulating financial sector with a financial transaction tax or increasing tax revenues with a corrective wealth taxation were some of the policies that are recommended by economists. From this point of view, international taxation is closely related to financial crisis and tax issues in the EU must be redesigned in supranational level.

In pre-crisis period harmonization of tax policies was remedy to the glitch of functioning of single market rather than harmonization of fiscal policy. However, aftermath of the crisis, tax harmonization efforts mean more stable and resilient revenue system against financial shocks for countries which have fragile fiscal structure. Moreover, risk sharing and creating shock absorption mechanism require some degree of centralized tax revenues.

In this paper, I analyze the impact of globalization and particularly global financial crisis on tax structures of 14 EU member states. Although, taxation is a secondary issue to assess global financial crisis, sovereign debt crisis has affected tax systems in the EU and this structural break has also increased fragility of public finance of member states. Contrary to current literature, I will test the reverse causality from tax structures to financial

crises. My hypothesis is that globalization and particularly global financial crises change tax policy of EU member states to increase tax revenues in short term.

The rest of the paper unfolds as follows; section two summarize the taxation systems of EU-15 countries, especially Greece, Italy, Ireland, Portugal and Spain (GIIPS) where the financial crisis affected most. Section three reviews literature in terms of the relationship between global financial crisis and taxation. Section four describes the data and the methodology for the empirical analyses. Section five discusses the empirical results. Finally, section six comments on policy implications and concludes.

2. Heterogeneity of Taxation Systems in the EU

In the EU, average tax revenues to GDP ratio consists of 38.7% (European Commission, 2017) and it is above the OECD average. There are significant differences between tax systems of member states. While some countries' public revenues are based on social security contributions, others, especially developing ones' tax systems, are based on indirect taxes and this heterogeneity also exist within the EU. For instance, in Denmark, France and Belgium tax revenue to GDP ratio is around 45% or more, while in Romania, Bulgaria and Ireland, that ratio is under 30%. Belgium, Germany and Austria are in a very high level of fiscal autonomy, which means that these countries have a certain degree of fiscal decentralization while in United Kingdom and Ireland tax revenue share of central government is around 90%, which is relatively high according to other EU member states.

If tax rates concerned, new member states impose lower tax rates, especially lower corporate tax rates, in order to attract foreign direct investment and there is a certain amount of tax competition among new member states. An attractive tax policy for capital; flat tax rates are implemented by Baltic countries such as Estonia, Lithuania and Latvia. Besides new member states, old members like the Netherlands and Ireland apply advantageous corporate tax rules to multinational companies. In addition to these countries, Cyprus and Luxemburg are considered as tax haven (Oxfam, 2017). Finally, Switzerland with a high level of banking secrecy is a loophole in the EU from taxation point of view. Although Switzerland is not a member of the EU, this situation affects functioning of single market within European Economic Area.

Since different tax systems create different fiscal stabilization mechanisms in times of crises, taxation deepens asymmetric structure of financial crisis within the EU. Divergences in tax rules, rates and tax bases cause international tax arbitrage and countries prefer debt to taxation. Moreover, low tax jurisdictions may result with distortions such as harmful tax practices (Keen et. Al, 2010).

Share of social contributions in tax revenues differ from country to country significantly (European Commission, 2017), which make common harmonized tax policy unrealistic in near future and there are many political obstacles on creating common fiscal policy in the EU from taxation perspective. Lack of harmony in tax policies blocks creating fiscal union unless bring out a centralized, common EU revenue budget. Only creating centralized fiscal capacity at supranational level may prevent the European economy from the asymmetric economic shocks which is created by global financial crises and this policy reform is only available with transferring some taxation power from national level to EU central budget.

2.1. Tax Revenues in the EU-15

As shown on the table of detailed tax statistics of EU-14¹ Finland, Sweden and Denmark have a higher tax revenue/ GDP ratio than it is in southern countries such as Greece, Portugal and Spain and this ratio is much higher than OECD countries' average tax rates.

Southern countries such as Greece and Italy have higher volatility of tax revenues although tax revenues to GDP ratios are increasing steadily aftermath of the crisis. In addition to decreasing growth rates, Southern countries' tax revenues are more sensitive to economic activities. Considering consumption tax revenues depend on economic activity, we expect more volatility in countries where tax revenues are based on indirect taxes such as value added tax. Since indirect taxes are collected from economic transactions and Southern countries' tax systems are based on consumption taxes, global financial crisis has affected revenue side budget of GIIPS deeply.

¹ Appendix I: ICTD/UNU-WIDER, 'Government Revenue Dataset', June 2016, [https://www.wider.unu.edu/project/government-revenue-dataset'](https://www.wider.unu.edu/project/government-revenue-dataset)

Closer examination of the changes in taxation trends from 1980 to 2015 shows us that revenue shares in GDP are increasing steadily in all EU-15 countries except Ireland, France and Austria. In countries, which have relatively low indirect taxes to GDP ratio, the impact of the financial crisis on tax revenues is more severe than the other countries of which tax system is based on direct taxation. Ireland, which has the lowest indirect taxes to GDP ratio, is affected by the financial crisis deeply but Ireland also seems has the most resilient economy among GIIPS countries aftermath of the financial crisis. In other GIIPS countries, indirect taxes share of GDP has increased steadily. For instance, in Greece this ratio has reached 15% in 2015 from 9% in 1980.

Another structural change in taxation is that changing composition of income tax towards higher tax burden on individuals than it is on corporations which creates higher average tax rates on labor. First reason of increasing individual taxation instead of corporate taxation is that tax competition among countries continues on corporate taxation rather than relatively immobile production factor, unskilled labor. Multinational corporations' mobility across countries is higher than labor mobility and this situation creates lower corporate tax rates instead of individual taxation.

Secondly, taxation of individual consumers is easier than corporate taxation since there is a control mechanism which is supported by social security system. Tax revenue from wages, which is an important source of public revenue, is usually collected by deductions from wages and following up these tax revenues is simpler comparison to corporate taxes, which are mostly based on tax filing.

Finally, most of the EU-15 countries have various tax exemptions and discounted rates, which reduce corporate tax base. One of the most relevant example of this tax base erosion is that interest deductions from corporate profits which means thin capitalization in many different countries' tax law. However, distribution of profit or financing from equity is not as advantageous as thin capitalization. Many countries prefer taxing distribution of profits among partners, instead of taxing corporate profits directly to avoid thin capitalization.

Although the share of indirect taxation such as environmental taxes is increasing in total taxation, direct taxation is a stable and sustainable source of revenue for the EU-15. This type of taxation is important for fighting with the impact of financial crisis, ensuring

justice in taxation and indicates improved tax collection system for some EU-15 countries. On the other hand, GIIPS countries, which are also, named Southern European countries in this study, have more indirect tax oriented revenue system that is a deviation from other EU countries such as Germany and France.

2.2 Tax Revenue Systems of GIIPS and Financial Crisis

The financial crisis that began in the United States in 2008, affected European economic governance and member states' public finance, particularly the economies of GIIPS. Increasing tax revenues of GIIPS and maintaining contractionary fiscal policy are important tools for reduction of debt stock. However, fiscal austerity packages may cause different budgetary and redistributive effects in GIIPS due to heterogeneity of tax systems.

For instance, in GIIPS countries the share of indirect taxes in total taxation is higher than the share of direct tax revenues. Ireland as the country of most quick recovered from the crisis, becomes separated from these countries with a unique tax system. Unlike the other GIIPS countries, Irish tax burden, which is calculated by using macroeconomic data, is decreasing steadily. Aftermath of the financial crisis the impact of austerity packages also affects collected tax revenue, but this effect is more severe in countries such as Greece relative to Ireland. Figure (1) presents tax revenue trends in Ireland and Greece between 1990 and 2017.

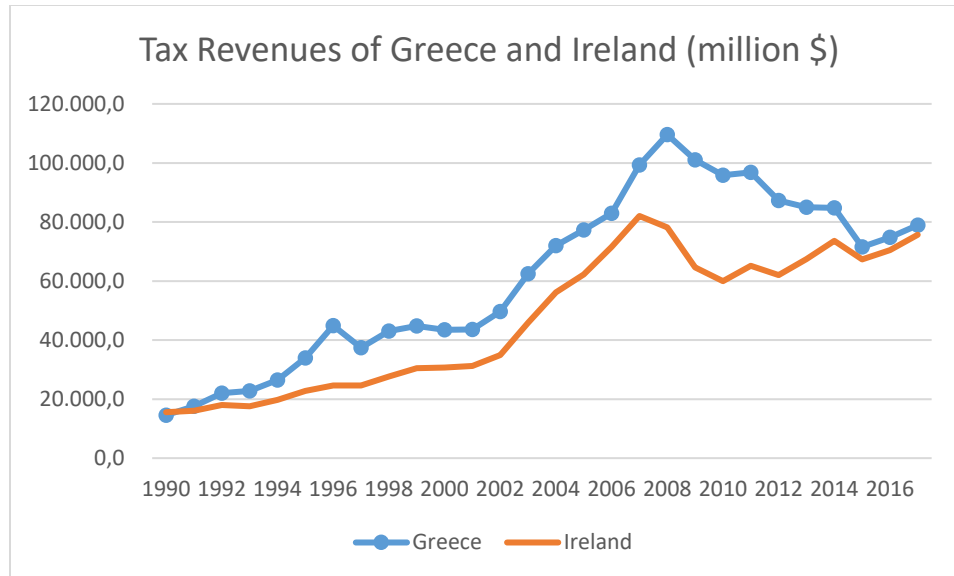


Figure (1): Tax Revenues of Greece and Ireland (in million \$, 1990-2016)

Source: OECD revenue statistics.

In countries, which have high debt stocks, are even getting worse with diminishing tax revenues with the effect of recession. The deterioration in revenue side of budgets make the impact of the crisis more destructive for public financial systems of GIIPS. Austerity packages implemented after the crisis have worsened revenue side of fiscal structures of countries, which have high debt to GDP ratios. According to Arellano and Bai (2016); increasing tax rates in Greece after financial crisis has worsened fiscal situation of the country and has deepened the recession.

However, this fiscal impact has changed public financial system of countries in different levels because of heterogeneity of revenue elasticity in different countries. This is the case of Ireland and the reason why Ireland's tax revenues have been less affected by the crisis that Irish tax revenues are less dependent on economic fluctuations than it is in other GIIPS countries. Tax revenue collecting capacity has increased in Ireland after sovereign debt crisis.

Figure (2) compares tax revenues of Italy and Spain. Tax revenues have diminished after 2008 financial crisis and the level of public revenue has remained below the 2007 level. The recovery of tax revenues is more precise in Ireland than the other GIIPS countries.

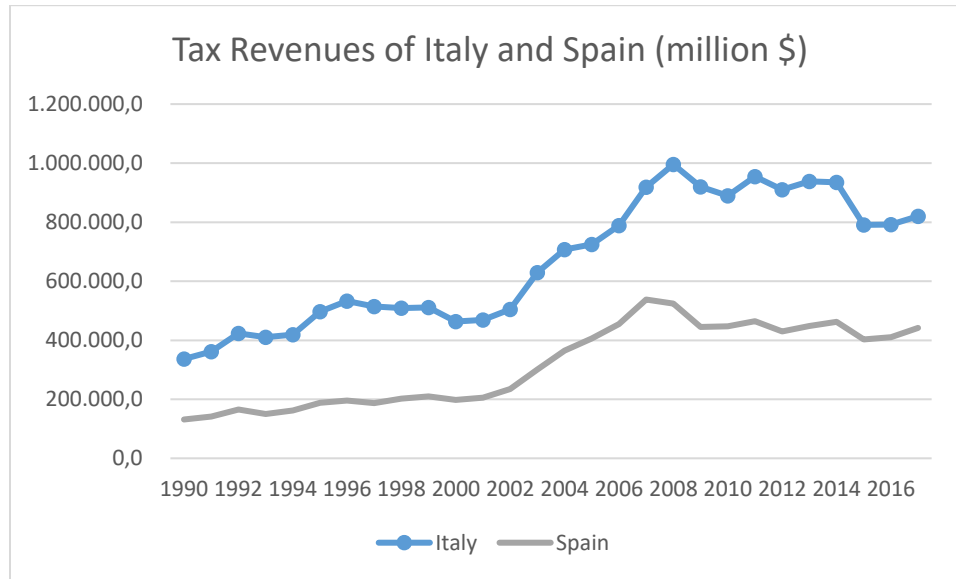


Figure (2): Tax Revenues of Italy and Spain (in million \$, 1990-2016)
 Source: OECD revenue statistics.

3. Literature Review on Global Financial Crisis and Taxation

Tanzi (2009) claimed that as international tax competition increased the formation of international tax authority would be a necessity over time in order to prevent from negative externalities of tax competition. National government’s efforts to reduce tax rates and to minimize the impact of harmful tax competition increase the international organizations' role in the field of international taxation. EU is also trying to establish common rules for the single market in commodity taxation and income taxation. Since these institutional struggles have started and accelerated with the pace of globalization, the literature about taxation and globalization has enlarged distinctively.

Academics that examine the relationship between globalization and taxation, concentrate on tax competition among countries over corporate taxation, assessing average tax rates within panel data estimation and tax revenue determinants of countries. Empirical results of these studies show that there is a complicated association between globalization and tax burden on mobile production factors. According to game theoretical approach, tax competition among countries to attract FDI and other kind of investments

to their countries, does not exist in selected OECD countries with an agglomeration effect of trade (Baldwin & Krugman, 2004; Borck and Pflüger, 2006). However, in some countries partial agglomeration exist and there is a limited tax competition in developing countries. On the other hand, some academics argue that there is a significant negative relationship between corporate tax rates and globalization (Bretschger and Hettich, 2005). According to Haufler *et. al.* 2008 corporate tax rates are decreasing because of tax competition about capital attractiveness relative to labor taxes with an effect of multinational companies.

Rodrik (1997) explains the effect of globalization on capital taxation and finds negative correlation between capital taxation and globalization, conversely globalization increases tax burden on labor, which is also called efficiency hypothesis. The higher public expenditures are meeting with the higher labor taxation. Parallel to this result; Bretschger and Hettich (2005) explain that globalization affects capital tax rates negatively with a panel data estimation for 12 OECD countries.

Aizenman and Jinjarak (2009), categorized public revenues as "hard to collect taxes" (VAT, income taxes, sales taxes) and "easy to collect taxes" (tariffs, inflation tax and financial repression). They find that there is a positive correlation between openness and "hard to collect" taxes but this relationship is negative for easy to collect taxes. The higher trade openness gives rise hard to collect taxes. Globalization has forced countries to reduce their trade barriers such as tariffs and custom duties. However, this trend also increased Value VAT and sales taxes.

The impact of globalization on taxation studies intensify on specifically capital taxation. Adam, Kammas and Lagou (2013), have summarized 20 years of empirical studies about the relationship between globalization and capital taxation meta-data regression model. They concluded that results might differs depending on the measurement of capital tax burden and globalization indicators.

Another article about tax burdens and globalization finds that globalization increases implicit tax rates on capital and national economic policies are not independent from global trends (Dreher, 2006). On the other hand, governments still powerful about collecting taxes although labor and capital mobility strains ability to collect tax (Neumann *et. al.* 2009).

According to quantitative analysis of Neumann et. Al. (2009); increasing mobility causes depreciation of tax revenues but the governments still have enough power to collect revenues instead of certain restriction. Krogstrup (2004) also states that capital mobility causes tax competition and reduction of corporate tax rates of countries.

In addition to globalization and economic integration, global financial crisis also contributes to volatility of tax revenues in the EU-15. Norregaard et.al. (2014) stated in his review on taxation and financial crisis that allowing the deduction of the interest expenses from the tax base eroded the tax bases by means of more borrowing and interest payments rather than shifting from the equity of the firms. The fact that financial structures of firms are based on borrowing rather than equity due to the current tax system increased the private debt stock and increased the fragility of the member countries against crises.

At household level, the deductibility of mortgage interests also contributed risky positions of individual taxpayers before the financial crisis. Other factors that affected the severity of financial crisis are capital flight to tax havens and the aggressive usage of debt financing in corporate operations such as restructuring. All these factors were not the main reason of global financial crisis, but they established a ground for high private debt accumulation (Alworth and Arachi (eds.), 2012).

Globalization and high volatility of financial markets changed risk perceptions of investors both individually and at corporate level. Mobility of production factors gives rise to tax avoidance activity of multinational companies and increases private debt to GDP ratios. For these reasons, taxation is another transmission mechanism between globalization and global financial crisis. High budget deficits and tax competition may result with depreciation of tax revenues and limit tax collecting capacity of countries which have fragile public financial system.

General economic recession, rather than direct influence of housing market, reduces both local and state tax revenues from 2006 to 2009 in the US (Lutz et. Al, 2011). Not only heterogeneity of tax systems within the EU but also dysfunctional national tax systems affected financial crisis and existence of different tax structures played an important role in sovereign debt crisis. Since Greek tax system is not well-functioning, tax revenues fell and revenue shortfalls worsened government budget before the outbreak of the financial crisis (Kaplanoglou and Rapanos, 2013).

In this study, I will focus on the determinants of tax revenues since tax revenue shortfalls are the main fragility of national budgets before the crisis and these shortcomings, which deepen asymmetric feature of financial crisis, differ significantly among member states. I will contribute three important factors to explain tax revenue trends in the EU. First, we will use political and economic integration as explanatory variables. Secondly, we will add indirect tax revenues to direct tax collections ratio as an explanatory variable in the model. Finally, country specific dummies for 2008 financial crisis and economic integration levels will be used in order to scrutiny tax revenues in an economic and monetary union.

4. Methodology

4.1. Tax Revenue Model and Database

This study uses panel data estimation methods to understand impact of globalization on national budgets. Ordinary least squares method for the EU-15 will demonstrate the change of tax structure of member states within the EU. Yearly data from 1980 to 2015 is collected from OECD, World Development Indicators and Swiss Economic Institute Database. First, I apply panel unit root tests to dependent variable of revenue growth model. In addition to globalization indicators such as trade openness and FDI inflows I will also test the significance of centralization degrees.

Short-term determinants of stationary dependent variables; tax revenue growth rate will be estimated by panel data estimation methods. The model to be used for the panel estimator showing the short-term relationship is formulated below. Because of the panel unit root tests, static dependent variables and independent variables were used in the model.

Tax Revenues = f (trade, FDI inflows, kof, political, growth, govexp, inflation, size, centralization, inddirect, crisis dummy)

Static model;

$$\text{Revgrow}_{it} = a_{it} + \beta X_{it} + n_i + e_{it} \quad i=1, \dots, N \quad t=1, \dots, T_i \quad (1)$$

Dynamic model;

$$\text{Revgrow}_{it} = b_i \text{revgrow}_{i,t-1} + \beta X_{it} + n_i + e_{it} \quad i=1,\dots,N \quad t=1,\dots,T_i \quad (2)$$

Where,

a_i ($i=1\dots N$) is the constant variable for each country,

b_i ($i=1\dots N$) is the unknown intercept for each country,

Revgrow_{it} is the dependent variable where i = countries and t = time

X_{it} represents the vector of independent variables

β is the vector of coefficients for independent variables

n_i is the country specific effects

e_{it} is the error term.

Explanatory and dependent variables and their definitions are listed in Table 1.

Table1: Dependent and Explanatory variables

Dependent	Explan. var.	Definition	Source
Revgrow		Tax revenues in million dollars growth rate	OECD
	Trade	Trade in goods and services/ GDP	WDI
	FDI inflows	Net foreign direct investment inflows/ GDP	WDI
	Growth	GDP growth (annual %)	WDI
	Govexp	Government expenditure/GDP	WDI
	Inflation	GDP deflator, yearly	WDI
	Size	National GDP/ world GDP	WDI
	Centralization	Tax revenues of general government/ Total tax	OECD
	KOF	Economic globalization index	Swiss Economic Institute
	Political	Economic globalization index	Swiss Economic Institute
	Inddirect	Indirect tax revenues to direct tax revenues ratio	OECD

Since ordinary least squares (OLS) method causes biases in panel data analysis, we have also applied GMM to explain tax revenue determinants in EU countries. Pooled OLS, random and fixed effects models are tested separately and tested which one is more accurate to estimate. OLS method may cause endogeneity problem in panel data models. GMM estimator developed by Arellano and Bond (1991) is based on moment equations constructed from further lagged levels of dependent variable and the first-differenced errors. In our tax revenue model, yearly tax revenue growth is the dependent variable, total tax revenue data is gathered from OECD statistics in million dollars and calculated

with growth formula. Moreover, we test the significance of direct and indirect tax to GDP ratio as dependent variable. In order to control tax structures of countries, indirect tax revenue to direct tax revenue ratio has been used in the model. The dataset which is used in the model summary statistics of dependent and independent variables are presented below in table 2.

Table 2. Summary Statistics

	Mean	S.D.	Min	Max
growth	2.188	2.786	-9.132	26.276
fdiin	4.923	14.957	-58.323	252.308
tradegdp	86.592	57.113	31.592	419.529
govexp	20.222	3.226	12.549	27.935
inflation	4.1	4.609	-5.256	27.213
centr	59.154	13.455	29.241	86.209
size	1.426	1.57	0.043	6.602
inddirect	0.972	0.379	0.493	2.544
revgrow	6.778	12.859	-26.271	71.716
kof	78.137	12.428	43.18	99
social	75.288	13.505	34.95	92.4
political	87.347	11.923	44.55	98.41

Growth rates of annual tax revenues in dollar terms are considered as dependent variable in this study. FDI, total goods and service flows, and KOF indices are the explanatory variables in the model. As can be seen from the correlation matrix, the relationship between these variables is high and the significance of individual globalization indicators will be tested in this study. In the model, the relationship between growth, public expenditures, inflation, the degree of centralization and the variables of economic size as control variables is tested by correlation matrix.

Table 3. Correlation Matrix

	growth	fdiin	tradegdp	govexp	inflation	centr	size	inddirect	revgrow	kof	social	political
growth	1											
fdiin	0.1	1										
tradegdp	0.22	0.51	1									
govexp	-0.33	-0.05	-0.14	1								
inflation	0.0	-0.1	-0.22	-0.32	1							
centr	0.2	0.13	0.32	-0.21	0.17	1						
size	-0.08	-0.16	-0.44	-0.08	0.01	-0.51	1					

indirect	-0.08	-0.11	-0.32	-0.29	0.49	0.13	-0.1	1				
revgrow	0.24	-0.08	-0.09	-0.24	0.32	0.11	0	0.26	1			
kof	0.16	0.32	0.65	0.15	-0.6	0.29	-0.33	-0.43	-0.22	1		
social	-0.07	0.19	0.25	0.39	-0.8	-0.14	-0.1	-0.46	-0.32	0.67	1	
political	-0.22	-0.02	-0.27	0.5	-0.38	-0.06	0.01	-0.19	-0.23	0.13	0.5	1

When the correlation coefficients are taken into consideration, it is observed that the data sets such as trade openness, social and political integration and KOF index, which we add to the model as economic variables, have high correlation as expected. Since economic integration variables have positive correlations within themselves, attention has been paid not to use more than one economic integration component in tax revenue growth model. Inflation is not used as an explanatory variable since there is a high correlation between inflation and globalization variables in EU-15 countries.

4.2. Economic Integration Indicators

Globalization stimulates economic convergence among nations and it changes public revenue systems of countries. Parallel to removing governments' control on capital, taxation of capital movements is more difficult than before. Our research focuses on that whether higher economic integration has caused lower tax collecting capacity in member states.

I have used five different economic integration indicators in revenue growth model. As explained previously, trade volume and FDI inflows are the main determinants of economic globalization in literature. In addition to these variables, economic globalization index (KOF) index² calculates different globalization indicators. I have tested the significance of flows index (harmonization of FDI and trade to GDP ratio), KOF and political globalization index (political) in the model.

KOF index differs from flows because it covers restrictions such as trade barrier. Political globalization has different characteristics and I have added to the model in order to enclose non-economic aspects of globalization.

² Globalization.kof.ethz.ch. (2017). *KOF Index of Globalization*. [online] Available at: <http://globalization.kof.ethz.ch/query/> [Accessed 30 Jan. 2017].

4.3. *Direct versus Indirect Taxation*

According to tax collection method, two main categories of direct and indirect taxation are accepted all over the world. Income tax, corporate tax and inheritance tax, which are generally based on the declaration system, are called direct taxation. If taxes are collected based on a transaction or consumption of the property, the method is called indirect taxation. This classification gives detailed information about the tax structures of countries.

Taxes on goods and services in an economy may led to number of deviations from the market structure characteristics and indirect taxes do not consider sufficiently the fair distribution of income from inequality perspective. For this reason, as a progressive method, the importance of income taxation has increased. Due to progressive structure, income taxation directly affects the distribution of income and progressivity is one of the most important components of an effective tax policy that can be used for different purposes.

In order to analyze taxation systems in the EU, indirect tax revenues divided by direct tax revenues is used in our tax revenue growth model. Indirect taxation-oriented revenue system has an advantage of easy collection but the higher indirect tax to direct tax revenue means the higher volatility and unequal system.

5. Results

5.1 Panel Unit Root Tests of Dependent Variables

Panel unit root tests for revenue growth and control variables for EU-15 are applied in order to determine stationary process of these series. Revenue growth rates are stationary according to common individual first-generation unit root tests. In addition to classical unit root tests we have also applied Pesaran's cross sectional dependence augmented Dickey Fuller test (PESCADF) in presence of cross-sectional dependence (Pesaran, 2007). Dependent variables are also tested for cross sectional dependence and the presence of dependence detected in most of them. Revenue growth variables have a cross sectional dependence according to cross-section dependence test (Pesaran, 2004). In

the presence of cross sectional dependence revenue growth data is still stationary according to results table 4 that is presented below.

Table4- Unit Root Tests

Variables	Levin, Lin & Chu*	Im, Pesaran & Shin*	ADF-Fisher*
Revgrow	-7.6369 (0.0000)	-9.9382 (0.0000)	237.6512 (0.0000)
KOF	-4.6368 (0.0000)	-3.5634 (0.0002)	67.5013 (0.0001)
Indirect	-1.5891 (0.0560)	-1.6287 (0.0517)	38.9682 (0.0814)

* Null hypothesis for Tests: Unit root

First generation unit root tests such as Levin, Lin and Chu (2002) and Im, Pesaran and Shin (2003) show that revenue growth, KOF and indirect tax to direct tax revenue variables are stationary. According to Pesaran (2004) test; revenue growth variable is cross sectionally dependent. I have applied Pesaran (2007) test which is more effective in the presence of cross-section dependence.

The results of PESCADF test are listed on table 5.

Table 5: PESCADF Tests for Dependent Variables (EU-15)

	Pesaran's CD Test*	Pesaran CD ADF Test**
	P values	P values
Revgrow	0.000	0.001

*Null hypothesis for Pesaran CD: There is no cross sectional dependence

**Null hypothesis for Pesaran CD ADF: Unit root

In EU-15 tax revenue growth series are stationary even in the existence of cross-sectional dependence.

5.2. Results of Revenue Growth Model

In the following table, the effect of economic integration on tax revenues was investigated by the random effect and fixed effect model. First, trade volume and FDI inputs, which are indicators of economic openness, were estimated and it was determined that these two variables were affected in the same direction, but these coefficients were insignificant. Then, the variables of flows (trade and FDI) and the effect of KOF were tested. It was concluded that the impact of economic globalization on tax revenues was

negative and significant at 10% level in random effect model. But political integration is more important for tax revenues in all three models.

Table 6. Results of Revenue Growth Model

	Random Effect	Fixed Effect	GMM
VARIABLES	revgrow	revgrow	revgrow
L.revgrow			0.131*** (0.0418)
growth	0.935*** (0.208)	0.766*** (0.237)	0.757*** (0.226)
kof	-0.195*** (0.0521)	-0.0997 (0.0803)	-0.0427 (0.0911)
political	-0.119** (0.0502)	-0.166** (0.0832)	-0.198** (0.0977)
govexp	-0.0165 (0.234)	-0.365 (0.425)	-0.292 (0.493)
inddirect	5.591*** (1.671)	15.36*** (3.511)	16.23*** (3.769)
size	0.122 (0.403)	0.650 (1.577)	0.355 (1.681)
centr	0.109** (0.0500)	0.180 (0.150)	0.179 (0.177)
crisisdummy	-10.18*** (3.846)	-8.190** (3.985)	-6.041* (3.651)
Constant	18.97** (7.784)	8.411 (14.65)	3.692 (17.59)
Observations	504	504	476
R-squared	0.193	0.189	
Number of countries		14	14

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In table 6, the effect of different explanatory variables on tax revenues was investigated with three different panel data methods. Here, it is seen that political integration which indicators of globalization are negatively affect tax revenues and its coefficients are significant at 5% level. In the estimations using the KOF and political integration index instead of FDI and trade openness data, the negative impact of political integration on tax revenues is observed. Political globalization index has a negative effect on tax revenues in all models.

As seen from the table 6, the lagged value of the dependent variable was found to be positive in dynamic model and the effect of growth on tax revenues decreased. In all models there is a significant positive indirect taxation effect. The more indirect taxation oriented economies means the more potential to create tax revenues. The fact that political integration coefficient is negative means that political convergence among nations negatively affects tax revenues in short-run. Also, dummy variable related to the crisis show that tax revenues are negatively affected during the crisis period. In other words, dummy variable related to the crisis were found to be significant and negative.

6. Conclusion

According to our estimations for EU-15 data, there is a negative relationship between political integration, an important indicator of globalization, and tax revenues in short run. The more politically integrated economies mean the less capability to collect tax revenues of member states in short run. As an indispensable part of globalization financial crises also affect tax revenues negatively in EU-15. Especially GIIPS countries' tax revenues have been affected by financial crisis deeply.

Increasing indirect tax revenues to direct tax revenue ratio shows that countries started to finance their public expenditures more intensely with indirect taxes such as value added tax and excise taxes. Although these consumption taxes are easy to collect, indirect taxation creates distortions in an economy. Moreover, these types of taxes cause unfair income distribution.

Increasing indirect taxation part of public revenue system also has created new potential for EU member states. Tax collection efforts of member states, especially in times of global financial crisis, are tended to be regulated by indirect taxation. Indirect taxation is more capital friendly policy, and it reduces tax burden on capital. Due to globalization the share of consumption taxes is increasing in total taxation and this process may result with higher tax burden on labor indirectly.

Empirical analysis shows that although taxation is not the main reason of global financial crisis, political integration and global financial crisis reduce tax revenue growth of member states significantly in the short run. Diminishing tax revenues worsen public financial system of member states and this effect is more severe in GIIPS.

Different taxation systems among member states increase the impact of asymmetric shocks due to different budgetary systems. In order to reduce the impact of financial crises, a centralized budget at least harmonized taxation rules are necessary for the EU's economic governance. Implementing efficient tax and benefit systems in all member states, especially in GIIPS, would help providing steadier tax revenues for EU-15. Revenue side fiscal harmonization at EU level will create more stable European macroeconomic structure and reinforce robustness against financial crises.

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Appendix

Detailed Tax Statistics of EU-15

Country	Calendar year	Social contributions	TotTax	Direct	Income	Indiv	Corp	Indirect
Austria	1980	0.12	0.27	0.14	0.10	0.09	0.01	0.13
Austria	2015	0.15	0.28	0.16	0.13	0.11	0.02	0.12
Belgium	1980	0.14	0.28	0.18	0.17	0.15	0.02	0.12
Belgium	2015	0.17	0.28	0.18	0.16	0.13	0.03	0.12
Denmark	1980	0.02				0.22	0.01	
Denmark	2015	0.01				0.25	0.03	
Germany	1980	0.13	0.24	0.14	0.13	0.11	0.02	0.10
Germany	2015	0.14	0.23	0.12	0.12	0.10	0.02	0.10
Spain	1980	0.11	0.11	0.06	0.06	0.05	0.01	0.05
Spain	2015	0.12	0.22	0.12	0.10	0.07	0.02	0.11
Finland	1980	0.11	0.25	0.14	0.14	0.13	0.01	0.13
Finland	2015	0.13	0.31	0.17	0.15	0.13	0.02	0.15
France	1980	0.17	0.23	0.09	0.07	0.05	0.02	0.14
France	2015	0.19	0.27	0.16	0.11	0.09	0.02	0.13
UK	1980	0.05	0.25	0.16	0.11	0.09	0.02	0.09
UK	2015	0.08	0.25	0.15	0.12	0.09	0.02	0.11
Greece	1980	0.07	0.14	0.05	0.04	0.03	0.01	0.09
Greece	2015	0.14	0.26	0.11	0.08	0.05	0.02	0.15
Ireland	1980	0.04	0.26	0.12	0.11	0.10	0.01	0.14
Ireland	2015	0.04	0.19	0.11	0.10	0.08	0.03	0.08
Italy	1980	0.11	0.18	0.09	0.09	0.07	0.02	0.08
Italy	2015	0.13	0.30	0.16	0.14	0.11	0.02	0.14
Netherlands	1980	0.16	0.25	0.15	0.13	0.11	0.03	0.11
Netherlands	2015	0.15	0.24	0.12	0.11	0.08	0.03	0.12
Portugal	1980	0.07	0.16	0.05	0.04			0.11
Portugal	2015	0.12	0.23	0.11	0.10	0.07	0.03	0.14
Sweden	1980	0.13	0.32	0.21	0.19	0.18	0.01	0.11
Sweden	2015	0.10	0.33	0.21	0.15	0.12	0.03	0.12

Source: ICTD/UNU-WIDER, 'Government Revenue Dataset', June 2016,

[https://www.wider.unu.edu/project/government-revenue-dataset'](https://www.wider.unu.edu/project/government-revenue-dataset)