WHAT IMPACT DO SINGLE TAXES HAVE ON THE CONVERGENCE OF TAXATION IN THE EU?

[Jaký je dopad jednotlivých daní na konvergenci zdanění v EU?]

Monika Bušovská[1]

[1]*University of Economics Prague, Faculty of finance and accounting, Department of Public Finance, Winston Churchill square 4, 130 67 Prague 3, Czech Republic*
e-mail: xbusm04@vse.cz

Abstract: Increasing globalization and the European Union enlargement have an influence not only on human culture or politics but mainly on the economies of the countries in which integration is at different levels of their development. This paper deals with the convergence of taxation in the European Union. The paper proposes to evaluate and quantify the impact of the single shares of the taxes and tax competition on the effective tax burden convergence in the EU 28 countries between the years 1965 – 2011. The panel regression model reports a statistically significant positive impact of all residuum on tax convergence in the European Union. The most important determinants of tax convergence are tax competition and property taxes. All models meet diagnostic tests and are econometrically robust. Results can be considered as relevant with sufficient information capability.

Keywords: convergence, European Union, tax competition, tax mix, tax quota, taxes.

JEL classification: H2

Doručeno redakci: 25.2.2015; Recenzováno: 6.3.2015; 27.3.2015; Schváleno k publikování: 27.5.2015

Introduction

The first step in the European integration consisted in strengthening economic cooperation between Member States whose goal was to establish a single market. That means free movement of goods, persons, services, and capital (European Commission, 2010) and a common currency, the Euro (Helísek, 2013). As a result, the original purely economic-oriented cooperation gave birth to a community that is now cooperating in a number of areas and tax policy is not excluded.

The homogeneity in terms of the tax burden of individual Member States may be questionable (Emerson et al., 1992). Due to the existence of differences in economic structures and political preferences, together with national fiscal autonomies, European tax systems are far from being uniform. However, the European Union has been trying to converge tax systems, which should lead to the removal of all obstacles to the creation of the single market.

Tax-coordination, as a tool for avoiding the emergence of very diverse politics, and tax-harmonization, as a tool for the approximation of tax systems, has been subject of much debate since the beginning of the European integration. The issues of the coordination, approximation, and harmonization of tax systems in the EU are discussed, for instance, in Musgrave (2002), Serna (2008), Láchová (2007), who make readers familiar with various directives and regulations that affect the tax systems of the Member States.

However, tax convergence has supporters as well as opponents. Cultural dissimilarities and freedom of adopting tax legislation, which are based on different structures, are the main arguments to reject the convergence of taxes. Another negative aspect is a loss of tax competitiveness of individual Member States (Mach, 2004). Reuven (2010) believes that

convergence is a positive phenomenon because it reduces the scope of "unfair" tax arbitrage for the price of higher transaction costs. All Member States would be able to benefit from the single tax system and no distortions would emerge. He prefers full harmonization and integration. Thus it is evident that since its establishment, there have been continuous clashes of views in the EU facing the question whether to maintain tax competition or rather press for tax harmonization.

Kubátová (2004) pursued the controversy between tax harmonisation and competition as well and she came to the conclusion that it was impossible to tell which is more favourable – tax competition or harmonisation. In her work, she draws attention to the fact that tax harmonisation brings the threat of the disproportionate growth of tax burden borne by taxpayers and if not applied within the whole territory of the community, it is ineffective. Nevertheless, tax competition itself should lead to the convergence of taxation systems as well because the reduction of the tax burden in one state will cause the growth of tax incomes by the relocation of tax bases and the outflow of tax revenues of other states. In order to prevent this phenomenon, they will reduce their tax burden too and according to economic theory, the whole process leads to the convergence of tax burden in one area (Theather, 2005).

Nerudová (2008) states that tax competition should result in a responsible, complex and effective tax policy with a lower tax burden which produces the positive and effective climate for greater economic growth.

In her work on the impact of tax competition on economic growth, Szarowská (2011, p.40) defined tax competition as "*A process of lowering effective tax burden to make investors and factors of production owners allocate their tax bases in a given country, provided that identical conditions are respected for all subjects.*"

In spite of these problems there is lot of authors who have been trying to find out whether taxation converge in the EU. Foltysová (2007) and Kubátová et al. (2008) deal with a cluster analysis of 22 OECD countries in several time periods between 1965 and 2003. They make use of five chosen main variables of the tax structure in accordance with the OECD classification. They conclude that the tax structure in the EU has become closer in four main groups – northern, southern, central European and non-European ones.

Drawing on the β-convergence and σ-convergence methodology, Esteve et all (1999, 2000) and Sosvilla et all (2001) infers that tax burden converges between 1967 and 1995 during an annual data analysis of 15 EU countries; with the only exception of the period between 1974 and 1984. The same methodology including unit root tests is used by Delgado and Presno (2007, 2009) and Rivero and Casquero (2010),whose key contribution is attached to the evidence that tax convergence in the EU occurs during the whole 1965 – 2005 period.

In their works, Bušovská (2012, 2014) and Bušovská and Petrovická (2013) address tax burden convergence by means of β-convergence and σ-convergence from several points of view. She analyses statutory tax rates but also implicit tax rates which give a true picture of the real tax burden of different economic activities, but especially compound tax quotas and their tax structures. According to her analyses, the effective tax burden itself converges in the EU between 1965 and 2011. These conclusions are used for subsequent research included in this work as well as the definition of tax competition taken from the work by Szarowská (2011).

Provided that tax systems in the EU countries between1965 and 2011 converge, the aim of this work is to determine the impact ratio of individual tax burden components (in other words tax mix - expresses share of individual taxes of the total tax revenues) convergence on tax systems convergence of the EU Member States and quantify the given issues. The article will try to answer:

1) To what degree tax burden components influence the convergence of tax systems in the EU countries.
2) To what degree tax competition influences the convergence of tax systems in the EU countries.

1 Methodology

The work uses methods of comparison, classification methods and deductive methods with the analogy method. The analysis method is important, supplemented by the synthesis method for the creation of a coherent objective opinion in the conclusion of the work.

Firstly, it is necessary to identify individual terms and their definition content. The easiest way to determine the tax burden is the use of *statutory rates* of taxes (Bušovská, 2014). However, Blechová (2008) emphasises in her research that statutory tax rates do not fully play the role of an objective indicator for the international comparison which is why the so called *implicit tax rates* are used within the scope of tax rates. They measure the average effective tax burden of various kinds of economic incomes and activities. In other words, implicit rates inform about the percentage from the given economic activity that is paid to the state on respect of taxes, including social allowances concerning labor (Blechová, 2008). This methodology is used e.g. by the European Commission (2012), Říhová (2008), Petráňová (2009) and Bušovská (2014).

The tax quota can be also applied for the international comparison of tax burden (Kubátová, 2010; Szarowská, 2011). It represents a macroeconomic indicator which is set as the ratio of tax and customs revenues to GDP in going prices. Thus *the tax quota (also called tax burden)* represents a certain proportion of GDP which is redistributed by means of public budgets. This indicator uses information on tax incomes actually collected for GDP by means of which it can inform about the value of the overall effective taxation figure in a given country. Nonetheless, the tax quota is the simple tax quota which represents the revenue proportion of individual taxes (without social insurance contributions) on GDP. On the other hand, the compound tax quota is more relevant because it expresses the share of all taxes (including social insurance contributions) on GDP (also *total tax burden* – shortcut *TTB*) (Kubátová, 2010). *Tax mix* represents the proportion of individual taxes on the total tax revenue (tax quota). This indicator informs us whether a country prefers direct or indirect taxes (Bušovská, 2014) – see Table 1.

Table 1: Example of the tax mix of the Czech Republic in 2011

Taxes on income (IT)	20,34%	Tax on payroll (Payroll)	1,75%
Social security contribution (SC)	44,06%	Tax on goods and services (Indir)	33,84%
Other taxes (Other)	0,01%	Tax on property (Property)	<0,00%

Source: OECD (2012), own processing

For the above stated reasons, the compound tax quota and its individual components classified according to the OECD classification will be used to achieve the objective. In this work, *gross domestic product* (hereinafter referred to as "GDP") is considered in common prices in the purchasing power parity because this representation eliminates the differences in price levels

among countries and allows us to compare even economies which markedly differ in the absolute magnitude. *Purchasing power parity* as an artificially created monetary unit used in international comparisons to express the volume of economic overall indicators.

The term of "*European Union*" denotes a community of 28 EU Member States. The panel regression analysis is based on the annual data of the EU countries since 1965 and the end of the individual time series is stipulated by 2011 which represents the most up-to-date period of time at the time of the analysis of the given issues. The data source comprises secondary information provided by OECD (2012). Tax shares are classified in accordance with OECD classes (Kubátová, 2012) and missing data are left out of account.

According to (Slavík, 2007, p.5), *convergence* means reducing the difference in time between two quantities. If $y_{1,t}$ and $y_{2,t}$ are relevant economic quantities of two countries within time *t*, then convergence in the period between *t* and *t+s* means:

$$|y_{1,t} - y_{2,t}| > |y_{1,t+s} - y_{2,t+s}| \quad (1)$$

The aforesaid holds true for the exploration of convergence between two countries. The standard deviation or σ-convergence used by Bušovská (2014) in her work represents a parallel for a group of countries. For the formation of individual models of the panel regression analysis, this work draws on the conclusions of works by Foltysová (2007) and Kubátová et al. (2008), Esteve et al. (1999, 2000) and Sosvilla et al. (2001), Delgado and Presno (2007, 2009), Rivero and Casquero (2010), Bušovská and Petrovická (2013) and Bušovská (2014), in which statistical methods (among others also β-convergence a σ-convergence) proved the tax system convergence, and further analyses these outcomes. The econometric analysis and the related calculations are made in programs Gretl 1.9. and Eviews 7.2. For individual residues, the work uses the following abbreviations presented by the Table 2 below.

Table 2: Shortcuts used in the paper

Shortcut	Name	Shortcut	Name
TTB	Total tax burden	SC	Social contribution (tax revenues)
dTTB	1. difference of time period of total tax burden	Payroll	Taxes on wages and salaries (tax revenues)
IT	Income taxes (tax revenues)	Indir	Indirect taxes (tax revenues)
PIT	Personal income taxes (tax revenues)	Property	Taxes on property (tax revenues)
dPIT	1. difference of time period of personal income taxes (tax revenues)	dProperty	1. difference of time period of taxes on property (tax revenues)
CIT	Corporate income taxes (tax revenues)	Other	Other taxes (tax revenues)
dCIT	1. difference of time period of corporate income taxes (tax revenues)	dOther	1. difference of time period of other taxes (tax revenues)

Source: own processing

In view of the fact that it is a time series analysis between 1965 and 2011, it is always necessary to check whether time series are stationary when working with them. The works by contemporary authors suggest unit roots tests of panel data which have greater power than unit roots tests used for checking the stationarity of one-dimensional time series (Novák, 2007, p.75). We can mention tests by these authors: Levin, Lin and Chu (2002) – test LLC, Im, Pesaran and Shin (2003) – test IPS, Maddala and Wu (1999), Choi (2001) – Fisher-ADF test and Fisher-PP test.

These tests are used in the work as well. Their explanatory power according to the null hypothesis (*H0*: ρ = 1) confirms that the monitored time series includes the unit root (it is not stationary). Thus if this is possible, we can reject the null hypothesis, the time series is stationary and it is possible to work with it for panel regression purposes.

Consequently, the work uses the panel regression analysis or panel data analysis which concerns the analysis of relations and connection of data in a two-dimensional space. The first dimension is made by time quantity, the second dimension is represented by the cross-section data of individual monitored objects. A panel stands for a set of units which are similar or related by some characteristic qualities and which are continuously monitored (Novák, 2007, p.75). A necessary precondition for the possibility of defining a panel and subsequent panel data analysis is that the set of units does not change in time and the missing units are not replaced by new ones. A general estimating equation is as follows:

$$y_{it} = \alpha + \beta' x_{it} + \delta_i + \varepsilon_{it} \quad (2)$$

In which y_i is the explained variable, x_{it} k-vector of explanatory variables, ε_{it} residual component of the model, $i = 1 \ldots N$ cross-section units, $t = 1 \ldots T$ time (data flow in time), α overall constant of the model, β' parameters (coefficients) representing the slope of variables, δi cross-section effects and γt time (periodic) effect (Novák, 2007; Szarowská, 2011).

When using the regression analysis, there are always at least two possibilities: the application of the regression analysis with random effects or fixed effects. Nevertheless, according to Dougherty (2006), we cannot suppose that in case of the panel of the EU countries these countries are a random sample of all sovereign states in the world and thus it is necessary to make use of the regression analysis with fixed effects. To confirm this hypothesis, the outcomes of the Durbin–Wu–Hausman test were also used of which the value confirmed that it is really more adequate to use a panel regression model with fixed effects (Davidson and MacKinnon 1989). A properly constructed model also should not show autocorrelation which is why the Durbin–Watson test (1951) is used in the work.

The work does not handle the issue of tax construction or the choice of optimal tax system; it also does not deal with the question of tax justice or processes and instruments of the EU tax policy. Model results from papers of Kubatová (2008), Foltysova (2007), Delgado and Presno (2007, 2009), Rivero and Casquero (2010) and Bušovská (2014) and do not reflect the impact of other variables that have got an effect on tax convergence in the EU (e.g. other macroeconomic indicators, adoptions of European laws, the acceptance of new Members etc.)

2 Results and discussion

Panel data tests

Panel unit root tests have shown that most time series are already stationary at a 1% significance level which makes it possible to use these data on the purpose of the panel regression analysis. The exceptions comprise the compound tax quota (TTB), tax revenues from income tax (IT), personal income taxes (PIT), corporate income taxes (CIT), property taxes (Property) and payroll taxes (Payroll) where it was necessary to use the first definition so that time series could show stationarity. For further information see the Table 3 below.

Table 3: Panel unit root tests

Unit Root Test	TTB	Prob	Obs	TTB 1.difer	Prob	Obs	IT	Pro.	Obs	IT 1.difer	Prob	Obs
LLC	-0,827	0,204	769	-11,796	0,000	748	-0,935	0,175	770	-10,60	0,000	749
IPS	-1,067	0,143	769	-14,571	0,000	748	-0,535	0,296	770	-13,93	0,000	749
Fisher ADF	49,493	0,199	769	303,091	0,000	748	41,24	0,504	770	292,28	0,000	749
Fisher PP	51,398	0,152	790	489,211	0,000	769	57,35	0,057	791	521,96	0,000	770
	CIT	**Pro.**	**Obs**	**CIT 1.difer**	**Prob**	**Obs**	**PIT**	**Prob**	**Obs**	**PIT 1.difer**	**Prob**	**Obs**
LLC	-0,069	0,474	747	-10,467	0,000	726	0,083	0,533	945	-7,751	0,000	924
IPS	-4,389	0,000	747	-15,766	0,000	726	0,504	0,693	945	-12,838	0,000	924
Fisher ADF	88,54	0,000	747	328,133	0,000	726	38,223	0,633	945	256,156	0,000	924
Fisher PP	182,859	0,021	768	615,734	0,021	747	39,343	0,588	966	534,493	0,000	925
	SC	**Prob**	**Obs**	**Indir**	**Prob**	**Obs**	**Property**	**Prob**	**Obs**	**Property 1.difer**	**Prob**	**Obs**
LLC	-3,641	0,000	772	-2,538	0,005	772	-1,506	0,066	771	-12,077	0,000	750
IPS	-3,137	0,000	772	-3,442	0,000	772	-0,156	0,437	771	-16,793	0,000	750
Fisher ADF	76,998	0,000	772	82,600	0,000	772	43,746	0,397	771	345,523	0,000	750
Fisher PP	62,733	0,021	793	87,779	0,000	793	73,125	0,002	792	562,009	0,000	771
	Payroll	**Prob**	**Obs**	**Payroll 1.difer**	**Prob**	**Obs**	**Other**	**Prob**	**Obs**			
LLC	2,769	0,997	772	-4,054	0,000	751	-3,389	0,000	772			
IPS	-4,156	0,000	772	-14,899	0,000	751	-3,721	0,000	772			
Fisher ADF	84,243	0,000	772	315,904	0,000	751	83,006	0,000	772			
Fisher PP	372,130	0,000	793	798,852	0,000	772	66,267	0,009	793			

Source: OECD (2012), own processing

Panel regression model

This model aims at answering the question to what extent the individual tax burden components influence the tax system convergence in the EU countries.

In accordance with Slavík (2007), the convergence of the EU tax systems, the left side of the equation, is represented in the model as the difference between the compound tax quota (y_{ttb}) of an individual Member State *s* (*s= 1…..28*) in different years *t (t =1…46)* and average values in the EU countries (y_{ttbav}) in the given year *t (t =1…46)*. The right side of the equation represents the impact of the convergence of individual tax mix components on the compound tax quota convergence as a whole (once again, the constants are specific for country *s* and time *t*). δ_i represents fixed effects in the *s*-th observation (*s*-th country), ε_{it} represents a residual component in time *t* and country *s*. The influence of the individual components is calculated for:

1) Income taxes $IT_{s,t}$ as the difference $(y_{it,s,t} - y_{itav,t})$,
2) Social allowances $SC_{s,t}$ as the difference $(y_{sc,s,t} - y_{scav,t})$
3) Indirect taxes $Indir_{s,t}$ as the difference $(y_{indir,s,t} - y_{indirav,t})$
4) Property taxes $Property_{s,t}$ as the difference $(y_{property,s,t} - y_{propertyav,t})$
5) Payroll taxes $Payrol_{s,t}$ as the difference $(y_{payroll,s,t} - y_{payrollav,t})$
6) Other taxes $Other_{s,t}$ as the difference $(y_{other,s,t} - y_{otherav,t})$,

In which the first value in brackets represents the difference of the value of a given part of the tax mix within an individual Member State *s* (*s= 1…..28*) in different years *t (t =1…46)* and the average value of the given part of the tax mix in the EU countries in the given year *t (t =1…46).* The estimating equation is as follows:

$$d\left(y_{ttb,s,t} - y_{ttbav,a,t}\right) = \alpha + \beta * dIT_{s,t} + \beta * sc_{s,t} + \beta * Indir_{s,t} + \beta * dProperty_{s,t}$$
$$+\beta * dPayroll_{s,t} + \beta * Other_{s,t} + \delta_i + \varepsilon_{it} \quad (3)$$

The table below presents the outcomes of the impact of individual components of the convergence of Member States' tax mixes on the total tax burden convergence in the EU. To gain the results, 774 observations were used and residues of other taxes (*Other*) were excluded because they did not show any significant dependence in the model specified. Model results are presented in the Table 4 below.

Table 4: Model estimation

Variable	Coefficient	Standard deviation	t-test	P-value	
Constant α	-0,0715776	0,0409081	-2,3940	0,01723	***
dIT	0,97608	0,0364901	26,7492	<0,00001	***
SC	0,0725883	0,022536	3,2210	0,00133	***
Indir	0,114497	0,0262755	4,3576	0,00002	***
dProperty	1,03675	0,0725328	14,2935	<0,00001	***
dPayroll	0,535058	0,130096	4,1128	0,00004	***

R^2	0,609131
Adjusted R^2	0,596084
Durbin-Watson test	1,978998
Number of observations	774

, **, * represent significant coefficient of 1% significance level*
Source: OECD (2012), own processing

The calculated values show a positive dependence among variables. The increase of e.g. income taxes by 1 percentage point in Member States increases the tax burden convergence in the EU by 0.97 % in the same year.

The given relations are statistically important already at a 1% significance level. The Durbin–Watson test confirms that residues do not suffer from autocorrelation. As for the panel regression, it is more appropriate to use an adjusted determination coefficient R^2 (Wooldridge, 2006) which specifies that the given model clarifies about a 59.6 % convergence value of the total tax quota in the EU.

The harmonisation of indirect taxes is on a high level in the EU, both in the field of selective indirect taxes imposed on selected commodities (the so called consumption taxes or octrois) and the general indirect tax which takes the form of the value added tax. The importance of this type of taxes should grow in the coming years, as stated by the European Commission (2012), and there is a trend to increase indirect taxes in many European Union countries, especially in the recent years after the outbreak of the financial crisis, is apparent.

This measure, very popular with Member governments, is to a certain extent induced by the fact that the increase of indirect taxes does not have to have such a negative impact on the domestic economy as the increase of direct taxes (Szarowská, 2011); indirect taxes also represent a relatively stable and well-predictable source of income, they are hidden in the prices of goods and services, their increase can normally be implemented more easily than with the income tax, they are potentially neutral and when fulfilling certain criteria, they cannot be avoided by a change of behaviour or e.g. by the change of residence; they also lead to a one-off price increase and higher inflation in the short run.

The harmonisation of common Europe-wide rules goes hand in hand with the increase of indirect tax shares on the total tax burden. Here, the harmonisation is at a higher level than with other taxes and practically has been in progress since the beginnings of the European economic integration. Thus the relatively low level of the impact of the indirect tax convergence (Indir with the value of 0.114) on the tax burden convergence of the EU countries is not surprising. This happens because a similar, if not the same, the legislative adjustment in the field of indirect taxes does not offer the Member States a greater choice as for manoeuvres and thus not even the possibility to reach the average values of the EU countries to a larger extent.

Unlike indirect taxes, the direct taxation field (i.e. especially the corporation taxes or payroll taxes) is affected by the European harmonisation trend only marginally. The cooperation of Member states comes through especially when providing information on taxes, avoiding double taxation, taxation of interest or licence fees or when fighting tax havens. At the European level, there have been fruitless discussions for several years concerning the adoption of the directive adjustment of the common consolidated tax base of corporations (the rate would remain in the discretion of Member States), which was strongly rejected by a number of states. Member States perceive the field of income taxation as a part of their national sovereignty which has been developing for centuries on political, geographical, social as well as humanitarian bases and this is why the efforts in this field are in most cases accepted with a negative initial attitude in the Member States.

Yet the high rates in the model (*dIT* with the value of 0.976 and *dPayroll* with the value of 0.535) suggest that they have a greater influence on the tax burden convergence than harmonised indirect taxes. Their share on the total tax burden in the EU ranges on average around 30 % and does not differ much from the indirect taxes shares. To justify the degree of this impact, it is also necessary to look at the other side and point out that in the field of income taxes, there still is tax competition in the EU. The tax competition formulation is dealt with in a work by Szarowská (2011, p. 40) who understands it in the same way as this work, or as: *"A process of lowering effective tax burden to make investors and factors of production owners allocate their tax bases in a given country, provided that identical conditions are respected for all subjects."*

It is also noteworthy in this area that it is the tax competition, which is supported especially by the efforts of less developed or new Member States to do well on the European market. For that reason, it is possible to observe relatively low rates concerning income taxes in accession countries (e.g. Bulgaria in 2004, Czech Republic, Lithuania etc.) in comparison with the EU average. They result in the outflow of tax bases from their original residual homelands which forces the original residual states establish countermeasures not to allow the outflow of tax bases, or to beguile these tax bases back.

As follows from a σ-convergence graph of personal income taxes in the works by Bušovská (2014) and Plojhar (2004), there is a clearly visible decrease of the tax level of income taxes in the EU countries, especially in the 1980s up to 2011. The decrease in rates occurs during the whole period, starting in the very half of 1980s further to the new idea approach of supply side economists. They were trying to reduce the economic policy by the support of factors of production owners who create economic wealth, or more precisely people who produce goods and services. The fundamental idea of supply side economics is the hypothesis that the offer of factors of production is much more flexible than it was assumed by Keynesian economics

which either ignored it completely or considered it negligible. The change of tax rates will arouse various changes in the behaviour of an individual.

The first change is the retirement effect reflecting the fact that to maintain their living standards, an individual increases their working efforts when tax rates increase and vice versa. The second change is the substitution effect that expresses the willingness to reconcile with lower wages accompanied by more free time. The key point is the statement that the changes of marginal tax rates cause changes in prorated labour costs and savings and thus they also cause changes in their offering.

The degree of influence of income and labour force taxes confirms the conclusion of Kubátová (2004) that it is not necessary to harmonise taxes artificially since tax competition can lead to the so called spontaneous harmonisation effect and theoretically also to a greater effectiveness of tax systems when the competition of taxation systems brings the increase of economic stimuli of individual taxes as well as to saving public budgets. In this case, the assumption that tax competition really has an impact on the tax burden convergence in the European area was confirmed.

The degree of influence of social security contributions (*SC*) on convergence is positively dependant (0.072) at a lower than 1% importance level. Nevertheless, no great harmonisation pressure occurs in the field of insurance in the EU, there is only coordination or rather the same application of several basic rules, e.g. equal treatment, the only insurance in the EU area, the addition of insurance periods, the payment of benefits, the assimilation of facts and good administrative cooperation. Obviously, it is not the same application of rules but only a certain general frame of the international operation of social insurance in the EU. Thus there is no application of harmonisation rules in this field since every country uses its own procedures which are based on historical, sociological as well as on political roots. This is why even the degree of the influence on the tax burden convergence is not noticeable.

The last analysed variable which showed a positive influence on the effective tax burden convergence in the EU are property tax revenues (*dProperty* with the value of 1.037). Bušovská´s work (2014) points out to the tax mix convergence in the EU between 1965 – 2011 and mentions that in the tax zone of property taxes, the convergence was confirmed by β-convergence but σ-convergence in the graph is faint. Nonetheless, it is impossible to say that the divergence occurs because – according to a work by Slavík (2007) – if β-convergence is confirmed, σ-convergence only depicts its picture. In the model above, though, the property tax convergence has the highest value (1.037) and to find out the reason of this value we have to look at their development.

The number of property taxes and rates of these taxes have always differed most in Europe. In some countries, they were very high, in others almost none. The attitude of domestic governments to individual taxes was and has been different. Although in some countries an opinion prevailed that there should be almost no property taxes because double income taxation occurs, other states praised their indisputable influence and the function of solidarity in society. Despite these great differences, the development took place in the field of property taxes from 1965 to 2011 and although property taxes differ within the EU and there are still many of them, we can currently observe that several main types of property taxes have been generated which are embraced by the legislatives of most European countries. Thus the most frequent property taxes in the EU include land tax, building tax, inheritance tax, gift tax, property transfer tax and wealth tax. This implies that following numerous property taxes in

the beginning of the period under consideration, during the 46 analysed years these taxes grouped into several main groups in which the rules are applied at a similar level.

Conclusion

The work draws on the conclusions of works by Foltysová (2007) and Kubátová et al. (2008), Esteve et al. (1999, 2000), Sosvilla et al. (2001), Delgado and Presno (2007, 2009), Rivero and Casquero (2010), Bušovská and Petrovická (2013) and Bušovská (2014) in which statistical methods proved the tax burden convergence in the EU between 1965 and 2011.

The aim of the work was to find out to what degree the components of the effective tax burden (compound tax quotas) influence the tax system convergence and to what degree the tax system convergence is influenced by tax competition in the EU. The individual parts of the compound tax quota were divided in accordance with the OECD classification into income taxes (*IT*), payroll taxes (*Payroll*), social contributions (*SC*), indirect taxes (*Indir*), property taxes (*Property*) and other taxes (*Other*). The subject of research was a panel of 28 countries between 1965 and 2011 and missing data were left out of account.

To meet the objectives, an analysis of available literature was made in the contribution thanks to which tax competition was defined. Secondary data from the OECD database for 1965 - 2011 were used and subsequently applied to a panel regression analysis with fixed effects. The model design showed a significant dependence at a significance level lower than 1 %. Moreover, according to the Durbin–Watson test, the model does not suffer from residual autocorrelation and works with stationary time series.

The model provides the proof of a positive dependence of fixed residues when 774 observations were made. The outcomes confirm that all parts of a tax mix and their changes affect the tax burden convergence in the EU. Surprisingly, the greatest influences are shown by property taxes where, in the period under consideration, six main groups were generated from the originally enormous number of taxes and these are currently used in all Member States. The indirect tax convergence does not have such a great impact on the effective tax burden convergence as one would expect, which is a consequence especially of high harmonisation measures applied since the very establishment and implementation of indirect taxes in the legislative of European states.

When understanding tax competition in accordance with a work by Szarowská (2011) high values of the dependence of income and payroll taxes (*IT* and *Payroll*) in models indicate that tax competition has a greater influence on the tax burden convergence than tax harmonisation or coordination which are direct taxes at a relatively low level because of the sovereignty restriction of Member States.

The degree of the influence of income taxes and labour taxes confirms the conclusion of Kubátová (2004) that taxes do not need to be harmonised artificially as tax competition can lead to the so called spontaneous harmonisation effect and theoretically also to greater effectiveness of tax systems when the competition of taxation systems leads to the increase of economic stimuli of individual taxes and saves public budgets which was also proved in the work by Szarowská (2011). In this case, the presumption was confirmed that tax competition has a really great impact on the growth of gross domestic product in Europe.

The conclusions above follow that the tax burden convergence is influenced by all applied taxes, yet the greatest share of the tax burden convergence was borne by tax competition and

property taxes between 1965 between 2011 and although one would think that the impact of indirect harmonised taxes should be the greatest, it is not the case.

Though the tax burden convergence is actually influenced by many more factors than only by its structure, the values of the adjusted determination of the coefficient of the estimated model ranged from 60 %. The model also satisfies diagnostic tests and thus it is so robust from the econometrical point of view. Hence the estimated results can be considered relevant with satisfactory explanatory power.

Model results from papers of Kubatová (2008), Foltysova (2007), Delgado and Presno (2007, 2008), Rivero and Casquero (2010) and Bušovská (2014) and do not reflect the impact of other variables that have got an effect on the tax convergence in the EU that will be part of next research (e.g. other macroeconomic indicators, adoptions of European laws, the acceptance of new Members etc.). The basis of the whole work is the methodology of new Keynesian economics according to which the econometric model used can only help reveal the relations among variables but its conclusions do not confirm nor disprove the validity of the economic theory. This is why recommendations for the economic policy cannot be drawn from the outcomes of the model. The work does not deal with fairness or equality in the field of taxes, nor does it aim at suggesting an appropriate tax policy for the Member States of the EU. The work provides a basis for further possible research in the same direction when it is possible to include additional variables in the model, e.g. the mobility of labour or the influence of the harmonisation legislative of the tax policy within the European Union.

Acknowledgment
This paper was written in relation with Project IGA F1/2/2013, The Project of Department of Public Finance, Faculty of Finance and Accounting with the number IGA F1/2/2013 named "The public finance in developed countries".

References

[1] BLECHOVÁ, B., 2008. Charakteristika přístupu používaných v EU pro hodnocení efektivního daňového zatížení příjmů korporací [CD]. In: *Teoretické a praktické aspekty veřejných financí.* Praha: VŠE. ISBN 978-80-245-1378-2.

[2] BUŠOVSKÁ, M., 2012. Convergence of VAT Rates within the EU Integration. In: *Teoretické a praktické aspekty veřejných financí*. Praha: Nakladatelství Oeconomica. ISBN 978-80-245-1764-3.

[3] BUŠOVSKÁ, M. and I. PETROVICKÁ, 2013. Convergence of Tax Revenues in the European Union. *ACC Journal*, **XIX**(2), 18-28. ISSN 1803-9782.

[4] BUŠOVSKÁ, M., 2014. Convergence of Tax Burden, Tax Revenues and Implicit Tax Rates in the European Union Countries. *Ekonomický časopis,* **4**, 363-376. ISSN 0013-3035.

[5] DAVIDSON, R. and J. MACKINNON, 1989. Testing for consistency using artificial regressions. *Economic Theory*, **5**, 363-389. ISSN 0938-2259.

[6] DELGADO, J. D. and M. J. PRESNO, 2009. Presión fiscal en la Unión Europea: un análisis de beta, sigma y gamma convergencia. *Revista de Economía Mundial,* 141-166. ISSN 1576-0162.

[7] DELGADO, J. D. and M. J. PRESNO, 2007. Convergence of the fiscal pressure in the European Union: a time series approach. *Aplied Economics* [online]. 4257-4267. [vid.

10th February 2015]. Available from: http://www.tandfonline.com/doi/abs/10.1080/00036846.2010.491449#

[8] DOUGHERTY, CH., 2006. *Introduction to Econometrics*. Oxford: Oxford University Press, 480 s. ISBN 978-0-19-928096-4.

[9] DURBIN, J. and G. S. WATSON, 1951. Testing for Serial Correlation in Least Squares Regression. *Biometrika*, **38**, 159–179. ISSN 0006-3444.

[10] EMERSON, M., D. GROSS and A. ITALIANER, 1992. *One market, one money. An evaluation of the potential benefits and costs of forming an economic and monetary union*. Oxford: Oxford University Press, pp. 354. ISBN 978-0-19-877324-5.

[11] ESTEVE, V., R. SOSVILLA and C. TAMARIT, 1999. Un análisis empírico del proceso de convergencia fiscal en la Unión Europea. *Hacienda Pública Española* [online]. **150**, 127-146. [vid. 15th February 2015]. Available from: http://www.uv.es/estevev/HPE1999.pdf

[12] ESTEVE, V., R. SOSVILLA and C. TAMARIT, 2000. Convergence in fiscal pressure across EU countries. *Applied Economics Letters* [online]. **7**(2), 117-123. [vid. 10th January 2015]. Available from: http://www.uv.es/~ecoapli2/documentos/wp99_14.pdf

[13] EUROEAN COMMISION, 2010. *Konsolidované znění smlouvy o fungování Evropské unie* [online]. [vid. 9th February 2015]. Available from: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:083:0047:0200:cs:PDF

[14] EUROEAN COMMISION, 2012. *Taxation trends: 2012* [online]. [vid. 18th February 2015]. Available from: http://ec.europa.eu/taxation_customs/taxation/gen_info/economic_analysis/tax_structures/index_en.htm

[15] FOLTYSOVÁ, M., 2007. *Zmena daňových mixov v OECD krajinách vplyvom meniacich sa podmienok globalizujúceho sa sveta* [online]. Prague. Dissertation. University of Economics in Prague. [vid. 9th February 2015]. Available form: http://www.vse.cz/vskp/eid/1500

[16] HELÍSEK, M., 2013. How Far Along is Euro Adoption in the Czech Republic? Benefits for Businesses Still Remain. *Central European Business Review*, **2**, 21-27. ISSN 1805-4854.

[17] CHOI, I., 2001. Unit Root Tests for Panel Data. *Journal of International Money and Finance* [online]. **20**, 249–272. [vid. 16th February 2015]. Available from: http://scholar.google.cz/scholar_url?url=http://www.researchgate.net/profile/In_Choi4/publication/222536415_Unit_root_tests_for_panel_data/links/5475e9e50cf29afed612bf82.pdf&hl=cs&sa=X&scisig=AAGBfm3N-235c5IL_CsnXqxR2rg8iLNz3w&nossl=1&oi=scholarr&ei=baFAVfiqJJCWaoLIgdgP&ved=0CB4QgAMoADAA

[18] IM, K. S., M. H. PESARAN and Y. SHIN, 2003. Testing for Unit Roots in Heterogeneous Panels. *Journal of Econometrics* [online]. **115**, 53-74. [vid. 19th February 2015]. Available form: http://scholar.google.cz/scholar_url?url=http://www.researchgate.net/profile/Hashem_Pesaran/publication/4854199_Testing_for_unit_roots_in_heterogeneous_panels/links/0fcfd50b76efd2b185000000.pdf&hl=cs&sa=X&scisig=AAGBfm1uymZFjWV4Sc9IPPUEcV18Ln0VGQ&nossl=1&oi=scholarr&ei=taFAVfiUNYL3atmPgIgC&ved=0CB4QgAMoADAA

[19] KUBÁTOVÁ, K., 2004. Daně - konkurence nebo harmonizace? In: *Daňová harmonizace vs. daňová konkurence. Sborník č. 29*. Praha: Centrum pro ekonomiku a politiku, pp. 51-60. ISBN 80-86547-29-9.

[20] KUBÁTOVÁ, K., A. VANČUROVÁ a M. FOLTYSOVÁ, 2008. Impact of Globalization on Taxation Mixes in OECD Countries During 1965–2003. *Prague Economic Papers*, **1**(17), 40-52. ISSN 1210-0455.

[21] KUBÁTOVÁ K., 2010. *Daňová teorie a politika*. 5. aktualiz. vyd, Praha: WoltersKluwer Česká republika, 275 s. ISBN 978-80-7357-574-8.

[22] KUBÁTOVÁ, K., 2012. Typologizace daňových mixů v zemích OECD. *Littera Scripta*. **5**(2), 75-82. ISSN 1802-503X.

[23] LÁCHOVÁ, L., 2007. *Daňové systémy v globálním světě.* 1. vyd. Praha: ASPI, pp. 271. ISBN 978-80-7357-320-1.

[24] LEVIN, A., C. F. LIN and C. CHU, 2002. Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties. *Journal of Econometrics* [online]. **108**, 1-24. [vid. 25th February 2015]. Available from: http://www.uio.no/studier/emner/sv/oekonomi/ECON5120/h07/undervisningsmateriale/ucsdUnitRootPanel9223.pdf

[25] MADDALA, G. S. and S. WU, 1999. A Comparative Study of Unit Root Tests with Panel Data and A New Simple Test. *Oxford Bulletin of Economics and Statistics*, **61**, 631–52. ISSN 1468-0084.

[26] MACH, P., 2004. *Daňová konkurence musí být zachována* [online]. [vid. 5th January 2015]. Available from: http://www.petrmach.cz/node/52

[27] MUSGRAVE, P. B., 2002. *Tax Policy in the Global Economy*. Cheltenham: Edward Elgar Publishing, 470 s. ISBN 9781840643138.

[28] NERUDOVÁ, D., 2008. *Harmonizace daňových systémů zemí Evropské unie.* 2. aktualiz. vyd. Praha: ASPI, pp. 257. ISBN 978-80-7357-386-7.

[29] NOVÁK, P., 2007. Analýza panelových dat. *Acta Oeconomica Pragensia*, **1**, 71-78. ISSN 0572-3043.

[30] OECD, 2012. *Tax Revenue Statistics 2012 edition* [online]. [vid. 25th February 2015]. Available from: http://www.oecd.org/tax/taxpolicyanalysis/oecdtaxdatabase.htm#ssc

[31] PETRÁŇOVÁ, L., 2009. *Implicitní daňové sazby v ČR - komparace se státy EU* [online]. Praha. Thesis. University of Economics in Prague. [vid. 15th February 2015]. Available from: http://www.vse.cz/vskp/13742_implicitni_danove_sazby_v_cr___komparace_se_staty_eu

[32] PLOJHAR, M., 2004. Konkurence ve zdanění podniků v rozšířené EU. In: *Seminář Daňová harmonizace vs. daňová konkurence* [online]. [vid. 13th February 2015]. Available from: http://cepin.cz/cze/prednaska.php?ID=467

[33] REUVEN, A. S., 2010. Tax Convergence and Globalization. *Michigan Law* [online]. University of Michigan Law School, **214**. [vid. 13th February 2015]. Available from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1636299.

[34] RIVERO, F. J. D. and M. J. P. CASQUERO, 2010. Tax policy convergence in EU: an empirical analysis. *Revista de Economía Mundial*, **26**, 53-83. ISSN 1576-0162.

[35] ŘÍHOVÁ, L. 2008. *Výnosy korporátní daně v zemích OECD a faktory, které je ovlivňují* [online]. Praha. Dissertation. University of Economics in Prague. [vid. 7th February 2015]. Available from: http://www.vse.cz/vskp/28058_vynosy_korporatni_dane_v_zemich_oecd_a_faktory_ktere_je_ovlivnuji

[36] SERNA, G. R., 2008. State Corporate Tax Policy: Is Tax Competition the Main Determinant? PA 796. *Independent Study* [online]. [vid. 10th February 2015]. Available from: http://www.martin.uky.edu/centers_research/.../Serna.pdf

[37] SLAVÍK, C., 2007. Reálná konvergence České republiky k Evropské unii v porovnání s ostatními novými členskými zeměmi. *Politická ekonomie 1/2007* [online]. [vid. 12th May 2015]. Available from: http://www.vse.cz/polek/abstrakt.php3?IDcl=588

[38] SOSVILLA, R., G. M. SIMÓN and A. M. J. ÁNGEL, 2001. Tax burden convergence in Europe. *Estudios de Economía Aplicada* [online]. **17**, 183-191. [vid. 10th May 2015]. Available from: http://dialnet.unirioja.es/descarga/articulo/1218144.pdf

[39] SZAROWSKÁ, I., 2011. *Daňová konkurence v Evropské uni a její vlivy na vybrané ekonomické veličiny* [online]. Dissertation. Karviná. SU OPF. [vid. 12th January 2015]. Available from: https://www.google.cz/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCMQFjAA&url=http%3A%2F%2Fkfi.rs.opf.slu.cz%2Fsites%2Fkfi.rs.opf.slu.cz%2Ffiles%2Fopf_disp_11_danova_konkurence_v_eu_szarowska_irena.pdf&ei=iqRAVfTIEdjiarz8gIgN&usg=AFQjCNFZe_ote1mLRMYKI16JjXV3tpcjbA&sig2=SyPcNoJfaAFgl9nM2ulKSQ&bvm=bv.91665533,d.ZWU

[40] TEATHER, R., 2005. *The Benefits of Tax Competition*. London: The Institute of Economic Affairs, pp. 91. ISBN 0255365691.

[41] WOOLDRIDGE, J., 2006. *Introductory Econometrics: A Modern Approach*. Michigan State University, pp. 888. ISBN 13-9780324581621.