



## WORLD TAX INDEX: NEW METHODOLOGY FOR OECD COUNTRIES, 2000–2012

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### Abstract

This paper follows our previous article, Kotlán and Machová (2012a), which presented an indicator of the tax burden that can be used as an alternative to the tax quota, or for implicit tax rates in macroeconomic analyses. This alternative is an overall multi-criteria index called the WTI – the World Tax Index. The aim of this paper is to present the new World Tax Index 2013 and its methodology, which allowed us to compute it for all 34 OECD countries for the 2000–2012 period, with special references to methodology changes from the previous version. We show that, using the WTI, the highest tax burden is measured for Denmark, Belgium and Turkey, while the lowest tax burden is in Switzerland, Ireland, Chile or Japan. The total ranking of the countries is from 66% correlated with the ranking according to the tax quota, mainly due to a strong correlation in the case of property taxes, personal income taxes and VAT-type taxes. In these cases, the tax quota seems to be a good approximator of the tax burden. However, there is no correlation between corresponding tax quotas and WTI sub-indices for corporate taxes or selective consumption taxes. In those cases, the tax quota apparently fails and is not suitable for use in further analyses.

### Keywords

Tax Burden Measurement, World Tax Index (WTI), Tax Quota, Corporate Tax

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### I. Introduction

In modern society, the existence of redistribution processes seems essential. The tax rate, which is a reflection of these, nevertheless substantially varies in different countries, both in absolute terms and particularly in the tax structure. Taxation, and also government spending, is regularly incorporated into growth theory, as long-term economic growth has

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a significant influence on such a key economic characteristic as the standard of living of the population. In addition, the related issue of comparison of tax systems is one of the most complicated areas of economics, finance and taxation in general. To measure the tax burden, tax quota or implicit tax rates are the most used indices, but their use has a number of disadvantages (see, e.g. Kotlán, Machová and Janíčková, 2011). To try to eliminate these, various alternative indicators have been constructed; however, this does not occur very often and most studies are satisfied with the aforementioned tax quota or implicit tax rates.

The tax quota remains by far the most widely used approximator of the tax burden. It is computed as the share of tax revenues to nominal product. The fundamental problem of such tax burden measurement is the use of tax revenues as a reflection of the tax burden. Even a simple tax theory postulates that the line between the tax burden and tax revenues may not be clear and that a higher tax burden may not lead to higher tax revenues. Approximation of the tax burden for the tax quota may therefore not be real. The high tax burden may result in lower tax revenues in the sense of an elementary Laffer curve.

Current growth theory, which integrates the size of taxation through its impact on growth variables, especially the level of savings and investment, the amount of capital, or technological progress, is often questioned in empirical verification and assumptions about the negative impact of taxation on long-term economic growth are not confirmed, or they are not confirmed in the case of certain taxes. From this perspective, one of the most problematic is corporate tax. The use of a more appropriate approximator of the tax burden thus appears necessary.

In our previous methodological paper on this issue (Kotlán and Machová, 2012a), we presented an alternative tax burden index, the WTI (World Tax Index), that we computed for OECD countries for the period 2005–2010. We were above all motivated to find the best possible indicator for measuring the tax burden in growth models. From this point of view, the weakest part of the former WTI construction can be seen in a relatively short time series. The aim of this paper is therefore to present the new World Tax Index 2013 and the methodology (with special references to methodology changes from the previous version) that allowed us to compute it for all OECD countries for the 2000–2012 period.

## **II. Tax burden measurement: Some theoretical and empirical notes**

As already mentioned in the introduction, the tax quota is the basic indicator that is used to measure the tax burden. It is expressed by the percentage share of tax revenues to nominal gross domestic product and it may be computed either in the form of total taxation or separately for individual types of taxes. The tax quota is commonly published in simple or compound form. A simple tax quota includes narrowly defined tax in the numerator, i.e. tax in a legal sense. The compound tax quota then works with broad-based taxes in the numerator, i.e. the levies that meet the fiscal characters. This includes, e.g. a part of the public insurance paid by the employer in the case of direct taxes, or duties in the case of indirect taxes. The basic advantage of the tax quota as a tax burden indicator is the simplicity of its design and the availability of a large sample of countries in a relatively

long period. For these reasons, it is almost exclusively used in comparative studies and econometric analyses.

The fundamental drawback, however, which is not often mentioned, is that the tax quota may not actually reflect the real amount of the tax burden. This is due to the fact that there may be no demonstrable correlation between the effective tax burden and tax returns. As follows from the elementary Laffer curve (e.g. Laffer, 2004), the relationship between the size of the effective tax burden, described, for example, by the nominal tax rate on the one hand and tax revenues on the other, dramatically changes over time and is obviously nonlinear. At a relatively low level of the tax burden, there may be a direct correlation between its amount and tax revenues, but with decreasing marginal yield at an additional increase in the tax rate. At a certain level, however, the dependence of tax changes and the link becomes inversely proportional. Enlarging the tax burden does not increase tax revenues (and therefore not the tax rate), but reduces them. Another disadvantage, rather marginal, is that the tax quota uses the indicator of gross domestic product, which may be statistically unreliable or involve the gray economy to varying degrees in different countries, etc. The tax burden is thus, rather than as an indicator of the tax burden, perceived as the part of the GDP that is redistributed through taxes. For more on the issue of the tax quota and its use in macroeconomic models, see e.g. Szarowská (2010), Johansson et al. (2008), or Arnold (2008).

As a kind of supplement, rather than an alternative, to the tax quota, we can use implicit tax rates, which do not apply tax revenues to GDP, but just to the type of activity or commodities which are affected by taxes. It is therefore an analysis of the impact of the tax burden on activities according to their function (capital, labour and consumption). The implicit tax rate on consumption is the relation of consumption taxes (mainly VAT and selective excise taxes) to total household consumption. The rate on labour is defined as the share of taxes on labour (including public insurance) to total labour costs. The rate on capital income means the share of capital taxes in capital and corporate pensions, etc. The disadvantage of implicit tax rates is that they are published in a credible and comparable form only for the countries of the European Union. Also, the above described disadvantages of the tax quota may be applied in the case of implicit tax rates. For more on the issue of implicit tax rates, see e.g. Zechner and Swoboda (1986), or Walden (1996). The use of alternative indicators of the tax burden allows the capturing of the impact of the increased tax burden on long-term economic growth and living standards in a more realistic way. The main advantage of alternative indicators is the elimination of the problematic relationship between the tax burden and tax quota. Their disadvantage is, however, their difficult construction and shorter time series, which may limit the number of degrees of freedom in econometric analyses, and hence the reliability of the tested statistics.

Besides the tax quota and implicit tax rates, De Laet and Wöhlbier (2008) show yet another way to measure the tax burden. They assign various economic functions (work, business, consumption) to various types of taxes, broken down according to national accounts, while their analysis is based on the definition of a tax as a compulsory unrequited payment to the government. Another alternative way to measure the tax burden is described by Kiss, Jedrzejowicz and Jirsáková (2009). Their criticism of the tax quota is mainly related to

its structure. They thus offer a customized version of the tax quota, which is based on the original quota, but eliminates e.g. the influence of government, which is seen as the major source of distortion by the authors. Their approach is also based on the tax definition above. In both cases, the authors only use some variation of the tax quota to measure the tax burden, which seeks to eliminate the most serious problems that are associated with its construction.

Other researchers are not trying to measure the overall tax burden, but focus only on a particular area, resp. on a certain type of businesses. For the calculation, they use variously constructed effective rates, i.e. such rates that try to take into account most aspects affecting the overall tax liability. For these methods, data sources derived e.g. from questionnaire surveys are often used, which leads to the above-mentioned problems of the time series, the number of observation, etc. Effective tax rates are often used to express the tax burden on corporations (Lazar, 2010, Janíčková, 2013), but also the tax burden on highly skilled labour (Elschner and Schwager, 2004) or e.g. the tax burden on the banking sector (Ricotti et al., 2010).

None of these alternatives, however, offers a real measurement of the total tax burden, which would also take into account factors such as progressivity of taxation, the administrative burden of tax collection, tax deductible expenses, etc., as permitted by the World Tax Index described in the next section. It is constructed in a way that allows us to utilize the advantages of both the tax quota and effective rates, as it combines high-quality hard and soft data to express the real tax burden the best.

### **III. World Tax Index 2013: Methodology changes**

The World Tax Index (WTI) is an overall multi-criteria indicator of the tax burden, combining data on tax conditions available from internationally-recognized data sources<sup>3</sup>, with data expressing a Qualified Expert Opinion (QEO). The index value indicates the overall tax burden in relation to other countries under coverage, with higher WTI values representing a higher tax burden.

The concept of the tax burden, with regard to the WTI, does not apply only to the amount of taxes collected and links to the GDP, as is the case for the tax quota. It seeks to expand its scope by incorporating other important aspects associated with, e.g. tax progression, the administrative difficulty of tax collection from the perspective of the payer, the range of tax exemptions, options concerning the tax deductibility of expenses, etc.

In the countries under coverage, the WTI as a whole represents more than 95% of the OECD tax mix, while the remaining part of the tax mix relates to other taxes that are so specific in each country that their comparison is virtually impossible. The WTI thus covers a substantial part of the tax burden in each country and can be considered an overall tax index.

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<sup>3</sup> OECD Tax Statistics, OECD Tax Database, World Bank's Doing Business, etc.

The WTI is composed of the following five sub-indices:

- Corporate Income Tax (CIT, the relative level of tax burden with respect to corporate taxation),
- Personal Income Tax (PIT, the relative level of tax burden with respect to household taxation),
- Value Added Tax (VAT, the relative level of tax burden with respect to a VAT-type taxes),
- Individual Property Taxes (PRO, the relative level of tax burden with respect to property taxes),
- Other Taxes on Consumption (OTC, the relative level of tax burden with respect to selective taxes on consumption).

Each of the individual sub-indices is also the result of several factors; therefore, the sub-indices also break down further into several components. So far, the WTI structure remains the same as in Kotlán and Machová (2012a), i.e. the main sub-indices of the WTI are not changed, as they follow the standard OECD tax classification (see OECD, 2011).

As already mentioned above, one of the most noticeable advantages of the WTI is the inclusion of the soft data expressing the QEO, gained from a large-scale questionnaire survey among tax specialist from all of the OECD countries (at least three from each country<sup>4</sup>). The survey was conducted three times in total – the first pilot round in 2010, the second, presented in Kotlán and Machová (2012a), in 2011, and the last one in 2012. The first two rounds of the survey enriched us with valuable comments and suggestions from the tax experts and led us to change the methodology in two important ways concerning: (1) the structure of selected WTI sub-indices, (2) changes of the WTI sub-indices weights over time.

### **Structure of WTI sub-indices**

On the basis of the tax experts' suggestions, we made changes in the structure of three WTI sub-indices (PIT, VAT, PRO). In the case of PIT, the criterion "administration" was abandoned. However, it is still incorporated in the CIT sub-index, as it primarily involves business activities and is one of the most important factors in ease of doing business (World Bank, 2012).

It has also been shown that, in the case of VAT, it is not realistic to separate the influence of tax exemptions from reduced tax rates, because the exemption de-facto means a zero rate. For that reason, these criteria were considered together as a sub-index "reduced tax rate and exemptions".

The largest changes had to be made in the case of the PRO sub-index. The previous rounds of our survey highlighted many difficulties resulting from different tax systems

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<sup>4</sup> The respondents' selection criterion was the number of publications and citations related to the issue of taxation in the RePEc database or the recommendations of these authors.

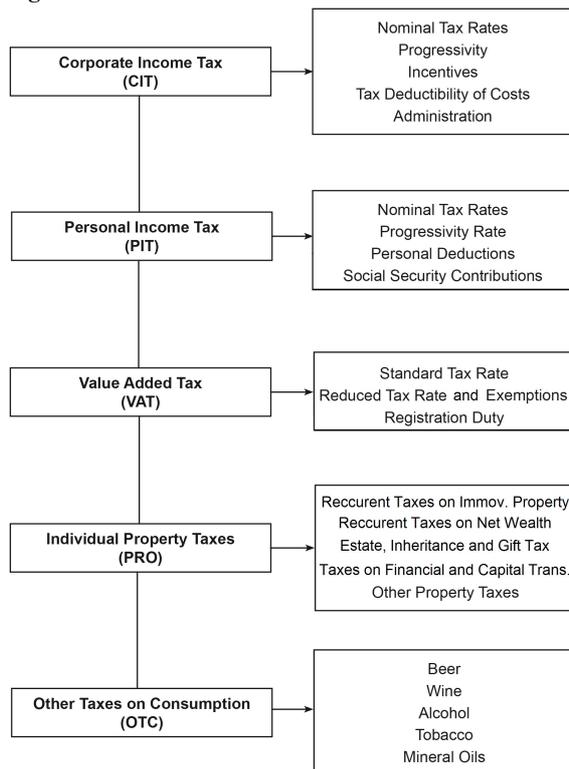
in the surveyed countries as well as from the linking of soft with hard data. After an appropriate adjustment (closer to the OECD classification), the sub-index is composed of the following parts: (1) recurrent taxes on immovable property, (2) recurrent taxes on net wealth, (3) estate, inheritance and gift tax, (4) taxes on financial and capital transactions, and (5) other property taxes.<sup>5</sup> For the actual structure of the WTI 2013, see Figure 1.

Although the questionnaire thus had to be changed a little to take the new structure into account, the methodology of the questioning did not change. The survey respondents had to distribute 100% for each sub-index among its components, depending on their contribution to the tax burden in each country, with a higher percentage meaning a higher tax burden. The average percentage given to the component for each country determined, in turn, its weight in the respective sub-index. The weights of the main sub-indices were determined on the basis of the Saaty method of pair-wise comparisons (see e.g. Saaty, 2008) carried out by the survey respondents. For the exact methodology and formulas of the computation, as well as for the approximation of each sub-index and sources of the hard data, see Kotlán and Machová (2012a).

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<sup>5</sup> It is necessary to emphasize that the new structure of the mentioned sub-indices does not constitute a change in the approximation of their individual parts. That was made in accordance with the methodology in Kotlán and Machová (2012a).

**Figure 1: Construction of the WTI 2013**



### **Changes to WTI sub-indices weights over time**

As already described in Kotlán and Machová (2012a), the methodology of the WTI construction enables us to construct the WTI indicator for the specific period for which tax experts express the weight of individual sub-indices and their components. However, they may change over time. To make use of the WTI for a deeper macroeconomic analysis not limited to cross-country data, those changes need to be reflected in calculating the WTI.

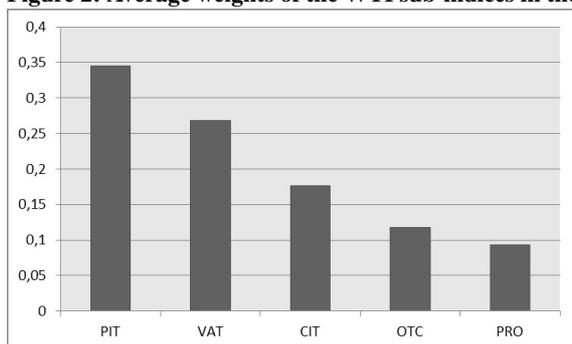
Therefore, in a previous survey from 2011, tax experts not only addressed the issue of the current tax burden from the perspective of individual sub-indices and their components during the survey, but they also assessed the extent to which their importance changed on a fixed three-stage scale in the period 2005–2010. Their responses, involving changes in tax rates, i.e. the relevant sub-parts of the CIT, PIT and VAT, were further confronted with the actual changes in these rates which occurred in the respective countries. On this basis, it was possible to quantify the average weight change which corresponded to one degree on the fixed three-stage scale over one year. After that, it was possible to re-calculate the

weights for all reference years 2005–2010. The results, however, showed that the weight changes in such a short period of time were almost negligible.

That constituted our assumption that the weights of the WTI sub-indices and their parts do not change significantly over time (in a fixed period). The survey from 2012 confirmed that assumption, as the weights that the tax experts assigned to the WTI sub-indices as well as to all their parts were not significantly different from the previous survey. That allowed us to compute the WTI using constant weights for all of the OECD countries back to the year 2000 (with respect to hard data availability), which is a very important step in the methodology.

However, we can assume that the weights will change gradually over time, and thus it will be necessary to re-calculate them in the future for another fixed-time period. Therefore, we will repeat the survey with annual frequency and we will observe the changes in expert opinion with the aim of finding a year when the changes appear significant. For the actual WTI 2013 weights, see Figure 2, where the average weights of the WTI sub-indices for OECD group are captured.

**Figure 2: Average weights of the WTI sub-indices in the OECD, survey 2012**



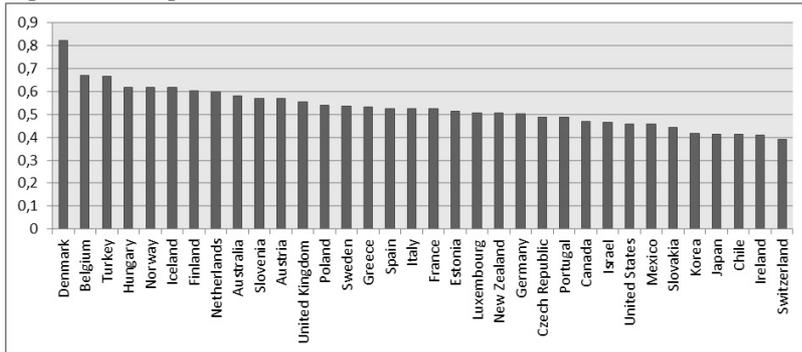
Source: own survey and calculations, data freely available at [www.worldtaxindex.com](http://www.worldtaxindex.com)

Figure 2 shows, that, on average, the highest weights were assigned to personal income tax (almost 35%) by the experts. The weight of 27% was assigned to VAT type taxes and the weight of 18% to corporate income tax. On the other hand, the weight of property taxes and selective taxes on consumption makes up just about 20% altogether. The weights for particular countries according to individual sub-indices are available in the appendix (Table A1).

#### IV. World Tax Index 2013: New data for OECD countries, 2000–2012

The new dataset, including the WTI and its sub-indices values for all of the OECD countries and for the period 2000–2012, is freely available at our website [www.worldtaxindex.com](http://www.worldtaxindex.com). For illustration, Figure 3 shows the average values of the total WTI for individual countries.

**Figure 3: Average values of the WTI, OECD 2000–2012**

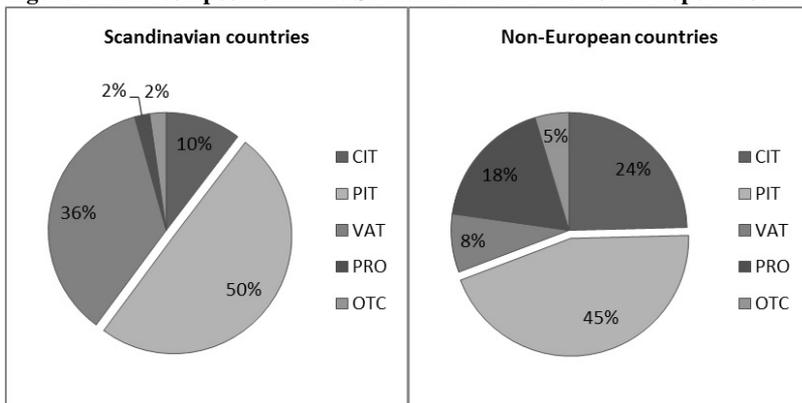


Source: own survey and calculations, data freely available at [www.worldtaxindex.com](http://www.worldtaxindex.com)

Figure 3 shows that the highest tax burden is in Denmark, Belgium and Turkey, while we can see the lowest tax burden in Switzerland, Ireland, Chile or Japan. It is not possible to find some kinds of “rules” for specific groups of countries, such as so-called new or old EU-member countries. But all Scandinavian countries are ranked among those countries with higher than average taxation, while the ranking of most non-European countries is the opposite.

As shown in Figure 4, in the group of the Scandinavian countries<sup>6</sup>, the most important part with respect to the tax burden is the PIT, i.e. personal income tax, but also the VAT-type taxes, while the taxation of corporations (CIT) is relatively low. In non-European countries<sup>7</sup>, which are in general characterised by lower overall taxation, the tax burden is shifted more from consumption and individual income to the income of corporations and individual property.

**Figure 4: WTI composition in the Scandinavian and the non-European countries**



Source: own survey and calculations, data freely available at [www.worldtaxindex.com](http://www.worldtaxindex.com)

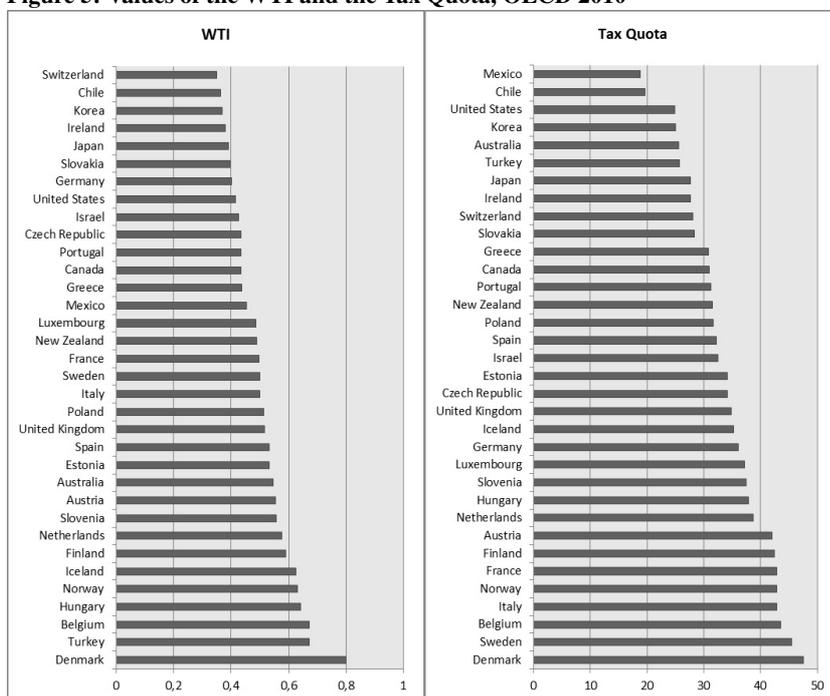
<sup>6</sup> Denmark, Finland, Iceland, Norway, Sweden.

<sup>7</sup> Australia, Canada, Chile, Israel, Japan, Korea, Mexico, New Zealand, United States.

### World Tax Index and Tax Quota

One of the most important and most interesting parts of the research lies in the comparison of the WTI and the tax quota. In Figure 5, you can see the values of the WTI and the tax quota for the OECD countries in 2010 (last available data for the tax quota for all countries).

**Figure 5: Values of the WTI and the Tax Quota, OECD 2010**



Source: own survey and calculations, data freely available at [www.worldtaxindex.com](http://www.worldtaxindex.com); OECD, 2013

The ranking of the countries differs mainly in the case of Turkey and Australia. Such differences are caused by high weights assigned to some of the WTI sub-indices by the tax experts for their countries in the QEO, but also by the high values of the hard data. In the case of Turkey, this concerns the sub-index OTC, with a weight of 35%, and in the case of Australia, it concerns the sub-index PIT, with a weight of 43%.

Nevertheless, the following correlation analysis<sup>8</sup> shows that the ranking of the countries is correlated from 66% (significantly at the 1% significance level). We have thus made the analysis separately for individual sub-components of both the WTI and the tax quota (see the Table 1).

<sup>8</sup> With regard to different scales of the values of the WTI and the tax quota, the Spearman's Coefficient was used that takes the ranking of the countries into account instead of the values themselves.

**Table 1: Correlation analysis: WTI and Tax Quota sub-components<sup>9</sup>, OECD 2010**

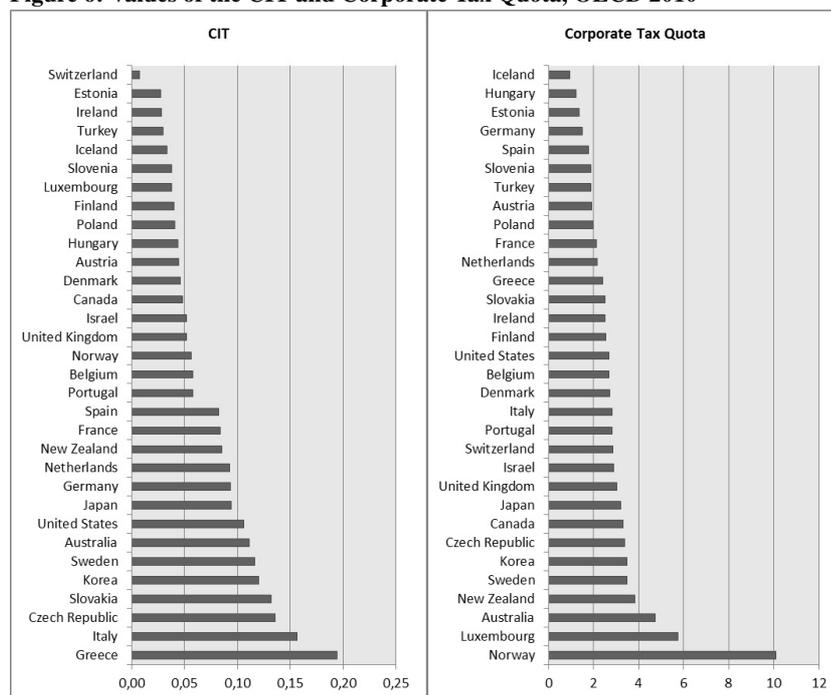
	WTI	CIT	PIT	VAT	PRO	OTC
Spearman's Correlation	0,664**	0,167	0,673**	0,660**	0,858**	0,275

Source: own survey and calculations, data freely available at [www.worldtaxindex.com](http://www.worldtaxindex.com)

Note: \*\* statistically significant at 1% significance level

The analysis shows that there is the strongest correlation between the PRO sub-index and the tax quota for property taxes, at 86%. Also, the correlation between PIT and the tax quota for individual taxes (67%), and between VAT and the tax quota for VAT-type taxes (66%) is relatively strong. On the other hand, in the case of the CIT and OTC sub-indices, the correlation is not statistically significant; in other words, the ranking of the countries differs significantly between the WTI and the tax quota. For illustration, see Figure 6, which shows the values of the CIT and corporate tax quota (corporate taxation also appears the most problematic in other studies, see e.g. Kotlán and Machová, 2012b) for individual OECD countries in 2010).

**Figure 6: Values of the CIT and Corporate Tax Quota, OECD 2010**



Source: own survey and calculations, data freely available at [www.worldtaxindex.com](http://www.worldtaxindex.com); OECD, 2013

Note: Missing values for Chile and Mexico because of no availability of the tax quota values

<sup>9</sup> Tax quota sub-components, according to the OECD classification: taxes on corporations (1200), on individuals (1100), VAT-type taxes (5110), property taxes (4000), selective taxes on consumption (5120).

## V. Conclusion

The aim of this paper was to present a new World Tax Index 2013 and the methodology that allowed us to compute it for all 34 OECD countries for the 2000–2012 period, with special references to methodology changes from the previous version in Kotlán and Machová (2012a).

The World Tax Index (WTI) is an overall multi-criteria indicator of the tax burden, combining data on tax conditions available from internationally-recognized data sources, with data expressing a Qualified Expert Opinion (QEO). The index value indicates the overall tax burden in relation to other countries under coverage, with higher WTI values representing a higher tax burden.

The survey for gaining the QEO was conducted three times in total – the first pilot round in 2010, the second, presented in Kotlán and Machová (2012a), in 2011, and the last in 2012. On the basis of the first two rounds, we have changed the structure of selected WTI sub-indices, and we have also come to a very important conclusion about the stability of the weights of the WTI sub-indices. This allows us to compute the WTI using constant weights for all OECD countries back to the year 2000 (with respect to hard data availability), so that it is possible for it to be used in macroeconomic models, especially in models of economic growth.

The average values of the WTI (the database is freely available at [www.worldtaxindex.com](http://www.worldtaxindex.com)) show the highest tax burden for Denmark, Belgium and Turkey, while the lowest tax burden is shown for Switzerland, Ireland, Chile or Japan. All Scandinavian countries are ranked among those countries with higher than average taxation, while the ranking of most non-European countries is the opposite. Non-European countries are characterized by a lower tax burden on consumption and individual incomes, while the taxation of corporations or property is relatively high.

One of the most important parts of the research lies in the comparison of the WTI and the tax quota. The correlation analysis between the two indicators shows that the ranking of the countries is correlated from 66%. The strongest correlation is between the PRO sub-index and the tax quota for property taxes (86%), then between PIT and tax quota for individual taxes (67%), and between VAT and the tax quota for VAT-type taxes (66%). In the case of the CIT and OTC sub-indices, the correlation is not statistically significant.

We can thus conclude that the tax quota can be quite a good indicator of the real tax burden for some types of taxes (mainly property taxes, personal income tax, including social security contributions, or VAT-type taxes). However, it appears to be highly problematic, primarily for corporate taxes, but also for selective consumption taxes, where it was shown that there is no clear correlation between the effective tax burden, as measured by the CIT (or OTC) and tax revenues to nominal GDP, which is represented by the tax quota. The WTI is a very important alternative to the tax quota that is applicable primarily as a tax burden indicator in macroeconomic models, especially in models of economic growth, as it can modify the conclusions in these as well as other econometric models that examine the influence of institutional and economic variables on key quantities such as e.g. the level of corruption (Kotlánová and Kotlán, 2012). Such conclusions may serve as a valuable instrument for fiscal policy makers, as described in e.g. Kotlán (2001, 2008),

or for the analysis of the relationship between taxation, government spending and economic growth in the context of the institutional environment and the different methods of governance (e.g. Nagy, 2011, or Börzel, 2011).

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## Appendix

**Table A1: QEO weights of the WTI sub-indices, OECD 2012**

	CIT	PIT	VAT	PRO	OTC
Australia	0,21	0,43	0,21	0,09	0,06
Austria	0,11	0,43	0,24	0,05	0,18
Belgium	0,09	0,31	0,41	0,13	0,06
Canada	0,15	0,44	0,19	0,13	0,08
Chile	0,16	0,22	0,38	0,09	0,16
Czech Republic	0,35	0,20	0,29	0,10	0,07
Denmark	0,10	0,60	0,22	0,03	0,05
Estonia	0,08	0,33	0,36	0,06	0,18
Finland	0,08	0,35	0,35	0,06	0,16
France	0,15	0,21	0,44	0,14	0,07
Germany	0,39	0,21	0,21	0,11	0,08
Greece	0,45	0,20	0,20	0,09	0,06
Hungary	0,13	0,25	0,43	0,05	0,14
Iceland	0,12	0,27	0,42	0,09	0,10
Ireland	0,19	0,22	0,26	0,14	0,19
Israel	0,12	0,33	0,22	0,16	0,17
Italy	0,29	0,35	0,09	0,22	0,05
Japan	0,16	0,44	0,21	0,13	0,06
Korea	0,36	0,22	0,29	0,08	0,05
Luxembourg	0,07	0,22	0,28	0,15	0,28
Mexico	0,21	0,42	0,21	0,05	0,11
Netherlands	0,19	0,35	0,28	0,10	0,08
New Zealand	0,15	0,45	0,26	0,09	0,05
Norway	0,10	0,41	0,31	0,06	0,12
Poland	0,11	0,29	0,41	0,05	0,14
Portugal	0,12	0,47	0,23	0,13	0,05
Slovakia	0,38	0,17	0,23	0,08	0,15
Slovenia	0,11	0,41	0,27	0,06	0,15
Spain	0,13	0,44	0,28	0,06	0,08
Sweden	0,24	0,42	0,12	0,08	0,14
Switzerland	0,19	0,45	0,20	0,09	0,07
Turkey	0,08	0,26	0,23	0,09	0,35
United Kingdom	0,09	0,48	0,23	0,07	0,13
United States	0,17	0,47	0,15	0,08	0,13

Source: own survey and calculations, data freely available at [www.worldtaxindex.com](http://www.worldtaxindex.com)