Research School of International Taxation

Taxes on Personal Income Around the World

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Abstract

This paper provides a survey on personal (earned and capital) income taxes around the world. We first describe our newly collected tax dataset, covering 165 countries, 11 tax measures, and 10 years. We then show how income taxes correlate with different country-specific characteristics. Among others, we show that higher income taxes are associated with lower GDP growth and income inequality.

1 Introduction

Policymakers as well as economists have raised concerns about an increasingly unequal distribution of income (Piketty, 2014). Comparing the average (after-tax) Gini coefficients of 52 countries in 2006 (37.71) to the same countries in the year 2012 (36.34) suggests, however, that inequality has not become greater.[1] For the same countries and years, the average top income tax rates have remained relatively stable at values of 37.13% in 2006 and 35.63% in 2012. Since we would expect that tax policy can to some extent correct an unequal distribution of income by implementing high taxes on top earners, it is not too surprising to find a relatively strong negative cross-sectional correlation between the two measures (-0.32).

The taxing wages approach by the OECD (2019) already information on income taxes for OECD countries, hereby being especially detailed on earned income taxes by differentiating between a wide range of characteristics (marital status, children, income level relative to national average). Similarly, Egger et al. (2019) present data on earned income taxes for most countries around the world. We contribute by rigorously focusing on taxes on top income earners. Our study covers a large number of countries (165 countries). Furthermore, acknowledging that capital income constitutes a major income source for top income earners (e.g. Eklund, 2019), tax measures on personal capital income taxes are included as well.

We first collect data on countries' tax systems to provide a survey on the following measures (among others): $TITR$ is the Top marginal Income Tax Rate; $TITRB$ is the income at which the $TITR$ starts to become effective, i.e. the Top Income Tax Rate Bound; $AITR$ is the Average Income Tax Rate, which applies at the $TITRB$, and accounts for all marginal tax rates below this income; DTR is the Dividend Tax Rate.

The paper is organized as follows. Section 2 surveys the data we have collected for the purpose of this paper. Correlations between country-specific characteristics and the tax measures are presented in Section 3. Section 4 concludes.

[1] Note the following issues. First, reliable data on Gini coefficients is only available for a limited set of countries. Second, the Gini coefficient may not be the correct measure to look at different forms of inequality as it does not distinguish between inequality with respect to earned or capital income, for example. Third, we only focus on a relatively short period of time.

2 Tax measures

We have collected tax data on 165 countries for the time period 2006 to 2015. Most of the tax information is taken from EY's *Worldwide Personal Tax and Immigration Guides* (see, for example, EY, 2016).[2] A detailed description of the variables in our dataset can be found in Table 1. The data we have collected include taxes on earned income, capital and self-employment income, as well as taxes on net wealth. If applicable, the tax measures include employee-borne social security contributions. In the following, we introduce and discuss the most important ones of the tax measures.

2.1 Taxes on earned income

We first present data on top income tax rate ($TITRs$).[3] The $TITR$ is levied on earned income.[4] The yearly boxplots in Figure 1 show that there is quite some variation across countries. While the highest value of $TITR$ exceeds 70%, some countries do not tax earned income at all. The average value decreased from 35% in 2006 to 33.5% in 2015. However, the larger interquantile range suggests that the degree of heterogeneity across countries has increased. This becomes even more obvious when comparing the densities of the $TITR$ for the years 2006, 2010, and 2015. We see a shift of density mass from average values to the tails of the distribution (see Figure 2).

The $TITR$ is equal to zero in oil-rich countries like Qatar and the United Arab Emirates, or also in tax haven countries like the Cayman Islands. The group of countries with the highest $TITRs$ include high-tax Scandinavian countries like Sweden and Finland.

Figure 4 illustrates the global distribution of countries' demeaned $TITRs$ in 2015, where darker color (lighter color) denotes that a country taxes above (below) the mean values across all countries. As expected, we find higher tax rates in more developed regions like Western Europe and North America, while the tax burden

[2] We also consider tax reports by Deloitte and KPMG as well as local tax codes for cross-checks or to remove ambiguities were the EY reports remained unclear.

[3] Usually, the $TITR$ is also the highest marginal tax rate of the tax schedule. One exception is Gibraltar, where the marginal income tax rate starts to decrease at an income level of 105,000 GIP from 28% to only 5% for incomes exceeding 700,000 GIP in 2015.

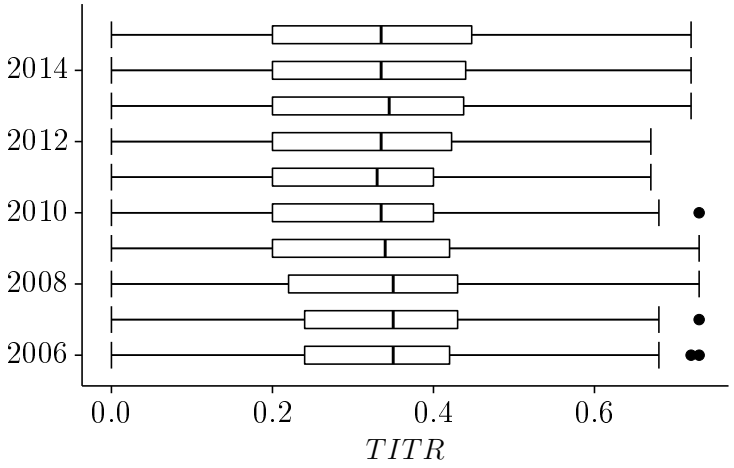
[4] For the sake of clarity, note that earned income sometimes also is referred to as labor income in the literature.

Table 1: Tax measures

Variable		Description
$TITR$	Top Income Tax Rate	$TITR$ equals the marginal tax rate which is levied at the top of the tax schedule. We include social security contributions. As outlined in footnote 3, this is not necessarily equal to the highest marginal tax rate in the tax schedule.
$TITRB$	Top Income Tax Rate Bound	$TITRB$ indicates the income level from where on $TITR$ is levied.
$AITR$	Average Income Tax Rate	$AITR$ is a proxy for the progressivity of the tax schedule and measures the average tax liability for incomes equal to $TITRB$. We include social security contributions.
$SEITR$	Self-Employed Income Tax Rate	$SEITR$ provides the tax rate levied on income from self-employment.
DTR	Dividend Tax Rate	DTR indicates the top marginal tax rate on dividend income.
$CGTR$	Capital Gains Tax Rate	$CGTR$ equals the top marginal tax rate on income from capital gains.
ITR	Interest Tax Rate	ITR measures the top marginal tax rate on interest income.
RTR	Royalties Tax Rate	RTR provides the top marginal tax rate on income from royalties.
$TWTR$	Top Wealth Tax Rate	$TWTR$ is calculated analogous to $TITR$ with net wealth as the tax base.
$TWTRB$	Top Wealth Tax Rate Bound	$TWTRB$ is calculated analogous to $TITRB$ with net wealth as the tax base.
$AWTR$	Average Wealth Tax Rate	$AWTR$ is calculated analogous to $AITR$ with net wealth as the tax base.

is lower in many Arab countries and Eastern European countries.
If we distinguish between members of the OECD and the rest of the world as we do in Figure 3, we see significantly higher rates in OECD countries with a marked difference in the number of countries with a very low tax rate. However, still, we see a large heterogeneity in the size of the tax rates although OECD countries could be considered to be fairly similar.

Figure 1: Boxplots of $TITR$



Notes: The vertical line indicates the median of the distribution of the $TITR$ for each year, the surrounding box portrays the interquartile range (IQR). The range of the whiskers is determined by the extreme values within the 1.5 × IQR, extreme values outside are represented by the dots.

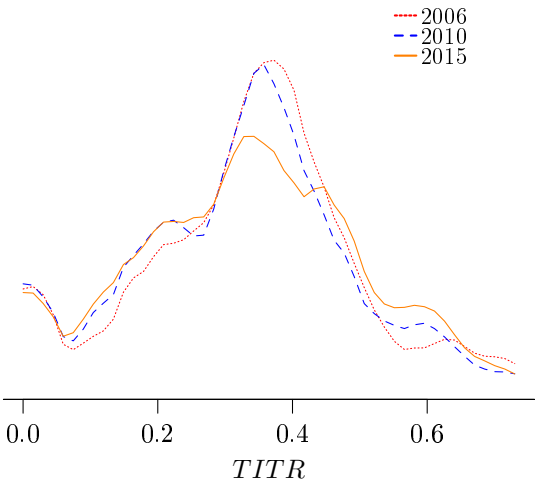
We define two additional measures to capture not only the marginal tax burden at the top. First, the income bound from where on the $TITR$ is levied, denoted by $TITRB$. Second, the average income tax rate, denoted by $AITR$, at that specific point. The $AITR$ is defined as

$$AITR = \frac{\sum_{b=1}^{B} \tau_b \cdot (Y_b - Y_{b-1})}{Y_B}, \tag{1}$$

where Y_b with $b \in (1, ..., B)$ is the upper limit of the b^{th} tax bracket[5] and $\tau(Y_b)$ the corresponding marginal tax rate.

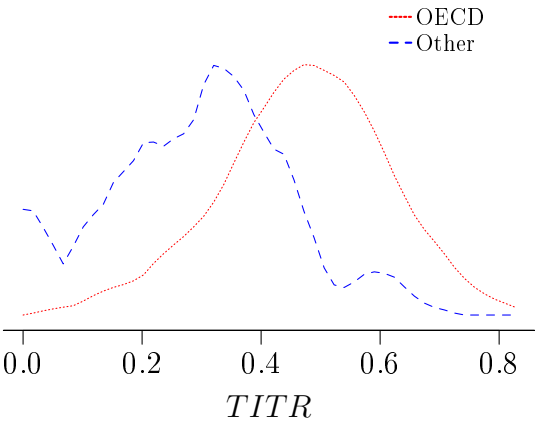
[5]We define the highest tax bracket B to be the tax bracket before the top marginal income tax rate steps in, i.e. $Y_B = TITRB$ is the last unit of income not to be taxed at $TITR$.

Figure 2: Distribution of $TITR$



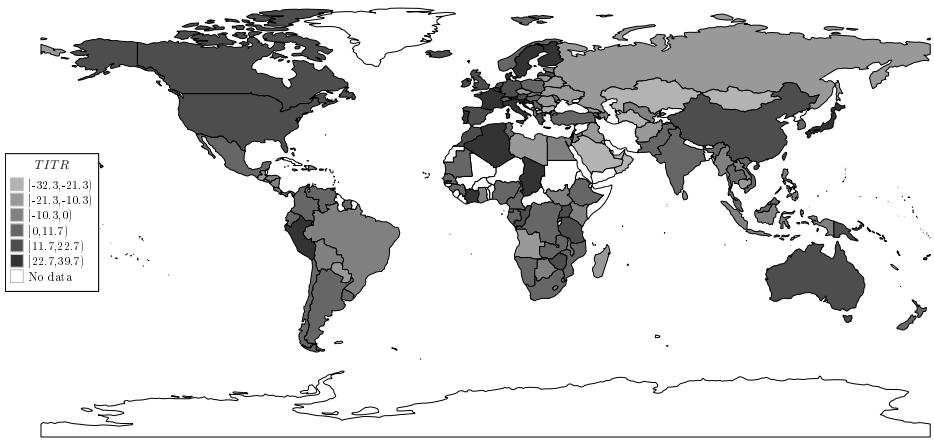
Notes: Density of $TITR$ for the years 2006, 2010 and 2015. Nonparametric estimation (bandwidth selection: likelihood cross-validation, kernel: epanechnikov).

Figure 3: $TITR$ in OECD and non-OECD countries



Notes: Density of $TITR$ for OECD and non-OECD countries. Nonparametric estimation (bandwidth selection: likelihood cross-validation, kernel: Epanechnikov).

Figure 4: Demeaned $TITRs$ across countries



Notes: Map depicting the demeaned $TITR$ in 2015. Dark countries tax above average, light below.

2.2 Taxes on dividend income

Among countries that levy non-zero tax rates, almost half of them use alternative taxes to generate tax revenue, such as taxes on capital incomes (e.g., dividend taxes). These taxes usually differ substantially in terms of rates but of course also in terms of tax base from the $TITR$. Let us, as for the $TITR$, first present the top marginal tax rate on dividend income, DTR.

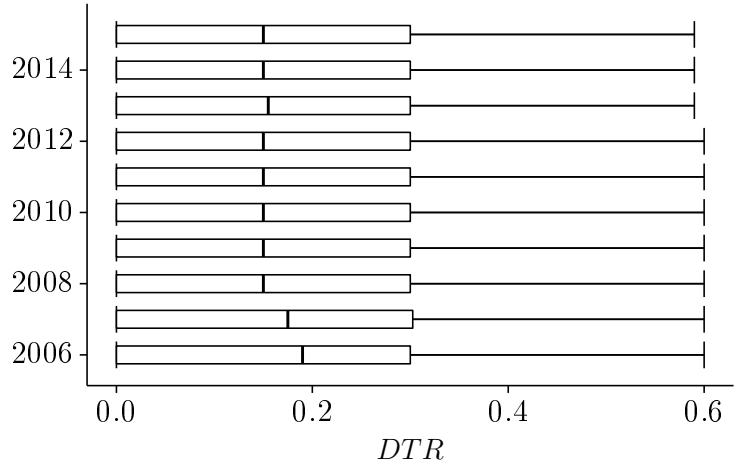
In 2015, countries' dividend tax rates vary between a minimum of 0% and a maximum of 60%. The mean DTR across 165 countries in our data equals 18.17% in 2006, and 17.06% in 2015 (the grand mean over all years equals 17.11%). While the change over time in the mean is rather modest, the median DTR declines by 4 percentage points from 19% (2006) to 15% (2015). Figure 5 provides boxplots for the $DTRs$ for the 10 years of our sample, and Figure 6 the DTR-densities for the years 2006, 2010 and 2015. Both figures suggest that the number of countries with a zero tax rate has increased, while the number of countries with very high rates has decreased slightly. We cannot, however, detect systematic trends in the way countries tax dividend income.

Figure 8, finally, highlights the countries' $DTRs$ in darker or lighter color, depending on whether their $DTRs$ is above (darker) or below (lighter) the grand mean. While the distribution is comparable to the $TITR$, African countries tend to have relatively low $DTRs$.

Comparable to the findings of the $TITR$, there are large differences in the dis-

tribution of the DTR between OECD and non-OECD countries. Again, OECD countries tend to tax dividend income more heavily. Also, OECD countries are again found to have very heterogeneous DTRs.

Figure 5: Boxplots of DTR



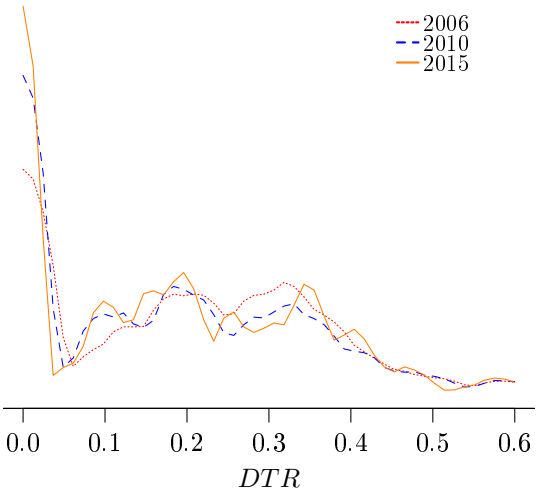
Notes: The vertical line indicates the median of the distribution of the DTR for each year, the surrounding box portrays the interquartile range (IQR). The range of the whiskers is determined by the extreme values within the 1.5 × IQR, extreme values outside are represented by the dots.

2.3 Summary of all tax measures

Our dataset includes a large number of additional tax measures, which we briefly discuss in the following. Table 2 provides summary statistics of all tax variables. We find an average $AITR$ of 0.247. Thus, tax authorities levy on average a 7 percentage points lower tax burden on all income (average income) below the $TITRB$, compared to income above this threshold which is then taxed with a marginal tax rate that equals $TITR$. The tax rate on top income of the self-employed is denoted by $SEITR$. On average, $SEITR$ equals 29%, which is comparable to the $TITR$.[6] However, on average, this rate has been cut by governments over the last decade. The same is true for the capital gains tax rate, the interest tax rate, as well as the tax on royalties, which we denote by $CGTR$, ITR, and RTR, respectively. The mean values of these taxes are comparable to the mean DTR: 14.7% ($CGTR$),

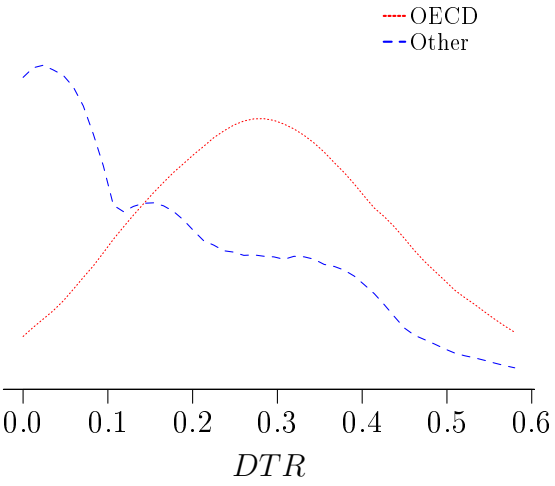
[6]This is what we would expect as there would otherwise be an incentive to systematically report income as one or the other type, depending on the tax differential between $TITR$ and $SEITR$.

Figure 6: Distribution of DTR



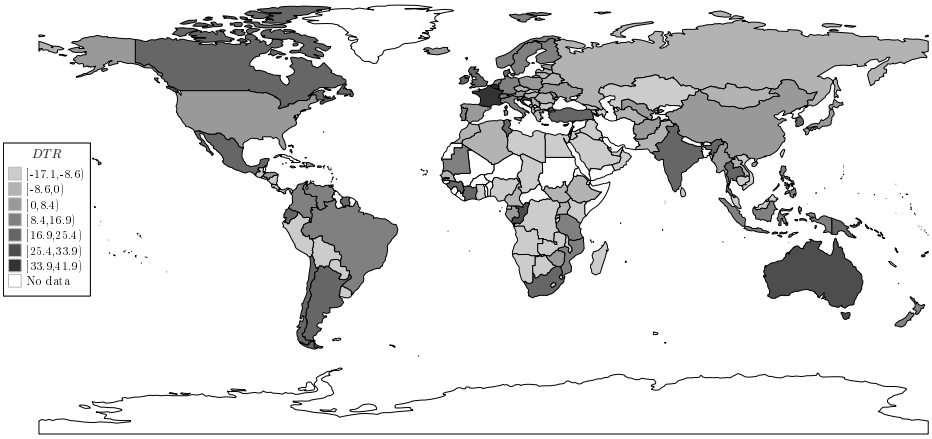
Notes: Density of DTR for the years 2006, 2010 and 2015. Nonparametric estimation (bandwidth selection: likelihood cross-validation, kernel: Epanechnikov).

Figure 7: DTR in OECD and non-OECD countries



Notes: Density of DTR for OECD and non-OECD countries. Nonparametric estimation (bandwidth selection: likelihood cross-validation, kernel: Epanechnikov).

Figure 8: (Demeaned) DTR across countries



Notes: Map depicting the demeaned DTR in 2015. Dark countries tax above average, light below.

18.6% (ITR), and 19.2% (RTR).

We finally observe only twelve countries with non-zero wealth taxes at least in one year. The average $TWTR$ equals 0.09% over all countries and 1.79% if we condition on countries where $TWTR$ is positive.

Table 2: Summary statistics tax data

Statistic		N	Mean	St. Dev.	Min	Max
$TITR$	Top Income Tax Rate	1,493	0.320	0.164	0.000	0.730
$TITRB$	Top Income Tax Rate Bound (USD 1000)	1,415	111.5	1,023	0.000	37,800
$AITR$	Average Income Tax Rate	1,493	0.247	0.128	0.000	0.590
$SEITR$	Self-Employed Income Tax Rate	1,493	0.290	0.150	0.000	0.660
DTR	Dividend Tax Rate	1,493	0.171	0.161	0.000	0.600
$CGTR$	Capital Gains Tax Rate	1,493	0.147	0.156	0.000	0.610
ITR	Interest Tax Rate	1,493	0.186	0.171	0.000	0.610
RTR	Royalties Tax Rate	1,493	0.192	0.176	0.000	0.610
$TWTR$	Top Wealth Tax Rate	1,493	0.001	0.005	0.000	0.060
$TWTRB$	Top Wealth Tax Rate Bound (USD 1000)	1,415	191	1,713	0.000	25,278
$AWTR$	Average Wealth Tax Rate	1,493	0.000	0.002	0.000	0.020

Notes: Our data includes information on 165 countries and 10 years (2006-2015). The total number of observations is smaller than 165*10=1650 since we did not find reliable sources for all countries in all years. Also, some states were founded (e.g. Kosovo) or dissolved (e.g. Netherlands Antilles) after 2006. The different variables are discussed in more detail in Table 1.

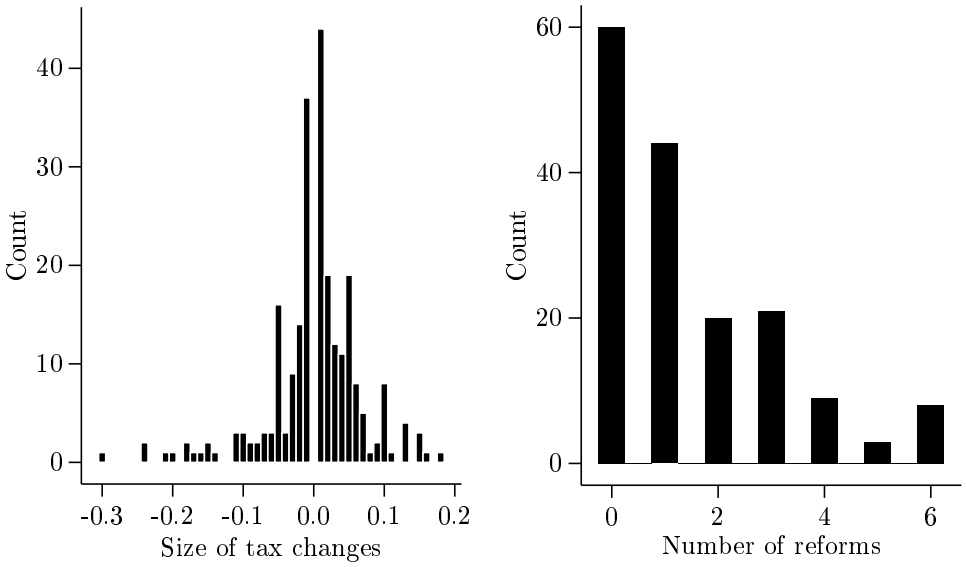
3 Correlations

The purpose of this section is to present some correlations between tax rates and country-specific characteristics. The first part discusses our main variable $TITR$, the second part focuses on the variable DTR.

3.1 *TITR*

As argued above, the average value of the $TITR$ has not changed substantially between 2006 and 2015. Let us now examine how level and tax changes of the $TITR$ are related to GDP growth and income inequality. We first plot the distribution of tax changes in Figure 9.

Figure 9: Distribution of changes in $TITR$

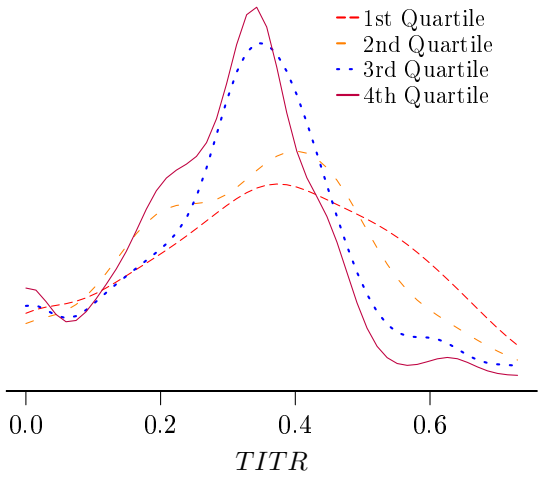


Notes: The left hand side provides a histogram on the different sizes of tax changes, we only include observations where we observe a change in the tax rate. The right hand side figure depicts the different counts of country groups which experience the same number of tax changes.

The left part of Figure 9 suggests that a large number of countries change tax rates over time. While many countries have changed their tax rates by about five percentage points, we also observe quite a few radical reforms where the change in the tax rate exceeds ten percentage points. The right-hand side of the figure sorts the countries by the number of tax changes. We observe tax changes in 105 countries. Among the countries that changed their tax rate, about half did so

more than once. While there is an overall downward trend in the average $TITR$, more OECD countries increased (19) than decreased (7) their tax rates.
The former countries, i.e. those that increased their $TITRs$, experienced a lower average GDP growth rate in 2015 (2.387%), compared to the countries which decreased their tax rate (3.901%). Figure 10 depicts the density of $TITR$ for each quartile of GDP growth.[7]

Figure 10: Tax rate distribution and GDP growth



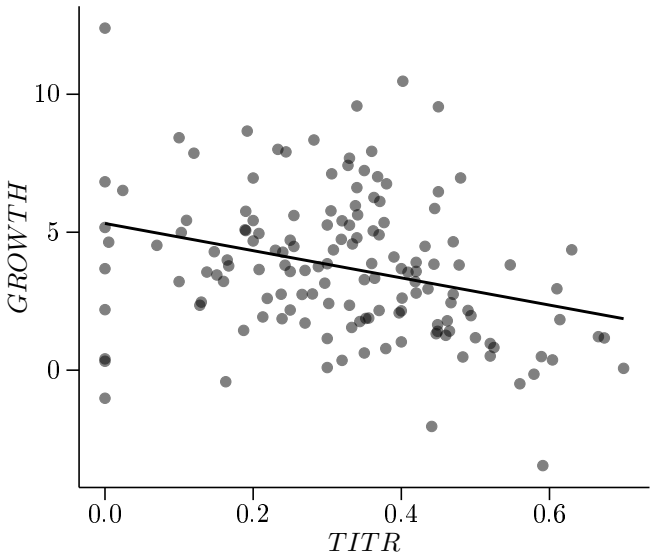
Notes: Density of $TITR$ for all GDP growth quartiles, all years. Nonparametric estimation (bandwidth selection: Silverman's Rule of Thumb, since likelihood cross-validation leads to under-smoothing, kernel: Gaussian).

While the number of countries with a zero tax rate are similar in the different quartiles, there are significantly more countries with high tax rates among countries with low GDP growth. Following Li et al. (2009), we perform a nonparametric test for equality of the distribution of the first and fourth quartile. Using 10,000 bootstrap replications, we reject equality at the 0.1% significance level. Figure 11 provides an alternative way to illustrate that there is a relatively clear negative relationship between growth and $TITRs$.[8] We find a similar distinct result if we compare the tax rates of countries with different levels of debt. Countries with very high levels of debt tend also to have significantly higher $TITR$ compared to

[7] We do not address the question of how taxes affect economic growth. This topic is discussed, for example, by Barro and Sala-I-Martin (1992), Alesina and Rodrik (1994), or Arin et al. (2015).

[8] Of course, if developing or emerging economies implement lower taxes, the correlation may simply pick up the 'catching-up' process of these countries.

Figure 11: Tax rate distribution and GDP growth



Notes: This graph presents a scatterplot of the $TITR$ and GDP growth. All observations represent country averages.

countries with very low debt.

Countries that levy relatively high tax rates on top income earners may have a strong preference for redistribution. To see whether there is a relationship between income inequality and top tax rates, Figure 13 depicts the conditional density of the $TITR$, given different values of the Gini coefficient (henceforth, $GINI$).[9]

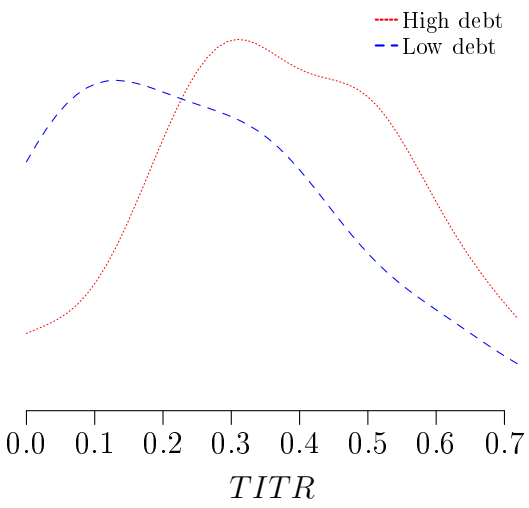
We find a strong negative relationship between $TITR$ and $GINI$. On average, countries with a $GINI$ higher than 50 levy a tax rate equal to 31%; the $TITR$ is 39%, on average, for countries with a $GINI$ below 30.

This relationship is even more pronounced if we do not use the GINI but the income shares of the lower 90% and the top 1% income earners.[10] In countries with high $TITR$, the share of the lowest 90% is much higher compared to countries with a low $TITR$, while the share of the top 1% strongly negatively correlated with $TITR$.

[9] A perfectly equal distribution of income implies a $GINI$ of zero. If the value of inequality is at its maximum, i.e. all income accrues to a single person, $GINI$ is equal to 1.

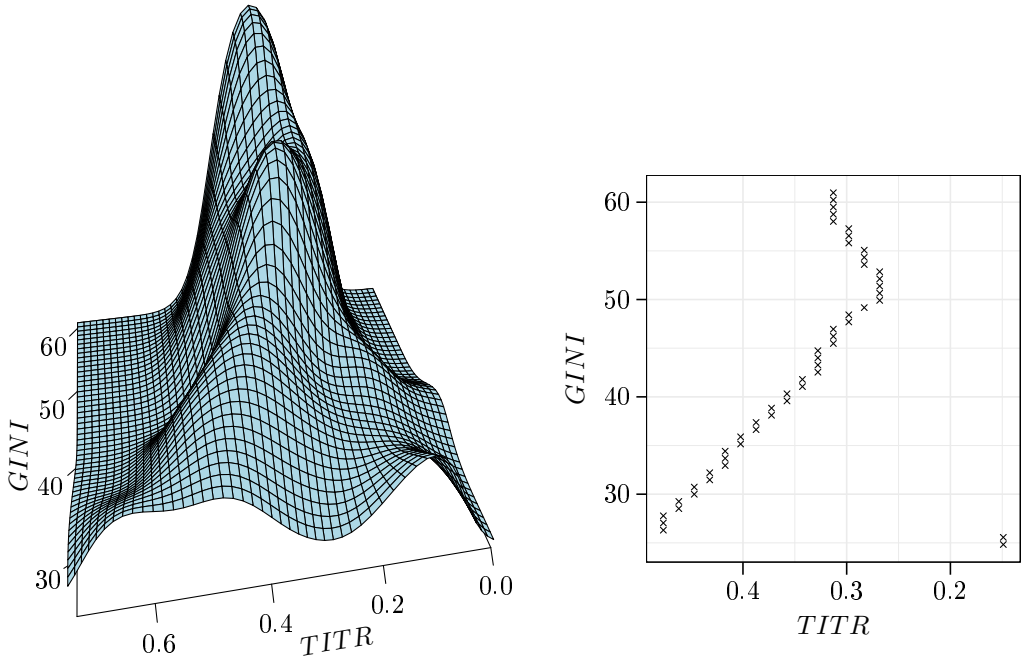
[10] The income share of the top 1% gives the fraction of total income in a country, that is earned by the top percentile of income earners. The data on income shares was taken from wid.world.

Figure 12: Tax rate distribution and government debt



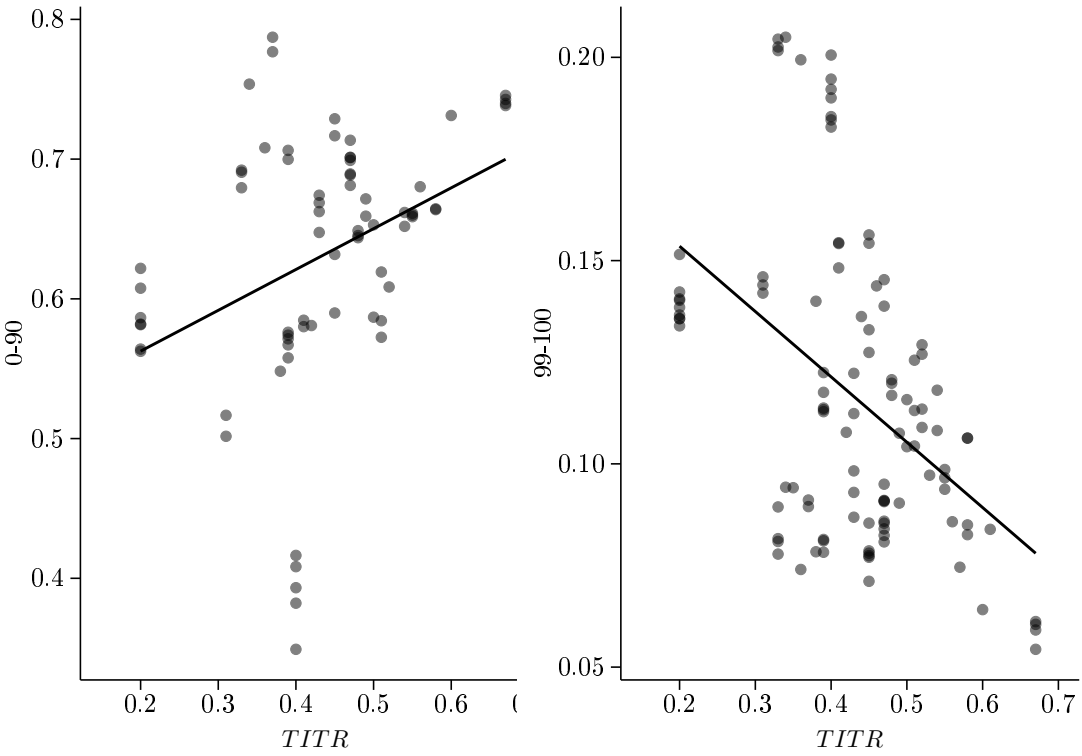
Notes: Density of $TITR$ for the first and fourth quartile of government debt. Year: 2015. Nonparametric estimation (bandwidth selection: Silverman's Rule of Thumb, since likelihood cross-validation leads to under-smoothing, kernel: Gaussian).

Figure 13: Conditional distribution of $TITR$ and $GINI$



Notes: The left hand side depicts the distribution of the $TITR$ conditional on $GINI$. The right hand side shows for each matrix dot of $GINI$ the respective $TITR$ value where the conditional density is maximized. We omit the largest outlier in the density estimation. Nonparametric estimation (bandwidth selection: likelihood cross-validation, kernel: Epanechnikov).

Figure 14: Income shares and $TITR_{ct}$



Notes: This graph provides a scatterplot of the $TITR_{ct}$ and two inequality measures: On the left hand side the income share of the lower 90% and on the right hand side of the top 1%.

3.2 *DTR*

As for the $TITR$, we also plot the distribution of the changes of the DTR. Figure 15 reveals that more countries left their DTR unchanged, as compared to the $TITR$. We observe more large tax increases than large tax decreases, while there are quite often smaller tax cuts. We also find that more OECD countries increased (12) than decreased (9) their $DTRs$.

The 2015 GDP growth rates of countries that increased their $DTRs$ are on average lower (1.781%) than the growth rates of those that decreased $DTRs$ (3.68%). Figure 16, in which we distinguish again between quartiles of GDP growth, depicts the DTR densities.[11]

Similar to the $TITR$, we find that countries with large growth rates are those where the DTR is typically low. Countries with poor growth rates tend to levy higher tax rates. However, based on the nonparametric test for equality of the distribution, we are not able to reject equality.[12] Also, the difference in the tax rate between countries with high and low debt levels is much less pronounced compared to the findings for the $TITR$.

Again, similar to the $TITR$, we find a negative relationship between DTR and $GINI$, as presented in Figure 19. As we would expect, this relationship is weaker now, particularly since there is no significant number of countries with a high $GINI$ and a high DTR.

Both, the left and the right part of Figure 19 suggest broadly three types of countries:[13] countries that implement a relatively high DTR and have a low $GINI$; countries that implement a relatively low DTR and have a relatively high $GINI$; but there is also a significant number of countries where $GINI$ is relatively high and DTR is high as well.

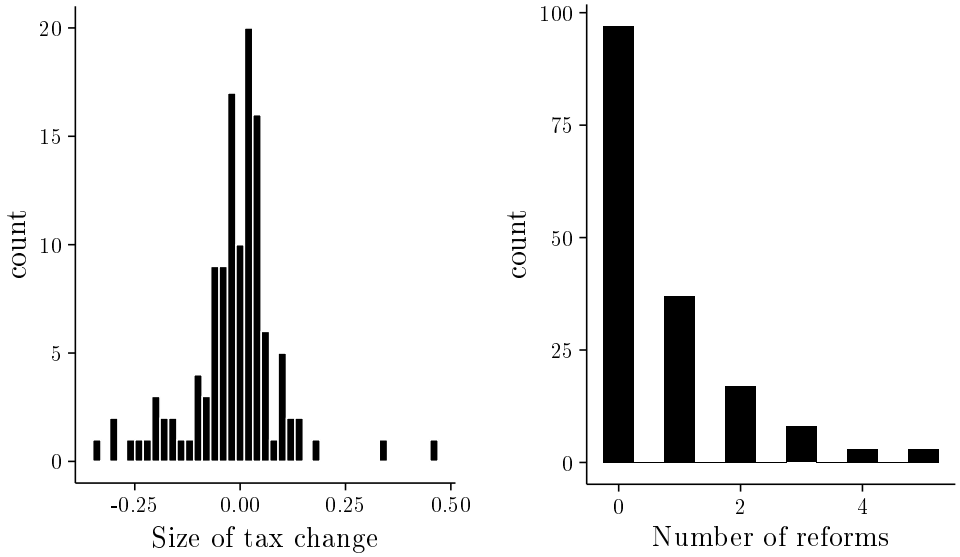
There is of course reason to believe that countries' tax setting behavior is very different when comparing the $TITR$ with the DTR. Although we find rather similar patterns, the two taxes naturally differ in terms of tax base, practical implementation, etc. In addition, whereas the $TITR$ contributes quite substantially to tax revenue, most countries raise little revenue with the DTR.

[11] We provide Figure 17 as an alternative illustration.

[12] In contrast to the $TITR$, where the differences between the distributions are much more pronounced.

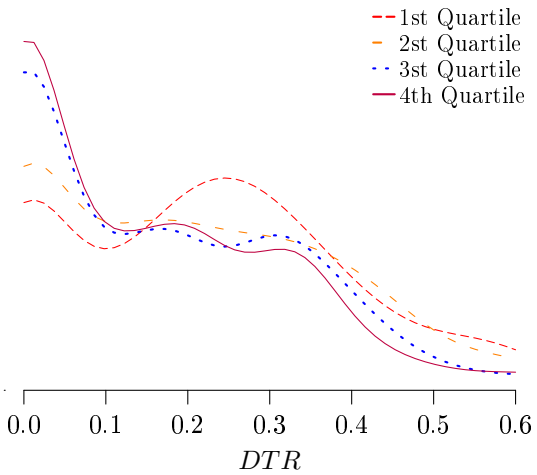
[13] Note that the right-hand side of Figure 19 again depicts the locus at which the estimates for the conditional density are maximized.

Figure 15: Distribution of changes in the DTR



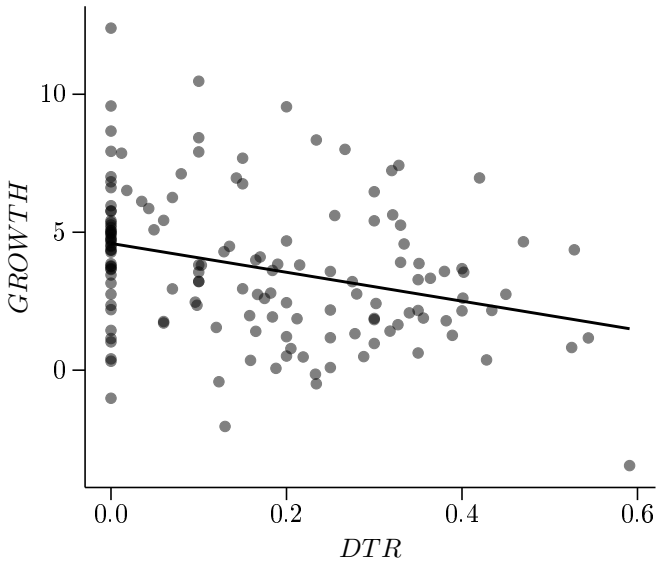
Notes: The left hand side provides a histogram on the different sizes of tax changes. We only include non-zero observations. The right hand side depicts the different counts of country groups which experience the same number of tax changes.

Figure 16: Tax rate distribution and GDP growth



Notes: Density of DTR for all GDP growth quartiles, all years. Nonparametric estimation (bandwidth selection: Silverman's Rule of Thumb since likelihood cross-validation leads to under-smoothing, kernel: Gaussian).

Figure 17: Tax rate distribution and GDP growth

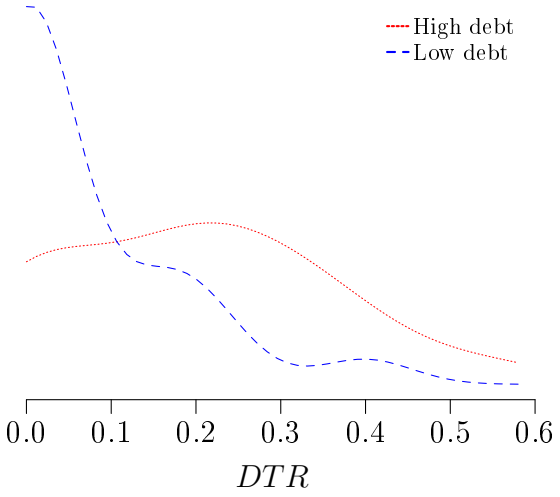


Notes: This graph presents a scatterplot of the DTR and GDP growth. All observations represent country averages.

4 Conclusion

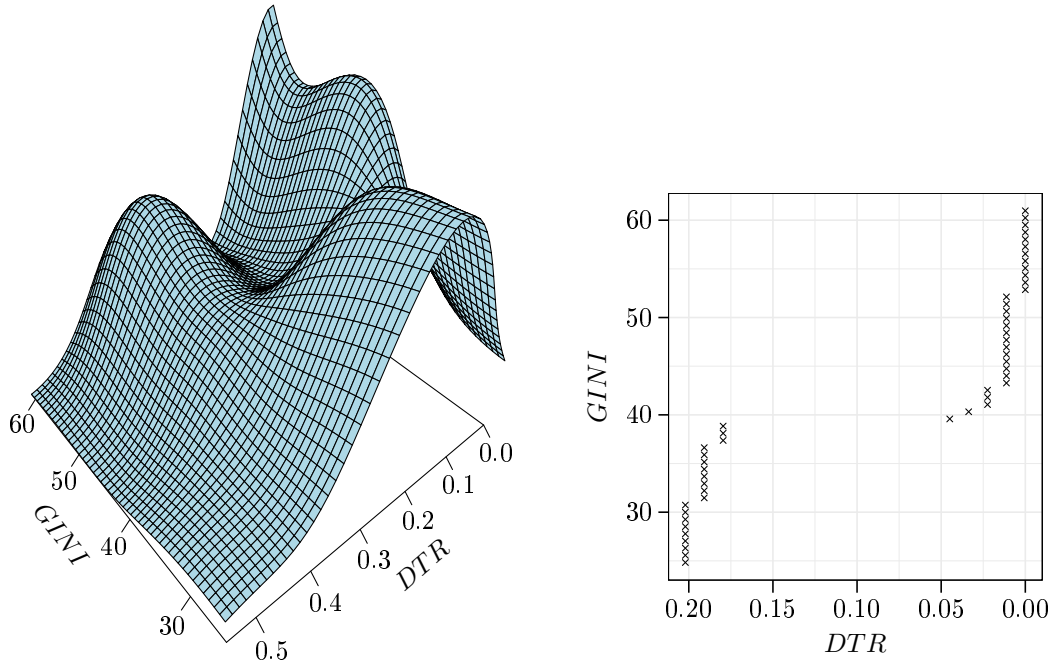
This study surveys tax rates (11 different measures) on top income earners for many countries (165) and years (10). We show that, while the median of the top income tax rate has remained fairly stable, cross-country variation has increased. This stands in contrast to taxes on dividend incomes where we find a slight downward trend in the size of the tax rate. High-income countries have increased their tax rates, whereas a downward trend across developing countries is observable. Unconditional tests suggest that top income taxes are negatively associated with GDP growth rates, debt, as well as with income inequality.

Figure 18: Tax rate distribution and government debt



Notes: Density of DTR for the first and fourth quartile of government debt. Year: 2015. Nonparametric estimation (bandwidth selection: Silverman's Rule of Thumb, since likelihood cross-validation leads to under-smoothing, kernel: Gaussian).

Figure 19: Conditional distribution of DTR and $GINI$



Notes: The left hand side depicts the distribution of the DTR conditional on $GINI$. The right hand side shows for each matrix dot of $GINI$ the respective DTR value where the conditional density is maximized. We omit the largest outlier in the density estimation. Nonparametric estimation (bandwidth selection: Silverman's Rule of Thumb since likelihood cross-validation leads to under-smoothing, kernel: Gaussian).

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