Who bears the cost of taxing the rich? An empirical study on CEO pay

WP15/27

Martin Ruf
University of Tubingen

Julia Schmider
University of Tubingen

SAID BUSINESS SCHOOL   UNIVERSITY OF OXFORD

Who bears the cost of taxing the rich? An empirical study on CEO pay

Martin Ruf

Julia Schmider

June 8, 2015

Abstract

An increase in the effective top marginal tax rate by 10 percentage points raises gross CEO pay at the firm level by 12.0 %. CEOs use their bargaining power to shift their tax load partly to the employer. Less powerful members of the executive board - measured in terms of their function or level of pay - are less successful in doing so.

1   Introduction

> Income inequality has surged back in the United States since the
> 1970s so that the United States is much more unequal than Europe
> today. (...). In the United States, the top decile income share (...)
> stabilized around 30 to 35 % in the 1950s-1960s (...). It then rose
> at an unprecedented pace since the 1970s-1980s, and is now close to
> 50%. According to this measure, primary income concentration is
> currently higher than it has ever been in U.S. history. (...) Modern
> U.S. inequality is based more on a very large rise of top labor incomes
> than upon the extreme levels of wealth concentration. (...) This is
> largely due to the rise of top executive compensation in large U.S.
> corporations (both financial and nonfinancial). (Thomas Piketty and
> Emmanuel Saez in Science May 23rd, 2014)

If the rise of top executive compensation is the main driver of the increasing
income inequality, a higher taxation of CEO pay is a natural candidate to limit
this evolution. Using a sample of CEO pay in 28 countries over 11 years (2003
to 2013), we investigate how changes in the effective top marginal tax rates for
CEO pay affect CEO income.

A higher taxation of CEO pay will obviously reduce net CEO income *given a
constant level of gross CEO pay*. But what happens to gross CEO pay? Will
CEOs respond with reduced labor supply decreasing their net income even fur-
ther? Or is their bargaining power that strong, that they are able to shift the tax
load to the employer? According to our results an increase in the effective top
marginal tax rate by 10 percentage points raises gross CEO pay at the firm level
by 12.0 %. CEOs are that powerful, that they are able to shift a significant part
of any additional tax load to the employer. A higher taxation of CEO pay may
thus not necessarily be the appropriate measure to reduce the increasing income

inequality in the U.S.

The theoretical literature identifies five distinct channels through which taxation affects gross CEO pay. Following standard textbook arguments (Atkinson & Stiglitz (1980), p. 28), a higher taxation of labor income should result in a substitution and an income effect. First, non-taxed leisure substitutes for taxed labor and gross pay should decrease (substitution effect). Second, the reduction in net income through taxation may result in more labor in order to compensate for the reduced net income (income effect). Gross pay should increase. Third, high tax rates are part of an institutional set-up putting a brake on rent extraction among top earners. When tax rates are very high, the net reward to a highly paid CEO for bargaining for more compensation is modest. When top tax rates fall, high earners start to bargain more aggressively to increase their compensation (Piketty et al. (2014)). Gross CEO pay will decrease as a reaction to higher taxation. Fourth, CEOs may have enough bargaining power to shift their tax load (partly) to the employer. CEO taxation then is employer-borne and no longer employee-borne (Feldstein & Wrobel (1998), Egger & Radulescu (2011) and Kleven et al. (2014)). Any increase in CEO taxation results in a (partly) offsetting increase in gross CEO pay. Fifth, higher CEO taxation may result in tax avoidance through changes in the form of compensation (Slemrod (1996) and Feldstein (1999)). CEOs may e.g. receive stock options instead of pay, if stock options are not affected by the tax rate increase. If tax avoidance is effective, overall gross CEO pay will not change at all.

There are theoretical arguments to expect an increase as well as decrease in gross CEO pay as a result of a change in the top tax rate. The overall effect of the theoretical predictions is ambiguous. It is thus up to empirical studies to identify this overall effect. Our results allow to predict the effect of a change in the top tax rate on gross CEO pay. Given the new level of gross CEO pay it is then possible to compute the new net CEO income. Only combining these effects of

taxation allows to evaluate how successful a higher taxation of CEO pay may be in limiting the increasing income inequality in the US.

There is a vast amount of literature on the elasticity of taxable income with respect to income taxation in general as summarized by Saez et al. (2012). Yet very few studies focus on the specific case of CEO pay. Goolsbee (2000), Hall & Liebman (2000) and Frydman & Molloy (2011) based on samples of top executive pay of large publicly-traded US firms are not successful in identifying a clear effect of income taxation on gross CEO pay.

Given the huge variation in top income tax rates internationally, the use of an international sample of top executive pay data is a promising way to make progress in the identification of income tax effects on gross CEO pay. Piketty et al. (2014) are the first to take this path. Using international CEO pay for 14 OECD countries in 2006, they find a negative effect of taxation on gross CEO pay. We advance further in this direction in extending their sample to 28 countries for the years 2003 to 2013 including many repeated observations of firm CEO pay data. Using a pooled cross section we are able to replicate their result.

However, the big advantage of having a panel at hand is the possibility to control for unobserved heterogeneity using country or even firm fixed effects. Using country or firm fixed effects in our regressions results in a reversed sign of the tax rate coefficient. Precisely, an increase in the effective top marginal tax rate by 10 percentage points raises gross CEO pay at the firm level by 12.0 %.

Accordingly, CEOs are able to shift a significant part of their additional tax load to the employer. As an example, starting with a gross CEO pay of 10 million USD and an effective top marginal tax rate of 40 %, net CEO income would be 6 million USD. As one of the five summarized theoretical predictions above, increasing the effective top marginal tax rate by 10 percentage points to 50 % could result in CEOs using their bargaining power to shift their tax load partly to

the employer. Consistent with this hypothesis, we find an increase in gross CEO pay by 12.0 % as a reaction. Thus, in our example, gross CEO pay would increase from 10 million USD to 11.2 million USD. Net CEO income then is - given the new effective top marginal tax rate of 50 % - 5.6 million USD. Compared to the pre reform scenario net CEO pay still decreases by 0.4 million USD. However, the larger part of the increased effective top marginal tax rate is borne by the employer, since gross CEO pay increases by 1.2 million USD.

If CEOs are able to shift an additional tax load to their employer because of their bargaining power, more powerful CEOs should be more successful in doing so. We proxy for the power of CEOs in two ways. First, we differentiate between supervisory directors, executive directors and CEOs. CEOs are more powerful than executive directors and executive directors are more powerful than supervisory directors. Based on a sample split, we find consistent with this expectation, that CEOs are more successful in shifting an additional tax load to their employer than executive directors. On the contrary, we find no empirical evidence for supervisory directors being able to do so. Second, we differentiate CEOs according to their level of pay. More powerful CEOs should have higher pay. Using quantile regressions, we indeed find evidence for higher paid CEOs being more successful in shifting an additional tax load to their employer.

Besides for the studies directly focusing on the effect of taxation on CEO pay cited above, our paper links to the broad literature on executive compensation. Murphy (2013) provides a recent summary. Our paper is especially close to the study of Fernandes et al. (2013), since we basically replicate their setting besides for the inclusion of effective top marginal tax rates as our main variable of interest.

Section 2 reviews the theoretical literature on taxation and CEO pay. Section 3 explains the data used and our empirical strategy. Section 4 presents results. Section 5 concludes.

2 Theoretical framework

There are many theoretical arguments on how gross pay could react to changes in tax rates. As a starting point, based on standard microeconomic textbook arguments (see Atkinson & Stiglitz (1980), p. 28), taxation may be seen as having two effects. Any increase in taxation takes income away from individuals. If leisure is a normal good, individuals respond in consuming less leisure or equivalently supplying more labor. Gross income increases (income effect). The other effect arises from the fact that not all activities are taxed. Taxation diverts economic activity from taxed to untaxed areas or less taxed areas. Since leisure, basically due to costs of observation, is not taxed, individuals consume more non-taxed leisure as a reaction to an increased taxation of labor. The payoff of working decreases due to taxation and consuming leisure is more attractive. The attempt to avoid taxes by substituting non-taxed for taxed activities is called the substitution effects of the tax. Gross income decreases.

The arguments of Piketty et al. (2014) focus more specifically on the case of CEO taxation. Their starting point is the observation, that pay may not equal marginal economic product for top income earners. Executives may use their power to influence compensation committees. In such a context, bargaining efforts on the job can conceivably play a significant role in determining pay. Marginal tax rates affect the rewards to bargaining and can hence affect the level of bargaining efforts. When tax rates are very high, the net reward to a highly paid CEO for bargaining for more compensation is modest. When top tax rates fall, high earners start to bargain more aggressively to increase their compensation. Gross CEO pay will decrease as a reaction to higher taxation.

Kleven et al. (2014) study the effects of taxation on pay in a wage bargaining model. The CEO has a pretax reservation wage y_0 and the employer values the CEO at her marginal product y and is therefore willing to pay up to this marginal

product y. Any wage $z \in [y_0, y]$ will be acceptable to both the CEO and the firm. Among the many potential models of wage determination in this type of setting, Kleven et al. (2014) favor the most widely used model assuming that the pretax wage z splits the surplus between the CEO and the firm through a Nash bargaining process. An exogenous parameter $0 \leq \beta \leq 1$ captures bargaining power of the CEO and $1 - \beta$ captures the bargaining power of the employer.

Formally, given the tax rate τ, pay z is set to maximize $W = (y - z)^{1-\beta}[(1 - \tau)z - y_0]^\beta$. Solving for z yields $z = \beta y + (1 - \beta)\frac{y_0}{1-\tau}$. Pay z is increasing in the tax rate. Any increase in the tax rate τ changes the relation between the firm's surplus $y - z$ and the CEO's surplus $(1 - \tau)z - y_0$. CEOs use their bargaining power to shift an increase in taxation partly to the employer and to rebalance the surpluses. Gross CEO pay will increase as a reaction to higher taxation (see also Bingley & Lanot (2002) and Kubik (2004)).

The latter argument is in line with the results of Feldstein & Wrobel (1998). Since in their model individuals can avoid unfavorable taxes by migrating to jurisdictions that offer more favorable tax conditions, a relatively unfavorable tax will cause gross wages to adjust until the resulting net wage is equal to that available elsewhere. This argument is especially relevant to CEOs, which are typically very mobile. Prominent examples are Dieter Zetsche (2000-2005: CEO at Daimler Chrysler Group in the US, 2006-2013: CEO at Daimler AG in Germany), Klaus-Christian Kleinfeld (2005-2007: CEO at Siemens AG in Germany, 2008-2013: CEO at Alcoa Inc. in the US), and Marijn E. Deckers (2002-2008: CEO at Thermo Fisher Scientific Inc in the US, 2010-2013: CEO at Bayer AG in Germany).

Slemrod (1996), Feldstein (1999) and Slemrod & Kopczuk (2002) point to specific tax avoidance opportunities of CEOs. As a result to a tax rate increase, gross CEO pay may not change, but CEOs may intensify their efforts to avoid taxation. This may be possible by demanding a change in the timing of pay in

order to shift cash flows to tax-advantaged periods. Alternatively, CEOs may change the composition of their pay in the direction of tax-advantaged compensation components. At the personal level, CEOs may avoid taxes by increasing deductible activities. If tax avoidance works perfectly well, then an increase in CEO taxation should not have any real economic implications. Income may be shifted across compensation components, tax bases or time periods, while gross CEO income in economic terms is not affected at all.

In the following empirical analysis we focus on overall CEO pay as it is published by firms due to reporting requirements. Neither increased deductible activities at the personal level nor changes in the composition of pay should affect this measure. Still, tax avoidance activities may affect our results. If tax avoidance is effective, CEOs have no reason to react to changes in tax rates through adjusting their gross income. This holds for all above mentioned motivations (income effect, substitution effect or bargaining). We analyze the effect of changes in CEO taxation on CEO gross pay *given* the various possibilities to avoid taxes. Any empirical effect we may find thus points to tax avoidance not working perfectly well.

Table 1 summarizes the arguments. There are reasons to expect an increase in CEO gross pay as a reaction to a tax rate increase as well as reasons to expect a decrease. Which of the effects dominates is an empirical question to be answered in the succeeding sections.

3 Data and Empirical Strategy

3.1 Data

We extract information on CEO pay from the database BoardEx. BoardEx is the leading database on board composition of publicly listed firms. The BoardEx

Table 1: Theoretical predictions of the tax effect on CEO pay

Reference	Pay	Main result
Atkinson & Stiglitz (1980), p. 28	+	Any increase in taxation takes income away from individuals. If leisure is a normal good, individuals respond in consuming less leisure or equivalently supplying more labor. Gross income increases (income effect).
Atkinson & Stiglitz (1980), p. 28	-	Taxation diverts economic activity from taxed to untaxed areas or less taxed areas. Individuals consume more non-taxed leisure as a reaction to an increased taxation of labor. Gross income decreases (substitution effect).
Piketty et al. (2014)	-	When tax rates are very high, the net reward to a highly paid CEO for bargaining for more compensation is modest. Gross CEO pay will decrease as a reaction to higher taxation.
Kleven et al. (2014)	+	CEOs use their bargaining power to shift an increase in taxation partly to the employer. Gross CEO pay will increase as a reaction to higher taxation.
Slemrod (1996), Feldstein (1999), Slemrod & Kopczuk (2002)	/	Income may be shifted across compensation components, tax bases or time periods, while gross CEO income in economic terms is not affected at all.

database contains biographical information on most board members and senior executives around the world. These individuals are associated with over 800,000 global organizations. In addition to providing biographic information, BoardEx also includes detailed compensation data for top executives.

We define CEOs as the highest paid executive director available in BoardEx for each firm. CEO pay extracted from BoardEx is the sum of direct and equity linked compensation, D.C. (*D*efined *C*ontribution) pensions and other compensation. Direct compensation is the sum of all cash paid compensation for the period. Equity linked compensation is the sum of shares awarded, estimated value of options awarded and LTIPs (Long term incentive plan) awarded in the period selected. Options plans are valued using the estimation value of options awarded, which is a prediction of the value of the options awarded during the period based on the latest closing stock price using the generalized Black Scholes option pricing model. D.C. Pensions are the employer's contribution towards the director's pension scheme. Other compensation includes e.g. fringe benefits. As argued above, neither tax avoidance through changes in the composition of pay nor increased deductible activities at the personal level should affect our analysis, since we use the sum of all kinds of pay at the employer level as our dependent

Table 2: Summary statistics for the level and composition of CEO pay

| Country | #Obs. | CEO Total Pay (million USD) | | Mean Composition of CEO Pay | | | | |
		Mean	Median	Salary	Bonus	Equity Pay	D.C. Pensions	Other
Australia	9	0,9	0,7	59%	26%	0%	0%	15%
Austria	11	2,6	1,9	40%	47%	3%	0%	10%
Belgium	108	2,1	1,6	41%	21%	21%	7%	11%
Canada	33	3,1	1,3	20%	13%	66%	0%	2%
China	7	1,1	0,3	18%	18%	65%	0%	0%
Cyprus	4	0,4	0,4	81%	0%	0%	18%	1%
Denmark	33	1,5	1,3	63%	9%	19%	8%	1%
Finland	32	3,2	1,8	39%	16%	40%	2%	2%
France	835	2,9	1,5	30%	23%	46%	1%	1%
Germany	321	4,0	2,6	26%	41%	23%	6%	4%
Greece	3	1,6	1,0	100%	0%	0%	0%	0%
Hong Kong	6	3,3	3,1	19%	60%	0%	3%	19%
Italy	263	4,1	2,7	32%	24%	23%	1%	20%
Luxembourg	17	2,8	2,8	35%	37%	26%	1%	2%
Mexico	1	3,1	3,1	85%	10%	0%	0%	5%
Netherlands	304	2,5	1,6	30%	22%	37%	7%	4%
Norway	34	1,6	0,9	30%	20%	22%	1%	27%
Poland	2	4,0	4,0	33%	11%	0%	0%	56%
Portugal	18	1,6	1,7	45%	46%	8%	0%	0%
Ireland	278	4,4	1,9	17%	10%	67%	3%	3%
Russia	2	1,4	1,4	92%	8%	0%	0%	0%
Singapore	15	3,3	2,1	27%	3%	62%	0%	8%
South Africa	14	5,8	4,4	27%	20%	48%	4%	2%
Spain	88	3,5	1,5	42%	30%	15%	4%	8%
Sweden	300	1,3	0,9	49%	18%	4%	22%	7%
Switzerland	124	5,2	2,6	24%	14%	50%	5%	7%
UK	3625	2,8	1,5	24%	18%	52%	3%	3%
USA	10743	9,1	5,3	10%	7%	81%	0%	2%

variable.

The sample includes all companies available in BoardEx, which report on their CEO compensation. As Fernandes et al. (2013) we restrict our analysis to companies with 2005 sales in excess of $ 100 million in order to reduce the impact of BoardEx's oversampling of small U.K. firms. We then match the observations from BoardEx to Datastream Worldscope, which is our source for firm financial and stock market data. We match the firms using ISIN codes. FactSet is our source for institutional ownership and Datastream Worldscope for insider ownership.

We end up with a sample of 17,256 observations representing 3.083 CEOs for the period 2003-2013. Table 2 shows the average level and composition of CEO pay by country. Table 3 shows the summary statistics for all dependent and independent variables in our sample. Figure 1 shows the worldwide distribution

Figure 1: Number of observations of CEOs by country
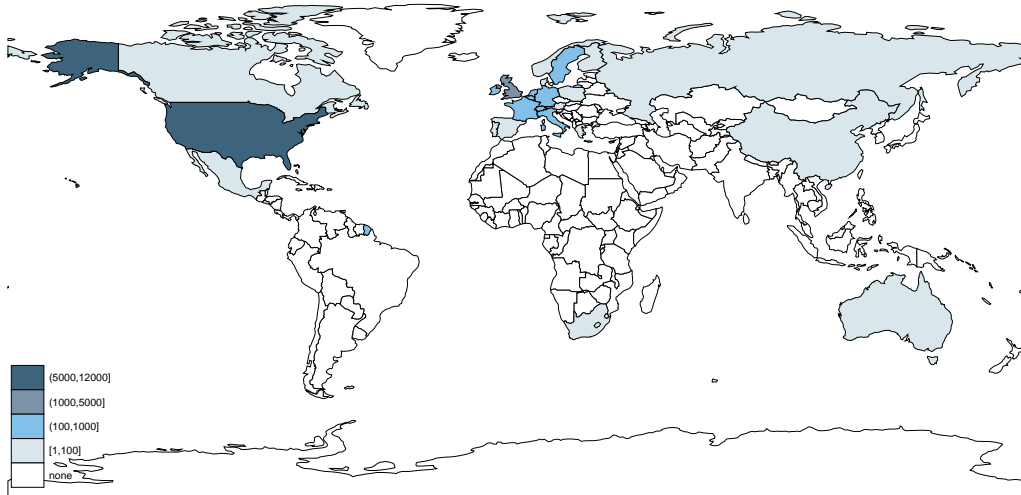
of our observations. Most observations are from the US, followed by the UK, France, Germany, the Netherlands, Sweden, Ireland and Italy. Overall we have observations from 28 different countries in our sample.

Table 3: Summary statistics for CEO pay and its hypothesized determinants

The table reports the summary statistics of CEO pay, net-of-tax-rate, firm performance, board and ownership structure and CEO characteristics for 17,256 directors-years over the period 2003 to 2013. We obtain the compensation data, board data and CEO characteristics from BoardEx and the firm performance data and ownership data from Datastream/Worldscope. We transform the dependent variable with the relevant constant purchasing power parity (PPP) conversion factor as of 2011. CEO pay is the sum of fixed compensation, bonus, stock awards value, restricted stocks, stock options, D.C. pensions and fringe benefits as of the company's fiscal year end. The explanatory variable is one minus the effective top marginal tax rate, which is called the net-of-tax-rate. Following *Kleven et al. (2013)*, the effective top marginal tax rate includes the top personal income tax rate, the uncapped social security contributions, and the value-added taxes. The explanatory variable and all firm control variables are measured at the company's fiscal year end of the previous year.

Variables	Mean	Std Dev.	Min.	25% Percentile	Median	75% Percentile	Max.	Skewness	Kurtosis
Panel A: CEO pay									
CEO pay/PPP ($ thousand)	$ 5321,36	$ 4931,28	$ 174,16	$ 1388,98	$ 3321	$ 7955,3	$ 15374,9	0,99	2,62
Panel B: Net effective top marginal tax rate									
Ln(1-TopMTR)	51%	8%	26%	45%	57%	57%	85%	-1,12	3,41
Panel C: Firm performance									
Ln(Sales in USD/GDPdefl.) ($ million)	$ 7234,71	$ 17163,54	$ 3,75	$ 479,91	$ 1461,05	$ 5198,50	$ 119247,83	4,36	24,18
Leverage	23%	19%	0%	8%	21%	35%	88%	0,84	3,6
Tobin's q	176%	105%	64%	111%	140%	199%	737%	2,55	11,11
Stock return (RET)	16%	50%	-81%	-14%	11%	36%	241%	1,43	7,21
Standard deviation of RET	38%	20%	10%	24%	33%	45%	125%	1,72	6,74
Panel D: Board and ownership structure									
Board size	9,82	3,4	2	8	9	11	34	1,56	7,99
Frac. of independent directors	64%	23%	0%	50%	69%	83%	100%	-1	3
CEO-Chairman dummy	0	0,5	0	0	0	1	1	0,04	1
Avg. number of board position	188%	68%	10%	138%	178%	225%	800%	1	6
Insider Ownership	0	0,21	0	0,02	0,15	0,32	0,89	1,13	3,56
Panel E: CEO characteristics									
CEO Age	54,95	7,46	31	50	55	60	94	0,36	3,87
CEO Tenure	8	7,26	0	3	5,76	10,48	59,71	2,03	8,6
CEO college degree dummy	0,86	0,35	0	1	1	1	1	-2,03	5,12

Figure 2 presents evidence on the mean CEO pay per country in million USD as of 2012. CEO pay is clearly higher in the US than in any other country. This is especially remarkable, since we have around 11,000 observations for the US compared to e.g. only around 500 observations for Germany. Although the basis of firms represented in our sample is much broader in the US - thus including also relatively less important firms - average CEO pay in the US is still by far the highest.

Figure 2: Distribution of the average CEO pay by country as of 2012
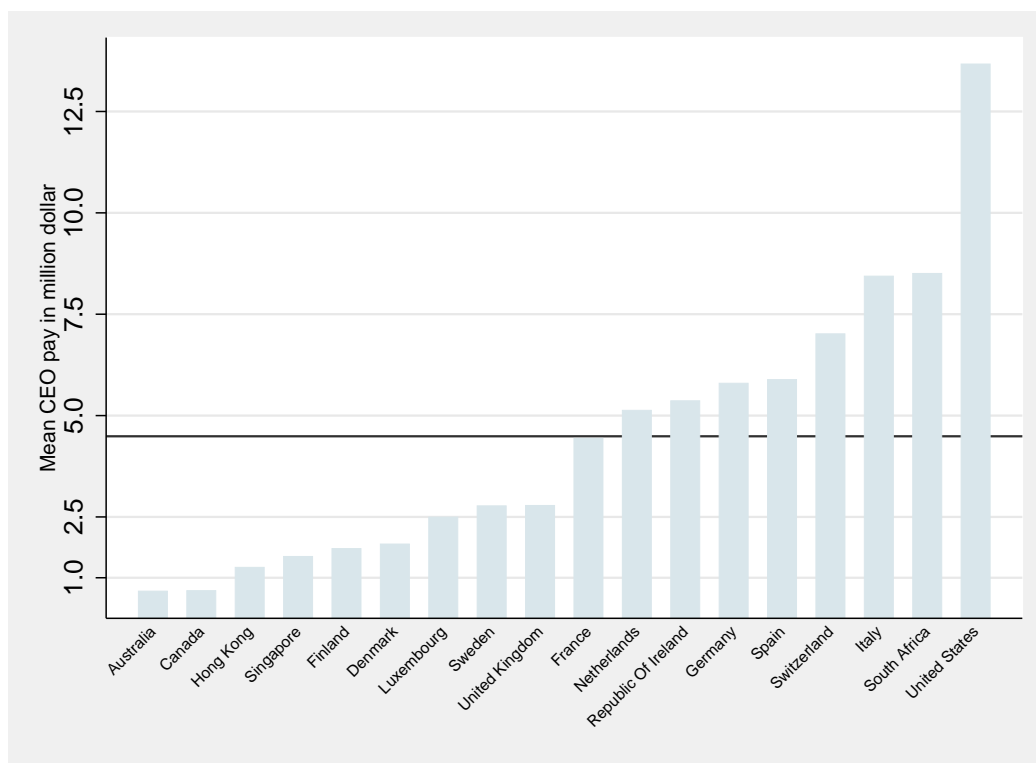
Having a closer look at individual CEO pay as presented in table 4, 5, and 6, in all recent years - 2011 to 2013 - the 10 best paid CEOs worldwide are from the US. In 2013, Lawrence Joseph Ellison working for Oracle is heading the list with an annual income of 134 million USD according to BoardEx. Margaret Cushing Whitman, Hewlett Packard, with an annual income of 67 million USD is second, Robert Iger, Walt Disney, with an annual income of 58 million USD

is third. In 2011 the best paid non US CEO is Josef Ackerman, Deutsche Bank, Germany, with an annual income of 29 million USD ranking 35th worldwide, in 2012 Alexander Cutler, Eaton, Ireland, with an annual income of 25 million USD ranking 56th worldwide and in 2013 Stephen Luczo, Seagate, Ireland, with an annual income of 37 million USD ranking 14th worldwide. Comparing the US to the UK or Germany as other leading industrialized countries again confirms this impression. The best paid CEO in the UK in 2013 is Rodney O'Neal, Delphi Automotive, with an annual income of 24 million USD, the best paid CEO in Germany in 2013 is Martin Winterkorn, Volkswagen, with an annual income of 15 million USD. Thus the level of CEO pay is a bit higher in the UK, but still approximately comparable to Germany, and clearly below the level of top CEO pays in the US. Already the second best paid German CEO in 2013, Wolfgang Reitzle, Linde, with an annual income of 11 million USD earns only as much as the average US CEO in our sample representing 11,000 observations.

3.2   Tax Rates

Since CEOs earn very high salaries, the average tax rate on their earnings is closely approximated by the effective top marginal tax rate on labor income. Following Kleven et al. (2013) we compute the effective top marginal tax rate including all taxes on labor income. We take individual income taxes at the national and local level, uncapped payroll taxes (social security contributions on both employees and employers that do not have an earnings ceiling), and value-added taxes (VAT) into account. We have computed such effective top marginal tax rates for all 28 countries in our sample and for all years 2003-2013.

Figure 3 plots effective top marginal tax rates for US, UK, Germany, France, Italy, Sweden, Switzerland, Belgium, Netherlands and Ireland. We observe a trend of increasing effective top marginal tax rates over time. The average effective top

Table 4: Best-paid CEOs (worldwide): 2011 - 2013 (BoardEx)

| Company	Director	Country	Pay ($'000)	Rank
Best-paid CEOs (worldwide) 2011				
APPLE INC	Timothy (Tim) D Cook	United States	406022	1
SIMON PROPERTY GROUP INC	David E Simon	United States	134182	2
CBS CORP	Leslie Moonves	United States	112981	3
DISCOVERY COMMUNICATIONS INC	David M Zaslav	United States	94634	4
COCA-COLA CO	Muhtar A Kent	United States	51028	5
HEWLETT-PACKARD	Margaret (Meg) Cushing Whitman	United States	48736	6
LIBERTY INTERACTIVE CORP	Michael (Mike) A George	United States	44787	7
MCKESSON CORP	John H Hammergren	United States	44357	8
INTERNATIONAL BUSINESS MA-CHINES	Samuel (Sam) J Palmisano	United States	43654	9
CHEVRON CORP	John S Watson	United States	39884	10
Best-paid CEOs (worldwide) 2012				
TESLA MOTORS INC	Elon R Musk	United States	117741	1
DISCOVERY COMMUNICATIONS INC	David M Zaslav	United States	115183	2
LIBERTY INTERACTIVE CORP	Gregory (Greg) Ben Maffei	United States	110315	3
ORACLE CORP	Lawrence (Larry) Joseph Ellison	United States	92586	4
CBS CORP	Leslie Moonves	United States	83058	5
COGNIZANT TECHNOLOGY SOLU-TIONS CORP	Francisco D'Souza	United States	73681	6
WALT DISNEY	Robert (Bob) A Iger	United States	57074	7
EBAY INC	John Joseph Donahoe II	United States	55159	8
ACTIVISION BLIZZARD INC	Robert (Bobby) A Kotick	United States	52864	9
COCA-COLA CO	Muhtar A Kent	United States	47778	10
Best-paid CEOs (worldwide) 2013				
ORACLE CORP	Lawrence (Larry) Joseph Ellison	United States	133871	1
HEWLETT-PACKARD	Margaret (Meg) Cushing Whitman	United States	67230	2
WALT DISNEY	Robert (Bob) A Iger	United States	57914	3
GENERAL DYNAMICS CORP	Phebe N Novakovic	United States	56454	4
HONEYWELL INTERNATIONAL INC	David (Dave) Michael Cote	United States	56128	5
COCA-COLA CO	Muhtar A Kent	United States	52591	6
BOEING CO	Walter (Jim) James McNerney Jr	United States	46638	7
RALPH LAUREN CORP	Ralph Lauren	United States	44827	8
JOHNSON & JOHNSON	Alex Gorsky	United States	44591	9
MCKESSON CORP	John H Hammergren	United States	42956	10
Best-paid non-US CEOs (Rank (all)) 2011				
DEUTSCHE BANK AG	Josef (Joe) Meinrad Ackermann	Germany	28859	1 (35)
XSTRATA PLC	Michael (Mick) Lawrence Davis	Switzerland	24269	2 (63)
COOPER INDUSTRIES PLC	Kirk S Hachigian	Ireland	21634	3 (81)
AVAGO TECHNOLOGIES LTD	Hock E Tan	Singapore	21213	4 (88)
ACE LTD	Evan G Greenberg	Switzerland	19437	5 (111)
ACCENTURE PLC	William (Bill) D Green	Ireland	18967	6 (116)
VOLKSWAGEN AG	Martin Winterkorn	Germany	17909	7 (130)
BG GROUP PLC	Sir Frank Joseph Chapman	United Kingdom	17457	8 (133)
SIEMENS AG	Peter H Löscher	Germany	17017	9 (135)
BHP BILLITON PLC	Marius Jacques Kloppers	United Kingdom	16826	10 (139)
Best-paid non-US CEOs (Rank (all)) 2012				
EATON CORP PLC	Alexander (Sandy) Macdonald Cutler	Ireland	25010	1 (56)
AON PLC	Gregory (Greg) C Case	United Kingdom	24221	2 (62)
VODAFONE GROUP PLC	Vittorio Amedeo Colao	United Kingdom	22370	3 (77)
LYONDELLBASELL INDUSTRIES NV	James (Jim) L Gallogly	Netherlands	21991	4 (79)
DIAGEO PLC	Paul Steven Walsh	United Kingdom	20701	5 (91)
XSTRATA PLC	Michael (Mick) Lawrence Davis	Switzerland	19594	6 (95)
SEAGATE TECHNOLOGY PLC	Stephen (Steve) J Luczo	Ireland	19147	7 (102)
ACE LTD	Evan G Greenberg	Switzerland	18817	8 (107)
HSBC HLDGS PLC	Stuart Thomson Gulliver	United Kingdom	18355	9 (118)
ACCENTURE PLC	William (Bill) D Green	Ireland	18286	10 (119)
Best-paid non-US CEOs (Rank (all)) 2013				
SEAGATE TECHNOLOGY PLC	Stephen (Steve) J Luczo	Ireland	36514	1 (14)
ROCHE HLDG AG	Severin Schwan	Switzerland	24989	2 (41)
DELPHI AUTOMOTIVE PLC	Rodney O'Neal	United Kingdom	23858	3 (48)
EATON CORP PLC	Alexander (Sandy) Macdonald Cutler	Ireland	22815	4 (53)
TE CONNECTIVITY LTD	Thomas (Tom) J Lynch	Switzerland	22600	5 (56)
ACCENTURE PLC	Pierre Nanterme	Ireland	20478	6 (67)
GLAXOSMITHKLINE PLC	Sir Andrew Philip Witty	United Kingdom	18659	7 (75)
SANOFI	Christopher (Chris) A Viehbacher	France	17749	8 (79)
VODAFONE GROUP PLC	Vittorio Amedeo Colao	United Kingdom	17593	9 (82)
DIAGEO PLC	Paul Steven Walsh	United Kingdom	17377	10 (84)

Table 5: Best-paid UK CEOs: 2011 - 2013 (BoardEx)

Director (Company)	Pay ($'000)	Rank (all)
2011		
Sir Frank Joseph Chapman (BG GROUP PLC)	17457	1 (133)
Marius Jacques Kloppers (BHP BILLITON PLC)	16826	2 (139)
Gregory (Greg) C Case (AON PLC)	16682	3 (143)
Dame Marjorie Morris Scardino (PEARSON PLC)	15354	4 (170)
Sir Andrew Philip Witty (GLAXOSMITHKLINE PLC)	15201	5 (175)
Alun (Mike) Michael Rees (STANDARD CHARTERED PLC)	13805	6 (203)
Sir Terence (Terry) Patrick Leahy (TESCO PLC)	13527	7 (211)
Daniel (Dan) Wayne Rabun (ENSCO PLC)	13288	8 (216)
Robert (Bob) Edward Diamond Jr (BARCLAYS PLC)	12894	9 (231)
John Mark Yallop (ICAP PLC)	12503	10 (246)
2012		
Gregory (Greg) C Case (AON PLC)	24221	1 (62)
Vittorio Amedeo Colao (VODAFONE GROUP PLC)	22370	2 (77)
Paul Steven Walsh (DIAGEO PLC)	20701	3 (91)
Stuart Thomson Gulliver (HSBC HLDGS PLC)	18355	4 (118)
Peter James Long (TUI TRAVEL PLC)	15125	5 (173)
Angela Jean Ahrendts (BURBERRY GROUP PLC)	13175	6 (220)
António Mota Horta-Osório (LLOYDS BANKING GROUP PLC)	13033	7 (223)
Marius Jacques Kloppers (BHP BILLITON PLC)	13017	8 (225)
Michael (Mike) Alan Spencer (ICAP PLC)	12185	9 (247)
Daniel (Dan) Wayne Rabun (ENSCO PLC)	11390	10 (271)
2013		
Rodney O'Neal (DELPHI AUTOMOTIVE PLC)	23858	1 (48)
Sir Andrew Philip Witty (GLAXOSMITHKLINE PLC)	18659	2 (75)
Vittorio Amedeo Colao (VODAFONE GROUP PLC)	17593	3 (82)
Paul Steven Walsh (DIAGEO PLC)	17377	4 (84)
António Mota Horta-Osório (LLOYDS BANKING GROUP PLC)	15695	5 (101)
Peter James Long (TUI TRAVEL PLC)	14749	6 (112)
Samuel (Sam) Maurice Walsh (RIO TINTO PLC)	13048	7 (135)
Angela Jean Ahrendts (BURBERRY GROUP PLC)	12591	8 (139)
Ernest (Graham) Arthur Mackay (SABMILLER PLC)	12521	9 (140)
Lord (Ian Paul) Livingston of Parkhead (BT GROUP PLC)	12319	10 (142)

Table 6: Best-paid German CEOs: 2011 - 2013 (BoardEx)

Director (Company)	Pay ($'000)	Rank (all)
2011		
Josef (Joe) Meinrad Ackermann (DEUTSCHE BANK AG)	28859	1 (35)
Martin Winterkorn (VOLKSWAGEN AG)	17909	2 (130)
Peter H Löscher (SIEMENS AG)	17017	3 (135)
Wolfgang Reitzle (LINDE AG)	12827	4 (233)
Jürgen R Großmann (RWE AG)	10960	5 (300)
Dieter E Zetsche (DAIMLER AG)	9467	6 (349)
William (Bill) R McDermott (SAP AG)	9378	7 (354)
Norbert Reithofer (BAYERISCHE MOTOREN WERKE)	8237	8 (402)
Johannes Teyssen (E.ON SE)	6832	9 (472)
Karl-Ludwig Kley (MERCK KGAA)	6514	10 (487)
2012		
Martin Winterkorn (VOLKSWAGEN AG)	14293	1 (190)
William (Bill) R McDermott (SAP AG)	11958	2 (252)
Peter Terium (RWE AG)	11094	3 (279)
Wolfgang Reitzle (LINDE AG)	10562	4 (293)
Norbert Reithofer (BAYERISCHE MOTOREN WERKE)	9089	5 (359)
Kasper Bo Rorsted (HENKEL AG & CO KGAA)	8142	6 (398)
Dieter E Zetsche (DAIMLER AG)	7991	7 (403)
Marijn E Dekkers (BAYER AG)	7655	8 (426)
Robert (Rice) Maurice Powell (FRESENIUS MEDICAL CARE AG & Co KGAA)	7026	9 (466)
Bernd Scheifele (HEIDELBERGCEMENT AG)	6966	10 (473)
2013		
Martin Winterkorn (VOLKSWAGEN AG)	15248	1 (109)
Wolfgang Reitzle (LINDE AG)	11237	2 (159)
Peter Terium (RWE AG)	10149	3 (176)
Norbert Reithofer (BAYERISCHE MOTOREN WERKE)	10147	4 (177)
Dieter E Zetsche (DAIMLER AG)	9126	5 (203)
Kasper Bo Rorsted (HENKEL AG & CO KGAA)	8797	6 (214)
Karl-Ludwig Kley (MERCK KGAA)	8615	7 (221)
Marijn E Dekkers (BAYER AG)	8601	8 (222)
Johannes Teyssen (E.ON SE)	8028	9 (239)
Bernd Scheifele (HEIDELBERGCEMENT AG)	7022	10 (273)

16

Figure 3: Effective top marginal tax rate (2003-2013) by countries
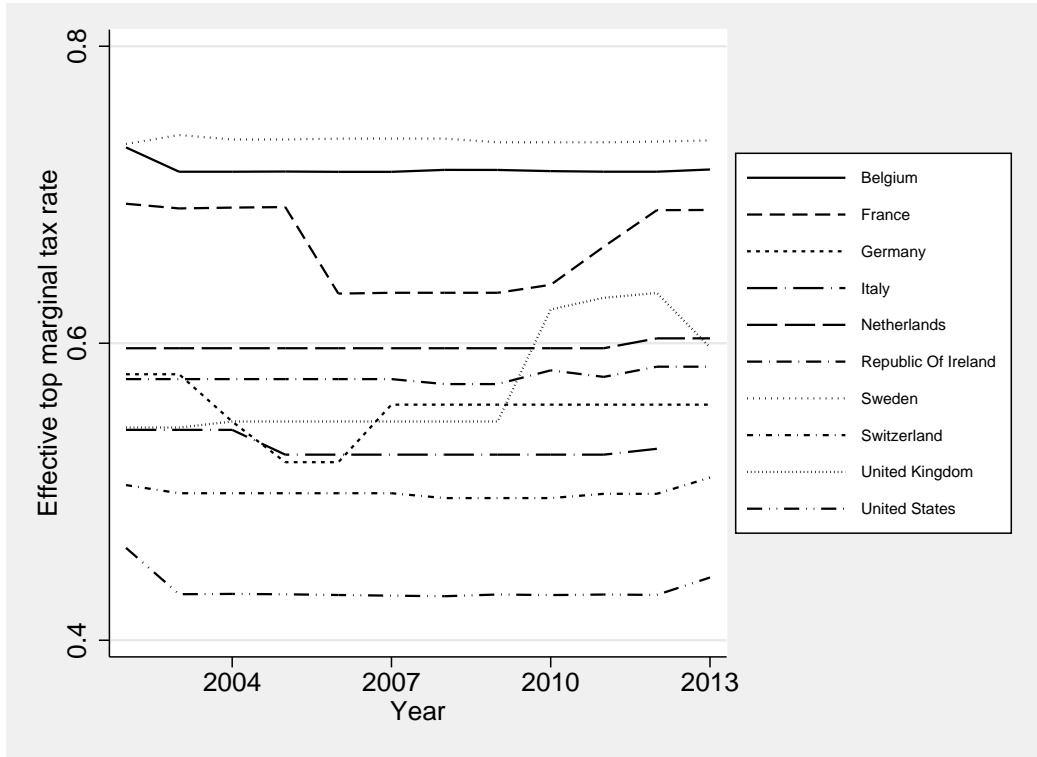
marginal tax rate in 2004 is 49.39% and 54.58% in 2013. Many increases of effective top marginal tax rates are driven by increases in the top income tax rate such as by 25 % (2010: 40 %, 2011: 50 %) in the UK in 2010, the increase by 21% (2010: 43 %, 2012: 52 %) in Spain since 2010, the increase by 13% (2012: 35 %, 2013: 39,5 %) in the US in 2013, or the increase by 10% (2011: 41 %, 2012: 45 %) in France in 2010.

3.3 Identification strategy

We closely follow the empirical setting of Fernandes et al. (2013) for identifying the effect of effective top marginal tax rates on gross CEO pay. Our baseline estimation is

$$Ln[TotalCompensation_{ijt}/PPP_{jt}] = \beta_0 + \beta_1 \cdot Ln[1 - TopMTR_{jt-1}]$$
$$+ \beta_2 \cdot X_{ijt-1} + \beta_i \alpha_i + \gamma_t + \epsilon \quad (1)$$

We transform our dependent variable logarithm of CEO pay of CEO i in country j and period t using the Worldbank constant PPP conversion factor from local currency to USD equivalents. We use the same control variables as Fernandes et al. (2013) summarized in X_{ijt-1}, namely as firm characteristics firm sales, firm leverage, Tobin's q, stock return and stock return volatility. Further we employ as controls for the board structure of the firm the board size, the fraction of independent directors, a CEO chairman dummy, the average number of board positions and insider ownership defined as the fraction of the number of closely held shares (held by insiders) of the outstanding common shares. We further control for CEO characteristics such as CEO age, CEO tenure and a CEO college degree dummy. Results including a control for the institutional ownership of the firm we present only as robustness test, since due to data availability this results in a significant reduction in sample size. We lag all controls by one period to eliminate joint endogeneity problems (Hermalin & Wallace (2001)).

As our main variable of interest we add the logarithm of one minus the effective top marginal tax rate as a control. Since our sample is a panel of CEO pay observations from 28 countries for years 2003 to 2013, we employ - different from Piketty et al. (2014) - firm fixed effects α_i allowing to control for unobserved firm and country heterogeneity. This difference is crucial for our results with respect to the coefficient on the effective top marginal tax rate. We finally add time fixed effects γ_t.
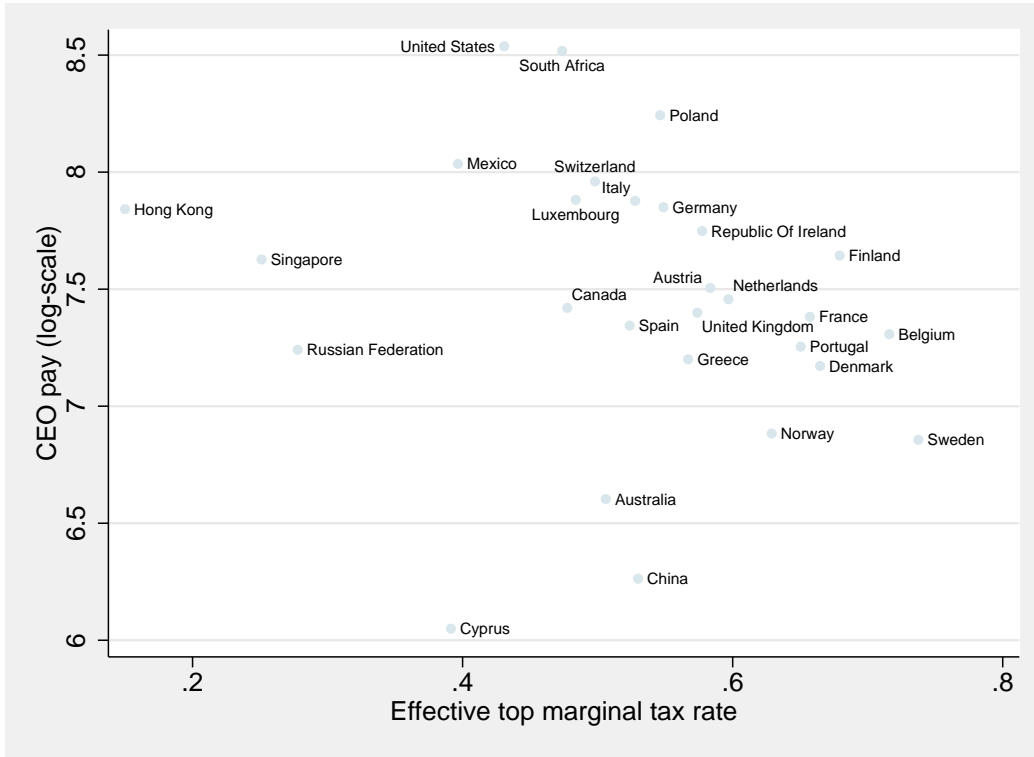
4 Results

4.1 Graphical Evidence

Figure 4 depicts the relationship across countries between average effective top marginal tax rates and average log CEO pay. Figure 4 indicates that average log CEO pay decreases with effective top marginal tax rates as found by Piketty et al. (2014). As an example average log CEO pay is 8.55 in the US having an effective top marginal tax rate of 43 %, 7.85 in Germany having an effective top marginal tax rate of 55 % and 6.86 in Sweden having an effective top marginal tax rate of 74 %. However, figure 4 does not control for firm characteristics or nontax features of host countries. It only provides suggestive evidence for CEO pay decreasing with effective top marginal tax rates. It is not possible to conclude on effective top marginal tax rates being causal for the observed decrease in CEO pay. To interpret such a causal relationship we employ more sophisticated econometrics in the following.

4.2 Regression Results

Table 7 presents OLS regression results. In all columns the dependent variable is the logarithm of CEO pay transformed using the purchasing power parity conversion factor. Column (1) only employs the log of one minus the effective top marginal tax rate as a control. The result confirms the impression of figure 4, namely an increase in CEO pay with a decrease in the effective top marginal tax rate. Column (2) uses additional control variables in a fashion similar to Piketty et al. (2014) or Fernandes et al. (2013). We add controls for firm performance, board and ownership structure, CEO characteristics as well as year dummies. This specification replicates the main result of Piketty et al. (2014)), namely an increase in CEO pay with a decrease in the effective top marginal tax rate even

Figure 4: Average log CEO pay and average effective top marginal tax rates

when controlling for firm, board and CEO characteristics. The estimated coefficient of 1.609 on log of one minus the effective top marginal tax rate translates into a semi-elasticity of -3. As a result of a 10 percentage point increase in the effective top marginal tax rate, gross CEO pay falls by 30.0 %. This result is robust to the inclusion of industry dummies instead of year dummies in column (3) and to the simultaneous inclusion of year and industry dummies in column (4).

In column (5) we use country fixed effects in order to control for unobserved country characteristics. As the main finding of our paper this reverses the sign of the coefficient on the effective top marginal tax rate. Obviously the effective top marginal tax rate is correlated with unobserved country characteristics resulting in a biased coefficient of the effective top marginal tax rate. As our preferred specification in column (6) we fully exploit the panel structure of our dataset and

plug in firm fixed effects allowing us to control for unobserved country as well as firm heterogeneity. The estimated coefficient of -0.475 on log of one minus the effective top marginal tax rate translates into a semi-elasticity of 1.2. Precisely, an increase in the effective top marginal tax rate by 10 percentage points raises the CEO compensation at the firm level by 12.0 %.

Table 7: Panel regression of CEO pay on effective top marginal tax rates and the hypothesized control variables, 2003-2013

The dependent variable is the logarithm of CEO pay and has been transformed using the relevant constant purchasing power parity (PPP) conversion factor as of 2011. The explanatory variable and all firm control variables are measured at the end of the previous fiscal year. Columns (1) - (6) include the net-of-tax rate. Column (1) includes no dummies and no other controls. Column (2) includes year dummies, column (3) includes industry dummies, column (4) includes year and industry dummies, column (5) includes year and country dummies, column (6) includes firm fixed effects as well as year dummies and further firm performance variables, board structure variables and CEO characteristics as control variables. Robust standard errors clustered by country are in parentheses. ***, **, * denote that the coefficient is significant at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: Ln(CEO pay/PPP)		ORDINARY LEAST SQUARE			FIXED EFFECT	
	(1)	(2)	(3)	(4)	(5)	(6)
Ln(1-TopMTR)	2.502***	1.609***	1.504***	1.637***	-0.181*	-0.475***
	(0.329)	(0.143)	(0.239)	(0.133)	(0.101)	(0.146)
Firm performance						
Ln(Sales in USD/GDPdefl.)		0.255***	0.294***	0.281***	0.266***	0.122***
		(0.021)	(0.012)	(0.011)	(0.015)	(0.012)
Leverage		0.297***	0.152**	0.192***	0.317***	-0.036
		(0.045)	(0.063)	(0.046)	(0.036)	(0.052)
Tobin's q		0.126***	0.106***	0.108***	0.123***	0.056***
		(0.007)	(0.012)	(0.014)	(0.006)	(0.010)
Stock Return (RET)		0.046***	0.037	0.052***	0.046***	0.010
		(0.007)	(0.025)	(0.009)	(0.010)	(0.013)
Standard deviation of RET		-0.196*	-0.050	-0.160	-0.241*	-0.170**
		(0.107)	(0.078)	(0.128)	(0.088)	(0.065)
Board and Ownership structure						
Board size		0.027**	0.024***	0.025***	0.031***	0.008
		(0.011)	(0.004)	(0.006)	(0.011)	(0.005)
Frac. of independent directors		0.684***	0.779***	0.721***	0.400***	0.173***
		(0.127)	(0.164)	(0.104)	(0.108)	(0.031)
CEO-chairman dummy		0.100***	0.082*	0.101***	0.115***	0.049***
		(0.030)	(0.043)	(0.031)	(0.030)	(0.013)
Avg. number of board position		0.204***	0.154***	0.169***	0.210***	0.062***
		(0.020)	(0.014)	(0.019)	(0.019)	(0.011)
Insider ownership		-0.396***	-0.440***	-0.393***	-0.387***	-0.072*
		(0.031)	(0.045)	(0.040)	(0.031)	(0.037)
CEO characteristics						
CEO Age		0.020***	0.033***	0.029***	0.018***	0.026**
		(0.005)	(0.004)	(0.004)	(0.004)	(0.010)
CEO Age (square)		-0.000***	-0.000***	-0.000***	-0.000***	-0.000**
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CEO Tenure		0.001	0.000	-0.000	0.000	0.001
		(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
CEO college degree dummy		0.110***	0.085***	0.094***	0.105***	0.019
		(0.017)	(0.014)	(0.017)	(0.019)	(0.028)
Constant	9.715***	3.963***	3.493***	4.199***	2.273***	5.069***
	(0.281)	(0.124)	(0.376)	(0.154)	(0.197)	(0.236)
Year dummies	No	Yes	No	Yes	Yes	Yes
Industry dummies	No	No	Yes	Yes	No	-
Country dummies	No	No	No	No	Yes	-
Firm fixed effects	No	No	No	No	No	Yes
Cluster robust se by	country	country	country	country	country	country
Observations	24,647	17,256	17,256	17,256	17,256	17,256
Adjusted R-squared	0.187	0.570	0.584	0.592	0.587	0.799

22

This finding is consistent with CEOs having enough bargaining power to pass the bill of an increase in effective top marginal tax rates at least partly to their employers as predicted by Kleven et al. (2014). As an example, starting with a gross CEO pay of 10 million USD and an effective top marginal tax rate of 40 %, net CEO income would be 6 million USD. Our result predicts an increase in gross CEO pay by 12.0 % as a reaction. Thus, in our example, gross CEO pay would increase from 10 million USD to 11.2 million USD. Net CEO income then is - given the new effective top marginal tax rate of 50 % - 5.6 million USD. Compared to the pre reform scenario net CEO pay still decreases by 0.4 million USD. However, the larger part of the increased effective top marginal tax rate is borne by the employer, since gross CEO pay increases by 1.2 million USD.

The effects of the other theoretical expectations summarized above are of second order. Neither the substitution effect nor decreased rent extraction as a reaction to increased effective top marginal tax rates is strong enough to result in a positive coefficient on the effective top marginal tax rate. These arguments are nevertheless plausible, but they are dominated by CEOs being able to shift their tax load (partly) to the employer.

Besides for the effective top marginal tax rate, we consider three group of controls as Fernandes et al. (2013): Firm performance, board and ownership structure and CEO characteristics. We expect a positive relationship between firm size proxied by firm sales and CEO pay. The marginal impact of talented CEOs is an increasing function of firm value. Large firms have higher value and thus more talented CEOs. Hence, firm size is a proxy for firm demand of high-quality CEOs with accordingly higher pay.

The leverage is typically expected to be positively related to pay, since CEOs may demand risk premiums for serving in riskier environments. A higher leverage increases the riskiness of equity-based compensation. As a further control for firm performance we use Tobin's q. CEO pay should be positively related to Tobin's

q, using the latter as either a measure of investment opportunities (requiring a more capable CEO and riskier pay, both which will increase pay) or an indicator of past performance leading to a higher level of pay for CEOs contributing to that performance.

Stock Return (RET) presents the growth in value of a stock holding as provided by Datastream. Past stock returns may affect current CEO pay positively. The effect of the standard deviation of stock return (RET) is theoretically ambiguous. On the one hand CEOs may demand risk premiums for serving in riskier environments. On the other hand, if the volatility reflects noise in the CEO's effect on firm performance, then higher volatility will lead to lower pay-performance sensitivities and lower CEO pay. The estimated coefficients are in line with these expectations. We lose significance for some of these firm specific controls (leverage and stock return) as soon as we include fixed effects in specification (6).

Board size, the fraction of independent directors, the CEO-chairman dummy and the average number of board positions are proxies for the quality of governance of the firm. The theoretical prediction of the effect of good governance on CEO pay is somewhat ambiguous, depending on whether a heavier reliance on independent and experienced boards will reduce pay through more effective monitoring, or increase pay through increased reliance on incentive compensation. We find the fraction of independent directors, the CEO-chairman dummy and the average number of boards on which directors sit to have a positive effect on CEO pay.

Insider ownership should have a negative impact on CEO pay for two reasons. Firstly, if insider ownership is high because of CEO ownership, CEOs are primarily rewarded and motivated by their ownership and not by their compensation. Secondly, if insider ownership is high because of large blockholders, these large blockholders can monitor and direct the activities of executives without relying on (expensive) incentive compensation. The estimated negative coefficient is in line with these expectations.

Finally we controls for CEO characteristics. CEO pay increases with CEO age, but decreases with squared CEO age. We find no effect of CEO tenure and of the CEO college degree dummy as soon as we control for firm fixed effects.

4.3 Quantile Regression Results

Our results show, that CEOs have enough bargaining power to pass the bill of an increase in effective top marginal tax rates at least partly to their employers. This bargaining power of CEOs may vary depending on their relative importance for their employers. We proxy for CEO bargaining power in two ways. Firstly, we differentiate CEOs according to their role descriptions as provided by BoardEx. Secondly, we differentiate CEOs according to their level of pay relative to other CEOs in our sample. More important CEOs should have more bargaining power resulting in a higher ability to pass the bill of an increase in effective top marginal tax rates to their employers.

BoardEx provides information on the role of directors. An executive director is a full time employed individual who is on the company board. On the contrary a supervisory director is any member of a company's board who is not employed at the company. It is thus plausible to expect, that executive directors are more influential than supervisory directors and as a result should be able to shift a larger part of any additional tax burden to the employer. Table 8 presents regression results from a sample split, where the sample in column (1) consists of only supervisory directors, the sample in column (2) consists of only executive directors and the sample in column (3) consists of CEOs - defined as the highest paid executive director of each firm - repeating the result from table 7 column 6.

Our results are in line with our expectations. For supervisory directors we find no significant coefficient on the effective top marginal tax rate in column (1). On the contrary the coefficient of -0.363 in column (2) for the sample of executive

Table 8: Panel regressions of the level of director compensation on effective top marginal tax rates, 2003-2013: Using the sample split method

Dependent Variable: Ln(Compensation/PPP)	Fixed effect regression		
	Supervisory Director (1)	Executive Director (2)	CEO (3)
Ln(1-TopMTR)	0.410	-0.363**	-0.475***
	(0.297)	(0.161)	(0.146)
Other controls	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Industry dummies	-	-	-
Country dummies	-	-	-
Firm fixed effects	Yes	Yes	Yes
Cluster robust se by	country	country	country
Observations	160,010	40,694	17,256
Adjusted R-squared	0.539	0.764	0.799

directors is significant, but below the coefficient of -0.475 in column (3) for the CEO sample. The bargaining power of executive directors is already great enough to shift part of an additional tax burden to their employers, while this is not the case for supervisory directors.

Pay is a proxy for the power of managers in firms (Bebchuk et al. (2002)). Again, more powerful managers should be able to shift a large part of their additional tax burden to their employers. Quantile regression is a useful tool for studying such heterogeneity (Cameron & Trivedi (2010), p. 211). We use the methodology of Parente & Silva (2016) to compute clustered standard errors and we follow Guthrie et al. (2012) in demeaning all variables to account for firm fixed effects. Table 9 presents results based on our standard regression sample as in table 7 column 6. The estimated significant coefficient on the effective top marginal tax rate increases from -0.426 for the 25 % quantile to -0.648 for the 75 % quantile. Again more powerful managers - this time measured in terms of level of pay - are able to shift a larger part of an additional tax burden to their employers.

We repeat this exercise for the nineteen quantile values $0.05, 0.10, ..., 0.95$. This time we estimate the standard errors using the bootstrap method with 400 re-samples. The results are condensed into figure 5. The estimated coefficient on

Table 9: Quantile (25%, 50%, 75%) regression of the level of CEO compensation on effective top marginal tax rates and the hypothesized control variables, 2003-2013

The dependent variable is the logarithm of CEO pay and has been transformed using the relevant constant purchasing power parity (PPP) conversion factor as of 2011. The explanatory variable and all firm control variables are measured at the end of the previous fiscal year. Columns (1) - (3) include year dummies and firm fixed effects by demeaning all variables. Robust standard errors clustered by country are in parentheses. ***, **, * denote that the coefficient is significant at the 1%, 5%, and 10% levels, respectively.

Dependent Variable:	QUANTILE REGRESSION		
Ln(CEO pay/PPP)	25%	50%	75%
	(1)	(2)	(3)
Ln(1-TopMTR)	-0.426***	-0.565***	-0.648***
	(0.099)	(0.148)	(0.190)
Other controls	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Industry dummies	-	-	-
Country dummies	-	-	-
Firm fixed effects	Yes	Yes	Yes
Cluster robust se by	country	country	country
Observations	17,256	17,256	17,256
R-squared	0.041	0.041	0.040

the effective top marginal tax rate is represented by the solid line. While the coefficient is negative for all quantiles, it increases in absolute value. Our baseline result - represented by the dashed line - from column 6 in table 7 corresponds approximately to the 45 % quantile. The shadowed area represents the confidence interval of the estimated coefficients, which are all significant above the 20 % quantile. Figure 5 confirms the conclusion, that more powerful managers are able to shift a larger part of an additional tax burden to their employers.

4.4   Robustness

In the following we present several robustness checks for our baseline results as presented in table 7 columns 6. Table 10 uses different ways to transform the dependent variable CEO pay. Our preferred transformation relying on purchasing power parities, which are less sensitive to exchange rate fluctuations, is repeated in column (1). In (2) we instead transform regional CEO pay to USDs for the sake of comparability. In column (3) we additionally deflate the USD values to

Figure 5: Quantile regression, OLS and confidence interval
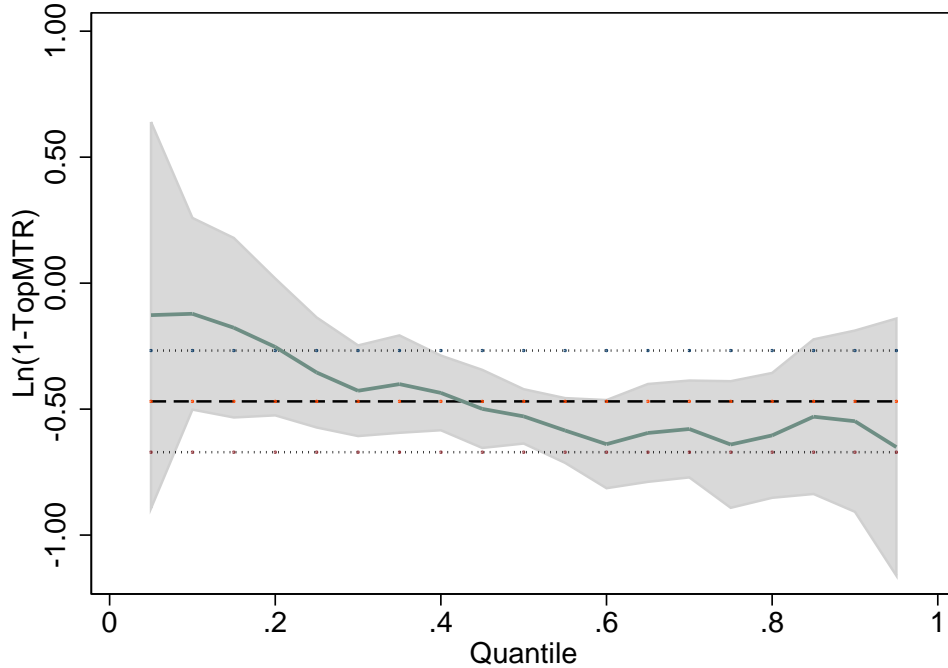
the base year 2005 using the GDP deflator provided by the Worldbank. Our results are robust to these changes.

In table 11 we use additional controls. In column (1) we add the corporate tax rate. If CEO pay is performance based, a higher corporate tax rate may result in less pay. However, the corporate tax rates proves to be insignificant. In column (2) we use firm value instead of firm sales as a proxy for firm size and we control for the return on assets as well as its standard deviation. We find no change in the result for the effective top marginal tax rate coefficient. In column (3) we control for institutional ownership, which results in a significant drop of sample size. We expect that institutions will press for tighter links between pay and shareholder performance (which will generally raise pay), and therefore we expect a positive relation between CEO pay and institutional (Fernandes et al. (2013)). Indeed the coefficient on institutional ownership is positive. Again, the result

28

Table 10: Panel regression of CEO pay on effective top marginal tax rates, transforming CEO pay in USD using market exchange rates

In column (1) the dependent variable has been transformed using the relevant purchasing power parity (PPP) conversion factor as of 2011 and in columns (2) - (3) all monetary values are presented in USD using the relevant market exchange rate. In column (3) all monetary values have been transformed using the relevant GDP deflator (=GDPcurrent/GDPconstant). All regressions include time dummies and firm fixed effects. The explanatory variable and all firm control variables are measured at the end of the previous fiscal year. The robust standard errors in parentheses are clustered by country. ***, **, *, ^{a} denote that the coefficient is significant at the 1%, 5%, 10% and 16% levels, respectively.

Dependent Variable:		Fixed-effect Regressions	
Ln(CEO pay/...)	PPP	USD	USD/GDPdefl.
	(1)	(2)	(3)
Ln(1-TopMTR)	-0.475***	-0.346^{a}	-0.506***
	(0.146)	(0.233)	(0.130)
Other controls	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Cluster robust se by	country	country	country
Observations	17,256	17,256	17,256
Adjusted R-squared	0.799	0.789	0.788

for the coefficient on the effective top marginal tax rate remains approximately unchanged. In column (4) we use additional country specific controls such as GDP, GDP per capita - both measured in purchasing power parities - and GDP growth. Once more the coefficient on the effective top marginal tax rate does not change essentially.

In table 12 we follow Piketty et al. (2014) and use a firm specific corporate governance index as an additional control. Due to data availability, the sample size drops by around 50 %. However, sign and significance of the effective top marginal tax rate coefficient prevails. The interaction between effective top marginal tax rate and the governance index is negative. Well governed firms allow CEOs to shift a larger part of their additional tax load to the employer. This result could occur, if CEO net pay is important for managerial effort and thus firm performance. Well governed firms should then increase gross CEO pay as a reaction to an increase in the effective top marginal tax rate.

In table 13 column (1) to (3) we use different clusters for computing standard errors. In column (1) the standard errors are clustered by firm, in column (2) by

Table 11: Panel regressions of CEO pay on effective top marginal tax rate, 2003-2013: Including different control variables

The dependent variable has been transformed using the relevant purchasing power parity (PPP) conversion factor as of 2011. The explanatory variable and all firm and country control variables are measured at the end of the previous fiscal year. Columns (1) - (4) include year and firm fixed effects and year dummies. In column (1) we add the corporate tax, in column (2) we add different firm performance variables, in column (3) we add institutional ownership variable and in columns (4) we add macro variables. Robust standard errors in parentheses are clustered by country. ***, **, * denote that the coefficient is significant at the 1%, 5%, and 10% levels, respectively.

Dependent Variable:	Ln(CEO pay/PPP)			
	(1)	(2)	(3)	(4)
Ln(1-TopMTR)	-0.453***	-0.523***	-0.608**	-0.438***
	(0.158)	(0.072)	(0.241)	(0.135)
Ln(Corporate Tax)	-0.056			
	(0.164)			
Ln(Sales in USD/GDPdefl.)	0.122***		0.110***	0.121***
	(0.012)		(0.024)	(0.013)
Leverage	-0.035	-0.010	-0.052	-0.035
	(0.051)	(0.076)	(0.049)	(0.049)
Tobin's q	0.056***		0.029***	0.056***
	(0.010)		(0.007)	(0.010)
Stock Return (RET)	0.010	-0.000	0.016	0.010
	(0.013)	(0.015)	(0.026)	(0.012)
Standard deviation of RET	-0.169**	-0.103*	-0.292***	-0.170**
	(0.065)	(0.055)	(0.086)	(0.066)
Board size	0.008	0.007	0.014**	0.009*
	(0.005)	(0.005)	(0.006)	(0.005)
Frac. of independent directors	0.173***	0.173***	0.139**	0.174***
	(0.031)	(0.031)	(0.066)	(0.030)
CEO-chairman dummy	0.049***	0.045***	0.083***	0.050***
	(0.013)	(0.011)	(0.014)	(0.012)
Avg. number of board position	0.062***	0.059***	0.083***	0.063***
	(0.011)	(0.008)	(0.012)	(0.011)
Insider ownership	-0.072*	-0.062*	-0.094	-0.071*
	(0.037)	(0.035)	(0.073)	(0.037)
CEO Age	0.026**	0.024***	0.040	0.025**
	(0.010)	(0.008)	(0.026)	(0.009)
CEO Age (square)	-0.000**	-0.000***	-0.000	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
CEO Tenure	0.001	0.001	0.003	0.001
	(0.002)	(0.002)	(0.004)	(0.002)
CEO college degree dummy	0.018	0.041*	-0.020	0.019
	(0.028)	(0.023)	(0.110)	(0.028)
Ln(Firm Value in USD/GDPdefl.)		0.065***		
		(0.005)		
Return on assets (ROA)		0.053*		
		(0.028)		
Standard deviation of ROA		-0.011		
		(0.166)		
Institutional ownership			0.281***	
			(0.077)	
Ln(GDP/PPP)				0.207***
				(0.060)
Ln(GDPPC/PPP)				-0.883
				(1.460)
GDPGrowth				-0.001
				(0.016)
Constant	5.022***	5.465***	4.873***	8.454
	(0.329)	(0.253)	(0.803)	(15.421)
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	-	-	-	-
Country dummies	-	-	-	-
Firm fixed effects	Yes	Yes	Yes	Yes
Cluster robust se by	country	country	country	country
Observations	17,256	15,998	6,776	17,256
Adjusted R-squared	0.799	0.802	0.754	0.799

Table 12: Panel regressions of the level of CEO pay on effective top marginal tax rates and Governance-Index, 2003-2013

Dependent Variable: Ln(CEO pay/PPP)	Fixed Effects Regression		
	(1)	(2)	(3)
Ln(1-TopMTR)	-0.475***	-0.807**	-0.884***
	(0.146)	(0.352)	(0.228)
Ln(1-TopMTR)	-0.475***	-0.807**	-0.884***
	(0.146)	(0.352)	(0.228)
Governance Index		-0.025**	-0.111***
		(0.009)	(0.026)
Retention Rate * Governance Index			-0.134***
			(0.043)
Firm/CEO controls	Yes	Yes	Yes
Board controls	Yes	No	No
Year dummies	Yes	Yes	Yes
Industry dummies	-	-	-
Country dummies	-	-	-
Firm fixed effects	Yes	Yes	Yes
Cluster robust se by	country	country	country
Observations	17,256	7,199	7,199
Adjusted R-squared	0.799	0.751	0.751

industry and in column (3) by country and year. The coefficient on the effective top marginal tax rate remains significant irrespective of the cluster used.

In table 14 we employ different tax rates. The top tax rate in column (1) only consists of top marginal income tax rates. In column (2) we add the VAT tax rate, and in column (3) finally social security contributions in order to arrive at the effective top marginal tax rate used in all other regressions. Results do not materially differ.

4.5   Aggregated Senior Executive Compensation

As a further robustness check we present regression results using aggregate total senior executive compensation available in Datastream/ASSET4 as the dependent variable. The advantage of using this data compared to BoardEx is the better country coverage. While we had 28 countries in our sample before, we now have aggregated senior executive compensation data from 46 countries in our sample. Figure 6 illustrates. As the disadvantage CEO pay is no longer

Table 13: Panel regressions of CEO pay on effective top marginal tax rates, 2003-2013: Clustering robust standard errors differently

The dependent variable has been transformed using the relevant purchasing power parity (PPP) conversion factor as of 2011. The explanatory variable and all firm control variables are measured at the end of the previous fiscal year. All specifications include firm fixed effects and year dummies. In columns (1) - (3) the robust standard errors in parentheses are either clustered by firm, industry or country/year. ***, **, * denote that the coefficient is significant at the 1%, 5%, and 10% levels, respectively.

Dependent Variable:	Fixed effect Regressions		
Ln(CEO pay/PPP)	(1)	(2)	(3)
Ln(1-TopMTR)	-0.475***	-0.475**	-0.475***
	(0.146)	(0.178)	(0.171)
Other controls	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Industry dummies	-	-	-
Country dummies	-	-	-
Firm fixed effects	Yes	Yes	Yes
Cluster robust se by	firm	industry	country/year
Time trend	No	No	No
Observations	17,256	17,256	17,256
Adjusted R-squared	0.799	0.799	0.799

Table 14: Panel regressions of the level of CEO compensation on taxes, 2003-2013

Dependent Variable:			
Ln(Compensation/PPP)		Fixed effect regression	
	(1)	(2)	(3)
Ln(1-TopTaxRate)	-0.448**		
	(0.173)		
Ln(1-TopMTR) without VAT		-0.495***	
		(0.169)	
Ln(1-TopMTR)			-0.475***
			(0.146)
Other controls	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Industry dummies	-	-	-
Country dummies	-	-	-
Firm fixed effects	Yes	Yes	Yes
Cluster robust se by	country	country	country
Observations	17,270	17,256	17,256
Adjusted R-squared	0.799	0.799	0.799

Figure 6: Number of observations of firms by country
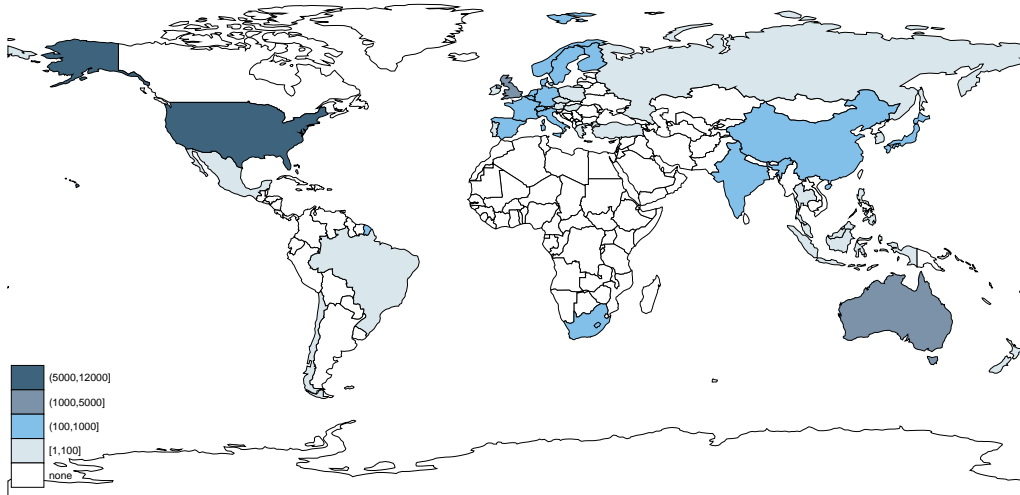
available at an individual CEO level. Datastream only provides total senior executive compensation aggregated at the firm level.

The results presented in table 15 are nearly unchanged compared to table 7 based on individual CEO pay provided by BoardEx. As in table 7, as long as we do not control for country or firm fixed effects we find consistent with Piketty et al. (2014) a negative effect of the effective top marginal tax rate on gross CEO pay. However, as soon as we include country dummies in column 5 or firm fixed effects in column 6 in table 15, the sign of the effective top marginal tax rate coefficient reverses as before. A higher effective top marginal tax rate now results in higher gross CEO pay. The estimated coefficient of -0.341 on log of one minus the effective top marginal tax rate translates into a semi-elasticity of 0.8. Precisely, an increase in the effective top marginal tax rate by 10 percentage points raises aggregate total senior executive compensation at the firm level by 8 %.

Table 15: Panel regression of aggregated senior executive compensation on effective top marginal tax rates and the hypothesized control variables, 2003-2012

The dependent variable is the logarithm of the total senior executive compensation and has been transformed using the relevant constant purchasing power parity (PPP) conversion factor. The explanatory variable and all control variables are measured at the end of the previous fiscal year. Column (1) includes year dummies, column (2) includes industry dummies, column (3) includes industry year and industry dummies, column (4) includes year and country dummies, column (5) includes industry, country and firm fixed-effects as well as year dummies, and column (6) includes year dummies and all variables are first-differenced. Robust standard errors clustered by country and year are in parentheses. ***, **, * denote that the coefficient is significant at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: Ln(Total Compensation/PPP)	ORDINARY LEAST SQUARE					FIXED EFFECT
	(1)	(2)	(3)	(4)	(5)	(6)
Ln(1-TopMTR)	1.402***	1.322***	1.300***	1.316***	-0.567**	-0.341**
	(0.241)	(0.150)	(0.150)	(0.148)	(0.221)	(0.149)
Firm performance						
Ln(Sales in USD)		0.260***	0.254***	0.263***	0.261***	0.135***
		(0.010)	(0.010)	(0.010)	(0.009)	(0.019)
Tobin's q		0.087***	0.070***	0.079***	0.069***	0.046***
		(0.008)	(0.009)	(0.007)	(0.007)	(0.009)
Stock Return (RET)		0.080***	0.153***	0.084***	0.073***	0.043***
		(0.024)	(0.035)	(0.025)	(0.017)	(0.012)
Standard deviation of RET		0.102	-0.065	0.039	0.089	-0.276***
		(0.070)	(0.097)	(0.069)	(0.056)	(0.057)
Board structure						
Board size		0.048***	0.046***	0.045***	0.058***	0.022***
		(0.005)	(0.005)	(0.005)	(0.005)	(0.003)
CEO-chairman dummy		0.149***	0.134***	0.156***	0.058***	0.072***
		(0.023)	(0.024)	(0.022)	(0.017)	(0.020)
Frac. of independent directors		0.742***	0.769***	0.724***	0.277***	0.077**
		(0.081)	(0.081)	(0.081)	(0.039)	(0.035)
Economic growth						
GDPGrowth		-6.829***	-6.017***	-6.826***	-0.242	0.400
		(1.494)	(1.056)	(1.479)	(0.677)	(0.497)
Constant	16.942***	11.681***	12.259***	11.757***	10.240***	12.857***
	(0.217)	(0.188)	(0.179)	(0.192)	(0.182)	(0.303)
Year dummies	No	Yes	No	Yes	Yes	Yes
Industry dummies	No	No	Yes	Yes	No	-
Country dummies	No	No	No	No	Yes	-
Firm fixed effects	No	No	No	No	No	Yes
Cluster robust se by	country/year	country/year	country/year	country/year	country/year	country/year
Observations	21,645	16,937	16,937	16,937	16,937	16,937
Adjusted R-squared	0.0737	0.418	0.415	0.426	0.491	0.174

34

5 Conclusion

An increase in the effective top marginal tax rate by 10 percentage points raises gross CEO pay at the firm level by 12.0 %. If gross CEO pay is 10 million USD and the effective top marginal tax rate 40 %, net CEO income is 6 million USD. Increasing the effective top marginal tax rate by 10 percentage points to 50 % results in an increase in gross CEO pay by 12.0 % as a reaction. CEO pay increases from 10 million USD to 11.2 million USD. Net CEO income then is - given the new effective top marginal tax rate of 50 % - 5.6 million USD. Compared to the pre reform scenario net CEO pay decreases by 0.4 million USD. CEOs bear 25 % of the tax rate increase. 75 % of the effective top marginal tax rate increase is borne by the employer, since gross CEO pay increases by 1.2 million USD. The ability to shift an additional tax load to their employer is less pronounced for executive directors and even zero for supervisory directors.

An increase in the effective top marginal tax rate as a policy tool to limit the evolution of increasing inequality driven by the rise of top executive compensation has thus several implications. With respect to CEOs the effect on their net income is rather modest, since they only bear 25 % of the tax rate increase. Most of the tax load - 75 % - is instead borne by the shareholders of their employers. This conclusion is different for executive directors or supervisory directors as members of the executive board. Due to less bargaining power they bear are larger part (executive directors) or even the complete (supervisory directors) burden of the tax rate increase.

A   Appendix

A.1   Variable definition and data source

Table 16: Variable Definitions and Data Sources

Panel A: Total Senior Executive Compensation	
Variable	Definition & Source
CEO pay, PPP (constant 2011 international $)	is the sum of direct and equity linked compensation, D.C. pensions and other compensation. Direct compensation is the sum of all cash paid compensation for the period (Direct Compensation item). Equity linked compensation is the sum of shares awarded, estimated value of options awarded and LTIPs awarded in the period selected (Equity Linked item). LTIPs is the sum of all cash, equity, equity matched and option plans awarded or held. The maximum performance is achieved and the total award granted. Options plans are valued using the estimation value of options awarded, which is a prediction of the value of the options awarded during the period based on the latest closing stock price using the Generalised Black Scholes option pricing model. D.C. Pensions are the employer's contribution towards the director's pension scheme (D.C. Pension item). Other compensation are other ad hoc direct payments such as relocation costs, fringe benefits (Other item).We transform the compensation data with the relevant constant purchasing power parity (PPP) factor as of 2011. We winsorize the compensation data at the 1% and 99% levels. Source: BoardEx/Compensation Data

Continued on next page

Table 16 – Continued from previous page

CEO (Chief Executive Officer)	We define the executive director with the highest total compensation as the CEO of the company. The notation of the highest ranked director varies across countries e.g. in British English MD (Managing director) stands for the highest ranking corporate officer and in American English CEO stands for the highest ranking corporate officer, MD is associated with a lower position. This makes it impossible to identify the CEO by the director role.
Panel B: Tax rates	
Net of effective top marginal tax rate	is defined as one minus the effective top marginal tax rate varying over time and country. The effective top marginal tax rate combines the top individual income tax rate, uncapped social security contributions and value-added taxes. Source: PWC, EY, KPMG, OECD, European Tax Handbooks
Panel C: Firm performance	
Sales, GDPdeflator (constant 2005 USD)	is the logarithm of net sales or revenue in 1000 US\$ (WC01001). We transform sales with the relevant GDP deflator and winsorize the data at the 1% and 99% levels. Source: Datastream/Worldscope item
Leverage	is the ratio of total debt (WC03255) to the total assets (WC02999). We winsorize the data at the 1% and 99% levels. Source: Datastream/Worldscope

Table 16 – Continued from previous page

Tobin's Q	is the ratio of the total assets (WC02999) plus the market value of equity (WC08001) minus the book value of equity (WC03501) to the total assets (WC02999). We winsorize the data at the 1% and 99% levels.
	Source: Datastream/Worlscope item
Stock Return (RET)	is a percentual calculation of the differences per year of the Return Index (RI). The return index (RI) presents the theoretical growth in value of a notional stock holding, the price of which is that of the selected price index. This holding is deemed to return a daily dividend, which is used to purchase new units of the stock at the current price. The gross dividend is used. We winsorize the data at the 1% and 99% levels.
	Source: Datastream
Std.dev.RET	is the annual standard deviation of daily percentage stock returns multiplied by the square of 250 (trading days). We winsorize the data at the 1% and 99% levels.
Total Firm Value	is the logarithm of debt plus equity calculated as the sum of market value (MV) and total assets (WC02999) or total liabilities and shareholders' equity (WC03999) minus total Common Equity (WC03501) and deferred taxes (WC03263). We winsorize the data at the 1% and 99% levels.
	Source: Datastream/Worldscope item

Table 16 – Continued from previous page

Return on Assets (ROA)	is the ratio of earnings before interest and taxes (EBIT) (WC18191) to the total assets (WC02999). We winsorize the data at the 1% and 99% levels.
	Source: Datastream/Worldscope item
Std.dev.ROA	is the std dev. of annual percentage corporate return on assets for the prior five years. We winsorize the data at the 1% and 99% levels.

Panel D: Board and Ownership structure

Board size	is the total number of board members (Total number of board members).
	Source: BoardEx/Org. Analysis Averages Data
CEO-Chairman-dummy	is an indicator variable if the CEO simultaneously chairs the board. If the director role includes both CEO and Chairman the variable is set to be 1 and otherwise 0.
	Source: BoardEx Data
Frac. of independent directors	is the percentage of independent board members reported by company. The number of independent director (director role) divided by the total number of board members. We winsorize the data at the 1% and 99% levels.
	Source: BoardEx Data
Average number of board position	is the total number of current board positions in other publicly listed companies by board members (Current Boards Quoted item) divided by board size (Total number of board members).
	Source BoardEx/Director profiles/Characteristics Data, BoardEx/Org. Analysis Averages Data

Table 16 – Continued from previous page

Insider Ownership	is the fraction of the number of closely held shares (held by insider) of the outstanding common shares. Share held by officers, directors, and their immediately families, other corporations or individuals who hold at least 5% (WC08021). We winsorize the data at the 1% and 99% levels.
	Datastream/Worldscope
Institutional Ownership	is the fraction of institutional ownership of the outstanding common shares. We winsorize the data at the 1% and 99% levels.
	Source: FactSet/Lionshares/Ownership 2.0

Panel E: CEO characteristics	
CEO Age	is the age of the CEO in years (Age item).
	Source: BoardEx/Director Profile/Characteristics
CEO Tenure	is the sum of the historic and current time as CEO in the period selected (Start/End Date item).
	Source: BoardEx/Director Profile/Current/Historic Board Role
CEO college degree dummy	is a dummy variable if the CEO has at least a bachelor degree the variable is set to be 1 and otherwise 0. All qualifications have been analyzed whether the qualification is equivalent to a bachelor degree or not (Qualification item).
	Source: BoardEx/Director Profile/Education

Panel F: Country characteristics	
GDP, PPP (constant 2011 international $)	PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates.

Table 16 – Continued from previous page

	Source: World Bank's World Development Indicators
GDPPC, PPP (constant 2011 international $)	GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates.
	Source: World Bank's World Development Indicators
GPDGrowth	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2005 U.S. dollars.
	Source: World Bank's World Development Indicators

A.2 Effective top marginal tax rate data

The effective top marginal tax rates includes the top marginal income tax rate, the VAT rate and social security contributions. We assume that all top executives fall into the top tax bracket and face the constant effective top marginal tax rate. The top income tax rate includes federal or national tax rates as well as local, state, cantonal or/and municipal taxes. Local taxes are significantly high in some countries like Finland, Sweden or Switzerland were the main tax burden comes from local tax rates. The data is retrieved from *KPMG (2010, 2012)*, *OECD (annual)*, *EY (annual)*, **?**, and European Tax Handbooks, various editions. We add VAT tax rates and social security contributions extracted from *KPMG (2010, 2012)*, *OECD (annual)*, *EY (annual)*, **?**, and European Tax Handbooks, various editions.

A.3 Summary statistics

Table 17: Summary statistics for senior executive compensation and its hypothesized determinants

The table reports the summary statistics of total senior executive compensation, net-of-tax-rate, firm performance, corporate governance and macroeconomic variables for 16,937 firm-years over the period 2003 to 2012. We obtain the compensation and board data from Datastream/ASSET4 ESG, the firm performance data from Datastream/Worldscope and the macroeconomic data from World Bank. We transform the dependent variable with the relevant constant purchasing power parity (PPP) conversion factor. Total senior executive compensation is the sum of fixed compensation, bonus, fringe benefits, stock awards value, restricted stocks, stock options as reported by the company. The explanatory variable is one minus the effective top marginal tax rate, which is called the net-of-tax-rate. Following *Kleven et al. (2013)*, the effective top marginal tax rate includes the top personal income tax rate, the uncapped social security contributions, and the value-added taxes. The explanatory variable and all control variables are measured at the company's fiscal year end of the previous year.

Variables	Mean	Std Dev.	Min.	25% Percentile	Median	75% Percentile	Max.	Skewness	Kurtosis
Panel A: Total Senior Executive Compensation									
Total executive compensation/PPP ($ million)	$15.919	$17.277	$0.392	$4.750	$10.394	$20.399	$101.912	2.47	10.55
Panel B: Net Top tax rate									
1-TopMTR	52%	10%	26%	45%	53%	57%	85%	0.50	5.22
Panel C: Firm performance									
Ln(Sales/PPP) ($ million)	$9334.849	$16769.538	$ 0.014	$1098.70	$3094.47	$8919.31	$90772.14	3.23	13.98
Tobins'q	178%	114%	68%	108%	139%	202%	787%	2.60	11.37
Stock Return (RET)	19%	53%	-77%	-13%	13%	39%	258%	1.54	7.51
Std. dev. of RET	37%	19%	0%	24%	32%	44%	121%	1.65	6.54
Panel D: Board structure									
Board Size	10.36	3.28	1.00	8.00	10.00	12.00	33.00	1.01	5.30
CEO-Chairman dummy	0.33	0.47	0.00	0.00	0.00	1.00	1.00	0.72	1.51
Frac. of independent directors	58%	27%	1%	38%	64%	82%	93%	-0.54	2.02
Panel E:Economic growth									
GDPGrowth	2%	3%	-9%	1%	02%	3%	15%	-0.11	5.40

43

REFERENCES

Atkinson, A. B. & Stiglitz, J. E. (1980), *Lectures on public economics*, MacGraw-Hill.

Bebchuk, L. A., Fried, J. M. & Walker, D. I. (2002), 'Managerial Power and Rent Extraction in the Design of Executive Compensation', *The University of Chicago Law Review* **69**, 751–846.

Bingley, P. & Lanot, G. (2002), 'The incidence of income tax on wage and labour supply', *Journal of Public Economics* **83**, 173–194.

Cameron, A. C. & Trivedi, P. K. (2010), *Microeconometrics Using Stata*, revised edn, Stata Press.

Egger, P. & Radulescu, D. M. (2011), 'Labor Taxation and Foreign Direct Investment', *The Skandinavian Journal of Economics* **113(3)**, 603–636.

EY (annual), *Worldwage Personal Tax Guides*.

Feldstein, M. (1999), 'Tax Avoidance and the Deadweight Loss of the Income Tax', *The Review of Economics and Statistics* **81(4)**, 674–680.

Feldstein, M. & Wrobel, M. V. (1998), 'Can state taxes redistribute income?', *Journal of Public Economics* **68(3)**, 369–396.

Fernandes, N., Ferreira, M. A., Matos, P. & Murphy, K. J. (2013), 'Are U.S. CEOs Paid More? New International Evidence', *Review of Financial Studies* **26(2)**, 323–367.

Frydman, C. & Molloy, R. S. (2011), 'Does tax policy affect executive compensation? Evidence from postwar tax reforms', *Journal of Public Economics* **95(11-12)**, 1425–1437.

Goolsbee, A. (2000), 'What Happens When You Tax the Rich? Evidence from Executive Compensation', *Journal of Political Economy,* **108(2)**, 352–378.

Guthrie, K., Sokolowsky, J. & Wan, K.-M. (2012), 'CEO Compensation and Board Structure Revisited', *Journal of Finance* **67(3)**, 1149–1168.

Hall, B. J. & Liebman, J. B. (2000), 'The Taxation of Executive Compensation', *Tax Policy and the Economy* **14**, 1–44.

Hermalin, B. E. & Wallace, N. E. (2001), 'Firm performance and executive compensation in the savings and loan industry', *Journal of Financial Economics* **61(1)**, 139–170.

Kleven, H. J., Landais, C. & Saez, E. (2013), 'Taxation and International Migration of Superstars: Evidence from the European Football Market', *American Economic Review* **103(5)**, 1892–1924.

Kleven, H. J., Landais, C., Saez, E. & Schultz, E. (2014), 'Migration and wage effects of taxing top earners: Evidence from the foreigners' tax scheme in denmark', *The Quarterly Journal of Economics* **129(1)**, 333–378.

KPMG (2010, 2012), *Individual Income Tax and Social Security Rate Survey.*

Kubik, J. D. (2004), 'The incidence of personal income taxation: evidence from the tax reform act of 1986', *Journal of Public Economics* **88**, 1567–1588.

Murphy, K. J. (2013), Executive Compensation: Where We Are, and How We Got There, *in* G. M. Constantinides, M. Harris & R. M. Stulz, eds, 'Handbook of the Economics of Finance', Vol. 2A, (Elsevier, Amsterdam, North Holland).

OECD (annual), *Taxing wages*, OECD, Paris.

Parente, P. & Silva, J. S. (2016), 'Quantile Regression with Clustered Data', *Journal of Econometric Methods* **forthcoming**.

Piketty, T. & Saez, E. (2014), 'Inequality in the long run', *Science* **344(6186)**, 838–843.

Piketty, T., Saez, E. & Stantcheva, S. (2014), 'Optimal Taxation of Top Labor Income: A Tale of Three Elasticities', *American economic journal: economic policy* **6(1)**, 230–271.

Saez, E., Slemrod, J. & Giertz, S. H. (2012), 'The Elasticity of Taxable Income with Respect to Marginal Tax Rates: A Critical Review', *Journal of Economic Literature* **50 (1)**, 3–50.

Slemrod, J. (1996), High-Income Families and the Tax Changes of the 1980s: The Anatomy of Behavior Response, *in* 'Empirical Foundations of Household Taxation', University of Chicago Press Martin Feldstein and James Poterba.

Slemrod, J. & Kopczuk, W. (2002), 'The optimal elasticity of taxable income', *Journal of Public Economics* **84**, 91–112.

Oxford University Centre for Business Taxation
Working Paper series recent papers

WP 15/26 Eric Orhn *The corporate investment response to the domestic production activities deduction*

WP 15/25 Li Liu *International taxation and MNE investment: evidence from the UK change to territoriality*

WP 15/24 Edward D Kleinbard *Reimagining capital income taxation*

WP 15/23 James R Hines Jr, Niklas Potrafke, Marina Riem and Christoph Schinke *Inter vivos transfers of ownership in family firms*

WP 15/22 Céline Azémar and Dhammika Dharmapala *Tax sparing agreements, territorial tax reforms, and foreign direct investment*

WP 15/21 Wei Cui *A critical review of proposals for destination-based cash-flow corporate taxation as an international tax reform option*

WP 15/20 Andrew Bird and Stephen A Karolyi *Governance and taxes: evidence from regression discontinuity*

WP 15/19 Reuven Avi-Yonah *Reinventing the wheel: what we can learn from the Tax Reform Act of 1986*

WP 15/18 Annette Alstadsæter, Salvador Barrios, Gaetan Nicodeme, Agnieszka Maria Skonieczna and Antonio Vezzani *Patent boxes design, patents,location and local R&D*

WP 15/17 Laurent Bach *Do better entrepreneurs avoid more taxes?*

WP 15/16 Nadja Dwenger, Frank M Fossen and Martin Simmler *From financial to real economic crisis: evidence from individual firm–bank relationships in Germany*

WP 15/15 Giorgia Maffini and John Vella *Evidence-based policy-making? The Commission's proposal for an FTT*

WP 15/14 Clemens Fuest and Jing Xing *How can a country 'graduate' from procyclical fiscal policy? Evidence from China?*

WP 15/13 Richard Collier and Giorgia Maffini *The UK international tax agenda for business and the impact of the OECD BEPS project*

WP 15/11 Irem Guceri *Tax incentives and R&D: an evaluation of the 2002 UK reform using micro data*

WP 15/10 Rita de la Feria and Parintira Tanawong *Surcharges and penalties in UK tax law*

WP 15/09 Ernesto Crivelli, Ruud de Mooij, Michael Keen *Base erosion, profit-shifting and developing countries*

WP 15/08 Judith Freedman *Managing tax complexity: the institutional framework for tax policy-making and oversight*

WP 15/07 Michael P Devereux, Giorgia Maffini and Jing Xing *Corporate tax incentives and capital structure: empirical evidence from UK tax returns*

WP 15/06 Li Liu and Ben Lockwood *VAT notches*

WP 15/05 Clemens Fuest and Li Liu *Does ownership affect the impact of taxes on firm behaviour? Evidence from China.*

WP 15/04 Michael P Devereux, Clemens Fuest and Ben Lockwood *The taxation of foreign profits: a unified view*

WP 15/03 Jitao Tang and Rosanne Altshuler *The spillover effects of outward foreign direct investment on home countries: evidence from the United States*

WP 15/02 Juan Carlos Suarez Serrato and Owen Zidar *Who benefits from state corporate tax cuts? A local labour markets approach with heterogeneous firms*

WP 15/01 Ronald B Davies, Julien Martin, Mathieu Parenti and Farid Toubal *Knocking on Tax Haven's Door: multinational firms and transfer pricing*

WP 14/27 Peter Birch Sørensen *Taxation and the optimal constraint on corporate debt finance*

WP 14/26 Johannes Becker, Ronald B Davies and Gitte Jakobs *The economics of advance pricing agreements*

WP 14/25 Michael P Devereux and John Vella *Are we heading towards a corporate tax system fit for the 21st century?*

WP 14/24 Martin Simmler *Do multinational firms invest more? On the impact of internal debt financing on capital accumulation*

WP 14/23 Ben Lockwood and Erez Yerushalmi *Should transactions services be taxed at the same rate as consumption?*

WP 14/22 Chris Sanchirico *As American as Apple Inc: International tax and ownership nationality*

WP 14/19 Jörg Paetzold and Hannes Winner *Taking the High Road? Compliance with commuter tax allowances and the role of evasion spillovers*

WP 14/18 David Gamage *How should governments promote distributive justice?: A framework for analyzing the optimal choice of tax instruments*

WP 14/16 Scott D Dyreng, Jeffrey L Hoopes and Jaron H Wilde *Public pressure and corporate tax behaviour*

WP 14/15 Eric Zwick and James Mahon *Do financial frictions amplify fiscal policy? Evidence from business investment stimulus*

WP 14/14 David Weisbach *The use of neutralities in international tax policy*

WP 14/13 Rita de la Feria *Blueprint for reform of VAT rates in Europe*

WP 14/12 Miguel Almunia and David Lopez Rodriguez *Heterogeneous responses to effective tax enforcement: evidence from Spanish firms*

WP 14/11 Charles E McLure, Jack Mintz and George R Zodrow *US Supreme Court unanimously chooses substance over form in foreign tax credit*

WP 14/10 David Neumark and Helen Simpson *Place-based policies*

WP 14/09 Johannes Becker and Ronald B Davies *A negotiation-based model of tax-induced transfer pricing*

WP 14/08 Marko Koethenbuerger and Michael Stimmelmayr *Taxing multinationals in the presence of internal capital markets*

WP 14/07 Michael Devereux and Rita de la Feria *Designing and implementing a destination-based corporate tax*

WP 14/05 John W Diamond and George R Zodrow *The dynamic economic effects of a US corporate income tax rate reduction*

WP 14/04 Claudia Keser, Gerrit Kimpel and Andreas Oesterricher *The CCCTB option – an experimental study*

WP 14/03 Arjan Lejour *The foreign investment effects of tax treaties*

WP 14/02 Ralph-C. Bayer Harald Oberhofer and Hannes Winner *The occurrence of tax amnesties: theory and evidence*

WP14/01 Nils Herger, Steve McCorriston and Christos Kotsogiannisz *Multiple taxes and alternative forms of FDI: evidence from cross-border acquisitions*

WP13/25 Michael Devereux, Niels Johannesen and John Vella *Can taxes tame the banks? Evidence from European bank levies*

WP13/24 Matt Krzepkowski *Debt and tax losses: the effect of tax asymmetries on the cost of capital and capital structure*

WP13/23 Jennifer Blouin, Harry Huizinga, Luc Laeven, Gaëtan Nicodème *Thin capitalization rules and multinational firm capital structure*

WP13/22 Danny Yagan *Capital tax reform and the real economy: the effects of the 2003 dividend tax cut*

WP13/21 Andreas Haufler and Christoph Lülfesmann *Reforming an asymmetric union: on the virtues of dual tier capital taxation*

WP13/20 Michael Blackwell *Do the haves come out ahead in tax litigation? An empirical study of the dynamics of tax appeals in the UK*

WP13/19 Johannes Becker and Ronald B Davies *Learning and international policy diffusion: the case of corporate tax policy*

WP13/18 Reuven S Avi-Yonah *And yet it moves: taxation and labour mobility in the 21ˢᵗ century*

WP13/17 Anne Brockmeyer *The investment effect of taxation: evidence from a corporate tax kink*

WP13/16 Dominika Langenmayr and Rebecca Lesterz *Taxation and corporate risk-taking*

WP13/15 Martin Ruf and Alfons J Weichenrieder *CFC legislation, passive assets and the impact of the ECJ's Cadbury-Schweppes decision*

WP13/14 Annette Alstadsæter and Martin Jacob *The effect of awareness and incentives on tax evasion*

WP13/13 Jarkko Harju and Tuomos Matikka *The elasticity of taxable income and income-shifting between tax bases: what is "real" and what is not?*

WP13/12 Li Liu and Andrew Harper *Temporary increase in annual investment allowance*

WP13/11 Alan J Auderbach and Michael P Devererux *Consumption and cash-flow taxes in an international setting*

WP13/10 Andreas Haufler and Mohammed Mardan *Cross-border loss offset can fuel tax competition*

WP13/09 Ben Lockwood *How should financial intermediation services be taxed?*

WP13/08 Dominika Langenmayr, Andreas Haufler and Christian J bauer *Should tax policy favour high or low productivity firms?*

WP13/07 Theresa Lohse and Nadine Riedel *Do transfer pricing laws limit international income shifting? Evidence from European multinationals*

WP13/06 Ruud de Mooij and Jost Heckemeyer *Taxation and corporate debt: are banks any different?*

WP13/05 Rita de la Feria *EU VAT rate structure: towards unilateral convergence?*

WP13/04 Johannes Becker and Melaine Steinhoff *Conservative accounting yields excessive risk-taking - a note*

WP13/03 Michael P.Devereux, Clemens Fuest, and Ben Lockwood *The Taxation of Foreign Profits: a Unified View*

WP13/02 Giorgia Maffini *Corporate tax policy under the Labour government 1997-2010*

WP13/01 Christoph Ernst, Katharina Richter and Nadine Riedel *Corporate taxation and the quality of research & development*