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Are Elasticities of Taxable Income Rising?

by Alexander Klemm, Li Liu, Victor Mylonas, and Philippe Wingender

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Prepared by Alexander Klemm, Li Liu, Victor Mylonas, and Philippe Wingender

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Abstract

This paper assesses a possible explanation for the global downward trend in top personal income tax rates over the last decades: globalization and the related tax evasion and avoidance opportunities could have raised elasticities of taxable income, which would imply lower optimal tax rates. The paper estimates elasticities of taxable income for top income earners using a large sample of economies and years with a common method, allowing an analysis of trends in such elasticities. The paper finds that elasticities do not appear to exhibit any clear pattern over the years. The downward trend in tax rates must have other possible explanations, which are briefly discussed.

JEL Classification Numbers: H21; H24

Keywords: Optimal tax; Elasticity of taxable income; Tax Progressivity; Progressive Taxation.

Authors' E-Mail Addresses: aklemm@imf.org; lliu@imf.org; vmylonas@imf.org; pwingender@imf.org.

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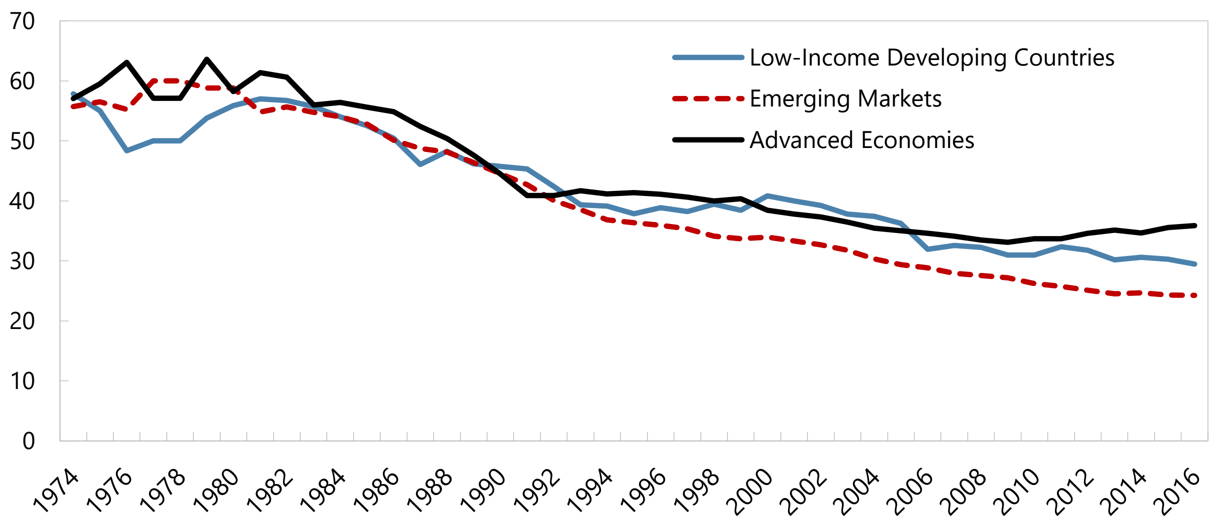
I. Introduction

Top personal income tax rates have been falling on average over the last few decades (Figure 1) and more comprehensive measures of progressivity have also revealed declining trends (IMF, 2017). What might explain this? According to optimal tax theory (Mirrlees, 1971, Piketty and Saez, 2013), a benevolent social planner would choose, all else equal, a lower top income tax rate: (i) the greater the elasticity of taxable income (ETI), (ii) the smaller the share of income earned by the highest-paid individuals, and (iii) the greater the weight placed on the marginal welfare of high-income individuals.

Figure 1. Top Personal Income Tax Rates (in percent)



Source: FAD Tax Policy Rates Database.

This paper focuses on the first channel that could explain the decrease in top income tax rates over the last few decades, namely an increasing ETI. Various developments make an increase in the ETI plausible. As a result of globalization and technological progress—in particular reduced financial transaction and information costs—well-off individuals are likely to have enhanced and cheaper access to international tax planning. Some high-earning individuals may be internationally mobile and can change their residence to low-tax jurisdictions. In addition, the decline in corporate income tax rates, in response to tax competition, may have created an incentive for shifting personal income into corporate income for tax purposes (Box 1).

Whether tax elasticities really increased is a question that this paper addresses. The existing empirical literature does not reveal a clear trend in elasticities, as most papers focus on one particular reform only or, at best, various reforms in one economy. This paper instead estimates a large number of elasticities for top income earners, from a sample of over 35 economies and more than three decades. This allows an analysis of trends and reveals the great variability in elasticities that can be obtained from different reforms. To ensure the best possible comparability across economies and time, we use one single data source for income and common methods of estimation. Based on this approach, we find no trend in estimated elasticities for top income earners over time.

While tax elasticities are the main topic of this paper, we also discuss other possible changes that would imply a reduction in the top personal income tax rate under optimal tax theory. We do not find evidence of a declining share of income earned by high-income individuals or of society being less concerned about inequality and redistribution and, thus, conclude that there must be other reasons behind the observed decline in personal income tax rates.
The rest of this paper is structured as follows. Section II briefly describes the optimal tax framework, the literature that underlies it, and related empirical results. Section III describes the data and estimation methodology. Section IV shows and discusses the estimated elasticities and their development over time, along with other determinants of optimal tax rates. Section V concludes.

II. Background and Related Literature

A. Optimal Income Tax Theory

Because workers respond to increasing marginal tax rates by reducing their earnings, the deadweight loss from a distortionary tax must be weighed against the value of the additional revenues collected. Modern optimal income tax theory builds on the seminal contribution of James Mirrlees, who formalized the problem of a utilitarian government that seeks to raise income tax revenues from a population with different skills and income levels (Mirrlees, 1971). Diamond (1998) and Saez (2001) showed that optimal marginal tax rates can be calculated using only a few parameters describing the observed income distribution, the government's taste for redistribution and the ETI, i.e., how responsive the tax base is to small changes in marginal tax rates. Optimal marginal tax rates generally vary by income level and are typically U-shaped, meaning they are highest at the bottom of the income distribution (implying high phase-out rates of transfers), lowest in the middle, and increasing above the modal income level, along with the redistributive motive.

The standard formulation of the optimal tax problem considered a static environment in which individuals of different skills only decide how much to earn. These modelling assumptions impose some constraints that matter from a policy perspective. An important extension developed by Saez (2002) and others was to add an extensive margin to labor supply. In these models, not only will individuals work less when faced with a higher marginal tax rate, but some of them will also drop out of the labor force entirely if their consumption level is too low compared to the welfare transfer. Such extensions to the Mirrlees model (e.g., Jacquet, Lehmann, and Van der Linden (2013) or Zoutman, Jacobs, and Jongen (2013)) still retain an optimally U-shaped pattern of marginal tax rates. The optimal schedule is then characterized by an earned income credit (transfer only available to working individuals) that is phased out quite rapidly, in addition to the basic transfer available to everybody (in the intensive-margin-only Mirrlees model).

Other dimensions of heterogeneity have also been considered. Kleven, Kreiner, and Saez (2009) study the optimal taxation of couples where labor supply decisions are jointly made by both spouses. Recent studies have also generalized the standard formulation of optimal tax rates by adding capital income and the possibility of shifting between capital and labor income (Piketty, Saez, and Stantcheva, 2014). Piketty and Saez (2013) derive elasticity-based optimal tax schedules in a dynamic setting with individual savings and bequests. Other papers have also relaxed the assumption of fixed wages and considered the optimal schedule in a general equilibrium context (Sachs, Tsyvinski, and Werquin, 2016).

Despite some of the limitations, the standard Mirrlees model offers a very helpful framework for guiding policy and can easily be applied to the data. As discussed above, the optimal tax schedule can be derived from the ETI, the distribution of income, and preferences about income inequality. In particular, the optimal top rate (t^*) can be derived by simplifying the general expression to a linear tax problem. Saez (2001) shows that it can be calculated based on the following formula:

$$t^* = \frac{(1-g)}{(1-g+ae)} \tag{1}$$

where a is the parameter of the Pareto distribution assumed to characterize the distribution of top incomes, e is the ETI, and g is the marginal social welfare weight on high-income earners. Intuitively, this parameter quantifies the value to society of changing the consumption of the richest individuals by one unit. An alternative interpretation is the answer to the question "How much revenue would the government be willing to forgo for a one-unit increase in the income of the highest earners?" (IMF, 2013). If the marginal welfare weight on high income earners is set to zero (the revenue-maximizing case), the formula simplifies to:

$$t^* = \frac{1}{1+ae} \tag{2}$$

Box 1. The Role of Corporate Income Taxes

The corporate income tax plays an important role in enforcing the taxation of labor income:

1. While dividends can easily be taxed at the shareholder level, taxing reinvested earnings would be difficult without a tax at the corporate level.[a]
2. Corporate taxation mitigates arbitrage in response to taxation of entrepreneurial income, because distinguishing labor income from capital income can be difficult (or impossible) when individuals can freely choose the form through which they declare their income (IMF, 2014).

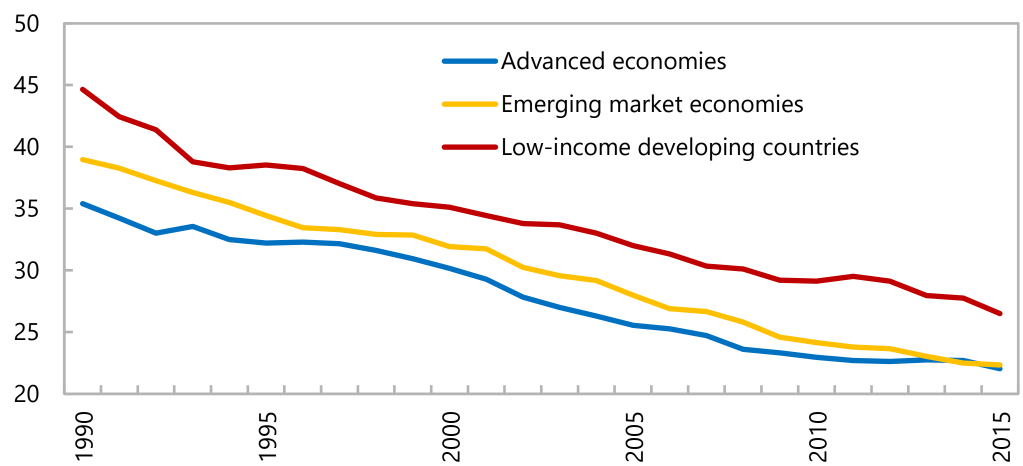
When the PIT base can be shifted to some alternative tax base that is taxed at a lower rate (such as corporate income), the optimal tax theory previously discussed implies that the optimal tax rate on personal income rises with the tax rate on the alternative base. The optimal top income tax rate (t^*), allowing for income shifting, can be calculated based on the following formula (Saez, Slemrod, and Giertz, 2012):

$$t^* = \frac{(1 + s \cdot \tau \cdot ae)}{(1 + ae)},$$

in which s is the share of marginal income shifted from the individual base, τ is the tax rate on the alternative tax base (for example, corporate or capital income), and all other parameters are as previously defined, with the marginal welfare weight set to zero.

In recent decades, international tax competition—resulting from capital mobility—has led to a steady downward trend in corporate income tax rates (Figure 2). This trend may also put downward pressure on PIT rates.

Figure 2. Average Corporate Income Tax Rate, 1990–2015 (percent)



Source: IMF Fiscal Affairs Department, Tax Policy Rates Database.
Note: Figure shows average statutory corporate income tax rate for balanced sample of 37 advanced economies, 92 emerging markets, and 59 low-income developing economies.

[a] Although distributed earnings can be taxed, in principle, through withholding taxes, many economies, especially developing economies, have signed tax treaties restricting withholding taxes on foreign shareholders. For those economies, the corporate income tax is also very important with respect to taxing distributed earnings. In economies that have converted their corporate income tax to a corporate level tax that is payable only on distributed profits, the corporate income tax cannot fulfill the withholding function on retained earnings.

B. Empirical Estimates of Tax Elasticities

The existing empirical literature estimating ETIs has yielded a wide range of estimates. Neisser (2017) performs a meta-analysis, finding that most estimates range from 0 to 1, with a peak at around 0.3. Saez, Slemrod, and Giertz (2012) review the literature and conclude that the best available estimates range from 0.12 to 0.4, with a midpoint of 0.25.[2] There are, however, papers with much higher elasticities, such as Feldstein (1995), which finds ETIs above 1, and there are papers with zero and even negative elasticities. Negative ETIs are not very plausible, though theoretically possible (the income effect could exceed the substitution effect). Most likely, though, they are the result of some omitted variable that caused a change in incomes in an unexpected reaction (e.g., if there is a tax cut in a recessionary year). Neisser (2017) also presents evidence of selective reporting bias, with significant results more likely and negative ETIs less likely to be reported.

Most papers focus on a single economy and often even a single reform. There are, however, a few papers that make comparisons over time. Saez, Slemrod, and Giertz (2012) conclude in their review that for the United States "estimated values of the ETI for the 1990s, identified largely off of the 1990 and 1993 tax changes, are generally lower than those for the 1980s." Using data from the United Kingdom, Brewer, Saez and Shepard (2010) estimate ETIs, finding a slightly higher elasticity from a tax cut in 1988 (0.4) than in 1979 (0.1-0.3, depending on method). However, using more long-term estimates, they find similar elasticities in the 1978-2003 period (0.6-0.9) as during 1962-1978 (also 0.6-0.9), though their most robust measure, the difference-in-difference estimate drops (0.9 to 0.6) from the earlier to the later period. Kleven and Schultz (2014) estimate a series of tax elasticities for Denmark, considering 4 different reforms during the period 1987-2004 and find a decline in elasticities over time, which they explain by effective tax enforcement and strong tax compliance. Piketty, Saez, and Stantcheva (2014) is an exception to most of the literature, as it uses data from many economies (18 OECD members) and explicitly reports ETIs for two periods (1960–80 and 1981–2010). They find an increase in average ETIs from 0-0.2 (depending on specification) in the earlier period to 0.6-0.8 in the later period. Overall, the literature yields ambiguous results about the trend of ETIs over the last few decades.

III. Data and Methodology

We use income distribution data from the World Wealth & Income Database (WID),[3] which contains panel data for a large sample of economies and years, providing especially rich

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[2] The following is a non-exhaustive list of some important papers estimating ETIs: Kumar and Liang (2016) find elasticities of 0.75 for taxable income and 0.20 for broad income for the US during 1979-1990. Matikka (2014) estimates elasticities for Finland at 0.35–0.60 during 1995–2007, finding that personal (taxable) income deductions have a large effect on elasticity levels. Jongen and Stoel (2016) estimate the elasticity of labor income in the Netherlands, taking advantage of the 2001 tax reform and finding elasticities of 0.1 and 0.25 within one and five years from the reform respectively. Carey and others (2015) estimate elasticities in New Zealand following a single tax reform in year 2001 and find that they range from 0.5 to 0.7. Burns and Ziliak (2012) find elasticities between 0.1 and 0.4, using a model based on US Common Population Survey data for the period 1980-2009 (these numbers, however, turn negative when the authors apply alternative specifications).

[3] Available over the internet at WID.world.

information on the highest income groups. One of the strong points of this database is that it combines survey results with other data sources to address the typical under-representation of the richest individuals in surveys. Moreover, its systematic approach allows comparisons across time and economies. One shortcoming of this and other datasets on income distributions is that they do not separate out taxable income. Ideally, we would want to disregard any income that is not taxable, or not taxable under the standard system. For example, if pensions are tax exempt or tax favored, we would prefer to exclude them, but this is not possible within our chosen data source.

We combine the WID with personal income tax data from the OECD tax database (including historical versions to cover years before 2000), which provides tax rates and thresholds for the central government rate.[4] To be able to calculate an ETI, we need a tax reform and income and tax system data around the reform. We, thus, obtain at least one elasticity for about half of the 35 OECD economies over the period 1981-2016.

Following the method used in Brewer, Saez, and Shephard (2010), the ETI is defined as the percentage change in taxable income (*Y*) in relation to the percentage change in the net-of-tax rate (1-*t*) of top income earners. Instead of the real income, the income share (*s*) can also be used, and it has the advantage of automatically controlling for general changes in real incomes. We define top incomes as either those of the highest percentile or ventile (i.e., the top 5 percentiles), indicated by a subscript (*i*=1 or 5):

$$e_i = \frac{\Delta\, ln(Y_i)}{\Delta\, ln(1-t_i)} \; or \; \frac{\Delta\, ln(s_i)}{\Delta\, ln(1-t_i)} \tag{3}$$

In many economies, the top percentiles of the income distribution simply pay the maximum tax rate. There are, however, cases where the top tax threshold exceeds the cutoff for the highest percentile (especially when looking at the top ventile). In that case, the average marginal tax rate of the top percentile is calculated, assuming a Pareto distribution of incomes at the top. Specifically, the average marginal tax rate is calculated as the sum of the product of the shares of income of each tax bracket in the top percentile (or ventile or second to fifth percentile) and the respective tax rates. For example, if the top percentile faces two tax rates (i.e., there is one tax threshold (*b*) that exceed the top percentile threshold), then the average marginal tax rate is estimated as: $\bar{t} = (1-w)t^{low} + wt^{high}$, where *w* is the share of top percentile income that exceeds the top tax bracket.[5]

While the income share automatically controls for broad-based changes in real income levels, it can still be affected by many non-tax developments that disproportionally impact top incomes.

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[4] We do not have such detailed data with tax brackets for the combined rate that includes any sub-central (e.g., state or municipal) personal income taxes. Hence our estimated ETIs are based on central rates only. However, as data on the top combined rates are readily available for many economies, we can use these data for comparisons between actual tax rates and estimated optimal tax rates (see below).

[5] It can be calculated as $w = \left(\frac{b}{m}\right)^{1-a}$, with *b* the threshold of the tax bracket and *m* the threshold for the income group.

These could include, for instance, secular trends in income inequality brought about by globalization, technological change and other long-run labor market developments. To address this potential source of bias, we also estimate ETIs based on a difference-in-difference (*DD*) approach, again in line with Brewer and others (2010). In this approach the ETI is identified only from differences between the top percentile and the group of the following 4 percentiles (indicated by subscript 2-5 which stands for the top second to fifth percentiles, i.e., the top ventile without the top percentile). Hence, any development unrelated to tax that affects the entire top ventile will not affect this estimate of the ETI. This measure can only be calculated when the top percentile faces a different tax rate from the following 4 percentiles, i.e., when the threshold for the highest tax rate is sufficiently high.

$$e_{DD} = \frac{\Delta \ln(Y_1) - \Delta \ln(Y_{2-5})}{\Delta \ln(1 - t_1) - \Delta \ln(1 - t_{2-5})} \tag{4}$$

In many cases, the WID reports income shares, but not real incomes. Assuming a Pareto distribution for high incomes, as done in most of the literature, real incomes can be estimated using the Pareto index (*a*) and threshold for the income group (*m*):

$$Y_i = \frac{a}{a-1} m_i \tag{5}$$

The Pareto index in turn is estimated by rearranging the survival function of the Pareto distribution ($P(X \geq x) = (m/x)^a$), either based on thresholds, or if unavailable, income shares:[6]

$$a = \frac{ln(0.2)}{ln(m_5/m_1)} = \frac{ln(0.2)}{ln(s_5/5s_1)} \tag{6}$$

As noted, elasticities can be estimated only for years in which there are tax rate changes. In most years, at least one economy has a tax reform, so we are able to obtain many estimates over the time period covered by our sample. To minimize the potential of small tax changes resulting in very large estimated elasticities through a very small denominator in Equation (4), we disregard tax reforms where the statutory tax rate changes by less than 1 percentage point.[7] We also do not count as tax reforms cases in which the average marginal tax rate in an income group changes simply as a result of changes to the income distribution rather than statutory rate changes.

[6] For economies for which no data on the top ventile are available (only Ireland), it is equivalently calculated based on the top decile versus the top percentile (for economies for which both are available, the correlation between both estimates of the Pareto index is very high).

[7] As a robustness check, we repeated the analysis with cutoffs of 2 and 3 percentage points and obtained similar results.

IV. Empirical Results

A. Estimated Elasticities

As noted, there are various methods of calculating elasticities. Some methods have theoretical advantages: for instance, the difference-in-difference approach is arguably the most robust. However, the simpler approaches yield more observations. Weighing these considerations, and noting that some of the choices, for example, between the top percentile and ventile, are arbitrary, our strategy is to calculate elasticities under many methods and check for trends in each of the measured elasticities.

Another important consideration when estimating ETIs is the response horizon of the tax base. If, for example, a tax rate cut is announced, then individuals have an incentive to shift income into the following year. An ETI estimate based on a year-to-year comparison (or a "short calculation window") of the tax base would, therefore, produce a higher short-run estimate, as some of the income increase would not reflect permanent changes in compliance or work effort, but simply income shifting between years. In turn, such an estimate would provide little information on the longer-term effects of a tax reform, which arguably are of more interest to policy-makers. To address this, we also calculate a medium-run measure of the ETI (termed "long calculation window"), using the year following the reform year compared to two years before the reform (i.e., if the tax reform takes place in year t, then we compare $t+1$ to $t-2$, instead of t to $t-1$). This leads to a major reduction in the number of elasticities, because this measure also requires that there be no further change in the tax rate in the year following the reform or the year before the reform.[8] As many reforms are phased in, those cannot be used to estimate this type of ETI. Despite the much smaller resulting sample of elasticities, we report them given their major theoretical advantage.

Putting all these possibilities together, we calculate elasticities under 12 definitions and for up to 16 economies (depending on the type of data employed in equations (3) and (4) above).[9] The approach yielding the greatest number of individual results is the ETI estimated using real incomes, under the short calculation window, which provides us with 89 elasticities, covering each year from 1982-2013, except 2008 when there was no reform in the sample. Table 1 shows descriptive statistics for the estimated elasticities under each approach. Given large outliers,

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[8] Another option would be to combine sequential reforms into one large reform and consider the two years before the first rate change and the year following the final rate change. This approach would yield an average estimate over the reform range, so it would also not allow analysis of ETIs over the years.

[9] More specifically, under the "short calculation window", we are able to estimate elasticities for 16 economies (Australia, Canada, Denmark, France, Germany, Ireland, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Spain, Sweden, United Kingdom, United States) based on real income/income share data for the top percentile of earners. This number falls by 1 economy (Ireland) when using real income/income share data for the top ventile of earners and 2 economies (Denmark, Ireland) when using the DD approach. Under the "long calculation window", we are able to estimate elasticities for 12 economies (Australia, Canada, France, Germany, Ireland, Italy, Japan, Korea, New Zealand, Spain, Sweden, United States) based on real income/income share data for the top percentile of earners. This number falls by 1 economy (Ireland) when using real income/income share data for the top ventile of earners and 3 economies (Ireland, New Zealand, Sweden) when using the DD approach.

medians are more informative than means. This is particularly true for some of the difference-in-difference estimates, where extreme outliers (with a maximum of 12,235 percent) drive up the mean. Dropping all elasticities that exceed 100 in absolute value reduces the mean elasticity (both for the real income and income share) to 0.2, in line with the median. In the following analysis we maintain our focus on outliers, checking that results remain valid when these outliers are dropped, and focusing on medians when assessing average values.

While the range of elasticities, (even median elasticities) is quite wide, an ETI of around 0.2 appears to be a reasonable figure. Using the short calculation window, which has many more observations, this figure is obtained in the more robust difference-in-difference calculations, as well as two other estimation methods. In the more demanding long calculation window, the difference-in-difference approach yields ETIs of 0 to 0.3, so 0.2 is close to the average of this approach. This figure is in line with the range found in the literature, though slightly below the midpoint of 0.25. About a quarter of our estimated ETIs are negative. As mentioned above, this most likely reflects some omitted variable, but as long as such variable is independent of the occurrence of a tax reform, it should not affect the average ETI.

Table 1. Overview of Estimated Elasticities

Scope	Statistic	Real Income			Income Share		
		Top 5%	Top 1%	Diff-in-Diff	Top 5%	Top 1%	Diff-in-Diff
Short calculation window	Median	0.2	0.4	0.2	0.1	0.2	0.2
	Mean	0.7	0.3	205.5	0.5	-0.1	205.4
	Standard Deviation	10.8	3.0	1577.7	3.9	2.8	1577.7
	Number of Observations	86	89	65	86	89	65
Long calculation window	Median	-0.1	0.3	0.3	-0.1	0.1	0.0
	Mean	-2.4	0.4	0.5	-2.3	0.1	0.0
	Standard Deviation	9.2	7.4	4.6	7.8	5.4	4.2
	Number of Observations	25	26	22	25	26	22

Source: Authors' estimates.

Instead of calculating elasticities directly, we can also obtain an average elasticity through regressions. This has the advantage of allowing simple tests of significance of the estimated average elasticities, as well as the option of including other explanatory variables. It has the disadvantage, though, of yielding only average elasticities, instead of country and time-specific estimates. We, therefore, present this as a robustness check, but use the direct estimates for the latter analysis of patterns over time.

Specifically, in a regression approach, the elasticity e_i can be obtained by estimating the equation either for the top ventile or percentile (i.e., i = 1 or 5):

$$lnY_i = \alpha + e_i\, ln(1 - t_i) + x'\beta + f_c + \varepsilon \quad (7)$$

where x is an optional vector of control variables, f_c is a country effect to control for any other differences across economies, and ε is the error term.

In the case of the difference-in-difference estimate, the regression is specified as follows:

$$lnY_i = \alpha + D_1 + e_5\, ln(1 - t_i) + e_{DD}\, ln(1 - t_i) \times D_1 + x'\beta + f_c + \varepsilon \qquad (8)$$

where D_1 is a dummy variable indicating the top percentile.

Table 2 presents the resulting average elasticity estimates for the top percentile and ventile. All but one of the estimated average elasticities (i.e., the coefficients of the natural log of the net-of-tax rate) are significant, at least at the 10 percent level. Regressions without control variables yield quite high estimates compared to Table 1. Regressions with the output gap[10] and capital account[11] openness added as control variables, however, yield estimates that are close in size to the medians for the same percentiles in Table 1. These coefficients are also in the ballpark of most values presented in the literature reviewed in Section II, which further corroborates our results. Table 3 shows results for the difference-in-difference estimate of the ETI. This yields again estimates of around 0.2, but they are only significant in specifications without control variables.

Table 2. Elasticities Estimated from Regressions

	Top Ventile				Top Percentile			
Dependent Variable:	ln(real income)		ln(income share)		ln(real income)		ln(income share)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(net-of-tax rate)	0.654***	0.396**	0.283**	0.128	0.888***	0.487**	0.560***	0.281*
	(0.163)	(0.171)	(0.0978)	(0.126)	(0.228)	(0.229)	(0.148)	(0.153)
Output gap		0.0238***		0.00789**		0.0358***		0.0193***
		(0.00531)		(0.00369)		(0.00695)		(0.00467)
Capital account openness		0.625***		0.263**		0.774***		0.431**
		(0.186)		(0.108)		(0.266)		(0.177)
Observations	411	397	411	397	423	409	423	409
R-squared	0.083	0.351	0.069	0.256	0.117	0.346	0.126	0.300
Number of countries	17	17	17	17	18	18	18	18

Notes: Country effects included, robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' estimates.

[10] An alternative specification with an interaction term including the net-of-tax rate and a positive output gap dummy revealed that the ETI is slightly smaller in booms, although the differences was rarely significant.

[11] This is the Chinn-Ito index from developed in Chinn and Ito (2006). Updated versions are available at http://web.pdx.edu/~ito/Chinn-Ito_website.htm.

Table 3. Difference-in-Difference Estimates of Elasticities from Regressions

Dependent Variable:	ln(real income)		ln(income share)	
	(1)	(2)	(3)	(4)
ln(net-of-tax rate)	0.696***	0.390**	0.362***	0.169
	(0.160)	(0.173)	(0.101)	(0.132)
ln(net-of-tax rate)*Top percentile	0.159*	0.137	0.153*	0.132
	(0.0852)	(0.0933)	(0.0839)	(0.100)
Top percentile dummy	0.815***	0.796***	-0.815***	-0.829***
	(0.0676)	(0.0698)	(0.0570)	(0.0616)
Output gap		0.0299***		0.0136***
		(0.00614)		(0.00414)
Capital account openness		0.696***		0.343**
		(0.224)		(0.140)
Observations	834	806	834	806
R-squared	0.637	0.731	0.888	0.908
Number of countries	18	18	18	18

Notes: Country effects included, robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' estimates.

Implied Optimal Top Tax Rates

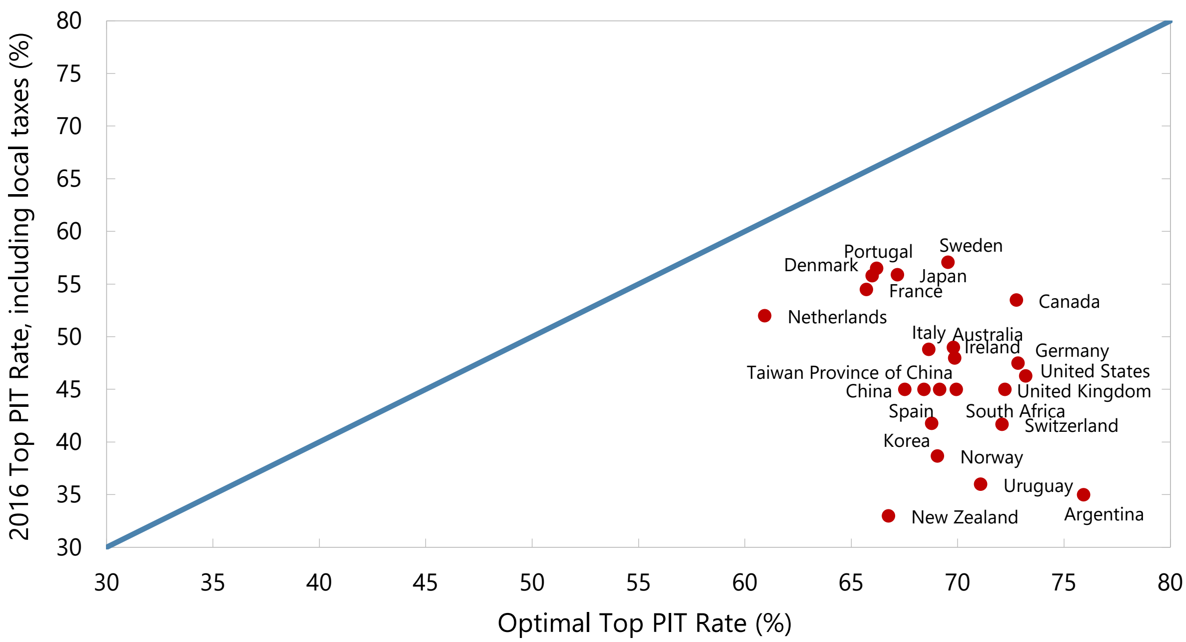
Based on the average ETI of around 0.2, and using each economy's Pareto index, we can calculate optimal top tax rates and compare them to actual rates. We choose a welfare weight on rich individuals of 0, implying that we calculate the revenue-maximizing rate. In principle, this calculation could also use economy-specific ETIs. However, given the lack of precision in ETI estimates, the differences in optimal tax rates across economies would mostly reflect measurement error. The advantage of our approach consists of drawing on many observations to get an average, cross-economy estimate that is better than an individual estimate from one reform or one economy. We would lose this advantage by using economy-specific estimates. Moreover, using a common elasticity allows us to calculate optimal tax rates even for economies outside the OECD,[12] for which we do not have data on tax brackets over time, provided we have an estimate of their Pareto index. Finally, we are able to compare the optimal tax rate to combined actual rates (i.e., including any local or state taxes), for which we also do not have bracket information. Clearly ignoring regional/local taxes would render the comparison meaningless, as some economies raise important shares of their income tax revenue at sub-

[12] We were able to calculate optimal rates for the following sample of economies: Argentina, Australia, Canada, China, Denmark, France, Germany, Ireland, Italy, Japan, Malaysia, Mauritius, Netherlands, New Zealand, Norway, Portugal, Seychelles, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan (Province of China), United Kingdom, United States, Uruguay

central levels of government. Figure 3 shows the results, depicting the revenue-maximizing tax rates on the horizontal axis and the actual tax rates on the vertical axis. It reveals that all economies are below the revenue-maximizing optimal tax rates.

The finding of actual tax rates being below our estimates of revenue-maximizing rates does not necessarily mean that tax rates are not optimal, as the actual welfare weight for rich people could exceed zero or governments may know that the elasticity in their particular economy is higher than average for some structural reason. Nevertheless, this finding provides indicative evidence that revenue-maximizing governments could raise tax rates. A counter-argument to this would be that consumption taxes, such as VAT should be added. Indeed, adding these to the combined (central and regional/local) personal income tax rate, would bring many economies very close to optimal rates. It is, however, questionable whether this should be done. As consumption taxes are also raised from spending of earnings that evade income taxes, they are likely to have a different elasticity. Moreover, if the marginal propensity to consume is low for rich individuals, those taxes will impose a lower burden on them, meaning that they cannot simply be summed.

Figure 3. Actual versus Revenue-Maximizing Tax Rates



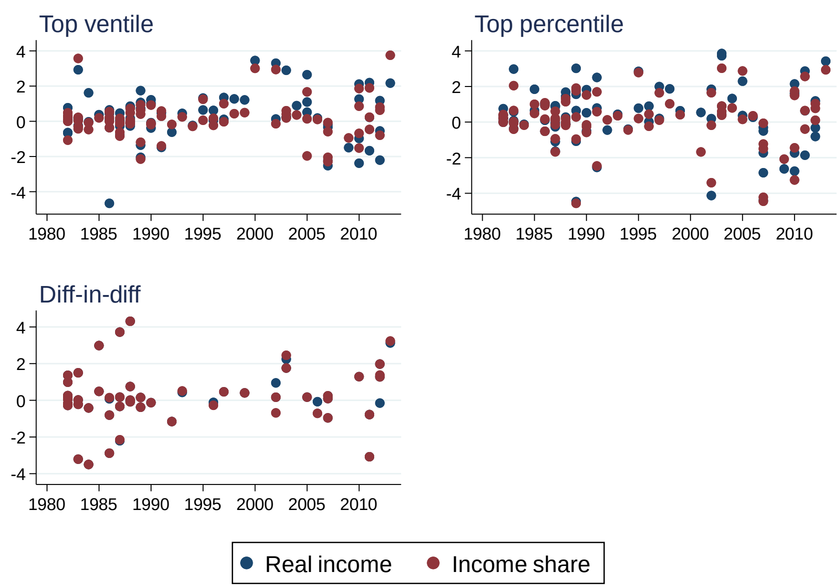
Source: Authors' estimates. Note: From optimal tax formula (assumptions: ETI = 0.2; g=0).

ETIs over Time

To detect any trend over time, Figures 4 and 5 show selected elasticities. While these charts do not suggest a clear time trend, we want to undertake a more systematic analysis, in order to formally document this. We, therefore, regress each type of ETI on a time trend. In addition to an unrestricted regression, we ran regressions removing outliers by either dropping all elasticities that exceed 2 in absolute value or by keeping only positive elasticities below 2. As shown in Table 4, out of these 36 regressions, only 5 had a significant coefficient (4 out of these 5 coefficients being positive). Three of the significant regressions occur with ETIs for which only very few observations are available, so they should not be given much weight. Overall, we conclude that there does not appear to be a significant increase in ETIs over the last three decades.

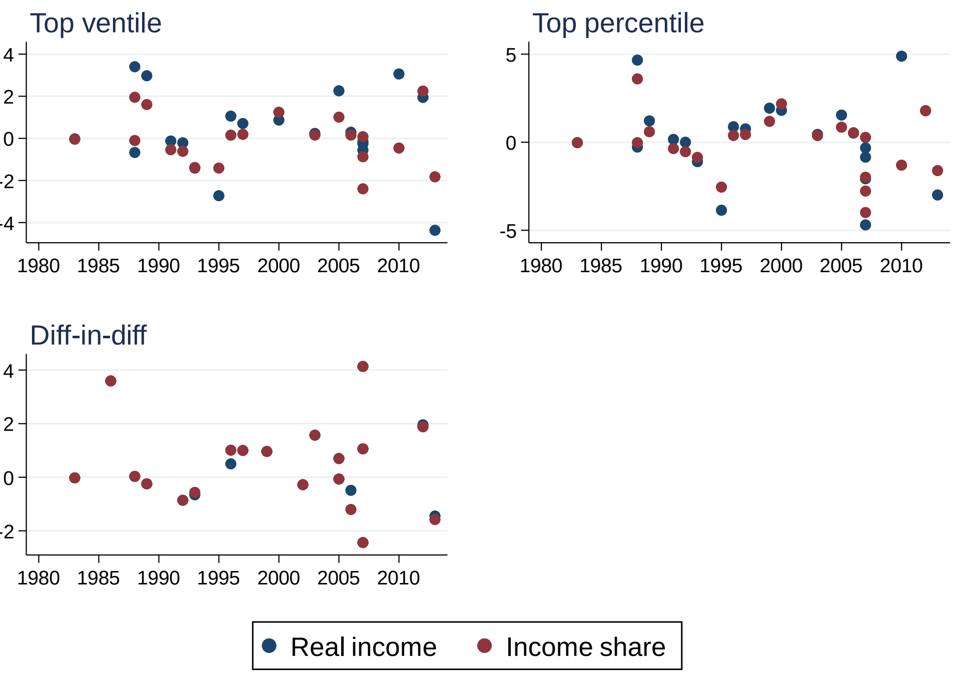
For further robustness checks, we reran these regressions controlling for the output gap, which yielded similar results. We also ran these regressions splitting the sample into groups determined by the level of social spending, in percent of Gross Domestic Product (upper half, upper third, and upper quartile) and by Esping-Andersen (1990) welfare state classifications, but this did not reveal a trend either.

Figure 4. ETI Estimates, Short Observation Window



Source: World Wealth and Income Database and authors' estimates.

Figure 5. ETI Estimates, Long Observation Window



Source: World Wealth and Income Database and authors' estimates.

Table 4. Regression Coefficients for ETIs on time trend

	Sample		Real Income			Income Share		
			Top 5%	Top 1%	Diff-in-Diff	Top 5%	Top 1%	Diff-in-Diff
Short calculation window	Full	b	-0.0646	-0.0271	-9.594	-0.0433	-0.00627	-9.619
		s.e.	(0.111)	(0.0319)	(9.451)	(0.0426)	(0.0309)	(9.451)
		N	86	89	65	86	89	65
	|EIT|<2	b	-0.00301	-0.00579	0.0114	0.00696	0.00311	0.0152
		s.e.	(0.0117)	-0.00579	(0.0127)	(0.0101)	(0.0108)	(0.0132)
		N	66	66	40	73	70	41
	0<EIT<2	b	0.0101	0.0130	0.0182	0.0208**	0.0109	0.0222*
		s.e.	(0.00821)	(0.00912)	(0.0123)	(0.00808)	(0.00777)	(0.0110)
		N	43	42	25	40	45	26
Long calculation window	Full	b	-0.0216	-0.288	-0.0784	-0.0159	-0.253	-0.154
		s.e.	(0.150)	(0.195)	(0.111)	(0.112)	(0.150)	(0.0961)
		N	25	26	22	25	26	22
	|EIT|<2	b	0.0373	0.0306	0.0236	-0.0328	-0.00901	0.0150
		s.e.	(0.0267)	0.0306	(0.0328)	(0.0274)	(0.0305)	(0.0342)
		N	14	16	16	18	17	16
	0<EIT<2	b	0.0416	0.0425	0.0665***	-0.0719**	0.0295	0.0579**
		s.e.	(0.0527)	(0.0256)	(0.0133)	(0.0207)	(0.0278)	(0.0157)
		N	6	11	8	9	9	8

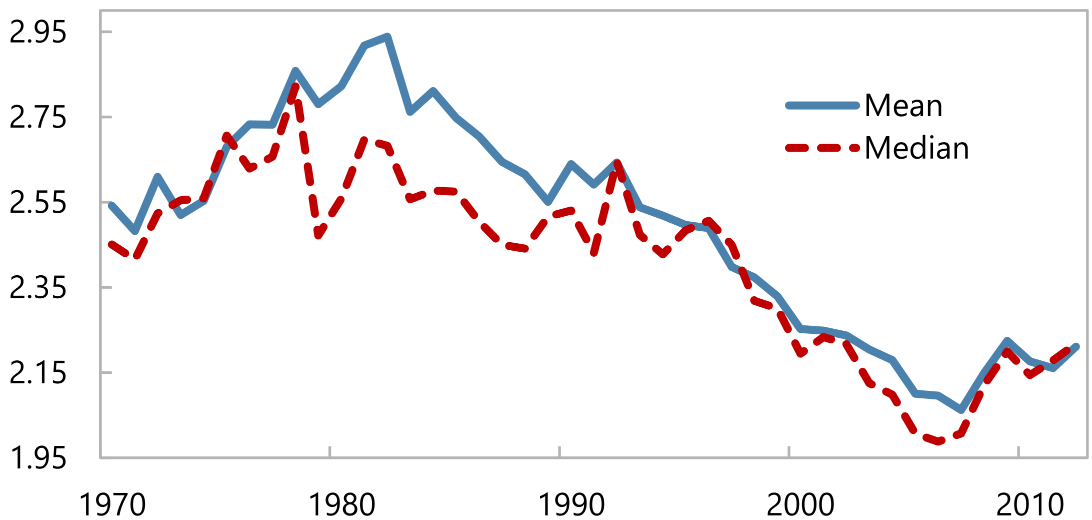
Source: Authors' estimates.

Note: These are the coefficients (b), robust standard errors (s.e.) and observation numbers (N) of ETI = a + bt + u, where t is a time trend and u an error term. *** p<0.01, ** p<0.05, * p<0.1.

B. Other Drivers of Optimal Top Tax Rates

Turning to the other determinants of optimal tax rates, we consider the share of incomes earned at the top. The well-documented rise in the shares earned by the top income percentiles (e.g., Piketty (2014)) suggests that this would call for a rise in the top optimal tax rate, rather than a fall. To confirm this in a way that is directly linked to optimal tax theory and using the same data as in the calculation of elasticities, we present the Pareto index, calculated for the top ventile, in Figure 6. This reveals a clear downward trend over the last 35 years, implying a greater share of income being earned in the top tail of the distribution, thereby indeed arguing for a rise in optimal top tax rates, all else equal. Changes in the income distribution, therefore, cannot be the explanation for the observed fall in top tax rates.

Figure 6. Average Pareto Index, Top Ventile

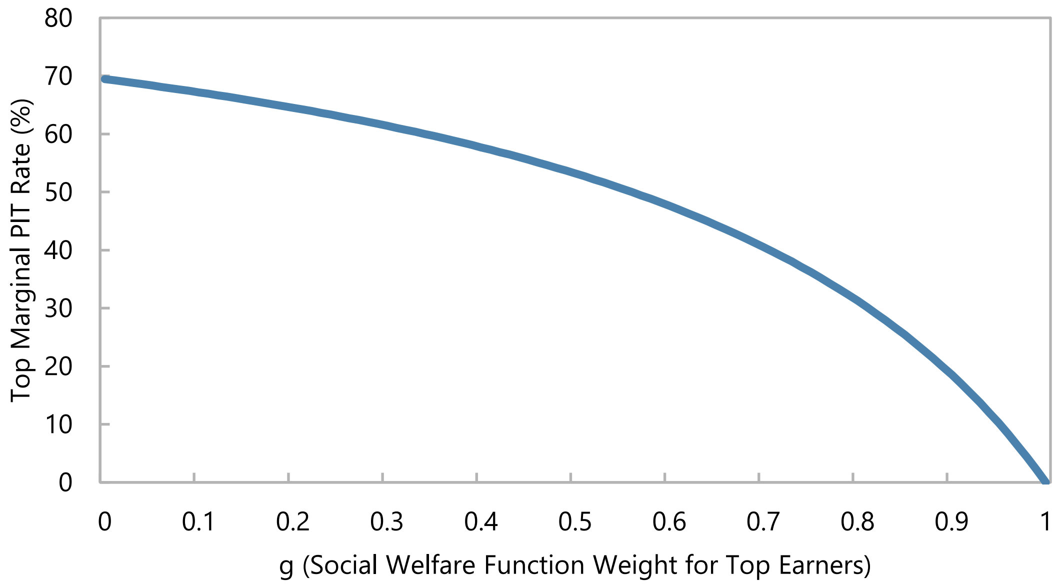


Sources: World Wealth and Income Database and authors' calculations.

Another theoretical explanation for declining tax rates could be a rising welfare weight on well-off individuals. Figure 7 shows optimal tax rates based on an ETI of 0.2 and a Pareto index of 2.2.[13] The substantial decline in top marginal personal income tax rates would be consistent with a rise in the social welfare weight on high-income earners from close to 0 to more than 0.5 over the last 35 years. However, evidence from the World Values Survey shows that societal preferences in favor of redistribution have become stronger since the 1980s (Figure 8), which would, instead, imply a reduction in the social welfare weight on high-income earners. For the United States, this issue has been examined in further detail by Lockwood and Weinzierl (2015) who also argue that the marginal social welfare weight implied by given tax reforms appears very high and inconsistent, both in relation to the welfare costs of unequal growth and recessions as well as evidence based on public opinion surveys.

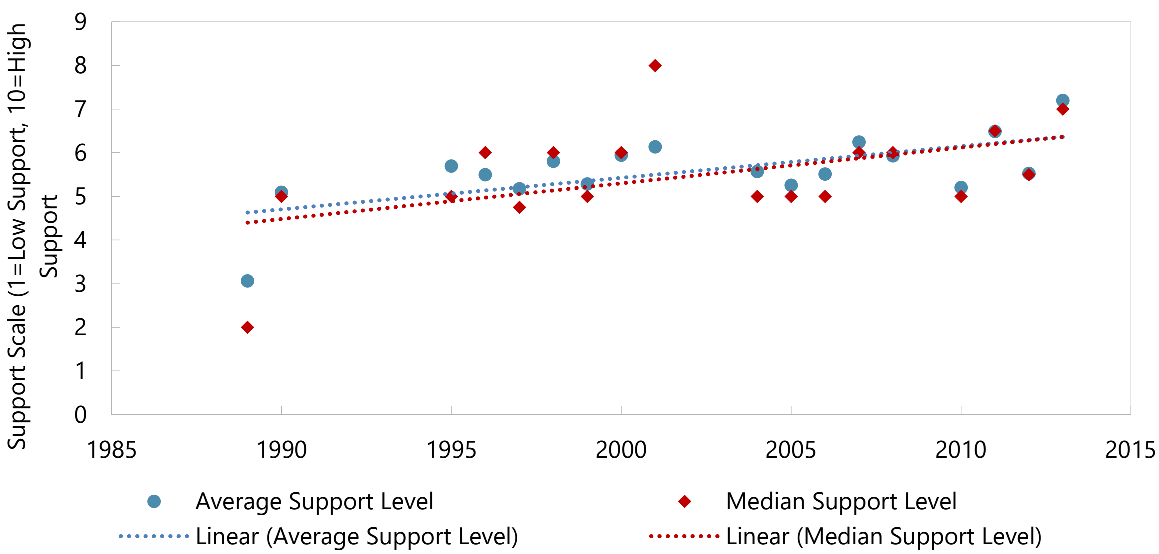
[13] This is the average of the latest available year of Pareto index data for the following economies: Argentina, Australia, Canada, China, Denmark, France, Germany, Ireland, Italy, Japan, Malaysia, Mauritius, Netherlands, New Zealand, Norway, Portugal, Seychelles, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan (Province of China), United Kingdom, United States, Uruguay

Figure 7. Optimal Top Income Tax Rate



Source: Authors' estimates based on an elasticity of 0.2 and a Pareto index of 2.2.

Figure 8. OECD Countries: Average and Median Level of Support for Redistribution, 1989-2013



Source: Authors' estimates based on the World Values Survey.

V. Discussion and Conclusion

This paper addressed the question of whether the widespread decline in top personal income tax rates was driven by changes in the determinants of optimal tax rates, and in particular rising ETIs. As ETIs are hard to measure precisely, we have calculated as many as possible under various assumptions. None of the approaches has revealed a trend in ETIs, suggesting that there must be other reasons behind the observed decline in personal income tax rates. Other direct determinants of optimal tax rates—the income distribution and welfare weight on well-off individuals—also do not appear to have changed in a way that could explain a declining trend in rates.

These findings, therefore, suggest that developments in income tax rates were likely driven by other factors. Political economy elements could play a role, because better-off individuals tend to have more political influence, for example, through lobbying, access to the media, and greater political engagement. Ardanaz and Scartascini (2011) find that economies with historically more unequal income often have political systems that are dominated by elites. Rodriguez (2004) argues that more inequality leads to less redistributive taxes because it implies "a greater share of resources in the hands of individuals with the capacity to extract fiscal favors from policy-makers."

One final caveat is that there is no reason to assume that the higher tax rates in the 1980s were based on optimal tax considerations. We, therefore, cannot exclude the possibility that tax rates were too high in the past, from an optimal taxation point of view, and have been cut toward their optimal level. While theoretically possible, this does not appear very plausible, given widespread concerns about inequality and the absence of high-income tax buoyancy over the last decades.

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