Piketty's $r - g$ model: wealth inequality and tax policy

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Abstract

This study discusses implications of Piketty's (2014) $r - g$ model for wealth inequality and tax policy. Using historical cross-country panel data on wealth inequality and indicators of capital returns and income growth we find some tentative empirical support for the predictions of the $r - g$ model. The scope for addressing inequality by increasing taxes on capital is limited due to capital mobility but some tax instruments, in particular recurrent taxes on immovable property, may offer an opportunity to tax the well off without undermining economic growth. Our main conclusion, however, is that more research is needed to establish a clearer understanding of the links between macroeconomic development and distributional outcomes.

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1. Introduction

The so-called $r - g$ model of Piketty (2014), which relates the difference between the rate of return on capital, r, and the rate of income growth, g to the level of economic inequality has received enormous attention in both academic and popular circles. In its simplest characterization, it says that when existing ("old") capital grows faster than new capital is created out of accumulated incomes, then already relatively rich capital owners will become even richer relative to the others not holding capital, and thus inequality will increase. In Piketty (2014) and Piketty and Zucman (2014, 2015) this model was incorporated into and derived from a more general theoretical framework.

How convincing is the view that the difference between the return on capital and the rate of economic growth is a key factor driving economic inequality? Piketty's formula raises a number of theoretical and empirical issues. From a theoretical perspective it is clear $r > g$ is neither necessary nor sufficient for inequality to increase. It is not necessary because inequality may increase due to other reasons like, for instance, inequality of labour income, which has been a key driver of the recent surge in income inequality in the United States. It is not sufficient either, in particular because capitalists may earn much but save little. As recently emphasised by Mankiw (2015), $r > g$ may not lead to increasing inequality because capital income taxes may reduce the net return to capital below g or because capital owners consume part of their income. If capital owners have enough children, wealth concentration will fall as they leave their wealth to the next generation.[1]

In addition, even if capital owners save a lot their income cannot grow indefinitely. While the interest rate may indeed be permanently higher than the growth rate of GDP, it is obvious that capital income cannot permanently grow faster than GDP. Also, the marginal productivity will decline as the capital intensity of production increases.

At the same time, while it is true that economic theory offers no unambiguous support for the view that $r > g$ leads to increasing inequality, it is equally true that a growing difference between r and g may, at least for periods of time, be an important factor driving income or wealth inequality, as argued by Piketty (2014) and Piketty and Zucman (2014, 2015). How the difference between r and g is related to inequality is ultimately an empirical question which

[1] However, evidence suggests that the number of children is decreasing with income (Jones and Tertilt, 2006). The average number of children per family is below 2 for rich households.

we address in this paper. We also derive implications for tax policy based on our empirical findings.

2. The $r - g$ model and wealth inequality: A preliminary empirical assessment

What is the empirical relationship between $r - g$ and economic inequality? To date quite limited systematic evidence about this relationship has been presented. Piketty himself presents some circumstantial pieces of evidence and informative point estimates in Piketty (2014), but the book contains no comprehensive statistical analysis using detailed historical country-specific or cross-country datasets. Recently, Acemoglu and Robinson (2015) made an attempt to empirically assess the $r - g$ model by relating proxies of $r - g$ to top income shares and the capital share of value added. Their main analysis used data from the World Top Income Database to regress the annual level of top income shares against the annual level of $r - g$ (including lags) and it did not indicate any clear systematic relationships. Acemoglu and Robinson also could not establish a link when using up to 20-year averages or capital share of value added as main inequality outcome.[2] While their empirical results thus questioned the mechanisms of the $r - g$ model, Piketty (2015) pointed out a number of potential explanations to their findings as well as conceptual problems with some of their data.

One important mechanism of the $r - g$ model that was not examined by Acemoglu and Robinson, however, is how $r - g$ influences wealth inequality. Even if income inequality has generally received more attention, the inequality of wealth is, in fact, at the centre of Piketty's $r - g$ model and perhaps the most direct distributional outcome of the $r - g$ relationship.[3]

We will in this essay therefore present a preliminary analysis of the link between $r - g$ and some standard measures of wealth concentration. There are several challenges associated with empirically estimating the $r - g$ model for wealth inequality. First, we can think of no catch-all measure of the rate of return to capital, r. For example, we know that r varies between different types of capital and we know that the composition of capital differs between countries, time periods and potentially also over the wealth distribution. Instead of trying to com-

[2] Acemoglu and Robinson presented several variants of these regressions, but none of them suggested a systematic relationship between $r - g$ and top income shares or the capital share. See also Piketty (2015) for a discussion of their results.

[3] See Piketty and Zucman (2015) and Piketty (2015) for a systematic derivation of this effect. In brief, they show using different variants of dynamic wealth accumulation models that a higher $r - g$ differential is associated with a higher wealth inequality.

pute an explicit measure of r, which we know would be highly imperfect in most dimensions, we therefore propose a proxy of r being *the development of the financial sector*. Much of the capital held by the rich consists of financial assets, either in the form of bank deposits, cash and bonds, or as corporate stock.[4] Therefore the growth of the financial sector, measured as a combination of the size of the banking sector and stock market capitalization, may in fact capture much of what we want to capture as canonical r in the $r - g$ model. We do, however, also run regressions similar to Acemoglu and Robinson (2015) where we assume r to be the same over time and across countries and only let the level of income growth g vary. Needless to say, all of these measures carry large problems of their own, but we leave it to future research to dwell deeper into measuring and estimating these variables.

A second challenge concerns time horizons. The $r - g$ model essentially describes the relationship between macroeconomic outcomes in steady state and is therefore not concerned primarily with annual variation in the relevant outcomes. In our regressions, we therefore use *averages over five-year periods*. We sometimes include lag variables stretching back three five-year periods, i.e., 15 years. A third challenge is that wealth inequality is also not measured as consistently and abundantly measured as income inequality is measured. We use the available data on historical top wealth shares that researchers have produced as of today, yielding a dataset with at most nine countries spanning some 130 years in the longest case.[5]

Our econometric methodology is to regress the wealth share of the top percentile $TopW1\%$ ("the rich"), the next nine percentiles in the top decile $TopW10-1\%$ ("the upper middle class"), and the bottom nine deciles $BotW90\%$ ("the rest"), a highly heterogeneous group, on a set of explanatory variables. Our most important explanatory variables are r, which is the level of financial development ($Fin.dev.$) and its growth ($\tilde{r}$), and g, which is measured as the log GDP per capita in level (Y) and growth (g). According to the $r - g$ model, we would expect that a higher r increases top wealth shares but reduces bottom wealth shares due to the skewed distribution of capital possessions. Equivalently, we would expect that a higher g reduces top wealth shares but increases bottom wealth shares, all according to the logic that

[4] For example, Saez and Zucman (2014) find that about 90 percent of the wealth held by the U.S. top 0.1 wealth percentile is different kinds of financial assets.

[5] Our data are based a dataset constructed by Roine, Vlachos and Waldenström (2009) where variable definitions and sources are provided. These data were recently updated and complemented with top wealth shares by the Roine and Waldenström (2015) handbook chapter. For the U.S. top wealth shares we use the series of Saez and Zucman (2014). The other countries included in this analysis are Argentina, Australia, Finland, Netherlands, Norway, Sweden, Switzerland and the U.K.

higher income growth enables the less well-off to accumulate new wealth and thus reduce wealth concentration. We also include control variables aimed at accounting for other influences on wealth concentration in order to see whether there are other, underlying institutional political or economic variables, that drive both r and g and wealth concentration. Here we include measures of income inequality, measured as the income shares to the top percent ($TopY1\%$), next nine percent ($TopY10-1\%$) and the bottom nine deciles ($BotY90\%$), trade openness measured as the sum of imports and exports as share of GDP ($Openness$), two measures of public-sector redistribution proxied by the size of central government spending ($Gov.spend.$) and top marginal income taxation ($Margtax$), and a control for the country's population size (Pop). The econometric specification follows the similar analysis of Roine, Vlachos and Waldenström (2009) in which a first-difference GLS accounting for country-specific effects and country-specific time trends was used in order to hold constant as many unobserved influences as possible.

The results are presented in two tables. Table 1 shows stripped-down regressions where wealth shares of the different groups are regressed on r and g. Looking first at the impact of r – whether in contemporaneous or lagged levels or growth – it is consistently positively associated with higher wealth shares in the top percentile and the next nine percentiles of the top decile (columns 1 through 6). For example, increasing total capitalization by one standard deviation (0.5, about 50% of GDP) is related to an instant increase in the wealth share of the top percentile by about 4 percentage points. When the lags are also included the increase is almost 10 percentage points. As the mean wealth share of the top percentile is about 30 percent, this effect is notable. The bottom nine percentiles in the wealth distribution, however, experience the exact opposite effect, reduced wealth shares, following financial sector growth. Looking instead at economic growth, g, the pattern is quite the opposite: a higher GDP per capita growth is negatively associated with top wealth shares but positively associated with bottom wealth shares. The impact is not as clear within the top as it is in the case of financial development, in particular as concerns the actual growth variable g which is statistically insignificant for all wealth groups.

[Table 1 about here]

Table 2 reports the $r-g$ regressions when including controls for some institutional differences across countries. The general pattern from the regressions in Table 1 is still visible and,

in fact, stronger when adding controls for income inequality and other potentially important confounding factors. The growth of the financial sector, our proxy for r, is positively correlated with top wealth shares, in particular the shares of the top percentile. By contrast, income growth, g, is negatively associated with top wealth shares, once again most clearly visible in the top percentile. As for the bottom 90 percent, admittedly a very heterogeneous group of wealth holders, the signs are opposite, with wealth shares decreasing as the financial sector expands but increasing as GDP per capital grows. The other control variables included in the regressions are not of primary interest to us in this investigation, yet it is reassuring to note that in particular public sector influence, whether in the form of government spending or marginal taxation of incomes, works in the expected direction by having a negative association with top wealth shares. Income distribution seems, also not too unexpectedly, correlated with the wealth distribution, especially in the top. But since incomes are themselves in part directly determined by wealth (e.g., in the form of capital income), the interpretation of these simultaneous outcomes cannot be fully settled here.

Altogether, the results in Tables 1 and 2 offer some tentative support for the $r - g$ model as proposed by Piketty (2014) and its proposed links between the $r - g$ differential and wealth inequality. Given the considerable problems at hand with measurement, data availability and statistical specification, much more effort is of course needed before we can begin to speak about any stable relationships in these outcomes. Furthermore, the relationship between top wealth shares, financial sector development and economic growth reveals nothing about the direction of causality. For instance, it is perfectly possible that an increasing wealth concentration causes a stronger growth of the financial sector. We conclude therefore that more research is needed to settle the issues at hand.

[Table 2 about here]

3. Implications for Tax Policy

What are the policy implications of the results described in the preceding section? As pointed out above the available empirical evidence is insufficient to conclude that the difference between r and g does indeed cause either income or wealth inequality. It is nevertheless interesting to consider different policy options to address inequality in the light of the hypothesis that $r - g$ may be an important driver of inequality. Piketty (2014) argues that governments

should use tax policy to fight trends towards increasing inequality. He proposes that governments should levy higher taxes on capital income and wealth. The ambition is that higher taxes on capital income will reduce the after tax return to capital and thus tend to reduce inequality of income and, ultimately, wealth. Wealth taxes would address wealth inequality directly. This proposal raises two questions: Firstly, how effective are capital taxes as an instrument to redistribute income, that is to reduce the (after tax) return on capital? Secondly, what are the implications of this proposal for economic growth?

3.1 How effective are capital taxes as an instrument to redistribute income?

An important objection against using capital income taxes as an instrument for income redistribution is that trying to do so will be self-defeating if capital is internationally mobile. Higher taxes would just lead to capital outflows until the after tax rate of return is the same as before, and the burden of capital taxation would fall on domestic immobile factors of production, in particular labour.[6]

This argument is most relevant for source-based capital income taxes. The most important source-based capital tax in existing tax systems is the corporate income tax. Empirical work on the impact of corporate income taxes on the international location of investment confirms that corporate income taxes have a significant effect on investment behaviour. Countries with a high income tax burden attract less investment and the investment they do attract is less profitable (Becker et al., 2012). Governments have understood this and, in the last two decades, reduced their corporate income tax rates significantly.

There are two ways in which countries can try to avoid that higher domestic taxes on capital income reduce domestic investment. Firstly, they can try to coordinate their tax policy internationally. This has been suggested many times in the past, with little effect, even within the European Union. The main reason for this inability to coordinate is that different countries have very different interests. While large countries with high income levels and preferences for high tax rates and high levels of public expenditures typically favour international tax coordination with the objective to limit tax competition, smaller and less wealthy countries usually oppose tax coordination because they benefit from tax competition or they see low taxes

[6] To be precise, a capital tax increase in one country would reduce domestic labor income but labor income in other countries, which experience a capital inflow, would increase, see, e.g., Kotlikoff and Summers (1987).

as an important policy instrument which allows them to compensate disadvantages like a poor infrastructure or an unfavourable geographical position.

Secondly, countries may rely on residence based capital income taxes. Residence based taxation at the corporate level is not very effective if corporate headquarters are internationally mobile or corporate group structures can be adjusted (Becker and Fuest, 2010).

International mobility is slightly less problematic when it comes to capital income taxation at the personal level. Personal capital income taxes are levied according to the residence principle, so that international mobility is not a problem as long as individuals do not change their country of residence in response to taxation. How effective is a residence based capital income tax as an instrument for redistribution? Here the views are divided. Opponents of higher capital income taxes emphasize that these taxes reduce incentives to accumulate capital. If the rate of time preference is given and determines the after-tax return on savings in the long term, and capital markets are frictionless (Judd, 1985), it follows that taxes cannot reduce the rate of return to capital and the optimal tax rate on capital income is zero. But other authors (e.g., Piketty and Saez, 2013) have argued that the existence of bequests, combined with capital market imperfections, can lead to different conclusions, with positive optimal tax rates on capital income. From this perspective capital income taxes have the purpose of i) indirectly taxing bequests and ii) providing insurance against uninsurable uncertainty about future returns to capital.

Many countries have in the last two decades introduced dual income tax systems where labour income is taxed progressively and capital income in the form of interest income or dividends is taxed at a lower, flat rate. Figure 1 provides an overview over effective marginal tax rates (EMTR) on dividend and interest income in selected European countries, simulated for the top income decile group for the years 2007 and 2013. These tax rates are derived in a simulation based on the European microsimulation model EUROMOD. The tax rates show a great variation ranging between 10 percent and 45 percent. With the notable exception of Germany (which introduced a dual income tax in 2009), most countries did not decrease or even increased their tax burden on capital income in the last few years.

[Figure 1 about here]

Besides interest payments and dividends, income from immovable property represents an important component of overall capital income. Its tax treatment, however, is usually different. Firstly, dual income tax systems often tax property income at higher and progressive rates, like labour income. The effective marginal tax rates for the top income decile are given in Figure 2. In most countries, the EMTRs are similar to those of capital income while in some they are lower. The reasons for this are large exemptions and deduction possibilities for property income. For instance in Germany, the sum of taxable property income is negative in most years.

[Figure 2 about here]

Secondly, immovable property is taxed not just through income taxation but also through taxes on property transactions and recurrent taxes on immovable property. Taxes on immovable property seem attractive as a redistributive instrument because land is immobile and its supply is fixed.

Should capital income taxation be increased to achieve more income redistribution? For instance, would it be desirable to abolish dual income taxation and tax capital income at progressive rates, like labour income? For a long time the enforcement of residence-based taxes on capital income was undermined by tax evasion through bank accounts held abroad. This was an important reason to reduce tax rates on capital income. But recent developments in international information exchange for tax purposes, in particular supported by the OECD and the US government, have made it significantly more difficult for taxpayers to evade these taxes.

However, very wealthy individuals are typically also internationally mobile in the choice of their country of residence. This implies that higher residence based capital taxes on savings may be effective as an instrument to redistribute income from the relatively well off to the less well off, but the very wealthy are likely to be able to avoid these taxes.

3.2 Tax policy and growth

If it is true that higher rates of economic growth, for given rates of return on capital, have an equalizing effect, tax reforms towards more growth friendly tax structures could have a desirable impact on the income distribution as well. To some extent this perspective would chal-

lenge the traditional view, according to which tax policy faces a fundamental trade-off between efficiency and equity.

How can the tax system be changed to achieve more economic growth? In the literature on the link between tax structures and economic growth, the view is widespread that capital income taxes, in particular corporate income taxes, are harmful for growth. For instance, a widely recognized study about the impact of tax structures on economic growth conducted by the OECD (Johansson et al., 2008) concludes:

> '*The reviewed evidence and the empirical work suggests a "tax and growth ranking" with recurrent taxes on immovable property being the least distortive tax instrument in terms of reducing long-run GDP per capita, followed by consumption taxes (and other property taxes), personal income taxes and corporate income taxes.*'

The interpretation of the results in Johansson et al. (2008) and the empirical approach used in this study are the subject of an ongoing and controversial debate (see Xing, 2012). Of course, the suggestion to reduce corporate income taxes and increase consumption taxes does seem to face the traditional efficiency equity trade-off. But this might be different for other tax instruments, in particular for a shift towards higher recurrent taxes on immovable property. Figure 3 gives an overview over the contribution of recurrent taxes on immovable property in selected European countries.

[Figure 3 about here]

Figure 3 shows that the role of these taxes differs considerably, ranging from 3.4 per cent of GDP in the United Kingdom to zero in Malta.[7] This suggests that there may be room for raising more revenue from this source. Using the additional revenue to reduce labour taxes, for instance, would probably stimulate growth and have positive effects on the income distribution.

[7] One should bear in mind, though, that fees charged for local government services, which are not classified as taxes, play a role similar to that of recurrent property taxes in some countries.

4. Conclusions

The so-called $r - g$ model of Piketty (2014) has received enormous attention in both academic and popular circles. In its simplest characterization, it says that when existing ("old") capital grows faster than new capital is created out of accumulated incomes, then already relatively rich capital owners will become even richer relative to the others not holding capital, and thus inequality will increase. However, economic theory offers no unambiguous support for the view that $r > g$ leads to increasing inequality. Hence, how the difference between r and g is related to inequality is ultimately an empirical question. Our preliminary analysis offers some tentative support for the $r - g$ model and its proposed link between the difference between r and g and wealth inequality. However, given the considerable problems at hand with measurement, data availability and statistical specification, much more effort is of course needed before we can begin to speak about stable relationships in these outcomes. This is an important direction for future research.

We also discussed implications for tax policy under the assumption that the $r - g$ model and its link to wealth inequality is correct. Increasing the taxation of mobile capitalis only possible on a global scale, as suggested by Piketty (2014). Experience with policy coordination in this area suggests that this will not be possible. It therefore seems more promising to try to increase g rather than to decrease r through tax policy. Some evidence suggests that recurrent taxes on immovable property and consumption taxes (and other property taxes) are the least distortive tax instrument in terms of reducing long-run GDP per capita. Increasing these taxes and using the additional revenue to reduce labour taxes, for instance, would probably stimulate growth and have positive effects on the income distribution.

References

Acemoglu, D. and J. A. Robinson (2015). "The Rise and Decline of General Laws of Capitalism". *Journal of Economic Perspectives* 29(1): 3–28.

Becker, J. and C. Fuest (2010). "Taxing foreign profits with international mergers and acquisitions". *International Economic Review* 51(1): 171–186.

Becker, J, C. Fuest and N. Riedel (2012). "Corporate Tax Effects on the Quantity and Quality of FDI". *European Economic Review* 56(8): 1495–1511.

Johansson, Å., C. Heady, J. Arnold, B. Brys and L. Vartia (2008), "Tax and Economic Growth", OECD Economics Department Working Paper 28.

Jones, L. E. and M. Tertilt (2008). "An Economic History of Fertility in the United States: 1826–1960." in: P. Rupert (ed.), *Frontiers of Family Economics*. Bingley, West Yorkshire: Emerald Group Publishing Limited.

Judd, K. (1985). "Redistributive Taxation in a Simple Perfect Foresight Model". *Journal of Public Economics* 28(1): 59–83.

Kotlikoff, L. and L. Summers (1987). "Tax Incidence", in: A. Auerbach and M. Feldstein (eds), *Handbook of Public Economics, Vol. II*, Amsterdam: North-Holland.

Piketty, T. (2014). *Capital in the 21st century*, Cambridge, MA: Belknap.

Piketty, T. (2015). "Putting Distribution Back at the Center of Economics: Reflections on Capital in the Twenty-First Century". *Journal of Economic Perspectives* 29(1): 67–88.

Piketty, T. and E. Saez (2013). "A Theory of Optimal Inheritance Taxation". *Econometrica* 81(5): 1851–1886.

Piketty, T. and G. Zucman (2014), "Capital is Back: Wealth-Income Ratios in Rich Countries, 1700-2010". *Quarterly Journal of Economics* 129(3): 1255–1310.

Piketty, T. and G. Zucman (2015). "Wealth and inheritance in the long run", in: A.B. Atkinson and F. Bourguignon (eds.), *Handbook of Income Distribution, vol.2B*, Amsterdam: North-Holland.

Roine, J., J. Vlachos and D. Waldenström (2009). "The Long-Run Determinants of Inequality: What Can We Learn from Top Income Shares?". Journal of Public Economics 93(7–8): 974–988.

Roine, J. and D. Waldenström (2015). "Long-run trends in the distribution of income and wealth", In: Atkinson, A.B., Bourguignon, F. (Eds.), *Handbook of Income Distribution, vol. 2A*, Amsterdam : North-Holland.

Saez, E. and G. Zucman (2014). "Wealth Inequality in the United States since 1913: Evidence from Capitalized Income Tax Data". NBER working paper 20625.

Xing, J. (2012). "Tax structure and growth: How robust is the empirical evidence?". *Economics Letters* 117(1): 379–382.

Table 1: The $r - g$ model and wealth inequality: Basic regressions

	$\Delta TopW\ 1\%_t$			$\Delta TopW\ 10-1\%_t$			$\Delta BottomW\ 90\%_t$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Proxies of r:									
$\Delta Fin.dev_t$		3.49***	4.91***		11.34***	10.32***		–14.55***	–17.04***
		(0.60)	(1.37)		(1.83)	(1.47)		(2.21)	(2.01)
$\Delta Fin.dev_{t-1}$		1.12**			1.00			–2.61	
		(0.53)			(1.57)			(1.97)	
$\Delta Fin.dev_{t-2}$		4.01***			0.83			–4.79**	
		(0.60)			(1.79)			(2.17)	
$\Delta \tilde{r}_t$			2.82**			1.31			–4.57***
			(1.16)			(1.30)			(1.71)
Proxies of g:									
ΔY_t	–6.51**	0.75	–10.84*	–6.27*	–54.95***	–39.71***	4.71	55.20***	46.43***
	(3.27)	(3.98)	(6.39)	(3.70)	(12.12)	(8.35)	(4.10)	(14.78)	(12.17)
ΔY_{t-1}		–6.19			–1.03			13.28	
		(4.52)			(12.42)			(14.88)	
ΔY_{t-2}		10.87***			–22.87*			3.60	
		(3.38)			(12.69)			(14.30)	
Δg_t			–5.35			7.30			–3.25
			(3.75)			(5.73)			(7.62)
Obs.	86	50	50	66	40	40	66	40	40
# countries	9	8	8	7	6	6	7	6	6

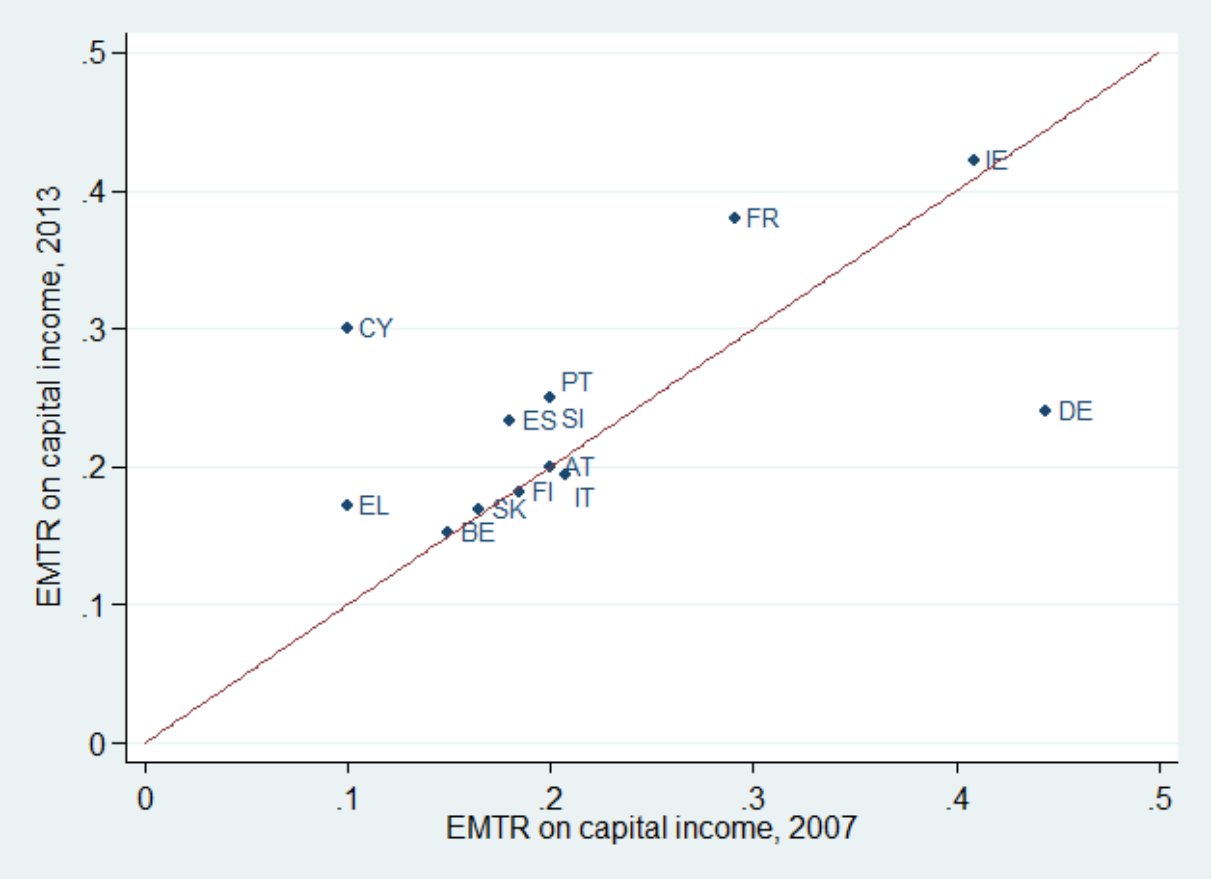
Notes and sources: Δ denotes that variables are in first-differences. Dependent variables are shares of total personal wealth held by the top percentile ($TopW1\%$), top decile minus top percentile ($TopW10-1\%$) and bottom nine deciles ($TopW1\%$) in the wealth distribution. $Fin.dev.$ denotes financial development, measured as the sum of bank deposits and market capitalization as share of GDP, $\tilde{r}$ denotes proxy for rate of return to capital, measured as the difference in first-differenced levels of financial development, Y denotes GDP per capita and g denotes economic growth which the difference in first-differenced GDP per capita. See text for further details and sources. All codes and data used are available on the author webpages and upon request. Robust standard errors stand in parentheses. ***, ** and * denotes statistical significance at the 1%, 5% and 10% levels, respectively.

Table 2: The $r - g$ model and wealth inequality: Controlling for policy and institutions.

	$\Delta TopW\ 1\%_t$				$\Delta TopW\ 10-1\%_t$		$\Delta BottomW\ 90\%_t$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Proxies of r:								
$\Delta Fin.dev_t$	4.42***	7.14***	2.05**		9.29***	7.50***	–14.86***	–13.41***
	(1.39)	(1.20)	(0.87)		(1.43)	(1.70)	(1.67)	(1.97)
$\Delta Fin.dev_{t-1}$			4.69***					
			(0.96)					
$\Delta\tilde{r}_t$	2.48**	4.70***			0.90	–0.97	–4.15***	–2.37
	(1.17)	(1.05)			(1.18)	(1.39)	(1.41)	(1.62)
$\Delta Fin.dev2_t$				3.95***				
				(1.19)				
$\Delta\tilde{r}2_t$				2.10**				
				(0.96)				
Proxies of g:								
ΔY_t	–8.69	–36.08***	–17.98***	–23.62**	–41.50***	–21.52*	56.23***	61.80***
	(5.65)	(8.57)	(6.68)	(9.69)	(7.41)	(11.37)	(9.32)	(13.37)
ΔY_{t-1}			–19.18***					
			(4.22)					
ΔY_{t-2}			15.51***					
			(5.90)					
Δg_t	–9.34**	–15.47***		–14.25***	1.60	2.45	11.82*	15.40**
	(3.74)	(3.98)		(4.71)	(6.25)	(6.34)	(6.82)	(6.95)
Controls:								
ΔPop_t	73.60***	76.42***	72.91***	61.32*	39.68	109.86**	–182.26***	–152.10**
	(26.42)	(29.04)	(28.06)	(34.40)	(47.59)	(51.43)	(55.14)	(59.79)
$\Delta Openness_t$	–1,470.1**	–1,377.4	–2,009.9**	–1,203.7		–1,150.2	1,544.4	2,597.6
	(730.2)	(947.0)	(902.9)	(1,042.7)		(1,333.2)	(1,256.9)	(1,672.6)
$\Delta Gov.Spend_t$	–0.23	13.09	–4.79	–0.96	–62.18***	–82.57***	69.60***	90.61***
	(13.67)	(14.35)	(16.68)	(16.45)	(18.40)	(20.62)	(20.18)	(26.35)
$\Delta Marg.tax_t$		–8.49***	–8.94***	–6.55**		5.26		6.47*
		(2.17)	(2.05)	(2.61)		(3.38)		(3.66)
$\Delta TopY\ 1\%_t$		0.78***	0.86***	0.36		–1.44***		–1.06
		(0.29)	(0.28)	(0.36)		(0.49)		(0.84)
$\Delta TopY10-1\%_t$						0.08		
						(0.30)		
$\Delta BotY\ 90\%_t$								–0.70*
								(0.38)
Obs.	50	43	43	43	40	38	40	38
# countries	8	7	7	7	6	6	6	6

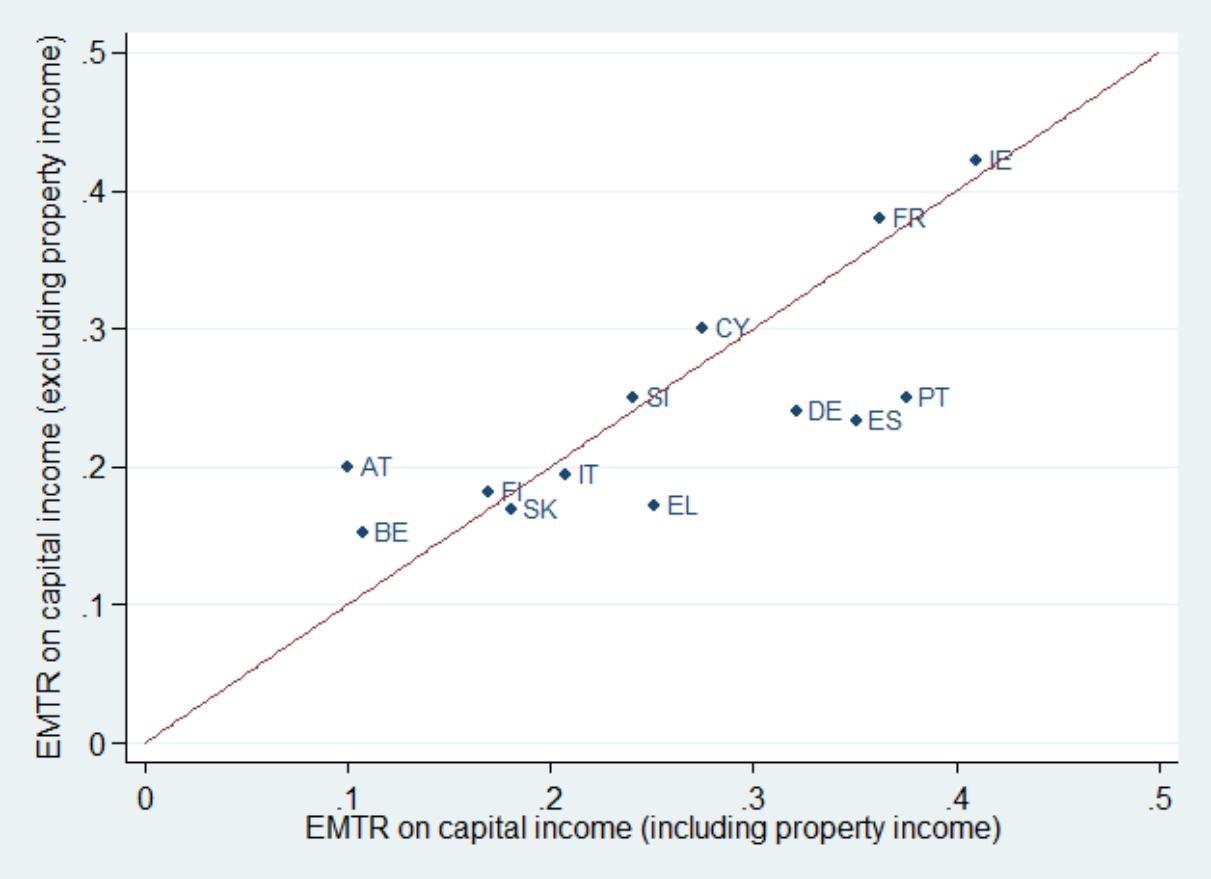
Notes and sources: See Table 1 for denotations of $Fin.Dev.$, $\tilde{r}$, Y and g. Dependent variables are shares of total personal wealth held by the top percentile ($TopW1\%$), top decile minus top percentile ($TopW10-1\%$) and bottom nine deciles ($TopW1\%$) in the wealth distribution. $Pop.$ denotes population, $Openness$ the trade share in GDP, $Gov.Spend.$ is central government expenditures over GDP, $Marg.tax$ is top marginal income tax rate, and $TopY1\%$, $TopY10-1\%$ and $BotY90\%$ are income shares of the top percentile, top decile minus top percentile and bottom nine deciles, respectively. See text for further details and sources. All codes and data used are available on the author webpages and upon request. Robust standard errors stand in parentheses. ***, ** and * denotes statistical significance at the 1%, 5% and 10% levels, respectively.

Figure 1: EMTR on capital income for top decile, difference between 2007 and 2013.



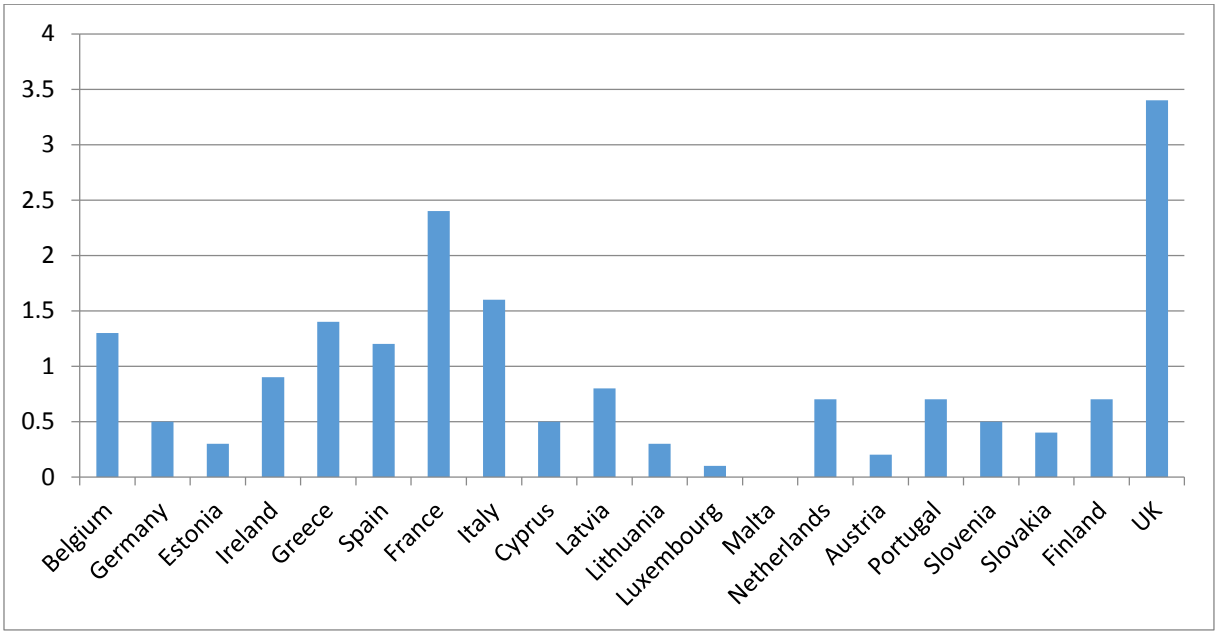
Notes and sources: This graph shows the effective marginal tax rate (EMTR) on capital income for 2007 (horizontal axis) and 2013 (vertical axis). The EMTRs are simulated by increasing interest and dividend payments by 1% and computing the resulting change in tax liabilities. The simulations are conducted using EUROMOD version G2 based on EU-SILC data. The red line is the 45 degree line.

Figure 2: EMTR on capital and property income for top decile, 2013.



Notes and sources: This graph shows the effective marginal tax rate (EMTR) on capital income for 2007 including (horizontal axis) or excluding (vertical axis) property income. The EMTRs are simulated by increasing interest and dividend payments (and property income for the horizontal axis) by 1% and computing the resulting change in tax liabilities. The simulations are conducted using EUROMOD version G2 based on EU-SILC data. The red line is the 45 degree line.

Figure 3: Revenue from recurrent property taxes 2012 (% of GDP).



Notes and sources: This graph shows the revenue from recurrent property taxes 2012 as per cent of GDP in selected European countries. The data is taken from Eurostat.