Do Capital outflow controls affect Wealth Inequality?

Michelle Ampadu
Department of Economics
Thesis 2016/2017
Western University, London, ON

Abstract

This research paper analyses the effect of capital outflow controls on Piketty's frame work of wealth inequality. Previous economic literature have not come to a consensus on Piketty's theory. The theory has recently been tested by Acemoglu and Robinson in *The rise and decline of the general laws of capitalism*. They find no evidence of a positive gap of r-g(rate of return on capital -the economic/ income growth rate),the main driver of wealth inequality that Piketty's theory assumes, on top income shares (which contain the capital share of income, a main sign of wealth inequality). This paper extends previous work in testing Piketty's theory by constructing a resident-based capital outflow control index from a recent Capital control measure database. There is some evidence that an increase in capital outflow controls can re-establish the r>g relationship. Specifically, the research finds some support for this claim for the top 10% income shares, however, there is evidence that shows that the top 1% income shares are less constrained by the capital outflow controls.

Keywords: Economic Inequality, Capital outflow Controls, Capital Control Policy, Top income shares, Wealth Inequality, rate of return on capital

Acknowledgments: I am grateful for the thesis experience, and thank Professor Castro for his, guidance, support, and encouragement through the journey. Also a very beautiful thank you to Professor Sicular for her kindness, and support. I would also like to thank Professor Davies and Professor Short for their helpful feedback. Also thank you to Professor Saunders and Robinson for the helpful comments! ; I would also like to say thank you to Vince at the Western libraries! The full dataset used in this research is available upon request.

† mampadu@uwo.ca

1 Introduction

[1]*Economic Inequality* is a phenomenon that occurs in all countries. However, the level of inequality varies with countries. In general, there has been a trend of increasing economic inequality. For example, countries like India and China have seen a high increase in inequality. Even though, some Western countries have seen smaller and steady increases. For instance, countries in Northern and Southern Europe have shown a substantial, yet smaller rise in inequality, while Continental Europe, and Japan indicate modest increases (Atkinson et al. 2011).

In Piketty's research based book, *Capital in the 21st century* (2015) immense light is shed specifically on wealth inequality, a contributor to Economic Inequality around the world. The French economist Piketty provides evidence that a positive gap between the rate of return on capital and the growth rate ("*r-g*") increases wealth inequality. Although the *r-g* (or *r > g)* relationship can also contribute to labor income inequality, Piketty asserts that the relationship of ' *r>g'* is a strong driver of wealth inequality, since it increases capital income (Piketty,2015). Piketty describes the terms capital and wealth interchangeably: wealth/capital includes all physical and financial property as well as working capital used by firms, government, and individuals.

Given the heated debate on Piketty's theory, Acemoglu and Robinson have taken the lead in testing Piketty's theory in their work "*The rise and decline*

[1]Economic Inequality is composed of wealth inequality and income inequality

of the general laws of capitalism". My research extends their analysis.[2] The authors show a negative and significant effect of (r - g) on the top 1% income shares. A negative effect also arises when I test (r - g) for the top 10% of income shares. The top income shares (1% and 10%) are a proxy for broader inequality measures like the Gini coefficient, and Atkinson index.

I extend Acemoglu and Robinson's work by hypothesizing that there needs to be a consideration of capital outflow controls, separating countries into closed or open economies. I also take a different approach to using the capital outflow control index by removing the non residents outflow controls since top income shares are based on residents income(WID-World Wealth and Income Database). This research is based on mostly OECD, and a few non OECD countries with Capital outflow control data from 1995 – 2010 (a list of countries is in the Appendix). Capital outflow controls needs to be considered, because there is a broken/imperfect link between r-g and the top 1% (or top 10% income shares), if top income earners are able to freely invest abroad(i.e. top income earners of open economies). As a result, the domestic interest rate or return to capital for open economies, may be of a lower value, when compared to closed economies whose top income earners are essentially forced to invest at home due to capital outflow restrictions.

The rate of return of capital/interest rate, used two measures: the return on government bond yields and the marginal product of capital. I use these measures

[2] I tested the top 10% using Acemoglu and Robinson's original regressions

in the regressions consisting of the benchmark, and aggregate index of capital outflow controls. The benchmark index uses capital outflow controls based on: real estate transactions income(investment properties), direct capital investments outflow, and government bonds yields. These capital outflow control types have moderately high prevalence percentages at: 42%, 33% and 52% respectively, also they are the most relevant choices for the 'r-g' measures which use government bond yields, and marginal product of capital, which is the output from a one unit increase in capital(it is also known as the rental rate of capital)(Refer to Appendix for more details on capital outflow control types) (Fernandez and co. 2015). These controls are on capital that would create an incentive for investors to outflow a high amount of capital from their home countries into countries that have higher returns on capital. For the very rich who have large funds that they can send abroad, such controls would limit/constrain a huge out flow of capital. I later relax this assumption and add in more capital outflow control types. In creating the bench mark index, I use capital outflow controls for residents, I average out the dummy variables (i.e. 1, 0.5, and 0) that were assigned to each capital control according to each year. The dummy variable are assigned based on evidence of capital outflow controls in the IMF'S Annual Report on Agreements and Exchange Restriction (AREAER).

Applying the model of capital outflow controls on Piketty's theory, results in some support for a significant and highly positive coefficient, for the interaction term of, capital outflow controls and r-g for the top 10% income shares. Specifically, there is also some evidence that the interaction coefficient is a positive number and is greater than just the coefficient on the 'r-g' term. The

top 1% income shares, however, are less constrained by the capital outflow controls. These findings also seem to be in line with the Feldstein-Horioka puzzle, which is the empirical evidence that domestic savings and domestic investments are highly correlated. The results show evidence of imperfect capital markets, and the ability of capital outflow controls to lead to the Feldstein-Horioka puzzle.

2 Literature Review

Piketty's theory begins with two general laws of capitalism.

First and Second Fundamental Laws of Capitalism

The **first fundamental law of capitalism** is based on the rate of return on capital and the capital income ratio, which shows the extent of capital dependency in a county. Let β be defined as the capital/income ratio:

$$\beta = \frac{K}{Y} \tag{1.1}$$

Let r denote the rate of return on capital, and 'α' denote the share of capital in national income. We now have **the second fundamental law of capitalism** :

$$\alpha = \frac{rK}{Y} \tag{1.2}$$

Substituting $\beta(1.1)$ into the definition of α results in a combined version of the two laws:

$$\alpha = r \times \beta$$

The result above shows the relationship between the share of capital income, the rate of return on capital and the capital/income ratio.

Acemoglu and Robinson also emphasize Piketty's long run relationship of the capital income ratio'β'.[3]The Long run 'beta' is : $\boldsymbol{\beta} = \frac{\frac{\Delta K}{K}}{\frac{\Delta Y}{Y}} = \frac{s}{g}$

(i.e "rate of change of K to the rate of change of Y", which is$\frac{s}{g}$) . Piketty's additional assumption is that even as *g(growth rate)* changes, *r(return on capital)* and *s(savings rate)* can be taken as approximate constant, and will not change at least as much as g (Acemoglu and Robinson, 2015). The long run law for β assumes that in the long run price variations balance out in $\beta = \frac{s}{g}$. Hence it does not explain short term shocks but helps determine the long run value of the capital/income ratio. Using the combined version of the **first and second general laws,** results in the, 'the long run expression of the capital share of income': $\alpha = r \times \frac{s}{g}$.

Declining Economic Growth

Economic growth rate is based on population growth and income per capita growth. First, Piketty's view is that differences in outputs and varying structures of economy is a restriction to growth. Another main theory that Piketty uses to explain low rates of economic growth, is the demographic transition, which shows that the increase in life expectancy is not sufficient to cover the falling birth rates, and hence low population growth rates should be expected in

[3] The intuition that Weiss (2015) discusses using Piketty's book, technical appendix, adds more understanding to this logic. It starts with an equation where National income at (t+1/current time) is defined, in terms of : the previous year national Income, and the growth rate:$Y_{t+1} = (1 + g_t)Y_t$. Additional definitions include: the savings rate at time t defined as, $s_t = \frac{(S_t)}{(Y_t)}$, and the capital stock at a certain time period defined as $K_{t+1} = (K_t) + S_t$. Dividing the left hand side and right hand side respectively by, Y_{t+1} and $(1 + g_t)Y_t$ will result in: $\frac{K_{t+1}}{Y_{t+1}} = \frac{(K_t)}{Y_t(1+g_t)} + \frac{(S_t)}{Y_t(1+g_t)}$. Substituting in for the capital income ratio β yields:
$\beta_{t+1} = \frac{(\beta_t + s_t)}{(1+g_t)}$. In the long run/ steady state: $\beta_{t+1} = \beta_t = \beta$, and $s_t = s \; and \; g_t = g$solving for $\beta, results \; in \; \beta = \frac{s}{g}$
.

the future. Over all, trade restrictions, and the effects of the demographic transition puts a downward pressure on the economic growth rate.

$r > g$ relationship

The rational for the $r > g$ relationship is derived by first multiplying the rate of return on capital (which does not change much) through the long run expression of $'\beta = \frac{s}{g}'$ '(i.e. the capital income ratio rate of change overtime), and then substituting for ' $r * \beta = \alpha$'(which is the expression based on the first two fundamental laws of capitalism) in the third step**:**

$\beta = \frac{s}{g}$

$r * \beta = \frac{r*s}{g}$

[4] $\alpha = \left(\frac{r}{g}\right) * s$

Since it is assumed that 's'/savings is roughly constant overtime. If 'α' the capital share of income(i.e. wealth inequality) is increasing over time, the only way that can happen is through the increase of $'\left(\frac{r}{g}\right)'$ which occurs exactly *when $r > g$*

[5] *(under assumption that s remains roughly constant overtime*)

The relationship between *r* and *g*

[6]A critique of Piketty's hypothesis is that as the capital stock increases, the rate of return on capital should fall. However, whether the rate of return falls, increases,

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[4] The appearance of α which is derived from short run components shows Piketty's framework connection of the short run and the long run

[5] Empirically savings being constant in countries is true, World Bank savings data) other economic models like the Solow economic model also assume constant savings rate

An increasing capital share of income implies wealth/capital inequality is increasing(since it is assumed that mostly capitalists own capital) low income workers do not own capital.

[6] Note that the interest rates and the growth rate are connected to both the production side and the household side. On the production side *g* affects *r* through the capital stock; and on the household side, it works through the elasticity of substitution between capital and labour (Acemoglu and Robinson, 2015). For the representative household this relationship between *r* and *g*, is $r = \rho + \phi g$ (where ϕ is the inverse

or stays the same is determined by the elasticity of substitution between labour and capital.[7] Piketty's framework assumes that the elasticity of substitution is higher than one, and so the general production function of constant elasticity of substitution (CES) is also assumed.[8] The CES is used to allow labour and capital to be substitutable at high rates.

Piketty's assumption of high elasticity of labour to capital has been refuted by Rognlie , and other authors who have mentioned that Piketty should factor depreciation rates into the $r > g$ relationship, as it would lower the elasticity between labour and capital (Rognlie, 2014). With this in mind, Acemoglu and Robinson and also in my research, define r = MPK-d, to account for depreciation ('d'), similarly for government bond yields, the realized inflation rate is subtracted from *r return on government bonds.* Despite the critique, Karabarbounis and Neiman (2014) research seem to find support for the r>g hypothesis, the researchers find evidence of high elasticities from low technology costs that have lowered the relative price of investments. Overall, to deal with the disputes about the elasticity of substitution between capital and labour, this research will use the net interest rates/net rate of return on capital.

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of the intertemporal elasticity of substitution and ρ is the time discount rate/base rate). As explained before, r will not change as much as g and so 'the intertemporal elasticity of substitution' has to be greater than 1. Hence the inverse 'ϕ' will be very small, this will keep r roughly the same over time.

[7] $\mathrm{F(K,L)} = \left(aK^{\frac{\sigma-1}{\sigma}} + (1-a)L^{\frac{1-\sigma}{\sigma}}\right)^{\sigma}$ As $\sigma \to 1$, the CES function approaches the Cobb Douglas production function form.

[8] in this case MPK (the partial derivate of the CES with respect to K) $= a\left(\frac{Y}{K}\right)^{\frac{-1}{\sigma}} = a\beta^{\frac{-1}{\sigma}}$ where 'a is some arbitrary constant'. Replacing MPK with 'r' in the capital share of income expression results in: $\alpha = r \times \beta = a\beta^{\frac{-1}{\sigma}} \times \beta = a\beta^{\frac{\sigma-1}{\sigma}}$(Weiss, 2015). To see the impact of changes of β on α, we use the partial derivate of the capital share of income with respect to β, $\frac{\partial \alpha}{\partial \beta} = \frac{\sigma-1}{\sigma} a\beta^{\frac{-1}{\sigma}}$, this derivative is positive exactly when the elasticity of capital to labour is greater than 1 i.e. $\sigma > 1$, and so under this condition an increase in the $\beta(thecapitalincomeratio)$ will then increase the capital share of income.

The link to Capital Outflow Controls

Bretton Woods system

An example of a Capital outflow controls policy is the Bretton Woods system which was based on mostly rules that controlled monetary Economics, and commercial and financial relations in the U.S, Canada, Australia, Japan and Western Europe in the mid 20th century. Eshegreen details the impact of Capital controls stemming from the Bretton Woods era:

"This was a period when governments intervened extensively in their economies and in their financial systems. Interest rates were capped. The assets in which banks could invest in were restricted. Governments regulated financial markets to channel credit toward strategic sectors. The need to obtain import licenses, complicated efforts to channel capital transactions through the current account. Controls held back the flood because they were not just one rock in a swiftly flowing stream. They were part of the series of levees and locks with which the raging rapids were tamed." (Eichengreen 2008).

Eichengreen's quote reveals the depth at which capital outflow controls affect the economy. Despite such pressure, the Bretton-wood system could not last for long, since in 1959, it become easier to send money abroad by changing trade volumes(Fauss, 2011). Also there were establishment of multinational enterprises that made the transfer of capital easier. Another issue was that, banks were sending out money to banks in different countries that offered higher interest

rates. For example, US capital controls, became weak because European banks were receiving U.S dollars that they then held at a higher interest, than the interest rates of the U.S banks which had more regulations (Fauss, 2011).

Frictions to Capital Mobility

Capital is said to be mobile between two regions if some of their residents may engage in interregional asset trades. Correspondingly, the degree of capital mobility is measured by the scope for such trades, a scope which might be limited by transaction costs, taxes, or social regulations." (Obstfeld 1986) .The so-called "Feldstein-Horioka puzzle" can occur from limiting capital mobility out of the country. The two authors, Feldstein and Horioka, discovered that changes in national savings are highly correlated with changes in domestic investment. In neoclassical economic theory, this would not occur since, a country can borrow from abroad at the world interest rate, when national savings do not meet investment demand. Capital outflow controls seems to magnify this puzzle since it can increase both national savings, and domestic investment. Therefore, this will result in an imperfect capital mobility.

In this research paper, I will be focusing on restrictions on capital outflows controls and its connection to Piketty's $r > g$. As discussed by Acemoglu and Robinson, '$r > g$'/ wealth inequality will rise, because capital income will tend to increase at the rate of return to capital 'r', while the income of non capitalists increase at the rate of *g(gdp/income growth rate)*. I chose to use capital outflow controls because of its emphasis on the domestic capital income ratio $\frac{Kd}{Y}$ $Kd(domestic\ capital)$. The connection between domestic r - g and top income shares, is broken if investors are allowed to freely move capital abroad. In

that scenario the capital income ratio would involve returns on capital earned abroad:$\frac{Kd+Kf}{Y}$with a high Kf. Capital outflow controls would result in the decrease of Kf (foreign capital) value, and an increase Kd(domestic capital).

In *Controlling Capital? Legal Restrictions and the Asset Composition of International Financial Flows,* Binici, Hutchison, and Schindler's main finding is that controls affect capital flows only through outflows with little or no discernable impact on inflows (Binici and co., 2009). In *Capital Controls – Myth and Reality A Portfolio Balance Approach to Capital Controls*, the authors asserts that capital controls on outflows preserve savings for domestic use (Magud et al., 2011). This result shows that capital controls can indeed increase Kd and hence may also lead to an increase in domestic investments. In that case, the Feldstein-Horioka puzzle would be present.

3 Empirical Model

To measure inequality , in " the Rise and Decline of the General Laws of Capitalism" Acemoglu and Robinson's main measurement for inequality is the top 1% income shares. For my research, I will be using both the top 1% income shares and the top 10% income shares, since Piketty's model, accepts both measurements of top income shares (Piketty and Zucman, 2014). The top 1% income shares as well as the top 10% income shares have a strong and significant relationship with broader inequality measures such as the Gini coefficient and Atkinson index (Leigh, 2007). I specify the top 1% and top 10% of income shares as the dependent variable, and the difference between the rate of return on capital and

the growth rate, and, the interaction of (r-g) and capital outflow controls as the main independent variables . The dependent variable top 1% /10% income shares is pre-tax income that was collected from the Top Wealth and Income database, and the GDP /income growth rate comes from the Maddison database. Also marginal product of capital has been collected from Penn world tables, and the realized interest rates from government bonds is from the OECD Database. It is important to note that the variable (r - g) can be used with three different measures of r. The first measure assumes r = 0, and this is the case of perfect capital mobility, where there is constant returns to capital for all countries. For the research, I deviate from Acemoglu and Robinsons assumption of Perfect capital mobility(r=0) and focus on the two other measures of r - g . I focus on r, the return on long term government bond yields minus annual inflation; this is for only OECD countries. And, r - g when r = MPK (marginal product of capital) - depreciation rate, since it may reflect more accurately how top incomes earners earn their capital income as MPK averages returns from different capital assets. Directly, marginal product of capital is the return from a one unit capital investment.

Capital outflow control and r-g Model

The three equations I used for the research model, build up from Acemoglu and Robinson model. The differences are that, capital outflow restrictions/controls index ‘capo’ is multiplied to (r - g)(i.e. together it is the interaction term), also the equations are initially based on the bench mark index of ‘capo’. It shows the marginal effect of an increase in capital outflow restriction on r-g. In addition the lags of (r - g) are also multiplied with ‘capo’ index, they show the marginal effects

of the of 'capo' on the r-g lags. The empirical method used is fixed effects. Since, the homoscedastic assumption for OLS is violated, thus there are better estimates than OLS(Ordinary Least Squares); the fixed effects model is a better option because it removes heteroskedasticity/autocorrelation among error terms. One reason why I choose the fixed effects model, is that savings is constant and does not vary much within countries overtime. In the fixed effects model, since the savings is part of the error term, it will be removed with the assumption that it 's'/savings is not varying over time. The equations are outlined below:

- $\boldsymbol{top1\%share_{it}} = \boldsymbol{\gamma_1(r-g)_{it}} + \boldsymbol{\gamma_2(capo*(r-g))_{it}} + \boldsymbol{capo} + \boldsymbol{\gamma_4 topdummy_{it}} + \boldsymbol{\gamma_5 year_{it}}$
- $\boldsymbol{top1\%share_{it}} = \boldsymbol{\gamma_1(r-g)_{it}} + \boldsymbol{\gamma_2(capo*(r-g))_{it}} + \boldsymbol{capo} + \boldsymbol{\gamma_4 topdummy_{it}} + \boldsymbol{\gamma_5 year_{it}} + \boldsymbol{\gamma_6 l1top1\%share_{it}} + \boldsymbol{\gamma_7 l2top1\%share_{it}} + \boldsymbol{\gamma_8 l3top1\%share_{it}} + \boldsymbol{\gamma_9\, l4top1\%share_{it}} + \boldsymbol{\gamma_{10}\, l5top1\%share_{it}}$
- $\boldsymbol{top1\%share_{it}} = \boldsymbol{\gamma_1(r-g)_{it}} + \boldsymbol{\gamma_2(capo*(r-g))_{it}} + \boldsymbol{capo} + \boldsymbol{\gamma_4 topdummy_{it}} + \boldsymbol{\gamma_5 year_{it}} + \boldsymbol{\gamma_6 capo*l1(r-g)_{it}} + \boldsymbol{\gamma_7 capo*l2(r-g)_{it}} + \boldsymbol{capo*\gamma_8 l3(r-g)_{it}} + \boldsymbol{capo*\gamma_9\, l4(r-g)_{it}} + \boldsymbol{\gamma_{10}\, l1top1\%share} + \boldsymbol{\gamma_{11}\, l2top1\%share} + \boldsymbol{\gamma_{12}\, l3top1\%share}\ \boldsymbol{\gamma_{13}\, l4top1\%share} + \boldsymbol{\gamma_{14}\, l5top1\%share}$

The first equation is more of a short run model and has no lags, however the second and third equations show the long run effects described in Piketty's model. The lags of the dependent variable top income shares, can be used to find the long run equilibrium on $y_t = \alpha + \gamma(r-g_t) * capo + \rho 1 y_{t-1} + p2y_{t-2} + \cdots pky_{t-k} + \varepsilon_t$: this involves the assumption that in the long run $y_{t-k} = y \quad for\ all \quad k > 1$, dividing through by $(1-\rho 1-\rho 2-\rho 3-\rho 4 \ldots\ldots -pk)$, this results in $y_t/(1-\rho 1-\rho 2-\rho 3-\rho 4 \ldots\ldots -pk)$ which is the long run effect coefficient on $(r-g_t) * capo$. Also the persistence of top income shares is $(\rho 1+\rho 2+\rho 3+\rho 4+\rho 5)$ (i.e. the sum of the coefficients of the 5 lags of

top incomes in the second equation). The third equation can be understood in a similar way, the only difference is that there are now lags for the independent variable (r-g)*capo. Whiles, the third equation contains 4 lags of *r – g*capo*, as well as the 5 lags of top incomes shares, which express the idea of persistent wealth inequality.

Aside from the main variable *r – g* and top 1% /top 10% income share, the specification involves using: dummy variable for those countries that have top 1%/and top 10% income shares data and 'year', which is a list of full year dummy variables between 1995-2010.

Capital Outflow Controls Empirical Approach

[9]To understand the impact of capital outflow controls on Wealth inequality, two empirical approaches are employed: first, I divided countries into open or close: above the median of capital outflow restrictions means closed economies(i.e. higher than 5% instance of capital outflow controls), if they are below the median of they were identified as open(refer to appendix for more details); I also use the new data on capital outflow controls, which builds from Shindler (2009), Klein (2012) and Fernández, Rebucci and Uribe (2014). It involves looking at the IMF'S Annual Report on Agreements and Exchange Restriction (AREAER) and contains a single outflow restriction index, that averages capital controls of outflows across ten asset categories which are assigned dummy variables of 0,0.5, and 1 as capital outflow control measure.

The median is 0.05/5%. If a country has more than 5% capital outflow controls they are categorized as closed

Full Dataset is available upon request

However, in the Capital Controls measure dataset the researchers do not have an aggregate index for domestic residents controls on outflows. So I construct an index that removes the non residents capital outflow controls. This is supported by the fact that top income shares are measured in terms of national income, which contains income that the, *residents of the country* earn domestically and internationally (WID, Methodology).

In terms of how capital outflow relates to increasing wealth inequality/ increasing capital share of income. Piketty's frame work would need to be referenced**.** If there are capital outflow controls, this results in an increase to the capital share of income (i.e. an increase in wealth inequality), the logic can be seen in the formula below:

An increase in domestic capital from the capital controls results in:

$$\uparrow \alpha = r * \beta = r\frac{k\uparrow}{y} \; and \; also \; in \; the \; long \; run \uparrow \alpha = (\frac{r}{g})*(s)$$

since s is assumed to be roughly constant over time for countries

$$the \; increase \; in$$

α (i.e. capital share of income or wealth inequality) is happening exactly when r-g>0 / r>g

And hence capital outflow restrictions will re-establish the link between (r - g) and wealth inequality.

4 Testing the Capital Outflow Control and r-g Model

Table 1 reports regressions using two measures of *r-g* from a unbalanced panel spanning between 1995-2010. The specification *r*=nominal yields on

long term government bonds minus realized inflation rate, has results in column 1-3. In column 1, I look at the relationship between annual top 1 percent share, *r-g term*, and the *r-g**capital outflow restrictions term; this specification includes full year and country dummies. Using Piketty's theory, I anticipate a positive and significant coefficient for *r-g* through the interaction with capital outflow controls, also the coefficient should be greater than the coefficient on just '(r-g)' .In contrast for the top 1% income share, I find a negative estimate for *r-g* and the interaction term, both are statistically insignificant. In column 2, five annual lags of top 1 percent share are specified on the right hand side of the interaction model; it is included to show the persistence of wealth inequality. The test also shows that lagged top 1%, *r-g*, and the capital outflow control interaction term are negative and insignificant at the 10% level. In column 3 there are five lags of *r-g*, as well as five lags of the top 1% share, there is once again no evidence of *r-g*'s impact in wealth inequality the relationship is also negative.

A concern with column 1-3 is, the rich may not generate wealth from just long term government bonds yields, and so through the method of Caselli and Feyrer (2007) the measure of marginal product of capital minus the depreciation *is used*. Marginal product of capital contains returns from different capital. The main set of regressions when *r*=MPK-*d* are in column 4 to 6, adding the capital outflows restrictions and r-g interaction term, leads to a negative effect and insignificant results in column 4, however in column 5 and 6 using the same lags as col 2-3, the interaction term *r-g**capital outflow controls, is positive and bigger than the negative coefficient on r-g,

however the results are still insignificant at the 10% level. Additionally, including controls like GDP per capita, and population growth does not provide any evidence of r-g on top 1% income shares. For some of these regressions capital outflow restrictions index moves in the positive direction, but is also insignificant.

I also use the top 10% income shares, as the dependent variable, since it could be the case that, the top 1% income shares are less constrained by capital outflow controls since they may have access to a high level of political connections/ties and so they may have more influence in weakening the policy of capital outflow controls. Thus, the impact of capital outflow controls for the top 1% income shares, may not be realized, than they would for the top 10%, who may experience weaker political connections/ ties.

For the top 10% income shares, in column 1 the main effect of *r-g* is negative and insignificant however the interaction term of capital outflow controls is positive significant, and out dominates the negative coefficient of *r-g* . In column 2 and column 3, however, the negative *r-g* effect is significant. In addition, the interaction term coefficient, is significant and also positive enough to overpower the significant negative effect of *r-g*. In column 4 , however, the interaction term of capital outflow controls and the *r- g*, has a very small and insignificant negative coefficient, and it is not greater than the negative and significant *r-g term*. In column 5 and column 6, lags are included and there is evidence of a high positive and significant interaction term of capital outflow controls interaction term with r-g. In both columns 5 and 6, there is a positive and significant coefficient on the

interaction term, and it is bigger than the significant negative coefficient on the (r-g) term. An interesting result in column 6 in particular , is that on its own, Capital outflow controls, is positive and significant which is a sign that capital outflow controls can increase the capital share of income and hence top income shares.

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TOP 1% INCOME SHARES bench mark	Col.1-3 Government bond yields			Coln 4-5 MPK		
4.1 PRESENTATION OF RESULTS	**Minus Inflation rate**			**Minus Depreciation**		
TABLE 1	Coln 1	Coln 2	Coln 3	Coln 4	Coln 5	Coln 6
	Panel A: Estimates using annual panel					
Estimate of *r-g* at *t*	0.000610	-0.0480	-0.0462	0.0249	-0.0169	-0.00940
	(0.02)	(-1.24)	(-1.14)	(0.85)	(-0.45)	(-0.24)
(r-g)*capital outflow restrictions	-0.0844	-0.00725	-0.0139	-0.0659	0.0299	0.0292
	(-1.14)	(-0.09)	(-0.04)	(-0.85)	(0.30)	(0.26)
Capital outflow restrictions	-0.294	-0.676	-0.562	1.078*	0.0950	-0.490
	(-0.42)	(-0.90)	(-0.66)	(1.77)	(0.14)	(-0.38)
Estimate of *r-g* at *t* – 1			-0.000891			0.0123
Multiplied by restrictions			(-0.38)			(0.16)
Estimate of *r-g* at *t* – 2			0.00529			-0.0406
Multiplied by restrictions			(0.91)			(-0.33)
Estimate of *r-g* at *t* – 3			-0.0103			-0.0105
Multiplied by restrictions			(-1.18)			(-0.06)
Estimate of *r-g* at *t* – 4			0.0038			0.138
Multiplied by restrictions			(0.67)			(0.67)
Joint significance of lags [p-value]		7.06(0.00)	4.01[0.00]		6.21[0.00]	3.54 [0.00]
Persistence of top 1 percent share [p-value estimate< 1]		0.04	0.05		0.09	0.08
Observations	224	164	164	303	207	207
Countries	19	18	18	27	24	24
Years per country	11.8	9.1	9.1	11.2	8.6	8.6

****p<0.001 *** p<0.01, ** p<0.05, *p<0.10

M.
A.
20

4.1 PRESENTATION OF RESULTS	Col.1-3 Government bond yields Minus Inflation rate			Coln 4-5 MPK Minus Depreciation		
TABLE 1	Coln 1	Coln 2	Coln 3	Coln 4	Coln 5	Coln 6
	Panel A: Estimates using annual panel					
Estimate of *r-g* at *t*	-0.000892	-0.00263**	-0.00311**	- 0.00144*	-0.00130*	-0.00155**
	(-1.11)	(-2.65)	(-2.97)	(-1.81)	(-1.68)	(-2.02)
(r-g)*capital outflow restrictions	0.00323**	0.00440**	0.00436**	0.0032	0.00720**	0.00981**
	(2.38)	(3.09)	(2.73)	(1.37)	(2.38)	(2.43)
Capital outflow restrictions	0.0165	0.0145	0.0106	-0.000278	-0.00752	0.0601**
	(1.30)	(1.09)	(0.78)	(-0.02)	(-0.57)	(2.01)
Estimate of *r-g* at $t-1$			-0.00000259			-0.00158
Multiplied by restrictions			(0.13)			(-0.33)
Estimate of *r-g* at $t-2$			0.000185			-0.00910**
Multiplied by restrictions			(0.74)			(-2.69)
Estimate of *r-g* at $t-3$			0.00000527			-0.00111
Multiplied by restrictions			(0.25)			(-0.30)
Estimate of *r-g* at $t-4$			0.000283			0.00311
Multiplied by restrictions			(1.51)			(-0.86)
Joint significance of lags [p-value]		5.40[0.00]	3.51[0.00]		7.13[0.00]	5.28 [0.00]
Persistence of top 10 percent share [p-value estimate< 1]		0.215	0.144		0.221	0.221
Observations	182	132	132	209	145	145
Countries	17	16	16	21	18	18
Years per country	10.7	8.3	8.3	10.0	8.1	8.1

****p<0.001 *** p<0.01, ** p<0.05, *p<0.10

LIMITATIONS OF MODEL

The model is likely to suffer from omitted variable bias. To address this issue, control variables such as population growth rates, and GDP per capita which relate to Piketty's theory can be added as control variables into the model. As discussed earlier the fact that Piketty assumes that the rate of return does not change much with response to changes in savings/accumulated capital stock overtime, helps to mitigate the impact of endogeneity. It is also likely that there may be measurement errors from the calculation of top income shares since it involves pre-taxes and administrative data. In addition, top income shares is based on gross incomes before tax, there may be an issue of tax avoidance or even tax evasion and as such, not all incomes may be reported with accuracy (Atkinson, Piketty, and Saez, 2011).Another issue for the model with capital outflow control is that, there are only 10 years of data, so adding lags may lead to an issue of Nickell Bias, however, this problem is reduced as more years are included in the regression.

4 Robustness Check

From the initial graphs that I plotted, Ireland was an outlier and so I dropped it from the panel data. Although the results are weaker there still seems to be some evidence of a positive interaction of capital outflow controls in making r >g(See appendix for more details). In the appendix, I dropped Ireland from the database for both the bench mark capital controls, and aggregate index based on residence controls, and similar results of the regressions hold. Although, the results are now much stronger for the return of government bond yields minus growth rate,

and weaker for r= MPK-d (marginal product of capital minus depreciation equals the rate of return on capital).

5 Conclusion

Wealth Inequality is a defining challenge of our times, and understanding how capital control policy can impact it, has important implications on fiscal policy and also monetary policy. This research adds insight to this issue by showing some evidence that capital outflow restrictions can help re-establish Piketty's theory that a positive gap between *r-g* increases wealth inequality (for the top 10% income shares/the rich). However, for the top 1% income shares (the outrageously rich), the link between r-g and top income shares is still broken, because the top 1% income share, can potentially find a way around the capital outflow restrictions. Future research should focus on developing a better/ tighter measurement of capital outflow controls, as this could potentially show a much stronger link between r-g and both top income shares.

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Online Supplementary Appendix

Figure 9.14: Predicting the impact of capital Controls on the (r-g) and top Income shares relationship - Benchmark

```
1.  /*Creation of variables*/
2. egen ccode=group(country)
3. sort ccode year
4. xtset ccode year
5. gen minusg=-d.y /*minus g from Madisson*/
6.gen pik_irate=irate-f.infrat-d.y_na /*irate from OECD data (net of inflation), minusg from PWT*/
7. gen pik_mpk=mpk_na-delta_k-d.y_na
8. gen l1top10share=L1.top10share
10. gen l2top10share=L2.top10share
11   gen l3top1share=L3.top10share                                          //topincome share lags
12     gen l4top10share=L4.top10share
13     gen l5top10share=L5.top10share
14
15   gen avg = ( re_pabr + bo_pabr + dio)/3
16
17
18 tab year, gen(dyear)
19    tab ccode, gen(dcode)
20      tab top10dummy, gen(dtop10dummy)
        bys country: egen meanavg = mean(avg)
21        //dividing countries into open or closed
22      gen closed1 =. replace closed1 = 1 if meanavg> 0.05
23
24    /*Panel B: i-pi-g*/
26 gen rminusg=100*pik_irate
27 xtset ccode year
28 gen l1rminusg=L1.rminusg*avg
29 gen l2rminusg=L2.rminusg*avg
30 gen l3rminusg=L3.rminusg*avg
31    gen l4rminusg=L4.rminusg*avg
32    //rminusglags with the interaction of capital outflow controls
33    *Column 1*
34      xtset ccode year
35
36      reg top10share rminusg  c.rminusgr#c.avg avg i.top10dummy i.year, fe
37
38
```

```
*Column 2*
xtset ccode year
xtreg top10share  l1top10share l2top10share l3top10share l4top10share l5top10share rminus  c.rminusg#c.avg avg i.top10dummy i.year,fe

*Column 3*                                                                                   /
xtset ccode year
xtreg top10share rminusg  c.rminusg#c.avg avg  l1rminusg l2rminusg l3rminusg l4rminusg l1top10share l2top10share l3top10share l4top10share l5top10share i.top10dummy i.year, fe

bysort country: egen meantop3= mean(top10share)
bysort country: egen  meanrg3= mean(rminusg)
    quietly reg  meantop3  meanrg3 if closed1 == .
    predict hat5
    twoway ( scatter meantop3  meanrg3  if closed1 == ., mlabel( wbcode ) )  (line hat5  meanrg3 if closed1 == ., sort), legend(off) title(" Mean Top 10%  Income shares vs. Mean r-g when r = return on long term government bonds")  ylabel(0(0.1)10) ymtick(0(0.1)10)  ytitle(" Mean Top 10%  Income shares") xtitle("  Mean r-g when r = return on long term government bonds") xlabel(0(0.1)10) xmtick(0(0.1)10)

    bysort country: egen meantop4= mean(top1share)
    bysort country: egen meanrg4= mean(rminusg)
    quietly reg meantop4  meanrg4 if closed1 == 1
    predict hat6
    twoway ( scatter meantop4  meanrg4 if closed1 == 1, mlabel( wbcode ) )  (line hat6 meanrg4 if closed1 == 1, sort), legend(off) title(" Mean Top 10%  Income shares vs. Mean r-g when r = return on long term government bonds")  ylabel(0(0.1)10) ymtick(0(0.1)10)  ytitle(" Mean Top 10%  Income shares") xtitle(" Mean r-g when r= return on long government bonds") xlabel(0(0.1)10) xmtick(0(0.1)10)

    *Drop variables*
    drop rminusg l1rminusg l2rminusg l3rminusg l4rminusg

    /*Panel C: MPK-delta-g*/
    gen rminusg=100*pik_mpk
    gen l2rminusg=L2.rminusg*avg
    gen l3rminusg=L3.rminus*avg
    gen l4rminusg=L4.rminusg*avg
```

```
70      *Column 4*
71      xtset ccode year
72      xtreg top10share rminusg  c.rminusgr#c.avg avg  i.top10dummy i.year, fe
73
74      *Column 5*
75      xtset ccode year
76      xtreg  top10share   l1top10share l2top10share l3top10share l4top10share l5top10share rminusg
c.rminusg#c.avg avg  i.top10dummy i.year, fe
77
78      *Column 6*
79      xtset ccode year
80      xtreg  top10share rminusg   c.rminusg#c.avg  avg  l1rminusg  l2rminusg  l3rminusg   l4rminusg
l1top10share l2top10share l3top10share l4top10share l5top10share i.top10dummy i.year, fe
81
82      bysort country: egen meantop= mean(top10share)
83      bysort country: egen  meanrg= mean(rminusg)
84      quietly reg meantop meanrg if closed1 ==.
85      predict hat3
86      twoway ( scatter meantop meanrg if closed1 == ., mlabel( wbcode ) )  (line hat3 meanrg if closed1
== ., sort), legend(off) title(" Mean Top 1%  Income shares vs. Mean r-g when r = MPK-depreciation rate")
ylabel(0(0.1)10) ymtick(0(0.1)10)  ytitle(" Mean Top 1%  Income shares")   xtitle(" Mean r-g when r= MPK-
depreciation rate") xlabel(0(0.1)10) xmtick(0(0.1)10)
87
88      bysort country: egen  meantop1= mean(top10share)
89      bysort country: egen  meanrg1= mean(rminusg)
90      quietly reg meantop1 meanrg1if closed1 == 1
91      predict hat4
92      twoway ( scatter meantop1 meanrg1 if closed1 == 1, mlabel( wbcode ) )  (line hat4  meanrg1 if if
closed1 == 1, sort), legend(off) title(" Mean Top 1%  Income shares vs. Mean r-g when r = MPK-depreciation
rate")  ylabel(0(0.1)10) ymtick(0(0.1)10)  ytitle(" Mean Top 1%  Income shares")   xtitle(" Mean r-g when
r= MPK-depreciation rate") xlabel(0(0.1)10) xmtick(0(0.1)10)
```

The same structure of code was used for the top 1% of income shares

All the measures do not include non -residents.
Bench mark Index gen avg = (re_pabr + bo_pabr + dio)/3
real estate. bonds for residents. and direct investments outflows

Aggregate index
gen avg1= (re_pabr + bo_pabr +eq_pabr+ de_pabr+ ci_pabr+ mm_pabr+ cco+ gso+ dio+fco)/10
real estate, bonds, equities, derivatives, credits investment, money market, guarantee securities, direct investments, financial credits.
List with definitions:
Real Estate transactions representing the acquisition of real estate not associated with direct investment, including, for example, investments of a purely financial nature in real estate or the acquisition of real estate for personal use. (re)

Direct investment accounts for transactions made for the purpose of establishing lasting economic relations both abroad by residents and domestically by nonresidents. (di)

debt securities with an original maturity of more than one year. (bo)

Money market instruments, which includes securities with an original maturity of one year or less, in addition to short-term instruments like certificates of deposit and bills of exchange, among others. (mm)

Equity, shares or other securities of a participating nature, excluding those investments for the purpose of acquiring a lasting economic interest which are addressed as foreign direct investment. (eq)

Collective investment securities such as mutual funds and investment trusts. (ci)

Financial credit and credits other than commercial credits granted by all residents, including banks, to nonresidents, or vice versa. (fc)

Derivatives, which includes operations in rights, warrants, financial options and futures, secondary market operations in other financial claims, swaps of bonds and other debt securities, and foreign exchange without any other underlying transaction. (de)

Commercial Credits for operations directly linked with international trade transactions or with the rendering of international services. (cc)

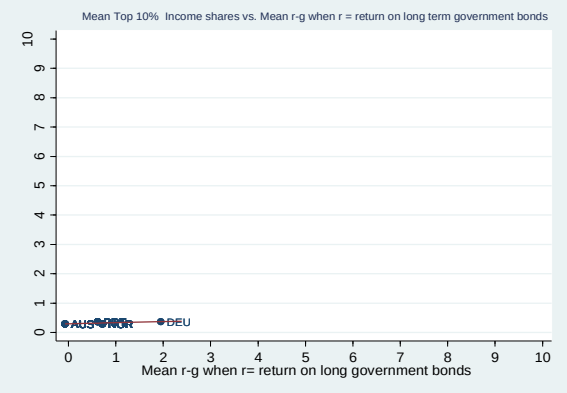
Guarantees, Sureties and Financial Back-Up Facilities provided by residents to nonresidents, and vice versa, which includes securities pledged for payment or performance of a contract—such as warrants, performance bonds, and standby letters of credit—and financial backup facilities that are credit facilities used as a guarantee for independent financial operations. (gs)

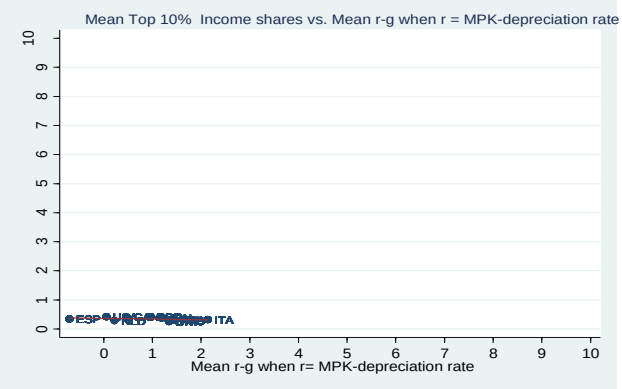
Determining the Optimal Capital Outflow control cut-off

```
. sum avg avg1,detail

                          (mean) avg
-------------------------------------------------------------
      Percentiles      Smallest
 1%           0              0
 5%           0              0
10%           0              0       Obs                  21
25%           0              0       Sum of Wgt.          21

50%      .047619                     Mean           .1833852
                       Largest       Std. Dev.      .3066691
75%     .1666667       .2916667
90%     .6666667       .6666667       Variance       .094046
95%      .952381        .952381       Skewness       1.861194
99%           1              1       Kurtosis       5.110236

                          (mean) avg1
-------------------------------------------------------------
      Percentiles      Smallest
 1%           0              0
 5%           0              0
10%           0              0       Obs                  21
25%           0              0       Sum of Wgt.          21

50%     .0642857                     Mean           .2142523
                       Largest       Std. Dev.      .3254535
75%         .325       .4714286
90%           .9             .9       Variance       .10592
95%     .9285714       .9285714       Skewness       1.493387
99%          .95            .95       Kurtosis       3.742227

.
```

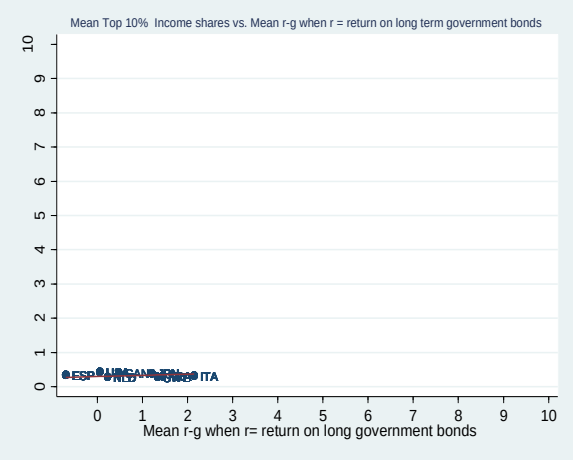
I use the median/ 50% Percentile for avg (cutoff for the benchmark capital outflow controls) the median cut-off is 0.05/5% and for the overall capital outflow controls the median is 0.06/6%. I use the 5% base line to divide countries into open and closed. Avg1 is the overall capital outflow control measure.

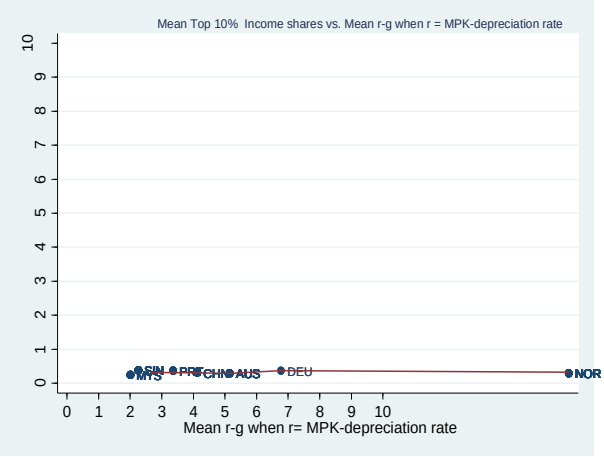
CLOSED ECONOMIES (ABOVE 5% CAPITAL OUTFLOW CONTROL)





OPEN ECONOMIES (5%OR LESS CAPITAL OUTFLOW CONTROL)

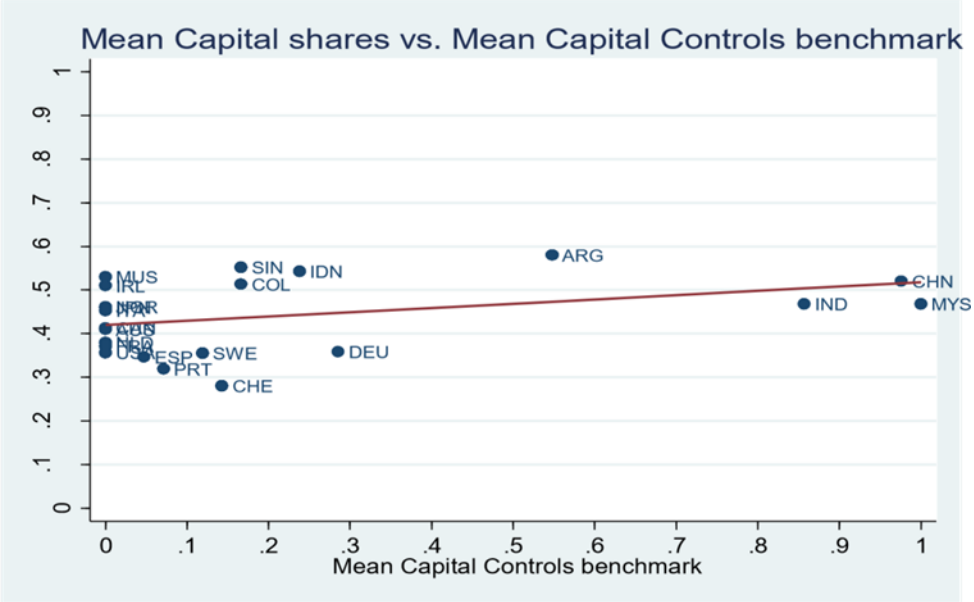


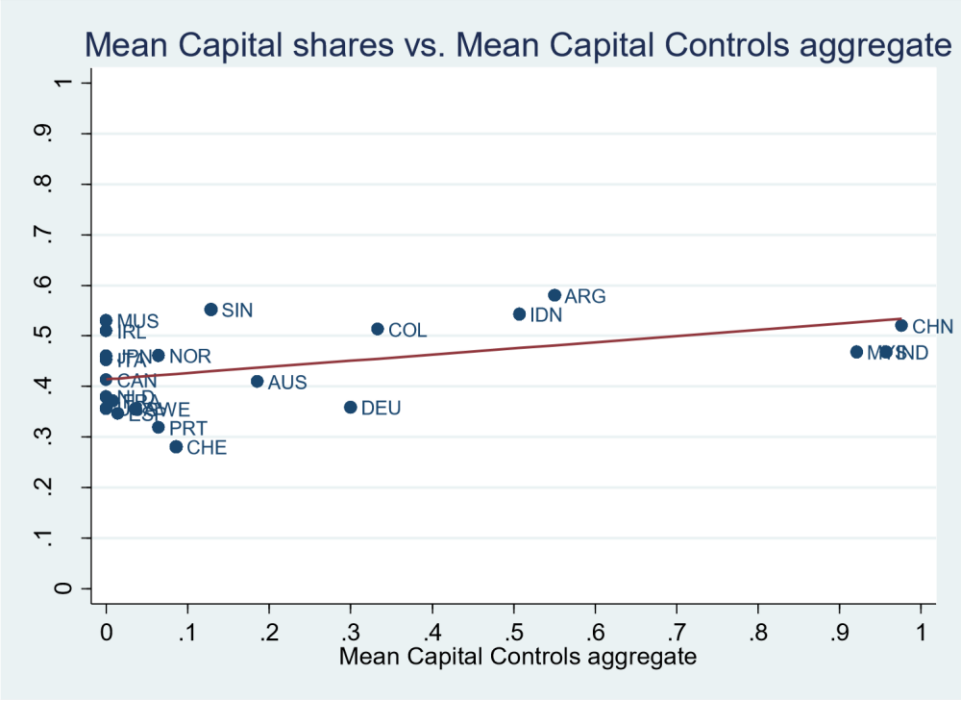


(Norway becomes an outlier after the drop of Ireland)

All these graphs are based on the results of dropping Ireland and removing non residents capital outflow controls.

Theory focuses on the capital share of income(the main component that drives Wealth Inequality) so here is the scatter plot that shows the relationship between capital controls and capital share of income.





TOP 1% INCOME SHARES benchmark NO IRELAND	Col.1-3 Government bond yields			Coln 4-5 MPK		
4.1 PRESENTATION OF RESULTS 5	Minus Inflation rate				Minus Depreciation	
TABLE 1	Coln 1	Coln 2	Coln 3	Coln 4	Coln 5	Coln 6
	Panel A: Estimates using annual panel					
Estimate of *r-g* at *t*	-0.0118	-0.101*	-0.107	0.0540	0.0160	0.0367
	(-0.23)	(-1.71)	(-1.63)	(1.60)	(0.32)	(0.66)
(r-g)*capital outflow restrictions	-0.0802	0.0365	0.0970	-0.0994	-0.02065	-0.0237
	(-0.98)	(0.40)	(0.28)	(-1.19)	(-0.18)	(-0.19)
Capital outflow restrictions	-0.246	-0.676	-0.636	1.287**	0.371	- 0.511
	(-0.35)	(-0.89)	(-0.72)	(2.06)	(0.49)	(-0.39)
Estimate of *r-g* at $t-1$			-0.000612			0.0138
Multiplied by restrictions			(-0.25)			(0.17)
Estimate of *r-g* at $t-2$			0.00550			-0.0138
Multiplied by restrictions			(0.91)			(-0.11)
Estimate of *r-g* at $t-3$			-0.00951			-0.0299
Multiplied by restrictions			(-1.07)			(-0.16)
Estimate of *r-g* at $t-4$			0.00426			0.176
Multiplied by restrictions			(-1.07)			(0.83)
Joint significance of lags [p-value]		7.22(0.00)	4.05[0.00]		5.38(0.00)	3.14 [0.00]
Persistence of top 1 percent share [p-value estimate< 1]		-0.02	-0.01		0.08	0.07
Observations	211	154	154	290	197	197
Countries	18	17	17	26	23	23
Years per country	11.7	9.1	9.1	11.0	8.1	8.1

****p<0.001 *** p<0.01, ** p<0.05, *p<0.10

TOP 10 % INCOME SHARES bench mark No Ireland	Col.1-3 Government bond yields			Coln 4-5 MPK		
4.1 PRESENTATION OF RESULTS	Minus Inflation rate				Minus Depreciation	
TABLE 1	Coln 1	Coln 2	Coln 3	Coln 4	Coln 5	Coln 6
	Panel A: Estimates using annual panel					
Estimate of *r-g* at *t*	-0.00109	-0.00322**	-0.00383*	- 0.00120	-0.0000387	-0.00155
	(-1.19)	(-2.90)	(-3.23)	(-1.07)	(-0.03)	(-0.74)
(r-g)*capital outflow restrictions	0.00329**	0.00458**	0.00462**	0.00297	0.00593*	0.00939**
	(2.32)	(3.02)	(2.82)	(1.17)	(1.77)	(2.13)
Capital outflow control index	0.0176	0.0146	0.0107	0.00116	-0.00145	0.0596 *
	(1.39)	(1.09)	(0.79)	(0.07)	(-0.07)	(1.94)
Estimate of *r-g* at $t-1$			0.00000434			-0.00141
Multiplied by restrictions			(0.22)			(-0.29)
Estimate of *r-g* at $t-2$			0.00000184			-0.00895*
Multiplied by restrictions			(0.73)			(-2.53)
Estimate of *r-g* at $t-3$			0.00000642			-0.00123
Multiplied by restrictions			(0.25)			(-0.31)
Estimate of *r-g* at $t-4$			0.0000262			-0.00283
Multiplied by restrictions			(1.39)			(-0.74)
Joint significance of lags [p-value]		5.15(0.00)	3.36[0.00]		4.87(0.00)	3.75 [0.00]
Persistence of top 1 percent share [p-value estimate< 1]		0.32	0.24		0.22	0.22
Observations	171	124	124	198	137	137
Countries	16	15	15	20	17	17
Years per country	10.7	8.3	8.3	9.9	8.1	8.1

****p<0.001 *** p<0.01, ** p<0.05, *p<0.10

TOP 1% INCOME SHARES no Ireland and aggregate residence index	Col.1-3 Government bond yields			Coln 4-5 MPK		
4.1 PRESENTATION OF RESULTS	Minus Inflation rate				Minus Depreciation	
TABLE 1	Coln 1	Coln 2	Coln 3	Coln 4	Coln 5	Coln 6
	Panel A: Estimates using annual panel					
Estimate of *r-g* at *t*	-0.00764	-0.0924	-0.129**	0.0552*	0.0133	0.0295
	(-0.16)	(-1.63)	(-2.05)	(1.42)	(0.26)	(0.56)
(r-g)*capital outflow restrictions	-0.112	0.00590	0.160	-0.0491	-0.0145	0.0851
	(-1.34)	(0.06)	(0.34)	(-0.55)	(-0.13)	(0.62)
Capital outflow control index	-0.369	-0.678	-1.700	1.731*	0.220	-1.053
	(-0.33)	(-0.62)	(-1.31)	(2.14)	(0.25)	(-0.55)
Estimate of *r-g* at $t-1$			0.000404			0.00719
Multiplied by restrictions			(0.17)			(0.07)
Estimate of *r-g* at $t-2$			0.0130*			0.0724
Multiplied by restrictions			(2.22)			(0.45)
Estimate of *r-g* at $t-3$			-0.0121			-0.238
Multiplied by restrictions			(-1.32)			(-1.21)
Estimate of *r-g* at $t-4$			0.00110			0.336
Multiplied by restrictions			(0.19)			(1.47)
Joint significance of lags [p-value]		7.04(0.00)	4.59[0.00]		5.30(0.00)	3.26 [0.00]
Persistence of top 1 percent share [p-value estimate< 1]		-0.01	0.02		0.08	0.05
Observations	211	154	154	209	197	197
Countries	18	17	17	26	23	23
Years per country	11.7	9.1	9.1	11.1	8.6	8.6

****p<0.001 *** p<0.01, ** p<0.05, *p<0.10

TOP 10% INCOME SHARES no Ireland and aggregate residence index	Col.1-3 Government bond yields			Coln 4-5 MPK		
4.1 PRESENTATION OF RESULTS	Minus Inflation rate			Minus Depreciation rate		
TABLE 1	Coln 1	Coln 2	Coln 3	Coln 4	Coln 5	Coln 6
	Panel A: Estimates using annual panel					
Estimate of *r-g* at *t*	-0.00106	-0.00293**	-0.00362**	-0.00112*	0.000355	-0.000146
	(-1.16)	(-2.63)	(-3.08)	(-1.01)	(0.25)	(0.09)
(r-g)*capital outflow restrictions	0.00320**	0.00411**	0.00401**	0.0035	0.00978**	0.0111**
	(2.22)	(2.67)	(2.41)	(1.12)	(2.14)	(1.99)
Capital outflow control index	0.0239	0.0167	0.0118	0.0265	-0.0131	0.0142
	(1.32)	(0.94)	(0.66)	(1.12)	(-0.50)	(0.36)
Estimate of *r-g* at $t-1$			-0.0000565			0.000987
Multiplied by restrictions			(0.29)			(0.16)
Estimate of *r-g* at $t-2$			0.000233			-0.00562
Multiplied by restrictions			(0.93)			(-1.19)
Estimate of *r-g* at $t-3$			0.0000483			-0.00199
Multiplied by restrictions			(0.23)			(-0.45)
Estimate of *r-g* at $t-4$			0.000301*			0.00136
Multiplied by restrictions			(1.60)			(0.33)
Joint significance of lags [p-value]		4.98(0.00)	3.44[0.00]		4.69(0.00)	2.81 [0.00]
Persistence of top 1 percent share [p-value estimate< 1]		0.25	0.33		0.19	0.16
Observations	171	124	124	197	137	137
Countries	16	15	15	20	17	17
Years per country	10.7	8.3	8.3	9.8	8.1	8.1

****p<0.001 *** p<0.01, ** p<0.05, *p<0.10

ORIGINAL ACEMOGLU AND ROBINSON	Coln 1	Coln 2	Coln 3	Coln 4	Coln 5	Coln 6	Coln 7	Coln 8	Coln 9
				Panel A: Estimates using annual panel					
Estimate of $r - g$ at t	-0.006	-0.018***	-0.018***	-0.066***	-0.038***	-0.040**	0.029*	-0.004	-0.011
	(0.011)	(0.005)	(0.005)	(0.022)	(0.013)	(0.017)	(0.016)	(0.008)	(0.010)
Estimate of $r - g$ at $t - 1$			0.001			-0.003			0.005
			(0.006)			(0.019)			(0.010)
Estimate of $r - g$ at $t - 2$			0.005			0.010			-0.012
			(0.006)			(0.019)			(0.010)
Estimate of $r - g$ at $t - 3$			-0.002			-0.012			0.014
			(0.006)			(0.019)			(0.010)
Estimate of $r - g$ at $t - 4$			-0.005			-0.005			0.006
			(0.006)			(0.017)			(0.009)
Joint significance of lags [p-value]			2.65 [0.02]			1.53 [0.18]			1.01 [0.41]
Long-run effect [p-value estimate> 0]		-0.16 [0.00]	-0.18 [0.05]		-0.39 [0.03]	-0.47 [0.06]		-0.04 [0.67]	0.03 [0.89]
Persistence of top 1 percent share [p-value estimate< 1]		0.89 [0.00]	0.89 [0.00]		0.90 [0.00]	0.89 [0.00]		0.90 [0.00]	0.92 [0.00]
Observations	1646	1233	1226	627	520	470	1162	905	860
Countries	27	27	27	19	18	18	28	26	26
Years per country	61.0	45.7	45.4	33.0	28.9	26.1	41.5	34.8	33.1
				Panel B: Estimates using 10-year and 20-year panels (columns 3,6,9)					
Average $r - g$	0.055	-0.036	-0.252	-0.114	-0.121	-0.110	0.069	0.148*	0.238
	(0.095)	(0.098)	(0.228)	(0.132)	(0.118)	(0.247)	(0.091)	(0.088)	(0.172)
Long-run effect [p-value estimate> 0]		-0.05 [0.72]			-0.25 [0.32]			0.29 [0.11]	
Persistence of top 1 percent share [p-value estimate< 1]		0.32 [0.00]			0.52 [0.00]			0.48 [0.00]	
Observations	213	181	106	82	80	43	135	124	61
Countries	27	25	24	18	18	17	27	25	22
Years per country	7.9	7.2	4.4	4.6	4.4	2.5	5.0	5.0	2.8

OECD Countries	Top income shares mean	r-g mean when r is MPK-depreciation	Standard deviation r-g mean when r is MPK-depreciation	r-g mean when r is return on govt yields (Only OECD countries)	Standard deviation r-g mean when r is return on govt yields
Australia	17.54	.4503	4.6423	-.1019	4.2141
Canada	11.44	11.7291	2.1625	-.2297	3.9629
Denmark	9.71	5.6582	2.5532	2.5065	2.9013
Finland	8.82	2.5313	3.0709	2.2624	5.5092
France	10.91	4.4392	1.6949	.1526	3.9512
Germany	14.89	5.3499	1.0775	96074584	2.8913
Italy	7.97	4.6083	2.1883	2.7943	5.9660
Ireland	8.53	30.8588	4.959	-.4897	5.9660
Japan	12.24	4.9758	3.7557	1.0456	2.5709
Netherlands	11.79	5.0681	2.7533	-.2419	3.6870
New Zealand	8.14	14.017	2.8331	-.1790	5.5648
Norway	9.45	11.8156	3.1210	1.9147	2.5176
Portugal	7.62	4.5515	2.5586	1.5250	3.2664
Spain	8.23	5.6680	3.0026	1.4683	3.2070
Sweden	7.73	9.4357	2.0823	1.9608	3.9343
Switzerland	9.80	5.529	2.9948	-1.0523	3.8623

United Kingdom	9.93	9.9382	2.0968	.2430	3.9072
United States	12.84	4.1061	2.2583	-.5887	3.6783

Non OECD countries	Top income shares mean	Standard deviation of top 1% income share	r-g mean when r is MPK-depreciation	r-g mean when r is return on govt yields (Only OECD countries)
Argentina	17.54	4.458	6.0301491	4.64826
China	4.24	.925	3.978958	5.0777534
Colombia	19.57	1.319	7.66426	1.9969654
India	10.87	3.448	6.839456	3.3016
Indonesia	14.28	4.399	15.290814	4.944430
Malaysia	10.08	1.310	3.535439	3.680827
Mauritius	7.70	2.629	6.2986896	4.709890
Singapore	11.68	1.537	3.581236	3.784337
South Africa	16.14	4.125	13.37188	2.359683
Uruguay	14.07	2.517	10.94692	5.48294

Variable name	Description	Source
Top 1 % share of income and Top 10% share of income	This is the top 1% share of income measure through income. This is a pretax. Piketty and Emmanual Saez us income tax, and administrative data to estimate top 1% income share, and the top 10% income share.	World Wealth and Income Database http://wid.world/wid-world/ income consists of two components: income from labor (wages, salaries, bonuses, earnings from nonwage labor, and other remuneration statutorily classified as labor related) and income from capital (rent, dividends, interest, profits, capital gains, royalties, and other income derived from the mere fact of owning capital in the form of land, real estate, financial instruments, industrial equipment, etc., again regardless of its precise legal classification).
r-g	This is the main independent variable the rate of return on capital minus the growth rate. Here the rate of return on capital is measured using the return on government bond yields, and it is measured with r= MPK-d	The growth rate is retrieved in the Maddison data base http://www.ggdc.net/maddison/maddison-project/data.htm When r= government bond yields minus inflation the data source for this is the OECD data base When r=MPK -d what is being used here is Caselli and Freyer measurement of mpk - depreciation