

## **Long Term Rates, Capital Shares, and Income Inequality**

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# Long-term Rates, Capital Shares, and Income Inequality

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## Abstract

Using Piketty and Zucman's (2014) recently published capital share data, this paper uses structural VARs to understand the relationship between long-term interest rates, capital shares, and the distribution of income in the U.S. The results indicate that increases in capital shares increase income inequality. Moreover, the relationship between the interest rate and capital shares is found to be negative and statistically significant. The findings suggest that the bargaining power of capital owners increases with persistent, low long-term rates, further increasing the unequal distribution of income in the U.S. The results help us further understand the channels through which monetary policy can potentially affect the income distribution.

**Key words:** *Income Inequality, Monetary Policy, Macroeconomic Policy*

**JEL Code:** *D31, E25, E66*

# 1 Introduction

A country's ability to increase production of goods and services and experience economic growth depends on the quantities and productivities of its existing inputs, such as capital and labor. The formal framework that relates production with the development of capital and labor was initially presented by Robert Solow in the late 1950s (Solow (1956)). Since then, the framework known as the Solow model has been widely used to understand what makes a country rich or poor. Correspondingly, one of the stylized facts of the model has been that the shares of production paid to capital and labor are constant (Kaldor (1957)). In the U.S., about one-third of GDP is paid to capital and about two-thirds is paid to labor. The literature suggests that these shares have been reasonably steady over time (Gollin (2002), Jones (2014), p.77).

However, recent studies have documented that the stability of factor shares might not hold. Particularly, for the period since the early 1980s, labor shares have declined followed by upsurges in capital shares. Trade openness, increases in capital mobility, capital-augmenting technological progress, and decreases in the relative price of investment goods are some factors identified to have contributed to the variation of input shares. Rodriguez and Ortega (2001) document a positive correlation between an economy's exposure to international trade and capital income shares. The theory behind their findings is that openness has harmed the bargaining power of labor relative to capital. Guscina (2006) shows that labor's share of national income declined over the last two decades. The three factors used to explain the decline in labor shares are factor-biased technological progress, openness to trade, and changes in employment protection. Guscina finds that, for the post-1980s period, technological progress has been capital-augmenting, leading to upsurges in capital income shares. Openness to trade and increasing trade with

developing countries have harmed labor shares in the industrial countries. Even though labor protection policies are found to move income toward labor, openness to trade is found to have dampened this effect. Similarly, Jayadev (2007) documents the decline in labor shares across many countries over the last two decades. He identifies capital account openness to have had a significant role in the decline of labor shares. The explanation is that increases in capital mobility have increased the bargaining strength of capital as opposed to labor. Karabarbounis and Neiman (2014) show that the decline in labor shares has occurred within the large majority of countries and industries. The hypothesis they put forward is that the efficiency gains in capital producing sectors, such as information technology, have decreased the relative price of investment goods. As such, a large shift from labor to capital has occurred, leading to upsurges in capital income shares. Rodriguez and Jayadev (2010) document a persistent decline in the labor share across different countries starting in 1980, which implies that income from capital has been increasing. Similarly, Piketty and Zucman (2014) show that capital shares have increased in all rich countries from about 15% - 25% in the 1970s to 25% - 35% in 2010.

Interestingly, the literature seems to have ignored, at the macroeconomic level, the role of the interest rate in driving the variation in capital income shares. Since capital investments are typically long-term, it should be expected that economic agents pay closer attention to long-term rates. Figure 1 shows three different specifications of capital income shares and the long-term rates. As can be seen, during the years prior to the 1960s, long-term rates were below 4 percent and capital income shares were between 17 percent and 30 percent, depending on the specification. As long-term rates start to increase, capital income shares begin to decrease. After the 1980s,

long-term rates show a secular decline, followed with upsurges in capital income shares. The negative association between long-term rates and capital shares is also documented in Figure 2. As shown, with increases in long-term rates, capital shares tend to decrease. Therefore, this paper adds to the existing literature by empirically testing the significance of how long-term rates influence changes in capital income shares in the U.S. The intuition is that interest rates, through changes in the net present value of capital investments, impact income attributed to capital. Particularly, low rates lead to higher net present value of capital investment causing the bargaining power of capital to go up. Note, drops in long-term interest rates may not be the result of any specific central bank policy. Over longer horizons, such as a decade or more, interest rates are mainly influenced by changes in spending and saving in the world as a whole (King (2016), p.28). Countries, such as the United States, were faced with structural trade deficits (excess of imports over exports) which created a continuous negative drag on demand. To ensure total demand (domestic demand minus the trade deficit) matched the capacity of the U.S. economy to produce, the Federal Reserve cut interest rates to boost domestic demand (King (2016), p.47). Thus, decreases in long-term rates in the U.S., over the last 30 years, have been used to create incentives to bring spending forward from the future to the present.

Given the fact that capital income is more unequally distributed than labor income (Solow (2014), Bengtsson and Waldenstrom (2015), Milanovic (2015)), we also examine the income distribution effect the variation in long term-rates and capital shares might have. The insight is that a more intensive application of capital due to declines in long-term rates increases the income share of capital over time, leading to increases in income inequality. The relationship is examined in a dynamic setting after controlling for

openness to trade. To estimate the dynamic relationship across the variables of interest, impulse responses from a structural vector autoregression (SVAR) are utilized. Additionally, we estimate variance decompositions to extract the contribution of each variable to the variation of the other variables. To preview, the results show that capital shares benefit from decreases in long-term rates. Income inequality responds positively to increases in capital shares and to drops in long term-rates. The results are consistent across two measures of income inequality and three specifications of capital shares.

The rest of the paper proceeds as follows: section 2 discusses our data and methodology, section 3 presents our results, and section 4 concludes.

## **2 Top Income Earners and the Sources of Household Income**

Understanding how households at different levels of the income distribution earn their income allows for a better understanding behind the use of income inequality measures that capture top income shares. Also, it highlights the mechanism through which long-term rates and capital shares drive changes in income inequality. Figure 3 shows that, in the U.S., the dynamics of income inequality are driven by the income share variation of the households at the upper end of the income distribution. The “10% - 1%” income group captures the income shares of the top decile, excluding the top 1%. Note that we do not see large changes in the income share of this group over time. The “10%-1%” share increased from 24.6% in 1980 to 26.2% in 2007. On the other hand, the income share of the top 1% increased from 10.0% to 23.5% over the same period. Within the top 1% group, it is the top 0.1% that has experienced the biggest increase in income. Their income share has almost

quadrupled, from 3.4% in 1980 to 12.3% in 2007.

Figure 4 shows the relevance of wages as a source of income for the top 0.1%, the top 1%, and bottom 90% of income earners. For the bottom 90% group, approximately 80% of their income comes from wages. This has been consistent since 1989. On the other hand, more than 40% of income for the top 1% group and more than 50% of income for the top 0.1% group is from non-wage sources. One important non-wage source is income from entrepreneurial activities. Figure 5 shows that entrepreneurial activities provide 20% of income for the top 1% group and 30% of income for the top 0.1% group. However, for the bottom 90%, only 5% of income comes from entrepreneurial activities. Another essential non-wage source of income is capital income. Figure 6 shows that, for the top 1% group, income from capital increased from 30% to approximately 40% of total income within the last 30 years. Interestingly, income from capital has been negative for the households in the bottom 50% and 10% groups. This suggests that the amount of income these households have allocated in servicing their debt exceeds the amount of income from housing assets, equity assets, interest, pensions, and social insurance.

Thus, differences in income sources among the households at various parts of the income distribution is the mechanism through which we believe long-term rates and capital shares are affecting the top income households differently than lower income households. Specifically, the inverse link between the long-term rates and capital shares, followed by increases in income inequality, is driven by the fact that the top income groups earn significantly more of their income and hold more of their wealth in equities. Additionally, if the interest rate is low, this may encourage wealthier households to put even more money into stocks, which will lead to increases in equity asset



income and further exacerbate inequality. These findings are supported by Owyang and Shell (2016) who highlight that wealthy households own most equities in the United States and, thus, increases in the stock market disproportionately benefit high income families. Similarly, Milanovic (2015) states that capital ownership is mainly concentrated across the households at the top end of the income distribution. Thus, as long-term rates decrease, the bargaining power of capital will increase, contributing to further increases in income inequality.

The empirical findings presented in the paper show further supporting evidence for the income composition channel, the financial segmentation channel, and the portfolio channel, as presented by Coibion et al. (2012), through which monetary policy can effect income inequality. The income composition channel indicates that, for many households, wages are the main source of income; whereas, high-income households secure income from business and financial gains. As interest rates decrease, profits will increase by more than labor earnings leading the owners of firms (upper-income households) to benefit more. The financial segmentation channel infers that low interest rates increase asset prices, benefiting owners of the financial assets (upper-income households), which then may exacerbate income inequality. The portfolio channel suggests that differences in the structure of assets owned by households at different parts of the income distribution is another mechanism through which the interest rate can impact the distribution of income. Particularly, low-income earners mainly hold currency; whereas, upper-income households own various securities. In general, low interest rates feed into higher prices and booms in financial markets, which will benefit upper-income households and harm lower-income households. During the recent financial crisis, wealthy households lost relatively more, but

they quickly made up their losses; whereas, lower income households have not really recovered.

The channels described by Coibion et al. (2012), Owyang and Shell (2016), and Milanovic (2015) are also readily apparent in further data from the Survey of Consumer Finances (SCF) gathered by Kuhn and Rios-Rull (2015). The income data they use includes almost all before-tax income for families. Appendix A in Kuhn and Rios-Rull's paper lists the full set of income generating items they use to construct their income data. Figures 7, 8, and 9 show how income is generated for the top 1% of income earners, the middle 40 to 60% of income earners, and the bottom 20% of income earners. As seen in Figure 7, the top 1% of earners do earn most of their income from labor. However, note that these households receive about 25% of their income from capital and about 30% of their income from business ownership. Income sources for the middle quintile are shown in Figure 8. For the middle quintile, these households earn about 2/3rds of their income from labor, substantially more than for the top 1% of earners. The other large source of income for these households are transfer payments, which contribute about 25% of income. Lastly, the bottom 20% of earners income sources are shown in Figure 9. As seen in the figure, bottom earners receive about 30% of their income from labor. The biggest contributor for these lowest earning households are transfer payments, contributing roughly 60% of these households' income.

As seen above, there are clear and significant differences between low and high-income households. Namely, high-income households receive about 55% of their income from capital and business sources compared to almost none for the bottom 20% of earners and little for middle-income earners. Labor income is most important for the middle-income households and

contributes about equal amounts to the top 1% of earners and the bottom 20% of earners. Transfer payments are, not surprisingly, the most important income source for the poorest households. It is clear, based on the data from the SCF collected by Kuhn and Rios-Rull, that monetary policy can affect the distribution of income. In particular, if low interest rates boost asset prices and profits from business holdings, as argued by Coibion et al. (2012), this will primarily benefit top households as they earn a large portion of their income from these sources. On the other hand, low and middle-income households benefit very little from increases in asset prices or profits as they earn little of their income from either capital or business sources.

## 3 Data and Methodology

### 3.1 Data

We use data spanning from 1919 to 2009 which includes key historical periods, such as the Great Depression era, and the 1950s and 1960s where capital income shares were relatively stable. During the 1950s and 1960s, long-term rates and income inequality were quite low. The capital share measures are from Piketty and Zucman (2014). Domestic capital is defined as the sum of agricultural land, housing, and other domestic capital (including the market value of corporations, and the value of other nonfinancial assets held by the private and public sectors, net of their liabilities). The capital share is equal to the output produced by domestic capital divided by total output<sup>1</sup>. The data source for the measures (domestic capital and output) are balance sheet data prepared by national statistical institutes and central banks. The concepts used to calculate the measures strictly follow the U.N. System of

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<sup>1</sup>The output and capital share series are net of depreciation.

National Accounts (SNA). Piketty and Zucman (2014) report three different specifications of capital shares: the capital share including the government interest rate, the capital share excluding the government interest rate, and the after-tax capital share. All three specifications are used in this paper.

For the long-term rate variable, the 10-year government bond rate from Robert Shiller’s website is used. Trade openness is calculated as the sum of U.S. imports and exports divided by U.S. GDP and the data are from the FRED Database. The annual data used for the measures of income inequality were obtained from The World Top Income Database due to its long time-series. The measures used from the database are the inverted Pareto coefficient (IPAR) and the Top 1% income share. IPAR captures income inequality within the top end of the income distribution (specifically within the top 1 and 0.1 percent of earners) and Top 1% captures the income share of the households in the top 1 percent of the income distribution. Intuitively, as the measures increase, income is less equally distributed. The top income shares are based on tax returns data published by the Internal Revenue Service (IRS). The income definition used in the construction of the measures is a gross income definition including all the income items reported on tax returns (prior to deductions): salaries and wages, small business and farm income, partnership and fiduciary income, dividends, interest, rents, royalties, and other small items reported as other income. Then, the income shares are estimated by dividing the income amounts accruing to each top fractile by total personal income computed from the National Accounts. Since capital share data might be correlated with capital gains, we use the calculated top income shares excluding realized capital gains.

### 3.2 Methodology

We set up a four-variable autoregressive model in the vector  $z_t = (to_t \ i_t \ csh_t \ ineq_t)'$  where  $to_t$  denotes the change in trade openness measured as  $\frac{Exports_t + Imports_t}{GDP_t}$ ,  $i_t$  represents the change in the 10-year Treasury maturity rate,  $csh_t$  signifies the growth rate in capital income shares, and  $ineq_t$  captures the growth rate in income inequality.

To capture the linear interdependencies that may exist among the four variables, the following structural VAR model is estimated:

$$A_0 z_t = \alpha + \sum_{i=1}^n A_i z_{t-i} + \varepsilon_t \quad (1)$$

where  $\varepsilon_t$  represents a vector of structural innovations and is estimated based on the innovations from the reduced-form representation of (1), which is given by

$$z_t = A_0^{-1} \alpha + A_0^{-1} A_1 z_{t-1} + \dots + A_0^{-1} A_n z_{t-1} + A_0^{-1} \varepsilon_t = v + \sum_{i=1}^n B_i z_{t-i} + e_t \quad (2)$$

where  $e_t$  denotes a vector of possibly contemporaneously correlated innovations from the reduced-form.  $v$  and  $B_i$  are the intercept and the slope of the reduced-form VAR. OLS can be applied to estimate the matrix coefficients  $\widehat{\mathbf{B}} = [\widehat{v} \ \widehat{\mathbf{B}}_1 \dots \widehat{\mathbf{B}}_n]$  and the innovations  $\widehat{e}$ . By definition  $e_t = A_0^{-1} \varepsilon_t$ , which indicates that the reduced-form innovations  $e_t$  are in general a weighted average of the structural shocks  $\varepsilon_t$ . The knowledge of  $A_0^{-1}$  would enable us to get  $\varepsilon_t$  from  $\varepsilon_t = A_0 e_t$  and  $A_i$  from  $A_i = A_0 B_i$ . To identify the elements of the

unknown matrix  $A_0^{-1}A_1$ , the covariance matrix of reduced form innovations is utilized as follows:

$$E(e_t e_t') = A_0^{-1} E(\varepsilon_t \varepsilon_t') A_0^{-1'} \quad (3)$$

$$\sum_e = A_0^{-1} \sum_u A_0^{-1'} \quad (4)$$

$$\sum_e = A_0^{-1} A_0^{-1'} \quad (5)$$

in the last step the diagonal entries of the covariance matrix of structural shocks are normalized to 1. We can think of  $\sum_e = A_0^{-1} A_0^{-1'}$  as a system of equations in the unknown parameters of  $A_0^{-1}$ . Since  $\sum_e$  can be estimated, it is treated as known. As such, the system of equations can be solved for the unknown parameters of  $A_0^{-1}$ . Because  $\sum_e$  is a  $(4 \times 4)$  symmetric matrix, to identify the structural innovations  $\varepsilon_t$  from the reduced-form innovations,  $\frac{k(k-1)}{2}$  restrictions in  $A_0^{-1}$  need to be imposed (Kilian (2011), Guentner (2014)). Recursive ordering, which leads to 6 restrictions, is imposed on  $A_0^{-1}$  and the vector of structural shocks,  $\varepsilon_t$  is identified by decomposing the reduced-form errors in  $e_t$  as follows:

$$\begin{pmatrix} e_t^{to} \\ e_t^i \\ e_t^{csh} \\ e_t^{ineq} \end{pmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} \times \begin{pmatrix} \varepsilon_t^{trade\ opennness\ shock} \\ \varepsilon_t^{long\ term\ rate\ shock} \\ \varepsilon_t^{capital\ share\ shock} \\ \varepsilon_t^{inequality\ shock} \end{pmatrix} \quad (6)$$

The recursive ordering in (6) hypothesizes that a shock to openness to trade ( $to_t$ ) influences each of the dependent variables contemporaneously, while a shock to income inequality ( $ineq_t$ ) affects only itself contemporaneously. The rationale for this ordering is based on the following considerations. ( $to_t$ ) is placed first because openness to trade depends on multilaterally agreed rules among countries. ( $i_t$ ) is placed second under the assumption that openness to trade affects macroeconomic volatility, which will lead to variations in long-term rates. Capital share and income inequality are placed last in the ordering under the assumption that trade openness and changes in long-term rates feed into changes in shares of income attributed to capital and overall changes in the income distribution.

## 4 Results

### 4.1 Impulse Response Functions

For ease of exposition, we standardized and cumulated the impulse responses. Figure 10, 11, 12 and 13 display the impulse responses from estimating (1) using the three specifications of capital shares and two measures of income inequality. The figures should be read such that the column variable shocks the row variable.

Figures 10 & 11 display impulse responses using Top 1% and IPAR

as the income inequality measures. In close correspondence with the literature, the findings suggest that openness to trade leads to subsequent changes in income inequality. Particularly, a positive one standard deviation shock to trade openness has a statistically significant, positive impact on income inequality which is approximately 0.5 standard deviations for the Top 1% measure and 0.25 standard deviations for the IPAR measure. In addition, it can be seen that a positive one standard deviation shock to the interest rate has a statistically significant, negative impact on income inequality, which is approximately 0.5 standard deviations after five years for the Top 1% measure and 0.4 standard deviations for the IPAR measure. This indicates that low long-term rates benefit households at the top end of the income distribution. This is no surprise since high income earners have a higher interest rate elasticity of income than those at the bottom of the income distribution. Particularly, low long-term rates may have helped high-income earners to further expand their entrepreneurial activities and invest in financial markets, which has led to upsurges in their income shares. As indicated earlier, decreases in long-term rates reflect the Federal Reserve's attempt to boost domestic demand (King (2016), p.47), which seems to have benefited top income earners relatively more. Another plausible factor that might drive the negative association between long-term rates and income inequality is the inflation rate. As presented by Doepke et al. (2015), low interest rates reflect low rates of inflation, which mainly helps savers (households at the top of the income distribution) and harms debt holders (households at the middle and bottom of the income distribution).

From Figures 12 & 13, it can be seen that the capital share has a statistically significant affect on the two measures of income inequality. Per one standard deviation increase in the capital shares, the income inequality



measures increase by roughly 0.25 standard deviations. The findings are stronger when capital shares are adjusted for taxes. Also, the results show strong supporting evidence that long term-rates matter for changes in capital shares. Particularly, increases in long-term rates have an adverse effect on the share of income attributed to capital. This suggests that capital shares benefit from loose monetary policy. The findings are consistent across the three specifications of capital shares. Thus, it can be said that there is a capital share channel through which the interest rate can drive changes in income inequality.

## 4.2 Variance Decompositions

To further understand the effect of long-term rates on capital shares and income inequality, we also estimate the forecast error variance decompositions. Since the findings are similar across the three specifications of capital shares, we only report the results for the capital share specification that excludes the government interest rate. Figure 14 displays the variance decompositions using Top 1% as the income inequality measure. The last bar in the figure displays the contribution of the variation in income inequality explained by the other variables in the model. As can be seen, 6% of the variation in income inequality is attributed to long-term rates, 5% is attributed to the capital share, and 10% is attributed to openness to trade. Overall, approximately 22% of the variation in income inequality represented by the Top 1% measure is explained by these 3 variables. In addition, 10% of the variation in capital shares is driven by long-term rates and roughly 7% by openness to trade. Figure 15 displays the variance decompositions using IPAR as the income inequality measure. Around 15% of the variation in income inequality is attributed to the other three variables in the VAR with 3% attributed

to the capital share, 7% attributed to long-term rates, and 5% attributed to trade openness. The results again confirm that long-term rates matter for the variation (11%) in capital shares. Also, 7% of the variation in capital shares is attributed to trade openness.

## 5 Conclusion

In the past, returns to capital and labor were viewed as relatively constant (Kaldor (1956)). However, this relationship has not held into the present. Past literature has attributed at least part of the change in capital's share of income to international trade and international capital mobility (Rodriguez and Ortega (2001), Jayadev (2007), Karabarbounis and Neiman (2014)). As trade across the world has increased and capital has become more mobile, this has factored into a substantial increase in capital's share of income as documented by Piketty and Zucman (2014). Interestingly, past studies have paid relatively little attention to the effect of interest rates on capital shares and income inequality. As capital income is more unequally distributed than labor income (Solow (2014), Bengtsson and Waldenstrom (2015), Milanovic (2015)), it seems likely that interest rates may then affect both capital shares and income inequality. We show this difference in how high and low-income households earn their respective incomes in-depth in section 2. There is a clear distinction between high-income households (high level of business and capital income) and lower-earning households (labor and transfer income dominate). Thus, it is not a surprise that interest rates may have different effects on different parts of the income distribution.

Namely, we show that, controlling for the effects of trade, decreases in long-term interest rates tend to directly increase income inequality. We

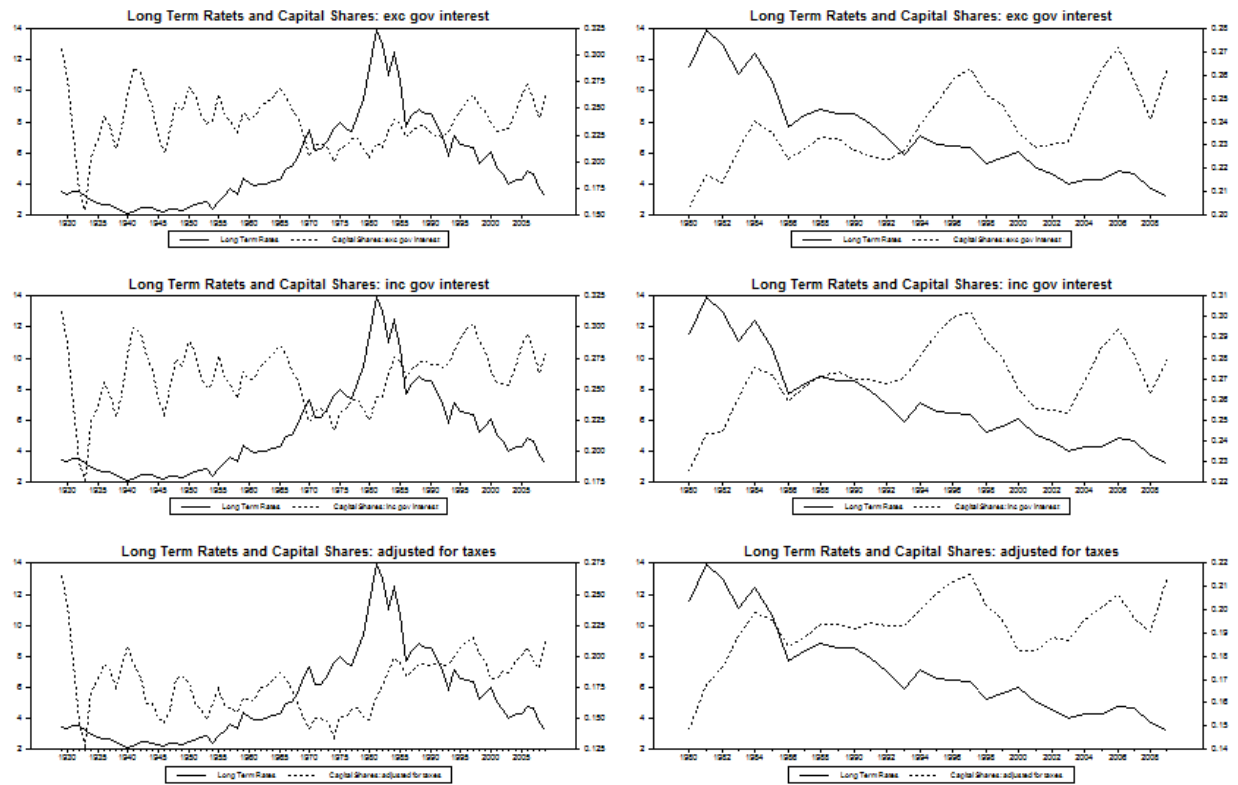
argue this is largely due to how households earn their income: low-income households mainly get income from labor and transfers while high-income households earn from capital and businesses. Low interest rates likely benefit high-income households as the low rates may allow them to invest in their own entrepreneurial activities or invest at lower cost in the stock market. Since lower income households have little exposure to capital or business ventures, the boost for the high-income households then increases income disparities. Further, our results show that increases in the capital share of income increase income inequality. This, again, is not shocking given the differences in how low and high-income households earn their income. Namely, high-income households receive a substantial portion of their income from capital; whereas, low and middle-income households do not. Also, our results show that low long-term rates boost capital income shares. These increases in capital shares then feed into further increases in income inequality as mentioned above. In summary, our results show that interest rates affect income inequality directly and also through the interest rate effect on capital shares. These results, taken together, show that loose monetary policy can further increase income disparities.

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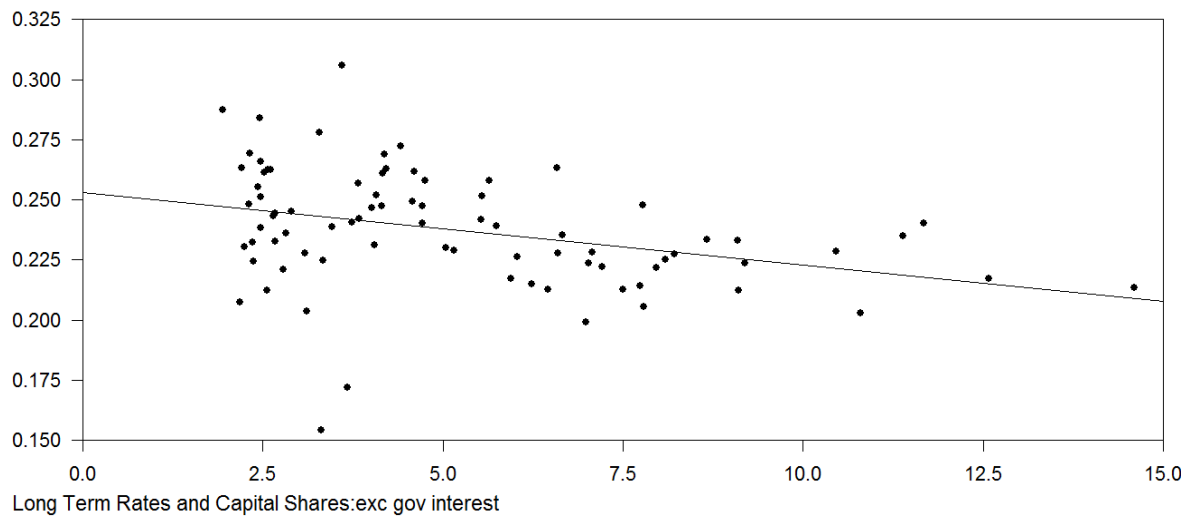
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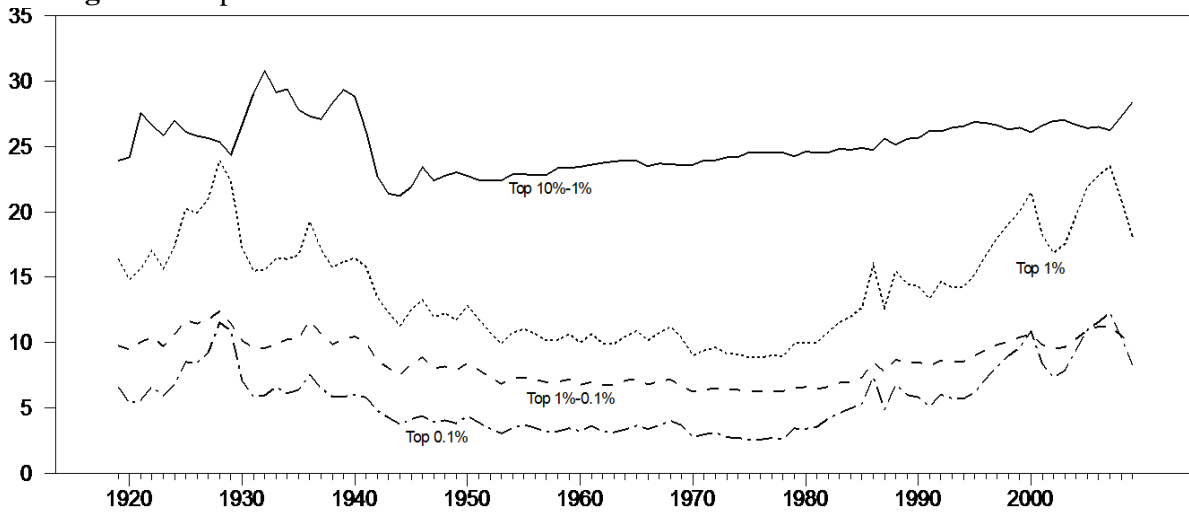
**Figure 1: Time Variation of Long Term Rates and Capital Shares**



**Figure 2: Correlation of Long-Term Rates and Capital Share**

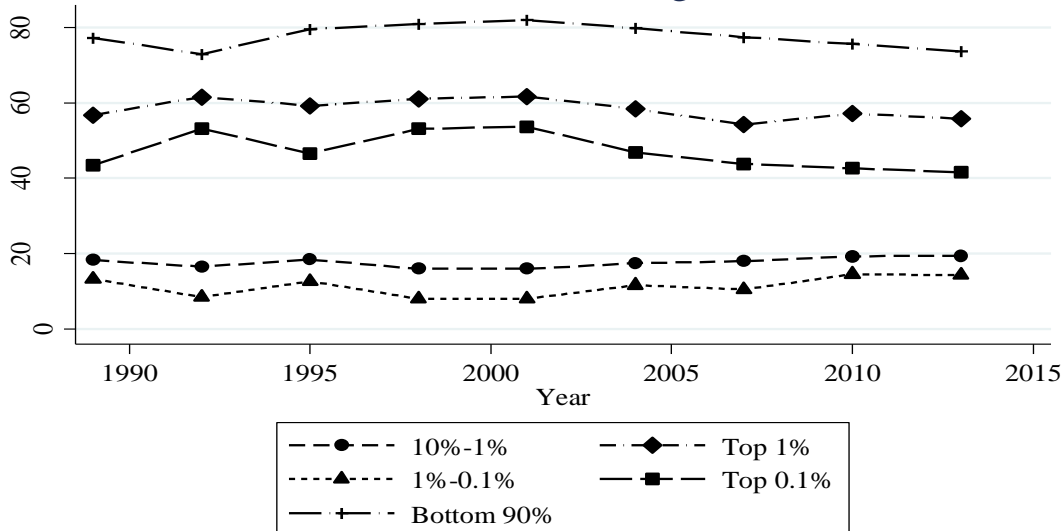


**Figure 3: Top Income Shares**



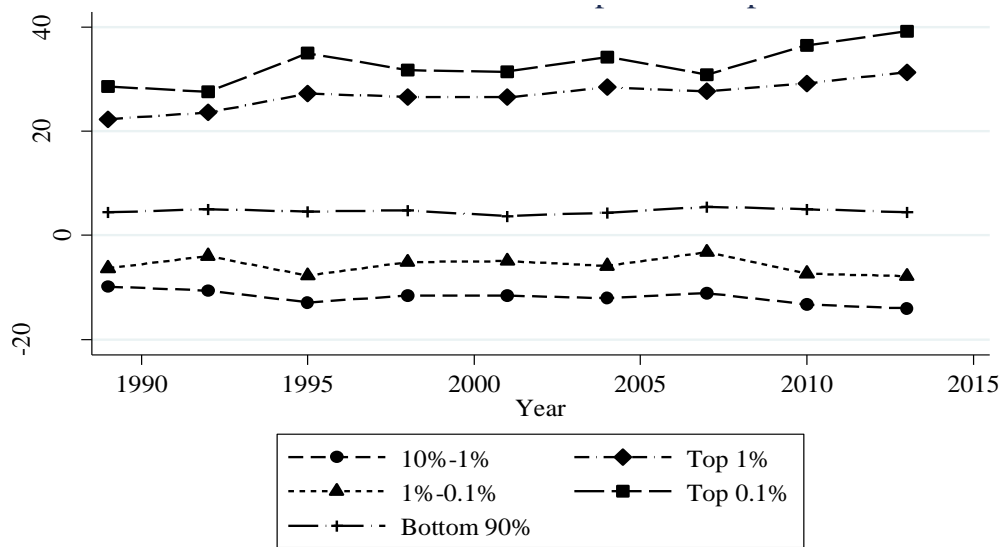
Notes: Top 10% - 1% represents the income shares of the top decile excluding the top 1% group. Top 1% - 0.1% represents the income shares of top centile excluding the top 0.1% group.

### Income from Wages



Note: 10%-1% excludes top 1%, 1%-0.1% excludes top 0.1%  
Source: Piketty, Survey of Consumer Finances.  
Note: The Bottom 90% data is before-tax family income from wages.

**Figure 5: Income from Entrepreneurship**

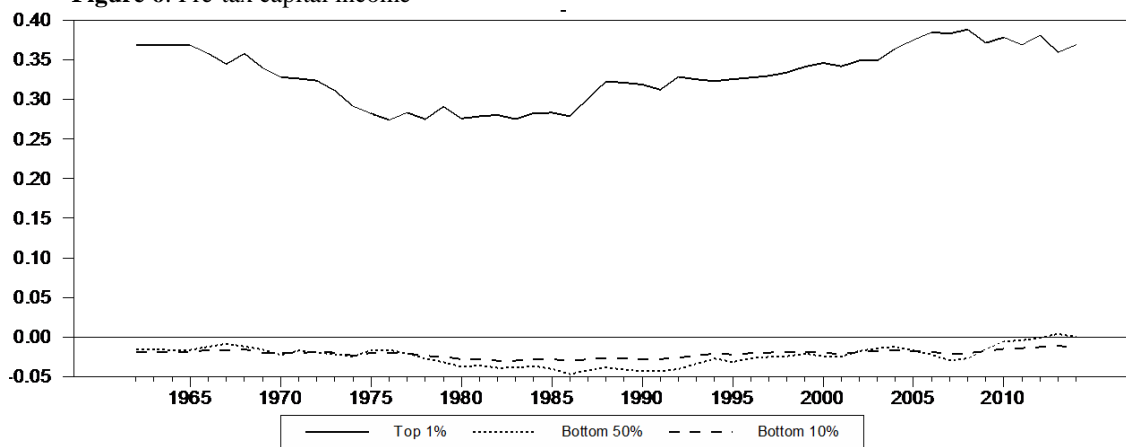


Note: 10%-1% excludes top 1%, 1%-0.1% excludes top 0.1%

Source: Piketty, Survey of Consumer Finances.

Note: The Bottom 90% data is before-tax family income from business, farm, or self-employment.

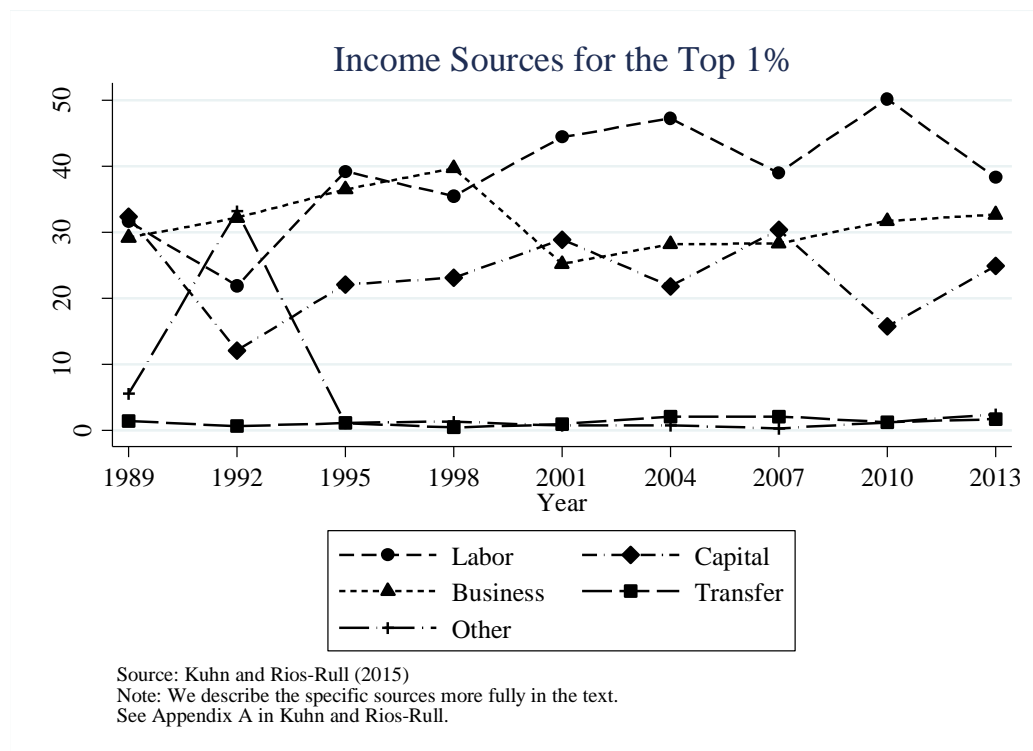
**Figure 6: Pre-tax capital income**



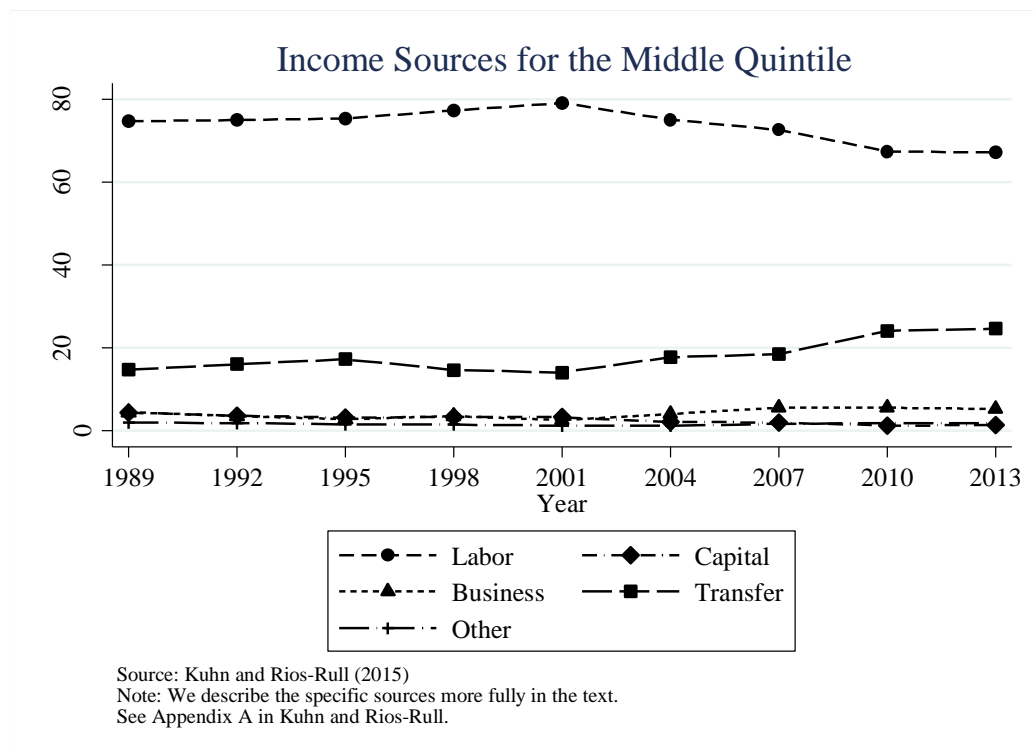
**Note:** Capital Income = Housing asset income + Equity asset income + Interest income + Pensions and social insurance income-Interest payments.



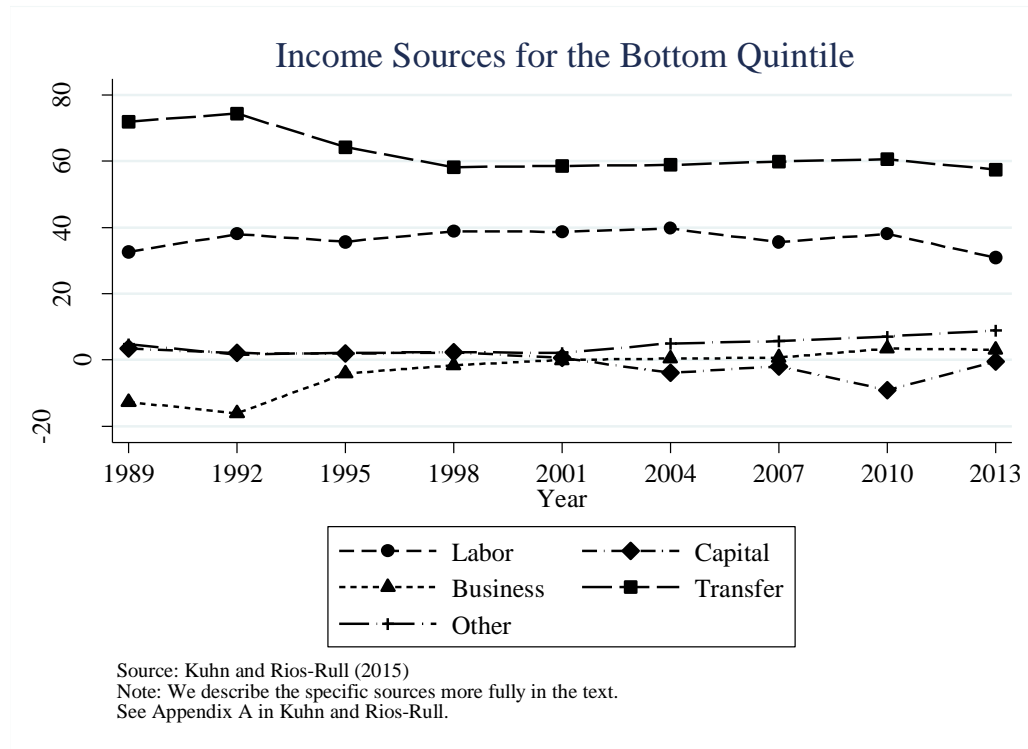
**Figure 7**



**Figure 8**

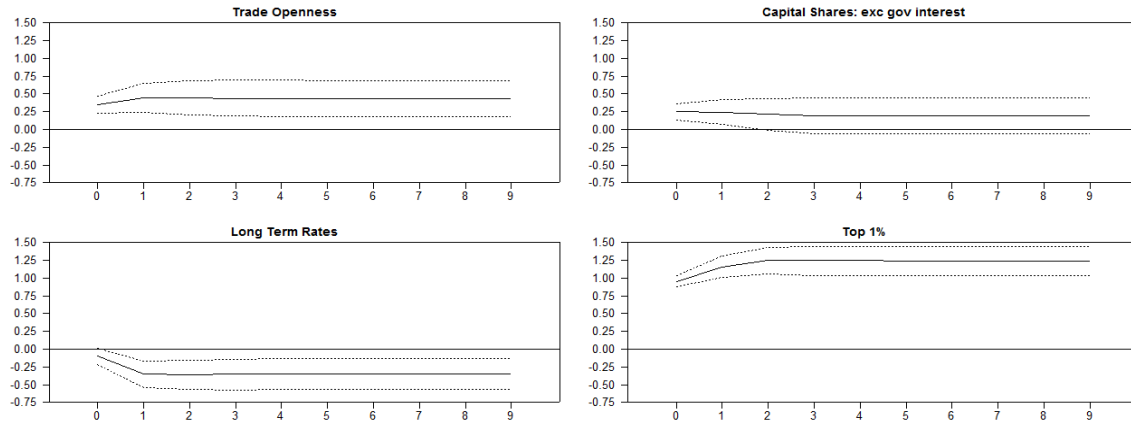


**Figure 9**



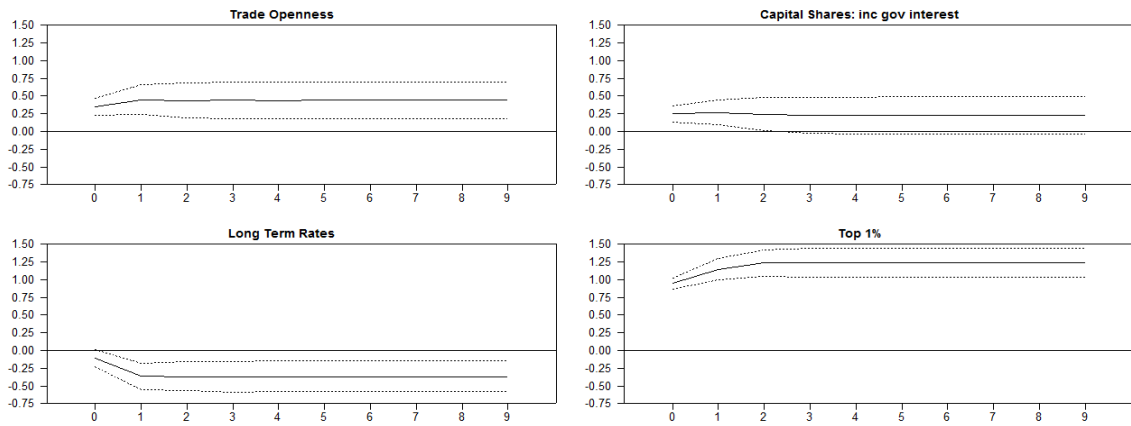
**Figure 10: Impulse Responses of Income Inequality using Top 1% as income inequality measure**

**Panel A: Capital Shares excluding government interest rate**



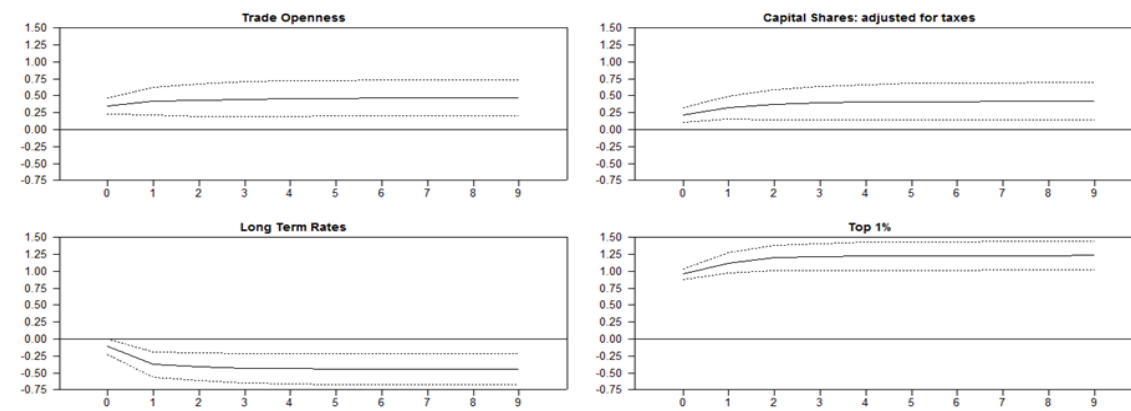
Responses of Top 1%

**Panel B: Capital Shares including government interest rate**



Responses of Top 1%

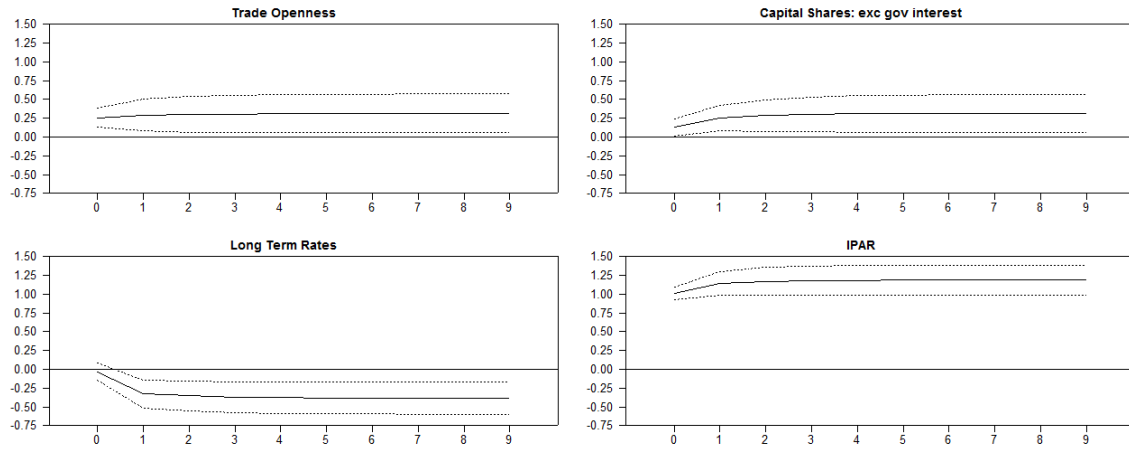
**Panel C: Capital Shares adjusted for taxes**



Responses of Top 1%

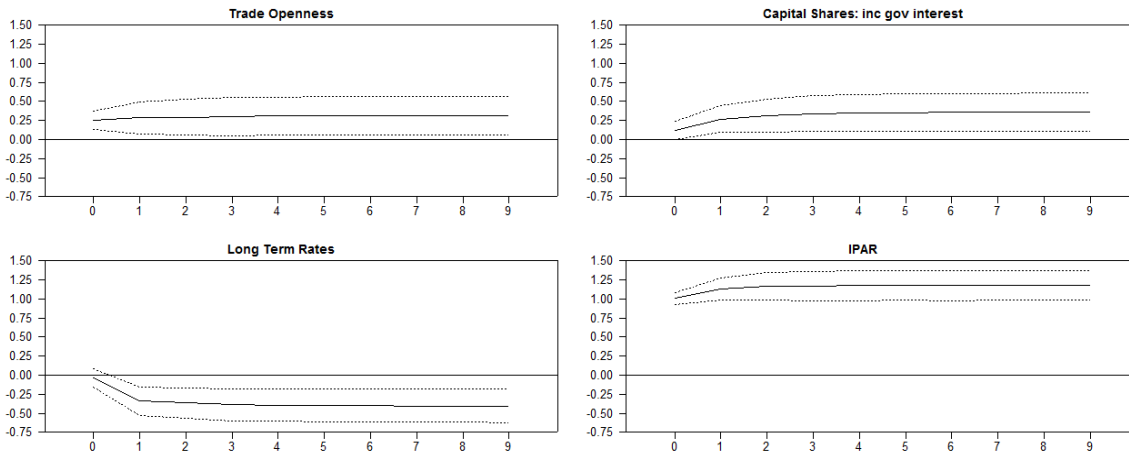
**Figure 11: Impulse Responses of Income Inequality using IPAR as income inequality measure**

**Panel A: Capital Shares excluding government interest rate**



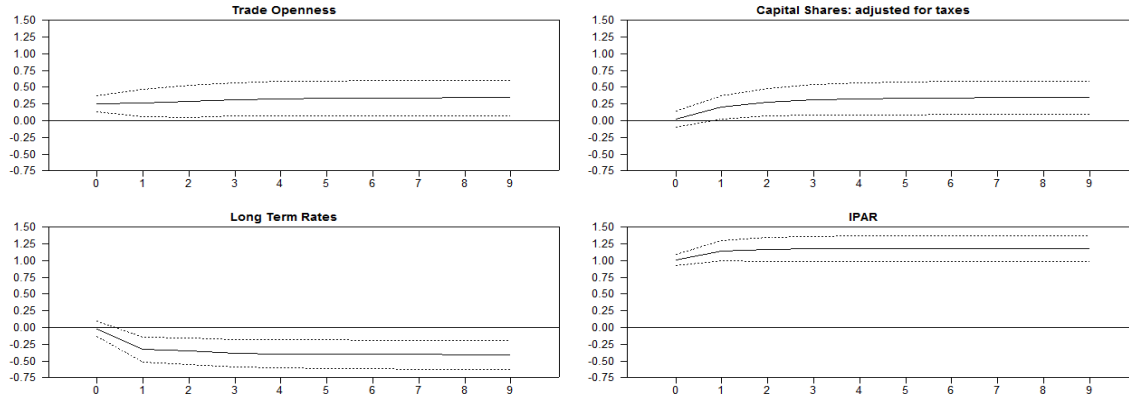
Responses of IPAR

**Panel B: Capital Shares including government interest rate**



Responses of IPAR

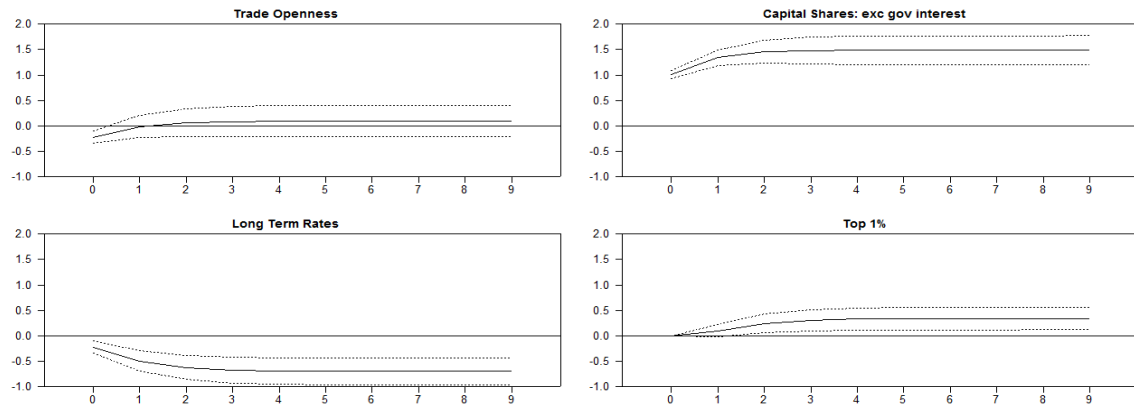
**Panel C: Capital Shares adjusted for taxes**



Responses of IPAR

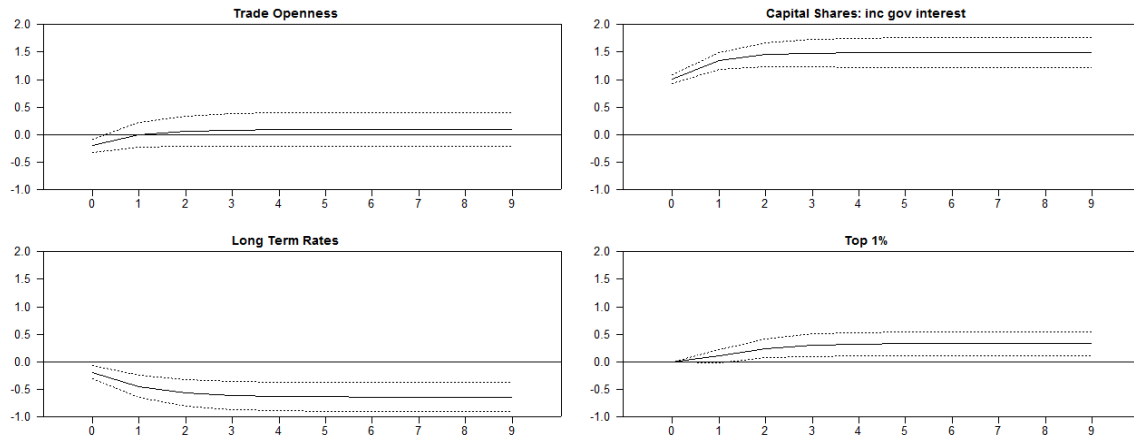
**Figure 12: Impulse Responses of Capital Shares using Top 1% as income inequality measure**

**Panel A: Capital Shares excluding government interest rate**



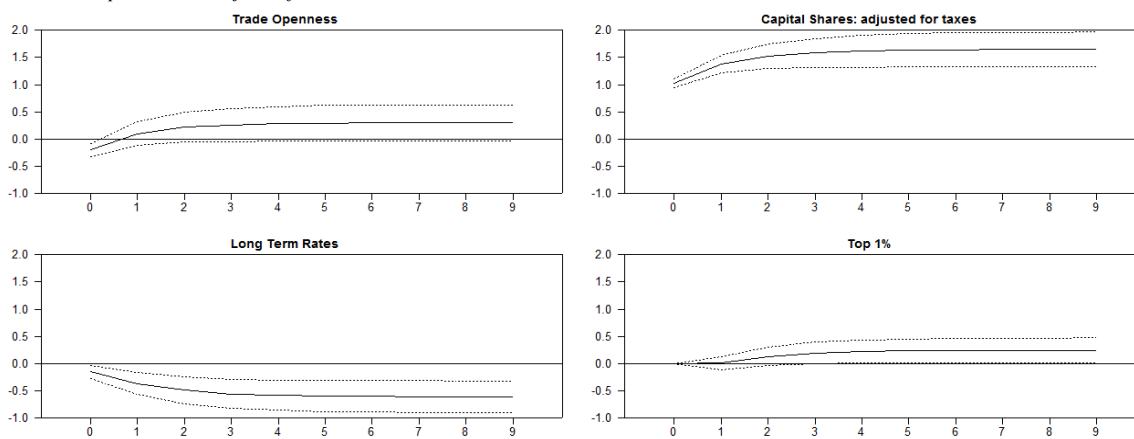
Responses of Capital Shares: exc gov interest

**Panel B: Capital Shares including government interest rate**



Responses of Capital Shares: inc gov interest

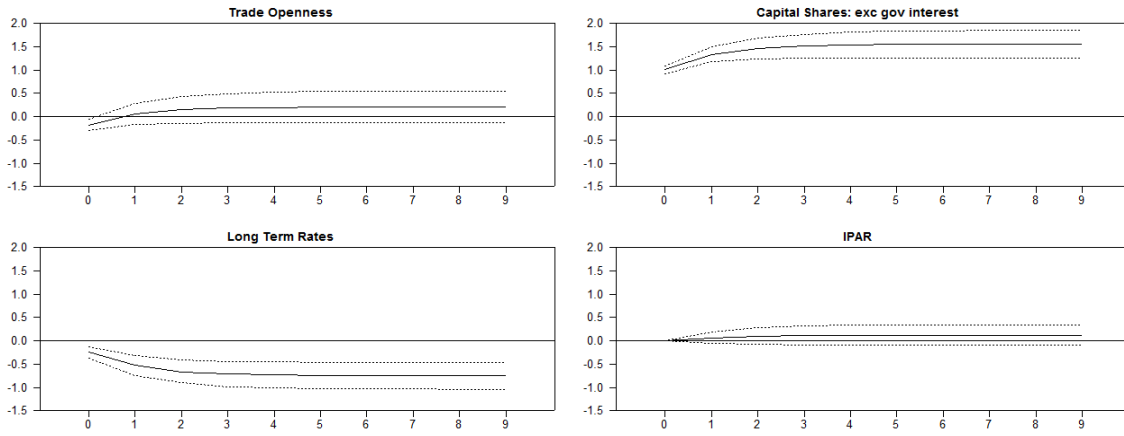
**Panel C: Capital Shares adjusted for taxes**



Responses of Capital Shares: adjusted for taxes

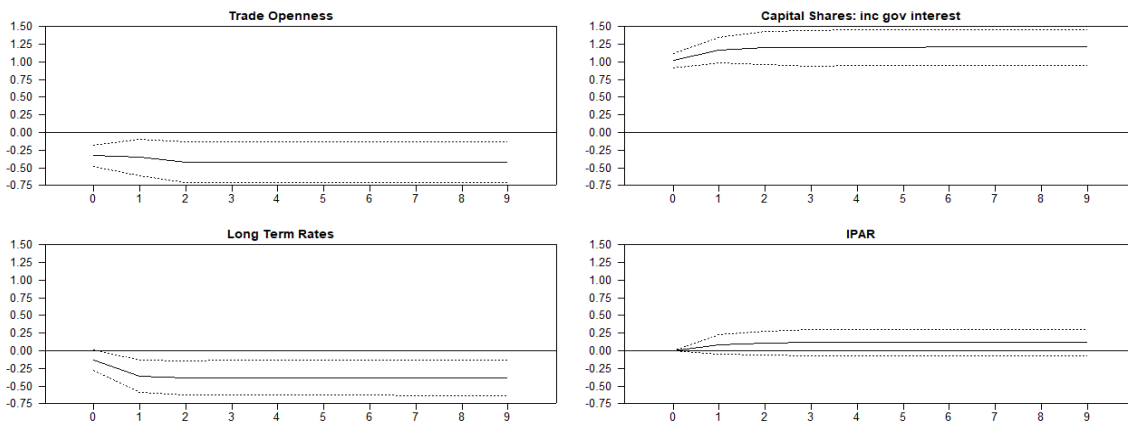
**Figure 13: Impulse Responses of Capital Shares using IPAR as income inequality measure**

**Panel A: Capital Shares excluding government interest rate**



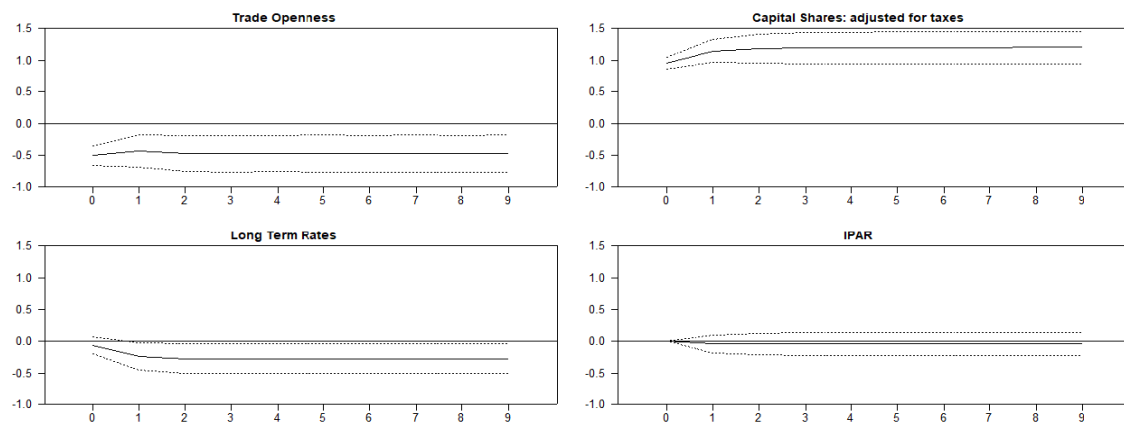
Responses of Capital Shares: exc gov interest

**Panel B: Capital Shares including government interest rate**



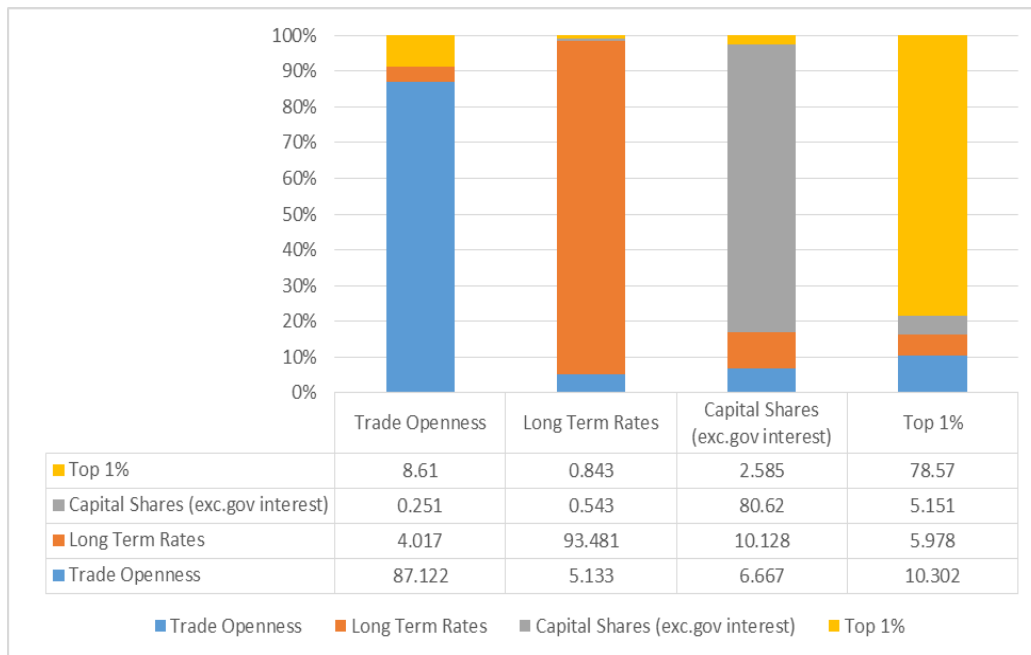
Responses of Capital Shares: inc gov interest

**Panel C: Capital Shares adjusted for taxes**



Responses of Capital Shares: adjusted for taxes

**Figure 14: Variance Decompositions using Top 1% as income inequality measure**



**Figure 15: Variance Decompositions using IPAR as income inequality measure**

