Unconventional Monetary Policy and the Rise of Inequality in Japan: The Pasinetti Index

Yuki Tada[1]

27th Conference of the Forum for Macroeconomics and Macroeconomics Policies (FMM)

Oct. 19-21th, Berlin, Germany

The recent works on monetary policy have revealed the unconventional monetary policy (UMP), in fact, accelerates the inequality by the asset price mechanism, widening the wealth inequality; however, the UMP does have limited accounting in creating wage inequality as the overall real wage has been stagnant (Saiki et al., 2020; Israel et al., 2023). This contradicts the analysis of Japanese income inequality by Moriguchi and Saez (2008) back until early 2000s, which shows inequality in Japan is limited only to wage inequality: as the top 1% of income source is primarily wage income. However, after almost 20 years, new research results show rising inequality, especially between wage earners and rentiers. We revisit this issue using the heterodox approach to functional income distribution. Following the methodology of Kappas et al. (2023) with Pasinetti Index (PI), we investigate if there has been a rise in income distribution to rentiers (Seccareccia and Lavoie, 2016). Our empirical result with the VAR model would show 1) implementing the analysis of functional income distribution other than the analysis of personal income distribution with the Gini coefficient shows the rise of rentier income, which affects macroeconomic growth negatively. 2) Higher rentier income flow also affects the wage share negatively

Keywords: Monetary Policy; Income Distribution; Post-Keynesian Economics; Pasinetti Index.

JEL codes: B50; E12; E52.

[1] Visiting Researcher at FFJ-EHESS, and Ph.D. Economics at The New School for Social Research

1. Introduction:

This paper investigates whether the higher income flow toward rentiers would restrain the demand and income distribution toward works under the conventional monetary policy in Japan. The country has observed higher income inequality in the last decades, and it has been revealed that unconventional monetary policy (UMP) accelerates inequality by the asset price mechanism, widening wealth and income inequality (Israel et al., 2023). However, the UMP has limited accounting for creating wage inequality as the real wage has stagnated (Saiki et al., 2014; 2019). This contradicts the analysis of Japanese income inequality by Moriguchi and Saez back in 2006, which shows inequality in Japan is limited only to wage inequality, as the top 1% of income source is primarily wage income. However, after almost 20 years, new research results show rising inequality, especially between wage earners and rentiers. We revisit this issue using the heterodox approach to functional income distribution. Following the methodology of Kappes et al. (2023) and Seccareccia and Lavoie (2016) with the Pasinetti Index (PI). Based on Pasinetti's (1993) fare interest rate rule, we investigate if there has been a rise in income distribution to rentiers (Seccareccia and Lavoie, 2016). As a contribution from our side. we developed our version of PI, which allows us to connect the issue of the recent rise in inequality in Japan between the top income group and the rest during the last 15 years in Japan in which unconventional monetary policy has been conducted. Other literature conducted an empirical investigation of the effect of unconventional monetary policy and the rise of inequality in Japan by contrasting the top 20% income group and the rest of the group and the rise of the Gini coefficient; for example, Saiki and Forest (2014; 2019) and Israeli et al. (2023) confirm that there is the rise of income inequality due to the unconventional monetary policy. Despite their work

being based on personal income distribution, we investigate the rise of inequality from the functional income distribution with *workers' debt-augmented PI*. We conduct standard vector autoregression model methodology from the functional income distribution approach to confirm this phenomenon. The main variables we use for this study are the Pasinetti Index, income distribution (wage share), and aggregate demand (capacity utilization rate) to see if they are connected, and the data we used is quarterly data from 2008 to 2022. Our empirical result with the VAR model would show 1) implementing the analysis of functional income distribution other than the analysis of personal income distribution with the Gini coefficient shows the rise of rentier income, which affects macroeconomic growth negatively. 2) Higher rentier income flow also affects the wage share negatively, which indicates that in Japan under the UMP, the U.S. type of debt-led effects would not hold but higher household debt rather restrains demand and growth.

This paper follows this order: in section 2, we discuss recent literature in income inequality, distribution, and growth. Section 3 compares other countries' empirical results in the precedent works on this topic. Section 4 explains the basic concept of the Pasinetti Index by analyzing Pasinetti's interest rule (1993). Section 5 shows the data description. Section 6 presents our VAR approach. Section 7 describes the result of our VAR model. Section 8 is conclusion.

2. Literature:

In the last decade, there has been a growing number of debates regarding the rise of inequality since Piketty's influential book *Capital* in the 21st Century. Some academic research revealed that inequality could destabilize growth (Ostry, Berg, and Charalambos, 2014) and increase the occurrence of financial crises (Bordo and Meissner, 2012). Another pressing issue is the *future* of the monetary policy, which could affect income distribution. While there has been a

growing number of studies regarding the distributional effects of monetary policy, the numbers are still substantially limited compared to those of fiscal policy or other public policy interventions. The study of macroeconomic policy for growth and stability (macro) and the study of inequality (micro) are gaining significant attention, but these are researched separately. First, the financial crisis started in 2008 in the U.S., which later had a major spillover effect that led to a serious macroeconomic crisis, causing high unemployment and long-term economic stagnation (Rajan, 2010; van Treeck, 2014). Unlike conventional monetary policy, in which central banks operate to purchase government bonds to adjust interest rates and money supply, unconventional monetary policy (UMP) consists of purchases of a broader array of assets, mainly held by the rich. With the new tool of UMP, the major central banks shifted their objective in the aftermath of the subprime and Eurozone crisis to focus more on quantitative easing (QE) under the mission of financial stability. Income inequality also has gained significant attention in recent years due to its potential impacts on economic and societal outcomes. However, there are not many studies to connect the linkage: higher inequality can also negatively affect economic growth and stability, while the opposite causality has been studied.

Another state of the art in this topic is that there are few studies on the effect of *UMP* on inequality. The subject on this issue, mainly done by the central bank, might be biased as they insist the positive effect of unconventional monetary policy is highlighted. However, most economists and policymakers argue that unemployment would have been higher without the implementation of UMP. Indeed, recent academic research has revealed that UMP monetary policy might cause, relative to economic fundamentals such as wages and employment, asset prices to become overvalued (Chappe and Semmler, 2019; Saiki et al., 2020; El Herradi and Leroy, 2019). For example, an increase in asset prices due to UMP when the overall economy is

stagnant will benefit those households with greater financial asset holdings, which typically have a high income. On the other hand, lower-income households hold fewer financial assets, will not see an impact on wages, and may even be negatively impacted by lower interest rate earnings on saving accounts.

Additionally, despite the limitation of the number of research devoted to the effect of monetary policy and the rise of inequality, not much has been done concerning the functional income distribution, while most research focuses on the wage differential or Gini coefficient to measure the personal income distribution. This is exceptional among the post-Keynesians who have traditionally approached the issue with functional income distribution, such as Pasinetti (1981; 1993). Pasinetti describes the "fairness interest rate" in this setting as an interest rate level that keeps the income distribution between creditors and debtors unaltered over time. The flow of income toward the rentiers, or Pasinetti Index, PI has been developed by Rochon and Setterfield (2012), Seccareccia and Lavoie (2016). Recently, Kappes et al. (2023) attempted to apply the PI in such an econometric analysis for the case of the U.S. to measure how income flow towards rentiers or lenders would affect economic demand and income distribution.

For this paper, we use the functional income distribution approach using PI, to see how it affects the wage share and the aggregate demand for the case of Japan. To complement the previous work in this field, our work is based on Pasinetti's (1993) attempt to capture the income flow to rentiers based on the *real wage increase*, and we apply this to compute our version of PI, which captures the income flow from *workers* (or wage earners) to rentiers specifically, and how it affects growth and distribution. This PI is different from the PI of Lavoie et al. (2016) and Kappes et al. (2023), which uses labor productivity growth in the index, which does not allow to distinguish the debt held by capitalists or workers. This, our own PI index, allows us to connect

the issue of the recent rise in inequality in Japan during the unconventional monetary policy. Other literature conducted an empirical investigation of the effect of unconventional monetary policy and the rise of inequality in Japan by contrasting the top 20% income group and the rest of the group and the rise of the Gini coefficient; for example, Saiki and Forest (2014; 2019) and Israeli et al. (2023) confirm that there is the rise of income inequality due to the unconventional monetary policy.

3. Comparison of empirical work in monetary policy/UMP and inequality

There are a couple of points regarding the importance of studying the effect of UMP and inequality in Japan. First, the country has the longest UMP duration compared with other countries. Quantitative easing (QE) was first conducted by the Bank of Japan (BOJ) in 2001. After the country experienced the major asset bubble burst phenomenon in 1990, Japan, following decades, experienced a major financial crisis in the late 90s and used it as a remedy for prolonged secular stagnation. Second, a recent study shows that there has been a notable shift in income and wealth distribution in Japan in recent decades. During the period of high economic growth in the 1980s, the inequality in Japan was insignificant as it was the lowest level of inequality among G7 countries. However, nowadays, it has become the second-highest among G7 countries and the ninth-highest among OECD countries (Komiya and Kihara, 2021).

For other countries, studies have shown the effect of contractionary monetary policy shocks on inequality, leading to higher income levels, labor earnings, consumption, and total expenditures inequality across households. Also, Romer and Romer's (1999) research argues that expansionary monetary policy can reduce poverty only temporarily; however, for the long-term strategy, the best monetary policy has to aim at stable output and low inflation. The study of

conventional monetary policy on inequality in the US is done by Coibion et al (2017) using data from 1980 to 2008 and for the case of the United Kingdom done by Mumtaz and Theophilopoulou (2017) using data from 1969 to 2012. Both studies show that contractionary monetary policy has created income inequality in the labor market, and the studies argue that expansionary monetary policy counters the effect. While their research successfully could show the negative effect of monetary policy; however, their methodology, especially the use of consumption and total expenditures to measure income inequality, has to be revisited. The problem is that they measure inequality in terms of consumption out of income is problematic and contradicts the current pressing issue of the US capitalistic economy of consumer debt and higher inequality: as many recent studies show that in the anglo-saxon countries such as US and UK, low-income households are taking higher loans (indebtedness) which contributes to the debt-led growth in the US; regardless of the income level, the debt-led consumption and other expenditure increases economic instability which led the financial crisis. Therefore, the use of consumption out of income is not the appropriate measure of the rise of inequality. Using the panel data exercises, such as Furceri, Loungani, and Zdzienicka (2018), with a sample of 32 advanced and developing countries, found contractionary monetary policy will increase income inequality. Another panel data exercise was done by El Herradi and Leroy (2019), considering 12 advanced economies also found a similar result. Davtyan's (2017) research, on the contrary, indicates that contractionary monetary policy decreases income inequality while in the US the rise of income inequality is significant. Therefore, the results are heterogeneous, and how to interpret these conflicting results remains a question.

Concerning the effect of UMP in the case of the US there are empirical analysis that shows the effect of UMP on widening inequality. A study by Doepke et al. (2015) shows that

UMP by the Fed has benefited middle-class borrowers with mortgages while hurting wealthy rentiers with nominal savings. Davtyan (2017) finds that UMP widened income inequality in the US. however, it is hard to be accepted by the BOJ and its governor.[2] For example, former Bank of Japan governor Kuroda said in June 2016 that inequality has not been rising in Japan; however, several studies have attempted to reveal the effect of UMP on the rise of inequality. Saiki and Frost (2014 and 2020), using the data between 2011-2015 and 2011-2018, show the effect of UMP into two categories. One is the wage income effect, in which UMP could create more employment and higher wages, and the other one is the financial market or wealth channel in which UMP could create higher asset prices and wealth/income. They found that UMP in Japan had contributed to greater income/wealth through higher asset prices; however, the wage income inequality has not been widening due to UMP (Israeli et al., 2023). On the contrary, Yoshino et al. (2018), using a sample dataset between 2002 and 2017, show that contractionary monetary policy worsened income inequality due to the assert price appreciation effect. At the same time, the larger government transfers, which offset the income distribution impact of monetary policy, made the net effect mitigate the unwanted result of UMP to be neutral. There is heterogeneity in the outcome of the studies of the euro area and the effect of UMP on inequality. For the case of Italy, Casiraghi et al. (2018) for the case of Italy, and Lenza and Slacalek (2018) for the case of EU show that using microdata negates the effect of UMP on higher inequality and find that the positive effects on labor markets were larger than the wealth effects of UMP. Guerello (2018) and Rupprecht (2018) also argue that for the euro area, the effect is quite country-specific despite the same monetary policy of ECB; there is the heterogeneity of UMP's impact on household income and financial wealth across different euro-area countries.

[2] Please see BIS working paper by Inui et al. (2017).

Comparing the regional results in the precedent works on this topic, most conclude that contractionary monetary policy shocks lead to increases in inequality or that expansionary shocks lead to decreases in inequality. However, the interesting case is Japan, the empirical studies find the opposite results; UMP only accelerates the inequality by asset price mechanism widening the wealth inequality, but the UMP does not work in creating wage inequality as the overall real wage has been stagnant, which is the opposite case with other European and US result which show that UMP works in creating employment and stabilize unemployment rate. Israeli et al. (2023) shows the negative effect of UMP and the rise of personal income distribution by using a Japanese household income survey, the Family Income and Expenditure Survey. From Q1 2007 to Q2 2021 data, they find that households in the highest income brackets have a higher proportion of their savings invested in stocks, while middle and lower-income households hold a greater share of their savings in bank deposits. The hypothesis is that the BOJ's monetary policies have particularly created a boom in stock markets, providing benefits for only high-income households through capital gains and dividends. For the empirical work, they implement local projections that confirm a positive, lasting cumulative effect of conventional and UMP on Japanese stock markets. Overall, the personal income distribution study revealed that i) stock market performance impacts household incomes and ii) finds that the wealth effect is strongest for high-income households, leaving middle-income households with less wealth and income and no benefits for lower-income households. Israeli et al. (2023) show that monetary policy may have contributed to the persistent growth in income inequality in Japan, as measured by metrics such as the Gini coefficient and top-to-bottom income ratios.

Despite Saiki et al. (2014; 2019) and Israeli et al. (2023) having made significant contributions to finding the connection between the new type of monetary policy and the rise of inequality in Japan, analyzing the rise of inequality solely on personal income distribution or just relying on the Gini coefficient is not sufficient; it is also necessary to capture the source of instability or stagnation in the transition of capitalism by acknowledging the fact that changes in the rate of interest have both a direct and indirect impact on the distribution of income between rentiers and the 'active wage earning class' who takes consumer debt. Also, as value added to the previous work on the effect of the UMP on the rise of inequality, we can incorporate the capitalistic regime analysis or a variety of capitalism discourses as often by regulation theorists and post-Keynesian.

4. Theoretical understanding of the Pasinetti Index

Pasinetti (1993) devoted a chapter, "Consumption, saving, Interest Rate, and Income Distribution" to provide a theoretical understanding of fair interest rates, which was later developed by Seccareccia and Lavoie (2016) as the *Pasinetti index*. For example, Luigi Pasinetti (1981; 1993) attempted to challenge the natural interest rate since the natural interest rate does not account for any distributional aspect. Pasinetti's theory of interest rate, accounts for income distribution in capitalism from borrowers towards lenders in which we have a third actor called rentiers who receive interest income from having wealth from financial investment or money market. In Chapter 6 of *Structural Economics Dynamics*, Pasinetti (1993) describes an economy in which consumption goods are perishable, and at the aggregate level, there are no savings, while at the inter-personal level, some individuals are save ($income - consumption > 0$) while others are dissaved ($income - consumption < 0$). The lending and borrowing will be canceled out at the aggregate level; however, at the individual level, the financial asset and

liability that matters for the lending and borrowing could be built up. The choice of *numeraire* matters to keep the relation of inflow of income and outflows of expenditure constant. Pasinetti explains that the consumption goods which involved in lending and borrowing are measures based on the purchasing power of all financial assets and liabilities.

Example :

> A numerical example may help to grasp the notion of the fair rate of interest. Take an economy with a 5 per cent inflation rate. Suppose that the average wage is initially €20 an hour. Suppose furthermore that an borrower contracts a €20,000 loan. This person has thus borrowed the equivalent of 1,000 hours of labour-time. Suppose now that the average real purchasing power, that is, overall productivity, has risen by 2 per cent. Nominal wages thus have risen by 7 per cent, reaching €21.40 per hour an year later. If the rate of interest charged to the borrower is also 7 per cent, that is, if it is equal to the growth rate of overall productivity plus the rate of price inflation, the borrower will have to reimburse an amount of €21,400 the next year. However, since the average nominal wage rate has now risen to €21.40 an hour, the amount given back by the borrower is still equivalent to 1,000 hours of labour-time. As long as the actual rate of interest is equal to the fair rate of interest, as defined above, the purchasing power that is being temporarily exchanged between the borrower and the lender remains constant in labour-time (Lavoie et al., 2019, 94).

Given this assumption, the goods involved in lending and borrowing arise from a closed pure-labor economy with m sectors that are vertically integrated, and each sector has its own productivity ρ_i:

$$\rho_1, \rho_2 \dots \rho_h \dots \rho_m$$

As with any commodity, i the value of the commodity, p_i is measured in terms of purchasing power; to measure the purchasing power of the good, we take a certain good (h) and its price p_h as the numeraire; divide any price of the general commodity p_i to measure all the other values of the commodity (i).

Assume each price is described as

$$p_i = l_i(0)e^{-\rho_{it}}w(t) \text{ (eq. 1)}$$

Here $w(t)$ as the nominal wage rate and being set as $w = 1$and $l_i(0)e^{-\rho_{it}}$ as number of labor hours which increase but decreasing rate at ρ_{it}. At the same time $l_i(0)$ is the quantity of commodity which the amount that is repaid could have purchased at time zero.

Own rate of interest rate is $-\rho_{it}$: initially when actual interest rate as 0, and at the maturity, the borrower will return $l_i(0)$ to lenders. However, the price of commodity p_i decreasing at the rate of ρ_{it}, and the purchasing power of $l_i(0)/\ p_i$ would rise.

Let's pick up one commodity h as numeraire, and this allows us to explain that the purchasing power of good i increases at time t, due to the productivity, ρ of each good has a positive difference $\rho_i - \rho_h$.[3]

The example above uses p_h as numeraire. However, when we change the numeraire, at the same time, we want to keep *interpersonal* relations distributional flow towards lenders constant. Pasinetti introduces interest rate, which allows debt and credit relations to remain unchanged in real terms through time, a rate of interest equal to $(\rho_i - \rho_h)$ would "have to be introduced on all debts reckoned in terms of the new numeraire (on top of whatever rate of interest had been stipulated already when debts were reckoned in terms of the old numeraire)" (Pasinetti 1993, 87). ρ_i can be described as the increase of the value of good p_i relates to the income inflow borrowers attain at each time. Assume the real interest rate, r_i as the return for the rentiers (lenders) from the lending and borrowing activity at the maturity, t. For borrowers, the gain arises when $\frac{p_i}{p_h} = \frac{l_i\,(0)}{l_h\,(0)} e^{(\rho_h - \rho_i)t}$ increases meaning ρ_h increases. For lenders, the income or the gain arises when

[3] This allows us to the point by Pasinetti's *which* commodity being used as numeraire matters:
"But if all the 'natural prices' vary through time, as we suppose here, it follows that the purchasing power of all financial assets and liabilities will vary through time in terms of all commodities (and, what is more, in a different manner from one commodity to another), with the exception only of the commodity chosen as numeraire" (Pasinetti, 1993, 97).
Then when we denominate the eq. 1 with p_h: $\frac{p_i}{p_h} = \frac{l_i\,(0)}{l_h\,(0)} e^{(\rho_h - \rho_i)t}$

the real interest rate increases. Then, the famous dynamic standard commodity will be replaced, which allows the difference of $\rho_h - \rho_i$ or the weighted average becomes ρ^*. Recall eq. 1, and we impose the actual real interest in monetary terms, then the Pasinetti's interest that keeps *interpersonal* relations distributional flow towards lenders constant

$$i_M - \pi - \rho^* \text{ (eq. 2)}$$

Seccareccia and Lavoie (2016) use the average labor productivity growth to account ρ^*. In other words, the flow of income to borrowers by having the liability is expressed in terms of labor productivity growth.

In the concrete manner, Pasinetti (1993) imposes the natural rate of interest rate, i^*

$$i^* = \sigma_W \text{ (eq. 3)}$$

Assume from eq 2,

$$i_M = \pi + \rho^* \text{(eq. 4)}$$

Then, when we assume natural interest rate i^* is captured by the market interest rate, i_M

$$\sigma_W = \pi + \rho^* \text{(eq. 5)}$$

Then, from eq. 2, 3, and 4

$$i_M - \sigma_M = \rho^* = \sigma_w - \sigma_M$$

$$PI_w = i_M - \sigma_M - (\sigma_W - \sigma_M) = i_M - \sigma_M - (\sigma_w)$$

Workers debt augumented Pasinetti Index (eq. 5)

This means that the real interest rate $i_M - \sigma_M$ and real wage growth rate $\sigma_w - \sigma_M$ are equal; we can set the fair interest rate, which attenuates the income flow towards rentiers.

In our paper, as a contribution towards the precedent work done by Seccareccia and Lavoie (2016) we use eq. 5 as our version of PI. This, our own PI index, allows us to connect the issue of the recent rise in inequality in Japan between the top income group and the rest during

the unconventional monetary policy. Other literature conducted an empirical investigation of the effect of unconventional monetary policy and the rise of inequality in Japan by contrasting the top 20% income group and the rest of the group and the rise of the Gini coefficient; for example, Saiki and Forest (2014; 2019) and Israeli et al. (2023) confirm that there is the rise of income inequality due to the unconventional monetary policy. Despite their work being based on personal income distribution, we investigate the rise of inequality from the functional income distribution with workers' debt-augmented PI. We conduct standard vector autoregression model methodology from the functional income distribution approach to confirm this phenomenon. The main variables we use for this study are the Pasinetti Index, income distribution (wage share), and aggregate demand (capacity utilization rate) to see if they are connected, and the data we used is quarterly data from 2008 to 2022. In order to construct the Pasinetti index,

$PI_W = i_M - \sigma_M - \sigma_W$ the following variables are used:

i_M as the long-term interest rate for ten years government bond,[4]

σ_M as the inflation rate, and

σ_w as real wage growth.

5. Data

This paper uses Q1 2008 through Q1 2022 (Figure 1). We found the Bank of Japan's comprehensive monetary easing (CME, which started in December 2010) and its even larger-scale quantitative and qualitative easing (QQE, which began in Q2 2013). Thus, our empirical analysis covers both CME and QQE. This allows us to conduct our functional income distribution methodology parallel to the same study of personal income distribution conducted by

[4] The appropriate choice of interest rate is also discussed by Lavoie et al. (2019). Despite the mortgage loans are the appropriate target of a fair rate of interest when we think about the income distribution from workers (wage earners) to lenders (rentiers), it comes with some risk premier. Thus, we chose the 10-year government bonds rate as Lavoie et al. (2019) suggest being royal to the notion of Keynes' 'classical rentier asset'.

Israeli et al. (2023), who used the data from Q1 2007 to Q2 2021, while Saiki and Forest (2020) used the data from Q4 2008 to Q1 2014. At the same time, our econometric analysis does not directly include the asset price hike or variables that indicate stock market performance and how they negatively affect personal income distribution (which was confirmed by Saiki and Forest, 2014; 2020, and Israeli et al., 2023) we use their work result to as a priori that under the era of BOJ's UMP, there is asset price appreciation which allows the shareholders or those top income group who posse financial asset has benefits widening the personal income inequality in Japan. Our motivation is given such a time frame of UMP, how rentiers who benefit from leading towards workers or household lending would have benefited, and how it has negatively affected the functional income distribution, dumping wage share, and capacity utilization rate, a proxy of growth and demand.

The definitions of the following variables and the manner in which they have been estimated are given:[5]

- The capacity utilization (seasonally adjusted), CAP is the output gap (GAP) as a percentage of potential output, and the source of the data is from BoJ.
- The wage share (seasonally adjusted), Omega is constructed from the Cabinet Office the Government of Japan Economic and Social Research Institute data. We divide the Compensation of employees by the national income.
- The Pasinetti index (with real wage growth rate), PI_w is composed of the following three variables: i_M as nominal interest rate; σ_M as the inflation rate, and σ_w as real wage growth (please see eq. 5).

[5] The Pasinetti Index and the choice of real wage growth instead of labor productivity growth can be explained by leaving the assumption that the profit rate and the capital-to-output ratio (inverse of the capacity utilization rate in a simplistic manner) are constants); we do not assume a condition of Harrod's neutral technical progress. This is the reason why Lavoie et al. (2019) emphasize the alternative way to compute the Pasinetti index which does not rely on labor productivity growth (please see Lavoie and Seccareccia, 2019, p98).

- For the i_M, we use the data (seasonally adjusted) constructed by the Japanese Ministry of Finance for 10-Year Government Bond Yields, which we downloaded from the Federal Reserve Bank of St. Louis.
- For σ_M we downloaded CPI data (seasonally adjusted) from the Cabinet Office, Japanese Statistics Bureau.
- σ_w we use the data of real wage indices growth from the Japanese Ministry of Health, Labour, and Welfare. These data are originally downloadable as quarterly time series data, and we haven't modified other frequent data into quarterly. This data is for all types of industries; the size of the establishment is more than 30 employees.

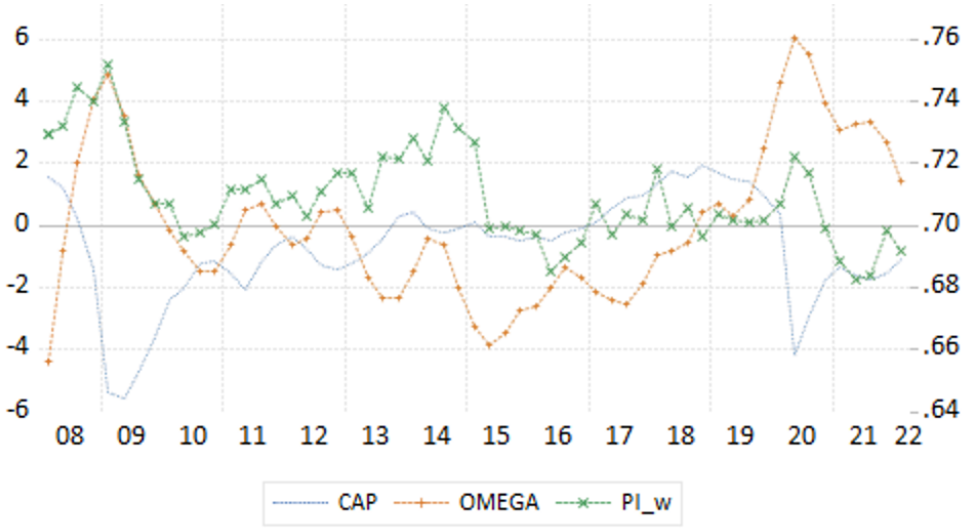


Figure 1: The capacity utilization (CAP); Wage share (OEMGA); and the Pasinetti Index (with real wage growth) using the Japanese macroeconomics data from q1 2008 to q1 2022 (horizontal axis).
*For the value of omega, please see the right-hand side axis.
*Please see the data description section for the source of data and details in section 5.

6. VAR Model

To examine how income flow towards rentier would affect income distribution in terms of wage share and the growth and demand in an empirical manner, we use a VAR model. The main

premise of the VAR model is its ability to provide a coherent and credible approach to data description, forecasting, structural inference, and policy analysis.[6] The VAR model has been used widely in the post-Keynesian literature, most notably to empirically investigate the relation between effective demand, income distribution, and unemployment for the USA, UK, and France (Onaran and Stockhammer, 2004). Also, the long debate of post-Keynesian literature regarding the wage-led or profit-led growth regime is empirically investigated by Barbosa-Filho and Taylor (2006) with the VAR model. Recently, the debt-led and debt-burdened demand analysis are investigated with VAR model for the case of Germany and the U.S. by Hein and Schoder (2009) and Japan by Nishi (2012).

We conduct three variable VAR model:

3-variable VAR model: $\boldsymbol{Y_t = [CAP_t, OMEGA_t, PI_t^w]}$

$$CAP_t = a_1 + \sum_{k=1}^{k=3} b_{11} CAP_{t-k} + \sum_{k=1}^{k=3} b_{12} OMEGA_{t-k} + \sum_{k=1}^{k=3} b_{13} PI_{t-k}^w + u_t$$

$$OMEGA_t = a_1 + \sum_{k=1}^{k=3} b_{21} CAP_{t-k} + \sum_{k=1}^{k=3} b_{22} OMEGA_{t-k} + \sum_{k=1}^{k=3} b_{23} PI_{t-k}^w + v_t$$

$$PI_t^w = a_1 + \sum_{k=1}^{k=3} b_{31} CAP_{t-k} + \sum_{k=1}^{k=3} b_{32} OMEGA_{t-k} + \sum_{k=1}^{k=3} b_{33} PI_{t-k}^w + z_t$$

The VAR model above shows autoregressive, which means that the presence of the lagged values of the dependent variable on the right-hand side of the equation. Also, the vector shows that the system contains three variables CAP, OEMGA, and PI_w. In our model, we first specify the following order: capacity utilization (CAP), wage share (OMEGA), and the Pasinetti Index (PI_w). We assume all the variables are endogenous and no exogenous variables in the model. u, v, z are white noise disturbances, and the coefficient of the main variables, b are

[6] Please see the detail of VAR model in the paper: Stock and Watson (2001)

estimated by OLS. As the equation shows, we set the appropriate lag as 3. To define the lag structure of the model, we set eight quarters as the maximum length and computed Akaike (AIC) and Schwarz (SC) information criteria for all specifications.

Lag	LogL	LR	FPE	AIC	SC
0	-41.14107	NA	0.001216	1.801676	1.917502
1	65.45551	195.7896	2.27e-05	-2.181858	-1.718555
2	81.85818	28.11886	1.68e-05	-2.484007	-1.673227
3	101.1497	30.70891	1.12e-05*	-2.904068*	-1.745811*
4	105.8738	6.941543	1.36e-05	-2.729542	-1.223807
5	119.1236	17.84675*	1.19e-05	-2.903006	-1.049794
6	121.8844	3.380475	1.62e-05	-2.648341	-0.447652
7	136.3400	15.93068	1.40e-05	-2.871019	-0.322853
8	140.3877	3.965149	1.91e-05	-2.668887	0.226756

Table 1: Information Criteria
*Denotes the minimum information value

The inverse roots of the AR characteristic polynomial are used to check the stability of the VAR or stationarity. The estimated VAR is stable if all inverse roots of the characteristic AR polynomial have a modulus less than one and lie inside the unit circle. From Table (X) in the Appendix, all lie inside the unit circle; therefore, the VAR model is stationary.

7. Result

Granger-causality statistics examine whether lagged values of one variable help to predict another variable in the model. Table 2 shows that when the dependent variable is capacity utilization (CAP), despite that the p-value is almost less than 5% for the Pasinetti Index (PI_w) while the p-value is less than 5% for the wage share (OMEGA), we can reject the null hypothesis that the Pasinetti index and wage share would cause the granger causality on capacity utilization. When the dependent variable is wage share, the p-value of the capacity utilization rate is only significant. When we have the Pasinetti Index as the dependent variable, only the p-value of the wage share is predictable.

Table 2: Granger Causality Test

Dependent variable: CAP			
Excluded	Chi-sq	df	Prob.
OMEGA	19.58123	3	0.0002
PI_w	7.218963	3	0.0552
All	22.74079	6	0.0009
Dependent variable: OMEGA			
Excluded	Chi-sq	df	Prob.
CAP	11.69818	3	0.0085
PI_w	3.695604	3	0.2963
All	14.56411	6	0.0239
Dependent variable: PI_w			
Excluded	Chi-sq	df	Prob.
CAP	2.923617	3	0.4036
OMEGA	10.23378	3	0.0167
All	18.82830	6	0.0045

IRF

First, we conduct the impulse response function (IRF) from our baseline model estimation in order to investigate the dynamic characteristics among the variables not to search the equilibrium relation among the income flow towards rentiers (PI_w), capacity utilization, and wage share. presented in Fig. 2.

- The shock of 1 standard deviation increase in the Pasinetti index would cause capacity utilization continuously up to the 10th quarter and wage share to decrease continuously.
- The shock of 1 standard deviation increase in the capacity utilization would increase wage share and Pasinetti index continuously.
- The shock of 1 standard deviation increase in the wage share would cause capacity utilization to increase up to the 10th quarter continuously, and the Pasinetti index would increase only up to the 4th but decrease up to the 10th quarter.

For the case of a positive shock of income flow towards rentiers (Pasinetti index), the shape of the IRF confirms the detrimental effect on capacity utilization and wage share; the monetary

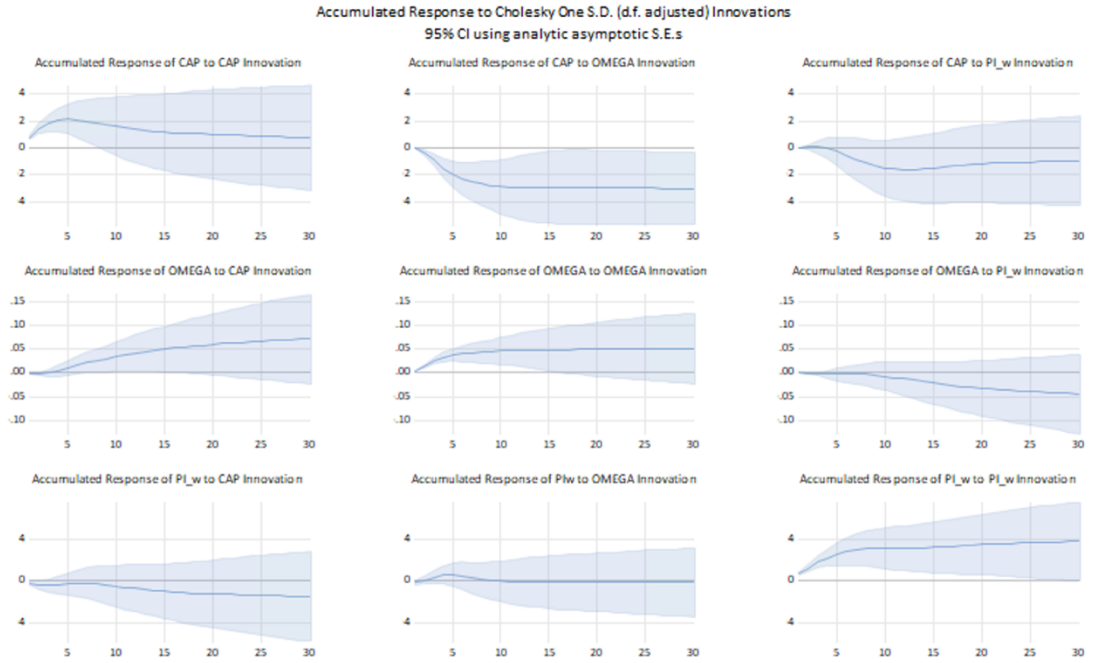
policy affects the distribution from workers to rentiers, eventually on aggregate demand and economic activity.

This model employs the alternative Pasinetti index, which considers the income flow from workers to rentiers. In terms of policy implications for the Japanese economy in the last 15 years, such an policy that attempts income flow towards workers (lower income earning group) compared to the financial asset holders/rentiers (higher income groups) would have been more effective in order to restore the effective demand and economic growth. Even though the BOJ has set a low-interest rate policy or even zero nominal rates for decades, Figure 1 shows that according to the Pasinetti index, most of the time (except during the Covid crisis), there has been positive income flow toward rentiers from workers. spend a more significant proportion of their income than wealthier ones, a policy that redistributes toward workers may encourage greater growth. In this sense, a permanent policy of low-nominal interest rates must be reconsidered; the last fifteen years since the BOJ accelerated the unconventional monetary policy with even control of the rate of the long-term government bond (since 2013) have shown the fragility of our economic system when monetary policy is not accommodative to workers. In other words, monetary policy has acted as an income policy that protected rentiers. This is a global phenomenon in developed countries such as the U.S., proved by Kappes et al. (2023) and Seccareccia and Lavoie (2016), showing that monetary policy has exacerbated an already unequal income distribution.

Despite the fact that our work is based on the theory of functional income distribution, analyzing the outcome with the personal income distribution would also give some important insight. Our result is not surprising, as we predicted from the literature review such as Saiki et al. (2024; 2020) and Israeli (2023), which have shown that UMP contributed to the higher income

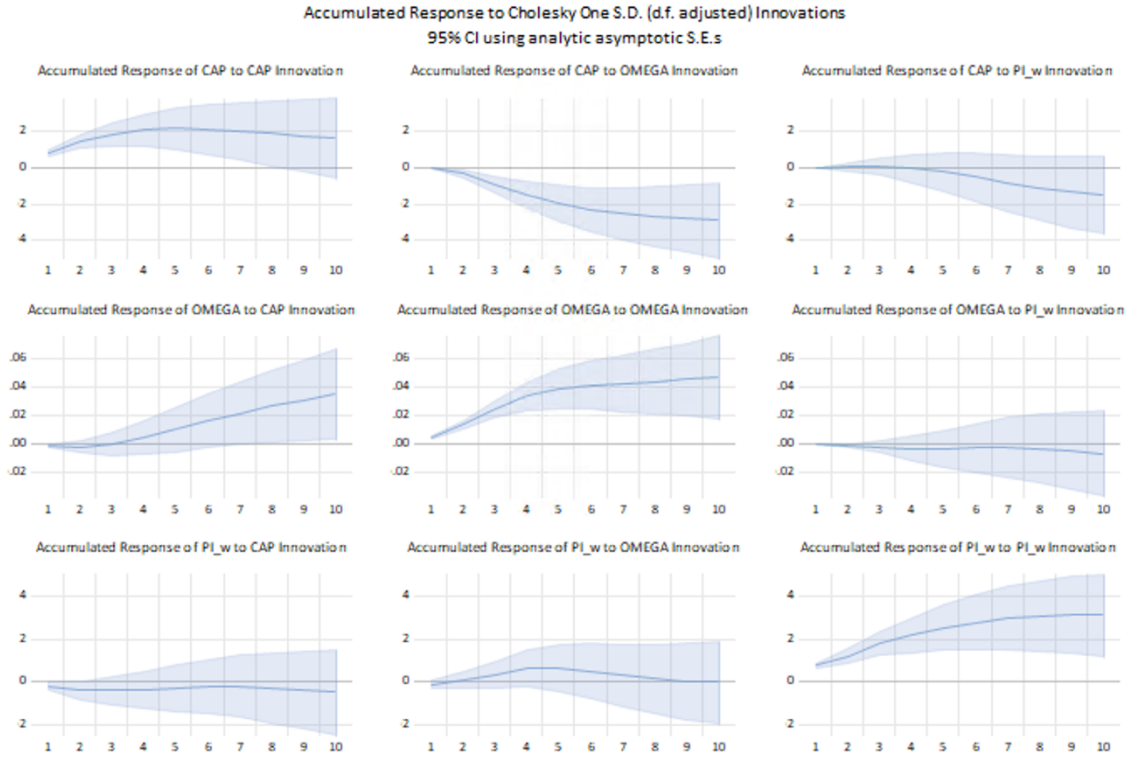
distribution for the higher income of the top group (top 20%) by the stock market performance and financial asset price appreciation. However, our result could also contribute an additional story in Japan's unconventional monetary policy age and higher income inequality. Higher inequality in comparison to rentiers and workers also contributes to the sluggish effective demand growth, higher income inequality has been detrimental to the macroeconomic performance in Japan.

Figure 2 (a): Cumulative impulse responses of VAR (3)



*From the data of 2007Q1–2022Q1. The first, second, and third rows represent the accumulated response functions of CAP, OMEGA, and PI_W cumulative response.

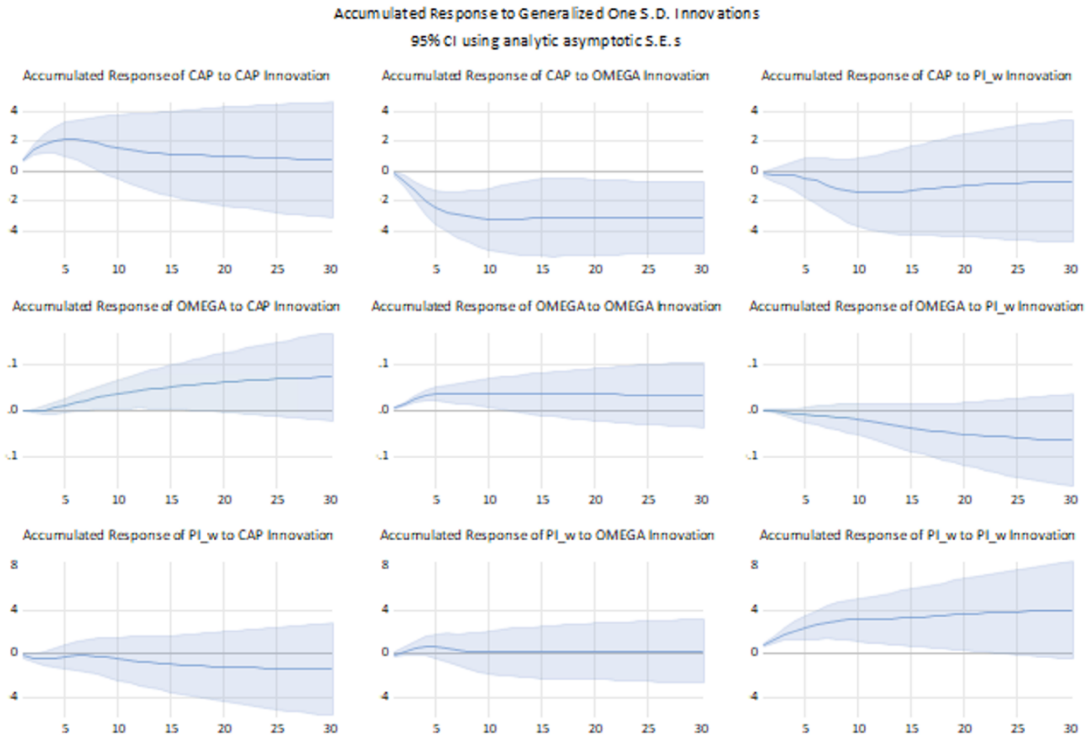
Figure 2 (a): Accumulative impulse responses of VAR (3)



Robustness Check:

We conduct different ordering with generalized impulse response functions. This is because impulse response analysis comes with the price: the result can depend on the ordering of variables in VAR. To make our work robust, we see how our results are sensitive to the ordering, we use a generalized IRF (Pesaran and Shin, 1998), which does not depend on the ordering. The results with generalized IRF (please see Figure 3) show that they are very similar to our baseline results. One thing to mention is that even though capacity utilization does not continuously decrease after an increase of 1 standard deviation in the Pasinetti index, the capacity utilization rate does not revert to the original. Also, the wage share contiguously rises after the 1 standard deviation increase in the Pasinetti index.

Figure 3: Accumulative generalized impulse responses of VAR (3)



8. Conclusion:

This paper sheds light on Pasinetti's work on a distributional aspect of monetary policy rate and employs his interest rule, which measures the higher income flow toward rentiers. We conduct the VAR model to investigate whether higher income inflow towards rentiers would restrain the demand and wage share toward works under the conventional monetary policy in Japan. The stylized fact is that the country has observed higher income inequality in the last decades, and it has been revealed that unconventional monetary policy (UMP) accelerates inequality by the asset price mechanism, widening wealth and income inequality (Israel et al., 2023). Before the UMP in the early 2000s, the basic consensus was that the analysis of Japanese income inequality was insignificant, according to Moriguchi and Saez (2006), as the top 1% of income source is primarily wage income. However, after almost 20 years, new research results show rising inequality, especially between wage earners and rentiers. Our empirical result with the VAR model would show 1) implementing the analysis of functional income distribution other than the analysis of personal income distribution with the Gini coefficient can show the rise of rentier income also affects macroeconomic demand growth negatively. 2) Higher rentier income flow also affects the wage share negatively, which indicates that in Japan under the UMP, the U.S. type of debt-led effects would not hold, but higher household debt rather restrains demand and growth. In terms of policy implication, a policy of low-nominal interest rates must be reconsidered when it comes to the distributional aspect: the last fifteen years since the BOJ accelerated the unconventional monetary policy with even control of the rate of the long-term government bond (since 2013) have shown the fragility of our economic system when monetary policy is not accommodative to workers. In other words, monetary policy has acted as an income policy that protected rentiers. The monetary policy does not protect workers who tend to hold

fewer financial assets, will not see an impact on wages, and may even be negatively impacted by lower deposit interest rate earnings on saving accounts.

Lastly, it is worth noting that the post-Keynesian literature has contributed historically to the study of growth and distribution: the relationship between wage/profit share and its implication on growth. However, there has been some disconnection regarding the functional and personal income distribution and its implication for growth. The former has accounted for growth and distribution with macroeconomic variable data, but the latter has employed microeconomics (based on wage differential and Gini coefficient). The complementarity of the two methodologies can be reconciled and strengthened by the endorsement of the Pasinetti Index methodology, which employs the income flow between wage earners and rentiers (lenders) by decomposing the traditional capitalists and workers into smaller segments.

Reference

Ampudia, M., D. Georgarakos, J. Slacalek, O. Trist, P. Vermeulen, and G. Violante. 2018. 'Monetary Policy and Household Inequality.' Working Paper Series, n. 2179, European Central Bank

Aoyagi, C., Ganelli, G. and Murayama, K. (2015): How inclusive is abenomics? IMF Working Paper 15/54.

Barbosa-Filho, N., Lance T. 2006. Distributive and Demand Cycles in the US Economy - A Structuralist Goodwin Model. Metroeconomica 57(3):389-411

Bordo, M. D., and C. M. Meissner. 2012. 'Does Inequality Lead to a Financial Crisis?' Journal of International Money and Finance 31 (8): 2147–2161.

Bunn, P., A. Pugh, and C. Yeates. 2018. 'The Distributional Impact of Monetary Policy Easing in the UK Between 2008 and 2014.' Bank of England Staff Working Paper, No. 720. Bank of England.

Casiraghi, M., E. Gaiotti, L. Rodano, and A. Secchi. 2018. "A 'Reverse Robin Hood'? The Distributional Implications of Non-standard Monetary Policy for Italian Households." Journal of International Money and Finance 85: 215–235. doi:10.1016/j.jimonfin.2017.11.006.

Chappe, R., Semmler, W. Financial Market as Driver for Disparity in Wealth Accumulation—A Receding Horizon Approach. Comput Econ 54, 1231–1261 (2019). https://doi.org/10.1007/s10614-018-9870-1

Cingano, F. (2014): Trends in Income Inequality and its Impact on Economic Growth. OECD Social, Employment and Migration Working Papers 163
Deutsche Bundesbank. 2016. 'Distributional Effects of Monetary Policy.' Monthly Report, September 2016.

Coibion, O., Y. Gorodnichenko, L. Kueng, and J. Silvia. 2017. 'Innocent Bystanders? Monetary Policy and Inequality.' Journal of Monetary Economics 88: 70–89.

Davtyan, K. 2016. 'Income Inequality and Monetary Policy: An Analysis on the Long Run Relation.' AQR–Working Papers, n. 16/04.

Doepke, M., V. Selezneva, and M. Schneider. 2015. "Distributional Effects of Monetary Policy." 2015 Meeting Papers 1099, Society for Economic Dynamics, Warsaw.

Domanski, D., M. Scatigna, and A. Zabai. 2016. 'Wealth Inequality and Monetary Policy.' BIS Quarterly Review 45–64

Dossche, M., J. Slačálek, and G. Wolswijk. 2021. 'Monetary Policy and Inequality.' ECB Economic Bulletin, issue 2/2021: 84–103.

El Herradi, M., and A. Leroy. 2019. "Monetary Policy and the Top One Percent: Evidence from a Century of Modern Economic History." DNB Working Paper no. 632.

Furceri, D., P. Loungani, and A. Zdzienicka. 2018. 'The Effects of Monetary Policy Shocks on Inequality.' Journal of International Money and Finance 85: 168–186.

Guerello, C. 2018. 'Conventional and Unconventional Monetary Policy vs. Households Income Distribution: An Empirical Analysis for the Euro Area.' Journal of International Money and Finance 85: 187–214.

Eckhard Hein eckhard.hein@hwr-berlin.de & Christian Schoder (2011) Interest rates, distribution and capital accumulation – A post-Kaleckian perspective on the US and Germany, International Review of Applied Economics, 25:6, 693-723, DOI: 10.1080/02692171.2011.557054

Israel, K. F., and Sepp, T. F., and Sonnenberg, N. 'The Effects of Unconventional Monetary Policy On Stock Markets and Household Incomes in Japan.' Documents de Travail du Centre d'Economie de la Sorbonne.

Kappes, S., and Cortes, P., and Rochon., L.P. (2023), "A Non-linear Analysis of the Macroeconomic Impact of Changes in the Pasinetti Index in the U.S.", Conference on Central Banks, Financial Markets, and Inequality.

Komiya, K. and Kihara, L. (2021): Japan confronts rising inequality after Abenomics. Reuters.

Kuznets, S (1953), Shares of Upper Income Groups in Income and Savings, National Bureau of Economic Research

Lavoie, M., and Seccareccia, M. 2019. "Macroeconomics and natural rates: some reflections on Pasinetti's fair rate of interest." Bulletin of Political Economy 13 (2): 85-94.

Lenza, M., and J. Slacalek. 2018. 'How Does Monetary Policy Affect Income and Wealth Inequality? Evidence from the Euro Area.' European Central Bank Working Paper Series No 2190.

Chiaki Moriguchi & Emmanuel Saez, 2008. "The Evolution of Income Concentration in Japan, 1886-2005: Evidence from Income Tax Statistics," The Review of Economics and Statistics, MIT Press, vol. 90(4), pages 713-734, November.

Mumtaz, H., and A. Theophilopoulou. 2017. 'The Impact of Monetary Policy on Inequality in the UK. An Empirical Analysis.' European Economic Review 98: 410–423.

Nishi, H. (2012). Structural VAR analysis of debt, capital accumulation, and income distribution in the Japanese economy: a Post Keynesian perspective. Journal of Post Keynesian Economics, 34(4), 685–712. http://www.jstor.org/stable/23469838

O'Connor, N. (2017): Three Connections between Rising Economic Inequality and the Rise of Populism. Irish Studies in International Affairs 28: 29-43

Ostry, J. D., A. Berg, and G. T. Charalambos. 2014. 'Redistribution, Inequality, and Growth.' IMF Staff Discussion Note 14/02

Ostry, J. D., Berg, A. and Tsangaride, C. G. (2014): Redistribution, inequality, and growth. IMF Staff Discussion Note, SDN/14/02.

Pasinetti, L.L. (1980), "The rate of interest and the distribution of income in a pure labor economy", Journal of Post Keynesian Economics 3 (2), 170 182.

Pasinetti, L.L. (1981), Structural Change and Economic Growth, Cambridge: Cambridge University Press.

Pasinetti, L.L. (1993), Structural Economic Dynamics: A Theoretical Essay on the Dynamics of the Wealth of Nations, Cambridge: Cambridge University Press.

Perron, P., Yamamoto, Y. and Zhou, J. (2020). "Testing jointly for structural changes in the error variance and coefficients of a linear regression model", *Quantitative Economics*, 11: 1019.

Perugini, Cristiano, Jens Hölscher, and Simon Collie (2016), Inequality, credit and financial crises, Cambridge Journal of Economics 4(1): 227-257

Piketty and Garbrinti (2018). “Income Inequality Dynamics in France 1900-2014: Evidence from Distributional National Accounts (DINA)”, Journal of Public Economics 162: 63-77.

Piketty T, E Saez and G Zucman (2018), “Distributional National Accounts: Methods and Estimates for the United States”, Quarterly Journal of Economics 133(2): 553-609

Rajan, R. 2010. Fault Lines: How Hidden Fractures Still Threaten the World Economy. Princeton: Princeton University Press

Rodrik, D. (2018): Populism and the economics of globalization. Journal of International Business Policy 1(1): 12-33.

Romer, C. D., and D. H. Romer. 2004. ‘A New Measure of Monetary Shocks: Derivation and Implications.’ American Economic Review 94 (4): 1055–1084.

Rupprecht, M. 2018. “Income and Wealth of Euro Area Households in Times of Ultra-loose Monetary Policy: Stylised Facts from New National and Financial Accounts Data.” Empirica. doi:10.1007/s10663-018-9416-8.

Ayako Saiki & Jon Frost (2014) Does unconventional monetary policy affect inequality? Evidence from Japan, Applied Economics, 46:36, 4445-4454, DOI: 10.1080/00036846.2014.962229

Saiki, A., and Frost, J. (2020): Unconventional monetary policy and inequality: is Japan unique?, Applied Economics, DOI:10.1080/00036846.2020.1745748

Seccareccia, M., and M. Lavoie. 2016. ‘Income Distribution, Rentiers, and their Role in a Capitalist Economy: A Keynes–Pasinetti Perspective.’ International Journal of Political Economy 45 (3): 200–223

Stock, James, H., and Mark W. Watson. 2001. "Vector Autoregressions." Journal of Economic Perspectives, 15 (4): 101-115.

Stockhammer, Engelbert & Onaran, Ozlem, 2004. "Accumulation, distribution and employment: a structural VAR approach to a Kaleckian macro model," Structural Change and Economic Dynamics, Elsevier, vol. 15(4), pages 421-447, December.

Rochon, L.-P. and M. Setterfield (2012), “A Kaleckian Model of Growth and Distribution with Conflict-Inflation and Post-Keynesian Nominal Interest Rate Rules”, Journal of Post Keynesian Economics, 34 (3), Spring, pp. 497-520.

Stiglitz, Joseph E. (2012): The Price of Inequality: How Today’s Divided Society Endangers Our Future. New York: W.W. Norton and Company

Sylvio Antonio Kappes (2023) Monetary Policy and Personal Income Distribution: A Survey of the Empirical Literature, Review of Political Economy, 35:1, 211-230, DOI: 10.1080/09538259.2021.1943159

van Treeck, T. (2014) Did inequality cause the US financial crisis?, Journal of Economic Surveys, 28, 421–48. doi:10.1111/joes.12028

Yoshino, N., F. Taghizadeh-Hesary, and S. Shimizu. 2018. “Impact of Quantitative Easing and Tax Policy on Income Inequality: Evidence from Japan.” ADBI Working Papers, No. 891.

Appendix

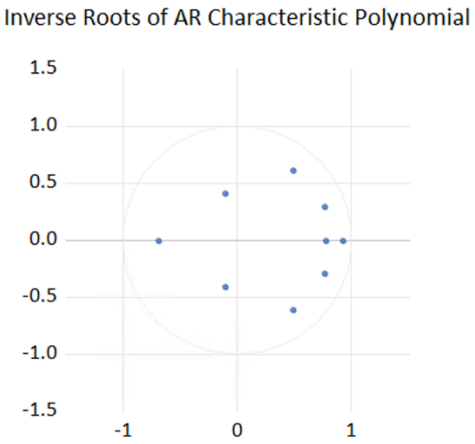


Figure A1: The AR root graph of the baseline model, $Y_t = [CAP_t\ , OMEGA_t, PI_t^w]$ with 3 lags

Table 3: Roots of Characteristic Polynomial
Endogenous variables CAP OMEGA PI_w

Exogenous variables: C	
Lag specification: 1 3	
Root	Modulus
0.922238	0.922238
0.758903 - 0.290906i	0.812749
0.758903 + 0.290906i	0.812749
0.485837 - 0.610347i	0.780103
0.485837 + 0.610347i	0.780103
0.771089	0.771089
-0.692581	0.692581
-0.101000 - 0.414825i	0.426944
-0.101000 + 0.414825i	0.426944
No root lies outside the unit circle. VAR satisfies the stability condition.	

Figure A2: Correlogram for the baseline model $Y_t = [CAP_t\ , OMEGA_t, PI_t^w]$ with 3 lags

*The lines with dash are the 2std. Err band

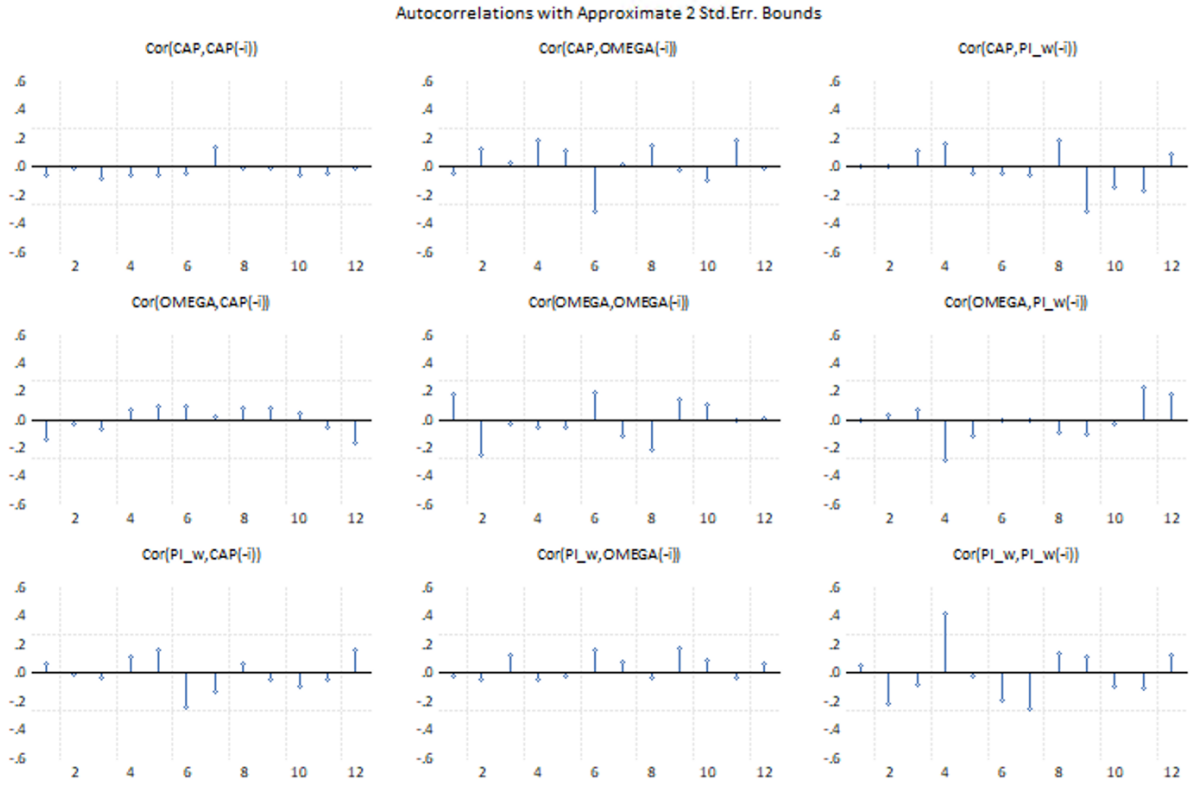


Table: Vector Autoregression Estimates of the baseline model

* Standard errors in ( ) & t-statistics in [ ]

	CAP	OMEGA	PI_w
CAP(-1)	0.727178	0.001849	-0.052555
	(0.15211)	(0.00093)	(0.15204)
	[4.78049]	[1.98400]	[-0.34566]
CAP(-2)	-0.086270	0.000399	0.244946
	(0.20073)	(0.00123)	(0.20064)
	[-0.42978]	[0.32458]	[1.22083]
CAP(-3)	0.148034	-0.000485	-0.255067
	(0.15166)	(0.00093)	(0.15159)
	[0.97610]	[-0.52226]	[-1.68263]
OMEGA (-1)	-67.19201	1.953919	57.67744
	(20.8869)	(0.12798)	(20.8772)
	[-3.21694]	[15.2678]	[2.76271]
OMEGA (-2)	55.38448	-1.406217	-74.05047
	(36.5402)	(0.22389)	(36.5231)
	[1.51571]	[-6.28096]	[-2.02749]
OMEGA (-3)	-0.936126	0.465566	14.19452
	(21.7295)	(0.13314)	(21.7193)
	[-0.04308]	[3.49685]	[0.65354]
PI_w(-1)	0.065471	-0.001044	0.607129
	(0.14278)	(0.00087)	(0.14271)
	[0.45856]	[-1.19315]	[4.25431]
PI_w(-2)	-0.156060	0.001085	0.478107
	(0.15858)	(0.00097)	(0.15851)
	[-0.98411]	[1.11658]	[3.01632]
PI_w(-3)	-0.119748	0.000462	-0.318895
	(0.13859)	(0.00085)	(0.13852)
	[-0.86407]	[0.54421]	[-2.30214]
C	8.996132	-0.008589	1.611355
	(4.48543)	(0.02748)	(4.48334)
	[2.00563]	[-0.31252]	[0.35941]
R-squared	0.820627	0.966780	0.752716
Adj. R-squared	0.783938	0.959985	0.702135
Sum sq. resids	27.97391	0.001050	27.94776
S.E. equation	0.797352	0.004885	0.796979
F-statistic	22.36660	142.2766	14.88144
Log likelihood	-58.86446	216.2674	-58.83921
Akaike AIC	2.550536	-7.639532	2.549600
Schwarz SC	2.918866	-7.271202	2.917931
Mean dependent	-0.776514	0.701248	0.814933
S.D. dependent	1.715381	0.024423	1.460284
Determinant resid covariance (dof adj.)		8.42E-06	
Determinant resid covariance		4.55E-06	
Log likelihood		102.2234	
Akaike information criterion		-2.674941	
Schwarz criterion		-1.569950	
Number of coefficients		30	