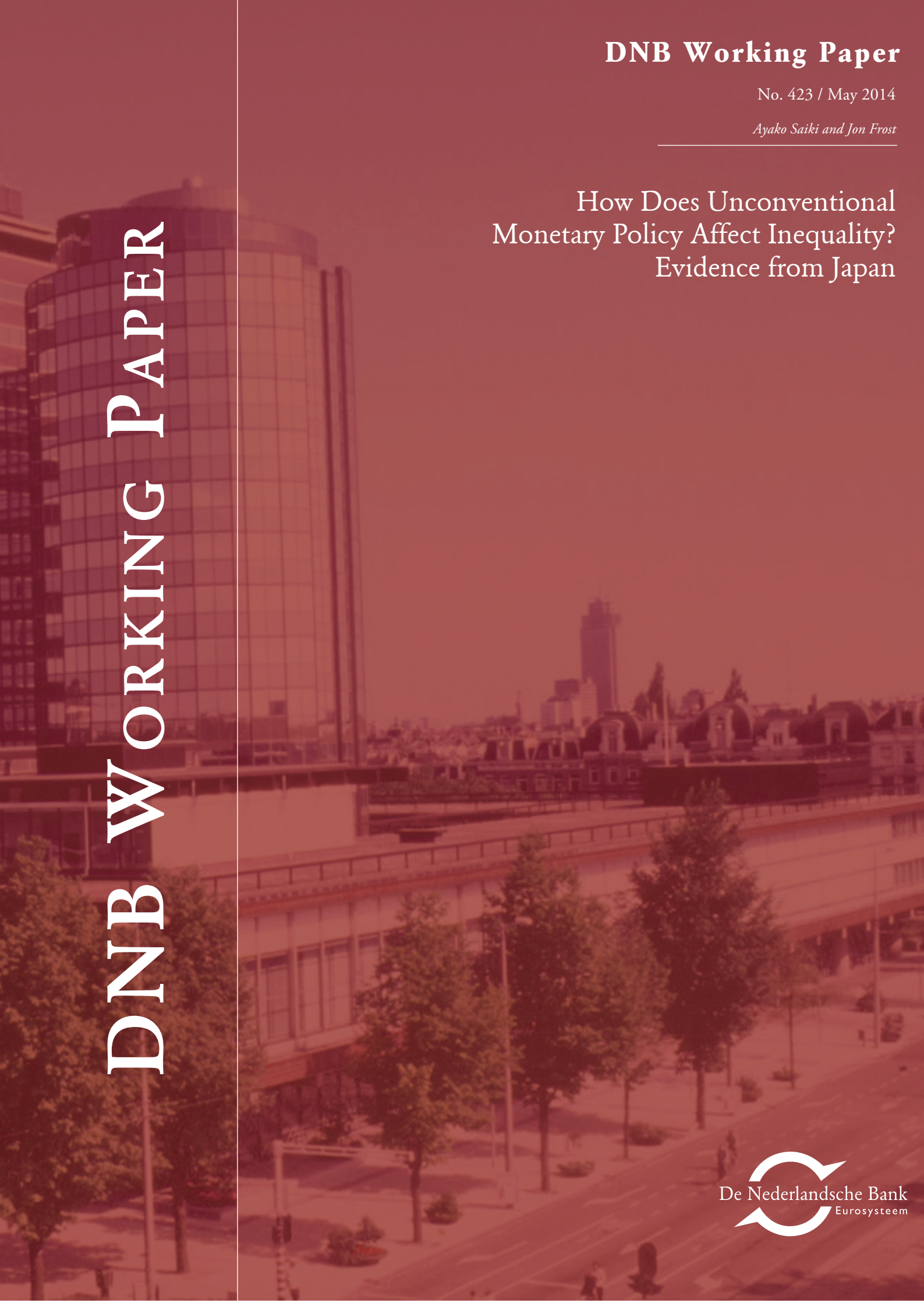

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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

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De Nederlandsche Bank NV
P.O. Box 98
1000 AB AMSTERDAM
The Netherlands

How Does Unconventional Monetary Policy Affect Inequality? Evidence from Japan

Ayako Saiki[+]
Jon Frost

"Does this imply that inequalities are irrelevant for central bankers? Not at all, as first, monetary policy may have impact on inequalities, and second, stability is conducive to equity".
Benoît Cœuré, ECB, Oct 17, 2012

Abstract

Inequality has been largely ignored in the literature and practice of monetary policy, but is gaining more attention recently. We look at how a decade of unconventional monetary policy (UMP) in Japan affected inequality among households using survey data. Our vector auto regression (VAR) results show that UMP widened income inequality, especially after 2008 when quantitative easing became more aggressive. This is largely due to the portfolio channel. To the best of our knowledge, this is the first study to empirically analyze the distributional impact of UMP. Japan's extensive experience with UMP may hold important policy implications for other countries.

JEL Code: E52, E63, D63
Keyword: Monetary Policy, Central Banking, Stabilization Policy, Inequality

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+Corresponding author: Ayako Saiki (ayako@alumni.brandeis.edu), Economist, De Nederlandsche Bank
Jon Frost, Economist, De Nederlandsche Bank (j.frost@dnb.nl)

I. Introduction

Income inequality is on the rise across developed countries in the past three decades, and in particular since the global financial crisis (OECD, 2013). This trend – while important in its own right for normative reasons – should have important economic and financial stability implications as well. It has been a mantra among economists that there are trade-offs between equality and efficiency (Okun, 1975). However, a number of recent studies seems to indicate that this claim is not– or no longer – necessarily supported by facts. Several recent studies indicate that greater income inequality may hinder both the level and duration of long-term growth spells (Ostry, et al., 2014). Moreover, widening inequality can be associated with greater financial instability (Skott, 2011; Vandemoortele, 2009; Prasad, 2010). This effect may have been particularly relevant in the debt-driven housing boom in the pre-crisis period in the United States (Rajan, 2010; Van Treeck, 2013)[1].

Despite its importance, the distributional impact of monetary policy has until recently been largely ignored, by both academics and central bankers. To the best of our knowledge there is no empirical study that empirically analyzed the impact of unconventional monetary policies (henceforth UMP) on income distribution. The distributional impact of UMP is increasing in importance, with the prolonging period of UMP in several major economies. This study attempts to fill the gap by looking at the impact of UMP in Japan – a country with the longest history of UMP that makes it particularly well suited to such a study. Using household survey data, we study the impact of the policy of the Bank of Japan (BoJ) on income distribution in two phases of UMP between 2002Q1 and 2013Q3. With a vector auto regression (VAR) model, we present evidence that UMP has increased inequality via higher asset prices, particularly since 2008.

Over the last couple of decades, the impact of inflation on income distribution was typically small, as central banks in major economies have successfully anchored inflation and inflation expectations ("Great Moderation"). However, after the eruption of the global financial crisis, the central banks' main objectives have shifted, with much more weight placed on financial stability and restoring the monetary transmission mechanism. As such, central banks have undertaken a wide variety of unconventional policies, with academic research often seeking to clearly understand the effects *a posteriori* (Krishnamurthy and Vissing-Jorgensen, 2012).

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1 The applicability of this effect is highly dependent on individual country factors and institutions, which shape the link between inequality and credit booms (Bordo and Meissner, 2012).

While UMP's tools are different, the common goals are to stabilize the financial market and secure monetary policy transmission mechanisms (Borio and Disyatat, 2009; De Haan et al., 2013). In order to achieve the latter goal, commercial banks' buffers (determined by the value of assets) play a crucial role; and in the process, central banks try to keep financial markets afloat by putting more liquidity into the market and supporting asset prices. In other words, asset prices *may* become overvalued while UMP is in place. Even if financial markets are not fundamentally overvalued, the increase in prices will benefit those households with greater financial assets. This can lead to higher inequality: wealthy households which tend to save their money in financial assets earn more income from dividends and capital gains, while other households will benefit less from asset prices rise and may face very low interest rates on savings, declining wages or worse, unemployment. The lack of counterfactual information makes it impossible for us to examine how "successful" UMP has been. The general consensus, however, is that central banks have prevented the worst-case scenario of a financial meltdown. But UMP's impact at the microeconomic-level – i.e. on income distribution – has not been examined.

The paper is organized as follows. Section II briefly sketches the relevant literature and theory around income inequality and UMP, with special attention to Japan – a vanguard of UMP. Section III describes our data and some stylized facts. Section IV presents our vector autoregression (VAR) approach and empirical results under different periods. Finally, section V concludes with policy implications.

II. Literature

i. Monetary Policy and Inequality

While analyses of monetary policy (especially UMP) and inequality is new, the literature on the impact of inflation on inequality and poverty is somewhat older. Romer and Romer (1998), based on cross-country research, find that low inflation and stable aggregate demand is good for the poor in the long run. Subsequently, the literature has examined a number of channels by which monetary policy can impact income inequality in normal times, including through the impact of inflation on borrowers and savers (see Erosa and Ventura, 2002; Albanesi, 2007; Doepke and Schneider, 2006). Coibion et al. (2012) summarize five channels whereby monetary policy can impact income inequality: i) the income composition channel: the differences between wages and capital income; ii) financial segmentation: the ability of some financial market actors to benefit more from policy shocks than others; iii) the savings

redistribution channel: the impact on nominal contracts of unexpected inflation; iv) the earnings heterogeneity channel: the tendency of lower incomes to be more sensitive to the business cycle (see also Heathcote, *et al*. 2010; Schlicht, 2007); and v) the portfolio channel: upper-income households, who tend to be the largest holders of securities, will gain more from asset market booms created by expansionary monetary policy. The empirical survey by Coibion et al. (2012) finds that contractionary shocks lead to *greater* inequality in the United States in the pre-crisis period. However, their study suffers from several shortcomings: (i) the data used does not include wealth data, so that their study cannot directly measure the effect of the portfolio channel or the financial market segmentation channel[2]; (ii) their study does not extend beyond 2008 (the period when UMP was implemented), as their model uses the Taylor model to exogenise monetary policy shocks, which would not be applicable to under the zero lower bound. With this limitation in mind, they interpret their results as an indication that contractionary monetary policy affects income distribution primarily through the savings redistribution (savers gain, borrowers lose) and earnings heterogeneity channels (lower household earn a large portion of income from transfers, which tend to be countercyclical). On the other hand, Watkins' (2014) narrative paper presents some evidence that income and wealth inequality has increased with the quantitative easing program of the Fed, although he does not analyze the mechanism behind it.

The idea that monetary policy may specifically impact asset prices has recently become more prominent in the literature. For example, Borio and Lowe (2002) show that in times of low inflation, demand pressures may build up in credit and asset markets rather than in the prices of goods and services. For this reason, they suggest that monetary policy should be tightened to contain pressures in credit and asset markets as a means to preserve both financial and monetary stability. A large body of empirical work seems to bear out this view, showing that loose monetary policy can put upward pressure on asset prices relative to fundamental values, and that these effects are particularly strong during asset boom periods (see Bordo and Landon-Lane, 2013, for an overview and long-run evidence from the US).[3]

ii. The Case of Japan

2 The micro data collected from US Consumer Expenditure Survey is available online at http://www.bls.gov/cex/capi/2011/cecapihome.htm. The survey does have a section "change in assets," but the question is asked to the participants in the 4th quarter only.

3 A contrary view is taken by Galí (2013), who shows with a theoretical model and empirical evidence from the U.S. that especially when asset prices diverge from their fundamental values (i.e. have a large "bubble component") contractionary monetary policy can even further inflate the bubble.

As is well-known, Japan is a frontrunner of UMP – along with many other problems that advanced economies are likely to face going forward, especially population aging and increasing public debt. On UMP, Japan has followed several steps: (i) a zero interest rate policy between August 1999 and August 2000; (ii) a first phase of QE between March 2001 and March 2006 ("Phase 1"); (iii) restarting a zero interest rate policy in October and QE in November 2008, in response to the global financial crisis: these were followed by comprehensive monetary easing (CME) from 2010, when the BoJ started purchasing higher risk assets[4]; and (iv) a new and much larger program of quantitative and qualitative easing (QQE) since April 2013 (Uchida, 2013). The QQE program, announced in December 2012, as the "first arrow of Abenomics", the economic program of Prime Minister Shinzo Abe, is ongoing. While the media tends to focus on QQE as a major monetary policy shift, we also consider 2008 as an important point of policy shift, as the monetary base started growing rapidly around that time under the zero lower bound. As such, we refer to the period since September 2008, including CME and QQE, in the following as "Phase 2".

[Insert figure 1 here]
[Insert figure 2 here]

Under "Abenomics," even before QQE started in April 2013, the stock market rallied (30% gain in 2013 alone, 10% before QQE even took place), while wages remained stagnant. Critics have stated that Abenomics widened income inequality[5], by benefiting already wealthy households and not the poor. Since Japanese households' savings consist chiefly of bank deposits, they earn little interest on their savings, while facing a stagnant wage growth or job losses. Thus, the benefits of higher asset prices are limited to those who own stocks and bonds which are typically upper income households (Fish, 2014). Under the Koizumi administration (2001-2006), stock prices more than doubled, thanks in part to Phase 1 of UMP. Moreover, Mr. Koizumi's Reaganomics-style structural reforms were accompanied by wider income inequality, and a higher relative poverty ratio. Therefore, not only monetary policy, but also structural reform is pivotal to determine income inequality and the relative poverty ratio[6].

4 See the detailed explanation of the CME program and its effectiveness in Lam (2011).

5 A recent analysis by Goldman Sachs (2014) reports that the bulk of domestic investors – including the household sector – sold equities in 2013, implying large capital gains.

6 Japan is in 4th place among the OECD countries on relative poverty, i.e. the proportion of the population with income less than half the median income, according to OECD data.

However, this also means that structural reforms (e.g. investing in education, combating duality in the labor market) can play a role to *offset* widened income inequality.

III. Data

i. Household Survey Data

In this study, we use household survey data from the Japanese Cabinet Office[7]. Unfortunately, only Japanese government and Japanese government-funded researchers can access the micro-level data, so we have to rely on aggregated data; the most disaggregated level we can access is at the decile level, major city level, etc. The household survey consists of two subsets: (i) household income and expenditure data (monthly frequency); and (ii) household savings and liabilities survey (quarterly frequency). While the first dataset starts from 1958, the latter is available from 2002. Since the authorities do not report a range or variance of incomes or savings, the only possible ways to measure inequality are the Gini coefficient or Theil statistics based on income groups. For both subsets of surveys, the sample size is around 7,000. In order to maintain continuity, they survey the same household with 1/6 of households are replaced every month[8].

The problem with the household income expenditure survey is that the income data represent only about half of Japan's households (approximately 3,500), because the survey exclude households where the head is president or in the management of corporations, business owners, self-employed, people working in the agricultural and fishery industries, retired, unemployed, property owners, etc. Since precluding these groups will grossly underestimate income inequality, we use the savings and liability survey, which covers all households except where the head of household is a foreigner, in prison, or in a hospital. This widens our sample and gives a more accurate picture of income distribution. The reporting of annual (instead of monthly) income saves us from smoothing out the effects of bi-annual bonus payments and other seasonal income, which are a large component of regular workers' wage revenues in Japan. In addition, the savings and liability survey reports the annual income in 10 income deciles with quarterly frequency (from 2002Q1), and savings in 10 income deciles with annual frequency (from 2007 to 2012), which enables us to calculate the Gini coefficient and Theil index. These are presented in the next section.

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[7] Available at www.stat.go.jp.

[8] After the earthquake, a larger fraction of sampled household was replaced as many were displaced, or deceased.

ii. Stylized Facts on inequality from Household Survey Data

Lise et al. (2013) summarize the descriptive statistics of the micro-level data of the household survey, which is available to them because their study was conducted on behalf of Japanese government. They look at – among other things – household-level inequality from the Family Income and Expenditure Survey (FIES) data from 1981 to 2008[9], to examine the main developments of inequality in wages, earnings, consumption and wealth. During the sample period, they find an increasing trend of inequality in wealth and income. Regarding FIES, they find that, among households whose head is employed (thus excluding corporate owners, self-employed, unemployed, etc.), there has been a dramatic shift after 1996, since the households at and below the median experienced real declines in earnings. This is probably due to the labor market reform under Mr. Koizumi, which led to a substantial increase in temporary workers with much lower wages and little or no secondary benefits.

Figure 3 presents the Gini coefficient and Theil index we calculated based on the annual ("last 12 months") income from savings and debt data (available only after 2002). Despite the different method of calculation, the two have a high level of correlation. There seems to be some correlation between stock market performance and inequality (compare figure 2 and 3). The surge in income inequality around Q1-Q2 2011 is due to the Great Earthquake when many people were dislocated or lost their income source (mainly agriculture and fishery industries). However, the disastrous effect of the Earthquake was followed by generous fiscal transfers and donations, which is probably the reason that the Gini coefficient dropped sharply. In addition, more recent data tells us that, since the start of QQE (last two quarters in our sample), income inequality seems to be increasing once again; expectations are that this trend is likely to continue.

[Figure 3 here]

To bridge the gap between income and wealth, it is natural to assess whether wealthier households will hold a higher percentage of their savings in securities. As of 2012 (the last year for which data is available by *savings* quintile), the top 20% of Japanese households held 15.4% of their assets in stocks and bonds, which is more than 5 times higher than the share of the second-top quintile. That said, much of the rest of the savings are in the form of bank

9 Note there is a structural break in surveying method in 2002 (i.e. including people engaging in agriculture and fishery), since when the data is available online.

demand and time deposits throughout all households. The top quintile has very limited total debt, while the bottom two quintiles actually have negative net assets due to higher debt loads (primarily residential-related) than asset holdings. These groups may have benefited from low interest rates (abstracting from further analysis on the ease of access to credit). While inflation has been very low throughout our sample period, the disproportionally large holdings of equities by the top 20% of Japanese households suggests one potential channel for monetary policy – i.e. the portfolio channel – to impact inequality going forward. One might wonder why we assess whether income inequality (instead of wealth) rises during a boom and/or expansionary monetary policy. So far we have been looking at income data due to data constraints – sufficiently detailed data on savings and liabilities is available only on an annual basis between 2002and 2012. However, the wealth inequality seems not very much responsive to the ups and downs of asset markets, possibly indicating that households are selling their assets and turning them into income. Figure 5 presents the percentage of the sampled household that falls in each wealth category group. The easiest comparison is between the 2002 and 2012 period, when the Nikkei Stock Index was at about the same level. Strikingly, the population that falls into the highest category, with net financial assets (excluding housing) of 20 million yen or more has increased by 1.4% (to 25.4%), at the same time that the bottom (net financial assets of less than 1 million yen) increased by 2.3% (to 28.6%). This indicates that wealth distribution is becoming polarized; more high-wealth and low-wealth households, and fewer households in the middle. This likely relates primarily to the higher asset holdings of households (portfolio channel), and potentially to the superior ability to turn price gains into capital income. In the same light, wealthy households may have better access to information on financial markets, have superior portfolio managers, or simply hold more widely diversified portfolios, meaning that they suffered fewer overall losses (the market segmentation channel). Notably, because our quarterly measure of income takes into account both wages and capital gains, it is able to capture these developments.

[Insert Figure 4 here]

[Insert Table 1 here]

[Insert Figure 5 here]

IV. VAR Estimation and Results

i. VAR Framework

To test these trends in the survey data more formally, we make use of a vector auto regression (VAR) framework. Formally, the list of endogenous variables are as follows:

$\boldsymbol{Y_t}$=[$\Delta\log(\mathrm{GDP_t})$, $\Delta\boldsymbol{\pi}_t$, $\Delta\log(\mathrm{MB}_t)$, $\Delta\log(\mathrm{S_t})$, $\mathrm{Gini_t}$] [1]

where the variables are given by:

$\Delta\log$ **GDP**: annual GDP growth (source: OECD)[10]

$\boldsymbol{\pi}$: YoY CPI headline inflation, seasonally adjusted[11] (source: Statistics Bureau of Japan)

MB: monetary base, seasonally adjusted (source: Bank of Japan)

S: Stock prices, as measured by the Nikkei 225 Index (Source: Datastream)

Gini: Gini coefficient of income inequality, calculated based on household survey as described in the previous section

For the Cholesky ordering, we assume that monetary policy (proxied by the monetary base) reacts to output growth and the YoY CPI inflation rate. This is a reasonable assumption as headline YoY inflation has been the BoJ's policy target over the sample period (implicitly in Phase 1, and more explicitly in Phase 2 of UMP), while low output growth levels (rather than the cycle) have been key considerations for additional monetary stimulus.[12] We then assume that the Nikkei index will react positively to expansionary monetary policy, and finally, we assume that the movement of stock market affects income distribution (Gini coefficient).

The Dicky-Fuller test shows that *MB*, *S* and $\boldsymbol{\pi}$ have a unit root. Accordingly, we take the first difference (after taking natural logs for MB and S). The optimal lag is determined based on the Schwarz Information Criterion.

We take two QE sub-samples: (i) 2002Q1 to 2006Q1, which covers the first round of QE and forward guidance ("Phase 1"); (ii) 2008Q4 (October) to the most recent quarter, during which the Lehman shock prompted the BoJ to push back interest rates back to zero and pump liquidity into the market, followed by CME (October 2010); accompanied by forward guidance (February 2012); and QQE as the first arrow of Abenomics ("Phase 2"; see Figure 1).

Broadly speaking, there are two econometric problems that we encounter: (i) there is a short period of "conventional monetary policy" between 2006Q2 and 2008Q2, (ii) each UMP

10 As a robustness check, we also tried the cycle component filtered by HP filter and Baxter-King filter, but obtained similar results. In addition, the deflation during "lost decade" was largely due to structural, not cyclical, reason. For these reason, we use output growth instead.

11 Despite the unit root problem, we consider YoY inflation to be a better variable to be used in our VAR analysis, since it has been used as a benchmark of the BoJ's policy target.

12 An alternative specification using the output gap based on an HP filter yields similar results.

episode has only 20 data points. Because of the small sample size in each QE episodes, ideally we would like to put the two episodes together. However, the very nature of our analysis (VAR) makes it difficult to connect these two periods. Here, we first take a crude approach of combining the two periods, without including the first observation of QE2 as a vector of x variables. In order to take into account the exogenous nature of the earthquake episode, we use two exogenous dummy variables in our VAR analysis – "earthquake" and "earthquake response" – that take a value of 1 in Q1 and Q2 2011 and in Q3 and Q4 2011, respectively. Moreover, we use a structural dummy which is 1 when the data is disconnected.

ii. VAR Results and Impulse-Response Functions

First, we run a VAR estimation for the connected two periods where QE was in place (2002Q1-2006Q1, 2008Q4-2013Q3)[13]. The impulse response is presented in Figure 6 (a). Our interest is how the Gini coefficient responded to the increase in monetary base (figures in the shaded box), which was a tool of UMP of the BoJ throughout the two UMP periods. It seems that, although the confidence interval includes negative zones, the increase in monetary base appears to positively affect the Gini coefficient. The impact is statistically significant after 2 quarters and remains positive in the quarters thereafter. After 10 quarters, a one-standard deviation shock to the monetary base has a *cumulative* upward impact of 0.010 on the Gini coefficient or about the twice the standard deviation of the Gini coefficient during our sample period. This means that income inequality increases from monetary shocks to an economically meaningful extent, with the largest impact in the initial quarters after the shock as the Nikkei increases. We have also tried the same estimation with Theil's statistic, and obtained very similar results.

Second, we look at Phase 2 only. To the extent that Phase 2 has been more aggressive, we expect that the effect of monetary policy on the Nikkei and Gini would be stronger than the entire UMP period combined. This is indeed the case (Figure 6(b)). Phase 2 has a significant positive impact on income inequality starting at 2 quarters after the shock and continuing for the full 10 quarters shown, for a cumulative impact of 0.013, , or two and a half standard deviations of the in-sample Gini coefficient. Moreover, the statistical significance of the impact of increase in the percentage change in monetary policy on income inequality is higher for Phase 2.. The impact of a monetary shock on the Nikkei is now also stronger and

[13]In fact, the first QE started in 2001, but due to the data restriction from Household Survey Data, our starting period if 2002Q1. Also, in order to take the disconnected data into our account, the endogenous variable starts from 2009Q1, instead of 2008Q4, to account for a lag under the second subset of the data.

statistically significant after 3 quarters. Notably, Phase 2 is still ongoing and the largest shocks are in the QQE program at the end of our sample period. Hence, we expect to see stronger results as we have more data.

Finally, we look at the entire sample period, including the period that the BoJ switched its policy tool from monetary base to interest rates – thus pausing the UMP for two years (Figure 6(c)). As expected, the impact of monetary base on the Gini coefficient becomes much weaker. This also holds for inflation, where there is no significant positive or negative impact. Notably, for the second phase of QE, the MB's impact on inflation and stock indices seem to be stronger, indicating the success of aggressive monetary policy by the BoJ.

[Figure 6 (a) (b) (c) here]

V. Conclusion and policy implications

Overall, our results provide evidence of the impact of the portfolio channel of UMP on income inequality. The mechanism is straightforward: an increase to the monetary base (through purchases of both safe and risky assets) tends to increase overall asset prices. Higher asset prices benefit primarily upper incomes, who hold a larger amount and share of overall savings in equities, and thus benefit from greater capital income. Overall, the BoJ's unconventional policies have increased income inequality, especially during Phase 2 of UMP (after the Lehman shock, including CME and QQE). Notably, the largest shock in the monetary base is at the very end of our sample, meaning that incoming data for Q4 2013 and subsequent quarters will allow us to assess the results of aggressive easing with more certainty.

Taken together, our results imply that, while the aggressive monetary policy finally seems to be bearing fruit, this strong medicine may come with an unwanted side effect: higher income inequality. With already high levels of inequality and increasing relative poverty, further polarization of the income and wealth distribution may not be desirable for the Japanese economy, or the society as a whole. The consumption tax rise, which took effect on April 1, 2014, may further exacerbate inequality. While we are not advocating a particular level of income inequality – which *may* be a natural result of differences in human capital and labor effort and reflect favorable incentives to the society (Mankiw, 2013) – we note that the inequality created by UMP, which works primarily through shocks to capital wealth, may have a negative social and economic impact. This should be a consideration for policy, which can consider complementary tax and structural reforms which offset the impact of UMP (see

Frankel, 2014, for concrete examples in the US context).

In addition to the relevance for Japan, our study also points to potential lessons for other countries undertaking UMP. While preventing deflation and repairing the monetary transmission mechanism at the zero lower bound is inherently a difficult undertaking, Japan's experience provides a cautionary tale on the side-effects of UMP. It is possible that the portfolio channel will be even larger in the US, UK, and many Eurozone economies, where households hold a larger portion of their savings in equities and bonds. This international comparison is an avenue for further research.

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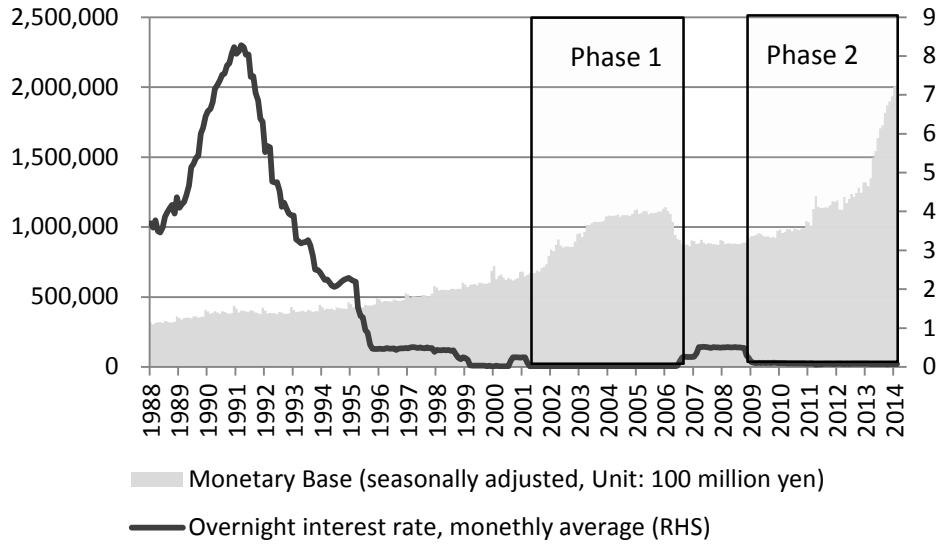
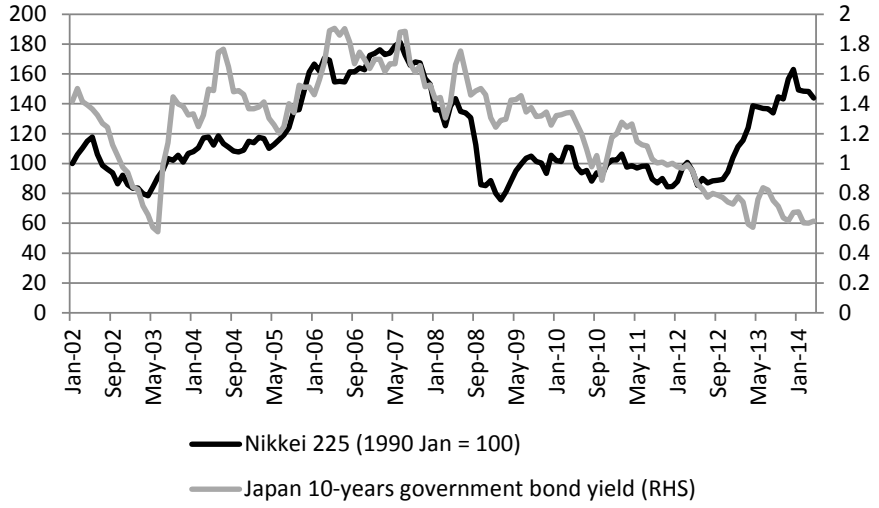
Figure 1: Monetary Base and Overnight Interest Rate



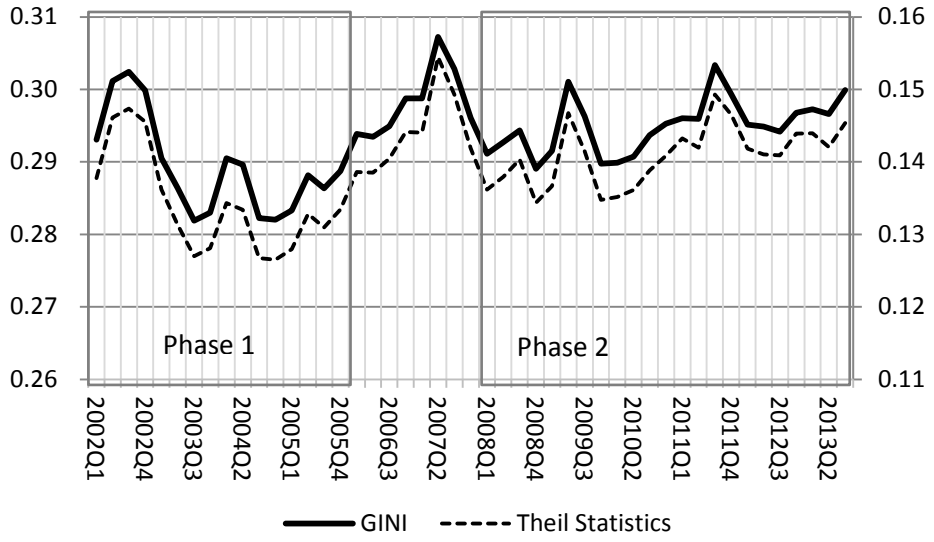
Source: Bank of Japan's Historical Database.

Figure 2: Stock and 10-year JGB yields during the sample period



Source: Datastream

Figure 3: Gini Coefficient and Theil Statistics (RHS)



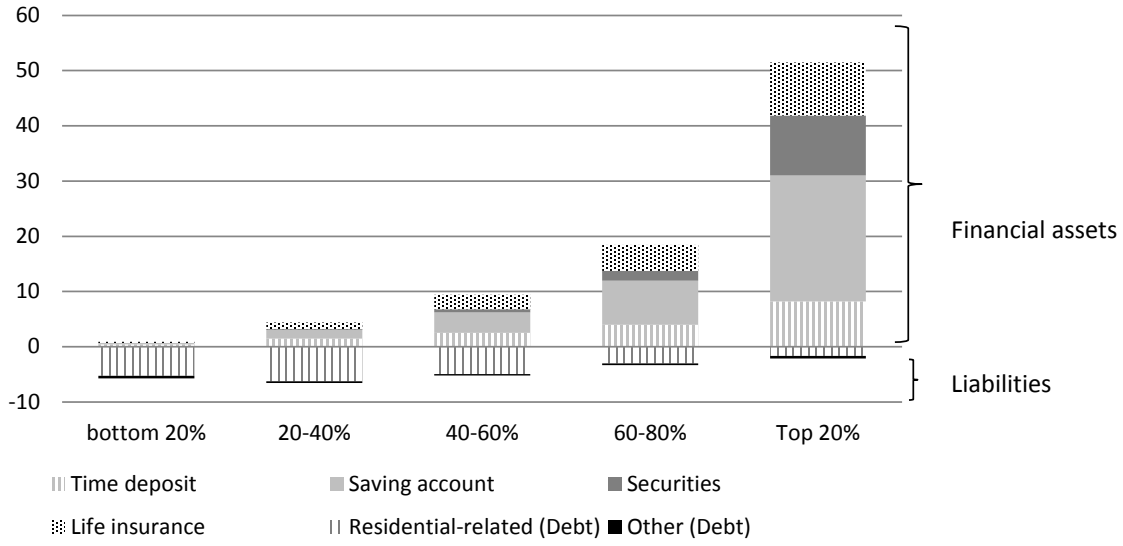
Theil index was calculated as follows:

$$T = \sum_{i=1}^{n} p_i \, ln \frac{p_i}{q_i}$$

the income share and population share of the i_{th} group are denoted p_i and q_i and respectively (Rohde, 2008).

Data Source: Japan Household Survey (Saving and Liabilities Survey)

Figure 4: Composition of Saving and Debt by Quintile



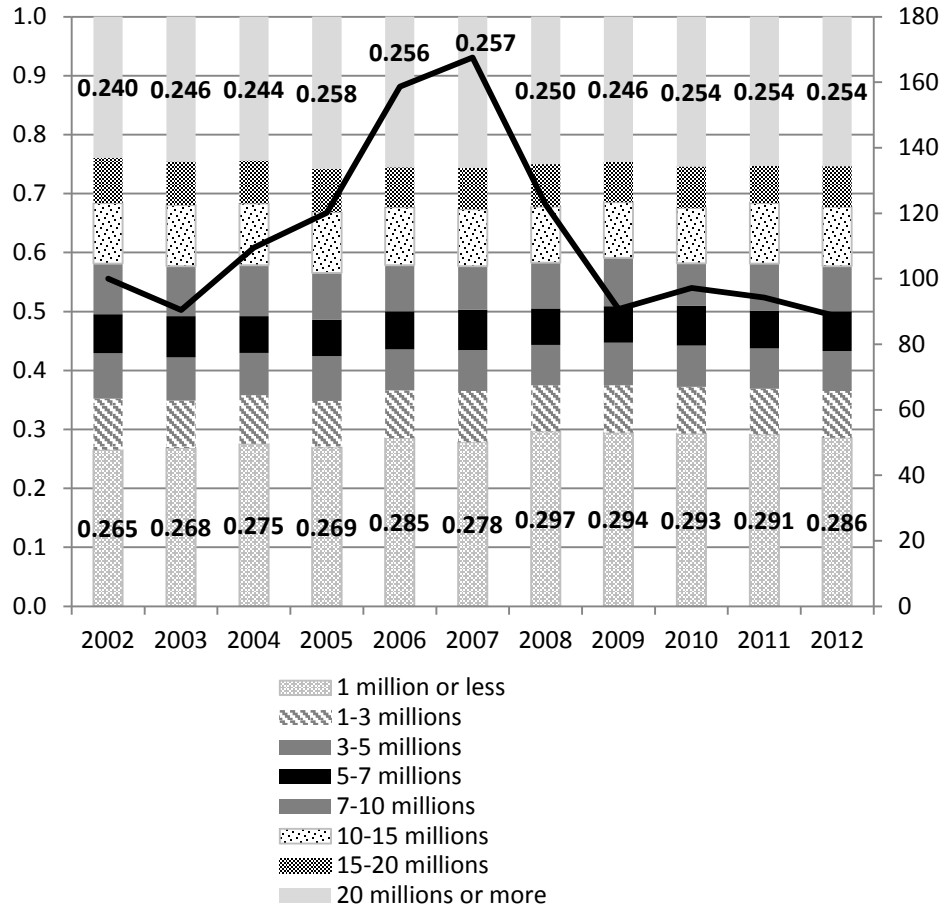
Data Source: Japan Household Survey (Saving and Liabilities Survey)

Table 1: Composition of Savings by Quintile, between 2007-2012

	bottom 20%	20-40%	40-60%	60-80%	Top 20%
2007	0.04%	0.31%	1.17%	3.52%	21.21%
2008	0.06%	0.32%	1.11%	3.49%	21.85%
2009	0.04%	0.33%	1.06%	3.30%	17.93%
2010	0.04%	0.28%	1.15%	3.29%	16.71%
2011	0.04%	0.28%	0.98%	3.05%	16.47%
2012	0.02%	0.30%	0.96%	2.91%	15.40%

Data Source: Japan Household Survey (Saving and Liabilities Survey)

Figure 5: Distribution of Net Financial Saving (2002-2012)



Note: The number on each bar represents the proportion of each category.

Data Source: Japan Household Survey (Saving and Liabilities Survey)

Figure 6(a): Impulse response function of VAR analysis: Period: Q1 2002 to Q1 2006 (Phase 1 of UMP) and Q4 2008 to Q4 2013 (Phase 2)

Response to Cholesky One S.D. Innovations ± 2 S.E.

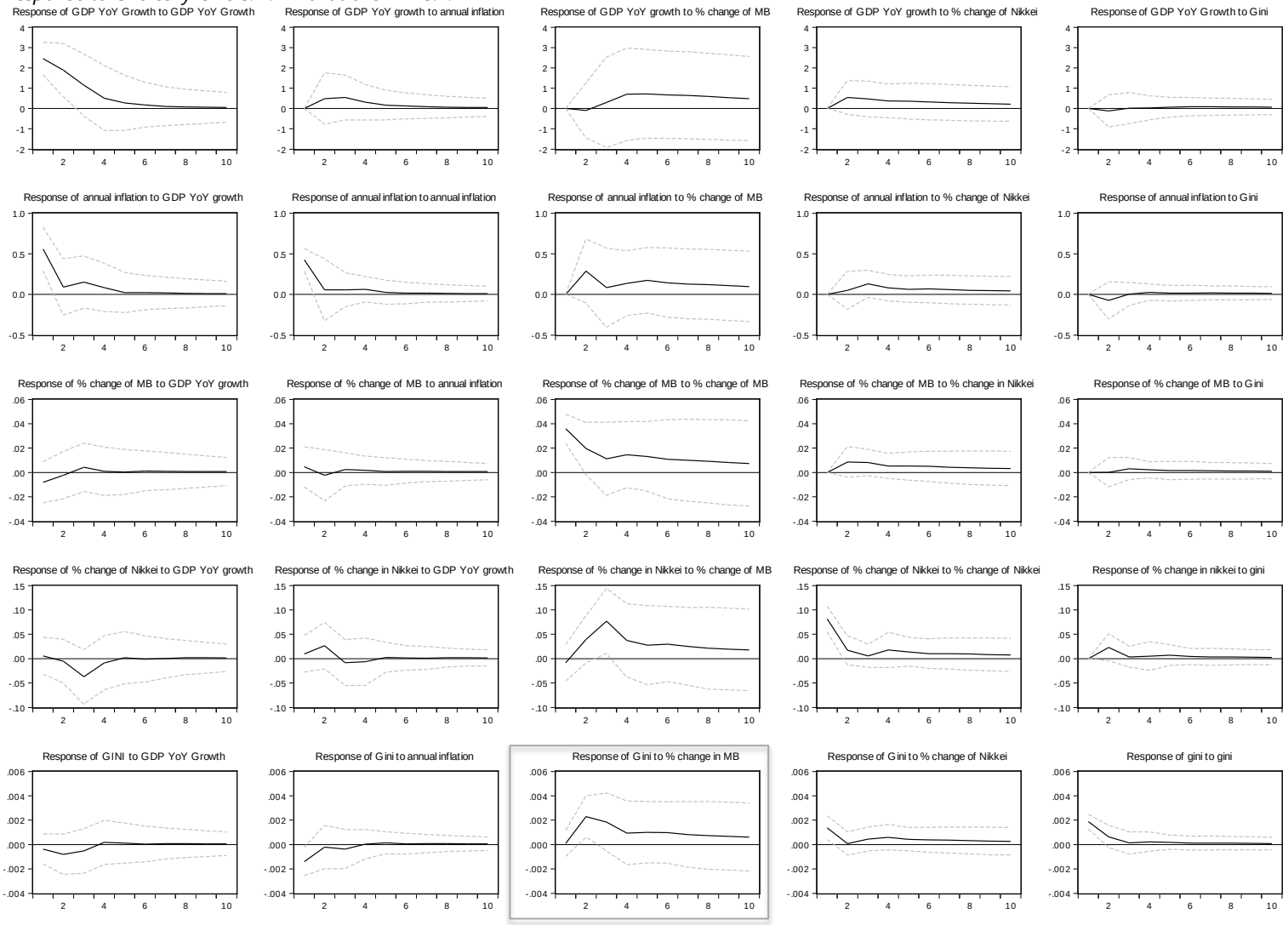


Figure 6(b): Impulse response function of VAR analysis: Phase 2 of UMP period (2008Q4 to 2013Q3)

Response to Cholesky One S.D. Innovations ± 2 S.E.

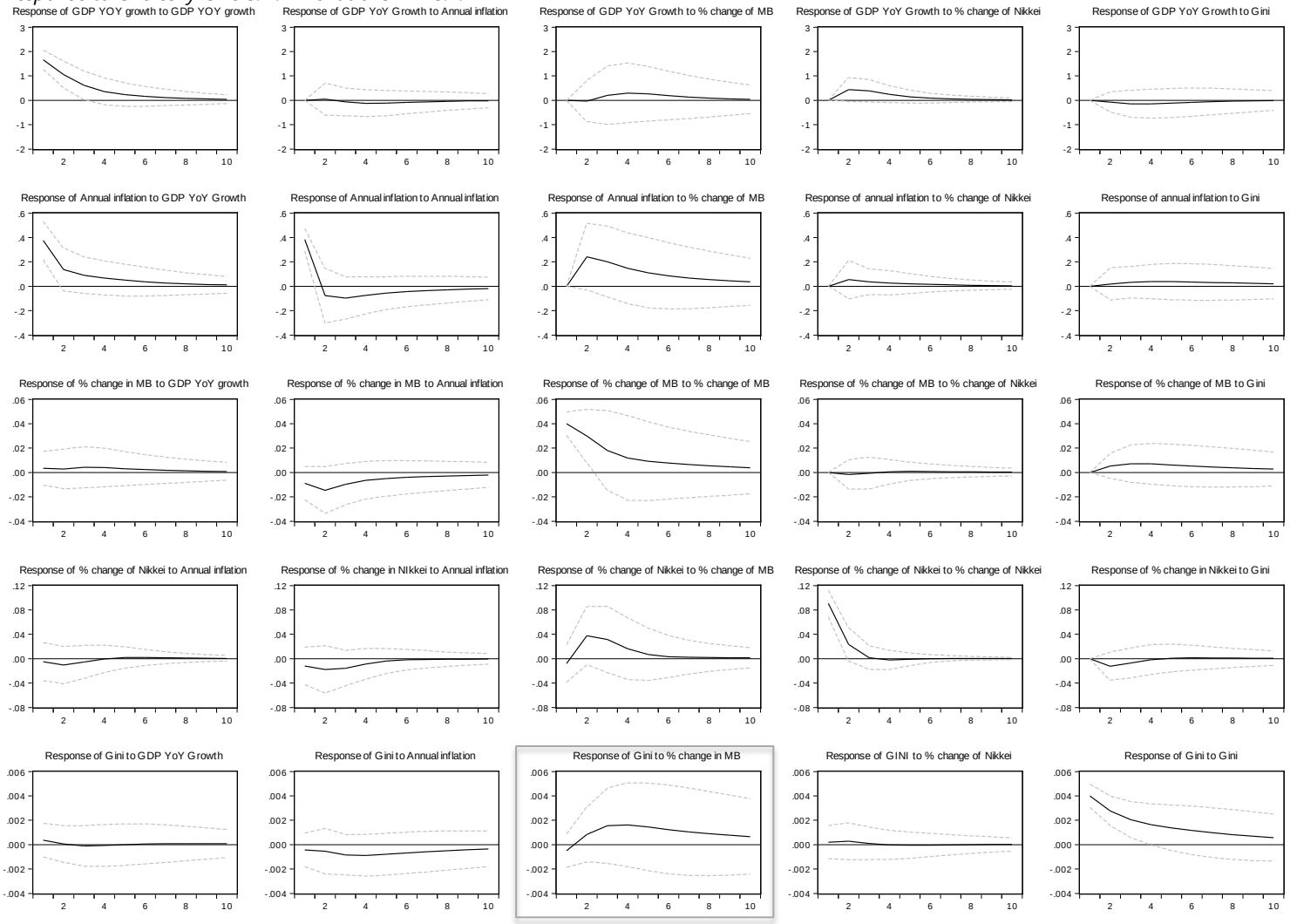
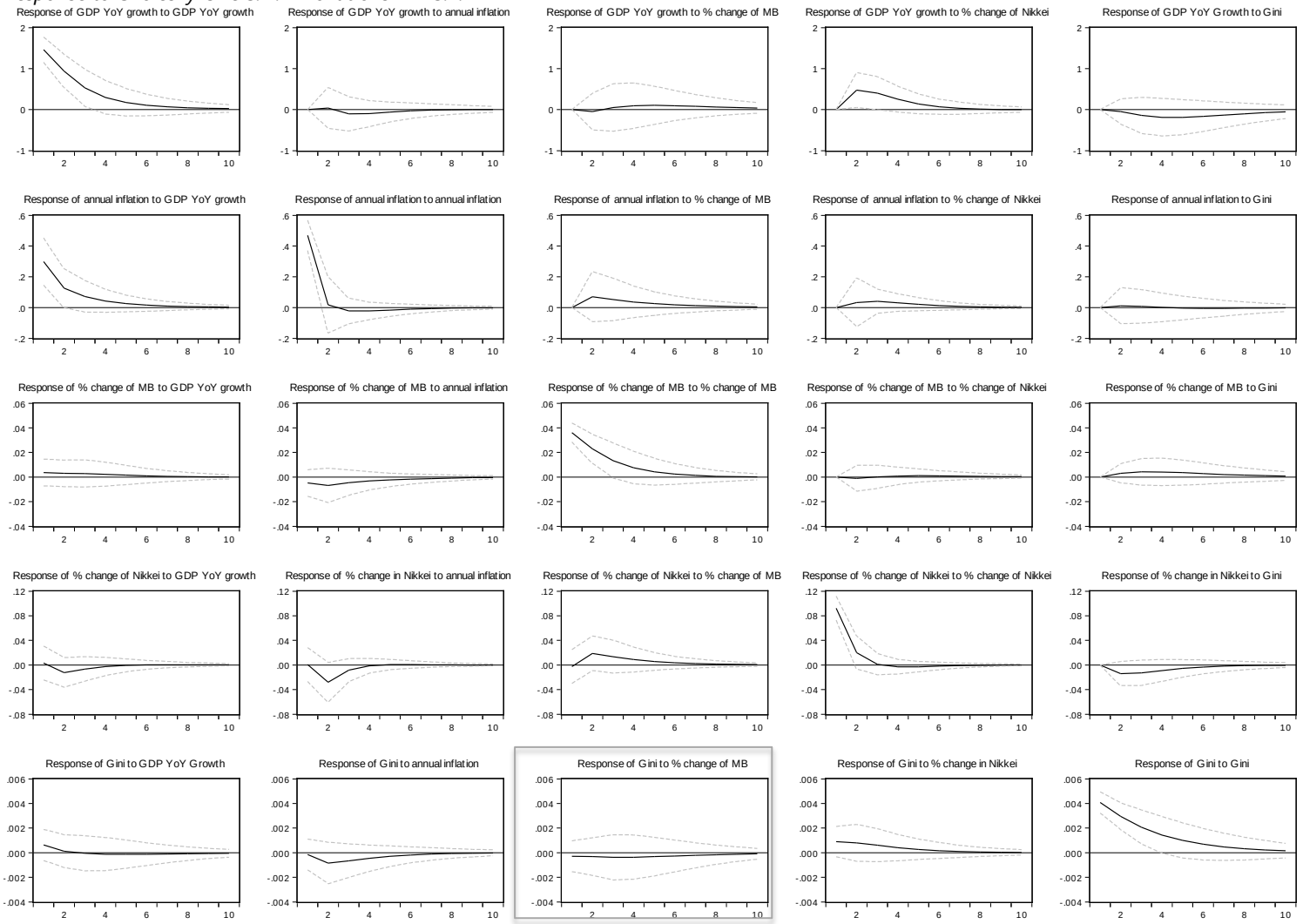


Figure 6(c): Impulse response function of VAR analysis of the entire sample period (2002Q1 to 2013Q3)

Response to Cholesky One S.D. Innovations ± 2 S.E.



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