Linkage between macroeconomic conditions and inequality in Japan

Michio Suzuki\textsuperscript{2}, Nao Sudo\textsuperscript{3} and Tomoaki Yamada\textsuperscript{4}

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\textsuperscript{2}University of Tokyo
\textsuperscript{3}Bank of Japan
\textsuperscript{4}Meiji University
Outline of the talk

1. Motivation
2. Literature
3. Direction and Contribution
4. Estimation Methodologies
5. Results
6. Conclusion
Motivation: macroeconomic variables

- High growth rates during the 1980s followed by slow down in the early 1990s.
Motivation: inequality measures

- High growth rates during the 1980s followed by slow down in the early 1990s.
Motivation: questions we ask in this paper

- Do inequalities and macroeconomic variables develop independently?
- If not, what are channels through which inequality and macroeconomic variables interact?

1. Which component of income reacts differently to macroeconomic shocks or does asset react differently?
2. Did growing inequality during the 1980s cause bubble boom and subsequent financial crisis?
2. Literature: from macro to inequality.

- **Macro shocks to disposable income inequality**
  1. Skill biased technology change (Acemoglu, 2002)
  2. Difference in adjustment for wage or hours (Carpenter and Rogers, 2004)
  3. Income composition (Coibion et al., 2014): profit vs earnings.
  4. Distributional policy: countercyclical tax or social security system etc.

- **Macro shocks to consumption inequality**
  1. Difference in asset composition (Saiki and Frost, 2014)
  2. Financial segmentation (Coibion et al., 2014)
2. Literature: from macro to inequality.

1. Krueger et al. (2010) summarize common features of developments in inequality in nine large countries and document that earnings inequality appears to be strongly counter-cyclical.

2. Storesletten et al. (2004), using Panel Study on Income Dynamics (PSID), document that the labor market risk is strongly countercyclical.


4. Saiki and Frost (2014) empirically show that unconventional monetary policy has increased income inequality across Japanese households.

5. Gornemanny et al. (2014) theoretically compare impact on inequality of monetary policy shock with TFP shock, and argue that the former shock affect inequality while the latter shock does not.
2. Literature: from inequality to macro.

- Inequality foster economic growth.


- Inequality dampens economic activity.

1. A severe inequality aggravates health or human capital of poor (Perotti, 1996; Galor and Moav, 2004; Aghion, Caroli, and Garcia-Penalosa, 1999).

2. A higher capital share leads rich to invest more on asset, boosts financial market, and results in financial crisis (Kumof, 2011).

3. Governmental response by supplying easy credit to poor in a rising inequality leads to financial crisis (Rajan, 2010).
2. Literature: from inequality to macro

1. **Ostry, Berg, and Tsangarides (2014)**, based on cross-country analysis, document that lower inequality is correlated with faster and more durable growth.

2. **Stiglitz (2013)** discusses that inequality fosters financial crisis because people who do not spend much (rich) possess the bulk of wealth in the economy.

3. **Bordo and Meissner (2012)**, based on cross-country analysis, document that inequality does not cause financial crisis and that a low interest rate and economic expansion are the only determinants of financial crisis.

4. **Rajan (2010)** argues that rising inequality pre-crisis period led to political pressure for redistribution that eventually came in the form of subsidized housing finance and financial crisis.
2. Literature: consumption theory

- Disagreement bw income and consumption provides information about underlying income process.

1. PIH: a permanent component of income affects both income and consumption while temporary component of income shock affects income only.


- Disagreement in how income and consumption inequality react provides information about how macro variables affect income process.
3. Direction and Contribution

- We investigate linkage between inequality and macroeconomic variables (i.e., first moment or aggregate variables) by formulating VARs.

1. Sample period covers both asset price boom and bust.
2. Inequality measures include disposable income, income-consumption covariance, and consumption.

- Our work differs from existing studies in the following aspects.

1. Focus: linkage bw inequality and boom-and-bust cycle in Japan.
2. Type of shocks: broad range of macroeconomic shocks including policy rate shocks.
3. Source of change in equality: paying attention to the different role played by permanent income component, transitory income component, or asset.
3. Direction and contribution

- Some macro variable shock are translated to inequality but opposite does not necessarily hold.
  1. Shocks to asset price, iip, and policy rate leads inequality to move cyclically.
  2. Shocks to asset price has played an important role in increasing consumption inequality during the 1980s.
  3. Macrovariables are barely affected by shocks to inequality measures.

- It is likely that transitory income component is not the key channel of transmission of macroeconomic variables.
  1. Under a premise that standard consumption theory holds, responses of transitory income component to macroeconomic shocks are small and insignificant.
  2. Under alternative consumption theory, response of transitory income component to macroeconomic shocks are insignificant.
  3. Shocks to permanent income component or those to asset do seem play a role in the transmission.
Estimation Methodologies
Data

1 Data source
   - the Family Income and Expenditures Survey (hereafter FIES)

2 Sample period

3 Definition of inequality
   - Variance of log of disposable income ($y_D$), covariance of $y_D$ and $c_{ND}$, and that of nondurable consumption ($c_{ND}$). Series are equivalized.
   - Variance of $y_L$, and other inequality measures, Gini coefficient, 90/50 ratio, and 50/10 ratio for sensitivity analysis.
Estimation methodology

- **Benchmark model**
  1. A textbook VAR with 5 macro variables; stock price, index of industrial production (IIP), inflation, unemployment, and policy rate, and 3 inequality measures, log variance of disposable income, covariance of disposable income and consumption, and log variance of consumption.

- **Alternative models used for sensitivity analyses**
  1. A VAR that consists of factors. Factors are taken from balanced panel that consists of 81 macroeconomic variables.
  2. Factor augmented VAR similar to Boivin, Giannoni, and Mihov (2009). Factors are taken from balanced panel that consists of 81 macroeconomic variables and 40 inequality variables.
Results (1)
Response of inequality to macro shocks
Summary of results

- Some macro shocks affect inequality in a statistically significant manner.

1. A positive shock to stock price and IIP increases inequality in disposable income and consumption and covariance.
2. A positive shock to policy rate decreases inequality in disposable income and consumption and covariance.
3. These macroeconomic shocks are translated to inequality mainly by affecting variance in permanent income.
4. A shock to inflation and unemployment do not affect inequality.
Summary of results

- Shocks to macrovariables are not the dominant but important shocks to inequality movements.

<table>
<thead>
<tr>
<th>Shocks</th>
<th>var yD</th>
<th></th>
<th>var cND</th>
<th></th>
<th>var cND</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>I</td>
<td>II</td>
<td>III</td>
</tr>
<tr>
<td>stock</td>
<td>.03</td>
<td>-.02</td>
<td>.01</td>
<td>.03</td>
<td>-.05</td>
<td>.04</td>
</tr>
<tr>
<td>iip</td>
<td>.02</td>
<td>.04</td>
<td>.02</td>
<td>.02</td>
<td>.01</td>
<td>.02</td>
</tr>
<tr>
<td>unemployment</td>
<td>-.00</td>
<td>.01</td>
<td>.02</td>
<td>-.04</td>
<td>.02</td>
<td>.03</td>
</tr>
<tr>
<td>inflation</td>
<td>.01</td>
<td>.01</td>
<td>.01</td>
<td>.01</td>
<td>.01</td>
<td>-.02</td>
</tr>
<tr>
<td>policy rate</td>
<td>.01</td>
<td>.01</td>
<td>.00</td>
<td>.03</td>
<td>-.02</td>
<td>-.02</td>
</tr>
<tr>
<td>varlog yD</td>
<td>.17</td>
<td>-.03</td>
<td>-.13</td>
<td>.09</td>
<td>-.02</td>
<td>-.06</td>
</tr>
<tr>
<td>cov(yD, cND)</td>
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<td>.02</td>
<td>-.00</td>
<td>-.02</td>
<td>.08</td>
<td>-.08</td>
</tr>
<tr>
<td>varlog cND</td>
<td>-.00</td>
<td>-.01</td>
<td>.03</td>
<td>.01</td>
<td>.00</td>
<td>-.01</td>
</tr>
<tr>
<td>total</td>
<td>.25</td>
<td>.03</td>
<td>-.03</td>
<td>.14</td>
<td>.05</td>
<td>-.09</td>
</tr>
</tbody>
</table>

where I covers 81-90, II covers 91-00, and III covers 01-80.
Response of inequality to macro shocks

- Baseline model, Cholesky

![Graphs showing the response of inequality to macro shocks](image_url)
Response of inequality to macro shocks

- Baseline model, Generalized impulse
Response of inequality to macro shocks

- Baseline model, Cholesky, sample ends in Jan. 1999
Identification using standard consumption theory

- Consumption theory provides following identification conditions.

\[
\begin{align*}
\Delta \text{var}(y_D(t)) & = \text{var}(v_P(t)) + \text{var}(\Delta v_T(t)) + \varepsilon_{yD}(t), \\
\Delta \text{cov}(y_D(t), c_{ND}(t)) & = \text{var}(v_P(t)) + \varepsilon_{yDcND}(t), \text{ and} \\
\Delta \text{var}(c_{ND}(t)) & = \text{var}(v_P(t)) + \varepsilon_{cND}(t) \text{ or} \\
\Delta \text{var}(c_{ND}(t)) & = \text{var}(v_P(t)) + \text{var}(v_A(t)) + \varepsilon_{cND}(t) \text{ or}
\end{align*}
\]

where \(v_P(t)\) and \(v_T(t)\) are permanent shock and transitory shock to income, and \(\varepsilon_{yD}(t)\), \(\varepsilon_{yDcND}(t)\), and \(\varepsilon_{cND}(t)\) are shocks to variance of \(y_D\), covariance, and variance of \(c_{ND}\). \(v_A(t)\) is non-income factor that affects consumption inequality such as asset. We further assume \(v_t\) is not serially correlated.

- We estimate how \(\text{var}(v_P(t))\), \(\text{var}(v_T(t))\), and \(\text{var}(v_A(t))\) react to macroeconomic shocks.
Response of variances to macro shocks

- Baseline model, decomposition using standard consumption theory I
Response of variances to macro shocks

- Baseline model, decomposition using standard consumption theory II
Model of Blundell, Pistaferri, Preston (2008) provides following identification conditions.

\[
\Delta \text{var}(y_D(t)) = \text{var}(v_P(t)) + \text{var}(\Delta v_T(t)) + \varepsilon_{yD}(t),
\]

\[
\Delta \text{cov}(y_D(t), c_{ND}(t)) = \phi \text{var}(v_P(t)) + \psi \text{var}(v_T(t)) + \varepsilon_{yDcND}(t),
\]

\[
\Delta \text{var}(c_{ND}(t)) = \phi^2 \text{var}(v_P(t)) + \psi^2 \text{var}(v_T(t)) + \text{var}(v_u(t))
\]

where \(v_P(t), v_T(t), v_u(t)\) is permanent shock to income, transitory shock to income, and shock to higher moment of income process, and \(\varepsilon_{yD}(t), \varepsilon_{yDcND}(t), \text{and } \varepsilon_{cND}(t)\) are shocks to variance of \(y_D\), covariance, and variance of \(c_{ND}\). We assume \(v_t\) is not serially correlated.

- Following Blundell, Pistaferri, Preston (2008), we further assume that \(\phi\) and \(\psi\) are 0.6 and 0.06, respectively.
- We estimate how \(\text{var}(v_P(t)), \text{var}(v_T(t))\) and \(\text{var}(v_u(t))\) react to macroeconomic shocks.
Response of variances to macro shocks

- Baseline model, decomposition following Blundell, Pistaferri, Preston
Contribution of macroeconomic variables to Inequality

- Decomposing varlog yD, baseline model

![Graph showing the decomposition of varlog yD variations over time with different economic variables represented.](image-url)
Contribution of macroeconomic variables to Inequality

- Decomposing cov yDcND, baseline model
Contribution of macroeconomic variables to Inequality

- Decomposing varlog cND, baseline model

![Graph](image-url)

**Decomposition of Varlog cND Variations (Level)**

- Stock
- IIP
- Inflation
- Unemployment
- FF
- Varlog yD
- Cov yDcND
- Varlog cND

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Results (2)
Response of macro to inequality shocks
Summary of results

- **Inequality shocks do not affect macro variables.**

1. Inequality shocks do not affect macroeconomic variables in statistically significant manner in baseline model.

2. Under the alternative model, a positive shock to inequality do not affect macro variables except that it lowers policy rate.

- **The bulk of variations in macroeconomic variables are attributed to macro shocks and not to inequality shocks.**
Response of macro to inequality shocks

- Baseline model, Cholesky
Response of macro to inequality shocks

- Baseline model, Generalized Impulse

![Graphs of responses to inequality shocks](image-url)
Contribution of inequality to macroeconomic variables

- Decomposing stock price variations to shocks
Contribution of inequality to macroeconomic variables

- Decomposing IIP variations to shocks
Contribution of inequality to macroeconomic variables

- Decomposing unemployment variations to shocks

![Decomposition of Unemployment Variations (Level)](image-url)
3. Our findings:

- Shocks to some macroeconomic variables significantly affect inequality.
- Shocks to stock, iip, and policy rate affect inequality mainly by changing variance in permanent income.
- Macroeconomic shocks are an important driver of income and consumption inequality.

- Shocks to inequality do not affect macroeconomic variables significantly.
- Inequality shocks are not an important driver of macroeconomic variables.
Thank you
Response of inequality to FF shock

- ACEL
Response of inequality to FF shock

FAVAR

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