

Inequality and Macroeconomics

Benjamin Moll
Princeton

University of Luxembourg/European Investment Bank “Inequality and...?” Lecture Series

The Main Point of My Talk

- Macroeconomics and inequality is a two-way street

inequality \iff macroeconomy

1. macroeconomic shocks and policies affect inequality
 2. inequality affects macroeconomic aggregates
- This idea may sound obvious to you but
 - it only made its way into mainstream macro relatively recently
 - lots of people (economists, journalists, ...) frequently forget
 - Another theme: large gap between
 - current research in academic macroeconomics
 - macroeconomics in media/blogs, undergraduate teaching

Plan

1. Inequality in macroeconomics: a **history of thought**
2. How inequality affects how we should think about **monetary policy**
 - based on joint work with Yves Achdou, SeHyouon Ahn, Andreas Fagereng, Xavier Gabaix, Jiequn Han, Martin Holm, Greg Kaplan, Pierre-Louis Lions, Jean-Michel Lasry, Gisle Natvik, Galo Nuño, Gianluca Violante, Tom Winberry, Christian Wolf

Inequality in Macro: A History of Thought

I find it useful to categorize macroeconomic theories as follows:

- **before modern macro**: 1930 to 1970
- **1st generation** modern macro: 1970 to 1990
- **2nd generation** modern macro: 1990 to financial crisis
- **3rd generation** modern macro: after the financial crisis

Main drivers of evolution in modern macro era

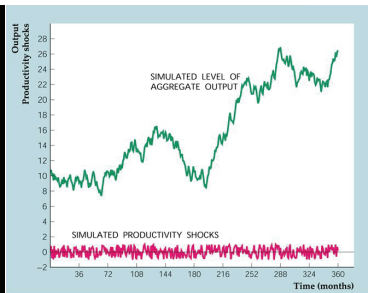
1. better data
2. better computers & algorithms
3. current events (rising inequality, financial crisis)

Before Modern Macro: 1930 to 1970

1. Keynesian IS/LM: about aggregates, no role for inequality/distribution by design
2. Distribution does play role in growth theory
 - mostly **factor** income distribution: Kaldor, Pasinetti and other Cambridge UK theorists
 - rarely **personal** income distribution: e.g. Stiglitz, Blinder
3. Disconnected empirical work on inequality (Kuznets)

First Generation Macro Theories: 1970 to 1990

Representative agent models, e.g. RBC & New Keynesian models



About aggregates, **no role for inequality/distribution** by design

Advertised as “microfounded” but representative agent assumption cuts 1st generation modern macro from micro inequality research

First Generation Macro Theories: 1970 to 1990

What's wrong with that?

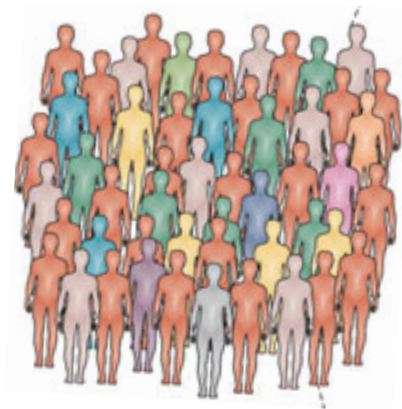
1. cannot speak to a number of important empirical facts, e.g.
 - unequally distributed growth
 - poorest hit hardest in recessions
2. cannot think coherently about welfare – “who gains, who loses?”

Second Generation Macro Theories: 1990 to 2008

(a) First Generation Theories



(b) Second Generation Theories



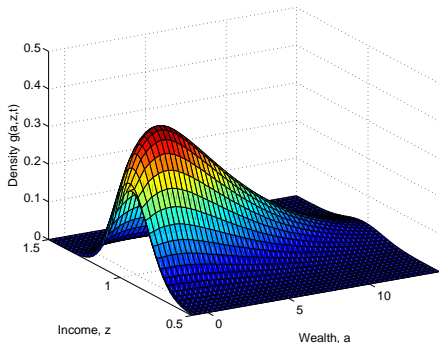
Second generation theories incorporate **heterogeneity** from micro data, particularly **in income and wealth**

Second Generation Macro Theories: 1990 to 2008

(a) First Generation Theories



(b) Second Generation Theories



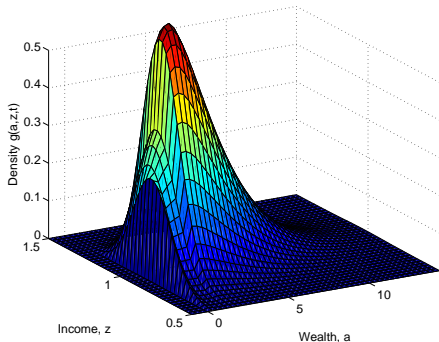
Second generation theories represent economy with a **distribution**...

Second Generation Macro Theories: 1990 to 2008

(a) First Generation Models



(b) Second Generation Models



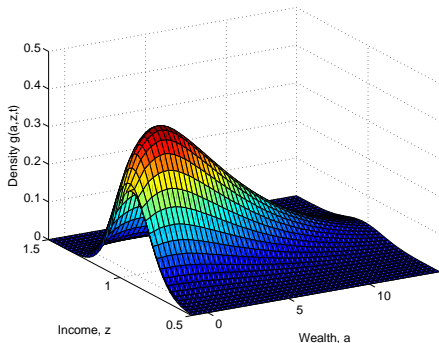
Second generation theories represent economy with a **distribution...** that moves over time, responding to macroeconomic shocks, policies

Second Generation Macro Theories: 1990 to 2008

(a) First Generation Models



(b) Second Generation Models



Second generation theories represent economy with a **distribution**... that moves over time, responding to macroeconomic shocks, policies

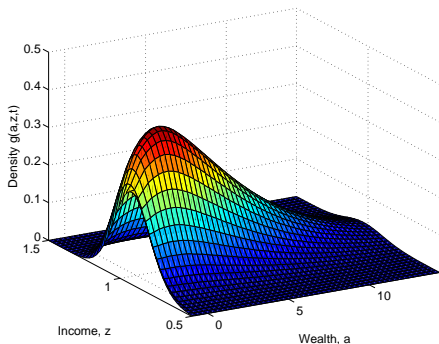
- important early contributions in the 1990s by Aiyagari, Bewley, Huggett, Krusell-Smith, Den Haan,...

Second Generation Macro Theories: 1990 to 2008

(a) First Generation Models



(b) Second Generation Models



Second generation theories can potentially speak to

- unequally distributed growth
- poorest hit hardest in recessions

and are useful for welfare analysis

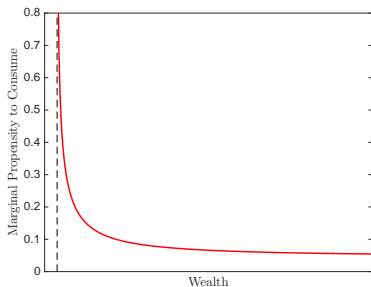
Second Generation Theories: Inequality \nrightarrow Macro

- 2nd generation theories featured rich heterogeneity
- ... but typically found **small effects of heterogeneity on macroeconomic aggregates**, particularly consumption and saving
- Summary by Lucas (2003):
 - “For determining the behavior of **aggregates**, [Krusell and Smith] discovered, realistically modeled household **heterogeneity just does not matter very much**. For individual behavior and welfare, of course, heterogeneity is everything.”
- Reason: rich and poor differ in their wealth but not their consumption and saving behavior – **rich = scaled version of poor**
- Note: some important contributions from same time period don't fit my narrative
 - **Banerjee-Newman, Benabou, Galor-Zeira, Persson-Tabellini, ...**
 - also related: 1950s “capitalist-worker theories” of Kaldor, Pasinetti, ...

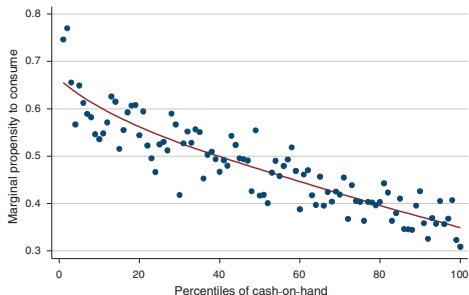
What's Wrong with Second Generation Theories?

They don't square well with consumption, saving behavior in micro data

- e.g. evidence on marginal propensities to consume (MPCs) out of transitory income changes



(a) 2nd Generation Model



(b) Data

- data source: Jappelli & Pistaferri (2014), note: self-reported MPCs

What's Wrong with Second Generation Theories?

- Angus Deaton (2016) again:
 - “While we often must focus on aggregates for macroeconomic policy, it is impossible to think coherently about national well-being while ignoring inequality and poverty, neither of which is visible in aggregate data.”
 - “Indeed, and except in exceptional cases, macroeconomic aggregates themselves depend on distribution.”
- Second generation models are exactly such “exceptional cases”

Third Generation Theories: after the Crisis

Recent Janet Yellen speech “Macroeconomic Research After the Crisis”: <http://www.federalreserve.gov/newsevents/speech/yellen20161014a.htm>

- “My second question asks whether individual differences within broad groups of actors in the economy can influence aggregate economic outcomes – **in particular, what effect does such heterogeneity have on aggregate demand?**”
- “Prior to the financial crisis, representative-agent models were the dominant paradigm for analyzing many macroeconomic questions.”
- “However, a disaggregated approach seems needed to understand some key aspects of the Great Recession. To give one example, consider the effects of negative housing equity on consumption...”
- “While the economics profession has long been aware that these issues matter, their effects had been incorporated into macro models only to a very limited extent prior to the financial crisis [= 2nd generation].”
- “I am glad to now see a greater emphasis on the possible macroeconomic consequences of heterogeneity [= 3rd generation].”

Third Generation Theories: after the Crisis

Recent speech by Bank of Japan Governor Haruhiko Kuroda

https://www.boj.or.jp/en/announcements/press/koen_2017/ko170524a.htm

- “The third issue is related to monetary policy and inequality.”
- “We know that increasing attention is being paid to the distributional effects of economic and other public policies. I would like to reiterate that [...] monetary policy is not a tool that is well suited for dealing with inequality or polarization and that central banks should remain focused on the aggregate implications of their own policy decisions.”
- “At the same time, however, **this does not mean that central banks are allowed to ignore the distributional effects of monetary policy, especially if the distributional effects have an aggregate impact.** With this aim, central banks should be, and in fact are, open to learning about heterogeneous agent macroeconomics.”
- “These days, much progress has been made on this front in computational economics. Central banks are keenly following the technical progress [...]”

Third Generation Theories: after the Crisis

Recent speech by ECB vice president Vítor Constâncio

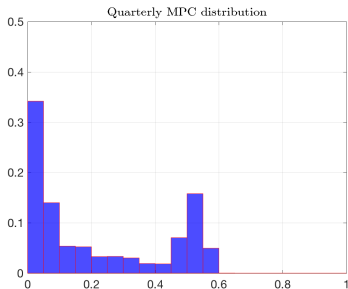
<https://www.ecb.europa.eu/press/key/date/2017/html/ecb.sp170822.en.html>

- “For too long, the distribution of income and wealth was almost ignored by macroeconomics. As recently recalled by Krusell, this is perhaps due to the ‘presumption in the literature that the distribution does not matter in the determination of aggregates’”
- “These views were wrong and, naturally, the crisis shattered both presumptions.”
- “First, the contributions of Mian and Sufi, Carroll or Muellbauer showed how relevant heterogeneities related to indebtedness, credit restrictions or marginal propensities to consume out of different sources of income or wealth, were important to explain aggregate consumption behaviour before and after the crisis. ”
- “Since then, the Heterogeneous Agents New Keynesian – HANK – class of models became an active area of research on the monetary policy transmission mechanism.”

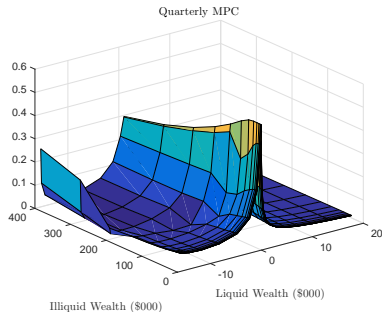
Third Generation Theories: after the Crisis

In order to match micro data, 3rd generation theories emphasize

- household balance sheets,
- e.g. nominal vs real assets, liquid vs. illiquid
- MPCs that are high on average but heterogeneous. Example:



(a) High and heterogeneous MPCs...



(b) ... that depend on balance sheets

Source: Kaplan, Moll, Violante (2017) "Monetary Policy According to HANK"

Mechanisms Through Which Inequality \Rightarrow Macro

1. Demand side

- rich spend smaller fraction of their income than poor \Rightarrow increase in inequality causes lower consumer spending
- more subtle versions of this story, e.g. what matters is not whether you're rich but whether you're **liquid-wealth rich**
- stories that emphasize housing and mortgages,...

2. Supply side

- credit constraints in education \Rightarrow poor children get inferior education \Rightarrow bad for long-run growth
- credit constraints in entrepreneurship \Rightarrow wealth distribution matters for entry, allocation of capital
- deregulation, tax cuts may boost growth, raise inequality

3. (Political economy, e.g. too much inequality leads to revolution)

- Theory makes no clear prediction whether inequality is good or bad for macro, only common feature is that **distribution matters**

Inequality in Macro: Summary

- **Before modern macro:** 1930 to 1970
 - it's complicated
- **1st generation:** 1970 to 1990
 - representative agent models (RBC, New Keynesian etc)
 - no role for inequality by design
- **2nd generation:** 1990 to financial crisis
 - early “distributional macro” models
 - “macro \Rightarrow inequality” but “macro \nRightarrow inequality”
- **3rd generation:** after the financial crisis
 - current “distributional macro” models
 - rich interaction: “inequality \iff macro”

What's Been Driving this Evolution?

1. Better data

- explosion of availability of high-quality micro data
- e.g. administrative data from places such as Internal Revenue Service, Social Security Administration,...
- need large samples to document fine-grained heterogeneity, particularly since distributions are typically very skewed

2. Better computers

- models with heterogeneity (generations 2 and 3) much harder to compute than those without (generation 1)
- 3rd generation models harder than 2nd generation ones

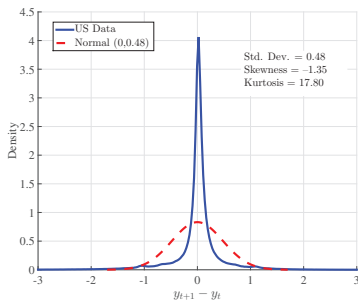
3. Current events

- rising inequality in many developed countries
- cannot understand some key aspects of Great Recession without thinking about heterogeneity

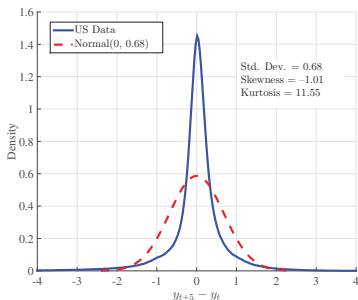
Example of Better Data

- Models with heterogeneity traditionally assume changes in individual income are normally distributed
- Social Security Administration data: bad description of data
- Recent models take new evidence on board

One-year change



Five-year change



Source: Guvenen, Karahan, Ozkan, Song (2016) “What Do Data on Millions of U.S. Workers Reveal about Life-Cycle Earnings Dynamics?”

Media and Undergrad Teaching are Stuck pre 1990

- Both almost exclusively concerned with first generation theories in which there is no role for inequality by assumption
 - Media often criticizes macroeconomists for ignoring heterogeneity. Here is a **5 May 2017** example from Reuters:
 - “The preference for high theory and abstruse mathematical modeling meant that mainstream economics had come to rest on a number of gloriously improbable assumptions.”
 - “In their models, millions of households were **reduced to a single ‘representative agent,’ a God-like being, omniscient and immortal.**”
 - “This unreal creature inhabited a world where peace – or equilibrium – ruled. Crises were impossible in such an Eden...”
- <http://de.reuters.com/article/us-review-crisis-breakingviews-idDEKBN1811XP>
- This is simply a **wildly inaccurate** description of academic macroeconomics, at least **after end of 1990s**

Bank of Japan Governor Kuroda Has it Right Again

- “In the aftermath of the global financial crisis, a number of pundits argued that macroeconomics and monetary economics are totally useless.”
- “One of the **misconceptions** of such critics is that they believe that modern macroeconomics relies only on representative agent models and ignores important implications arising from various heterogeneities in the economy, such as debtors and creditors, the financial sector and the non-financial sector, importers and exporters, and more controversially, haves and have-nots.”
- “Heterogeneous agent models were developed in the 1990s, and have been extended since then.”

Media and Undergrad Teaching are Stuck pre 1990

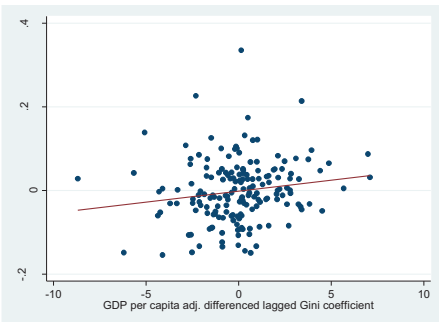
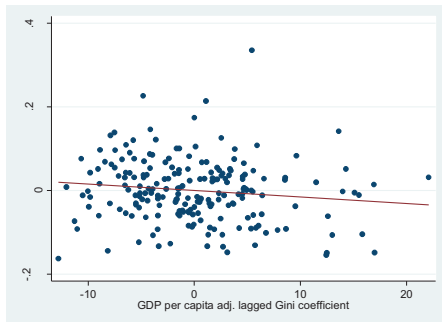
- Place where “macroeconomists ignore heterogeneity” criticism does apply: undergraduate teaching
 - undergrads typically learn Old Keynesian IS-LM
 - or maybe RBC-type representative agent models
 - but very rarely heterogeneous agent models
- For similar points, see
 - Kocherlakota (2009) “Some Thoughts on the State of Macro”
<http://online.wsj.com/public/resources/documents/KOCHERLAKOTA20090930.pdf>
 - Ricardo Reis (2016) “Is Something Really Wrong with Macroeconomics?”
<http://personal.lse.ac.uk/reisr/papers/17-wrong.pdf>

Aside: Inequality-Growth Cross-Country Regressions

Large number of papers:

- country-level data on GDP growth, inequality measure (e.g. Gini)
- regress growth in subsequent 10 years on inequality in base year
- see e.g. recent IMF and OECD studies that got a lot of press

Example: Inequality and Economic Growth in OECD Countries



Source: Kolev and Niehues (2016) who criticize the literature

Aside: Inequality-Growth Cross-Country Regressions

Most economists are quite **skeptical** of such studies

See e.g. Banerjee and Duflo (2003) “Inequality and Growth: What Can the Data Say?”

- “On the question of whether inequality is bad for growth, **[cross-country] data has little to say**. It is clear that the most compelling evidence on this point has to come from micro data.”

Reasons:

1. many omitted variables in such cross-country regressions
2. relation could be very non-linear (see e.g. Banerjee-Duflo, 2003)
3. **“inequality \iff macro”, not just “inequality \Rightarrow macro”**
(see e.g. Fuest, 2017)
4. typically lack of evidence on particular mechanisms
 - This skepticism is probably justified

Inequality Changes How We Should Think about Macroeconomic Policies: Case of Monetary Policy

- Based on Kaplan, Moll and Violante (2017) “Monetary Policy According to HANK”
- “HANK” = Heterogeneous Agent New Keynesian model
- Goal: introduce heterogeneity into models used by Central Banks which we like to call
- “RANK” = Representative Agent New Keynesian model

How monetary policy works in RANK

- Total consumption response to a drop in real rates

$$C \text{ response} = \underbrace{\text{direct response to } r}_{>95\%} + \underbrace{\text{indirect effects due to } Y}_{<5\%}$$

- Direct response is everything, pure intertemporal substitution
- However, data suggest:
 1. Low sensitivity of C to r
 2. Sizable sensitivity of C to Y
 3. Micro sensitivity vastly heterogeneous, depends crucially on household balance sheets

How monetary policy works in HANK

- Once matched to micro data, HANK delivers realistic:
 - wealth distribution: small direct effect
 - MPC distribution: large indirect effect (depending on ΔY)

$$C \text{ response} = \underbrace{\text{direct response to } r}_{\text{RANK: } >95\%} + \underbrace{\text{indirect effects due to } Y}_{\text{RANK: } <5\%}$$

RANK: >95%

RANK: <5%

HANK: <1/3

HANK: >2/3

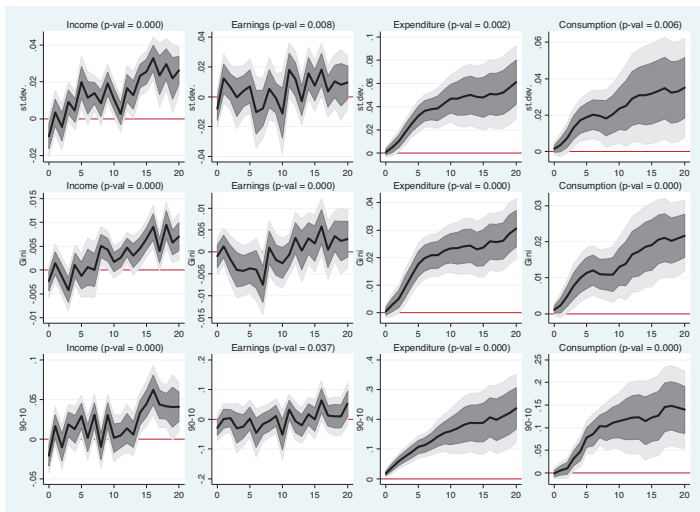
- Overall effect depends crucially on fiscal response, unlike in RANK where Ricardian equivalence holds
- **Q:** Is Central Bank less in control of C than we thought?

Macro Also Matters for Inequality

- HANK allows studying **distributional implications** of monetary policy
 - lower interest rates \Rightarrow negative income effect on savers, positive on borrowers
 - Yellen again: “even though the tools of monetary policy are generally not well suited to achieve distributional objectives, it is important for policymakers to understand and monitor the effects of macroeconomic developments on different groups within society”
- Empirical evidence?

Distributional Effects of Monetary Policy?

FIGURE 3: RESPONSE OF ECONOMIC INEQUALITY TO A CONTRACTIONARY MONETARY POLICY SHOCK



Monetary vs Fiscal Policy?

- In HANK model with wealthy-hand-to-mouth also fiscal policy is much more powerful than in RANK
 - See Kaplan and Violante (2016) “Wealthy ‘hand-to-mouth’ households: key to understanding the impacts of fiscal stimulus”
- **RANK**: clear **pecking order** between monetary and fiscal policies
 - away from zero lower bound, monetary policy can by itself restore first-best equilibrium allocation (“divine coincidence”)
- **HANK**: no longer true
 - Is fiscal policy sometimes preferable to monetary policy when there are incomplete markets and distributional concerns?

Conclusion

- Macroeconomics and inequality is a two-way street

inequality \iff macroeconomy

- Current research in macroeconomics takes this seriously,...
- ... incorporates enormous heterogeneity observed at micro level, in particular the large disparities in income and wealth
- Doing so often delivers strikingly different implications for monetary and fiscal policies...
- ... and allows us to study their distributional implications

References: Some “Third Generation” Papers

- Ahn, Kaplan, Moll, Winberry & Wolf (2017) “When Inequality Matters for Macro and Macro Matters for Inequality”
- Auclert (2016) “Monetary Policy and the Redistribution Channel”
- Auclert & Rognlie (2016) “Inequality and Aggregate Demand”
- Bayer, Pham, Luetticke & Tjaden (2015) “Precautionary Savings, Illiquid Assets, and the Aggregate Consequences of Shocks to Household Income Risk”
- Carroll, Slacalek & Tokuoka (2016) “The Distribution of Wealth and the Marginal Propensity to Consume”
- Den Haan, Rendahl & Riegler (2017) “Unemployment (fears) and Deflationary Spirals,”
- Gornemann, Kuester & Nakajima (2016) “Doves for the Rich, Hawks for the Poor? Distributional Consequences of Monetary Policy”
- Guerrieri & Lorenzoni (2017) “Credit Crises, Precautionary Savings, and the Liquidity Trap”

References: Some “Third Generation” Papers

- Kaplan, Moll & Violante (2017) “Monetary Policy According to HANK”
- Luetticke (2015), “Transmission of Monetary Policy with Heterogeneity in Household Portfolios”
- McKay & Reis (2016), “The Role of Automatic Stabilizers in the U.S. Business Cycle”
- McKay, Nakamura & Steinsson (2016) “The Power of Forward Guidance Revisited”
- Hedlund, Karahan, Mitman & Ozkan (2017) “Monetary Policy, Heterogeneity and the Housing Channel”
- Hagedorn, Manovskii & Mitman (2017) “The Fiscal Multiplier”
- Oh & Reis (2012), “Targeted Transfers and the Fiscal Response to the Great Recession”
- Ravn & Sterk (2016), “Job Uncertainty and Deep Recessions”
- Werning (2016), “Incomplete Markets and Aggregate Demand” (depends)
- Wong (2016), “Population Aging and the Transmission of Monetary Policy to Consumption”

References: Other Academic Articles

- Aiyagari (1994) “Uninsured Idiosyncratic Risk and Aggregate Saving”
- Banerjee & Newman (1993) “Occupational Choice and the Process of Development”
- Banerjee & Duflo (2003) “Inequality and Growth: What Can the Data Say?”
- Benabou (1996) “Inequality and Growth”
- Bewley (1986) “Stationary Monetary Equilibrium with a Continuum of Independently Fluctuating Consumers”
- Carroll (2000) “Requiem for the Representative Consumer? Aggregate Implications of Microeconomic Consumption Behavior”
- Coibion, Gorodnichenko, Kueng, Silva (2016) “Innocent Bystanders: Monetary Policy and Inequality in the U.S.”
- De Nardi & Fella (2017) “Saving and Wealth Inequality”
- Den Haan (1996) “Heterogeneity, Aggregate Uncertainty, and the Short-Term Interest Rate”
- Fuest (2017) “Inequality Reduces Growth” in “Economic Ideas You Should Forget”

References: Other Academic Articles

- Galor & Zeira (1993) “Income Distribution and Macroeconomics”
- Heathcote, Perri & Violante (2010), “An Empirical Analysis of Economic Inequality in the United States, 1967-2006”
- Heathcote, Storesletten & Violante (2009) “Quantitative Macroeconomics with Heterogeneous Households”
- Huggett (1993) “The Risk-free Rate in Heterogeneous-Agent Incomplete-Insurance Economies”
- Jappelli & Pistaferri (2014) “Fiscal Policy and MPC Heterogeneity”
- Kolve & Niehues (2016) “The Inequality-Growth Relationship An Empirical Reassessment”
- Krueger, Mitman & Perri (2016) “Macroeconomics and Household Heterogeneity”
- Krusell & Smith (1998) “Income and wealth heterogeneity in the macroeconomy”
- Lucas (2003) “Macroeconomic Priorities”
- Persson & Tabellini (1994) “Is Inequality Harmful for Growth?”
- Piketty, Saez & Zucman (2016) “Distributional National Accounts”

References: Speeches, Newspapers, Blogs

- Blinder (2014) “The Supply-Side Case for Government Redistribution”
<http://economistsview.typepad.com/economistsview/2014/08/the-supply-side-case-for-government-redistribution.html>
- Coeure (2013) “The Relevance of Household-Level Data for Monetary Policy and Financial Stability Analysis”
<https://www.ecb.europa.eu/press/key/date/2013/html/sp131017.en.html>
- Constâncio (2017) “Inequality and Macroeconomic Policies”
<https://www.ecb.europa.eu/press/key/date/2017/html/ecb.sp170822.en.html>
- Kaplan and Violante (2016) “Wealthy ‘hand-to-mouth’ households: key to understanding the impacts of fiscal stimulus” <http://microeconomicinsights.org/wealthy-hand-to-mouth-households-key-to-understanding-the-impacts-of-fiscal-stimulus/>
- Kocherlakota (2009) “Some Thoughts on the State of Macro”
<http://online.wsj.com/public/resources/documents/KOCHERLAKOTA20090930.pdf>
- Kuroda (2017) “Opening Remarks at the 2017 BOJ-IMES Conference”
https://www.boj.or.jp/en/announcements/press/koen_2017/ko170524a.htm
- Yellen (2016) “Macroeconomic Research After the Crisis”
<https://www.federalreserve.gov/newsevents/speech/yellen20161014a.htm>