Savings and Wealth Inequality

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June 30, 2016

Important open questions

- Why are some people rich while others are poor?
- To what extent can governments affect inequality?
- Which instruments should they use?

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To better answer these questions we need to better understand why people save.

This talk

- Why do people save?
- How does saving behavior translate into wealth inequality?

Talk roadmap

- Basic facts.

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- Basic Bewley-Huggett-Aiyagari-Imrohoroglu model.

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- Richer models.
- What have have learned so far about savings?
- What needs to be done?

Basic facts

Earnings and wealth inequality

- Skewed distributions with thick upper tails.
- Wealth more concentrated than earnings.

Top				Perc. at zero
1%	5%	20%	40%	or negative
Wealth, 1989 SCF data				
29	53	80	93	6
Gross earnings, 1989 LIS data				
6	19	48	72	8

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Top 1%	Top 5%	Top 20%	Top 40%	Perc. at zero or negative
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- Wealth and earnings becoming more concentrated over time.
- Rich people (high lifetime income, education, wealth) have a higher saving rate before and after retirement.

Facts: U.S. earnings, income and wealth

- Many contributors, including Wolff (1987), Venti and Wise (1988), Davies and Shorrocks (2000), Diaz-Gimenez, Quadrini, and Rios-Rull (1997) + updates, Kuhn and Rios-Rull (2016), Bernheim et al. (2001), Kennickel (2003), Dynan et al. (2004), Campbell and Hercowitz (2015), Saez and Zucman (2016), Piketty's book...

Basic Bewley model of inequality

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- Preferences

$$\max_{\{c_t\}_{t=0}^{T}} E \sum_{t=0}^{T} s_t \beta^t \frac{c_t^{1-\sigma}}{1-\sigma}$$

- Budget constraint

$$a_{t+1} = y_t + (1+r)a_t - c_t, \quad a_{t+1} \geq \underline{a}$$

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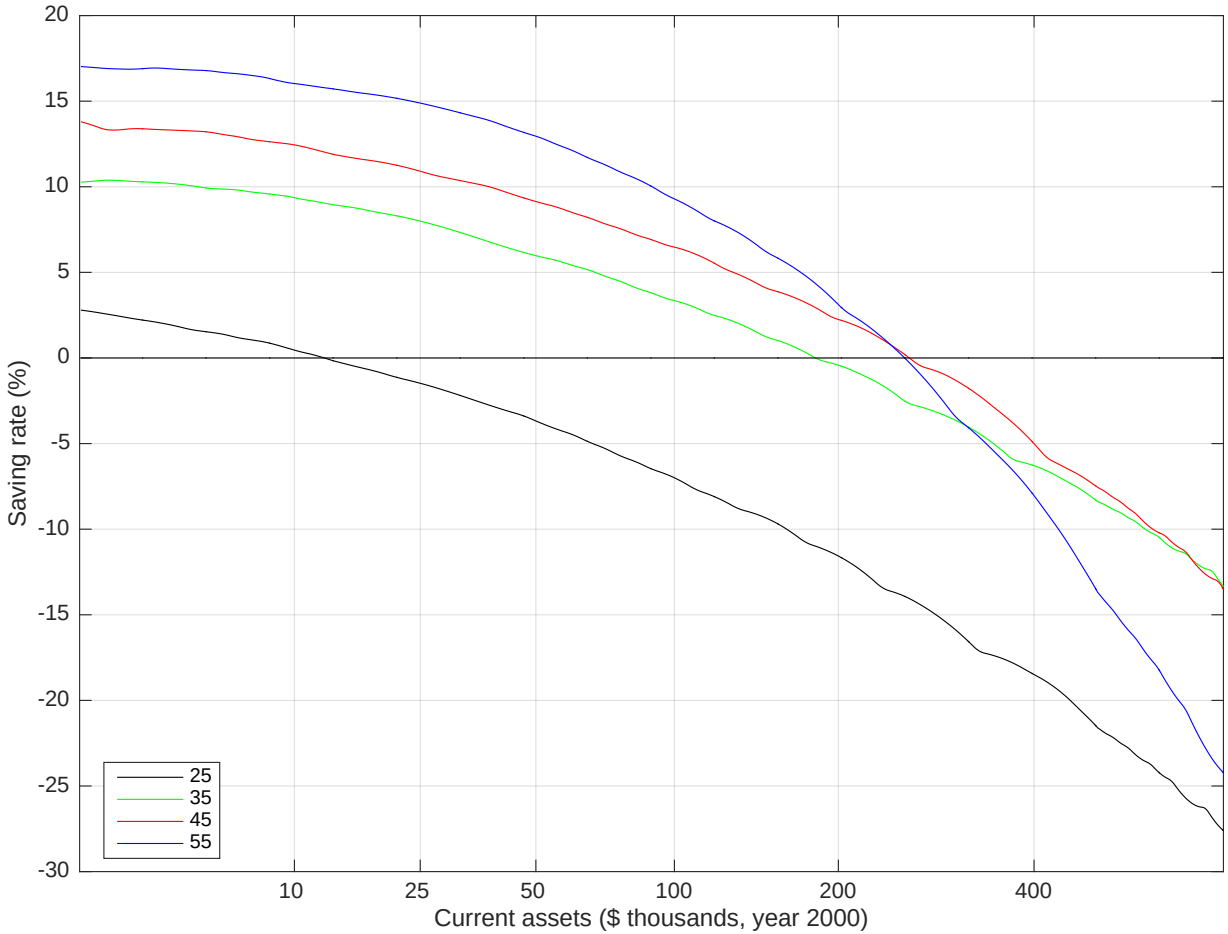
- Ex-ante identical households hit by earning shocks.
- Households are ex-post heterogeneous.
- Constant distribution of people over states (assets, age) and individuals face a lot of uncertainty.

Saving rate by age and wealth, median earnings level



Standard life cycle Bewley model.

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  - Earnings risk.
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  - Retirement.
- Once "buffer stock savings" is reached, people start dissaving. Carroll (1997).
- The saving rate of the high wealth households is low or even negative.
  - Contrasts with much empirical evidence (Dynan Skinner and Zeldes, 2004 and De Nardi, French and Jones, 2010).

Limitations of the standard model

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- They do not generate the high wealth people that we see in the data.

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- Counterfactual saving behavior.
- They do not generate the high wealth people that we see in the data.
- They allow for very few saving motives. Might miss important saving motives even for households whose saving behavior we think we understand.
- Why people save is important.

An example

- Out of pocket medical and long-term-care (LTC) expenses in old age are large for upper and middle income people. $\Rightarrow$ Additional motive to self-insure.

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- In a model in which we abstract from this risk, choose a higher discount factor to match observed net worth.
- When we evaluate government insurance
  - Patient people might value government insurance less than people facing significant out-of-pocket medical costs.
  - Misguided policy evaluation.

Richer models of wealth inequality
Six main ingredients

Explaining wealth inequality

$$\max_{\{c_t\}_{t=0}^{T}} E \sum_{t=0}^{T} \beta^t \left(s_t \frac{c_t^{1-\sigma}}{1-\sigma} + (1-s_t) s_{t-1}(a_t) \right)$$

$$a_{t+1} = y_t + (1+r)a_t - c_t + b_t, \quad a_{t+1} \geq \underline{a}$$

1. Bequests and human capital transmission across generations.

Explaining wealth inequality

$$\max_{\{c_t\}_{t=0}^{T}} E \sum_{t=0}^{T} \beta_i^t s_t \frac{c_t^{1-\sigma_i}}{1-\sigma_i}$$

$$a_{t+1} = y_t + (1+r)a_t - c_t, \quad a_{t+1} \geq \underline{a}$$

1.
2. Heterogeneous preferences.

Explaining wealth inequality

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$$a_{t+1} = y_t + (1 + r_t^i) a_t - c_t, \quad a_{t+1} \geq \underline{a}$$

1.
2.
3. Idiosyncratic rates of return.

Explaining wealth inequality

$$\max_{\{c_t\}_{t=0}^{T}} E \sum_{t=0}^{T} \beta^t s_t \frac{c_t^{1-\sigma}}{1-\sigma}$$

$$a_{t+1} = [I_e f(\theta_t, k_t) + (1 - I_e) y_t] + (1 + r)(a_t - k_t) - c_t, \quad a_{t+1} \geq \underline{a}$$

1.
2.
3.
4. Entrepreneurship.

Explaining wealth inequality

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1.
2.
3.
4.
5. Richer earnings dynamics.

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1.
2.
3.
4.
5.
6. Medical and nursing home expenses.

1. Bequests and human capital

Bequests and human capital, facts

- A large fraction of wealth is inherited.
  Kotlikoff and Summers (1981), Modigliani (1988), Gale and Scholz (1994).
- Earnings of parents and children are correlated.
  Solon (1992), Zimmermann (1992), Stokey (1996), ... Chetty et al. (2014).

Bequests and human capital, model
De Nardi, 2004

- OLG with retirement period.
- Earnings and lifetime uncertainty. Accidental bequests.

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- OLG with retirement period.
- Earnings and lifetime uncertainty. Accidental bequests.
- Parents value leaving bequests. Voluntary bequests.
- Children partially inherit parents' earnings ability.

$$\max_{\{c_t\}_{t=0}^{T}} E \sum_{t=0}^{T} \beta^t \left(s_t \frac{c_t^{1-\sigma}}{1-\sigma} + (1-s_t) s_{t-1} \phi(a_t) \right)$$

$$a_{t+1} = y_t + (1+r)a_t - c_t + b_t, \quad a_{t+1} \geq \underline{a}$$

The bequest motive

- "Warm glow altruism."

$$\phi(a_t) = \frac{(a_t+\eta)^{1-\sigma}}{1-\sigma}$$

- The larger is η, the more bequests are luxury goods. Non-homoteticity.

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- The larger is η, the more bequests are luxury goods. Non-homoteticity.
  - Many people leave no bequests. Hurd and Smith (2001).
  - The altruistic model has strong implications about risk sharing across generations that have been strongly rejected by data, Altonji, Hayashi, Kotlikoff, 1997.
- Do not pick model parameters to match wealth inequality.

Data and basic Bewley life cycle model

Wealth Gini	Percentage wealth in the top 1%	5%	20%	40%	60%	% ≤ 0 Wealth
U.S. data, SCF 1989						
.78	29	53	80	93	98	6
Accidental bequests distributed equally to all						
.67	7	27	69	90	98	17
Accidental bequests distributed to one's children						
.68	7	27	69	91	99	17

Data and richer life cycle model

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U.S. data, SCF 1989						
.78	29	53	80	93	98	6
Accidental bequests to one's children						
.68	7	27	69	91	99	17
+ Voluntary bequests						
.74	14	37	76	95	100	19
+ Voluntary bequests + HC inheritance						
.76	18	42	79	95	100	19

Bequests and human capital: main results

- Accidental bequests do not help explain the concentration in the upper tail of the wealth distribution.

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Bequests and human capital: main results

- Accidental bequests do not help explain the concentration in the upper tail of the wealth distribution.
  Voluntary bequests help explain wealth concentration because of non-homoteticity.
- Transmission of earnings ability across generations increases wealth concentration in the upper tail.
- But, the wealthy in the model are still not wealthy enough and the poor are too poor.
- The family that you are born to matters a lot for your lifetime expected utility. De Nardi and Yang, 2015.

2. Heterogeneous preferences

Heterogeneous preferences, facts

Lots of evidence of preference heterogeneity.

- Estimate Euler equations. PSID. Lawrence (1991).
- Estimate life cycle model with SMM. PSID. Cagetti (2003)
- Heterogeneity of effects of earnings shocks on consumption. PSID. Alan, Browning, and Ejenaes (2016).
- Estimate life cycle model with ML. Danish registry. Druedhal and Jorgensen (2015).
- Many others...

Heterogeneous preferences, models

$$\max_{\{c_t\}_{t=0}^{T}} E \sum_{t=0}^{T} s_t \beta_i^t \frac{c_t^{1-\sigma_i}}{1-\sigma_i}$$

- Krusell and Smith (1998)- Infinitely-lived agent model: A little heterogeneity in β generates
  - More wealth concentration.
  - But not enough very wealthy people.

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- Hendricks (2007), Paz Pardo (2016) - Life cycle model:
  - Even large heterogeneity in both parameters does not generate very wealthy people.

Heterogeneous preferences: main results

- Heterogeneous preferences might drive important difference in savings.
- But, little evidence they are the key reason why the wealthiest are so wealthy.
- Interesting mechanisms that might interact with other savings motives in richer Bewley models.

3. Heterogeneous returns

Heterogeneous rates of returns, facts

Fagereng, Guiso, Malacrino, Pistaferri (2016) find that rates of returns are

- Heterogeneous across households (over 200 basis points between 10th and 90th percentile of the distribution of returns).
- Also heterogenous within asset classes.
- Persistent.
- Correlated with household wealth and across generations.

Exogenous rates of return, models Benhabib, Bisin and Luo (2015)

$$a_{t+1} = y_t + (1 + r_t^i)a_t - c_t, \quad a_{t+1} \geq \underline{a}$$

- Choose model parameters to match wealth inequality.

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- Choose model parameters to match wealth inequality.
- Exogenous and stochastic rates of return alone do not not give rise to very rich people, also need bequest motives.
- Discipline on the choice of rates of return? Are they consistent with the data?

Endogenous rates of returns

- Rates of return depend on investment choices.
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  - **Entrepreneurial choices**: Quadrini (1999), Cagetti and De Nardi (2006 and 2009), Bassetto, Cagetti, and De Nardi (2015).
  - **Portfolio choice**: Khan and Kim (2015).
  - **Heterogeneous investor sophistication**: Kacperczyk, Nosal, and Stevens (2015).

4. Entrepreneurs

Entrepreneurs, facts

Many entrepreneurs are wealthy and many wealthy people are entrepreneurs. Cagetti and De Nardi, 2006.

Fraction of entrepreneurs, SCF 1989

Wealth percentile, top	1%	5%	10%	20%
Self-employed business owners				
	54%	39%	32%	22%

Entrepreneurs, facts

- Entrepreneurs have a high saving rate before and after entry. Quadrini (1999) and (2000) and Buera (2009).
- Entrepreneurs face borrowing constraints. Evans and Jovanovic (1989), Gentry and Hubbard (2004), and Cagetti and De Nardi (2006).
- Entrepreneurs hold very undiversified portfolios. (Vissing-Jorgensen and Moskowitz, 2002).

Entrepreneurs, models
Cagetti and De Nardi, 2006

- Every period agents decide whether to be a worker or run a business.
- Entrepreneurial technology

$$f(\theta_t, k_t) = \theta_t k_t^{\nu} + (1-\delta)k_t$$

$$k_t \leq k(a_t)$$

- Budget constraint

$$a_{t+1} = [I_e f(\theta_t, k_t) + (1-I_e)y_t] + (1+r)(a_t - k_t) - c_t, \quad a_{t+1} \geq \underline{a}$$

Entrepreneurs, results

- Do not pick model parameters to match wealth inequality.

		Percentage wealth in the top			
Gini	entrepreneurs	1%	5%	20%	40%
1989, SCF data					
0.8	7.55%	30	54	81	94
Baseline with entrepreneurs and altruism					
0.8	7.50%	31	60	83	94

Entrepreneurs: main results

- Entrepreneurship can generate a realistic wealth distribution.
- Key mechanism: Some entrepreneurs
  - Have potentially very high rates of returns from investing in their firm.
  - Are borrowing constrained.
  - Have a large optimal firm size.
  - Keep saving to grow their business even when they are wealthy.

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  - Keep saving to grow their business even when they are wealthy.
- Model rationalizes entrepreneurial undiversified portfolios, high saving rates, and high wealth.

4. Earnings dynamics

Richer earnings dynamics, facts

- Earnings dynamics are typically much richer than in our models.
- High earners face more downward earnings risk.

Arellano, Blundell, and Bonhomme (2015), Guvenen, Karahan, Ozkan, and Song (2015), DeBacker, Panousi, Ramnath (2013)...

Earnings risk, model
Castaneda, Diaz-Gimenez, and Rios-Rull, 2003

$$a_{t+1} = y_t + (1 + r)(a_t - k_t) - c_t, \quad a_{t+1} \geq \underline{a}$$

- Choose earnings to match cross-sectional moments of earnings and wealth inequality. Hence, it matches wealth concentration by construction.

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Earnings levels	1.0	3.0	10.0	1060

+ High earners face 20% risk of dropping every period $\Rightarrow$ Can generate the wealth concentration observed in the data.

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- Rationale: earnings processes are typically estimated on data sets that miss the highest earners.

Earnings risk, model
De Nardi, Fella, and Paz Pardo (2016)

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- Do not pick model parameters to match wealth inequality.
- Estimate rich earnings process from tax data (which includes high earnings workers) and use it in a standard life cycle model.
- $\Rightarrow$ This richer earnings process

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  - Fits the wealth holdings of the poorest 60% of people better. The poor people are realistically poor.

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  - Matches the increase in the variance of consumption over the life cycle.

Earning risk: main results

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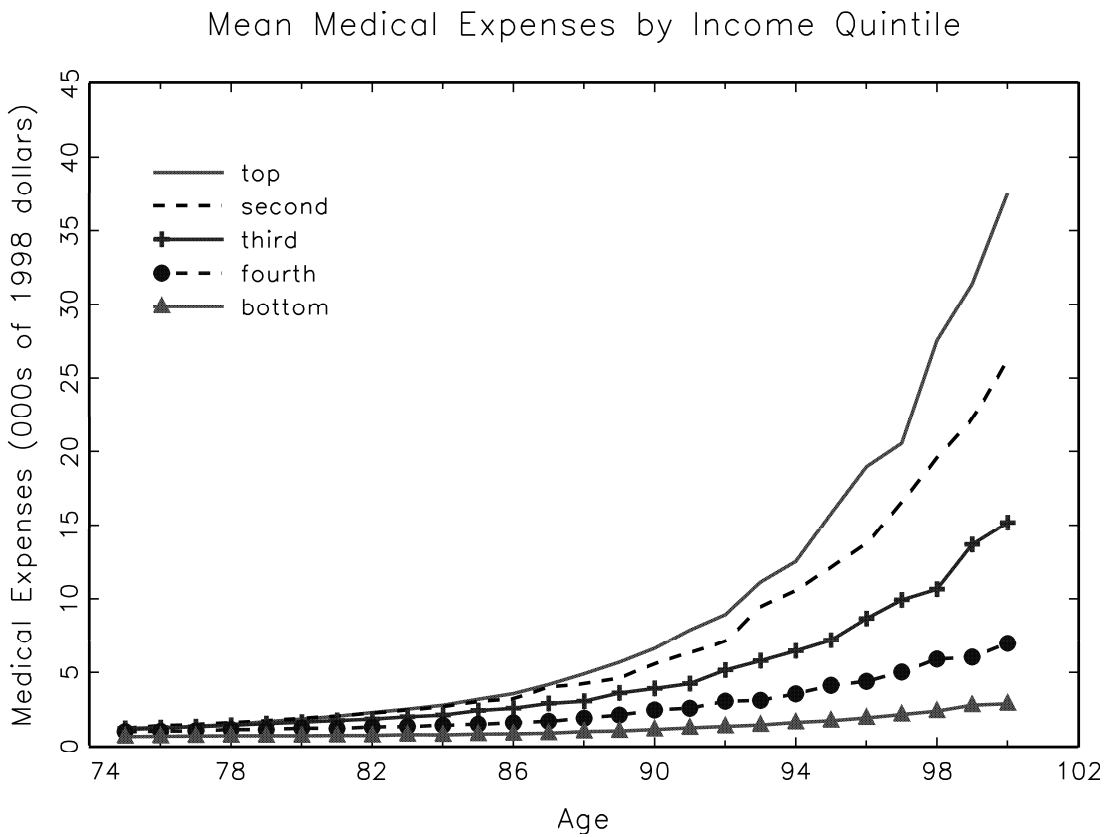
- If the high earners face very high earnings risk, they might save a lot to smooth consumption and and thus also be very wealthy (Castaneda et al. 2003).
- De Nardi, Fella, and Paz Pardo (2016) use richer tax data and do not find evidence for this mechanism but their data does not contain entrepreneurial earnings.
- However, if entrepreneurs face much more risk, it is both wage and capital income risk and is important to model it explicitly.

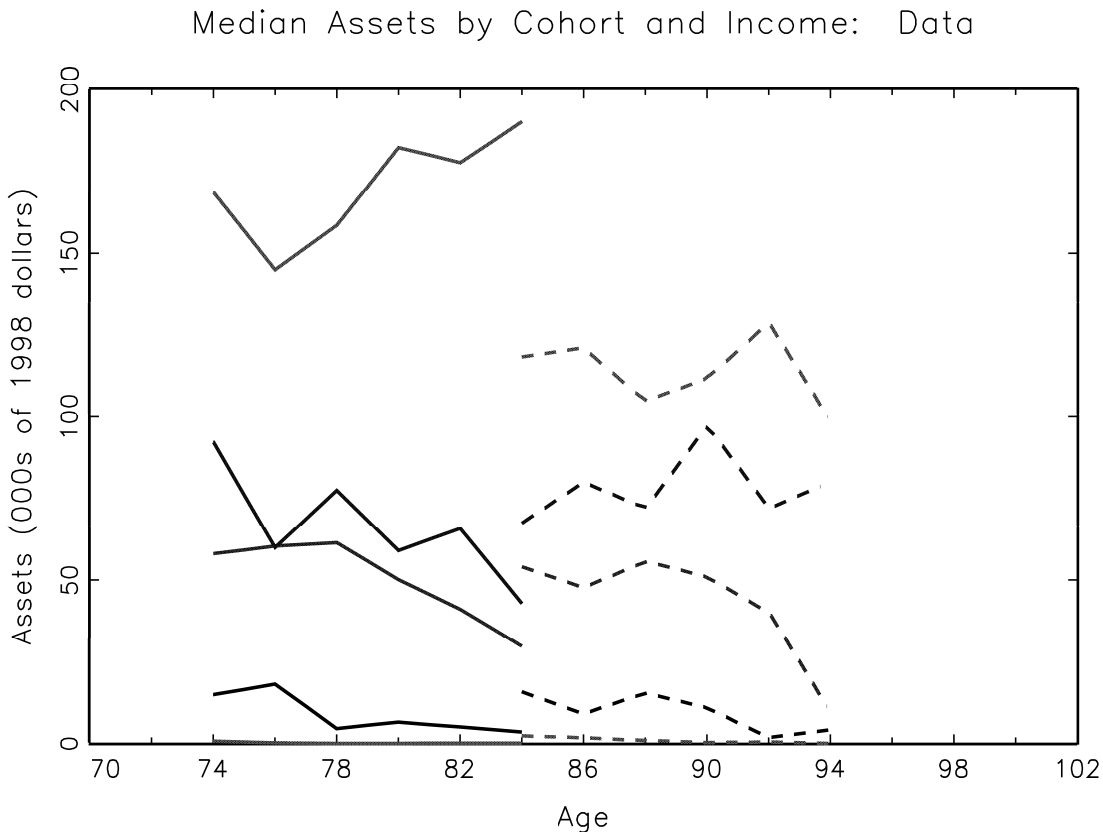
6. Medical expenses

Medical expenses in the US, facts. De Nardi, French and Jones, 2010



- Out-of-pocket medical costs rise with age and permanent income (HRS data).

Old age savings in the US, facts



- The high permanent income (PI) elderly do not dissave. The low PI elderly never save. The middle PI elderly do dissave (HRS data).

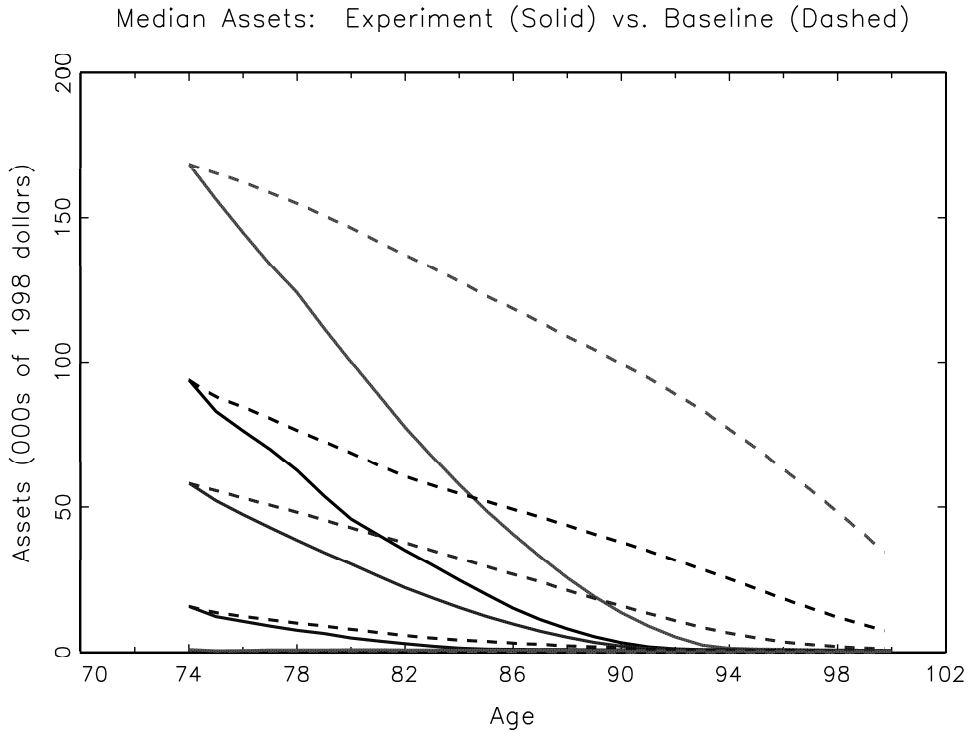
Medical expenses, model
De Nardi, French, and Jones, 2010

- Medical expenses hit the budget constraint (Hubbard, Skinner, and Zeldes, 1994 and 1995).

$$a_{t+1} = (1 + r)a_t + y_t - m_t, \quad a \geq \underline{a}$$

- There is a consumption floor.

De Nardi, French, and Jones, 2010



- Medical expenses increasing with age and permanent income are an important reason why the high PI elderly do not run down their assets. Government insurance covers the the low PI, who never save.

Ameriks, Briggs, Caplin, Shapiro, and Tonetti, 2016

- Vanguard data + different identification strategy.
- Long term care risk (LTC) + government insurance $\Rightarrow$ wedge in saving behavior between people with low wealth/PI and those with higher wealth/PI.

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- Vanguard data + different identification strategy.
- Long term care risk (LTC) + government insurance $\Rightarrow$ wedge in saving behavior between people with low wealth/PI and those with higher wealth/PI.
- Single males aged 55, with financial wealth
  - Below 100K: Government insurance encourages driving savings towards zero.
  - Over 100K: LTC risk adds 200K at age 75.

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- Long term care risk (LTC) + government insurance $\Rightarrow$ wedge in saving behavior between people with low wealth/PI and those with higher wealth/PI.
- Single males aged 55, with financial wealth
  - Below 100K: Government insurance encourages driving savings towards zero.
  - Over 100K: LTC risk adds 200K at age 75.
- Increase in savings is strongest in % terms at the top 20th percentile of financial wealth.

Medical and nursing home expenses: main results

- Medical expenses/LTC risk + government programs
  - Have large effects on savings.
  - Have heterogeneous effects depending on lifetime income.
- Are important to understand savings.

Conclusions and directions for future research

What have we learned so far?

- Not everyone is middle aged (as in the infinitely-lived model).
- Precautionary savings against earnings risks are not the only reasons why people save (as in the infinitely-lived model).

What have we learned so far?

- Not everyone is middle aged (as in the infinitely-lived model).
- Precautionary savings against earnings risks are not the only reasons why people save (as in the infinitely-lived model).
  - Modelling the life cycle is important.
  - Better model retirement. Retirement is a period of big risks (medical expenses and LTC risk) and government insurance has a large effects on savings (or lack thereof).
  - Model intergenerational links explicitly. Who your parents are matters for your lot in life.

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- Precautionary savings against earnings risks are not the only reasons why people save (as in the infinitely-lived model).
  - Modelling the life cycle is important.
  - Better model retirement. Retirement is a period of big risks (medical expenses and LTC risk) and government insurance has a large effects on savings (or lack thereof).
  - Model intergenerational links explicitly. Who your parents are matters for your lot in life.
- Entrepreneurship can explain why many households are wealthy.

What have we learned so far?

- Not everyone is middle aged (as in the infinitely-lived model).
- Precautionary savings against earnings risks are not the only reasons why people save (as in the infinitely-lived model).
  - Modelling the life cycle is important.
  - Better model retirement. Retirement is a period of big risks (medical expenses and LTC risk) and government insurance has a large effects on savings (or lack thereof).
  - Model intergenerational links explicitly. Who your parents are matters for your lot in life.
- Entrepreneurship can explain why many households are wealthy.
- Household-level earnings dynamics over the life cycle matter.

Directions

- Contents
  - Human capital.
  - Health.
  - The family.
  - Rates of returns on wealth.
  - Changes in inequality over time.
- Methods

Human capital

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- Where do earnings and wages come from?
- Jointly modeling human capital and wealth inequality, and their evolution and interaction over the life cycle is crucial.

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- Modeling health accumulation:
  - How does health evolve and interacts with earnings and wealth? What are their inequality implications?

The family

- From bequests and intergenerational links to modelling the family.
- The family is an important source of both risks and insurance. Blundell, Ecksten-Saporta, Pistaferri (2016). Attanasio, Sanchez, Low (2005). Borella, De Nardi, and Yang (2016).

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- Study the role of the family in affecting inequality.
  - Wage risk and labor supply of both spouses.
  - Marriage and divorce risk.

Rates of return on wealth

- What are the important determinants of rates of returns? Why are they different across people?
- To what extent is entrepreneurship a crucial determinant?
- Are there other determinants?

Dynamics over time

- Modelling changes in wealth inequality and their determinants over time.
  - Gabaix, Lasry, Lions, and Moll (2015).
  - Kaymak and Poschke (2015).
- Much more work is needed.

Methods

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- Introducing several saving motives in one model and determining their relative importance.
- Thinking about the identification of the various saving motives.
- Use household-level data to
  - Establish key new facts that the model needs to capture.
  - Model the sources of risks that household face over their life cycle, not just cross-sectional facts.

Thank you!