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The importance of modeling couples and singles

Mariacristina De Nardi[1]

[1]University of Minnesota, Federal Reserve Bank of Minneapolis, CEPR, and NBER

Based on work with

- Borella and Yang (2018), (2019a), (2019b)
- French, Jones, and McGee (2021)

Facts, part 1

- Women and married people make up a large fraction of
  - Labor market participants
  - Total hours worked
  - Total earnings

Facts, part 1

- Women and married people make up a large fraction of
    - Labor market participants
    - Total hours worked
    - Total earnings
- Wages, labor market participation, hours worked, and savings differ
    - By gender
    - By marital status

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Facts, part 2

- Many government policies have different provisions for couples and singles

Facts, part 2

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- In the U.S.
    - Taxation
    - Old age social security benefits (public pensions)
    - Welfare program (both eligibility criteria and program generosity)

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- Lot of work on these programs, but most ignores that

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    - Couples and singles might react differently to reform

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- In the U.S.
    - Taxation
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- Lot of work on these programs, but most ignores that
    - Couples and singles might react differently to reform
    - The effects of program rules for the secondary earner

Facts, part 2

- Many government policies have different provisions for couples and singles
- In the U.S.
  - Taxation
  - Old age social security benefits (public pensions)
  - Welfare program (both eligibility criteria and program generosity)
- Lot of work on these programs, but most ignores that
  - Couples and singles might react differently to reform
  - The effects of program rules for the secondary earner
  - Program rules mid affect primary and secondary earner differently

Facts, part 3

- Couples and singles and their heterogeneity can generate very heterogenous behavior and elasticities. Matters for

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Facts, part 3

- Couples and singles and their heterogeneity can generate very heterogenous behavior and elasticities. Matters for
  - Government program rules (even those not targeted to couples and singles per se)
  - Changes over time for men and women

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Plan

- ES conference: effects of taxation and old age Social Security on couples and singles, Borella, De Nardi, and Yang (BDY, 2019b)

Plan

- ES conference: effects of taxation and old age Social Security on couples and singles, Borella, De Nardi, and Yang (BDY, 2019b)
- Today: importance of couple and singles more generally
  - Borella, De Nardi, Yang (BDY, 2018)
  - De Nardi, French, Jones, McGee (DFJM, 2021)

BDY, 2018

- What do many papers do?

BDY, 2018

- What do many papers do?
- Only use data on men (women are "complicated")

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BDY, 2018

- What do many papers do?
- Only use data on men (women are "complicated")
- These models or estimated preferences or elasticities are then used to draw inference about the whole economy (by same paper or others)

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BDY, 2018

- What do many papers do?
- Only use data on men (women are "complicated")
- These models or estimated preferences or elasticities are then used to draw inference about the whole economy (by same paper or others)
- Could this possibly be a problem?

BDY, 2018

- Understanding savings and labor supply of single and married men and women over the life cycle...
- ... and their implications

BDY, 2018

- Over the life cycle, can we match
    - Labor participation
    - Hours worked
    - Labor income
    - Net worth
    - Labor supply elasticities
- by ignoring gender and marriage in both model and data and only considering men?

BDY, 2018

- Over the life cycle, can we match
    - Labor participation
    - Hours worked
    - Labor income
    - Net worth
    - Labor supply elasticities
- by ignoring gender and marriage in both model and data and only considering men?
- Are there other calibration strategies or relatively simple models of marriage that can do better?

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Compare the implications of three life-cycle models

- Economy 1: "No marriage, only men"
  - Model: single decision maker (labor supply and savings)
  - Calibration: data on men only

Compare the implications of three life-cycle models

- Economy 1: "No marriage, only men"
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- Economy 2: "No marriage, men and women together"
  - Model: single decision maker (labor supply and savings)
  - Calibration: individual-level data on men and women

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Compare the implications of three life-cycle models

- Economy 1: "No marriage, only men"
    - Model: single decision maker (labor supply and savings)
    - Calibration: data on men only
- Economy 2: "No marriage, men and women together"
    - Model: single decision maker (labor supply and savings)
    - Calibration: individual-level data on men and women
- Economy 3: "Marriage and singles"
    - Model: Married and singles. Everyone chooses labor. Spouses also save and consume jointly
    - Calibration: data for married and single men and women

Data and Methodology

- Data
  - PSID: working period
  - HRS: retirement period

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Data and Methodology

- Data
  - PSID: working period
  - HRS: retirement period
- Methodology
  - Pick the 1941-1945 birth cohort and follow it over their life cycle
  - Take its initial conditions and exogenous processes from data (data inputs)
  - Study the evolution of its endogenous variables and match them to data (data outputs)

Fraction of married and single men and women by age

Age Group	25	35	45	55	65
Fraction of married women	0.43	0.42	0.40	0.39	0.37
Fraction of married men	0.43	0.46	0.44	0.43	0.44
Fraction single women	0.07	0.07	0.10	0.12	0.13
Fraction of single men	0.07	0.05	0.06	0.06	0.06

- Single decision makers are a minority in the data.
- Among the working age workers single men are only about 6%.

Women and married people as a fraction of workers, hours, or earnings

Age Group	25	35	45	55	65
Fract. women among workers	0.37	0.40	0.46	0.46	0.44
Fract. hours worked by women	0.28	0.31	0.39	0.40	0.40
Fract. earnings by women	0.24	0.22	0.30	0.27	0.27
Fract. married among workers	0.86	0.85	0.84	0.82	0.78
Fract. hours worked by married	0.86	0.86	0.84	0.83	0.80
Fract. earnings by married	0.88	0.87	0.86	0.87	0.85

- The aggregates are comprised of large fraction of women and married people.

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Single and married men and women over the life cycle
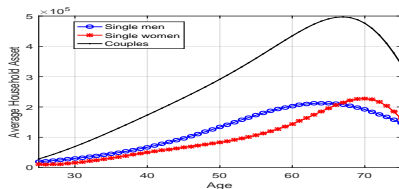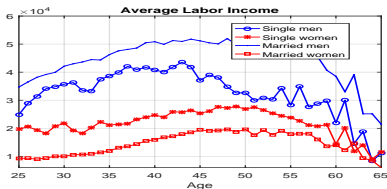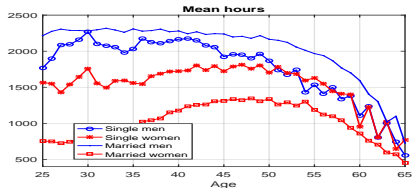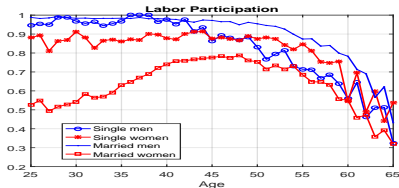
Key data facts, summary

- Single decision makers are a minority in the data
- Aggregates are comprised of large fraction of women and married people
- Married couples' behavior is very different from that of singles

More general model

- Lifecycle model
- Partial equilibrium, cohort level analysis
- Period length: one year

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More general model

- Lifecycle model
- Partial equilibrium, cohort level analysis
- Period length: one year
- Working stage (t_0 to t_r)
    - Alive for sure
    - Face shocks to their labor productivity
    - Either are married or single
    - Singles and people in couples can choose whether to work and hours
    - Fixed cost of working

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More general model

- Lifecycle model
- Partial equilibrium, cohort level analysis
- Period length: one year
- Working stage (t_0 to t_r)
    - Alive for sure
    - Face shocks to their labor productivity
    - Either are married or single
    - Singles and people in couples can choose whether to work and hours
    - Fixed cost of working
- Retirement stage (t_r to T)
    - Exogenous probability of death. Thus, married people might lose their spouse.

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Household preferences

- Discount factor: β.
- Singles:

$$v(c_t, l_t) = \frac{(c_t^\omega l_t^{1-\omega})^{1-\gamma} - 1}{1 - \gamma}$$

- Couples:

$$w(c_t, l_t^1, l_t^2) = \frac{((\frac{c_t}{2})^\omega (l_t^1)^{1-\omega})^{1-\gamma} - 1}{1 - \gamma} + \frac{((\frac{c_t}{2})^\omega (l_t^2)^{1-\omega})^{1-\gamma} - 1}{1 - \gamma}$$

- Labor participation cost (time cost): $\phi_t^{i,j}$.
- $j =$ marital status, $i =$ gender.

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Recursive problem for working-age singles

$$W_t^{s,i}(a_t^i, \epsilon_t^i) = \max_{c_t, a_{t+1}, n_t} \left[v(c_t, 1 - n_t - \phi_t^{i,1} I_{n_t}) + \beta E_t W_{t+1}^{s,i}(a_{t+1}^i, \epsilon_{t+1}^i) \right]$$

$$Y_t = e_t^{i,j} \epsilon_t^i n_t \tag{1}$$

$$c_t + a_{t+1}^i = (1 + r)a_t^i + (1 - \tau_{SS})Y_t \tag{2}$$

$$a_t \geq 0, \quad n_t \geq 0, \quad \forall t \tag{3}$$

Recursive problem for retired singles

$$R_t^{s,i}(a_t) = \max_{c_t, a_{t+1}} \left[v(c_t, 1) + \beta s_t^{s,i} R_{t+1}^{s,i}(a_{t+1}) \right] \tag{4}$$

$$c_t + a_{t+1} = (1+r)a_t + Y_r^{i,j} \tag{5}$$

$$a_t \geq 0, \quad \forall t \tag{6}$$

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Recursive problem for working-age couples

$$
W_t^c(a_t, \epsilon_t^1, \epsilon_t^2) = \max_{c_t, a_{t+1}, n_t^1, n_t^2} \Big[w(c_t, 1 - n_t^1 - \phi_t^{1,2} I_{n_t^1}, 1 - n_t^2 - \phi_t^{2,2} I_{n_t^2})
$$
$$
+ \beta E_t W_{t+1}^c(a_{t+1}, \epsilon_{t+1}^1, \epsilon_{t+1}^2) \Big] \tag{7}
$$

$$
Y_t^i = e_t^{i,j} \epsilon_t^i n_t^i \quad i = 1, 2 \tag{8}
$$

$$
c_t + a_{t+1} = (1 + r)a_t + (1 - \tau_{SS})(Y_t^1 + Y_t^2) \tag{9}
$$

$$
a_t \geq 0, \quad n_t^1, n_t^2 \geq 0, \quad \forall t \tag{10}
$$

Recursive problem for retired couples

$$R_t^c(a_t) = \max_{c_t, a_{t+1}} \Big[w(c_t, 1, 1) + \beta s_t^{c,1} s_t^{c,2} R_{t+1}^c(a_{t+1}) + \tag{11}$$
$$\beta s_t^{c,1}(1 - s_t^{c,2}) R_{t+1}^{s,1}(a_{t+1}) + \beta s_t^{c,2}(1 - s_t^{c,1}) R_{t+1}^{s,2}(a_{t+1}) \Big]$$

$$c_t + a_{t+1} = (1 + r)a_t + (Y_r^{1,c} + Y_r^{2,c}) \tag{12}$$

$$a_t \geq 0 \quad \forall t \tag{13}$$

Exogenous parameters common across economies

Parameters		Value
r	Interest rate	4%
γ	risk aversion coefficient	2
τ_{SS}	Social Security tax rate on employees	3.8%

Table: Calibration of the interest rate, risk aversion, and Social Security tax rate

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PSID: Wages over the life cycle (in $1998)
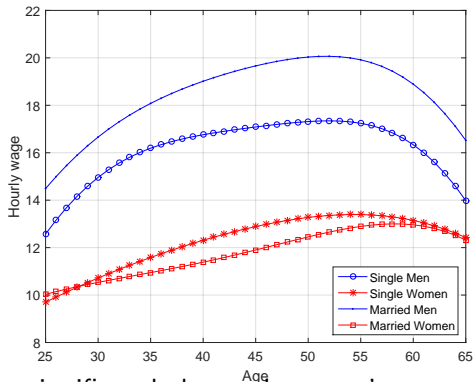
- Women's wages are significantly lower than men's wages.
- Single men's wages are significantly lower than married men's wages.

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PSID: Wages over the life cycle (in $1998)
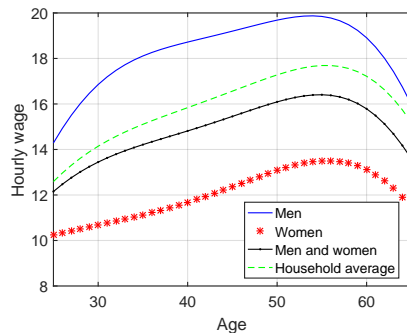
- Women's wages are significantly lower than men's wages.

Results

- Economy 1: "No marriage, only men"
  - Only heterogenous by age and realized earnings shocks
  - Only labor supply and saving decisions by men
  - Calibrated using data on men

- Economy 2: "No marriage, men and women together", calibrated using data on both men and women together, as individual-level data.

- Economy 3: A rich life-cycle economy
  - Heterogeneous by gender, marital status, wages, and life expectancy
  - Everyone can choose to supply labor, and spouses also save and consume jointly
  - Calibrated using data for married and single men and women

Economy 1: The singles economy, calibrated parameters

- Model: single decision maker
- Calibration: data on men only
- Calibrated parameters: discount factor, weight on consumption, participation cost, Social Security benefit
- Targets: SS budget balance, participation and average assets and hours at age 50

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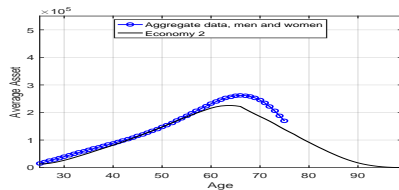000000000

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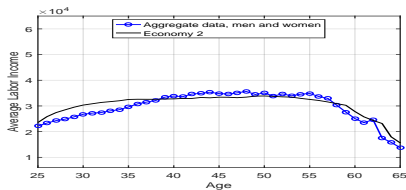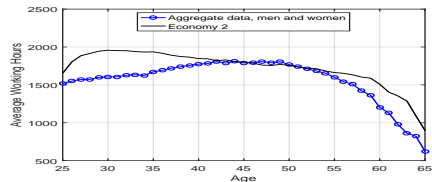00

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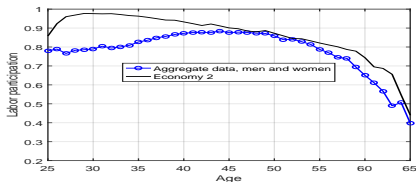0000000
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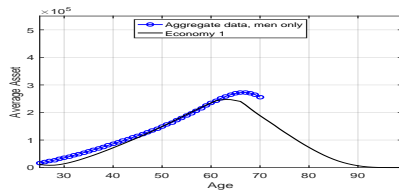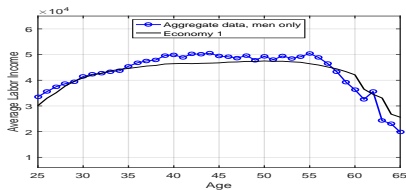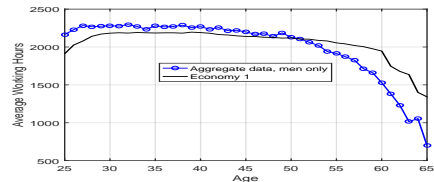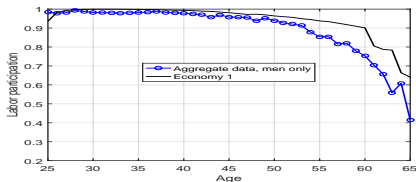
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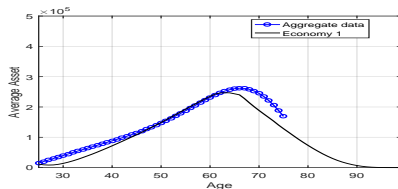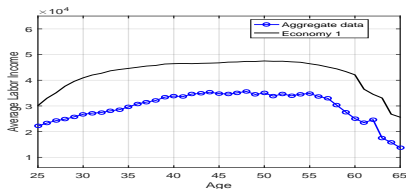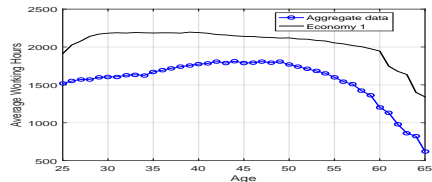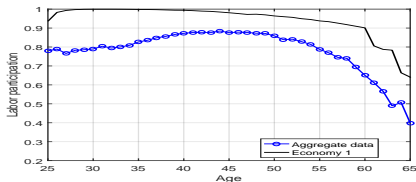
Economy 2: The singles economy, calibrated parameters

- Model: single decision maker
- Calibration: data on men and women together
- Calibrated parameters: discount factor, weight on consumption, participation cost, Social Security benefit
- Targets: SS budget balance, participation and average assets and hours at age 50

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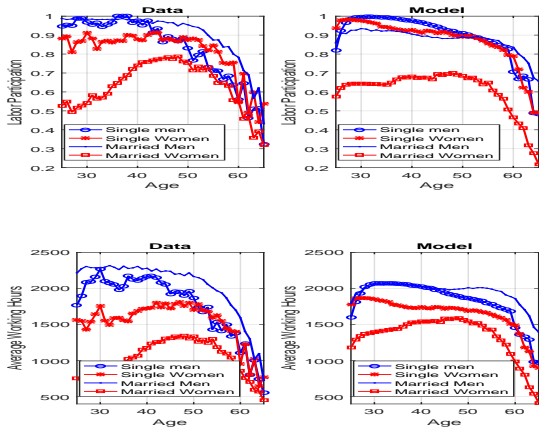Elasticity Results
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Aggregating up the profiles by gender and marital status

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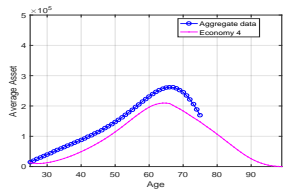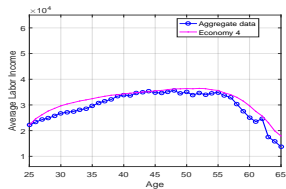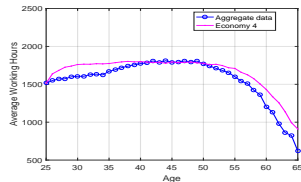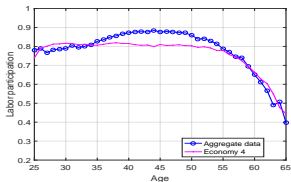000000000

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Economy 3: Couples and singles economy

- Model: couples and singles
- Calibration: data on men and women
- Calibrated parameters: discount factor, weight on consumption, participation cost (men, single women, and married women), Social Security benefit
- Targets: SS budget balance, participation and average hours (single and married men and women) at age 50 and average assets at 50 (couples, single men and women)

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Aggregating up the profiles by gender and marital status

Aggregating up the profiles, what have we learned?

- The economy with only men, calibrated using men
  - Overestimates participation by 10 percentage points
  - Overestimates average hours by about 500 hours
  - Overestimates average earnings by age
- Adding women in the calibration helps in fitting the aggregates.
- The marriage economy does a much better job of fitting aggregate behavior by age

Aggregating up the profiles, what have we learned?

- The economy with only men, calibrated using men
  - Overestimates participation by 10 percentage points
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- Adding women in the calibration helps in fitting the aggregates.
- The marriage economy does a much better job of fitting aggregate behavior by age

Compensated elasticities by age (singles economies)

	Participation in economy		Hours in economy	
Age	1	2	1	2
30	0.01	0.25	0.49	1.13
40	0.06	0.58	0.47	1.59
50	0.24	0.53	0.73	1.75
60	0.36	2.68	0.74	1.87

- Elasticity increases by age.
- Economy 1 has the lowest elasticity.

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Compensated elasticity by age (marriage economy)

	Participation					Hours				
	Single		Married			Single		Married		
	M	W	M	W	All	M	W	M	W	All
30	0.02	0.23	0.07	1.02	0.39	0.11	0.75	0.37	1.01	0.59
40	0.34	0.54	0.22	1.85	0.86	0.67	0.99	0.66	2.26	1.29
50	0.99	1.50	0.49	1.76	1.06	1.40	1.96	0.95	2.14	1.49
60	0.83	3.42	0.91	1.59	1.30	1.68	3.57	1.42	2.14	1.80

- Large heterogeneity
- Larger elasticity for women

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DFJM, 2021

- Can we better understand retirement savings by modeling both couples and singles?

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DFJM, 2021

- Can we better understand retirement savings by modeling both couples and singles?
  - Couples save differently compared to singles, even after retirement
  - Couples become singles and give out bequests when first one dies
  - Last survivor also leaves bequest

DFJM, 2021

- Can we better understand retirement savings by modeling both couples and singles?
  - Couples save differently compared to singles, even after retirement
  - Couples become singles and give out bequests when first one dies
  - Last survivor also leaves bequest
- What can we learn about precautionary savings and bequest motives when also modeling couples?

DFJM, 2021

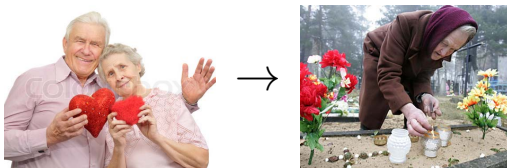- Understanding savings of couples and singles during retirement

DFJM, 2021

- Understanding savings of couples and singles during retirement
- How do *life transitions* affect the savings of *older households*?

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DFJM, 2021

- Understanding savings of couples and singles during retirement
- How do *life transitions* affect the savings of *older households*?

DFJM, 2021

- Understanding savings of couples and singles during retirement
- How do *life transitions* affect the savings of *older households*?

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DFJM, 2021

- Understanding savings of couples and singles during retirement
- How do *life transitions* affect the savings of *older households*?

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- Role of bequest motives?

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DFJM, 2021

- Understanding savings of couples and singles during retirement
- How do *life transitions* affect the savings of *older households*?

- Role of bequest motives?
- Role of medical expenses & survival risk?

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Data

- AHEAD Cohort of the HRS
- Households heads aged 72 or older in 1996, data every 2 years until 2016

Data

- AHEAD Cohort of the HRS
- Households heads aged 72 or older in 1996, data every 2 years until 2016
- Detailed information from "exit interviews" and "post-exit interviews"
  - Estates
  - End-of-life expenses
  - Wealth transfers to spouse+other heirs

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Facts

- Singles (especially low income singles) decumulate wealth
- Couples accumulate wealth
- Large wealth drops around death of first household member

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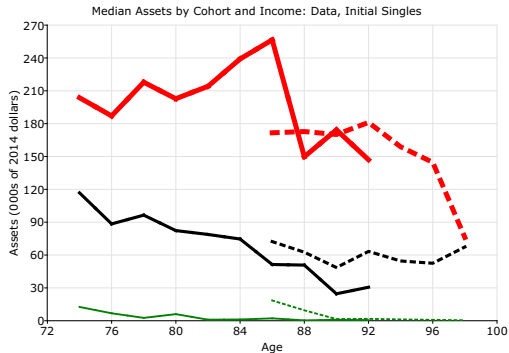
Wealth

(a) Initial Singles

(b) Current Couples

Wealth and Medical Expenses around Death
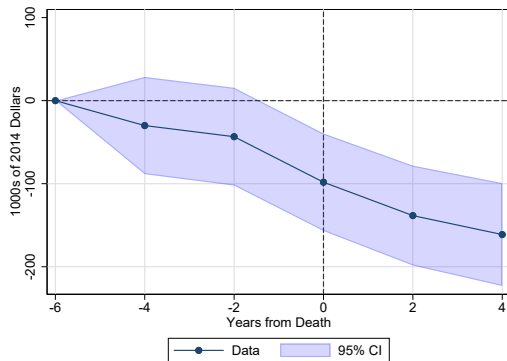
(a) Assets

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Wealth and Medical Expenses around Death

(a) Assets

(b) OOP medical spending

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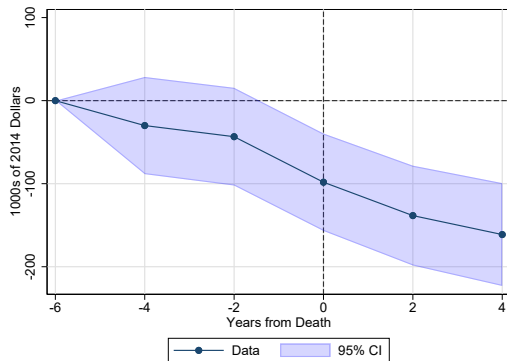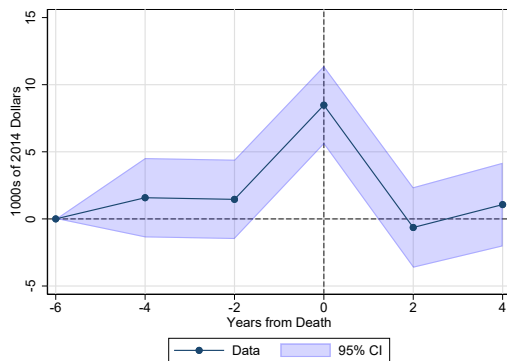
Wealth and Medical Expenses around Death
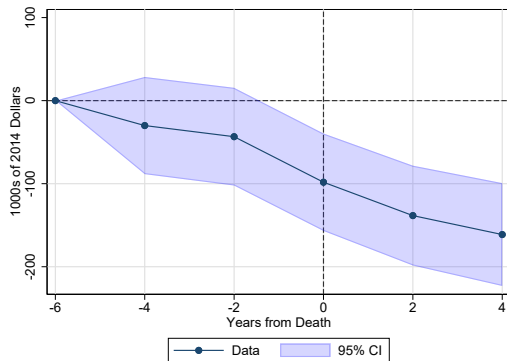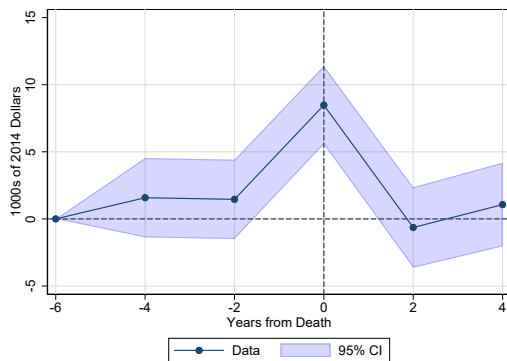
(a) Assets

(b) OOP medical spending

- Wealth drops \$160,000 around spousal death. Medical spending jumps \$27,000

Wealth and Medical Expenses around Death
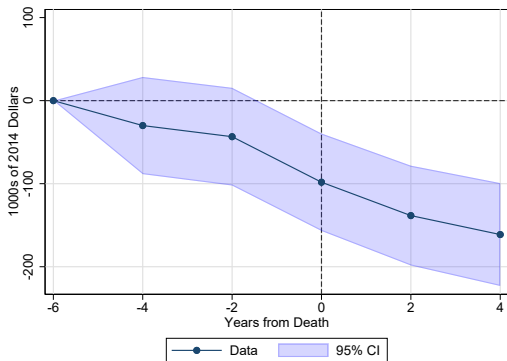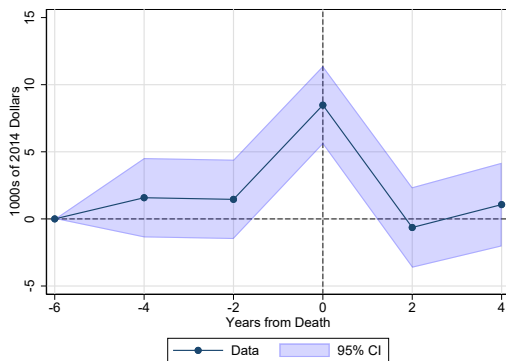
(a) Assets

(b) OOP medical spending

- Wealth drops $160,000 around spousal death. Medical spending jumps $27,000
- Transfers to non-spousal heirs average $79,000

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Model Overview

- Family structure: couples and singles. They consume, save, and leave bequests

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Model Overview

- Family structure: couples and singles. They consume, save, and leave bequests
- Bequest motives
  - When first household member dies
  - When last one dies

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Model Overview

- Family structure: couples and singles. They consume, save, and leave bequests
- Bequest motives
  - When first household member dies
  - When last one dies
- Medical spending
  - Rich pay out of pocket, poor covered by Medicaid
  - End-of-life expenses

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Model Overview

- Family structure: couples and singles. They consume, save, and leave bequests
- Bequest motives
  - When first household member dies
  - When last one dies
- Medical spending
  - Rich pay out of pocket, poor covered by Medicaid
  - End-of-life expenses
- Health and longevity: Rich, married, healthy live longer

Two-step Estimation Strategy

- First step: estimate parameters of income, health, mortality, and medical expense processes.
- Second step: choose preference parameters and consumption floor using the method of simulated moments (MSM) to match
    - Wealth and Medicaid

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Estimated Bequest Motives

$$\phi_j \frac{(b + \kappa_j)^{(1-\nu)}}{1-\nu},$$

when first ($j = 1$) and last ($j = 0$) spouse dies

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Estimated Bequest Motives

$$\phi_j \frac{(b + \kappa_j)^{(1-\nu)}}{1 - \nu},$$

when first ($j = 1$) and last ($j = 0$) spouse dies

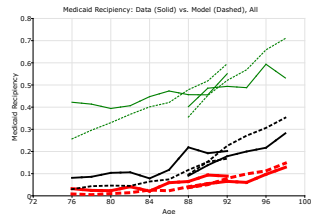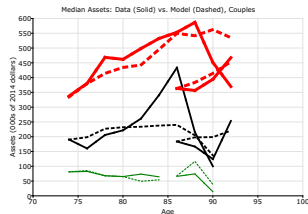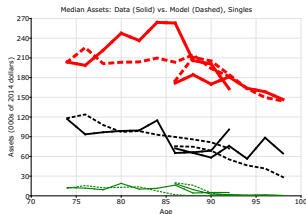Share allocated to bequests when death is certain next period

-- Singles   — Couples

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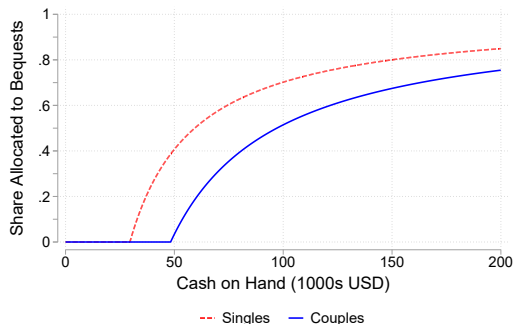
Estimated Bequest Motives

$$\phi_j \frac{(b + \kappa_j)^{(1-\nu)}}{1 - \nu},$$

when first ($j = 1$) and last ($j = 0$) spouse dies

Share allocated to bequests when death is certain next period
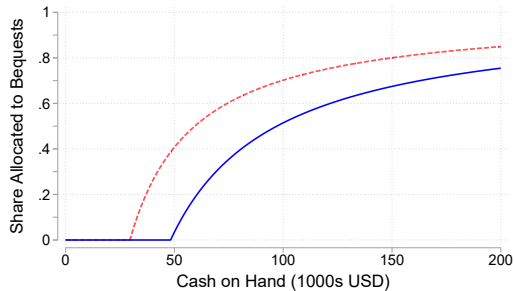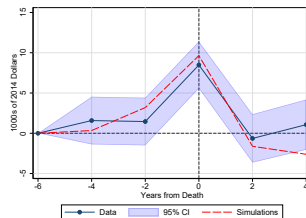

-- - Singles — Couples
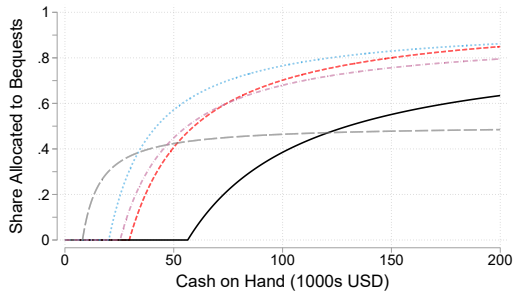
-- - Singles — DFJ ⋯⋯ Lockwood — ABCST — L&T

Model Fit: Wealth and Medicaid

Median Assets: Data (Solid) vs. Model (Dashed), Singles

Median Assets: Data (Solid) vs. Model (Dashed), Couples

Medicaid Recipiency: Data (Solid) vs. Model (Dashed), All

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Validation: Wealth and OOP Around Death
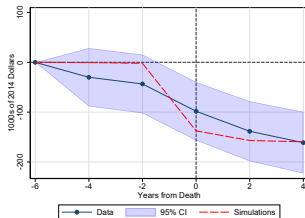
- Model fits wealth drops and medical spending around death

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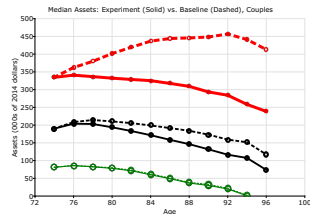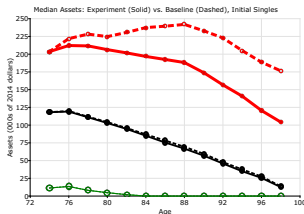Conclusions
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Understanding Savings Motives

- Experiments: re-solve and re-simulate model
  1. Set medical spending to zero
  2. Eliminate bequest motives
  3. No medical spending and no bequest motives
- Fix age-74 distribution of state variables, utility parameters

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What is the Role of Medical Spending?
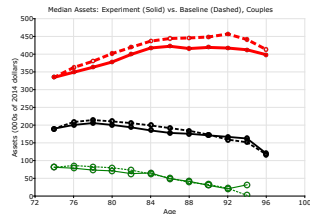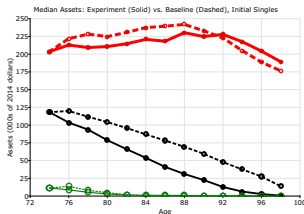
- Singles: medical spending most important for middle income
- Couples: less important

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What is the Role of Bequest Motives?

- Singles: bequest motives more important for high income
- Couples: important for middle income as well
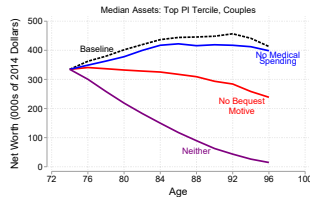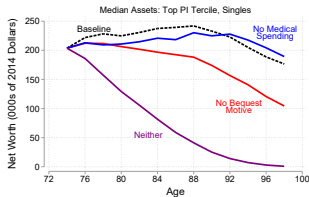
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How does Medical Spending Interact with Bequest Motives?

Median Assets: Top PI Tercile, Singles

Median Assets: Top PI Tercile, Couples

- Interactions are important
- Medical spending more important when no bequest motives

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How does Medical Spending Interact with Bequest Motives?
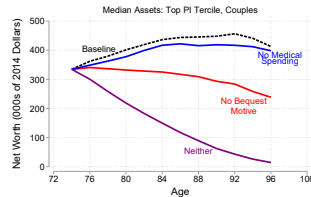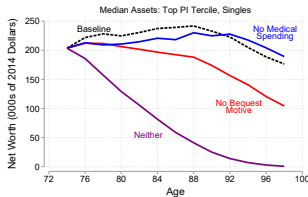
- Interactions are important
- Medical spending more important when no bequest motives
- But this paper shows that bequest motives are important

DFJM 2021

- We establish the following facts
  - Singles decumulate wealth as they age
  - Couples accumulate wealth as they age
  - Wealth drops significantly at the death of a spouse

DFJM 2021

- We establish the following facts
  - Singles decumulate wealth as they age
  - Couples accumulate wealth as they age
  - Wealth drops significantly at the death of a spouse
- Estimate a rich model of savings and find that
  - Medical expenses, including end-of-life: important
  - Transfers to heirs: even more important
  - Interaction of bequest motives and medical expenses: crucial

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Conclusions

• Modeling both singles and couples is important for many questions