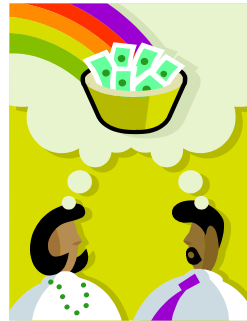


Optimization of Post-Retirement Income



“European Congress of Actuaries”

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Sources of post retirement income

- ✓ **Social Security** many households' *most important financial decision*:
 - Mandatory deferred life annuity with **complex claiming options**
 - Benefits for retirement / spouse / survivor
- ✓ **Funded Pension Programs**
 - Tax-favored programs / non tax-favored
 - Company Pensions Plans (DB / DC)
 - Private savings (Life insurance, annuities, mutual funds, bank deposits, other)
 - **Germany**: 16m Riester pension plans + 20m company plans
 - **USA**: 90m IRA, 401(k), 403 Accounts + 41m DB plans

→ These are the most important sources of retirement income for private households



Social Security Systems in Brief

Determination of Benefit

Early/ Late Retirement



Pension Pts: one point for every year earning the average earnings in that year
Pension = Pension Pts * Pension Value

- Early: Age 63
- Full Ret. Age (FRA): 66
- Red.: 3.6%, Credit 6%



AIME = Average Indexed Amount of Monthly Earnings -> converted to Pension at FRA using a degressive formula

- Early: Age 62
- FRA 66
- Red.: 5 - 6.67%,
- Credit 8%

Claiming Later Boosts Lifetime Social Security Annuity

Current rules (NRA = 66)

Claiming Age	Benefit as % of PIA	% Boost with 1 year delay	% Boost with N year delay
62	75		
63	80	6.67	6.67
64	86.67	8.34	15.56
65	93.33	7.70	24.45
66	100	7.15	33.33
67	108	8.00	44.0
68	116	7.41	54.67
69	124	6.90	65.33
70	132	6.45	76

2.9%, Unisex

Claiming retirement benefits and how to invest

Men (Women) age 62, 15 T p.a. pension benefits, wealth 200 T, consumption 25 T p.a. interest rate 0%, risky equities (mean 6%, Vol 18%)

Alternative 1: Claim retirement benefits age 62, invest at 0%, withdrawal 10 T p.a. + 15 T p.a. pension benefits

→ Age 82 running out of money (lifelong loss 10 T p.a.)

→ Probability to survive until age 82 = 52% (64%) = Longevity Risk

Alternative 2: Claim benefits age 66, invest at 0%, withdrawal 25 T until 66, thereafter withdrawal 5 T + 20 T (higher) retirement benefit

→ Age 86 running out of money (lifelong loss 5 T p.a.)

→ Probability to survive until age 86 = 36% (49%)

Alternative 3: Claim ret. benefits age 66, invest 40% stocks / 60% bonds

→ Probability running out of money and still alive = 16% (22%)

Retirement, Claiming, Investing & Working:

Retirement is not only a financial decision !

- ✓ Not all people have enough wealth to stop working and delay claiming pension benefits. Many must work.
- ✓ Combined **work decision** & **financial decision (claiming)**
 - claim benefits today & stop working today
 - claim benefits later & stop working later
 - claim benefits today & stop working later
 - claim benefits later & stop working today

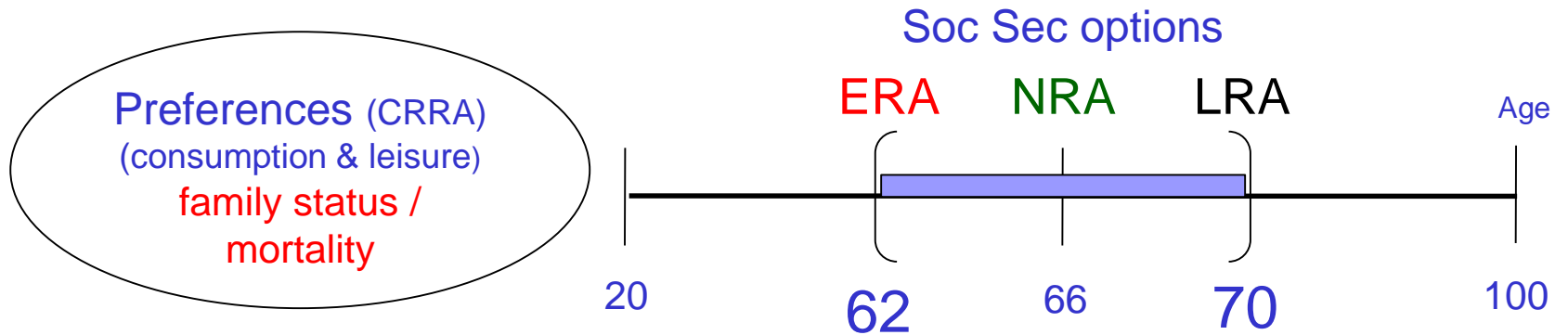
Additional Questions

- ✓ How to save & invest during work-life and withdrawal assets in retirement:
- ✓ What is the influence individual characteristics: **Health / family status / wealth / preferences**
- ✓ What are the impact of institutional characteristics: **taxation, claiming rules,**

Next step:

- ✓ Build & calibrate dynamic portfolio model over the **complete** life cycle

Life-Cycle Model: Building Blocks



Wages: stochastic; education, age, sex, uncertain family status

Social Security: payroll- tax / benefits claiming rules, uncertain family status

Financial Position: risky stock; bond; life insurance, uncertain family status

Housing: age, uncertain family status

numerical dynamic optimization; simulation

Consumption

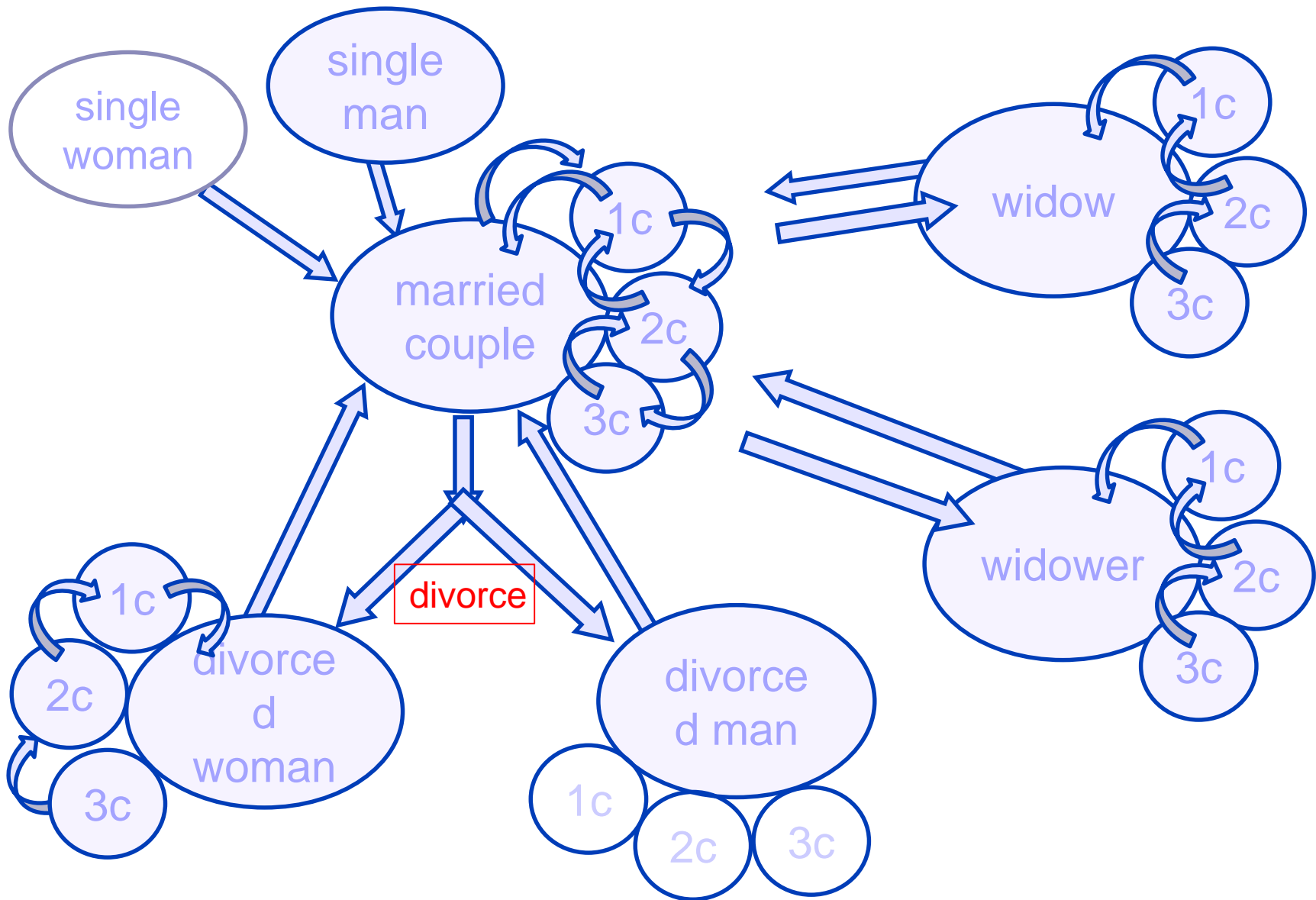
Work hours

Asset allocation

Retirement / claiming

Problem not easy to solve!

Family Status Transitions (MINT model)



Time Budget

$$16 \text{ hrs/day} = \theta^i + \tau^i + l^i$$

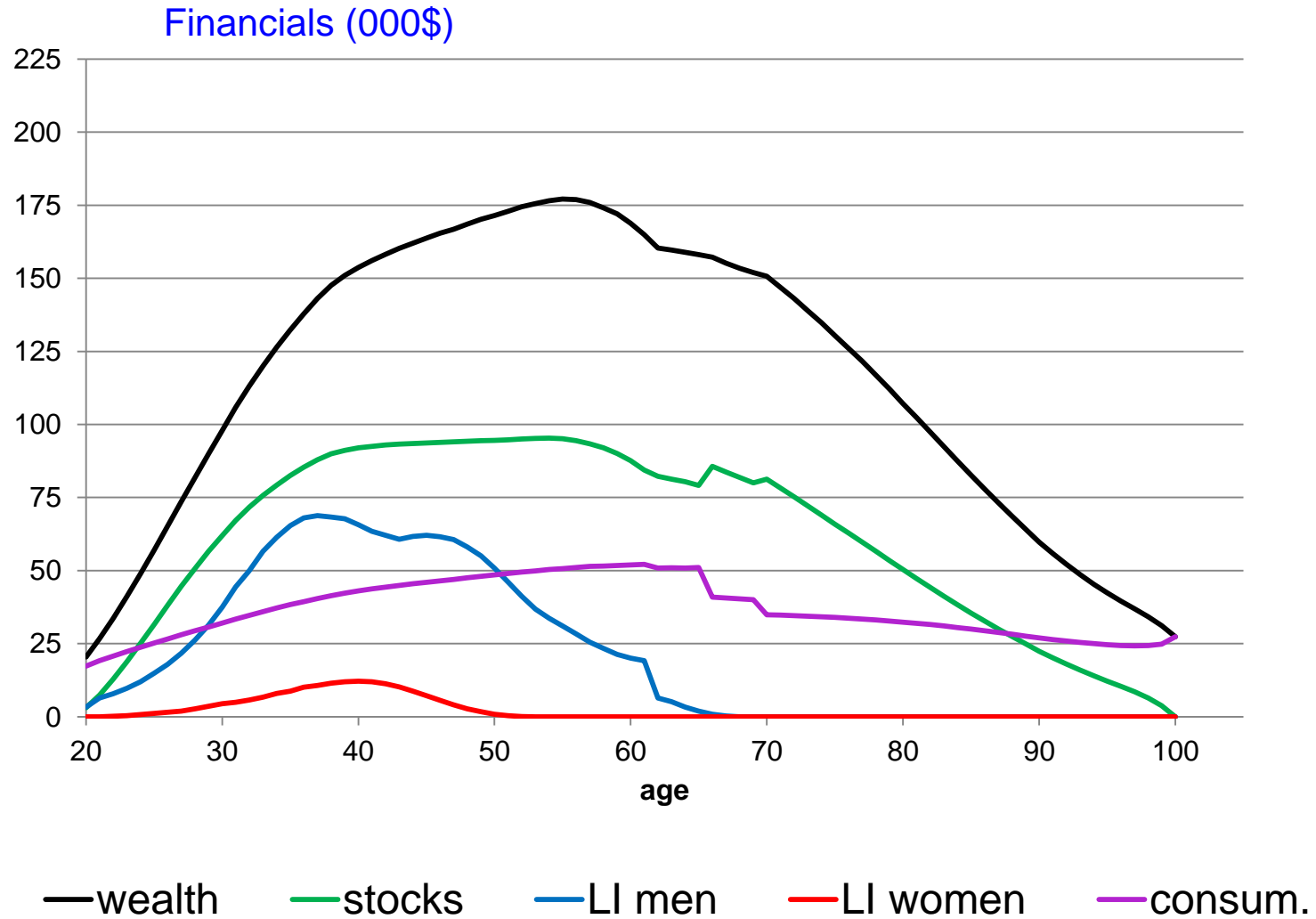
Home work (mkt) work leisure

From Time Use
Survey

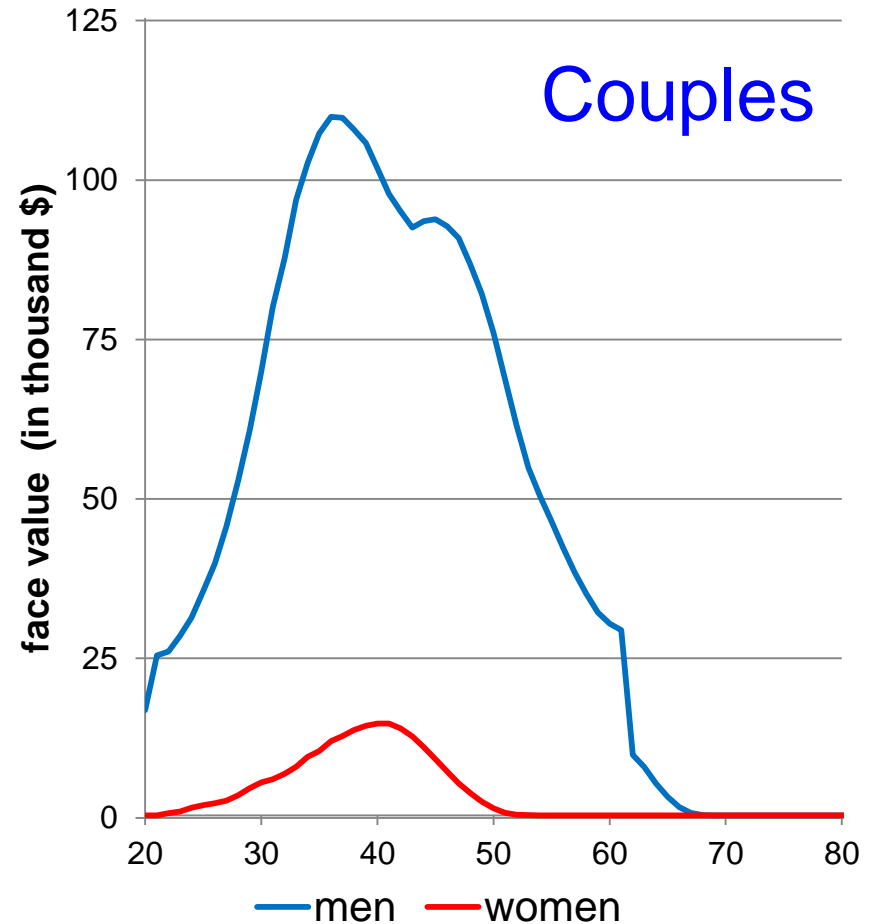
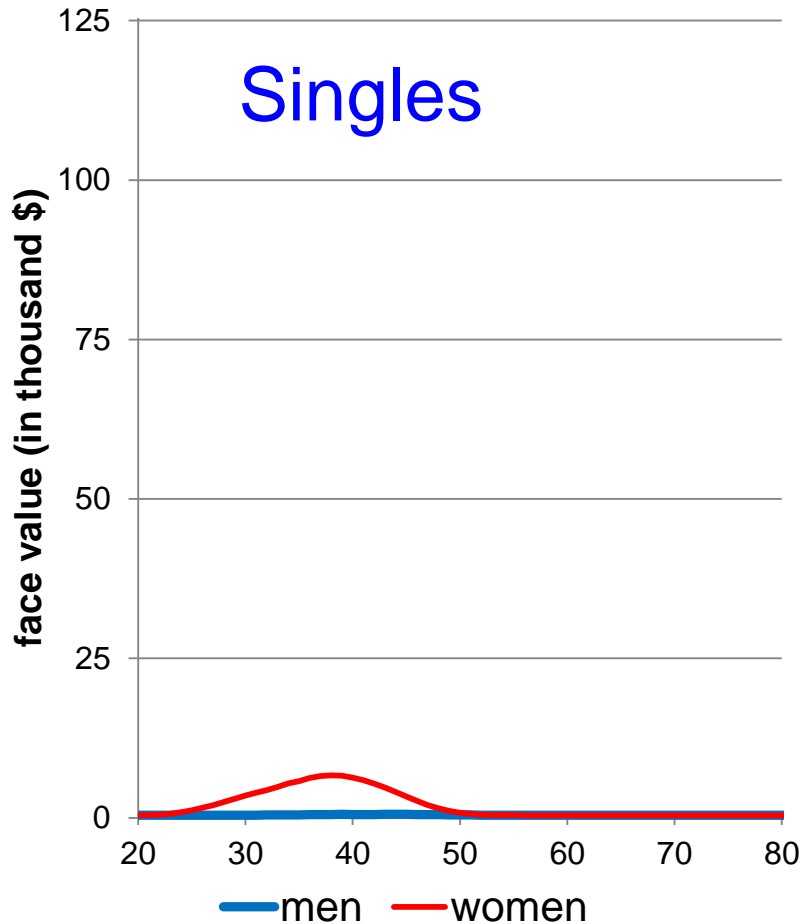
Provides
utility

Labor income: $Y^i = \tau^i \cdot \text{wage}^i$
Ret. benefit = f(income in best 35
years)

Life Cycle Profiles: Population averages



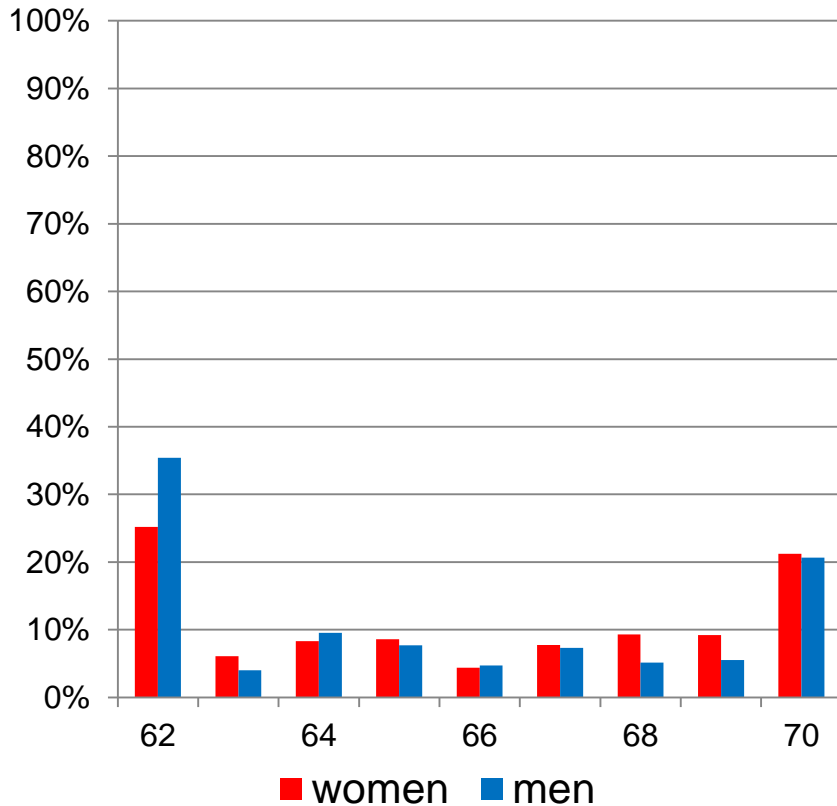
Life Insurance Face Values: Singles vs. Couples



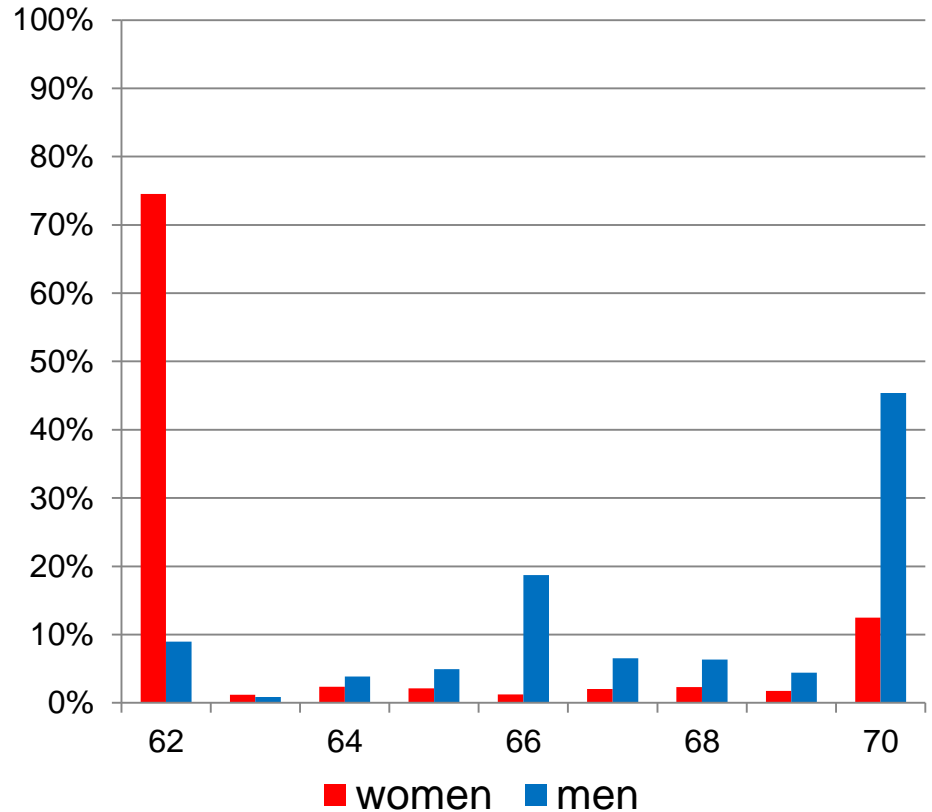
- Singles: virtually no demand (only single mothers)
- Couples: large demand for husbands; small demand for wives.

Social Security Claiming Ages: Singles vs. Couples

Singles



Couples



- Singles: similar for men and women.
- Couples: early claiming for wives; late claiming for husbands.

What we've learned...



- ✓ Optimal household portfolios driven by complex risks and opportunities:
 - Post retirement income highly influenced by saving and investment decision during working life.
 - Social Security *optionality* and *family shocks* interact to shape household financial behaviors (i.e. saving, stocks, bonds, insurance, and claiming).

- ➔ Modern financial planning must be able to integrate funded pensions, Social Security, and household objectives.

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