

# Lecture 12: Social Security, Retirement and Disability

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## GOALS OF THIS LECTURE

- (1) Understand main theories behind social security.
- (2) Empirical effects of social security.

## RETIREMENT PROBLEM

**Life-Cycle:** Individuals ability to work declines with aging but individuals continue to live after they are unwilling/unable to work

**Standard Life-Cycle Model Prediction:** Absent any government program, rational individual would save while working to consume savings while retired [draw Modigliani graph]

Optimal saving problem is extremely complex: uncertainty in returns to saving, in life-span, in future ability/opportunities to work, in future tastes/health

**In practice:** When govt was small  $\Rightarrow$  Many people worked till unable to (often till death) and then were taken care of by family members (paygo system not funded) [US elderly poverty rate very high before Social Security]

## GOVT INTERVENTION IN RETIREMENT POLICY

**Actual Retirement Programs:** All OECD countries implement substantial retirement programs (substantial share of GDP around 6-10%, US smaller around 4%)

Started in first part of 20th century and have been growing. Common structure:

Individual pay social security contributions (payroll taxes) while working and receive retirement benefits when they stop working till the end of their life (annuity)

**Various types of retirement programs (private or public):**

(a) Funded vs. Unfunded, (b) Defined Benefits vs. Defined Contributions, (c) Mandatory vs. Voluntary, (d) Universal vs. Means-tested, (e) Annuitized benefits vs. lumpsum

## FUNDED VS. UNFUNDED PROGRAMS

**Unfunded (pay-as-you-go):** benefits of current retirees are paid out of contributions from current workers [generational link]

current benefits = current contributions

**Funded:** workers contributions are invested in financial assets and will pay for benefits when they retire [no generational link]

current benefits = past contributions + market returns on past contributions

## Defined Contributions vs. Defined Benefits

**Defined Contributions (DC):** System specifies the level of contributions [e.g., 10% of earnings]. Benefits then depend on level of contributions and returns on contributions.

**Defined Benefits (DB):** System specifies the level of benefits [e.g., 60% of average earnings during career]. Contributions adjusted to meet required level of benefits.

DC pro: Easier to implement and contributions are not perceived as a “tax”

DC con: Benefits are risky. Risk in benefits worse than risk in contributions [as workers can adjust and absorb shocks more easily than retirees]

## EXAMPLES

- 1) Unfunded DB: most public retirement programs (such as Social Security in the US)
- 2) Funded DB: traditional US private employer pension plans [e.g., annual benefits =  $2.5\% \times \text{years worked} \times \text{last salary}$ ], a govt DB retirement program could also be funded [govt invests payroll taxes]
- 3) Funded DC: new US private employer pensions plans [401(k)s]: worker contributes fraction of salary and invests contributions in financial assets.
- 4) Unfunded DC: Notional accounts in some government retirement programs (Sweden): payroll taxes yield fictitious returns and benefits are based on contributions plus this fictitious (notional) return.

# WHY SHOULD GOVERNMENT INTERVENE?

**1) Individual Failures:** (MOST IMPORTANT) Individuals would not save adequately for retirement on their own (information and self-control problems).

Paternalism: govt imposes its preferences against individuals  $\Rightarrow$  Individuals should oppose govt program

Behavioral: individuals understand that they have problems and welcome govt intervention

**2) Market Failures:** Adverse selection in annuitization market

**3) Redistribution:**

(a) Within Generations: Retirement programs can redistribute based on life-time earnings (instead of annual)

(b) Across Generations: Retirement programs can redistribute across cohorts (so does govt debt)

## SOURCES OF RETIREMENT INCOME

1) Govt provided retirement benefits (US Social Security): US: For 2/3 of retirees, SS is more than 50% of income. 1/3 of elderly households depend almost entirely on SS.

2) Home Ownership: 75% of US elderly are homeowners

3) Employer pensions (tax favored): 40-45% of elderly US households have employer pensions. Two types:

a) Traditional: DB and mandatory: **employer** carries full risk [in sharp decline, many in default]

b) New: DC and elective: 401(k)s, **employee** carries full risk

60% of workers have access to empl. pensions, 45% contribute

4) Supplementary individual elective pensions (tax favored): IRAs and Keoghs (Keoghs for the self-employed)

## MODEL: MYOPIC SAVERS

1) Some individuals are rational:

$$\max u(c_1) + \delta u(c_2) \text{ subject to}$$

$$c_1 + s = w \text{ and } c_2 = s \cdot (1 + r), c_1 + c_2/(1 + r) = w$$

FOC:  $u'(c_2)/u'(c_1) = 1/[(1 + r)\delta]$ , let  $s^*$  be optimal saving

Example: If  $\delta = 1$  and  $r = 0$  then  $s^* = w/2$  and  $c_1 = c_2 = w/2$

2) Some individuals are myopic:

$$\max u(c_1) \text{ subject to}$$

$$c_1 + s = w \text{ and } c_2 = s \cdot (1 + r) \Rightarrow c_1 = w \text{ and } s = c_2 = 0$$

## MODEL: MYOPIC SAVERS

Social welfare is always  $u(c_1) + \delta u(c_2)$

Govt imposes forced saving tax rate  $\tau$  such that  $\tau \cdot w = s^*$  and benefits  $b = \tau \cdot w \cdot (1 + r)$ . We consider a funded system. Cannot borrow against  $b$  [as in current Social Security]

1) Rational individual unaffected: adjusts  $s$  one-to-one so that outcome unchanged [rational unaffected as long as  $\tau w \leq s^*$ ]: 100% crowding out of private savings by forced savings

2) Myopic individual affected (0% crowding out): new outcome maximizes Social Welfare

Forced savings is a good solution: (a) does not affect those responsible, (b) affects the myopic individuals in the socially desired way

## MODEL: COMMENTS

1) **Universal vs. Means-Tested Program:** Universal forced savings is better than means-tested program financed by tax on everybody. With forced savings:

- a) No transfer from myopic to non-myopic individuals
- b) No incentives to under-save to get means-tested pension

2) **Adding labor Supply Responses:**

$$u(c_1) - h(l_1) + \delta u(c_2) \text{ with } c_1 = (1 - \tau)wl_1 - s \text{ and } c_2 = (1 + r)(s + \tau wl_1) \\ \Rightarrow c_1 + c_2/(1 + r) = wl_1 \Rightarrow$$

- a)  $l_1$  of the rational individuals not affected [as benefits are **actuarially fair**]
- b)  $l_1$  of myopic is distorted downward:  $\max_{l_1} u((1 - \tau)wl_1) - h(l_1)$  as they perceive the tax but not the future benefits

## FUNDED VS UNFUNDED SYSTEMS

OLG model with 2 periods (work and retirement). Generation  $t$  lives in periods  $t$  and  $t + 1$ , cohort size  $N_t$ , wage  $w_t$

1) **Unfunded system:** Free benefits to 1st generation of retirees. For Generation  $t$ :

$$\begin{aligned} tax_t &= \tau w_t, \quad ben_t = \tau w_{t+1} N_{t+1} / N_t = \tau w_t (w_{t+1} / w_t) (N_{t+1} / N_t) \Rightarrow \\ ben_t &= tax_t \cdot (1 + g)(1 + n) = tax_t \cdot (1 + \gamma) \end{aligned}$$

All the other generations get return equal to  $\gamma \simeq n + g$  where  $n$  is population growth and  $g$  real wage growth per capita

2) **Funded system:** each generation gets a market return  $r$  on contributions:  $ben_t = tax_t \cdot (1 + r)$

## FUNDED VS UNFUNDED SYSTEMS

Famous theoretical results:

1) Samuelson JPE'58: In OLG economy with no capital and no way to save (chocolate economy), unfunded system generates **Pareto** improvement because it allows trade across generations [same result with fiat-money]

2) Diamond AER'65: In OLG economy with capital and saving, unfunded pension generates Pareto improvement iff  $n + g > r$  (economy is dynamically inefficient and has too much capital)

If  $n + g < r$ , unfunded pension redistributes from all generations to 1st generation.

## FUNDED VS UNFUNDED SYSTEMS

In practice  $r > n + g$  almost everywhere: funded system delivers higher returns because it does not deliver a free lunch to 1st generation

US economy: Annual  $n = 1\%$  and  $g = 1\%$  [ $n + g$  was higher in 1940-1970].

$r = 5 - 6\%$  if  $r$  is average return on all capital assets held by households over the long-run

Note that  $r$  is much more risky than  $n + g$ : risk adjusted market rate of return should be lower than average market rate  $r$  but still higher than  $n + g$

## GENERATIONAL ACCOUNTING

Let  $\gamma = n + g$  be the generational growth rate

1) Generation 0 nets:

$$V_0 = -0 \cdot w_0 N_0 + \tau w_1 N_1 / (1 + r) = \tau w_0 N_0 (1 + \gamma) / (1 + r)$$

2) Generation  $t$  nets:  $V_t = -\tau w_t N_t + \tau w_{t+1} N_{t+1} / (1 + r) = \tau w_0 N_0 (1 + \gamma)^t [-1 + (1 + \gamma) / (1 + r)]$

3) Accounting from period 0:  $\sum_{t=0}^{\infty} V_t / (1 + r)^t =$

$$\tau w_0 N_0 \frac{1 + \gamma}{1 + r} + \tau w_0 N_0 \sum_{t=1}^{\infty} \frac{(1 + \gamma)^t}{(1 + r)^t} \left[ -1 + \frac{1 + \gamma}{1 + r} \right] = 0$$

No behavioral responses  $\Rightarrow$  No net effect

Unfunded vs. Funded is about redistribution across cohorts

Originally: priority was to alleviate old age poverty so most govt started with unfunded system

## FUNDED VS. UNFUNDED SYSTEMS

Historical development of pension systems:

- 1) Before 20th century: private pension arrangements are family based (kids take care of aging parents) which is an unfunded system [funded private saving was never a major source of retirement income for the majority of the population]
- 2) 20th century: Governments introduce unfunded pension systems to replace the family based system [workers start paying taxes but no longer have to care for elderly parents]
- 3) Today: some debate on whether government systems should be funded instead of unfunded [social security privatization debate]

With  $r \gg n + g$ , unfunded system looks like bad deal for current and future generations

## SOCIAL SECURITY IN THE US

1) **Financed** by payroll taxes: 6.2% on employee and 6.2% on employer (up to annual cap of \$117,000 in 2014, indexed for wage growth): funds retirement and disability benefits [1.45%+1.45% with no cap funds medicare]

2) **Benefits** based on AIME (average indexed monthly earnings) over the best 35 years of (indexed) taxable earnings

Indexation based on average wage growth

PIA (primary insurance amount) is a piece-wise linear function of AIME: 90% of first \$700 of AIME, 32% of AIME over \$700 to \$4,300, 15% of AIME above \$4,300 ⇒ **Redistributive**

Average replacement rate around 40% (higher for low earners)

## SOCIAL SECURITY IN THE US

Married couple with  $PIA_H, PIA_W$  get maximum of

$1.5 * \max(PIA_H, PIA_W)$  and  $PIA_H + PIA_W$ .

Surviving spouse gets  $\max(PIA_H, PIA_W)$

Divorced spouse is eligible for benefits based on ex-spouse  $PIA$  if marriage spell longer than 10 years (no empirical spike in divorces after 10th anniversary though!)

Benefits are fully **annuitized** indexed based on consumer price index (debate about moving to less generous chained CPI)

## RETIREMENT AGE IN SS

1) **Normal Retirement Age (NRA):** Currently 66 and increasing slowly from 65 to 67. Get *PIA* when retiring at NRA

2) **Early Retirement Age:** is 62 [Earliest age you can get SS benefits (unless disabled)]. Benefits reduced permanently by 8% if retire 1 year before NRA, 16% if 2 years before NRA, etc. [actuarially fair on average]

3) **Late Retirement:** get permanently higher benefits [used to be 3% more per year of delay (unfair)] but now moving to 8% (actuarially fair). Benefits automatic at age 70.

⇒ Current SS system should not distort retirement age on average (as adjustments are fair) if people understand it

Early retirement age: Availability of benefits seems to have huge effects (inconsistent with standard model with no credit constraints) ⇒ **Liquidity Effects**

## EARNINGS TEST OF SS

Currently:  $62 \leq \text{Age} < \text{NRA}$ , benefits taxed away at 50% above \$15,000 of annual earnings.

$\text{Age} = \text{NRA}$ , benefits taxed away at 33% above \$40,000 of annual earnings.

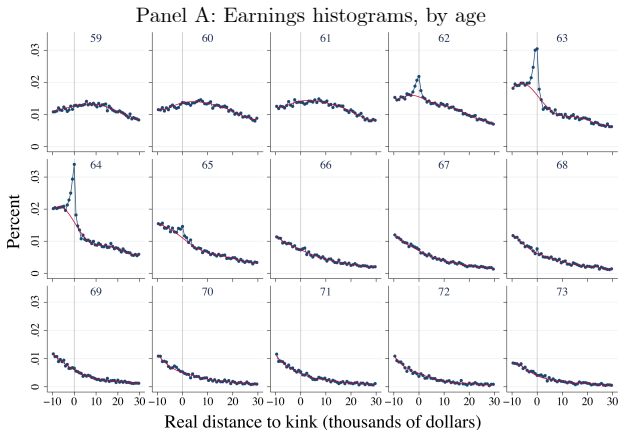
No earnings test for age above NRA

Actually, not a pure tax, as benefits taxed away will be credited back at NRA (as if you had retired later).

However, individuals may not understand this and actually bunch at the kink point of the Earnings Test [Friedberg Restat '00, CPS data and Gelber-Jones-Sacks '13, SSA admin data]

Source: Gelber, Jones, Sacks (2013)

Figure E.6: Adjustment Across Ages: Histograms of Earnings and Normalized Excess Mass, 59-73-year-olds Claiming OASI by Age 65, 2000-2006



## KEY QUESTIONS IN THE LITERATURE ABOUT SOCIAL SECURITY

- 1) How does Social Security affect private savings?
- 2) How does Social Security affect retirement?
- 3) What are the distributional implications for SS?
- 4) Funding problems: Social Security Reform and Privatization

## SOCIAL SECURITY AND SAVINGS: THEORY

Two period model  $u(c_1) + \delta u(c_2)$  st  $c_1 = w - \tau - s$  and  $c_2 = (1 + r)s + b$  where  $\tau$  is SS tax and  $b$  is SS benefits.

1) If  $b = \tau \cdot (1 + r)$  (actuarially fair program) and  $b \leq c_2^*$  (optimum with no SS) then  $ds/d\tau = -1 \Rightarrow$  SS crowds out private saving **one-for-one**

2) If  $b > c_2^*$ , then  $s = 0$  and  $ds/d\tau = 0 \Rightarrow$  0% crowd-out

Why does this matter?

Most SS programs are unfunded so if private savings fall, then capital stock will fall (in closed economy)

Lower capital stock per capita  $k$  increases rate of return  $r = f'(k)$  but reduces wages  $w = f(k) - rk$

## Additional effects in more complex models:

- 1) Uncertainty in retirement spell+missing annuity market  $\Rightarrow$  Precautionary savings high  $\Rightarrow$  SS provides annuity and reduces private savings more than one-to-one
- 2) Induced retirement effect: if benefits are larger than what you would have saved, you may decide to retire earlier, in which case you want to save more ( $s$  increases)
- 3) If  $b < \tau(1+r)$  (not actuarially fair program), then income effect reduces  $c_1$  and hence increases  $s = w - \tau - c_1$
- 4) Ricardian Equivalence effect: pay-go is a transfer from all future generations to first generation: does not change the budget set of the dynasty  $\sum c_t / (1+r)^t \leq \sum w_t / (1+r)^t$

First generation can exactly offset pay-go pension by leaving larger bequests to kids, etc.  $\Rightarrow$  No effect on consumption

## SOCIAL SECURITY AND SAVINGS

Four approaches:

- 1) Aggregate Time series within a country [Feldstein JPE'74]
- 2) Micro-Cross sectional [Feldstein and Pellochio '79]
- 3) Cross-country [Barro-McDonald JpubE'79]
- 4) Reform based within a country

First 3 approaches are weak in terms of identification with mixed evidence (see Page, CBO'98 extensive survey).

Last approach is much more promising and could be extended to other countries

## Italy Reform Study

Italy reform 1992: Attanasio- Brugiavinni QJE '03. Cohort based reform: young workers affected but not older workers (unfortunately phased-in slowly, no sharp discontinuity)

Compare saving rates of old cohort (generous SS) to new cohort (less generous SS)  $\Rightarrow$  Find 30-40% of SS cuts offset by private savings

## UK Reform Study

Attanasio and Rohwedder AER'03

1) Basic State Pension (BSP) indexation change, 1975 (from ad-hoc to wages) and 1981 (from wages to prices). BSP is a flat rate pension (today replaces 15% of past earnings)

2) Introduction of SERPS (State Earnings-Related Pension Scheme) in 1978 (supplemental contributory pension, mandatory for those with no employer pension till 1988, not mandatory since 1988)

Heterogeneity in responses: no response for young workers (likely credit constrained), no response to basic pension reform (lower paid workers), large response to SERPS

## Next Steps

US: use private sector DB plans or DB reforms (like freezes) and see whether workers adjust their own savings to changes in their retirement plans (not easy to get the data but identification would be better).

Outside US: cohort based reforms that are not phased-in slowly are best (allow to do RDD), even better if reforms affect different regimes differently (public vs private sector workers).

Main difficulty is getting good savings data (few administrative data records all wealth sources, have to rely on smaller and noisier survey data)

Chetty et al. QJE14 in Denmark recently makes good progress

## Chetty et al. QJE14: Govt mandated Saving

With Danish administrative data, can observe earnings, income (linked to firms) as well as savings (both retirement savings and other financial savings)

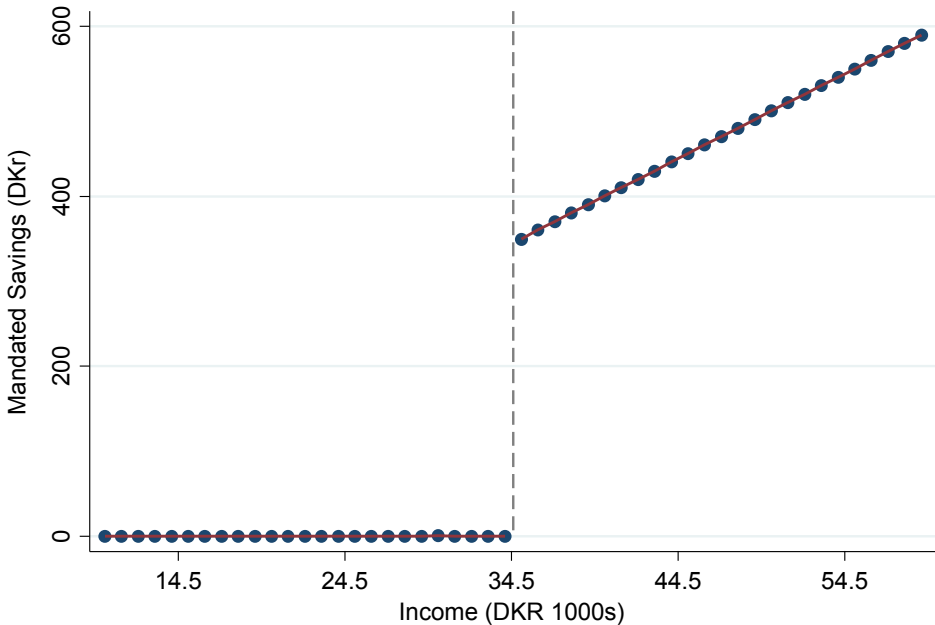
In Denmark, starting in 1998, firms are mandated (by govt) to make automatic retirement contributions to workers' retirement savings accounts of 1% of earnings when earnings crosses some threshold (34.5K DKr)

⇒ Generates a discontinuity by earnings levels: can use a **Regression Discontinuity Design**

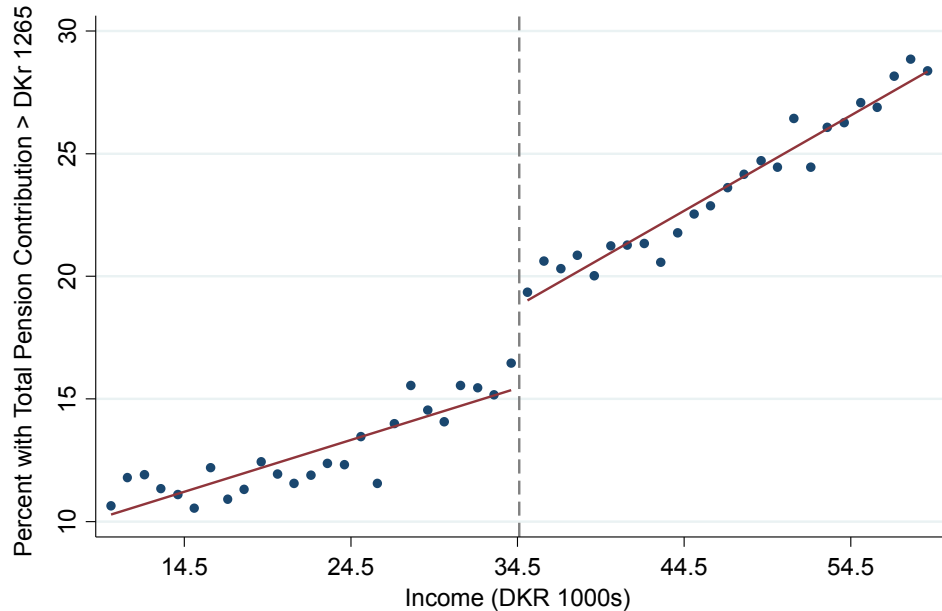
Main finding: \$1 contribution to mandatory savings plan → \$1 increase in pensions and total savings

No offset of the forced contribution with reduced savings

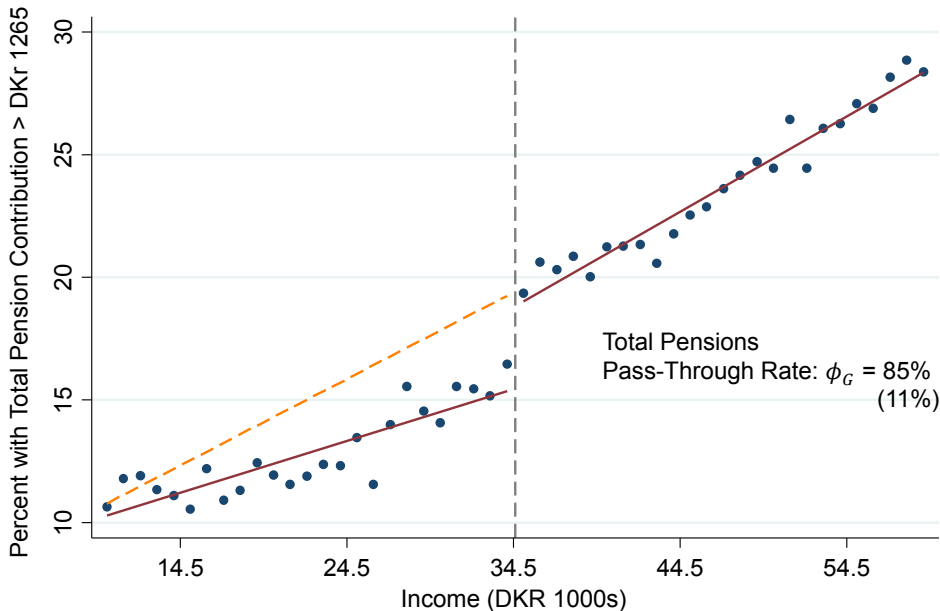
## Mandated Savings (M) Around Eligibility Threshold in 1998



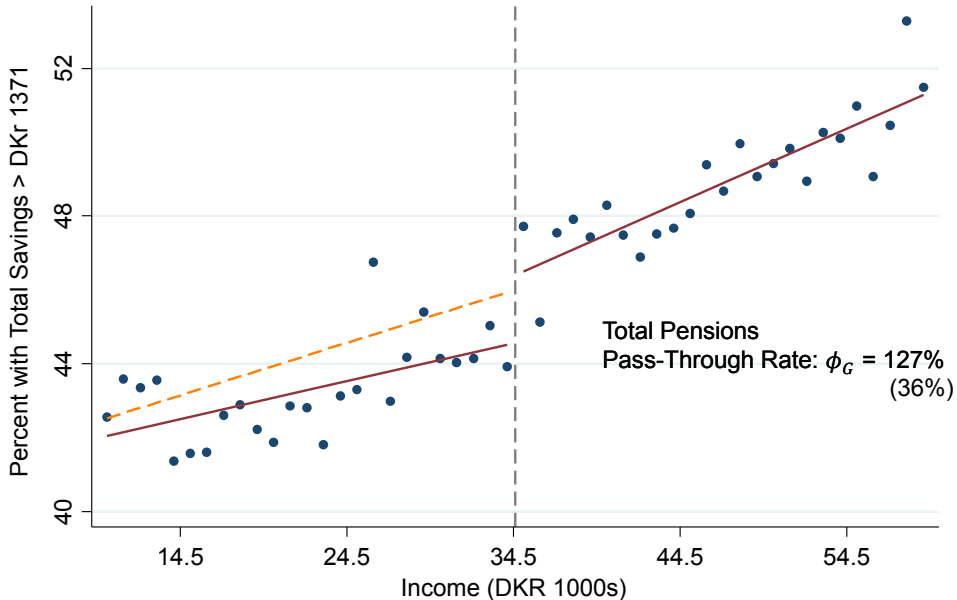
## Effect on Mandate on Total Pension Contributions



## Effect on Mandate on Total Pension Contributions



## Effect on Mandate on Total Saving



## Mandated Savings Plan: Pass-Through Estimates

Dep. Var.:	Δ Total Pensions			Total Pension Threshold	Total Saving Threshold	Total Ind. Saving Threshold	Net Saving Threshold
	(1)	(2)	(3)	(4)	(5)	(6)	
Pass-Through Estimate	0.883 (0.204)	1.052 (0.200)	0.801 (0.310)	0.845 (0.113)	1.268 (0.363)	1.336 (0.349)	2.188 (0.587)
Research Design	Linear	Linear	Quadratic	Linear	Linear	Linear	Linear
No. of Obs	35,578	35,578	35,578	158,229	148,380	148,380	128,988

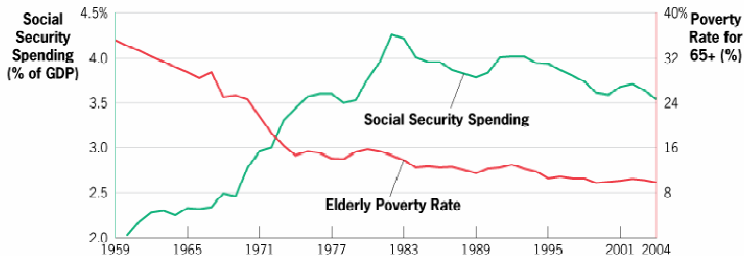
## Evidence for Myopia and adequate savings

- 1) Diamond JpubE 1977: old age poverty has fallen as SS expanded (Gruber book graph). Poverty for other groups has not fallen nearly as much
- 2) Fall in consumption **at** retirement: Bernheim, Skinner, Weinberg (2001) show that drop in consumption is significant and sharply correlated with wealth [consistent with myopia]
- 3) Countervailing view: Scholz et al. JPE '06 develops micro-model of rational savings with uncertainty. With reasonable parameters, 80% of families over-save, 20% under-save [optimal savings is low given SS, DB, Medicaid asset tests]

## Consumption-Smoothing Benefits of Social Security

### Living Standards of the Elderly

■ FIGURE 13-2



**Elderly Poverty and Social Security, 1959–2004** • There is a striking negative correspondence over time between the poverty rates of the elderly (which have fallen) and the size of the Social Security program (which has risen).

Source: U.S. Bureau of the Census (2005b).

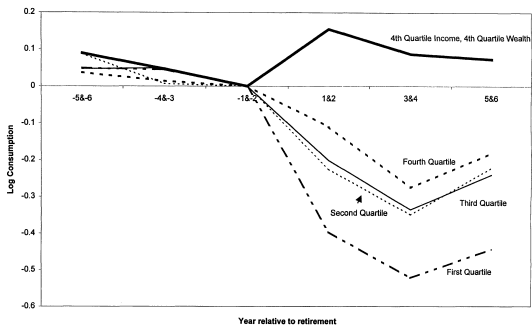


FIGURE 4. CHANGE IN CONSUMPTION AT RETIREMENT, BY WEALTH QUARTILE

## Consumption drop at retirement: Aguiar-Hurst JPE' 05

Starting point: Empirically, consumption falls with retirement...but studies use expenditures as measure of consumption

Aguiar-Hurst JPE05 shows that it is important to differentiate between consumption and expenditures. Further, the paper provides new information on the complementarity of consumption and leisure after retirement.

- 1) Confirm that expenditure on food falls by 17% at retirement but
- 2) Time spent on home production rises by 60%
- 3) All measures of caloric intake, vitamin intake, meat quality, etc. do not drop at retirement (find that caloric intake falls when getting unemployed, hard to believe but suggestive)

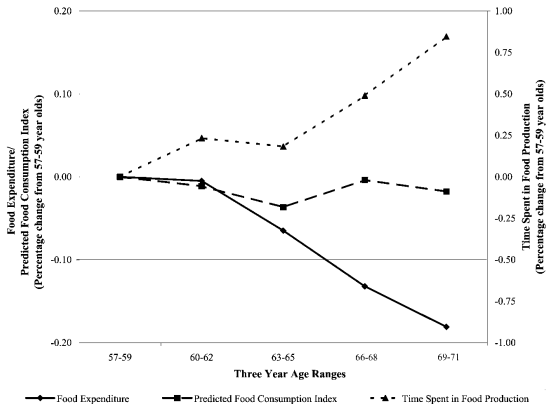


FIG 1.—Percentage change in food expenditure, predicted food consumption index, and time spent on food production for male household heads by three-year age ranges. Data are taken from the pooled 1989–91 and 1994–96 cross sections of the CSFII, excluding the oversample of low-income households. The sample is restricted to male household heads (1,510 households). All series were normalized by the average levels for household heads aged 57–59. All subsequent years are the percentage deviations from the age 57–59 levels. See Sec. IV for details of data and derivation of food consumption index

## Redistributive effects of SS

Various studies (Liebman and Feldstein '02, handbook chapter)

1) Redistribution to older generations due to pay-go structure

2) Within cohort redistribution:

Annual: Redistributes from workers to elderly

Life-time: Roughly neutral in terms of redistribution by life-time earnings because:

a) Redistribution in the progressive benefits formula

b) Regressivity because people with higher incomes live longer

## Redistributive effects of SS

Life-time perspective best if people are rational life-time savers

Annual perspective best if people totally myopic

Redistribution from males to females (as substantial longevity differences by gender)

Redistribution from single to married and from two earner couples to one earner couples (as non-working spouses get 50% spousal benefits)

## SOCIAL SECURITY AND RETIREMENT: THEORY

Two key elements of a social security system may affect retirement behavior:

1) Availability of benefits at **Early Retirement Age (ERA)**: (62 in US)

Those effects arise because of (a) liquidity constraints, (b) self-control problems, (c) focal point norm

2) Non-actuarially fair adjustments of benefits for those retiring after the ERA:

If benefits are not adjusted in a fair way, they can create a huge implicit tax on work (US used to have very little adjustment)

Empirical literature not very good at distinguish those two effects

## Social Security and Retirement: Early retirement age

Conceptually early retirement age can be seen as a device to force myopic people to keep working

**(a) Rational individual:** Wants to retire at age 60 but benefits not available till age 62=ERA. Rational individual saves ex-ante to fund retirement at age 60-61 out of savings before getting benefits at age 62.

⇒ ERA does not affect the rational person [if she can perfectly forecast retirement age]

**(b) Myopic person:** Person cannot resist retiring once benefits are available. Myopic person will typically have no savings so cannot retire before ERA.

⇒ ERA affects positively the myopic person to prevent her from retiring too early (optimal ERA analysis yet to be done)

## Social Security and Retirement: Implicit tax

Theory: life-time budget constraint: Live  $T$  years, work  $R$  years and retire  $T - R$  years.

$C$  life-time consumption and  $R$  retirement age. With constant wage  $w$  and interest rate  $r = 0$ :  $C = w \cdot R$

With a fair retirement program:  $w - \tau$  when working and  $b(R) = \tau R / (T - R)$ , then  $C = (w - \tau)R + b(T - R) = wR$

⇒ No effect on lifetime budget constraint

⇒ Actuarially fair system does not affect retirement age [with no uncertainty, no myopia, and no credit constraints]

## Social Security and Retirement

SS programs are not actuarially fair in general:

Benefits  $b(R)$

Life-time consumption:  $C = (w - \tau)R + (T - R)b(R)$

$$dC/dR = w - \tau - b + (T - R)b'(R)$$

Distort both slope and levels: substitution and wealth effects ( $dC/dR = w \Rightarrow$  system is actuarially fair)

Implicit tax rate of SS program:  $t = [w - dC/dR]/w$ :

If you delay retirement by 1 year, your PDV of consumption increases by  $dC/dR = w \cdot (1 - t)$  [fair has  $t = 0$ ]

## Social Security and Retirement

Some European systems had  $b'(R) = 0$  (no adjustment of benefits)

$\Rightarrow dC/dR = w - \tau - b$  If  $b = 0.6 \cdot w$  and  $\tau = .15 \cdot w$ , then  
 $dC/dR = w \cdot (1 - 0.75) \Rightarrow$  enormous implicit tax  $t = 75\%$

United States now has  $b'(R) = .08$  (8% adjustment per year) which is about actuarially fair

## Empirical Evidence

1) US time series evidence  $LFP_t = \alpha + \beta \cdot SS_t / w_t + \varepsilon_t$  (replacement rate): growth of SS and reduced LFP of elderly are correlated but not clear effect is causal

2) US cross-sectional evidence  $LFP_i = \alpha + \beta SS_i / w_i + \varepsilon_i$

Poorly identified as replacement rate  $SS_i / w_i$  is function of  $w_i$  and regression should control for  $w_i$  non-parametrically

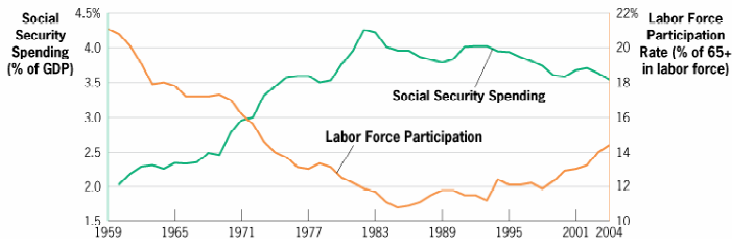
Krueger and Pischke JOLE'92 use notch generation (larger benefits for a couple generations due to ad-hoc adjustments, affects level of benefit but not the slope of lifetime budget constraint)  $\Rightarrow$  Find small wealth effects of SS on retirement

All this literature does not distinguish clearly wealth and substitution effects

# 13.3 Social Security and Retirement

## Evidence

■ FIGURE 13-3



**Elderly Work and Social Security, 1959–2004** • There is a striking negative correspondence over time between the labor force participation (LFP) rates of the elderly (which have fallen) and the size of the Social Security program (which has risen).

Source: U.S. Department of Labor (2005b) and the Bureau of Labor Statistics, accessed at <http://www.bls.gov/wemp/home.htm>.

## Retirement Hazard Spikes

Retirement hazard at age  $t$  is the fraction of people who retire at age  $t$  among those still working at age  $t - 1$

Retirement spike at Early Retirement Age of 62 very clear and convincing: spike moves from 65 to 62 when the ERA was reduced from 65 to 62

⇒ Suggests strong liquidity effects / non-rational behavior [outside the lifetime constraint model]

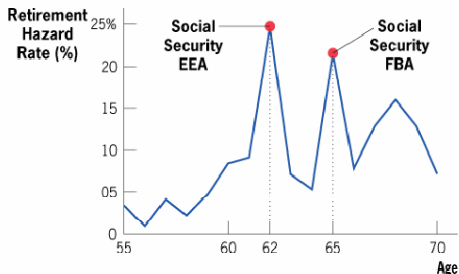
Evidence from other countries also shows strong spike effects

Note: those macro-level studies do not always define carefully retirement: claiming benefits vs. stopping to work. Stopping to work is fuzzy.

# 13.3 Social Security and Retirement

## Evidence

■ FIGURE 13-4



**Hazard Rate of Retirement for Males in the United States** • The male hazard rate, or exit rate at each age given that a man has worked to that age, has a distinct spike at age 62 (the Early Entitlement Age, EEA) and 65 (the Full Benefit Age, FBA), key ages for the Social Security system.

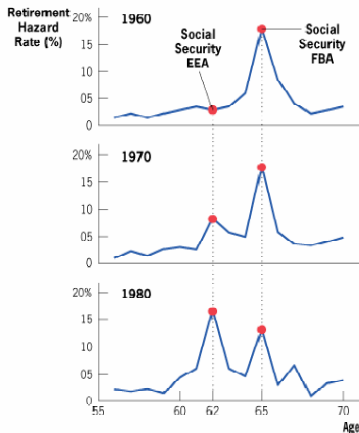
Source: Diamond and Gruber (1999), Figure 11.12.

**retirement hazard rate** The percentage of workers retiring at a certain age.

# 13.3 Social Security and Retirement

## Evidence

■ FIGURE 13-5



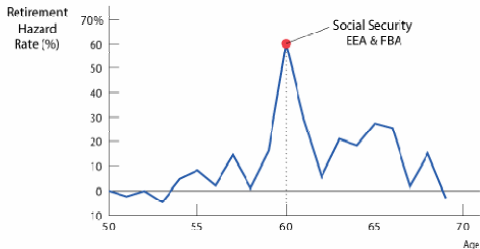
**The Evolution of the U.S. Male Retirement Hazard** • In 1960, before the EEA of 62 was introduced for men, the hazard rate for men was highest at age 65 (the FBA), with no spike at age 62. By 1970, the spike at 62 had begun to emerge, and by 1980 it was larger than the spike at age 65.

Source: Gauthier and Wise (1999), Figure 12

# 13.3 Social Security and Retirement

## Evidence

■ FIGURE 13-6



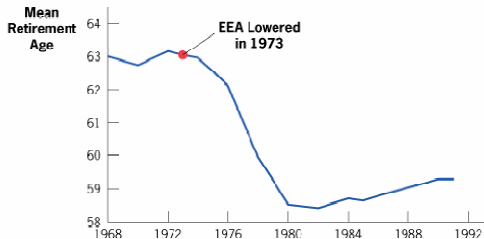
**Hazard Rate of Retirement in France** • In France, there is an enormous exit rate from the labor force at age 60, which is both the EEA and FBA.

Source: Gruber and Wise (1998), Figure 11.

# 13.3 Social Security and Retirement

## Evidence

■ FIGURE 13-7



**Change in Average Retirement Age in Germany from 1968 to 1992** • Germany lowered its age of social insurance entitlement by five years (from 65 to 60) in 1973; within seven years, the average age at which individuals retire had fallen from 63 to 58.

Source: Gruber and Wise (1999), Figure 5.

## Early Retirement Age effect on Retirement

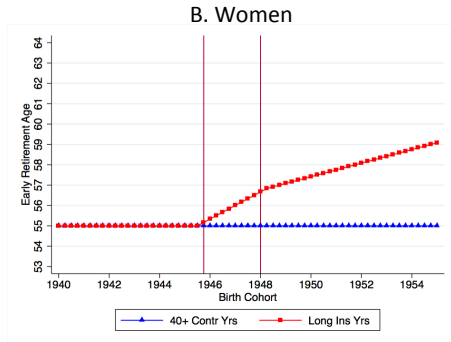
Best evidence from Manoli-Weber '13. Austria changed the ERA by cohorts for those with less than 45+ contribution years (40+ for women)

Men goes from 60 to 62, Women goes from 55 to 57 (based on birth quarter)

Use population admin data on benefits claims and work. Sample is everybody working at age 53.

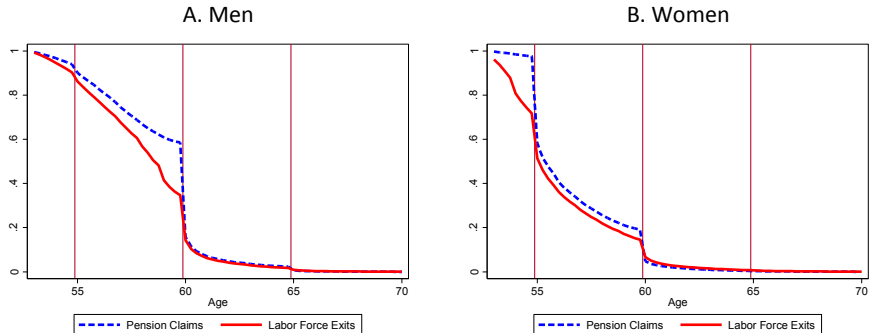
- 1) Very strong effect on claiming age (benefits claiming)
- 2) Strong effect on retirement decision (work behavior)
- 3) Evidence of spillover effects on groups not affected [men (women) with 45+ (40+) contribution years]

# Fig. 1. Early Retirement Ages by Pension Type



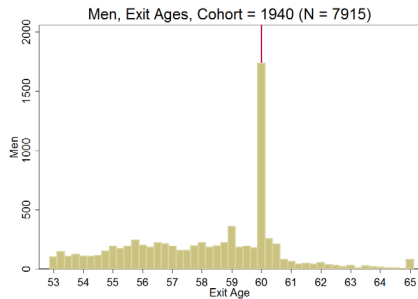
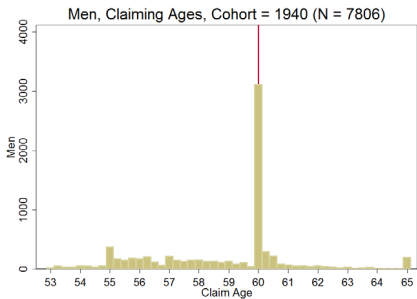
Notes: The vertical lines mark the beginning of changes implemented under the 2000 and 2004 pension reforms.

# Fig. 2. Pre-Reform Pension Claims & Job Exits

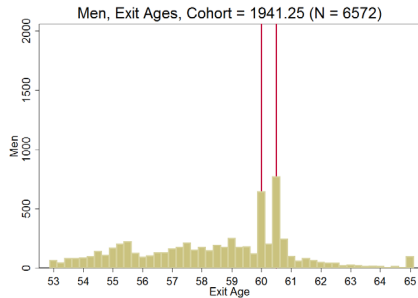
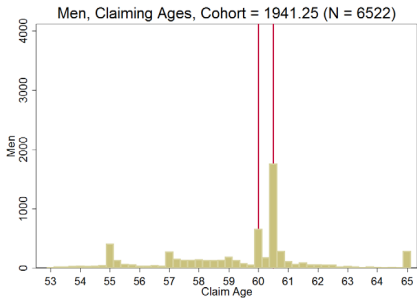


Notes: For computing the survival curves, the sample is restricted to pre-reform birth cohorts (1930 through 1939 for men and 1935 through 1944 for women) and also to individuals for whom a claim is observed prior to age 70. See Table 1 for the full sample restrictions.

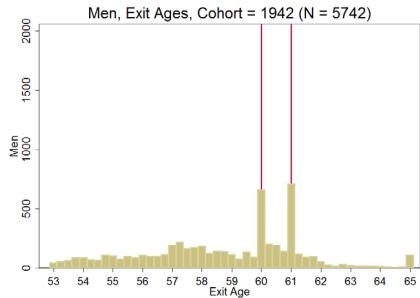
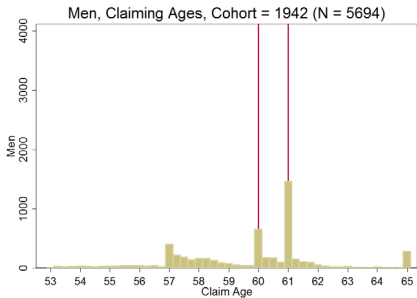
# Fig. 5A. Men's Claiming Ages & Exit Ages by Cohort



# Fig. 5A. Men's Claiming Ages & Exit Ages by Cohort



# Fig. 5A. Men's Claiming Ages & Exit Ages by Cohort



# Fig. 5A. Men's Claiming Ages & Exit Ages by Cohort

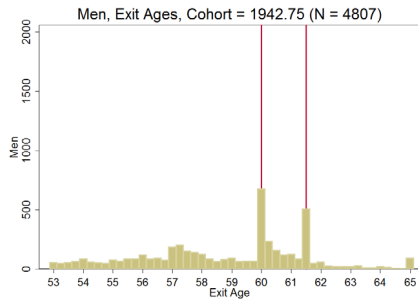
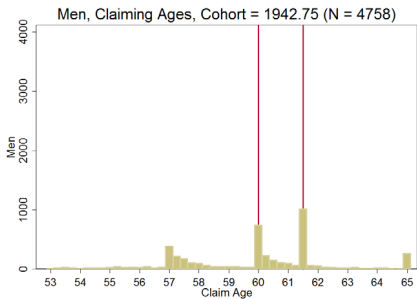
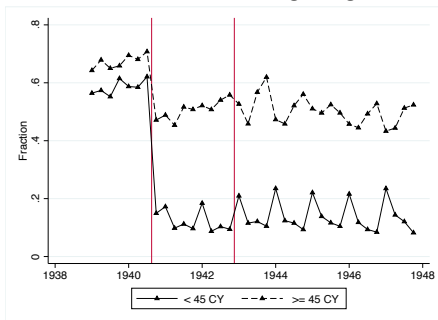
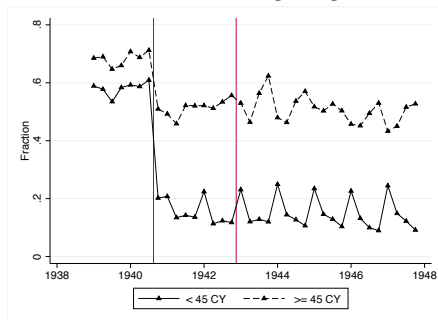


Fig. 9. Claiming & Exiting by Birth Cohort & Contribution Years, Men

A. Fraction Claiming at Age 60



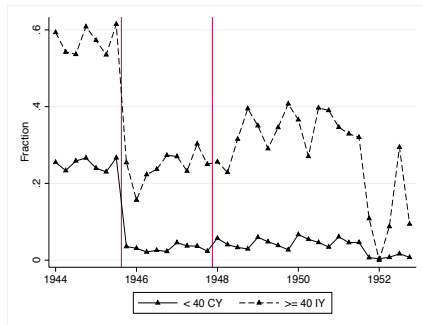
B. Fraction Exiting at Age 60



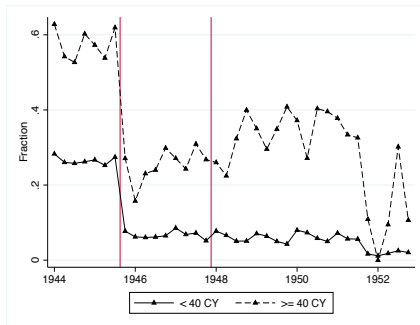
Notes: Each figure plots the fraction individuals still in the labor market who claim pensions or exit jobs by birth cohort. Women with 40 or more contribution years and men with 45 or more contribution years are exempt from the increases in the Early Retirement Ages and can continue to retire at ages 55 and 60 respectively. The sample is restricted to men ages 59 through 62 in birth cohorts 1939 through 1947 and women ages 54 through 57.75 in birth cohorts 1944 through 1952. Observations are censored at the Early Retirement Age specified for each individual.

Fig. 9. Claiming & Exiting by Birth Cohort & Contribution Years, Women

C. Fraction Claiming at Age 55



D. Fraction Exiting at Age 55



Notes: Each figure plots the fraction individuals still in the labor market who claim pensions or exit jobs by birth cohort. Women with 40 or more contribution years and men with 45 or more contribution years are exempt from the increases in the Early Retirement Ages and can continue to retire at ages 55 and 60 respectively. The sample is restricted to men ages 59 through 62 in birth cohorts 1939 through 1947 and women ages 54 through 57.75 in birth cohorts 1944 through 1952. Observations are censored at the Early Retirement Age specified for each individual.

Source: Mañor and Weber 13

## Substitution Effects on Retirement Age

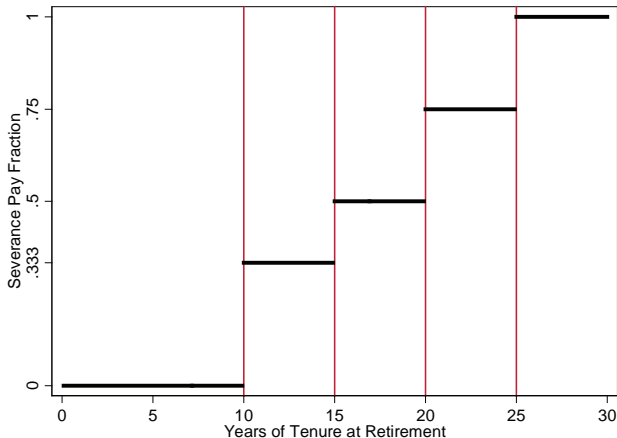
Best evidence from Manoli-Weber NBER'11. Austria has a system of discontinuous severance payments for retirees based on tenure at job [that's separate from retirement benefits]

⇒ Creates notches [draw graph] in the lifetime budget constraint that can be exploited to estimate substitution effects. Information on those notches likely to be widespread.

Use complete admin earnings data linking workers/firms/benefits claims.  
Key results:

- 1) Very clear evidence of substitution effects
- 2) Clear evidence that some people are constrained and cannot respond [unhealthy sample]
- 3) Overall implied elasticity is fairly modest [possibly due partly to frictional constraints, lack of information]

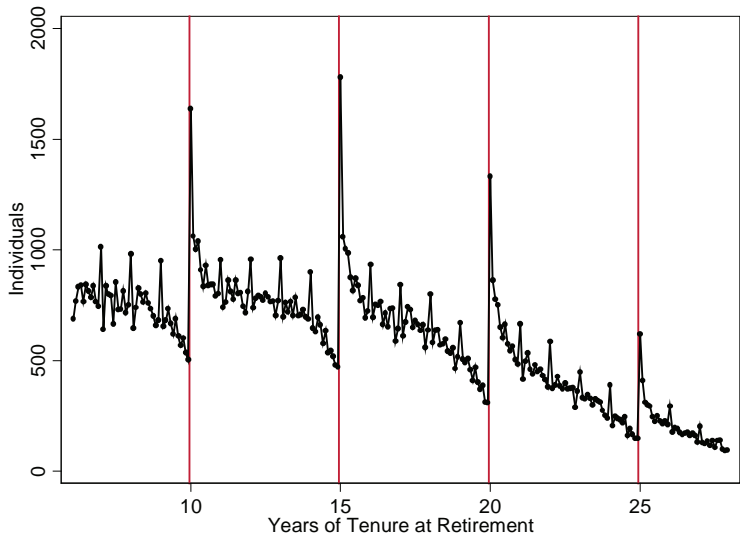
# Fig. 1. Payment Amounts based on Tenure at Retirement



Notes: There are two forms of government-mandated retirement benefits in Austria: (1) government-provided pension benefits and (2) employer-provided severance payments. The employer-provided severance payments are made to private sector employees who have accumulated sufficient years of tenure by the time of their retirement. Tenure is defined as uninterrupted employment time with a given employer and retirement is based on claiming a government-provided pension. The payments must be made within 4 weeks of claiming a pension according to the following schedule. If an employee has accumulated at least 10 years of tenure with her employer by the time of retirement, the employer must pay one third of the worker's last year's salary. This fraction increases from one third to one half, three quarters and one at 15, 20 and 25 years of tenure respectively. Since payments are based on an employee's salary, overtime compensation and other non-salary payments are not included when determining the amounts of the payments. Provisions to make these payments come from funds that employers are mandated to hold based on the total number of employees. Severance payments are also made to individuals who are involuntarily separated (i.e. laid off) from their firms if the individuals have accumulated sufficient years of tenure prior to the separation. The only voluntary separation that leads to a severance payment, however, is retirement. Employment protection rules hinder firms from strategically laying off workers to avoid severance payments and there is no evidence on an increased frequency of layoffs before the severance pay thresholds.

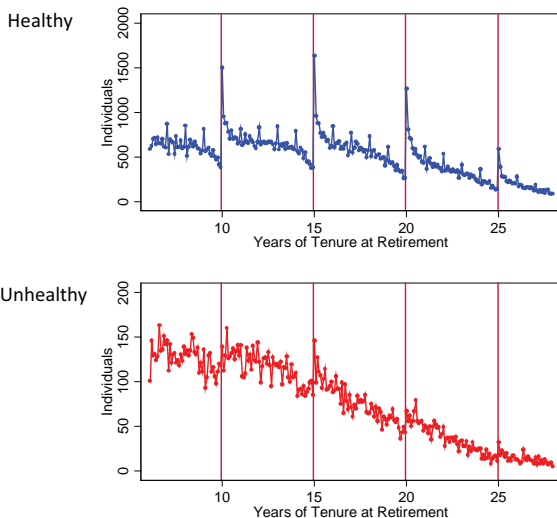
Source: Manoli and Weber NBER'11

Fig. 3. Distribution of Tenure at Retirement, Full Sample



Notes: This figure plots the distribution of tenure at retirement at a monthly frequency. Each point captures the number of people that retire with tenure greater than the lower number of months, but less than the higher number of months. Tenure at retirement is computed using observed job starting and job ending dates. Since firm-level tenure is only recorded beginning in January 1972, we restrict the sample to individuals with uncensored tenure at retirement (i.e. job starting after January 1972).

# Fig. 6. Tenure at Retirement by Health Status



Notes: Health status is measured based on the fraction of time between age 54 and retirement that is spent on sick leave. An individual is classified as unhealthy if his health status is below the median level. The median health status is computed within the sample of individuals with positive sick leave and uncensored tenure at retirement.; this median health status is 0.076.

## International Empirical Evidence

Gruber and Wise books: extensive analysis within each country: 2 strong and consistent findings:

1) Large effect of tax rate  $t$  on LFP of elderly  $\Rightarrow$  Key to give good incentives to elderly to keep working if you want to increase retirement age

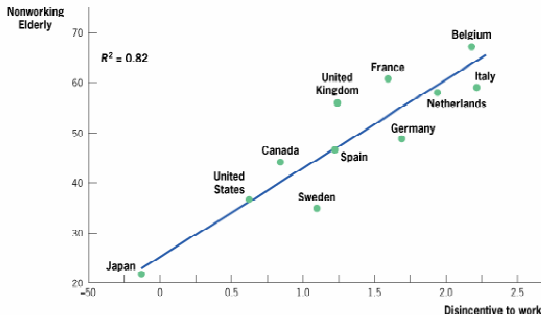
2) Large effect of Early entitlement age on retirement decisions: many individuals show liquidity/myopic effects: they retire as soon as they can get some benefits (even under fair system like US)

Gruber and Wise studies do not separate cleanly early retirement age effects from substitution effects due to implicit tax

## APPLICATION

## Implicit Social Security Taxes and Retirement Behavior

■ FIGURE 13-8



**Implicit Taxes on Work and Nonwork** • There is large variation across nations in the social security disincentives to work at older ages. The disincentive to work is measured here as the natural logarithm of the sum of implicit taxes on work at older ages. Those nations with greater disincentives to work tend to have much higher nonwork among older workers.

Source: Gruber and Wise (1999), Figure 17.

## Social Security and Retirement: Other Questions

- 0) Few studies on how private DB pensions affect retirement in US (good case study is Brown JpubE'13 for Cal teachers)
- 1) Does increasing retirement age increase unemployment? [in principle: not in a US type flexible market but maybe in rigid EU market]. Gruber and Wise (2010) book suggests no strong link in most countries.
- 2) Interactions between pay seniority (diverging from marginal productivity) and retirement rules is very important (Japan system of forced retirement from career job at 60)
- 3) Effect of retirement on longevity

## SOCIAL SECURITY REFORM: PROBLEMS WITH CURRENT SYSTEM

Rate of return  $n + g$  has declined from over 3% to about 2% due to:

**1) Demographics:**  $n$ : Retirement of baby boom large cohorts born 1945–1965: 1995: 3.3 workers per beneficiary, 2030: 2 workers per beneficiaries

Due to (a) fall in fertility, (b) increased longevity at retirement age (note bottom half earners have made no life expectancy gains over last 2 decades while top half have gained).

**2) Growth:**  $g$ : Slower productivity growth since 1975 ( $g$  has fallen from 2% to 1%)

System requires adjusting taxes or benefits to remain in balance.

## 1983 GREENSPAN COMMISSION

Demographic changes are predictable, so 1st reform was implemented in 1983 (designed to solve budget problems over next 75 years)

- 1) Increased payroll taxes to build a trust-fund
- 2) Increased retirement age in the future (from age 65 to 67)

Trust fund invested in Treasury Bills (Fed gov debt):

$$TF_{t+1} = TF_t \cdot (1 + i) + SSTax_t - SSBen_t$$

Trust fund is now peaking around (\$2.5 Tr), will be exhausted by 2040, taxes will then cover about 75% of promised benefits

Requires additional adjustment: can fix it for next 75 years by increasing payroll tax rate now by 1.7 percentage points or wait till 2040 and then increase tax by 3.5 pp (not huge)

## POLITICAL ECONOMY OF THE TRUST FUND

In principle,  $TF$  should have been net additional saving by the govt to prepare for baby boom retirement costs

$$S_t = [T_t^{NSS} - G_t^{NSS} - r_t TF_t] + [T_t^{SS} - G_t^{SS} + r_t TF_t]$$

First term  $S_t^{ON}$  is on-budget, second term (SS account) is  $S_t^{OFF}$  off-budget,  $S_t$  is unified budget. If govt and media concentrated on on-budget,  $TF$  could increase total US govt saving.

In practice, govt budget deficit presented to public/media is the unified budget  $S_t$  inclusive of SS surplus. Absent SS Trust fund build up, govt deficit would have been worse by (1.5 GDP points in recent years).

When  $TF$  stops growing and starts decreasing in coming years, US govt deficit will look worse and will require adjustments in the non-SS sector

## Is the Trust Fund a Store of Value?

If Trust Fund works as intended  $S_t^{OFF}$  should have no effect on  $S_t^{ON}$ .

If govt focuses on unified budget  $S_t$  taking  $S_t^{OFF}$  as exogenous, then  $S_t^{OFF}$  will have a negative effect on  $S_t^{ON}$

Smetters AEA-PP'04 runs regressions:

$$S_t^{ON} = \alpha + \beta S_t^{OFF} + X_t \delta + \varepsilon_t$$

Finds  $\beta < 0$  (even  $\beta < -1$ ) especially in period 1970-2002 (relative to 1949-1969)

Not very well identified but suggestive evidence that Trust Fund has not disciplined the government

TABLE 1—LEAST-SQUARES REGRESSION WITH (ROBUST)  
STANDARD ERRORS, 1949–2002 (DEPENDENT VARIABLE:  
MODIFIED PRIMARY ON-BUDGET SURPLUS,  $S_t^{\text{ON}}$ )

Variable	Specification			
	1	2	3	4
$S_t^{\text{OFF}}$	0.524 (0.736)	-0.643 (0.688)	-2.292 <sup>†</sup> (0.877)	-2.755 <sup>†</sup> (0.649)
$\text{GDP}_t$		0.449 <sup>†</sup> (0.094)	0.431 <sup>†</sup> (0.084)	0.006 (0.119)
Year ( $t$ )			-0.0036 <sup>†</sup> (0.0008)	-0.0043 <sup>†</sup> (0.00074)
Year <sup>2</sup> ( $t^2$ )			0.000047 <sup>†</sup> (0.000012)	0.000066 <sup>†</sup> (0.000011)
Wages and salaries				0.582 <sup>†</sup> (0.128)
Intercept term	-0.019 <sup>†</sup> (0.002)	-0.458 <sup>†</sup> (0.093)	-0.377 <sup>†</sup> (0.078)	-0.256 <sup>†</sup> (0.077)
$R^2$ :	0.01	0.27	0.54	0.69

Notes: Robust standard errors shown in parentheses.

<sup>†</sup> Statistically significant at the 2-percent level.

## SOCIAL SECURITY REFORM OPTIONS

- 1) Increased contributions: increase tax rate or earnings cap [eliminating cap entirely would likely produce income shifting]
- 2) Reduce benefits: straight cut not politically feasible: a) Index NRA on life expectancy, b) Index benefits using chained CPI instead of regular CPI, c) Make benefits fully taxable
- 3) Means-tested benefits: bad for savings incentives and could make program politically unstable [a program for the poor is a poor program]. Explains conservatives support.
- 4) Invest Trust Fund in higher yield assets (such as stock-market, as proposed by Clinton in 1990s). Advantage: higher return on average and govt can be a long-term investor. Issue: Socialism (or lobbying and corruption in investment choices), investment choices could be left to independent board
- 5) Major reform: privatization

## SOCIAL SECURITY PRIVATIZATION

Two components:

- 1) Funding the system
- 2) Replace DB by DC:

benefits = past contributions + market return

Main proponent: Feldstein, main critic: Diamond

Pros: get higher return on contributions  $r > n + g$ , increase  $K$  stock and future wages

Some countries such as Chile, Mexico, UK have privatized (partly) their systems

# SOCIAL SECURITY PRIVATIZATION ACCOUNTING

Exactly the reverse of pay-as-you-go calculations:

- 1) First generation loses as they need to fund current retirees and own contributions. All future generations gain [generational redistribution]
- 2) If govt increases debt to pay for current retirees: future generations get higher return on contributions but need to re-pay higher govt debt  $\Rightarrow$  Complete wash for all generations

tax to pay debt interest = returns on funded contributions - returns on paygo contributions

$\Rightarrow$  Only way funding generates real changes is by hurting some transitional generations which have to double pay

Feldstein calculations look better bc  $r_{\text{contributions}} \gg r_{\text{govt debt}}$

Should govt exploit this equity-premium opportunity?

## ADDITIONAL PRIVATIZATION ISSUES

- 1) Risk:** individuals bear investment risk (stock market fluctuates too much relative to economy) and cannot count on defined level of benefits [⇒ Privatization needs to include minimum pension provision]
- 2) Annuitization:** hard to impose in privatized system bc of political constraints [sick person forced to annuitize her wealth] ⇒ Some people will exhaust benefits before death and be poor in very old age [looming problem with 401K system]
- 3) Lack of financial literacy:** Individuals do not know how to invest [1/N rules in 401k, Sweden case]. Complicated choice, govt can do it for people more efficiently
- 4) Administrative costs:** privatized systems (Chile, UK) admin costs very high (1% of assets) due to wasteful advertisement by mutual funds [SS has very low admin costs]

## Notional Accounts System: Sweden and Italy

- 1) Benefits = Contribution + fictitious return set by govt
- 2) Return in Sweden depends on life expectancy, population growth, wage growth to insure financial stability: return rates are low ( $n + g$ ) but stable [in Italy, return=GDP growth]
- 3) System unfunded so no transitional sacrifice
- 4) Individuals understand link bt contributions and benefits
- 5) Mandatory annuitization based on cohort-life expectancy
- 6) Individuals can choose retirement age freely (system is almost actuarially fair)
- 7) Could add minimum pension and incentives to contribute more through savings (e.g., matching incentives)

## DISABILITY INSURANCE

Disability is conceptually close to retirement: some people become unable to work before old age (due to accidents, medical conditions, etc.)

All advanced countries offer public disability insurance almost always linked to the public retirement system

Disability insurance allows people to get retirement benefits before the “Early Retirement Age” if they are unable to work due to disability

⇒ Disability is a way to screen those who really need to retire early

**Empirics:** Bound and Burkhauser Handbook Labor Economics '99 provide survey of empirical evidence

**Theory:** Diamond-Sheshinski JpubE'05 analyze optimal DI

## US DISABILITY INSURANCE

- 1) Federal program funded by OASDI payroll tax, pays SS benefits to disabled workers under retirement age (similar computation of benefits based on past earnings)
- 2) Program started in 1956 and became more generous overtime (age 50+ condition removed, definition of disability liberalized, replacement rate has grown)
- 3) Eligibility: Medical proof of being unable to work for at least a year, Need some prior work experience, 5 months waiting period with no earnings required (screening device)
- 4) Social security examiners rule on applications. Appeal possible for rejected applicants. Imperfect process with big type I and II errors (Parsons AER'91) ⇒ Scope for Moral Hazard
- 5) DI tends to be an absorbing state (very few work again)

## US DISABILITY INSURANCE

- 1) In 2014, about 10m DI beneficiaries (not counting widows+children), about 5-6% of working age age 20-64 population
- 2) Very rapid growth: In 1960, less than 1% of working age population was on DI
- 3) Growth particularly strong during recessions: early 90s, late 00s

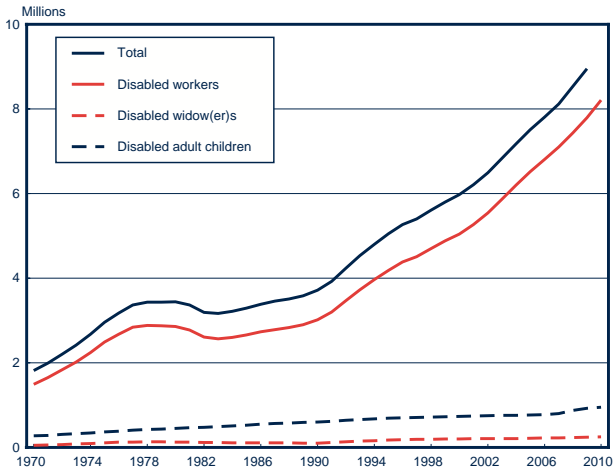
**Key empirical question:** Are DI beneficiaries unable to work? or are DI beneficiaries not working because of DI.

Chart 2.

Source: SSA DI annual report

**All Social Security disabled beneficiaries in current-payment status, December 1970–2010**

The number of disabled workers grew steadily until 1978, declined slightly until 1983, started to increase again in 1984, and began to increase more rapidly beginning in 1990. The growth in the 1980s and 1990s was the result of demographic changes, a recession, and legislative changes. The number of disabled adult children has grown slightly, and the number of disabled widow(er)s has remained fairly level. In December 2010, slightly over 8.2 million disabled workers, over 949,000 disabled adult children, and just under 245,000 disabled widow(er)s received disability benefits.



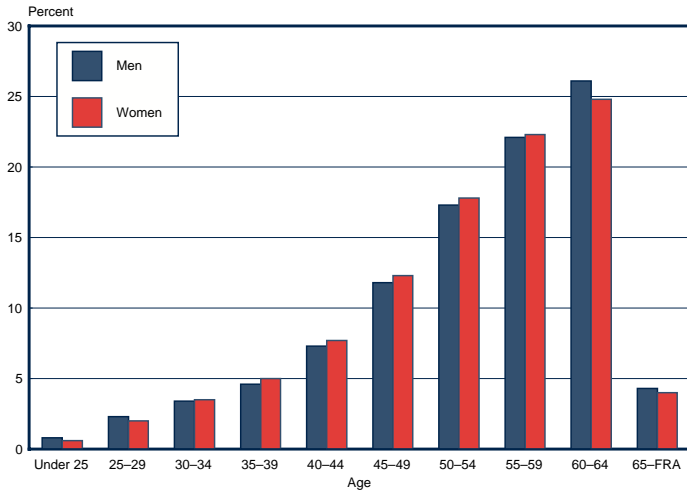
SOURCE: Table 3.

Chart 4.

Source: SSA DI annual report

**Age of disabled-worker beneficiaries in current-payment status, by sex, December 2010**

The percentage of disabled-worker beneficiaries increases with age for both men and women. In December 2010, the largest percentage of disabled-worker beneficiaries was aged 60–64. Disability benefits convert to retirement benefits when the worker reaches full retirement age, 65–67, depending on the year of birth.



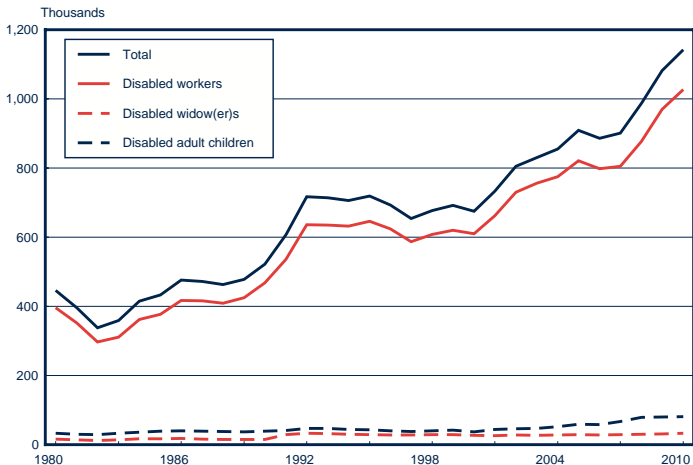
SOURCE: Table 4.

NOTE: FRA = full retirement age.

**Chart 8.**  
**Social Security disability awards, 1980–2010**

Source: SSA DI annual report

The total number of awards decreased from 1980 through 1982, started to rise in 1983, and began to increase more rapidly in 1990. Awards for disabled-worker benefits have been most pronounced and drive the overall pattern shown in the total line. They increased from a low of 297,131 in 1982 to 636,637 in 1992, were relatively flat from 1992 through 2000, and started to increase again in 2001. There were 1,026,988 worker awards in 2010. Other awards have risen at a much slower rate. Awards to disabled adult children have gradually increased from 33,470 in 1980 to 81,681 in 2010. Awards to disabled widow(er)s have risen from just over 16,000 in 1980 to 33,259 in 2010.



SOURCE: Table 35.

**Chart 10.**  
**Disabled-worker awards, by selected diagnostic group, 2010**

Source: SSA DI annual report

In 2010, 1,026,988 disabled workers were awarded benefits. Among those awardees, the most common impairment was diseases of the musculoskeletal system and connective tissue (32.5 percent), followed by mental disorders (21.4 percent), circulatory problems (10.2 percent), neoplasms (9.0 percent), and diseases of the nervous system and sense organs (8.2 percent). The remaining 18.7 percent of awardees had other impairments.

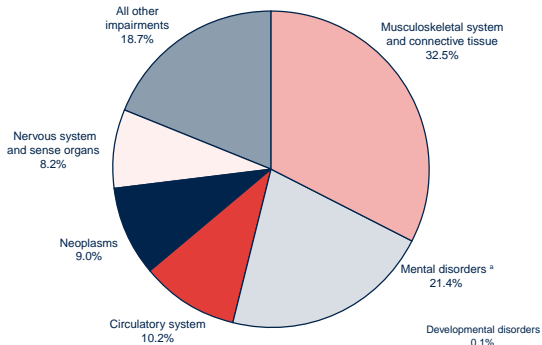


TABLE 1—REASSESSMENTS OF INITIAL  
SOCIAL SECURITY DETERMINATIONS

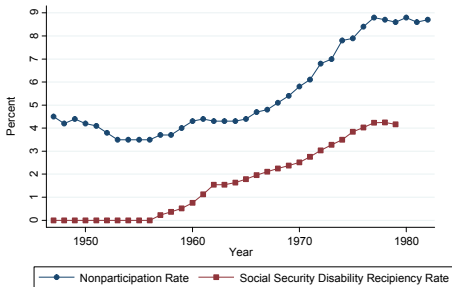
A. *Bureau of Disability Insurance Review One Year  
After Initial Determination (Percentages):*

BDI assessment	Initial determination	
	Allowance	Denial
Allowance	78.8	21.1
Denial	22.5	77.5

*Note:* The sample sizes are 250 initial allowances and 248 initial denials.

*Source:* Smith and Lilienfeld (1971 p. 195).

Nonparticipation and Recipiency Rates, Men 45-54 Years Old



Source: Parsons 1984 Table A1

## DI EMPIRICAL EFFECTS: OBSERVATIONAL STUDIES

Parallel growth of DI recipients and non-participation rates among men aged 45-54 but causality link not clear

**Cross-Sectional Evidence (Parsons JPE'80):** Does potential DI replacement rate have an impact on LFP decision?

Uses cross-sectional variation in potential replacement rates

NLSY data on men aged 45-59 from 1966-69

OLS regression

$$NLFP_i = \alpha + \beta DIreplate_i + \varepsilon_i$$

Large  $\beta > 0$  effect that can fully explain decline in LFP among men 45+

## DI EMPIRICAL EFFECTS: OBSERVATIONAL STUDIES

### Issues with Cross-Sectional Evidence:

- 1) *Dlreprate<sub>i</sub>* depends on wages (higher for low wage earners) and likely to be correlated with  $\varepsilon_i$  (likelihood to become truly disabled)
- 2) Impossible to control non-parametrically for wages in regression because all variation in *Dlreprate<sub>i</sub>* is due to wages (destroys identification)
- 3) Bound AER'89 replicates Parson's regression on sample that never applied to DI and obtains similar effects implying that the OLS correlation not driven by UI

## DI EMPIRICAL EFFECTS: REJECTED APPLICANTS

Bound AER'89 bounds effect of DI on LFP rate using data on LFP on (small sample of) rejected applicants as a counterfactual

**Idea:** If rejected applicants do not work, then surely DI recipients would not have worked absent DI  $\Rightarrow$  Rejected applicants' LFP rate is an upper bound for LFP rate of DI recipients absent DI

**Results:** Only 1/3 of rejected applicants return to work and they earn less than half of the mean non-DI wage

$\Rightarrow$  at most 1/3 of the trend in male LFP decline can be explained by shift to DI

Von Waechter-Manchester-Song AER'11 replicate Bound using full pop SSA admin data and find similar results

TABLE 2—EMPLOYMENT, EARNINGS, AND OTHER CHARACTERISTICS OF REJECTED DISABILITY INSURANCE APPLICANTS

	1972			1978		
	Population	Rejected Applicants	Beneficiaries	Population	Rejected Applicants	Beneficiaries
Labor Supply						
Percent Employed	77.7	32.6	3.2	69.3	28.7	2.3
Percent Worked 71/77	91.9	45.0	7.5	86.7	40.4	5.5
Percent Full Year						
(≥ 50 Weeks) <sup>a</sup>	76.8	47.4	31.4	83.5	41.2	22.2
Percent Full Time						
(≥ 35 Hours) <sup>a</sup>	95.4	75.9	25.0	92.4	79.6	38.3
Earnings Among Positive Earners						
Median Annual Earnings, 71/77 <sup>b</sup>	\$9000	\$4000	\$700	\$14000	\$5300	\$1000

## DI EMPIRICAL EFFECTS: REJECTED APPLICANTS

Maestas-Mullen-Strand AER'13 obtain causal effect of DI on LFP using natural variation in DI examiners' stringency and large SSA admin data linking DI applicants and examiners

**Idea:** (a) Random assignment of DI applicants to examiners and (b) examiners vary in the fraction of cases they reject  $\Rightarrow$  Valid instrument of DI receipt

**Result 1:** DI benefits reduce LFP of applicants by 28 points  $\Rightarrow$  DI has an impact but fairly small (consistent with Bound AER'89)

**Result 2:** DI has heterogeneous impact: small effect on those severely impaired but big effect on less severely impaired

Tough judges marginal cases unlikely to work without DI, lenient judges marginal case somewhat likely to work without DI

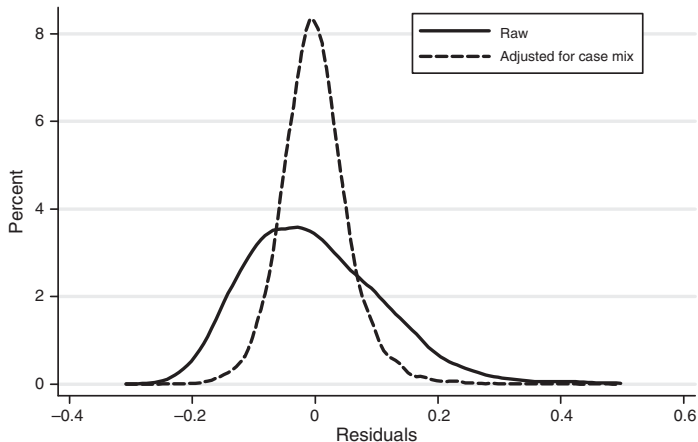


FIGURE 3. DISTRIBUTION OF EXAMINER DEVIATIONS FROM DDS MEAN INITIAL ALLOWANCE RATE

*Note:* Caseload characteristics include DDS office, age, preonset earnings, body code, three-digit zip code, terminal illness diagnosis, and decision month.

*Source:* 2005–2006 DIODS data.

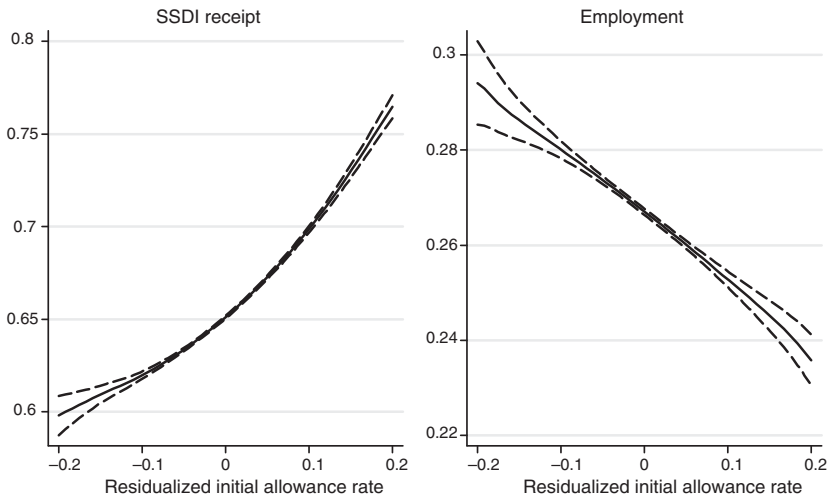


FIGURE 4. SSDI RECEIPT AND LABOR SUPPLY BY INITIAL ALLOWANCE RATE

*Notes:* Ninety-five percent confidence intervals shown with dashed lines. Employment measured in the second year after the initial decision. Bandwidth is 0.116 for DI and 0.130 for labor force participation.

*Source:* DIODS data for 2005 and 2006

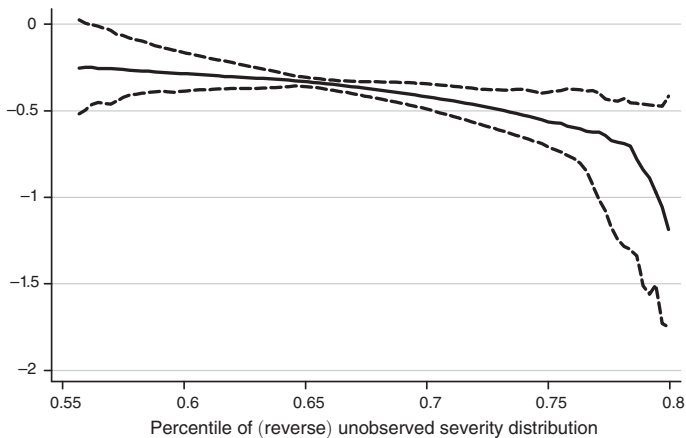


FIGURE 7. MARGINAL TREATMENT EFFECT ON EMPLOYMENT

Notes: Ninety-five percent confidence intervals shown with dashed lines. Bandwidth is 0.084.

Source: DIODS data for 2005 and 2006.

## Effect of DI Processing Time: Autor et al. 2013

DI requires a lengthy application process and 5 months out of the labor force  $\Rightarrow$  Process takes 10 months on average

Being out of the labor force for 10 months could hurt future job prospects  $\Rightarrow$  Could partly explain why DI rejected applicants work so little  $\Rightarrow$  DI could have higher negative effects [Parsons 1991 reply to Bound]

Autor et al. 2013 test this using (quasi-random) variation in DI applications processing time due to backlog

Find that 1 sd processing time delay (2.4 month) reduces employment rate by 1 point (3.2%) in years 2-4 for denied applicants

$\Rightarrow$  DI processing time reduces LFP of denied applicants by 4.1 points [8%] (significant but not super large)

## DI and Unemployment: Autor and Duggan QJE'03

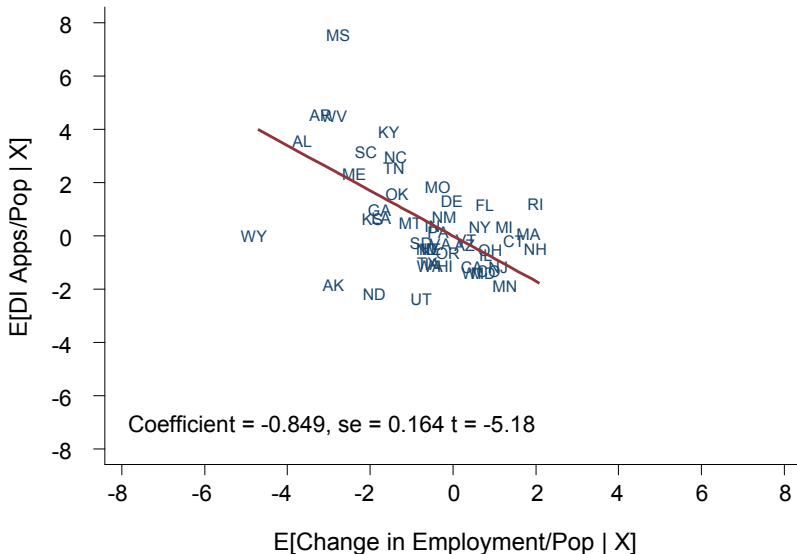
DI claims raise in recessions (as partly disabled workers have less working options)  $\Rightarrow$  Reduces unemployment rate (DI recipients outside labor force) and labor force participation

Test this hypothesis using cross-state variation in employment shocks (using industry mix Bartik's instrument) [e.g., car industry shock creates employment shock in Michigan]

Negative employment shocks do increase DI applications and reduce the size of labor force (workers+job seekers)

DI keeps beneficiaries outside labor force permanently and is an inefficient substitute to temporary unemployment insurance benefits

## Employment Shocks and DI Applications: 1993-1998



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