

# A Unified Framework to Evaluate Social Security Old-Age Insurance and Disability Insurance Reforms

Yue Li

University at Albany, SUNY

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# Research Motivation

- Social security issues two types of long-term benefits: Disability Insurance (DI) and Old-Age Insurance (OAI)
- Research identifies interactions between these two programs, in particular, OAI benefit reductions lead more people to claim DI  
*Duggan, Singleton and Song (2007); Li and Maestas (2008); Coe and Haverstick (2010)*
- Considering the mutual interaction between these two programs, rethink about social security reforms

# Research Background

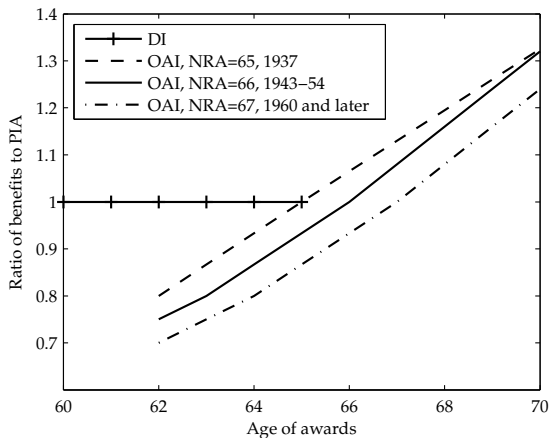


Figure: Social Security Benefits by the Age of Awards

# Key Trade-Off

- Reduction in OAI benefits
  - Labor supply: income channel  $\uparrow$ ; interacts with DI  $\downarrow$  (more DI applicants, more DI recipients and rejected applicants, lower incentive to accumulate human capital)
  - Impaired group: healthy individuals who have low disutility of work and unhealthy individuals passing the NRA
  - General equilibrium benefits: private insurance premiums  $\downarrow$ , lump sum transfer  $\uparrow$
- Reduction in DI benefits
  - Labor supply: both channels  $\uparrow$
  - Impaired group: unhealthy individuals younger than the NRA

# Research Method

- Develop a life cycle model with search friction and social security claiming choices
- Calibrate the model to match the 2010 US economy
- Simulate social security reforms

## Preview of Findings

- Future OAI reform that raises the normal retirement age (NRA) from 66 to 67 leads to
  - a 0.4 percent reduction in labor supply
  - a 44.2 percent increase in DI spending.
- To reduce DI spending, a smaller DI benefit decrease for all is preferred to a larger DI benefit decrease for the elderly
- The optimal plan to reform DI and OAI

# Literature

- Studies on social security reforms:
  - Gustman and Steinmeier (1985); Mitchell and Phillips (2000); Bound et al. (2010); Imrohoroglu and Kitao (2012)
- Labor supply along the life-cycle:
  - Rust and Phelan (1997); French (2005); Rogerson and Wallenius (2009) French and Jones (2011); Low and Pistaferri (2012); Benítez-Silva, García-Pérez, Jiménez-Martín (2012); Kitao (2014); Li (2014)
- Policy options for reforming DI:
  - Golosov and Tsyvinski (2006); Autor and Duggan (2010); Burkhauser and Daly (2011); Kitao (2014); French and Song (2014)

Model



# Demographics, Preferences and Labor Markets

- Demographics

- age index  $j$  increases stochastically<sup>1</sup>
- survival risks depend on age  $j$  and health status  $h$

- Preferences

- $u(c, l)$ , future utility is discounted at rate  $\beta$
- time cost of employment and job search
- utility cost of filing DI claims

- Labor markets

- job separation and search friction
- skill level  $g$  increases during employment and depreciates during unemployment

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<sup>1</sup>This approach is built on an overlapping generations framework developed by Blanchard (1985), and Weil (1989). Recent applications of this approach include Gertler (1999); Cagetti and De Nardi (2009); Ljungqvist and Sargent (2008); Kitao (2014).

# Health, Medical Expenditures, and Insurance

- Health status changes stochastically and determines:
  - survival rates, time cost of employment and search, the probability of receiving DI benefits, and the distribution of medical expenses
- Medical expenses also depend on age and health spending shocks
- Two types of insurance: private and public
  - public: people 65 and older, and some DI recipients ( $\pi^M$ )
  - private: the rest population

# Government

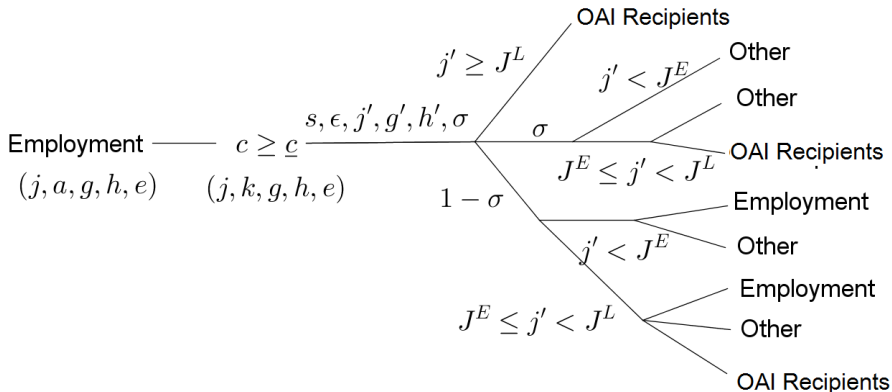
- OAI: Benefits depend on average past earnings  $e$  and the age of awards  $J^E \leq j \leq J^L$
- DI: Benefits depend on average past earnings  $e$ ; the probability of awards depends on health status
- Unemployment insurance: Benefits depend on  $e$  and unemployment duration  $d_u$ ; no unemployment benefits for DI applicants
- Social insurance and Medicare
- Taxes on labor, assets, and consumption

# Individual Problem

- Four categories: employed, DI recipients, OAI recipients, and other
- All individuals: consumption and savings
- Employed individuals: quit current job, file an OAI claim if  $j' \geq J^E$
- Other individuals
  1. choose search intensity, determine DI applications
  2. accept employment opportunities, file an OAI claim if  $j' \geq J^E$
- Timing of decisions:

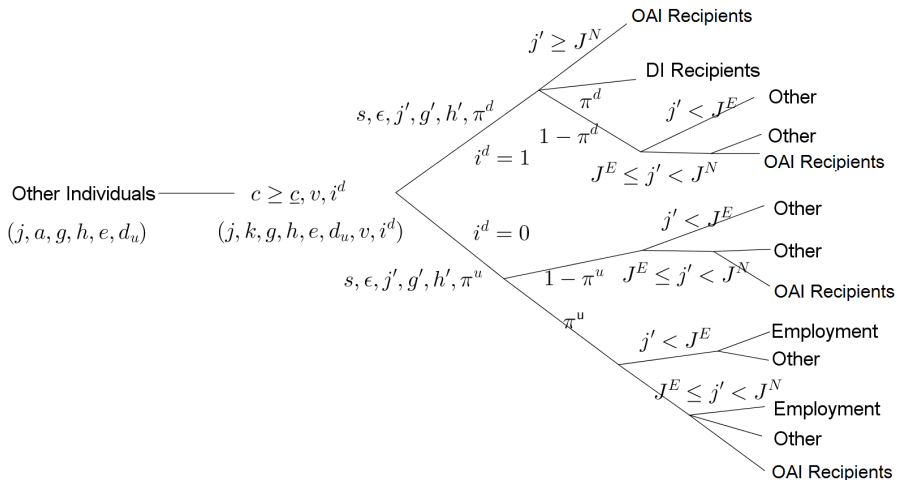
Current period  $\Rightarrow c, v, i^D \Rightarrow$  shocks  $\Rightarrow$  choose categories  $\Rightarrow$  next period

# Individual Problem: Employed Individuals



► Recursive Problem

# Individual Problem: Other Individuals with $j < J^N$



► Recursive Problem

# Calibration

# Data

- 2010 US economy
  - Medical Expenditure Panel Survey (MEPS) panels 14 and 15: health and earnings
  - 2010 Survey of Consumer Finances: assets
  - NBER TAXSIM, SSA reports, CMS reports: government programs
- 2006 labor markets
  - MEPS panels 10 and 11: employment rates
  - 2006 Current Population Survey: job separation rates
  - Social security annual statistical supplement and Census: percentage on the DI rolls
  - Department of Labor: unemployment insurance



# Demographics and Preferences

- 13 age groups: 20-44, 45-59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, and 70<sup>+</sup>
- Each period: 4 months
- Utility function  $u(c, l) = \frac{(c^\eta l^{1-\eta})^{1-\gamma}}{1-\gamma}$
- $\beta = 0.996$ : the ratio of assets of age group 45-59 to average earnings=9.44

# Health Status

- Perceived health status: 1 (excellent) to 5 (poor)
  - average score of one year
  - bad health: score larger than 3; good health: otherwise
- Transition probabilities (annual)

Age	Health	Good	Bad	Age	Health	Good	Bad
20-44	Good	0.954	0.046	65-69	Good	0.918	0.082
	Bad	0.428	0.572		Bad	0.245	0.755
45-59	Good	0.910	0.090	70+	Good	0.851	0.149
	Bad	0.308	0.692		Bad	0.285	0.715
60-64	Good	0.913	0.087				
	Bad	0.265	0.735				

## Total Medical Expenses, 2010 Dollars

Age	Health	0-60%	61-95%	96-100%
20-44	Good	156	2,485	18,727
	Bad	735	8,818	52,843
45-59	Good	479	4,548	31,607
	Bad	1,971	16,365	73,106
60-64	Good	1,010	6,670	36,844
	Bad	3,198	24,473	93,849
65-69	Good	1,353	8,610	52,416
	Bad	3,856	23,987	102,758
70+	Good	1,948	10,509	48,524
	Bad	4,687	26,959	92,737

# Employment and Search Cost

- Search cost (Kitao, 2014)

$$N^u(h, v) = N^e(h)(1 - (1 - v)^{0.98}), \quad v \in [0, 1]. \quad (1)$$

- Job finding rate  $\pi^u(v) = v$ : average unemployment duration=16.8 weeks
- $N^e(\text{good}) = 0.367$ : employment rate of good health individuals aged 45-59=0.87
- $N^e(\text{bad}) = 0.738$ : employment rate of bad health individuals aged 45-59=0.53

# Labor Market

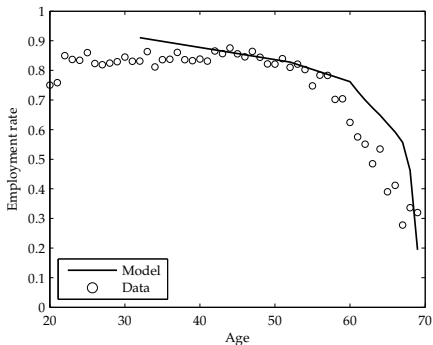
- Skill level  $g \in [0.1, 1]$ 
  - increase during employment: 6.0% for 20-44, 0.5% for 45-59, 0.0% for the rest
  - depreciate during unemployment: 15.0% (Pavoni and Violante, 2007)
- Wage  $w = 141k$ : average annual earnings of workers at age 20=14106
- Job separation: 23.9% for 20-44, 12.8% for 45-59, 12.8% for 60-64, 15.7% for 65-69

# Government

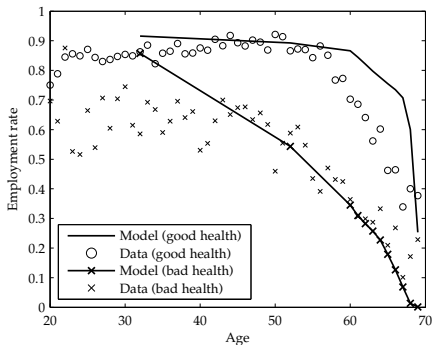
- Average earnings and PIA
- OAI:  $J^E = 62$ ,  $J^N = 66$ ,  $J^L = 70$  (1943-54 birth cohorts)
- DI:
  - $\pi^d(\text{good}) = 0$  and  $\pi^d(\text{bad}) = 0.28$
  - DI application cost: match percentage of people aged 45-59 on the DI rolls=5.7%
- UI: Replace 46% of average earnings up to 6 months
- Social insurance: Consumption floor of \$4,000
- Tax rates: 25.8% on labor, 28.1% on capital, 6.8% on consumption

# Evaluation

# Benchmark Economy: Employment Rates



(a) Average

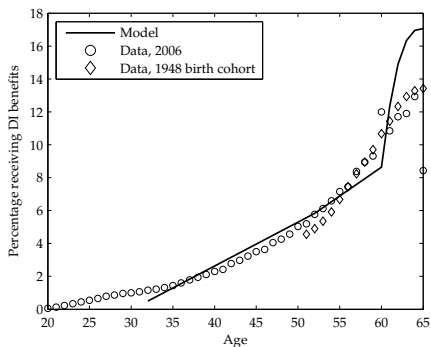


(b) By Health

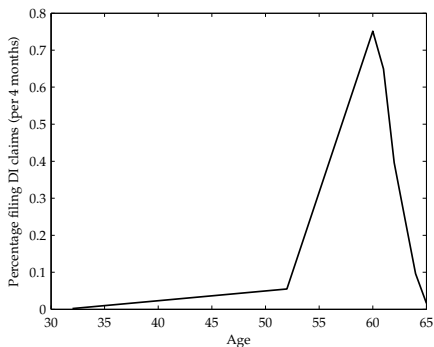
Data: MEPS panels 10 and 11



# Benchmark Economy: DI Recipients and Applications



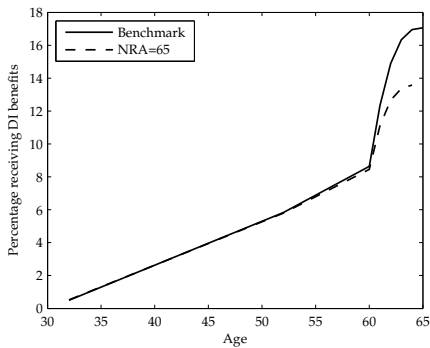
(c) Recipients



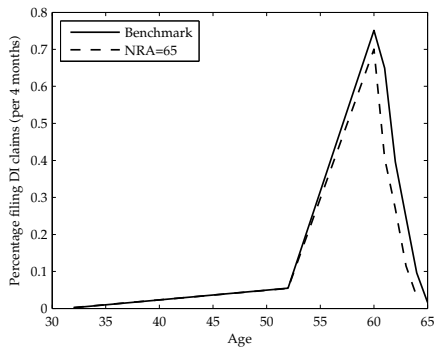
(d) Applications

Data: Social Security Annual Statistical Supplement and Census

# Past OAI Reform: From the 1937 to the 1943 Birth Cohort



(e) Recipients



(f) Applications

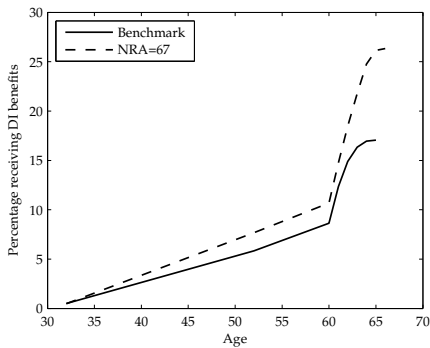
Figure: Effects of the Past OAI Reform on DI

- % of DI recipients among people aged 45-64 rises by 0.5 percentage points, which is close to Duggan, Singleton and Song (2007).

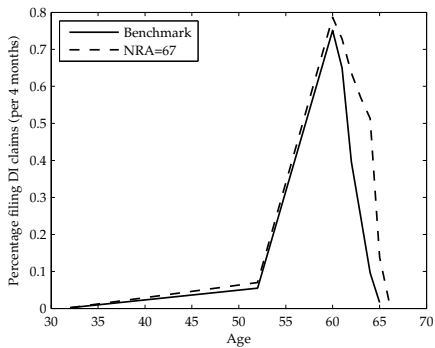
## Reforms

1. Future OAI reform that raises the NRA from 66 to 67
2. Two alternative DI reforms that reduces the DI spending to the level in the benchmark economy
3. A combination of DI and OAI changes that achieve the same level of savings on social security as the experiment that shifts the NRA from 66 to 67

# Future OAI Reform: DI



(a) Recipients



(b) Applications

Figure: Effects of the Future OAI Reform on DI

- Raise the percentage of people aged 45-64 on the DI rolls by 2.5 percentage points

## Future OAI Reform (NRA from 66 to 67): Labor Market

	Benchmark (1)	NRA=67 (2)
Labor force participation rate	69.78	69.04
Employment rate (20-69)	82.93	82.11
20-59	88.10	87.65
60-69	59.96	57.48
Unemployment rate	7.70	7.64
Labor supply*	100.00	99.61

Notes: \* normalizes the benchmark economy value to 100.

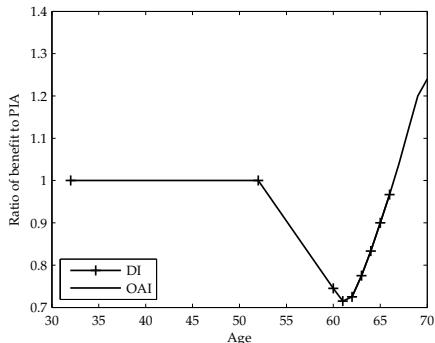
## Future OAI Reform: Government Budget

	Benchmark (1)	NRA=67 (2)
Tax revenue	9617.7	9627.6
Labor	6833.0	6806.4
Capital	1191.4	1235.5
Consumption	1593.3	1585.6
Transfer spending	7787.2	7640.8
DI	311.0	448.6
OAI	4427.8	4138.4
Unemployment ins.	853.3	846.7
Medicare	2080.2	2104.8
Social ins.	114.8	102.3
Direct spending	1830.5	1986.8

*Notes:* Numbers are annual per capita.

# DI Reforms that reduce DI spending to the benchmark economy level

## 1 Targeting the elderly:



## 2 Targeting all individuals: reduce DI benefits by 1.9 percent

## Comparing DI Reforms: Labor Market

	No (1)	Elderly (2)	All (3)
Labor force participation rate	69.04	70.12	70.14
Employment rate (20-69)	82.11	83.19	83.36
20-59	87.65	87.58	88.59
60-69	57.48	63.74	60.15
Unemployment rate	7.64	7.85	7.69
Labor supply*	99.61	100.18	100.32

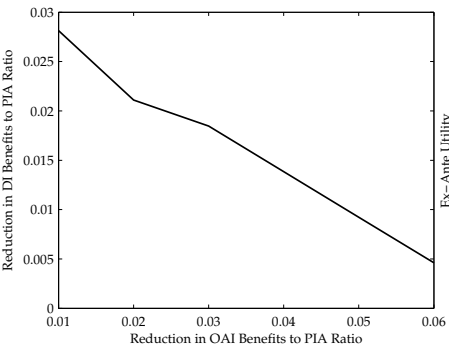
Notes: \* normalizes the benchmark economy value to 100.



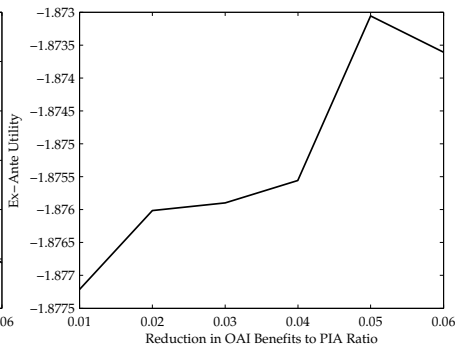
# Comparing Two DI Reforms

- Generate similar savings on DI
- The second reform targeting all individuals
  - encourages young and middle-aged people to stay in the labor force
  - induces greater ex-ante utility than the first reform does
- But the first reform targeting the elderly may be more efficient in the short run

## Alternative policies that Achieve a Similar Level of Savings as the Policy that raises the NRA from 66 to 67



(a) Policy



(b) Ex-Ante Utility

Figure: Effects of Reforming Both OAI and DI programs

## Next Step

- Isolate the effect from general equilibrium feedback via changes in insurance prices and lump-sum transfers
- Describe the partial effects of reducing DI and OAI benefits on government budget, ex-ante utility, and conditional utility
- Compare short-term responses with long-term responses

# Conclusion

- Develop a lifecycle model with search frictions and social security claiming decisions
- Reproduce the effect of past OAI reforms and DI
- Simulate the long-term responses towards future OAI reforms: labor supply  $\downarrow$  0.4%, and DI spending  $\uparrow$  44.2%
- Explore alternative DI and OAI reforms

## Employed Individual: Recursive Problem

$$\begin{aligned} V^e(j, a, g, h, e) = & \max_c \{ u(c, 1 - N^e(h)) + \beta s_j(h) E_{\epsilon, j', g', h' | j, g, h} [\sigma I_{j' < J^E} V^u(j', a', g', h', e', 0) \\ & + \sigma I_{j' > j' \geq J^E} \max\{V^u(j', a', g', h', e', 0), V^r(j', a', h', b^r(e', j'))\} \\ & + (1 - \sigma) I_{j' < J^E} \max\{V^e(j', a', g', h', e'), V^u(j', a', g', h', e', 0)\} \\ & + (1 - \sigma) I_{j' > j' \geq J^E} \max\{V^e(j', a', g', h', e'), V^u(j', a', g', h', e', 0), \\ & V^r(j', a', h', b^r(e', j'))\} + I_{j' \geq J^L} V^r(j', a', h', b^r(e', j')) \} \end{aligned}$$

subject to:

$$k = \max\{a - (1 + \tau^c)c, 0\} \quad (2)$$

$$\underline{c} \leq c \leq \max\{\underline{c}, a/(1 + \tau^c)\} \quad (3)$$

$$a' = (1 - \tau^s)wg + (1 + r(1 - \tau^k))k - Q(m(j, h, \epsilon), I_{j \geq J^M}) + x \quad (4)$$

$$e' = f_j(e, wg) \quad (5)$$

▶ Back

# Unemployed Individual: Recursive Problem

$$\begin{aligned} V^u(j, a, g, h, e, d_u) = & \max_{c, v, i^D} \{ u(c, 1 - N^u(h, v)) - i^D u^d(j) + \beta s_j(h) E_{\epsilon, j', g', h' | j, g, h} \\ & [i^D I_{j'=jN} V^r(j', a', h', b^r(e', j')) + i^D \pi^d(h) I_{j' < jN} V^d(j', a', h', b^d(e', j'), I_{j' \geq jM}) \\ & + i^D (1 - \pi^d(h)) I_{j' < jE} V^u(j', a', g', h', e', \bar{d}^u) \\ & + i^D (1 - \pi^d(h)) I_{jE \leq j' < jN} \max\{V^u(j', a', g', h', e', \bar{d}^u), V^r(j', a', h', b^r(e', j'))\} \\ & + (1 - i^D) \pi^u(v) I_{j' < jE} \max\{V^e(j', a', g', h', e'), V^u(j', a', g', h', e', d_u + 1)\} \\ & + (1 - i^D) \pi^u(v) I_{j' \geq jE} \\ & \max\{V^e(j', a', g', h', e'), V^u(j', a', g', h', e', d_u + 1), V^r(j', a', h', b^r(e', j'))\} \\ & + (1 - i^D)(1 - \pi^u(v)) I_{j' < jE} V^u(j', a', g', h', e', d_u + 1) \\ & + (1 - i^D)(1 - \pi^u(v)) I_{j' \geq jE} \max\{V^u(j', a', g', h', e', d_u + 1), V^r(j', a', h', b^r(e', j'))\} \} \end{aligned}$$

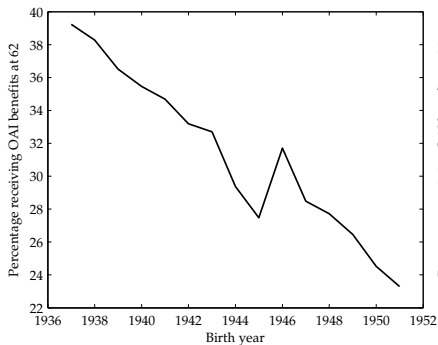
subject to (2), (3) and:

$$a' = b^u(e, d_u)(1 - i^D) + (1 + r(1 - \tau^k))k - Q(m(j, h, \epsilon), I_{j \geq jM}) + x \quad (6)$$

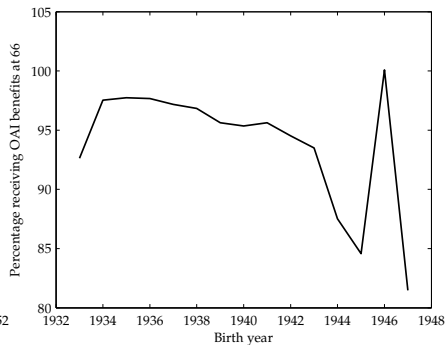
$$vi^D = 0 \quad (7)$$

$$e' = e. \quad (8)$$

## Percentage of RI recipients by Birth Cohort



(a) 62



(b) 66

- More people delay RI claims