Government Old-Age Support and Labor Supply
Evidence from the Old Age Assistance Program

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Wellesley College and NBER
University of Virginia and NBER

November 2017
Government old-age support and retirement

Gainful employment, 1860-1980
Post-1970
Separate OAA & SS

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Government old-age support and labor supply

- Many programs both transfer resources to the old and tax their labor
- This paper investigates Old Age Assistance (OAA) circa 1940
  - Means-tested, state-administered program; part of Social Security Act
  - Largest source of government old-age support until 1950s
- Questions:
  - How did OAA affect later-life labor supply in 1940?
  - How did taxation of later-life labor affect value to recipients?
  - What role did OAA and SS play in mid-20th c. rise in retirement?
Labor force participation by age and OAA program size

![Graph showing labor force participation by age and OAA program size.](image)

- **Share in the labor force at Census**
- **Age in April 1940**
- **Above median states**
- **Below median states**

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November 2017 4 / 48
Age profiles of labor force participation, 1930-60

Share in the labor force at Census

1930 1940 1950 1960

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Preview of results

- OAA significantly reduced labor supply
  - Reduced LFP of 65–74-year-old men by $\sim 8.5$ p.p. in 1940
  - Accounted for $\sim 60\%$ of 1930–40 decline in LFP for ages 65–74

- Welfare cost to recipients of earnings test relatively low
  - Reduced-form bound: $1$ of OAA $\geq 0.48$ of unconditional income
  - Estimated model: $1$ of OAA $\approx 0.95$ of unconditional income

- Social Security could account for large share of 1940–60 LFP decline
  - Reduced-form regression results: $90\%$
  - Estimated model: $\geq 55\%$
Contributions

- Insight into mid-20th c transformation in social insurance, retirement
  - OAA and mid-century Social Security both taxed late-life earnings, and very saliently: OAA typically dollar for dollar
  - Effect of implicit taxation on value to recipients unaddressed, but critical determinant of welfare effects

- Key advantages of our setting
  - Census microdata on entire US population
  - Large program variation (down to extremely meager programs)
  - Lack of other old-age support programs
Background

The effect of OAA on labor force participation

The cost of the earnings test

Government old-age support and the rise of retirement

Conclusion
Background

1. The effect of OAA on labor force participation
2. The cost of the earnings test
3. Government old-age support and the rise of retirement
4. Conclusion
Old Age Assistance

- **1935 Social Security Act**
  - Old Age Assistance (OAA): assistance for needy elderly
  - Old Age Insurance (after 1939, OASI): “Social Security”

- **Old Age Assistance**
  - State-run, means-tested program with federal matching
  - About 22% of people aged 65+ received OAA payments in 1940
    - 1940 was first year of OASI monthly payments: \( \sim 1.9\% \) of 65+ pop
    - OAA was larger than Social Security until 1950 (dollars and recipients)
Eligibility and payments

- Minimum age: 65 in nearly all states
- Means tests
  - Earnings test (income or consumption floor): 100% marginal tax rate
  - Many states also tested assets and other factors
- Most states had max payment of $30/month ($450 in 2010 dollars)
  - Ranged from $15-$45, and a few had no legislated maximum
- In 1940, average annual payment of $232 ($3,615 in 2010 dollars)
  - ∼25% of median wage+salary earnings of wage earners aged 60–64
  - ∼50% of 25th percentile wage+salary earnings of wage earners 60–64
## Basic features of state OAA programs

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<td>.23</td>
<td>.23</td>
<td>.09</td>
<td>.08</td>
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<tr>
<td>Payment per recipient</td>
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<td>Payment per person 65+</td>
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<td>1.01</td>
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<tr>
<td>Legal maximum payment</td>
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<td>30</td>
<td>5.34</td>
<td>15</td>
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<tr>
<td>99th percentile payment</td>
<td>29.62</td>
<td>30</td>
<td>6.08</td>
<td>15</td>
<td>45</td>
<td>49</td>
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</table>

Notes: Includes the 48 states and the District of Columbia. Payments are monthly, and in nominal terms. Data on total payments and number of recipients is for December 1939; recipiency rate and payments/person 65+ are normalized by state population at 1940 Census.
Background

The effect of OAA on labor force participation

The cost of the earnings test

Government old-age support and the rise of retirement

Conclusion
Data

- **Key data:** universal 1940 Census
- **Focus on men aged 55-74 in states with eligibility age of 65 in 1939**
- **Our sample:** men with non-missing demographic, work information
  - Missingness of demographic and 1940 work information exhibits no significant relationship with our variation:

[Summary statistics](#)
Identification

(1) Age eligibility cutoff
   ▶ OAA was by far the largest program with age cutoff at 65
   ▶ Main estimates net of anticipatory effects

(2) State variation in OAA policies
   ▶ Simulated IV for payments per person 65+  
   ▶ Limit comparisons to state boundaries
Preferred specification

For individual $i$ of age $a$ living in state $s$ and county $c$:

$$y_{iacsb} = \beta_c + \delta_{ba} + \sum_{a \neq \bar{a}} \gamma_a \times \log(\text{payments per person 65+})_s + \Lambda'x_{iacs} + \varepsilon_{iacsb}$$

- Reference age $\bar{a} = 64$ (or age group 60-64)
- IV for log(payments/person) with log(simulated payments/person)
- Comparisons across state boundaries
  - Sample limited to counties on state boundaries
  - Border segment $b$ includes all counties on the boundary of two states
  - Border segment by age fixed effects limit comparisons to boundaries
### Labor force participation: regression results

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<td>0.048*</td>
<td>0.028***</td>
<td>0.006</td>
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<td>× age 55-59</td>
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<td>(0.007)</td>
<td>(0.005)</td>
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<td>-0.060***</td>
<td>-0.063***</td>
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<td>× age 65-69</td>
<td>(0.008)</td>
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<td>(0.008)</td>
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<td>-0.078***</td>
<td>-0.074***</td>
<td>-0.075***</td>
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<tr>
<td>× age 70-74</td>
<td>(0.016)</td>
<td>(0.013)</td>
<td>(0.010)</td>
<td>(0.010)</td>
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<td>2403915</td>
<td>2403915</td>
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<tr>
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<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Education × age fixed effects</td>
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<td>no</td>
<td>yes</td>
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<tr>
<td>Race × age fixed effects</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>
Labor force participation: age-payment/65+ interactions
Labor force participation results

- LFP declines faster after age 65 in states with larger OAA programs
  - Non-wage income “first stage”:

- Extrapolation suggests OAA reduced labor force participation among 65–74-year-olds by \(\sim 8.5\) p.p. in 1940
  - \(\sim 17\%\) of average for 65-74 year olds \(\sim 50\%\)
  - \(\sim 60\%\) of observed 1930-40 decline of 14 p.p.

- Under slightly stronger assumptions, can estimate counterfactual no-OAA age-LFP profile allowing for potential anticipatory effects
  - Will be useful for understanding cost of the earnings test
Labor force participation: counterfactual age profile
Heterogeneity

- Heterogeneity by potential earnings is important for understanding cost of earnings test, but unobserved for those not in the labor force
- Two approaches
  - Heterogeneity by levels of education
  - Predicted earnings based on $X$’s (estimate using men aged 45-54)
    - Education, race, state of birth and foreign birth indicators, first name indicators (on first names, see Olivetti and Paserman 2015)
Responses by education

Average wage and salary earnings for non-self-employed, by education

Coefficient on log payment X age 65−69
Responses by decile of predicted earnings

Coefficient on log payment X age 65–69

Median predicted earnings by decile

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Responses by employment status

- Labor force participation bundles very different activities
- Sources of reduction in labor force participation:
  - \( \sim 50-55\% \) from private or non-emergency public employment
  - \( \sim 20\% \) from unemployment
  - \( \sim 25-30\% \) from work relief
- Also suggests that effects of OAA were in large part on people with poor earnings prospects
Interpretation of labor force participation results

- Did high unemployment make effects particularly large?
  - Ex ante unclear whether it would make effects bigger or smaller
  - Across counties with differing unemployment rates for age 45-54: only modest differences

- State policies correlated with underlying differential trends in LFP?
  - Lack of pre-trends provides evidence against this interpretation
  - Further evidence: 1930 placebo
LFP effects in 1940 (in states with no program in 1930)
Gainful occupation effects in 1930
1 Background

2 The effect of OAA on labor force participation

3 The cost of the earnings test

4 Government old-age support and the rise of retirement

5 Conclusion
Understanding the value and effects of OAA

- Results so far indicate OAA reduced labor supply significantly
  - To what extent did this entail a social cost?
  - One key dimension: how much earnings test reduced value to recipients
- Reduced-form results alone offer some insight
- Suppose “marginal” benefits valued at zero, “inframarginal” fully
  - 8.5 percent of men 65–74 out of labor force due to OAA in 1940
  - Estimate of male 65–74 OAA recipiency rate in 1940: \( \sim 16.5\% \)
  - Suggests that average recipient valued $1 of OAA benefits at \( \geq $0.48 \)
  - Heterogeneity results suggest “marginal” benefits valued highly
- Estimate, simulate a model of labor supply to obtain point estimate
Intuition for results: key drivers

- Degree to which benefits are inframarginal over the life cycle
  - If someone permanently exits labor force before 65 in absence of OAA, not affected by earnings test (as long as leisure is non-inferior)
  - To the extent that income effects pull retirement forward, reduces “exposure” to earnings test (retire earlier even without earnings test)

- Effects of OAA by earnings potential
  - Earnings test less costly to people with lower earnings potential
  - Have seen some evidence they also responded more
Model

\[ U_{it} = \sum_{s=t}^{T} \beta^{s-t} \left( \frac{c_{is}^{1+\eta}}{1 + \eta} - \delta_i 1(h_{is} = \bar{h}) \right), \quad h_{is} \in \{0, \bar{h}\} \]

\[ a_{it+1} = (1 + r)(a_{it} + N_{it} + \hat{w}_{it} h_{it} + b_{it} - c_{it}) \geq 0 \]

- “Income-focused” OAA program: \( b_{it} = \max\{0, \bar{y}_{it} - \hat{w}_{it} h_{it}\} \)
- Assume that individual is unable to borrow
- Calibrate \( \beta = 1/(1 + r) = 1/1.03 \)
- Estimate \( \eta, F(\delta) \)
Eligibility for OAA

- OAA limited eligibility based on many characteristics other than earnings, e.g., assets, family characteristics
- Challenge: lack of data on some determinants of eligibility
- Approach: infer “eligibility” from behavior
  - “Eligibility”: receive benefits if old enough and low enough earnings
  - Encompasses take up
- Assume eligibility is a linear function of potential earnings
  - \( Pr(\text{eligible}_i|\text{x}_i) = \max\{0, \min\{1, \alpha_e + \beta_e w_i\}\} \)
Estimating the model

- Convex kink in lifetime budget constraint $\rightarrow$ retirements bunch at 65
  - Amount of bunching, how quickly it fades as replacement rate falls is informative about eligibility for OAA and curvature of utility ($\eta$)
- Estimated no-OAA retirement age distribution helps to identify $F(\delta)$
Main results use three key empirical patterns

- Discrete changes in earnings distribution at OAA eligibility age
- Estimated age-LFP profile in the absence of OAA
  - Assume cross-sectional profile proxies for cohort’s retirement ages
  - Useful feature of our setting: few other sources of bunching
- Relationship between earnings and likely ineligibility based on assets
  - Not strictly necessary, but helps to separate $\eta$ and $\beta_e$
“Bunching” of retirements

- Desired input: bunching of retirements at 65 by potential earnings
- Challenge: potential earnings unobserved for those not employed
- Approach: estimate breaks at age 65 in state earnings distribution
  - E.g., break in $\Pr(\text{earnings} \in (500, 600])$ at age 65
- Focus on Massachusetts: greatest similarity of program to model
  - All central results are robust to alternatives: e.g. using all states
Breaks in earnings distribution at 65
Estimation results

Proportional break in LFP(age) at age 65

Empirical
Simulated

Pr(wage in bin)

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Estimation results

- Eligibility $\sim 22\%$ overall, decreasing in earnings
  - $\hat{\eta} \approx -1.3$, within typical range in literature
  - Model matches well reduced-form results and LFP age profile in 1940
Effects and values of OAA

- Income and taxation similarly important in reducing labor supply
  - Income 55%; Substitution 45%
- Equivalent variation per $1 of benefits (ex-post value):
  - $0.95 of late-life income: earnings test not very costly
  - Rough bounds from regression results: $EV \in [0.48, 1]$
  - Intuition: Large fraction of benefits inframarginal; large fraction of marginal benefits drew low-earning men out of labor force
- Note that of 65+, men 65–74 have highest earnings and employment
1 Background

2 The effect of OAA on labor force participation

3 The cost of the earnings test

4 Government old-age support and the rise of retirement

5 Conclusion
Role of OAA and SS in mid-century labor supply

[Graph showing the relationship between LFP and OAA+OASI payments per person 65+, 2010 USD over the years 1920 to 1970.]

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November 2017 42 / 48
Role of OAA and SS in mid-century labor supply

- Reduced-form results speak to role of OAA from 1930–1940
  - Suggest OAA reduced LFP among 65–74 by 8.5 p.p., or 60% of total
- Use regression, estimated model to forecast effects of SS 1940–1960
  - Caveat: OAA and SS had very different eligibility and payment determination rules
  - But both shared feature of transferring resources to elderly and taxing their labor relative to younger people
Role of OAA and SS in mid-century labor supply

Regressions:
- Predict $\Delta LFP$ from $\Delta(\log)$ payments per person 65+
- Predict that growth in OAA+OASI would reduce labor force participation at ages 65–74 by 12.4 p.p.: $\sim 90\%$ of observed reduction

Estimated model:
- Can account for some other factors likely to be important
  - E.g.: recipiency vs. benefits, non-linearities, wage growth
Role of OAA and SS in mid-century labor supply

- Aim for lower bound on effects of Social Security from 1940–1960
- Simulate effects of a “modest” Social Security program
  - 1939 benefits formula and eligibility: e.g. only 42% of men classified as eligible for Social Security (cf. 67% actually receiving benefits in 1959)
  - Ignore OAA entirely
Role of OAA and SS in mid-century labor supply

- Even understated Social Security program has big effects
  - Predicted to reduce LFP 65–74 by 7.4 p.p., 55% of total
Background

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The cost of the earnings test

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Conclusion
Conclusion

- OAA significantly reduced labor supply in 1940
  - Reduced LFP among 65–74-year-old men in 1940 by \(~8.5\) p.p.
  - Accounted for \(~60\)% of LFP reduction from 1930–1940
- Estimated welfare cost of earnings test to recipients quite small
- OAA and Social Security likely important in growth of retirement
- Many further questions: e.g.
  - “Family insurance” and intergenerational effects
  - Effects of OAA-induced labor force exit on workers ineligible for OAA
Gainful employment rate of men 65+

Source: Moen (1988)
Government old-age support and retirement

**FIGURE 13-3**

**Elderly Work and Social Security, 1959–2009**

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:** Gruber, *Public Finance and Public Policy*, 4th ed.
Government old-age support and retirement

![Graph showing labor force participation rate and payments per person 65+](image)
LFP by age and OAA program size

Share in the labor force at Census:

Age in April 1940:

Above median states

Below median states

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County-level payments per recipient, December 1939
Missingness of demographic and 1940 work information
Missingness of demographic and 1939 work, income info

[Graph showing trends over time]

Return
## Summary statistics: Demographics

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<th>Full sample</th>
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<td>Completed primary school</td>
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<td>US citizen</td>
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<td>0.227</td>
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<td>Currently married</td>
<td>0.755</td>
<td>0.430</td>
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<td>0.755</td>
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Sample: men aged 55-74 with non-missing demographic information (education, race, birthplace, citizenship, and marital status) and non-missing 1940 labor force status.
Summary statistics: 1940 Labor Supply

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<td>Mean</td>
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<td>In the labor force</td>
<td>0.713</td>
<td>0.452</td>
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<td>Employed</td>
<td>0.651</td>
<td>0.477</td>
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<tr>
<td>Employed, non-emergency work</td>
<td>0.616</td>
<td>0.486</td>
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</table>

Sample: men aged 55-74 with non-missing demographic information and non-missing 1940 labor force status
### Summary Statistics: 1939 Labor Supply and Income

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<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Worked in 1939</td>
<td>0.720</td>
<td>0.449</td>
<td>6283146</td>
<td>0.730</td>
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<tr>
<td>Any wage/salary income in 1939</td>
<td>0.480</td>
<td>0.500</td>
<td>6283146</td>
<td>0.480</td>
</tr>
<tr>
<td>Wage/salary income in 1939</td>
<td>557</td>
<td>911</td>
<td>6283146</td>
<td>551</td>
</tr>
<tr>
<td>≥$50 in non-wage/salary income</td>
<td>0.516</td>
<td>0.500</td>
<td>6283146</td>
<td>0.518</td>
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</table>

Sample: men aged 55–74 with non-missing demographic information, 1940 employment information, 1939 employment and income information.
Simulated instrument

- Treat state “maximum payment” as the level of an income floor
  - Incorporate earnings disregards, if any (5 states)
  - Use 99th percentile payment in states with no legal max (8 states)
    - In general payments = “needs” - “resources”
    - Even in states with no maximum payment, were administrative norms/procedures determining typical standards of “needs”
    - 99th percentile should measure payments to individuals with no “resources” and be less driven by outliers than e.g. observed maximum
    - Robust to using highest legal max across all states instead

- Simulate payments under using national population of men aged 60–64, omitting own state
Simulated instrument vs. observed, by state

Graph showing the comparison between actual and simulated payments per person 65+, December 1939, by state. The graph includes states that have legal maximum payments and states that have no legal maximum payments.
## Simulated IV first stage regressions

<table>
<thead>
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<th>(1) age 55-59</th>
<th>(2) age 65-69</th>
<th>(3) age 70-74</th>
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<tr>
<td>Log simulated per-65+</td>
<td>0.897***</td>
<td>0.000</td>
<td>-0.000</td>
</tr>
<tr>
<td>payment × age 55-59</td>
<td>(0.113)</td>
<td>(0.001)</td>
<td>(0.000)</td>
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<td>Log simulated per-65+</td>
<td>0.002</td>
<td>0.892***</td>
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<td>payment × age 65-69</td>
<td>(0.003)</td>
<td>(0.114)</td>
<td>(0.002)</td>
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<td>Log simulated per-65+</td>
<td>-0.004</td>
<td>-0.002</td>
<td>0.907***</td>
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<td>payment × age 70-74</td>
<td>(0.003)</td>
<td>(0.002)</td>
<td>(0.110)</td>
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<tr>
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<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Education × age fixed effects</td>
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<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Race × age fixed effects</td>
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Balance checks (observed payments)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Share 65 and above</th>
<th>Share foreign born</th>
<th>Share nonwhite</th>
<th>Median years of schooling</th>
<th>Log median earnings</th>
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<td>Panel A. Observed payments variable, no border fixed effects</td>
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<tr>
<td>Log per-65+ payment</td>
<td>0.010**</td>
<td>0.033***</td>
<td>-0.127***</td>
<td>1.137***</td>
<td>0.291***</td>
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<td>(0.003)</td>
<td>(0.007)</td>
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<tr>
<td>Panel B. Observed payments variable, border fixed effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Log per-65+ payment</td>
<td>0.002</td>
<td>0.003</td>
<td>0.015*</td>
<td>-0.045</td>
<td>-0.045</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.007)</td>
<td>(0.132)</td>
<td>(0.046)</td>
</tr>
<tr>
<td>Observations</td>
<td>1192</td>
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<td>1183</td>
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### Balance checks (simulated payments, reduced form)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Share 65 and above</th>
<th>Share foreign born</th>
<th>Share nonwhite</th>
<th>Median years of schooling</th>
<th>Log median earnings</th>
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<tbody>
<tr>
<td><strong>Panel C. Simulated payments variable, no border fixed effects</strong></td>
<td></td>
<td></td>
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<tr>
<td>Log simulated per-65+ payment</td>
<td>0.014* (0.006)</td>
<td>0.058*** (0.012)</td>
<td>-0.175* (0.075)</td>
<td>1.258*** (0.303)</td>
<td>0.534*** (0.071)</td>
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<td>Observations</td>
<td>1192</td>
<td>1192</td>
<td>1192</td>
<td>1183</td>
<td>1183</td>
</tr>
<tr>
<td><strong>Panel D. Simulated payments variable, border fixed effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Log simulated per-65+ payment</td>
<td>0.002 (0.002)</td>
<td>0.001 (0.001)</td>
<td>-0.011 (0.012)</td>
<td>-0.205 (0.176)</td>
<td>-0.013 (0.038)</td>
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<td>1192</td>
<td>1192</td>
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</tbody>
</table>
## Labor force participation: OLS results

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log per-65+ payment</td>
<td>0.018***</td>
<td>0.016***</td>
<td>0.000</td>
<td>0.001</td>
</tr>
<tr>
<td>× age 55-59</td>
<td>(0.005)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Log per-65+ payment</td>
<td>-0.061***</td>
<td>-0.057***</td>
<td>-0.049***</td>
<td>-0.049***</td>
</tr>
<tr>
<td>× age 65-69</td>
<td>(0.004)</td>
<td>(0.006)</td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Log per-65+ payment</td>
<td>-0.068***</td>
<td>-0.068***</td>
<td>-0.060***</td>
<td>-0.061***</td>
</tr>
<tr>
<td>× age 70-74</td>
<td>(0.008)</td>
<td>(0.009)</td>
<td>(0.006)</td>
<td>(0.006)</td>
</tr>
<tr>
<td>Observations</td>
<td>6722869</td>
<td>2403915</td>
<td>2403915</td>
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<tr>
<td>Sample</td>
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<td>border</td>
<td>border</td>
<td>border</td>
</tr>
<tr>
<td>Border segment × age fixed effects</td>
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<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Education × age fixed effects</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Race × age fixed effects</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>yes</td>
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</table>
Non-wage income: age-by-payment/65+ interactions

Return

Fetter and Lockwood

Government pensions and labor supply

November 2017

67 / 48
Decomposing reduction in labor force participation

<table>
<thead>
<tr>
<th></th>
<th>(1) In labor force</th>
<th>(2) Employed</th>
<th>(3) Non-emergency</th>
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<td>Log per-65+ payment</td>
<td>0.006</td>
<td>0.008</td>
<td>0.001</td>
</tr>
<tr>
<td>× age 55-59</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Log per-65+ payment</td>
<td></td>
<td></td>
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<tr>
<td>× age 65-69</td>
<td>-0.063***</td>
<td>-0.050***</td>
<td>-0.032***</td>
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<td></td>
<td>(0.008)</td>
<td>(0.008)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Log per-65+ payment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>× age 70-74</td>
<td>-0.075***</td>
<td>-0.060***</td>
<td>-0.042***</td>
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<tr>
<td></td>
<td>(0.010)</td>
<td>(0.009)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Observations</td>
<td>2403915</td>
<td>2403915</td>
<td>2403915</td>
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<tr>
<td>Kleibergen-Paap rk Wald F-stat</td>
<td>20.53</td>
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</tr>
<tr>
<td>Border segment × age fixed effects</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Education × age fixed effects</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Race × age fixed effects</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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</tbody>
</table>
LFP effects, top and bottom quartiles of unemployment

Bottom (mean unemployment=.05)

Top (mean unemployment=.2)
Break at age 65 in earnings distribution

Share with $501–600 in wage and salary earnings
Within-period consumption/leisure choice

\[
Y \rightarrow
\]

\[
\overline{y}_1 \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow 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\rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \righta
Lifetime labor supply

\[ LC = a_0 + wT \]

No OAA

\[ a_0 + (T - T_{elig}) \bar{y} \]

OAA

slope = \( w - \bar{y} \)

\( t_0 = 0 \)  \( T_{elig} \)  \( T \)  age of retirement
Lifetime labor supply

\[ a_0 + (T - T_{elig}) \bar{y} \]

\[ LC = a_0 + wT \]

\[ t_0 = 0 \]

\[ T_{r}^{AA} \]

\[ T \]

age of retirement

\[ LC \]
Lifetime labor supply

\[ LC = a_0 + wT \]

\[ a_0 + (T - T_{elig})\bar{y} \]

\[ t_0 = 0 \quad T^{OAA}_r \quad T_r \quad T \quad \text{age of retirement} \]