*American Economic Review 2018, 108(8): 2174–2211*
*https://doi.org/10.1257/aer.20160921*

# Government Old-Age Support and Labor Supply: Evidence from the Old Age Assistance Program[†]

*By* Daniel K. Fetter and Lee M. Lockwood*

*Many government programs transfer resources to older people and implicitly or explicitly tax their labor. We shed new light on the labor supply and welfare effects of such programs by investigating the Old Age Assistance Program (OAA). Exploiting the large differences in OAA programs across states and Census data on the entire US population in 1940, we find that OAA reduced the labor force participation rate among men aged 65–74 by 8.5 percentage points, more than one-half of its 1930–1940 decline, but that OAA's implicit taxation of earnings imposed only small welfare costs on recipients.* (*JEL* H24, H55, H75, J14, J22)

Many of the most important government programs, including Social Security and Medicare, transfer resources to older people and tax their labor relative to that of younger people.[1] Standard economic theory predicts that such programs reduce late-life labor supply and that the implicit taxation reduces the ex post value of the programs to recipients. Understanding the size and nature of such effects on labor supply and welfare is an increasingly important issue, as demographic trends have increased both the potential labor supply of the elderly and its aggregate importance, while simultaneously increasing the need for reforms to government old-age support programs. This raises three important questions. What are the effects of government old-age support programs on late-life labor supply? What is the relative importance of the two key features of these programs, the transfers to older people and the taxation of their labor, in determining these effects? And to the extent that taxation of labor is important, how large are the associated welfare costs to recipients?

* Fetter: Department of Economics, Wellesley College, 106 Central Street, Wellesley, MA 02481, and NBER (email: dfetter@wellesley.edu); Lockwood: Department of Economics, University of Virginia, 248 McCormick Road, Charlottesville, VA 22903, and NBER (email: leelockwood@virginia.edu). This paper was accepted to the *AER* under the guidance of Hilary Hoynes, Coeditor. We thank Courtney Coile, Joe Ferrie, Andrew Goodman-Bacon, Jon Guryan, Eric Hilt, Lorenz Kueng, Phil Levine, Matt Notowidigdo, Gal Wettstein, Heidi Williams, and seminar participants at Berkeley, Boston College, Calgary, Clemson, Davis, Harvard, Queen's, McGill, Montréal, the Minneapolis Fed, Nebraska, Northwestern, NYU-Stern, Rutgers, Stanford, SUNY-Buffalo, UBC, UCLA, UVA, Wellesley, Williams, UW-Madison, the NBER DAE, and PE program meetings, and the annual meetings of the AEA, EHA, and NTA for helpful comments. We thank Rose Burnam, Angelina Li, Paul Mohnen, and Jordan Norris for excellent research assistance. We both gratefully acknowledge financial support from National Science Foundation (NSF) grant SES-1628860. The authors declare that they have no relevant or material financial interests that relate to the research described in this paper.

† Go to https://doi.org/10.1257/aer.20160921 to visit the article page for additional materials and author disclosure statement(s).

[1] See, for example, Goda, Shoven, and Slavov (2009) and Gelber, Jones, and Sacks (2017) on Social Security and Goda, Shoven, and Slavov (2007) on Medicare.

We address these questions by investigating Old Age Assistance (OAA), a means-tested program introduced in the 1930s alongside Social Security that later became the Supplemental Security Income (SSI) program. OAA was large both in absolute terms, as 22 percent of people 65 and older received OAA in 1940, and relative to Social Security, which made no regular payments until 1940 and remained smaller than OAA until 1950. OAA transferred resources to older people and, through an earnings test, implicitly taxed their labor relative to that of younger people. Unlike Social Security and other social insurance programs that are national in scope and near-universal in coverage, OAA was state-administered and exhibited considerable variation across states in eligibility and benefit levels, from very small to substantial programs. The combination of wide variation across states and, compared to more recent periods, the relative paucity of private pensions and other government programs targeting the elderly provides a promising opportunity to learn about the effects of these programs.

The particular setting we study is of special interest because it marked the beginning of a large expansion of government old-age support through OAA and Social Security that coincided with large declines in labor force participation among older men. Panel A of Figure 1 illustrates these trends during the early expansions of these programs, from 1920 through 1970. The striking time-series correlation between the expansion of the Social Security program after 1950 and declining labor force participation is often noted in discussions of Social Security and retirement (e.g., Feldstein and Liebman 2002; Krueger and Meyer 2002; Gruber 2013; Coile 2015). But, as the same authors note, there is still significant uncertainty about the causal relationship between the two trends. Moreover, during this period both OAA and Social Security implicitly taxed late-life earnings in a highly salient way. OAA payments were typically reduced dollar-for-dollar with earnings, and the Social Security earnings test withheld benefits from people earning more than a small amount, without any compensating increase in future benefits.[2] The extent to which the earnings tests reduced the value of OAA and Social Security is an unaddressed yet critical determinant of the welfare effects of the mid-century growth in government old-age support.

Our analysis combines large policy variation with recently released data on the entire US population from the 1940 US Census. The large sample size of this dataset and its precise geographic information enable a wide range of empirical tests that would have been difficult or impossible with previously available data. Our main empirical tests make use of two sources of variation. The first is age eligibility requirements, which almost always limited eligibility for OAA to people 65 and older. Importantly, other modern-day programs that use age 65 as a cutoff, including Social Security, were either small or nonexistent at the time, and private pensions were still relatively uncommon. Panel B of Figure 1 shows that while labor force participation declined fairly continuously around age 65 in 1930, by 1940 the decline at age 65 was slightly sharper than at other ages and by 1960 the decline at age 65 was quite pronounced. The second source of variation is cross-state variation in payment and eligibility levels of OAA programs. The empirical analysis tests

[2] For example, between 1939 and 1950, Social Security withheld benefits from people earning more than $15 per month. In 2010 dollars, this amount corresponded to about $230 in 1939 and about $135 in 1950.

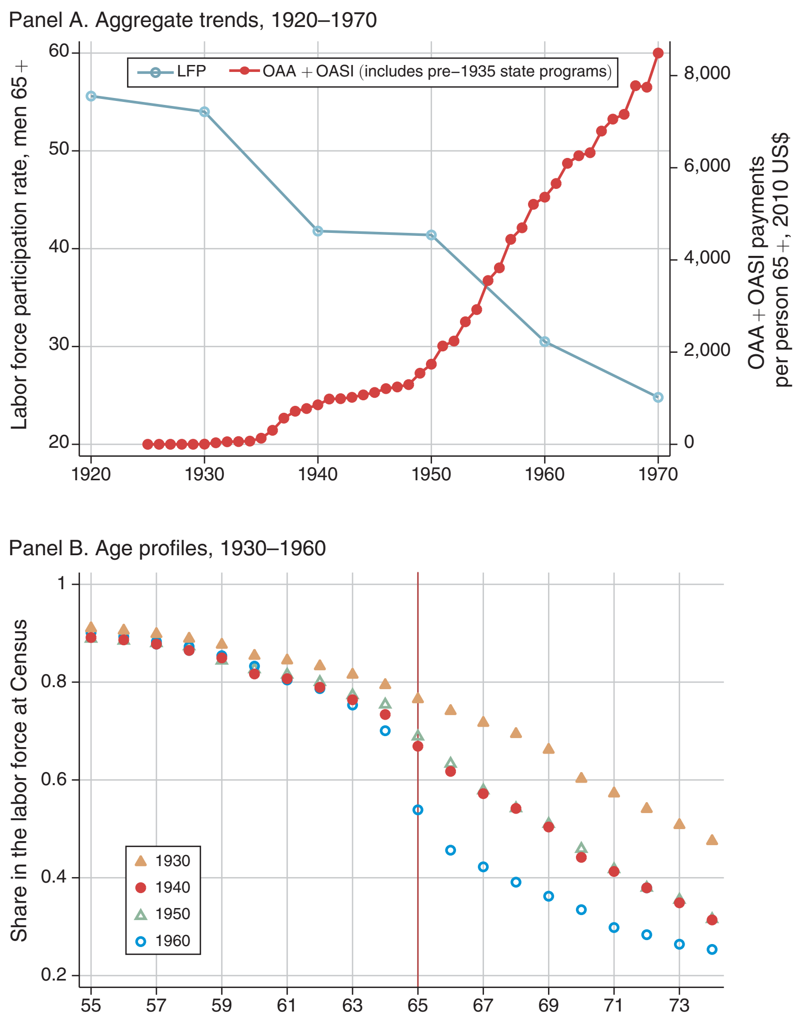



Figure 1. Government Old-Age Support and Retirement over the Mid-Twentieth Century

*Note:* Panel A shows labor force participation rate of men 65 and older, from Series D35 of US Bureau of the Census (1975), and payments under Old Age Assistance (OAA) and Old Age and Survivors Insurance (OASI) per person 65 and older, in 2010 US dollars. OAA payments data come from Parker (1936) for 1925 to 1935 and Series Bf621 of Carter et al. (2006) for 1936 onward. OASI payments data come from Series BF396 of Carter et al. (2006). Panel B shows share of men in the labor force at each age, calculated from the 1930–1960 Censuses. Rates prior to 1940 are adjusted for comparability. See online Appendix Section A.1 for details.

whether there is a greater reduction in labor force participation after age 65 in states with larger OAA programs relative to states with smaller programs.

Our estimates indicate that OAA significantly reduced labor force participation among older individuals. The basic patterns that we explore in the data are evident in Figure 2, which plots male labor force participation by age, separately for states with above- and below-median OAA payments per person 65 and older. Up to age 65, the age pattern of labor force participation was extremely similar in states with larger and smaller OAA programs. At age 65, however, there was a sharp divergence in labor force participation between states with larger OAA programs relative to those with smaller programs, and this divergence continued at older ages. Our regression

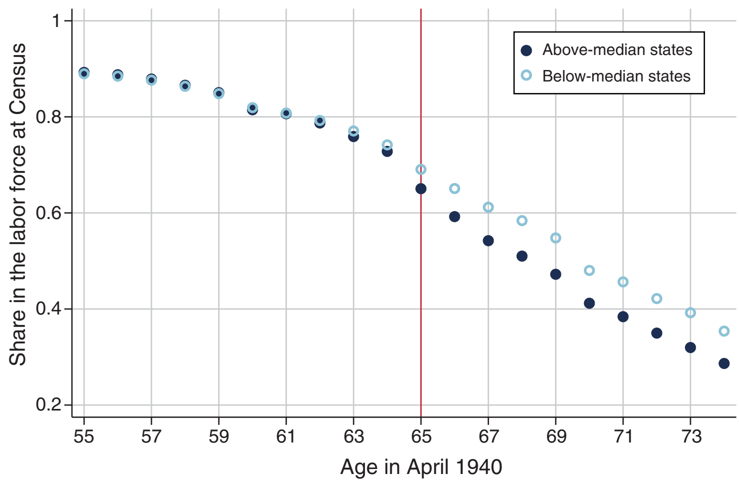



FIGURE 2. LABOR FORCE PARTICIPATION IN 1940, BY AGE AND STATE OAA PAYMENTS PER PERSON 65+

*Note:* Figure shows share of men in the labor force at the time of the 1940 Census, in states with above- and below-median OAA payments per person 65+ in 1939, for states with an eligibility age of 65 in 1939.

results, which isolate variation in OAA program size due to state policy differences, imply that OAA can explain more than one-half of the large 1930–1940 drop in labor force participation of men aged 65–74.

Although we find large effects of OAA on labor force participation, both reduced-form and structural results suggest that the welfare cost to recipients of OAA's implicit taxation of work was small. Combining our reduced-form results with an estimate of overall OAA recipiency for men aged 65–74 implies that 52 percent of OAA recipients in this group changed their labor force participation status in response to OAA. Assuming that the remaining 48 percent of recipients valued their benefits fully, \$1 of OAA benefits was worth at least \$0.48 of unconditional late-life income to the average recipient. Moreover, the effects of OAA were concentrated among men with low potential earnings. Labor force exit in response to OAA was greater for men with lower levels of education, and nearly one-half of the reduction in labor force participation from OAA was due to exit from unemployment or from employment in work relief programs that were targeted at individuals with poor labor market prospects.

In order to better understand the effects of OAA on labor supply and the value of OAA to recipients, we go beyond our reduced-form results by estimating a model of lifetime labor supply and retirement. Identification of the model comes from the pattern of bunching of retirements at the OAA eligibility age, at which OAA's earnings test creates a convex kink in the lifetime budget constraint, across different earnings groups. By comparing the extent of bunching among different earnings groups, we can jointly estimate eligibility, which we do not observe in the data, and preferences. The estimates suggest that 22 percent of the male population was eligible for OAA in 1940, and simulations indicate that, had all men aged 65–74 in 1940 been eligible for OAA, OAA would have reduced their labor force participation rate by 21 percentage points. Further simulations of the model indicate that, although OAA's earnings test explained close to one-half of its labor supply effects, recipients valued their benefits highly. The average $1 of OAA benefits was worth about $0.95 of unconditional late-life income. The average value of OAA benefits is high for two reasons. First, the effects of OAA were concentrated among people with low potential earnings, for whom the cost of meeting an earnings test is smaller. Second, many people were inframarginal in the sense that they would have retired either before or relatively soon after the OAA eligibility age even without OAA, or even if OAA did not impose an earnings test.

In the final section of the paper, we ask what both the reduced-form results and the estimated model suggest about the role of government old-age support, and of Social Security in particular, in the growth of retirement over the mid-twentieth century. Although OAA was targeted at the poor elderly and had very different eligibility and payment determination rules from those of Social Security, OAA and Social Security shared the core features of transferring resources to older people while taxing their labor relative to that of younger people. Our results suggest that Social Security had the potential to drive at least one-half, and likely more, of the mid-century decline in late-life labor supply for men.

This paper relates to literatures on the labor supply and welfare effects of government old-age support and means-tested transfer programs. A large body of work has investigated the effects of Social Security and other government old-age support programs on labor supply and retirement (for reviews, see Diamond and Gruber 1999; Feldstein and Liebman 2002; Krueger and Meyer 2002; Coile 2015). Our paper is especially related to a branch of this literature on the labor supply effects of OAA (Parsons 1991; Friedberg 1999) and to work on the role of government old-age support programs in the mid-twentieth century rise in retirement (Boskin 1977; Moffitt 1987; Parsons 1991; Friedberg 1999; Gelber, Isen, and Song 2016).[3] It is also especially related to a branch of this literature that has sought to decompose the labor supply effects into those due to income transfers and those due to changes in marginal incentives to work associated with the tax and benefit rules (e.g., Burtless and Moffitt 1985; Friedberg 2000; French 2005; Gelber, Isen, and Song 2016; Gelber, Jones, and Sacks 2017). Our work on OAA, a means-tested program, also relates to other work on the labor supply effects of means-tested transfers. A large literature, reviewed by Moffitt (2003) and Ziliak (2016), has investigated the labor supply effects of Aid to Families with Dependent Children (AFDC) and Temporary Assistance to Needy Families (TANF). A much smaller literature (Neumark and Powers 2000, 2006) has investigated the labor supply effects of Supplemental Security Income (SSI) for the aged, the successor program to OAA and the modern program that OAA most closely resembles.

Relative to the earlier literature, one important contribution of this paper is that the combination of our setting and approach allows us to credibly estimate the *full* labor supply effects of OAA programs, from essentially no program to the largest

[3] Although the time series relationship over the mid-twentieth century is striking, Costa (1998) and Lee (1998) note that attachment to the labor force among men 65 and older had already declined significantly between 1880 and 1910, before OAA and Social Security were established. Studying Union Army pensions and retirement in the first decade of the twentieth century, Costa (1995) suggests that rising incomes could account for much of the rise in retirement over the twentieth century.

of those observed in 1940. Although the full labor supply effects of government old-age support and means-tested programs are crucial determinants of the welfare effects of such programs, most research on both old-age support programs and welfare programs is limited to the more modest aim of estimating effects of marginal changes in program parameters.[4] The existing literature has provided substantial evidence on the effects of marginal changes in Social Security benefits on retirement, for example by examining changes in retirement timing associated with changes in eligibility ages (e.g., Atalay and Barrett 2015), by exploiting different treatment under program rules of otherwise similar people (e.g., Coile and Gruber 2007; Liebman, Luttmer, and Seif 2009), and, less often, by using within-country differences in pension programs (Baker and Benjamin 1999). But this literature has focused on data from the last several decades, a period in which benefit levels are high, multiple programs affect incentives to retire at specific ages, and there is significant bunching of retirements at certain ages. Any one of these factors alone would make extrapolations to zero inherently speculative.

Another key contribution of this paper is to shed light on the welfare effects of government old-age support programs by using transparent sources of identification, and a variety of empirical methods, to estimate the cost to recipients of OAA's earnings test. Although the cost to recipients of earnings tests is a crucial determinant of the welfare effects of means-tested programs, relatively little work has sought to estimate this cost directly. To the best of our knowledge, the cost of the earnings test is completely unaddressed by papers on the early years of OAA and Social Security and is rarely addressed even in the vast literature on government old-age support and means-tested programs, including Temporary Assistance to Needy Families and SSI. Those papers that do address this issue rely almost entirely on calibrated structural models, whereas our setting enables us to implement approaches based on both reduced-form methods and an estimated structural model.[5] Our finding that the cost to recipients of OAA's earnings test is small is notable in light of OAA's large effects on labor supply and its high implicit taxation of earnings.

## I. Background on the Old Age Assistance Program

Old Age Assistance (OAA) was introduced alongside Old Age Insurance (OAI), which came to be known as Social Security, in the Social Security Act of 1935. OAA provided federal matching grants for state-administered, means-tested old-age support programs for the low-income elderly. Social Security was initially small; it made no payments until 1940, and even then to less than two percent of the elderly. But

[4] For example, in his review of research on the TANF program and its predecessor the AFDC program, Moffitt (2003, p. 317) writes, "Probably the major methodological problem with these estimates is the obvious one that they are not based on any data in which AFDC was literally absent, but rather are extrapolations from estimated effects of the existing, positive level of AFDC benefits down to a benefit level of zero."

[5] Friedberg (2000), using an estimated structural model, estimates the deadweight loss of the Social Security earnings test on the intensive margin for working beneficiaries during the period spanning the late 1970s and early 1990s. During this period, the taxation implicit in the earnings test was smaller than it was during the middle of the twentieth century, the period on which we focus. Laitner and Silverman (2012) is another rare example of a welfare analysis of Social Security policies in an estimated model. Large literatures analyze the welfare effects of Social Security in calibrated computable general equilibrium models (e.g., Auerbach and Kotlikoff 1987) and estimate the income and substitution effects of means-tested programs on labor supply using structural models (for a recent review of the literatures on several means-tested programs, see Moffitt 2016).

the introduction of OAA led to a major and rapid expansion in government old-age support. In 1929, just seven states had laws providing for assistance to the elderly. By 1940, every state had an OAA program, and about 22 percent of people aged 65 and older received OAA payments. The average annual OAA payment was $232 ($3,615 in 2010 dollars), about 25 percent of 1939 median wage and salary earnings for 60–64-year-olds earning a wage, and slightly over one-half of the twenty-fifth percentile of wage earnings. OAA was by far the largest source of old-age support at this time, greatly exceeding both Social Security and employer pensions. Only in the 1950s did Social Security become the larger program, as cohorts "aged in" and legislation expanded eligibility and benefits.

States had a great deal of discretion in the design and administration of their OAA programs, and both the share of the elderly receiving OAA and average payments varied widely. Figure 3 shows county-level data from the US Social Security Board (1940c) on total OAA payments in the month of December 1939, scaled by the population 65 and older in the 1940 Census. Many state borders exhibit stark differences in payments per elderly person, which suggests that different state policies led to large differences in payments for individuals in similar circumstances.

In general, OAA programs were set up as either an income floor or a consumption floor (the latter of which takes into account all resources when determining payments), both of which implicitly tax recipients' income at a 100 percent rate, as benefits are phased out dollar-for-dollar with income. In practice, state or local OAA administrators evaluated the "needs" and "resources" of each applicant. The excess, if any, of needs over resources determined the size of the payment, up to a maximum level. In some states the level of "needs" could vary across people, while in others a common dollar amount was used.[6] In the analysis, we use measures of maximum payments to approximate variation across states in the level of the income or consumption floor. The statutory maximum monthly payment was $30 in most states ($470 in 2010 dollars), which was the federal matching cap, but ranged from $15 to $45, with eight states having no statutory maximum. The states that had no statutory maximum had a small number of very high payments, but the ninety-ninth percentile of payments were well in line with other states' legal maxima.[7]

State OAA laws specified a variety of eligibility criteria. All states required that an applicant have little income and be of at least a certain age, nearly always 65. Nearly all states had residency requirements. Many states also imposed asset tests and restricted eligibility to US citizens or long-term residents. Some states required that an applicant have no legally responsible relatives able to provide support. As was common in public assistance programs of the time, relief officials retained a significant amount of discretion in determining eligibility. For example, Lansdale et al. (1939) note some moralistic provisions in OAA laws (e.g., limiting eligibility to the "deserving") and emphasize the significant variation in how strictly certain

[6] See online Appendix Section A.2.1 for more detail. Online Appendix Figure A1, discussed in more detail there, shows distributions of payments in selected states to illustrate the differences across states in whether "needs" were set at a common level or varied across people.

[7] See online Appendix Table A1, which reports basic features of each state's payments; also see online Appendix Figures A2 and A3, which show maps of legal maximum payments and ninety-ninth percentile payments, respectively.

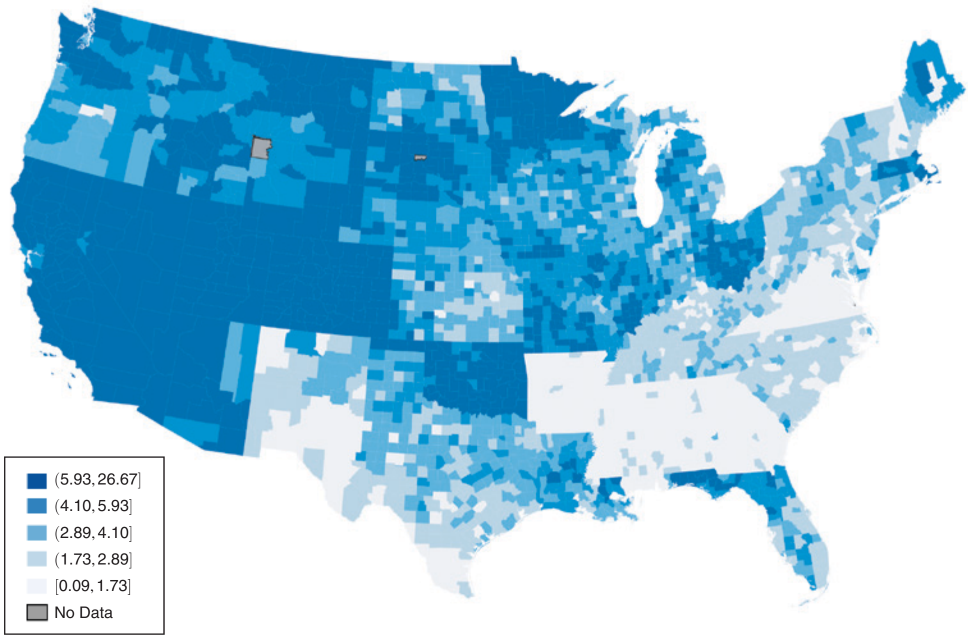



Figure 3. OAA Payments per Person 65 and Above, December 1939

*Notes:* Figure shows total OAA payments for the month of December 1939 scaled by the population 65 and above in the 1940 Census. OAA payments data come from US Social Security Board (1940c). In 2010 dollars, bottom quintile is approximately \$1.40 to \$27 and top quintile is \$93 to \$419.

eligibility requirements, such as relatives' responsibility laws, were enforced.[8] As a result, features of OAA other than statutory eligibility criteria affected recipiency rates (e.g., see Fetter 2017). These potential influences on recipiency will be relevant in the structural estimation in Section V, in that they are a reason we estimate eligibility from behavior rather than observing it directly.

Table 1 shows summary statistics at the state level on recipiency and payments in December 1939. Variation in recipiency rates and benefits per recipient, which were not strongly correlated across states, generated wide variation in average OAA benefits: payments per person 65 and older varied more than thirteen-fold across states.

## II. Theoretical Predictions

The simplest model for understanding how OAA might affect the labor supply and welfare of recipients is a model of the lifetime budget constraint relating total lifetime consumption to the length of retirement, as illustrated in Figure 4.[9]

[8] Although not the focus of this paper, the discretion of OAA administrators left significant scope for discrimination (see, e.g., Quadagno 1988, on racial discrimination in the South).

[9] This framework is better suited to analyzing those OAA programs that provide income floors than those programs that provide consumption floors, since the latter might distort the timing of consumption. We assume throughout that OAA recipients do not bear any of the burden from the taxes necessary to finance the program. This is likely a good approximation for the cohorts we study, who finished most of their working years before OAA was introduced.

Table 1—Basic Features of State OAA Programs

| | Mean | Median | SD | Min | Max | $N$ |
|---|---|---|---|---|---|---|
| OAA recipiency rate, December 1939 | 0.23 | 0.23 | 0.09 | 0.08 | 0.49 | 49 |
| OAA payment per recipient, December 1939 | 17.93 | 18.90 | 6.49 | 6.01 | 32.97 | 49 |
| OAA payment per person 65+, December 1939 | 4.16 | 3.59 | 2.59 | 1.01 | 13.17 | 49 |
| Legal maximum payment | 29.37 | 30 | 5.34 | 15 | 45 | 41 |
| 99th percentile payment | 29.43 | 30 | 6.22 | 12 | 45 | 49 |
| 99th percentile payment, states with legal maximum | 28.78 | 30 | 4.85 | 15 | 45 | 41 |

*Notes:* Includes the 48 states and the District of Columbia. "99th percentile payment" is for new recipients in fiscal year 1938–1939. Eight states had no legal maximum payment. Recipiency rate and payments per person 65+ are normalized by state population from 1940 Census.

*Sources:* Data on OAA dollar payments and number of recipients from US Social Security Board (1940b), data on legal maximum payments from US Social Security Board (1940a), data on ninety-ninth percentile payment from US Social Security Board (1939b).

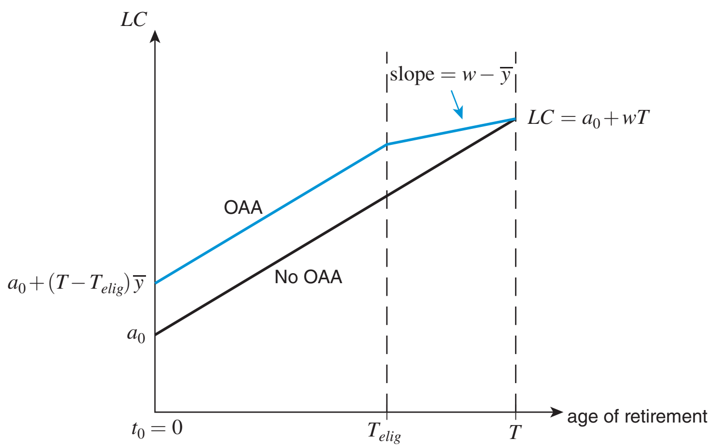



Figure 4. Lifetime Budget Constraint with OAA

*Notes:* Lifetime budget constraint relating the present value of lifetime consumption ($LC$) to age at retirement, with and without OAA. The OAA program depicted is an income-floor program with eligibility age $T_{elig}$, which implicitly taxes labor earnings at a 100 percent rate from the first dollar (by phasing out benefits dollar-for-dollar with labor income). For simplicity, the figure depicts the case in which the rate of return is zero, $r = 0$.

OAA expands the set of consumption-leisure opportunities available to potential recipients by paying recipients $\overline{y}$ for each period they do not work after the OAA eligibility age. OAA has an income effect that tends to hasten retirement and, for people who would retire after the OAA eligibility age if OAA benefits did not depend on earnings, a substitution effect that also tends to hasten retirement.

By reducing the private return to work after the OAA eligibility age but not before, OAA introduces a convex kink in the lifetime budget constraint at that age. For retirement ages younger than the OAA eligibility age, working an additional year increases total lifetime consumption by the full amount of earnings, $w$.

For retirement ages older than the OAA eligibility age, working an additional year increases total lifetime consumption by the excess, if any, of earnings over the OAA benefit level, $\max\{0, w - \overline{y}\}$ . OAA therefore imposes an implicit marginal tax on earnings after the OAA eligibility age, with implicit tax rate $\tau = \min\{1, \overline{y}/w\}$. With a smooth distribution of preferences for consumption versus leisure in the population, such a convex kink attracts more people than nearby allocations on the budget constraint. This prediction of a "bunching" of retirements at the eligibility age underlies both our reduced-form and structural estimation strategies.

The extent to which the earnings test affects labor supply and the value of the program to recipients depends critically on the distribution of people along the budget set. People who retire earlier are less affected by the earnings test. As long as leisure is non-inferior, someone who would retire before the OAA eligibility age even without OAA is unaffected by the earnings test; his optimal retirement age with OAA, which is weakly earlier than it is without OAA, is before the earnings test reduces benefits. Someone who would work only a short time after the eligibility age without OAA is at most slightly affected by the earnings test.

## III. Data and Empirical Approach

### A. *Data*

The key data source that enables many of our empirical tests is the full-population microdata from the 1940 Census (Ruggles et al. 2017). In addition to the large size of the sample, an advantage relative to previously available datasets is precise geographic location, which enables empirical tests that would not otherwise be possible. We focus on men aged 55 to 74 in states in which the OAA eligibility age was 65 in 1939.[10] We restrict the sample to men with nonmissing information on basic demographics (birthplace, race, citizenship status, marital status, and years of education). Our main analysis focuses on work behavior at the time of the 1940 Census. Some additional analyses use information on work and income outcomes in 1939. For each set of outcomes, we exclude from the sample those men with missing information on work (or income) outcomes in the relevant year.[11]

Table 2 describes the characteristics of the men in our sample. About 71 percent were in the labor force, and 65 percent were employed. An important component of overall employment in the late 1930s was "public emergency" employment: employment through one of the federal programs that provided work-based relief to the unemployed, such as the Work Projects Administration (WPA) (see, e.g., Fishback 2007). About 62 percent of men in our sample were employed

[10] Three states (Missouri, New Hampshire, and Pennsylvania) had an OAA eligibility age of 70 in 1939 but reduced the eligibility age to 65 on January 1, 1940 to meet a requirement to continue receiving federal matching funds. The fact that the age requirement was changed just a few months before the 1940 Census complicates including them in the sample. We also exclude Colorado, in which long-term residents became eligible at age 60.

[11] The share of individuals missing data varies across states, but the variation in OAA policies that we use in the main specifications is not significantly associated with the probability of being dropped from the sample for 1940 outcomes; nor is it significantly associated with the probability of being dropped from the sample for 1939 outcomes, with the possible exception of older ages (70 and higher). These results are shown in online Appendix Figure A4.

Table 2—Summary Statistics

| | Full sample | | | Border county sample | | |
|---|---|---|---|---|---|---|
| | Mean | SD | *N* | Mean | SD | *N* |
| Years of education | 7.142 | 3.740 | 6,722,869 | 7.013 | 3.718 | 2,055,456 |
| Completed primary school | 0.547 | 0.498 | 6,722,869 | 0.528 | 0.499 | 2,055,456 |
| Non-white | 0.079 | 0.269 | 6,722,869 | 0.088 | 0.283 | 2,055,456 |
| US citizen | 0.946 | 0.227 | 6,722,869 | 0.953 | 0.211 | 2,055,456 |
| Currently married | 0.755 | 0.430 | 6,722,869 | 0.755 | 0.430 | 2,055,456 |
| In the labor force in 1940 | 0.713 | 0.452 | 6,722,869 | 0.725 | 0.447 | 2,055,456 |
| Employed in 1940 | 0.651 | 0.477 | 6,722,869 | 0.666 | 0.472 | 2,055,456 |
| Employed, non-emergency work in 1940 | 0.616 | 0.486 | 6,722,869 | 0.630 | 0.483 | 2,055,456 |
| Worked in 1939 | 0.720 | 0.449 | 6,283,146 | 0.730 | 0.444 | 1,915,313 |
| Any wage/salary income in 1939 | 0.480 | 0.500 | 6,283,146 | 0.480 | 0.500 | 1,915,313 |
| Wage/salary income in 1939 | 557 | 911 | 6,283,146 | 551 | 905 | 1,915,313 |
| $\geq$ \$50 in non-wage/salary income | 0.516 | 0.500 | 6,283,146 | 0.518 | 0.500 | 1,915,313 |

*Notes:* Full sample: men aged 55–74 in states with 1939 eligibility age of 65 with non-missing demographic information (education, race, birthplace, citizenship, and marital status). For demographic variables and 1940 labor force and employment variables (reflecting labor force status in last week of March 1940), sample restricted to men with non-missing information on labor force status and non-missing demographic information. For 1939 employment and income variables, sample restricted to men with non-missing information for all 1939 employment and income variables and non-missing demographic information. State border county sample further limits to counties that border a state included in the sample.

in either private or non-emergency government work and about 4 percent were employed in public emergency work. About one-half reported receiving any wage or salary income in 1939. (Those with no wage or salary income would include both those who did not work and those who worked but were self-employed.) Including those who reported zero wage and salary income in 1939, the average reported income was $557 (corresponding to about $8,672 in 2010 dollars). The only information on income from sources other than wages and salaries is whether such income totaled $50 or more (about $780 in 2010 dollars). Just over one-half of our sample reported receiving at least $50 of such income. It may be helpful to note that vital statistics data suggest that in 1940, remaining life expectancy of men reaching age 65 was about 12 years (Grove and Hetzel 1968).

As discussed in more detail below, our primary specifications limit comparisons to counties on either side of a state boundary. The "border county" sample excludes counties that did not border at least one other state in our sample. As shown in Table 2, a comparison of means across the full and border county samples indicates only small differences between the two, which suggests that inferences drawn from the border county sample likely apply to the population as a whole.

We use data on OAA payments and recipients from a variety of sources. We do not have individual-level data that include OAA recipiency, although we show some results using the measure of non-wage income in the 1940 Census data, which include OAA. As a summary policy measure, we use state OAA payments in December 1939 per person in the state aged 65 and older. The OAA data for this measure come from

US Social Security Board (1940b), which reports monthly data on total OAA dollar payments and the number of recipients at the state level. Geographically, the finest data we have on recipiency and payments are at the county level, from December 1939, as used in Figure 3. Neither of these sources contains detail on recipients' characteristics. We do, however, have state-level tabulations on new OAA recipients and the payments approved for these recipients for each fiscal year from 1936 through 1940, from research memoranda of the Social Security Board (US Social Security Board 1939a, b, 1941). We use this information for two purposes: first, to determine how high payments tended to be in states without statutory maximum payments, and second, to estimate an OAA recipiency rate for the demographic group we study (men aged 65–74) as opposed to the whole population 65 and older.

## B. *Empirical Approach*

We use two key sources of variation to investigate the effects of OAA. The first is the age-eligibility requirement, nearly always limiting assistance to people 65 and older.[12] The second key source of variation is the heterogeneity in state policy discussed in Section I. Combining variation in age-based eligibility and state policy, we test for differential changes in the age profile of labor force participation after the eligibility age, controlling flexibly for any age-specific effects common across states and for the possibility that state OAA policies were correlated with unobserved determinants of the level of labor force participation-age profiles.

A useful aspect of our context is that OAA was by far the largest source of old-age support for which 65 was a cutoff age in 1940. In more recent periods, changes in behavior at or around age 65 could be associated with any of a number of factors, such as eligibility for Social Security or Medicare. However, Medicare did not exist until 1965, and as noted in Section I, Social Security made no monthly payments until 1940, and even then to a very small share of the elderly. Other public or private pensions at the time made payments to a significantly smaller share of the elderly than OAA did and were primarily relevant for people higher in the income distribution than OAA recipients. Online Appendix Section A.3.2 offers more detail.

Because our main specifications use age eligibility for identification, we do not directly identify any anticipatory effects of OAA on labor supply before the eligibility age; our estimates are net of any such effects. Differential trends across states in the age profile of labor force participation will provide some indication of the likely size of such anticipatory effects, however, and will also speak to the relative size of the net-of-anticipatory effects between the young elderly (those just turning 65) and older individuals.

We follow a simulated instruments strategy, in the spirit of Currie and Gruber (1996), to capture variation in observed levels of OAA driven by policy rather than by population characteristics. Using the earnings distribution for a national population of men aged 60–64, the oldest ineligible age group, we simulate payments

[12] Most states did not have mandatory birth certificates for the cohorts in our sample, so, in addition to birth certificates, a range of other records such as marriage records and school records were used to determine age-eligibility (Lansdale et al. 1939). Although misreporting or inaccurate knowledge of age is a potential concern (Ransom and Sutch 1986; Elo and Preston 1994), in online Appendix Table A3, we find no evidence that our OAA variation is associated with the share of the population reporting they are 65 or older.

per person 65 and older treating a state's maximum payment as an income floor and incorporating any earnings disregards.[13] The basic idea is that a state's maximum payment is correlated with its typical income floor and is not itself affected by labor market conditions or population characteristics. For the eight states with no legal maximum payment, we measure variation in income floors using the ninety-ninth percentile payment among recipients accepted in fiscal year 1938–1939 in each state (based on information in US Social Security Board 1939b).[14] In all but a few cases, the ninety-ninth percentile payment is the same as the legal maximum in those states that had legal maxima (see online Appendix Table A1). Online Appendix Figure 5 illustrates some of the variation used in the simulated instrument, showing the distribution of monthly earnings for the national population against the minimum, median, and maximum levels of the maximum payment (plus any earnings disregards) across states. Despite using only some of the eligibility and payment criteria, the resulting instrument is clearly predictive of realized payments per person 65 and older at the state level, as can be seen in online Appendix Figure A6.[15] Online Appendix Section A.2.3 provides full details of the construction of the instrument.

The potential endogeneity of OAA policy is a concern if differences in policy were correlated with other, unobserved determinants of the shape of labor force participation-age profiles (any correlation between policies and the level of labor force participation-age profiles is differenced out by the estimation). We investigate the relationship between realized OAA payments and state-level demographics and income in online Appendix Table A2. OAA payments per person 65 and older tended to be greater in higher-income states, suggesting that these states tended to have more generous policies. Greater elderly population shares, greater foreign-born shares, and lower non-white population shares also correlated with higher OAA levels. We discuss these results in more detail in online Appendix Section A.3.1. To address potential policy endogeneity, in all of our main specifications we restrict comparisons to counties lying on either side of the same state border. The idea is to compare individuals who have similar characteristics and who are in the same labor market (and hence subject to similar shocks), but who face different OAA policies. Online Appendix Table A3 indicates that in unconditional comparisons using county-level data, similar correlations are evident between population characteristics and both realized and simulated payments. But when comparisons are limited to state boundaries by adding a fixed effect for the set of counties that touch each state border, these correlations disappear. This result supports the identification

[13] The national population we use for each state omits the state itself, although in practice this makes little difference. Earnings disregards existed in only a few states and were always at low levels. For the purposes of the simulated instrument, we impute earnings for the self-employed by drawing from the distribution of earnings for wage earners with the same level of education and the same number of weeks worked.

[14] The idea is that with payments equal to the gap between "needs" and "resources," payments near the top of the distribution tend to reflect payments to individuals with virtually no resources, present in every state, and therefore likely reflect administrative norms or rules. We use the ninety-ninth percentile payment rather than the observed maximum payment because the latter could be driven by quite exceptional situations.

[15] Online Appendix Figure A6 also shows, in some cases, considerable variation in observed payments for states with the same simulated payment. This is partly because assessed "needs," and hence the income floor, could vary across people in some states. Consistent with this, payments per recipient also exhibit some dispersion across states with the same maximum payment (see online Appendix Figure A7). The variation is also partly due to important determinants of eligibility for OAA, such as those discussed in Section I, that cannot be mapped into characteristics we observe in Census data. We discuss these issues at greater length in online Appendix Sections A.2.2 and A.2.3.

assumption that in the absence of OAA, the shape of labor force participation-age profiles would be similar in counties on either side of a state boundary.[16]

In our main specifications, for individual $i$ living in state $s$ and county $c$, we estimate equations of the form

$$(1) \quad y_{iacsb} = \beta_c + \delta_{ba} + \sum_{a \neq \overline{a}} \gamma_a \times \log(\textit{payments per person } 65+)_s + \Lambda' \mathbf{x}_{iacs} + \varepsilon_{iacsb},$$

where $a$ indexes age (either in single years or groups of years), $\overline{a}$ is a reference age, and $\mathbf{x}_{iacs}$ is a vector of controls. The variable of interest, $\log(\textit{payments per person } 65+)_s$, is the log of the December 1939 OAA payments per person 65 and older in state $s$. We instrument for this variable using the log simulated payment per person 65 and older. Online Appendix Table A4 reports first-stage regressions.[17] We limit the sample to counties lying on state borders and define a border segment between two states (indexed by $b$) as the set of all counties in either state that touch the boundary between the two. Since some counties border two or more different states, a county, and hence all the individuals in it, will appear in the data as many times as there are states that it borders. The border segment-by-age fixed effects then limit comparisons of age profiles to men living on either side of the same border. Since our policy of interest varies at the state level, we cluster standard errors at the state level. This level of clustering also accounts for the duplication of observations in counties lying on multiple state boundaries.

## IV. The Effect of OAA on Labor Supply

### A. *Baseline Results*

Estimates of equation (1) indicate that larger OAA payments led to sharper declines in labor force participation after age 65. For our primary results we group ages into five-year age bins, with ages 60–64 as a reference age. Table 3 reports both OLS and IV estimates. We focus our discussion on the (preferred) IV specifications; the OLS results follow similar patterns. All specifications indicate that states with larger OAA programs featured larger reductions in labor force participation after the OAA eligibility age. To demonstrate the importance of the border-by-age fixed effects, columns 1 and 2 show estimates from a variant on equation (1) replacing these with age fixed effects, in the full and border county samples. Interpreted at face value, these specifications suggest that larger OAA programs led to a greater reduction in labor force participation from ages 55–59 to ages 60–64. In principle, these reductions prior to eligibility could reflect anticipatory effects of OAA. But the fact that they disappear after including border-by-age fixed effects in column 3 suggests both that these controls are important and that they are effective in controlling for underlying differences in age trends in labor force participation between states with

[16] In principle, these comparisons could be refined further, for example by comparing only adjacent counties on either side of a state border. Because specifications using the entire state border pass covariate balance checks and placebo tests, we focus on these less computationally costly specifications. For all of the core results of the paper, however, using county pairs yields very similar results.

[17] All models are just-identified, so bias from weak instruments is unlikely to be a problem (see, e.g., Angrist and Pischke 2009).

Table 3—Labor Force Participation by State Payments per Person 65+ and Age

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| *Panel A. OLS results* | | | | |
| log per-65+ payment × age 55–59 | 0.018 | 0.016 | 0.000 | 0.001 |
| | (0.005) | (0.004) | (0.004) | (0.003) |
| log per-65+ payment × age 65–69 | −0.061 | −0.057 | −0.049 | −0.049 |
| | (0.004) | (0.006) | (0.004) | (0.004) |
| log per-65+ payment × age 70–74 | −0.068 | −0.068 | −0.060 | −0.061 |
| | (0.008) | (0.009) | (0.006) | (0.006) |
| Observations | 6,722,869 | 2,403,915 | 2,403,915 | 2,403,915 |
| Sample | Full | Border | Border | Border |
| Border segment × age fixed effects | No | No | Yes | Yes |
| Education × age fixed effects | No | No | No | Yes |
| Race × age fixed effects | No | No | No | Yes |
| *Panel B. IV results* | | | | |
| log per-65+ payment × age 55–59 | 0.048 | 0.028 | 0.006 | 0.006 |
| | (0.019) | (0.007) | (0.005) | (0.005) |
| log per-65+ payment × age 65–69 | −0.070 | −0.060 | −0.063 | −0.063 |
| | (0.008) | (0.010) | (0.008) | (0.008) |
| log per-65+ payment × age 70–74 | −0.089 | −0.078 | −0.074 | −0.075 |
| | (0.016) | (0.013) | (0.010) | (0.010) |
| Observations | 6,722,869 | 2,403,915 | 2,403,915 | 2,403,915 |
| Kleibergen-Paap rk Wald *F*-stat | 2.00 | 8.39 | 20.46 | 20.53 |
| Sample | Full | Border | Border | Border |
| Border segment × age fixed effects | No | No | Yes | Yes |
| Education × age fixed effects | No | No | No | Yes |
| Race × age fixed effects | No | No | No | Yes |

*Notes:* Dependent variable is indicator for being in the labor force at 1940 Census. In Panel B, log simulated payment by age interactions used as instruments for log per-65+ payment by age interactions. Sample for column 1: men aged 55–74 in states with 1939 eligibility age of 65. Columns 2–4 include only counties on state boundaries and exclude counties on borders of excluded states. Unit of observation in columns 2–4 is an individual-state border pair. All specifications include county fixed effects and five-year age group fixed effects. All age-interactions are with five-year age groups. Standard errors (in parentheses) are clustered at the state level.

larger and smaller OAA programs.[18] Our preferred specification, column 4, further controls for interactions of education and race with age. The coefficients suggest that a 1 standard deviation increase in log payments per person 65 and older (about 0.62 log points) was associated with a 3.9 percentage point reduction in labor force participation at ages 65–69, and a 4.7 percentage point reduction in labor force participation at ages 70–74. These results are broadly similar to those of Friedberg (1999) and Parsons (1991)(see online Appendix Section A.5).

Panel A of Figure 5 plots the coefficients on the age-payment interactions when we estimate (1) using interactions with single years of age. There is little evidence of large differential age trends prior to age 65, but at age 65 states with larger OAA programs exhibit a sharp, differential decline in male labor force participation that levels out around age 69. Panel B shows estimates from the same specification using the closest measure to a "first-stage" outcome available in the 1940 Census,

[18] It is also noteworthy that the first stage *F*-statistics indicate that our simulated instrument has a stronger relationship with observed payments when comparisons are restricted to state borders. This likely reflects greater predictive power of policy for observed outcomes when examining more similar populations.

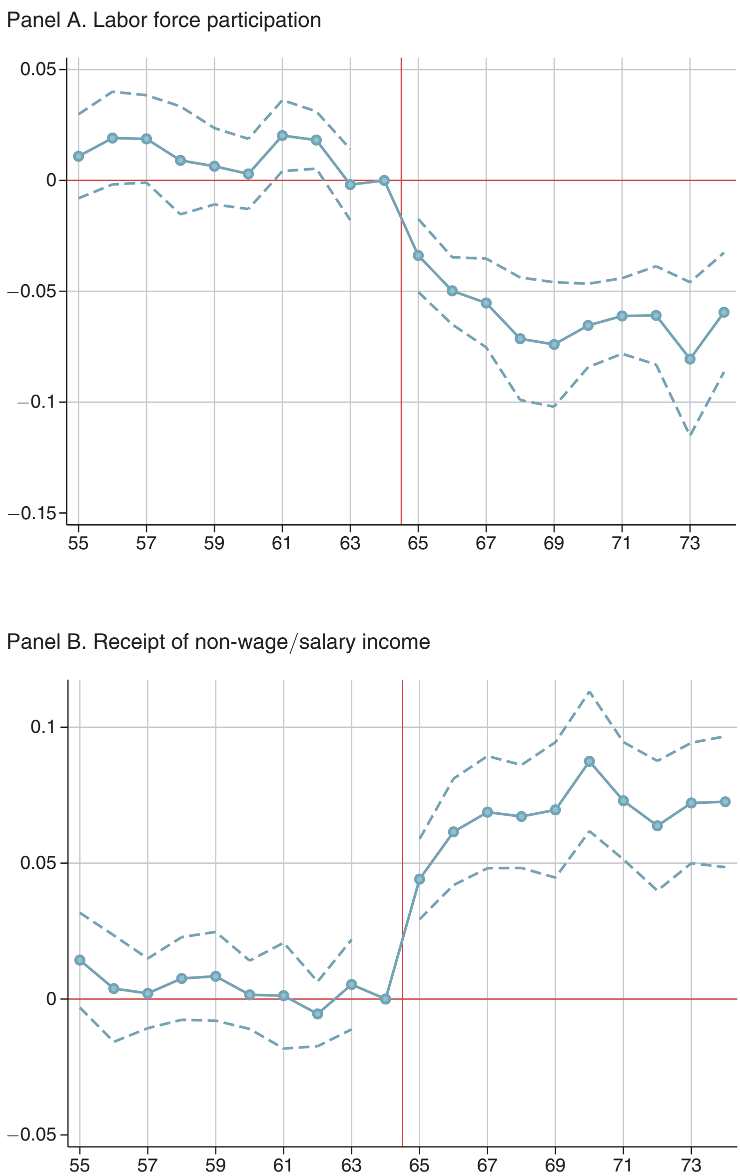



Figure 5. Differential Changes in Labor Force Participation and Receipt of Non-Wage Income

*Notes:* Figure shows point estimates and 95 percent confidence intervals on age-payment interactions from estimation of equation (1), using log simulated payment by age interactions as instruments for log per-65+ payment by age interactions and controlling for state border-by-age fixed effects. Sample restricted to counties on state boundaries, excluding counties on borders of states with age eligibility requirement other than 65 in 1939. Unit of observation is an individual-state border pair. Standard errors clustered at the state level. For panel A, $N = 2{,}403{,}915$ and Kleibergen-Paap rk Wald $F$-stat is 3.06. For panel B, $N = 2{,}238{,}476$ and Kleibergen-Paap rk Wald $F$-stat is 3.55.

an indicator for receipt of at least \$50 (about \$780 in 2010 dollars) of income from sources other than wages and salaries in 1939. Receipt of non-wage income follows a pattern analogous to that of labor force participation. It does not appear to trend differently prior to age 65 in states with greater expected OAA payments but shows a sharp, differential increase at age 65. Online Appendix Table A5 shows results for receipt of non-wage income analogous to those in Table 3.

To illustrate the relationship between exit from the labor force at age 65 and receipt of non-wage income, and the degree to which these outcomes varied across states, we take a simple approach to estimating "excess" exit from the labor force and receipt of non-wage income at age 65. We estimate the following model, separately by state:

$$(2) \quad y_i = \beta_0 + \beta_1 \mathbf{1}(\text{age}_i \geq 65) + \beta_2(\text{age}_i - 65) + \beta_3(\text{age}_i - 65)\mathbf{1}(\text{age}_i \geq 65) + \varepsilon_i ,$$

where the outcome is either labor force participation or receipt of non-wage income.[19] In Figure 6 we plot the estimated breaks at age 65 from equation (2) for receipt of non-wage income against the estimated breaks in labor force participation. Declines in labor force participation line up strikingly well with increases in receipt of non-wage income. The results also illustrate the substantial variation across states in the overall drop in labor force participation at age 65, from nearly zero in Arkansas to 15 percentage points in Oklahoma.

In order to assess OAA's contribution to the large decline in labor force participation of the elderly over the 1930s, we re-estimate the state-border specification using the level rather than the log of OAA payments per person 65 and older. The results, reported in online Appendix Table A6, are comparable to our main estimates at the mean level of OAA payments. The results imply that were it not for OAA, labor force participation among men aged 65–74 would have been 8.5 percentage points greater, about 17 percent of this group's observed labor force participation rate in 1940 of 51 percent. As another point of comparison, between 1930 and 1940 the labor force participation of men aged 65–74 fell from about 65 to 51 percent (see online Appendix A.1 for details on comparability of labor force participation rates between these years). Our estimates suggest that OAA can explain about 60 percent of this 14 percentage point decline.

Under slightly stronger assumptions, we can estimate what the age profile of labor force participation would have been in the absence of OAA in a way that allows for potential anticipatory effects. We compare labor force participation profiles across state boundaries, and assume that if OAA levels were the same in two states, the levels of labor force participation would be the same on either side of the boundary, rather than the weaker assumption in our main analysis of parallel age trends. Formally, we estimate

$$(3) \quad y_{iacsb} = \alpha_{ba} + \sum_a \gamma_a \times (\textit{payments per person } 65+)_s + \varepsilon_{iacsb}$$

with no age omitted from the summation. The counterfactual age profile of labor force participation with payments per person set to zero is shown in Figure 7. It is

[19] The 1940 Census has information only on age in completed years at the time of the Census, meaning that individuals who were 65 at the time of the Census may or may not have been eligible for OAA during 1939, the time period covered in the non-wage income question. Hence, in estimating the break in non-wage income we omit 65-year-olds. Note that for the primary outcomes in our analysis, work behavior during the week preceding the 1940 Census, age will be correctly observed for nearly all people.

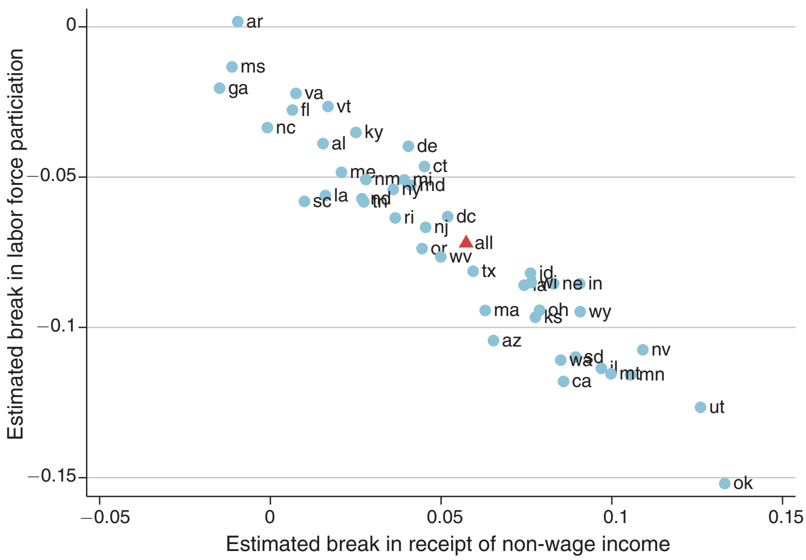



Figure 6. Breaks in Non-Wage Income versus Breaks in Labor Force Participation, by State

*Notes:* Figure shows point estimates from estimation of equation (2) for receipt of non-wage income in 1939 against estimates for labor force participation in 1940, separately by state. Sample: men aged 56–64 or 66–73 at 1940 Census, in states with an eligibility age of 65 in 1939; breaks in receipt of non-wage income estimated on sample of men with non-missing 1939 income information ($N = 5{,}277{,}150$) and breaks in labor force participation estimated on sample of men with non-missing 1940 labor force participation information ($N = 5{,}649{,}733$).

noteworthy that using this approach, we find reductions in labor force participation after age 65 similar to our main estimates, and any anticipatory effects of OAA on labor supply before age 65 appear to be quite small. As we discuss further in Section V, counterfactual labor force participation in the absence of OAA is an important determinant of the cost of the implicit taxation of earnings by OAA's earnings test.

## B. *Heterogeneity by Potential Earnings*

Also important for understanding the cost of OAA earnings tests are the potential earnings of the people OAA induced to exit the labor force, since people with lower potential earnings have lower costs from the earnings test. Panel A of Figure 8 shows the age 65–69 estimates from equation (1) separately by grouped years of education. The effects of OAA tended to be greater for men with less education, who tend to have lower potential earnings. Panel B shows the results of a similar exercise that uses a broader range of characteristics to predict earnings. In a sample of 45–54-year-old men who were not self-employed, we regress wage and salary earnings on indicators for each number of years of education; for being non-white; for state of birth and for foreign birth; and for each of the 1,000 most common first names, exploiting the fact that first names contain information about socioeconomic status (Olivetti and Paserman 2015). We then use the coefficients to predict earnings for men aged 55–74 and estimate equation (1) separately by decile of predicted

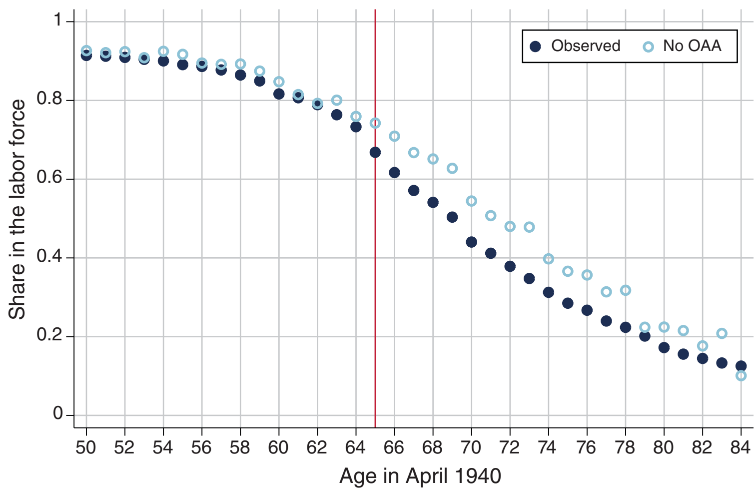



Figure 7. Actual and Counterfactual Profile of Labor Force Participation

*Note:* Figure shows observed rates of labor force participation by age and estimated counterfactual rates of labor force participation in the absence of OAA, based on IV estimates of equation (3).

earnings. The results line up well with those based on education alone, showing greater effects for lower deciles of predicted earnings.

Separating the effect of OAA on labor force participation into effects for employed and unemployed individuals provides further evidence that the effect of OAA on labor force participation was concentrated among people with poor labor market prospects. To the extent that the effects of OAA on labor force participation were driven by exit from unemployment or work-based relief programs such as the WPA, the costs of OAA work disincentives would be smaller. Table 4 shows estimates of equation (1) using overall employment (including work-based relief) as an outcome variable, as well as employment in private or public non-emergency work. (Results by single years of age are shown in online Appendix Figure A8.) Comparison of the point estimates for different outcome variables suggests that at ages 65–69, about 21 percent of the reduction in labor force participation was associated with exit from unemployment and about 29 percent with exit from public emergency work. These results also suggest that the implicit taxation of work by OAA's earnings test may not have significantly reduced the value of OAA benefits to recipients.

### C. *Responses by Local Labor Market Conditions*

An important question for assessing the generalizability of the results is whether the effect of OAA on labor force participation was larger in 1940 than it would have been in a context of lower unemployment. By the late 1930s unemployment had fallen significantly from its peak in the early 1930s, but it remained fairly high (Margo 1993). In theory, the effects of a program like OAA on labor force participation could be larger or smaller in a context of high unemployment. On one hand, people might be more likely to exit the labor force in response to OAA if they are unemployed than if they are employed. On the other hand, high unemployment means that many


Figure 8. OAA Reduced Labor Supply More for Men with Lower Potential Earnings

*Notes:* Figure shows estimates of age 65–69 interaction in equation (1) separately by grouped years of education (panel A) and by decile of predicted earnings (panel B), using log simulated payment by age interactions as instruments for log per-65+ payment by age interactions and controlling for state border-by-age fixed effects. Sample restricted to counties on state boundaries, excluding counties on borders of states with age eligibility requirement other than 65 in 1939. Unit of observation is an individual-state border pair. In panel A, education groups are arranged horizontally by average 1939 wage and salary earnings for 45–54-year-old men who were not self-employed at the time of the Census.

people with weak attachments to the labor force might be out of the labor force regardless of OAA. To shed light on this question, we leverage the substantial geographic variation in labor market conditions during this time period (Wallis 1989;

Table 4—Alternative Labor Force Participation Outcomes

| | In labor force (1) | Employed (2) | Non-emergency (3) |
|---|---|---|---|
| log per-65+ payment × age 55–59 | 0.006 | 0.008 | 0.001 |
| | (0.005) | (0.005) | (0.004) |
| log per-65+ payment × age 65–69 | −0.063 | −0.050 | −0.032 |
| | (0.008) | (0.008) | (0.008) |
| log per-65+ payment × age 70–74 | −0.075 | −0.060 | −0.042 |
| | (0.010) | (0.009) | (0.008) |
| Observations | 2,403,915 | 2,403,915 | 2,403,915 |
| Kleibergen-Paap rk Wald *F*-stat | 20.53 | 20.53 | 20.53 |
| Sample | Border | Border | Border |
| Border segment × age fixed effects | Yes | Yes | Yes |
| Education × age fixed effects | Yes | Yes | Yes |
| Race × age fixed effects | Yes | Yes | Yes |

*Notes:* Dependent variables: in labor force at 1940 Census (column 1), employed at 1940 Census (column 2), employed in private or non-emergency government work (column 3). Log simulated payment by age interactions used as instruments for log per recipient payment by age interactions. Sample restricted to counties on state boundaries, excluding counties on borders of states with age eligibility requirement other than 65 in 1939. Unit of observation is an individual-state border pair. All specifications include county fixed effects and five-year age group fixed effects. All age-interactions are with five-year age groups. Standard errors (in parentheses) are clustered at the state level.

Rosenbloom and Sundstrom 1999). We calculate county unemployment rates for men aged 45–54 and estimate equation (1) separately for counties in the bottom quartile (which had an average of 5 percent unemployment) and the top quartile (an average of 20 percent unemployment). As shown in online Appendix Figure A9, we find that reductions in labor force participation immediately after the eligibility age were somewhat greater in high-unemployment counties, and there are small reductions slightly before the eligibility age, around age 63, in these counties as well. The latter finding may reflect a greater propensity of men in high-unemployment counties to lose jobs shortly before reaching OAA eligibility and then to remain out of the labor force in anticipation of receiving OAA. Overall, however, it is striking how similar the effects of OAA are across widely varying labor market conditions.[20]

## D. *Further Robustness Checks*

Given that relatively few states had OAA programs in 1930, a natural further check on the validity of our estimates is to test whether, conditional on comparisons across state borders, OAA policies in 1940 were systematically related to differential age patterns of labor force participation in 1930. If differential age trends in the underlying propensity to exit the labor force were driving our results, it is likely that we should see similar patterns in 1930. We estimate equation (1) using the 1930 complete-count Census data to test whether observed payments in 1940 predict labor force outcomes in 1930. We omit the nine states in our 1940 sample that had

[20] Online Appendix Table A7 reports specifications with linear interactions between OAA benefits and the unemployment rate. The coefficients on the interaction terms are positive, which interpreted at face value suggest smaller effects in places with higher unemployment, and mostly statistically insignificant at standard levels.

laws providing for old-age payments in 1930. Panel A of Figure 9 shows that there was no systematic difference in work behavior in 1930 after age 65 in states that had larger OAA programs in 1940. For comparison, panel B shows estimates from 1940 using the same sample of states. The results are very similar to our main estimates, so the absence of differences in 1930 is not an artifact of using a different set of states.

We address various additional potential concerns in robustness checks reported in the online Appendix. Our main simulated IV estimates use the ninety-ninth percentile of observed payments in 1938–1939 as a measure of "maximum" payments in states without legal maxima, based on the notion that these payments reflect typical standards of need. The typical concern with an observed-payments measure is that it could be contaminated by reverse causation. In practice, while population and labor market characteristics likely affect average OAA payments in a state, they are unlikely to affect payments as high up in the distribution as the ninety-ninth percentile, since it is extremely likely that there will be some people with no "resources" in every state. But as an alternative that does not use any information on observed payments, we have also tried assigning these eight states the highest legal maximum across states ($45 per month, in Colorado), based on the idea that the absence of a maximum payment means that payments in these states could have been as high as those in any other state. The results, reported in online Appendix Table A8, are also in line with our main estimates. Given that there was significant variation across these eight states in the highest (and typical) payments actually granted, the first stage is weaker, with an $F$-statistic of 2.6 for the regressions describing labor market outcomes.

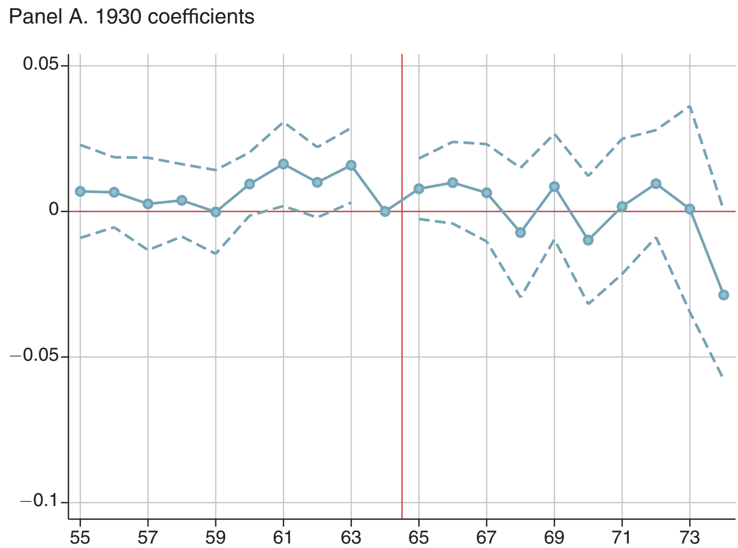
In principle, the comparison across state borders does not address concerns about differences in state policies other than OAA that relate to either old-age pensions or public assistance. In practice, introducing controls for other major types of pensions (railroad pensions or state and local government employee pensions) leads to very little change in the results, as documented in online Appendix Table A9. Differences in state general assistance do not explain the results either, as shown in online Appendix Table A10. These results are discussed in significantly more detail in online Appendix Section A.3.3.

Finally, in online Appendix Table A11 we test whether more generous OAA policies were associated with greater probability of having migrated between 1935 and 1940. As we discuss in more detail in online Appendix Section A.6, the confidence intervals suggest that endogenous migration is at most an order of magnitude smaller than our labor force participation results. This result is unsurprising given the residency requirements for OAA in nearly all states.

## V. The Cost to Recipients of OAA's Earnings Test

The overall welfare effect of OAA depends critically on the extent to which the large reductions in labor supply we have documented entail a social cost.[21] A key

[21] Other important factors include the deadweight loss from raising taxes to finance the program, risk and the insurance benefits of OAA, and fiscal externalities (e.g., from people substituting to OAA from other government programs such as unemployment insurance and the WPA).



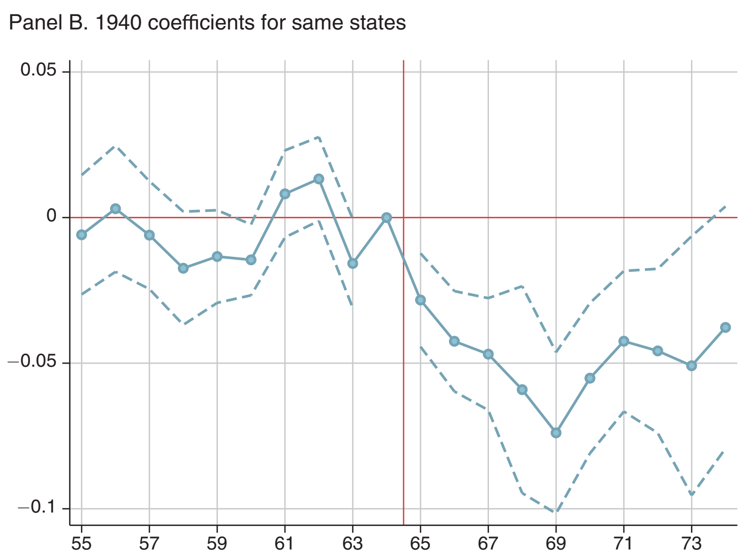




Figure 9. 1940 OAA Payments Are Not Associated with Differential Age Trends in 1930

*Notes:* Panel A shows point estimates and 95 percent confidence intervals on age-payment interactions from estimation of equation (1) using "gainful employment" in 1930 as the outcome and December 1939 payments as the payment variable, with log simulated payment by age interactions used as instruments for log observed payment by age interactions and controlling for state border-by-age fixed effects. Sample includes only those states that had no old-age assistance program in 1930. For comparison, panel B shows analogous estimates for 1940 labor force participation for the same sample of states. In both, sample restricted to counties on state boundaries, excluding counties on borders of states with age eligibility requirement other than 65 in 1939. Standard errors clustered at the state level. For 1930 coefficients $N = 1{,}602{,}079$ and Kleibergen-Paap rk Wald $F$-statistic is 1.36, for 1940 coefficients $N = 1{,}930{,}322$ and Kleibergen-Paap rk Wald $F$-statistic is 1.44.

dimension of this question is the degree to which OAA's earnings test reduced its value to recipients. To the extent that a recipient "earned" his OAA benefit by reducing his earnings in response to the earnings test, his valuation of the benefit would be less than its full amount. This section presents evidence on the cost to recipients of OAA's earnings test based on our regression results and an estimated structural life-cycle model.

### A. *Bounding the Cost of the Earnings Test*

Our regression results suggest a natural upper bound on the cost of the earnings test. Economic logic suggests that OAA benefits that would have been received even in the absence of a behavioral response should be valued fully. The estimates reported in Section IVA suggest that about 8.5 percent of men aged 65–74 were out of the labor force because of OAA in 1940. No data directly measure the recipiency rate specifically for this group, but as detailed in online Appendix Section A.4, a conservative estimate is about 16.5 percent. Hence, about 48 percent of recipients in this group were inframarginal, in the sense that they would have received OAA even without leaving the labor force in response to OAA. Under the assumption that these inframarginal recipients valued their OAA payments fully, this calculation suggests that the average recipient valued his OAA benefits at between 48 and 100 percent of their dollar amount.

Several considerations suggest that the average recipient valued his OAA payments significantly more than this lower bound. As shown in Section IVB, a large fraction of marginal recipients were people who had low potential earnings or who had been unemployed or receiving work-based public assistance. The earnings test is not very costly to people with poor labor market prospects, in part because someone with lower potential earnings forgoes less consumption by not working.

Obtaining a point estimate requires making several assumptions, and in the next section we do so by estimating a life-cycle model. To develop further intuition for the results, however, it is useful to consider an alternative approach to constructing a bound, in the spirit of Afriat (1967) and Varian (1982). This bound is based largely on the extent to which benefits are inframarginal over the life cycle for any particular individual. As an extreme example, someone who would have retired before the OAA eligibility age even in the absence of OAA is not affected by the earnings test as long as leisure is non-inferior, since he would retire before the eligibility age even if OAA did not have an earnings test. More generally, the earlier someone would leave the labor force in the absence of OAA, the lower the maximum possible cost of the earnings test. Furthermore, to the extent that income effects of OAA pull retirement forward, meaning that recipients would retire earlier even if OAA did not impose an earnings test, they tend to diminish the cost of the earnings test.

To construct the bound, we use consumer theory to derive the minimum equivalent variation of OAA for someone with a given level of potential earnings, OAA benefit level, and retirement age in the absence of OAA. We introduce the assumptions that falling levels of labor force participation at older ages reflect retirement, that is, that exit from the labor force is an absorbing state, and that the counterfactual age profile of labor force participation shown in Figure 7 can be interpreted as reflecting the distribution of retirement ages that would arise in the absence of OAA. We combine this latent retirement age distribution with the observed joint distribution of state OAA benefit levels and earnings for men aged 48–52. Calculations making conservative assumptions about rates of take-up across the earnings-benefit distribution suggest that within the class of preferences in which utility is quasilinear in retirement, the usual case in many applications of the life-cycle model, the average \$1 of OAA was worth at least \$0.72 of unconditional late-life income. Details of this and related calculations are in online Appendix Section A.7. Intuitively, a large fraction of OAA recipients would have retired either before or soon after the OAA eligibility age even without OAA, which limits the degree to which the earnings test can reduce the average value of OAA benefits to recipients.

### B. *Estimating the Cost of the Earnings Test*

In this section, we estimate the cost to recipients of the earnings test using an estimated life-cycle model. The estimation targets empirical moments that provide transparent identification of the key parameters that govern the model's predictions about the counterfactuals of interest; in this sense, our general approach is broadly similar to that of, for example, Laitner and Silverman (2012). We adopt a standard model that is widely used in diverse settings. This enables us to assess the extent to which the key determinants of behavior in other settings have similar effects in our setting as well.

*Model.*—Consider a standard model of lifetime labor supply in which people choose how much to consume at each date and when to retire. Individual $i$ at age $t$ chooses whether to retire, if he has not already, and how much to consume in order to maximize the discounted sum of utility from age $t$ forward,

$$U_{it} = \sum_{s=t}^{T} \beta^{s-t}\left(\frac{c_{is}^{1+\eta}}{1+\eta} - \delta_i \mathbf{1}(h_{is} = \overline{h})\right), \quad \eta \leq 0,$$

subject to a constraint on hours of work, $h_{is} \in \{0, \overline{h}\}$ (so there is only an extensive-margin labor supply decision), and a dynamic budget constraint,

$$a_{it+1} = (1+r)(a_{it} + N_{it} + \widehat{w}_{it} h_{it} + b_{it} - c_{it}) \geq 0.$$

The discount factor is $\beta \in (0,1]$. The absolute value of $\eta$ is the coefficient of relative risk aversion. The variable $\delta_i$ is the disutility of work, which is allowed to vary across individuals, with cumulative density function $F(\delta)$; $c_{it} \geq 0$ is consumption, and $h_{it} \in \{0, \overline{h}\}$ is hours of work; $a_{it}$ is assets, $N_{it}$ is nonlabor income, $\widehat{w}_{it}$ is the wage, $\widehat{w}_{it} h_{it}$ is labor earnings, and $b_{it}$ represents OAA payments. The requirement that assets must be nonnegative rules out borrowing.

We consider an OAA program that provides an income floor of $\overline{y}_{it}$ to individual $i$ at age $t$:

$$b_{it} = \max\{0, \overline{y}_{it} - \widehat{w}_{it} h_{it}\},$$

where $\overline{y}_{it}$ is the OAA benefit available to individual $i$ in the period in which $i$ is $t$ years old. If individual $i$ is not eligible for OAA at age $t$ for any reason, due to being too young, to not meeting an asset test, or to having relatives who are able to support him, then $\overline{y}_{it} = 0$. This is a simplified version of a typical OAA program in 1940.[22]

Potential earnings, $w_{it} \equiv \widehat{w}_{it}\overline{h}$, are constant in real terms over the life cycle. Everyone is assumed to have positive potential earnings, which tends to work against our main results. OAA benefits are fixed at their real values in 1940. People learn about OAA in 1936, a year in which many state OAA programs were introduced. Because assets and nonlabor income are measured only coarsely in the data, we make the simplifying assumptions that initial assets when the individual enters the labor market at age 21 are 0 and that OAA is the only source of nonlabor income. Individuals live to age 75 with certainty $(T = 75)$. Any assets the individual accumulates earn a constant real return of 3 percent per year, $r = 0.03$. The individual discounts future utility at this same rate, $\beta = \frac{1}{1+r} = \frac{1}{1.03} \approx 0.97$.

A challenge we face is that an individual's eligibility for OAA depended on many characteristics that are not available in the Census or alternative sources of data, which means we have to infer eligibility rather than measure it directly. In our baseline case, we assume that the probability that a randomly chosen individual with potential earnings $w_i$ is "eligible" for OAA, by which we mean that he would receive a positive OAA benefit if he met the age requirement and had low enough earnings, is a piecewise-linear function in the individual's potential earnings,

$$\Pr(eligible_i | w_i) = \max\{0, \min\{1, \alpha_e + \beta_e w_i\}\}.$$

This measure of eligibility, which is exclusive of the minimum age restriction and the earnings test, is meant in part to approximate the many other restrictions that individuals must have met in order to qualify for OAA, including any requirements related to citizenship, residency, housing wealth, and relatives' characteristics. In addition to being exclusive of the age and earnings tests, this notion of eligibility further departs from the standard one in that it bundles together many things that are conceptually distinct and not necessarily related to the usual meaning of the word "eligibility." For example, it includes unmodeled factors, such as incomplete information and stigma, that limit take-up of OAA benefits. By definition, in the simulations take-up is universal among people who are "eligible," old enough, and have low enough earnings.

Additional details about the model and estimation beyond those described in the text are in online Appendix Section A.8.

*Estimation Strategy.*—The key trade-off in the model is between consumption and the length of retirement. By retiring later, the individual can enjoy more consumption over his lifetime at the expense of less leisure (a shorter retirement). The marginal cost of retiring later is the disutility of work, $\delta_i$, which is allowed to differ across individuals. The marginal benefit of retiring later is the extra

[22] The key simplification here is the assumption that there is a common income floor across people. As described in more detail in online Appendix Section A.2.1, in many states there was significant variation in benefits even for people with no other source of earnings. This fact suggests that these states either had consumption floors rather than income floors or had income floors with heterogeneous income levels.

consumption that retiring later buys, $\max\{0, w_{it} - \overline{y}_{it}\}$, valued at the marginal utility of consumption, $c_{it}^{\eta}$, which depends on the curvature of the utility function, $\eta$. OAA potentially affects both elements of the marginal benefit of retiring later. OAA reduces the consumption benefit of work after the eligibility age through its earnings test, and OAA reduces the marginal utility of consumption at any given retirement age through its income transfers. Both of these factors tend to lead people to retire earlier as a result of OAA.

These considerations guide our estimation strategy. We estimate the model using the Method of Simulated Moments, with the target moments measuring the extent of "bunching" of retirements at the OAA eligibility age. Intuitively, the estimation is based on comparing the extent of "bunching" of choices (retirement ages) at convex kinks in the budget set (the OAA eligibility age) that differ in their sharpness (due to different people facing different replacement rates from OAA, $\overline{y}/w$). As discussed in Section II, OAA creates a convex kink in the lifetime budget constraint relating lifetime consumption to retirement length, and this kink is sharper for people who face higher replacement rates from OAA, $\overline{y}/w$. With a smooth distribution of disutility of work in the population, $F(\delta)$, such convex kinks lead to bunching of retirements at the OAA eligibility age, as some of the people who would have retired somewhat after the OAA eligibility age in the absence of the earnings test choose to hasten their retirements due to the substitution effects of the earnings test. The amount of bunching is informative about the level of eligibility for OAA. The greater the observed bunching, the greater the inferred eligibility. The speed with which the bunching "fades out" as the replacement rate declines is informative about the curvature of utility, $\eta$. The faster the fade out, the greater the curvature of utility, $|\eta|$.

This estimation strategy is related to the bunching strategy of Saez (2010). The most important difference is that some of the bunching in our context could be due to binding borrowing constraints, since the kink is in the intertemporal, not intratemporal, budget constraint. This complication prevents us from identifying structural parameters without estimating a full structural model. Although estimating a full structural model requires us to make stronger assumptions than must be made in simpler contexts, it has the advantage of enabling us to analyze a larger set of counterfactuals. Incomplete eligibility in our approach serves the same conceptual role as optimization frictions in the recent bunching literature (e.g., Chetty et al. 2011; Chetty 2012; Kleven and Waseem 2013; Gelber, Jones, and Sacks 2017). Although in general those who bunch may not be representative of the broader population of interest, in our context much of the labor supply response to OAA is driven by people who retire at the eligibility age, making them unusually representative of the broader set of people whose labor supply is affected by the program. Other research that analyzes the bunching of retirement ages includes Burtless and Moffitt (1984), Brown (2013), and Manoli and Weber (2016).

In principle, all of the key parameters of the model can be identified from the bunching of retirements at the OAA eligibility age. But intuition suggests and estimations confirm that the slope of the eligibility-potential earnings relationship, $\beta_e$, is not well identified using this information alone. Intuitively, the estimation has a hard time distinguishing between two potential sources of fadeout in the bunching of retirements in potential earnings: curvature in the utility function ($\eta$) and declining eligibility with potential earnings ($\beta_e$). This motivates a two-stage estimation procedure. In the first stage, we estimate the slope of the eligibility-potential earnings relationship, $\beta_e$, using the empirical relationship between earnings and housing wealth; we use housing wealth because it was the key non-income determinant of eligibility in many states that is measured in Census data. In the second stage, we estimate the key preference parameters, $\eta$ and $F(\delta)$, and the level of the eligibility-potential earnings relationship, $\alpha_e$, taking as given the first-stage estimate of $\beta_e$. The key results are robust to estimating all of the key parameters of the model in a single step, as shown in online Appendix Table A12, but the two-stage procedure yields a more reasonable estimate of the relationship between eligibility and potential earnings.

The second stage of the estimation is based on the Method of Simulated Moments. The target moments are the proportional breaks at the OAA eligibility age in the labor force participation-age profile for each of 15 different earnings groups. We weight each moment by the inverse of its variance; more-precisely estimated moments receive greater weight in the estimation. Specifically, we estimate $\eta$ and $\alpha_e$ by attempting to match the pattern of bunching of retirements at the OAA eligibility age, while requiring that the model also match the counterfactual distribution of retirement ages in the absence of OAA, which nonparametrically identifies $F(\delta)$. The key assumptions are that any heterogeneity in retirement behavior among people who face the same budget constraint is due to heterogeneity in the disutility of labor and that all earnings groups have the same counterfactual no-OAA retirement distribution.

*Empirical Inputs.—*

**"Bunching" of Retirements by Potential Earnings Level:** The main target moments in the estimation are measures of the bunching of retirements at the OAA eligibility age of 15 different earnings groups. Potential earnings, $w$, are not observed for those out of the labor force, so we approximate the bunching of retirements of different earnings groups using changes in the distribution of earnings at the OAA eligibility age. We continue to make the assumption, introduced in the second bound described in Section VA, that exit from the labor force at these ages is an absorbing state. We create separate indicator variables for reporting 1939 wage and salary income of \$1–\$100, of \$101–\$200, and so on in multiples of \$100 (\$1,550 in 2010 dollars) for a total of 15 groups. We then estimate equation (2), reproduced below, with an indicator for each level of earnings as a separate dependent variable.[23] In order to focus on situations as similar as possible to the model, we estimate these regressions using data from Massachusetts only, a state whose OAA program appears to have closely approximated an income floor with a common level for all individuals. Our

[23] We use a uniform kernel and the Imbens and Kalyanaraman (2012) approach to select a bandwidth separately for each dependent variable. The results are robust to alternative choices on these dimensions. We omit 65-year-olds from the regression since, observing a person's age only at the time of the Census (in April 1940), we cannot determine whether a given 65-year-old would have been eligible for OAA in 1939.

key results, as we discuss in online Appendix Section A.8.1, are robust to estimating the model using data from other states or the full United States. Recall

$$(2) \quad y_i = \beta_0 + \beta_1 \mathbf{1}(\text{age}_i \geq 65) + \beta_2(\text{age}_i - 65) + \beta_3(\text{age}_i - 65)\mathbf{1}(\text{age}_i \geq 65) + \varepsilon_i.$$

Under two assumptions, the share of men of a given potential earnings level who retire upon reaching 65, conditional on working up until age 65, equals $\beta_1/\beta_0$. First, we assume that for someone who worked in 1939, his actual earnings are his potential earnings, so that someone either earns his potential earnings or zero. Second, because the available measure of earnings does not include self-employment earnings, we also assume that self-employment is independent of earnings and responds in the same way to OAA as does wage and salaried employment. Note that this approach does not difference out factors other than OAA that may have induced retirement at age 65, but since these other sources were significantly smaller than OAA and relevant primarily for individuals higher in the income distribution (see online Appendix Section A.3.2), this is likely of modest importance and would tend to work against our key findings.

Estimation of equation (2) provides further evidence that the effects of OAA on labor supply were concentrated among those with low potential earnings. Online Appendix Figure A10 shows estimates of $\beta_1/\beta_0$ at each earnings level along with estimates of $\beta_1$. The point estimates suggest that at levels of potential earnings up to \$800 per year, about 20 percent more men left the labor force at age 65 than would have been expected based on general trends in labor force participation by age. Online Appendix Figure A11 shows underlying shares by age for amounts up to \$1,000. There are clear breaks in the underlying shares at age 65, and these breaks diminish at higher earnings levels.

**Counterfactual Retirement Ages in the Absence of OAA:** To identify $F(\delta)$, we require the estimated model to match the counterfactual distribution of retirement ages in the absence of OAA. We use the counterfactual age profile of labor force participation estimated in Section IVA together with the assumption that the observed cross-sectional relationship between labor force participation and age is a good proxy for the unobserved life-cycle relationship. Because the distribution of people along a nonlinear budget constraint plays a key role in determining how policy changes affect behavior (e.g., Moffitt 1986), the ability to identify the counterfactual distribution of people along the lifetime budget constraint on the eve of the major mid-twentieth-century expansions in Social Security greatly facilitates an understanding of the role of government old-age support programs in reducing late-life work at this time.

**The Relationship between Earnings and Housing Wealth:** We use the relationship between earnings and housing wealth, the main determinant of eligibility other than income and age available in the Census data, to estimate the slope of the eligibility-potential earnings relationship in the first stage of the estimation. The estimate of the slope of the eligibility-potential earnings relationship, $\widehat{\beta}_e$, is the slope of the empirical relationship between earnings and the fraction of people in Massachusetts with house values below the Massachusetts OAA eligibility threshold of \$3,000. The underlying assumption is that the slope of the relationship between potential earnings and eligibility for OAA based on house value alone equals the slope of the relationship between potential earnings and eligibility for OAA based on all determinants of eligibility. Online Appendix Figure A12 shows the share of Massachusetts men aged 60–64 with less than \$3,000 of house value as a function of wage and salary earnings. In addition to limiting OAA eligibility to people with less than \$3,000 of equity in real property, Massachusetts imposed additional eligibility requirements as well, so the actual share eligible was less than the share that would be eligible based on the property test alone.

*Estimation Results and Validation.*—The estimation is well behaved and yields plausible results. Online Appendix Figure A13, the objective function, shows that the parameters are well identified (see online Appendix Section A.8.2 for details). The coefficient of relative risk aversion is 1.3 ($\hat{\eta} = -1.3$), indicating slightly greater risk aversion than the log utility benchmark ($\eta = -1$) at which income and substitution effects of wage changes exactly offset one another. This is within the usual range reported in the labor supply literature, despite the particular characteristics of our setting. Roughly 22 percent of the male population is estimated to be eligible for OAA, with eligibility declining from about 36 percent among those with the lowest potential earnings to about 13 percent among people with potential earnings of \$2,000. Fitting a linear relationship suggests that no one with potential earnings greater than about \$3,163 would have been eligible. Both the level of eligibility and its slope with potential earnings seem reasonable based on OAA eligibility rules and recipiency rates. The relatively low eligibility rate suggests that the effects of OAA would have been significantly larger had everyone been eligible for the program. If everyone had been eligible for OAA, the model predicts that OAA would have reduced the labor force participation rate in 1940 of men aged 65–74 by 21.5 percentage points, whereas our main reduced-form estimates imply a reduction of 8.5 percentage points. The results of this estimation and several robustness tests appear in online Appendix Table A12.

The estimated model matches key features of the data well. Figure 10 compares the empirical and simulated moments, proportional breaks in labor force participation-age profiles at the OAA eligibility age for people with different potential earnings levels. The model matches the empirical pattern that increases in the probability of retiring at the OAA eligibility age are concentrated among groups with low potential earnings: primarily those between \$0 and about \$900 (about \$14,000 in 2010 dollars), about 2.5 times the Massachusetts OAA benefit of \$360.[24] The probabilities of retiring at the OAA eligibility age, especially the probabilities among groups with low potential earnings, pin down the level of the eligibility-potential earnings relationship. If everyone were eligible for OAA, nobody whose potential earnings were less than the OAA benefit level would work past the OAA eligibility

[24] The one wage group where the simulated and empirical moments match poorly is the lowest, those with potential earnings between \$1 and \$100 per year (about \$1,550 in 2010 dollars). Although we treat this as a valid wage group, it likely reflects incorrectly reported income or people with other sources of income in addition to a small amount of wage income. Given its large standard error, this moment has little effect on the results, and in any case works against the key finding of large responses at low earnings levels. The results are robust to dropping all of the low-earnings moments up to the OAA benefit of \$360.

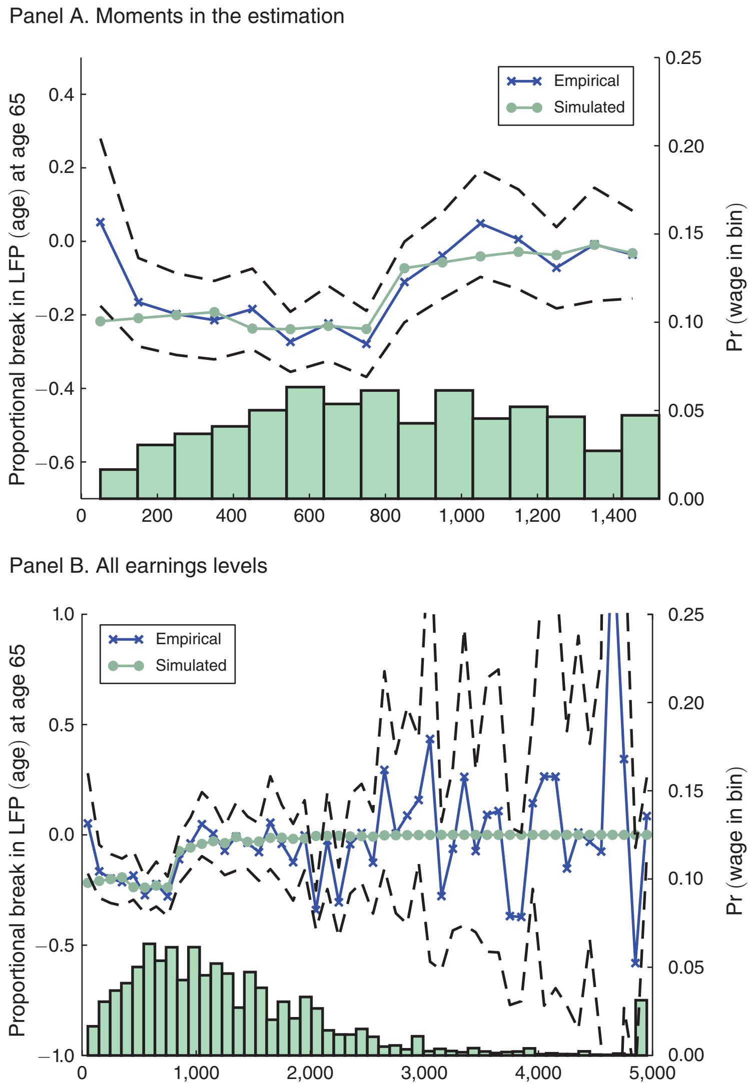



Figure 10. Empirical versus Simulated Moments

*Notes:* Empirical versus simulated moments and annual earnings distribution for moments in the estimation (panel A) and for all earnings levels, including those not in the estimation (panel B). Dashed lines are 95 percent confidence intervals of the empirical moments. The moments are the proportional breaks in labor force participation-age profiles at age 65. Empirical moments correspond to the proportional breaks at age 65 in the share of men with the specified amount of wage/salary income in Massachusetts in 1939, relative to the predicted share at age 65 based on data from younger ages. The earnings distribution is the distribution of wage/salary income among men in Massachusetts aged 60–64 in 1939 who had any wage/salary income. For reference, the "income floor" in Massachusetts is \$360 per year (about \$5,600 in 2010 dollars). Earnings above \$5,000 are set to \$5,000.

age, since doing so would give up leisure for no gain in consumption. In this case, the probability of retiring at the OAA eligibility age conditional on not retiring before that age would be one: about four times the observed probabilities among groups with low potential earnings. The model infers from this pattern that even among groups with low potential earnings, no more than about one-third of individuals were eligible for OAA in the sense we defined above.

As a validation exercise, we simulate labor force participation in 1940 of everyone aged 55–74. This requires an additional empirical input: the joint distribution of potential earnings and OAA benefits. In each state, we use the observed distribution of earnings in 1940 among people aged 48–52 with positive earnings together with the OAA benefit level in 1940. (Details are in online Appendix Section A.9.) We find, in online Appendix Figure A14, that the simulated labor force participation-age profile matches its empirical counterpart closely. Simulations of the model predict that OAA should have reduced labor force participation among 65–74-year-olds by 6.3 percentage points in 1940, not far from the main reduced-form estimate of 8.5 percentage points.[25] Overall, the results suggest that the model can provide a useful benchmark for understanding the value and labor supply effects of OAA in 1940 and for predicting the effects of Social Security during the middle of the twentieth century.

*Effects of the Earnings Test on the Labor Supply and Welfare of Recipients*.—What was the role of OAA's earnings test in reducing labor supply, and how much did it reduce the value of the program to recipients? We address these questions by using the estimated model to simulate the behavior and outcomes of a particular cohort of the US population, that aged 55 in 1940, under a variety of budget constraints based on state OAA programs in existence in 1940. Details are in online Appendix Section A.10.

Simulations of the model suggest that about one-half of the overall effect of OAA on labor force participation was due to its earnings test. Figure 11 shows the simulated age profile of labor force participation under three scenarios: no OAA, actual OAA, and a counterfactual unconditional OAA program, i.e., a program that pays the same fixed benefit regardless of the individual's current earnings. The results indicate that about 46 percent of the reduction in labor supply among men aged 65–74 was due to OAA's earnings test.

Despite the importance of the earnings test in reducing labor supply, further results suggest that the earnings test had little effect on the value of OAA benefits to recipients. Simulations of the model indicate that the average \$1 of benefits was worth about \$0.95 of unconditional late-life income, on the upper end of the bounds calculated using our regression results. The average cost to recipients of the earnings test was small for two main reasons. First, as discussed in Section VA, a large fraction of OAA benefits were inframarginal; they would have been received even if recipients did not adjust their labor supply in response to OAA. The model implies that 49 percent of benefit-years were inframarginal without any behavioral response and 72 percent were inframarginal after income effects. Second, labor supply responses to OAA were highly concentrated among people with poor earnings prospects, mainly because they faced the highest replacement rates.

[25] We also estimate an alternative version of the model with perfect capital markets and find that it is highly inconsistent with the pattern of bunching of retirements at the OAA eligibility age. With perfect capital markets, the simulated breaks in the earnings distribution at the OAA eligibility age among groups with very low potential earnings are zero, since everybody in these groups who is eligible for OAA retires strictly before age 64. The much better fit of the model with borrowing constraints is additional validation of the model given the poor functioning of household credit markets at the time (see, e.g., Rose 2014).

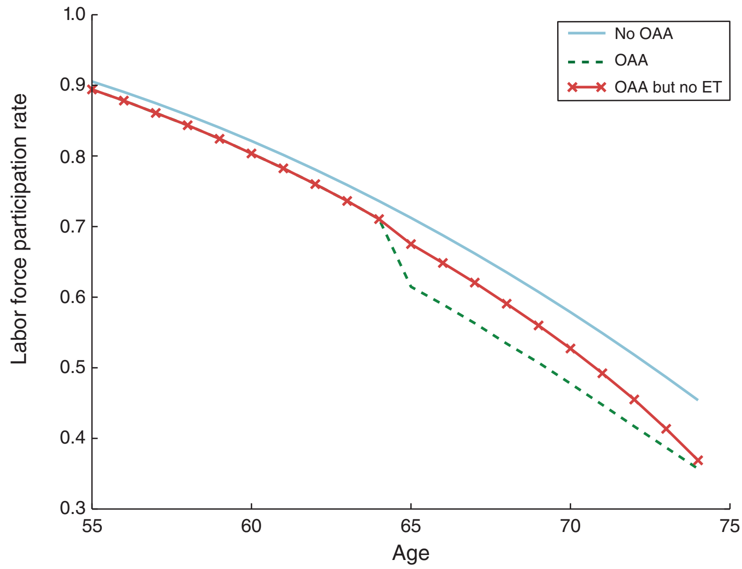



Figure 11. Simulated Effects of OAA on Labor Force Participation

*Notes:* Simulated life-cycle labor force participation profiles of the cohort of people aged 55 in 1940 in the United States under different OAA programs. The policy underlying the "OAA but no ET" profile is a counterfactual OAA program that did not impose an earnings test.

The conclusion that the cost to recipients of the earnings test is small is extremely robust to a wide range of alternative empirical inputs and assumptions. Online Appendix Table A12 reports results based on several alternative specifications, and online Appendix Section A.8.1 discusses these and other results at length. For example, the results are highly robust to targeting the bunching of retirements observed in populations other than that of Massachusetts alone, including that of California, which also had a clear income floor with a common level for everyone, and of the United States as a whole.[26] Our main conclusions are also robust to making a wide range of alternative assumptions about nonlabor income, lifespan, discounting, asset returns, and eligibility for OAA. The key role of inframarginal benefits in limiting the cost of the earnings test means that the main effect of many possible changes in the model would come through any effects on the counterfactual distribution of retirement ages in the absence of OAA. But because we force the estimation to match this distribution directly, the analysis is not very sensitive to changes in assumptions about the underlying determinants of retirement ages in the absence of OAA. Furthermore, our key conclusions are robust to larger-than-plausible changes in the distributions of counterfactual retirement ages and potential earnings, the primary determinants of the cost of the earnings test.

[26] Online Appendix Figure A15 shows empirical and simulated moments using the entire United States (instead of only Massachusetts), and online Appendix Figure A16 shows the underlying shares of men with earnings in each range. Online Appendix Figures A17 and A18 show the analogous results for California. Both the United States and California exhibit the same basic patterns as Massachusetts.

This robustness also speaks to the external validity of our conclusions. For example, while the earnings test was likely less costly because of the poor labor market conditions around 1940, using the (higher) 1950 earnings distribution and the (also higher) 1930 age profile of labor force participation increases the average cost only slightly, to $0.07.

## VI. Social Security and the Rise in Retirement

Government old-age support expanded dramatically from 1940 to 1960 in both recipiency rates and benefit levels. Combined OAA and Social Security payments per person 65 and older grew by a factor of more than six, from about $850 to more than $5,300 in 2010 dollars. This was partly due to an expansion of OAA in the late 1940s but was mainly due to the much greater growth of Social Security, which grew from $41 per person 65 and older in 1940 to $677 in 1950 and $4,644 in 1960 (all in 2010 dollars). Social Security differed from OAA in many ways, but over this period Social Security imposed an earnings test not unlike those of OAA, only gradually liberalized over the 1950s. Although providing a definitive point estimate is beyond the scope of this paper, our results can provide some indication of the probable importance of this expansion.

The simplest approach to answering this question is an extrapolation based on our main regression results. This extrapolation suggests that the large growth in combined OAA and Social Security between 1940 and 1960 would be expected to decrease labor force participation among men aged 65–74 by 12.4 percentage points, or about 90 percent of the observed reduction of 13.5 percentage points. An obvious limitation of this approach is that it fails to account for other major changes over this period, perhaps most importantly rising wages and falling unemployment. It also fails to account for nonlinearities in the relationship between log benefits per person and labor force participation, and for differences in the effects of changes in recipiency rates and changes in benefits per recipient.[27]

To overcome these limitations, we use our estimated life-cycle model to try to obtain a lower-bound estimate of the effect of the growth in government old-age support from 1940 to 1960. To do so, we attempt to make consistently conservative assumptions that reduce the magnitude of the implied effect. Most importantly, we significantly understate mid-century Social Security. We simulate the effect of a Social Security program fixed at its 1939 characteristics, ignoring the large expansions in Social Security eligibility and benefits that occurred from 1950 onward. We also make assumptions that tend to reduce the implied effect of Social Security along several other key dimensions, including wage levels and growth rates, inflation, eligibility for Social Security supplemental benefits, and counterfactual labor supply in the absence of Social Security. The simulation compares the predicted behavior of a single cohort of early recipients, men aged 50 in 1940, under this relatively modest

[27] Simulations of our estimated model suggest that labor-supply effects are concave in the replacement rate, due to income effects shifting retirements earlier and thereby reducing exposure to the earnings test. This is a potential explanation for the sometimes weak relationship between Social Security benefits and labor supply in the aggregate time series (e.g., Moffitt 1987).

version of Social Security to its predicted behavior in the absence of government old-age support. Details are in online Appendix Section A.10.2.

The results indicate that even this conservative representation of Social Security would reduce labor force participation among members of this cohort from age 65 to 74 by 7.3 percentage points, 54 percent of the 13.5 percentage point reduction observed from 1940 to 1960. As shown in online Appendix Table A12 and online Appendix Section A.8.1, the prediction that Social Security significantly reduced labor supply from 1940 to 1960 is highly robust to a wide range of alternative assumptions and holds even in models that underpredict the effects of OAA in 1940. Within the standard life-cycle model framework, it is hard to imagine a model in which the rapid growth in government old-age support from 1940 to 1960 would not reduce labor supply significantly.

We cannot provide a direct estimate of the cost to recipients of Social Security's earnings test over this period because the assumptions we make to be conservative in terms of labor supply generate bias of ambiguous sign. We can, however, offer speculation informed by our analysis in Section VB. The key determinants of the cost of the earnings test are replacement rates and counterfactual retirement ages. Rising replacement rates tend to decrease the cost of the earnings test, since greater income effects lead people to retire earlier and therefore have less "exposure" to the earnings test. Falling "latent" retirement ages also tend to decrease the cost of the earnings test by reducing "exposure" to the earnings test. Replacement rates increased significantly between 1940 and 1960 (Clingman, Burkhalter, and Chaplain 2014). It is less straightforward to know how latent retirement ages changed over this period, but it is notable that panel B of Figure 1 shows little apparent change in the labor force participation-age profile at ages below 65 from 1940 to 1960. Together with the small cost to recipients of OAA's earnings test, these considerations suggest that mid-century Social Security's earnings test was also unlikely to be very costly.

## VII. Conclusion

Many of the most important government programs transfer resources to older people and explicitly or implicitly tax their labor. In this paper, we investigate the labor supply and welfare effects of the Old Age Assistance program in 1940. OAA was a large source of government old-age support at the time—nearly one-quarter of all individuals 65 and older received OAA in 1940—and it helped pave the way for many of the important social insurance programs of the present day. Even independent of its historical importance, OAA presents a valuable opportunity for learning about the effects of government old-age support programs. Like many modern programs, it had both a transfer component and a high implicit tax on labor. But unlike many modern programs, it varied significantly across states and across otherwise-similar groups of people within states. The recent availability of Census data on the full US population in 1940 makes studying OAA a particularly fruitful way to shed light on the effects of these programs.

Our results suggest that OAA caused large reductions in labor supply in 1940, explaining more than one-half of the observed decline in labor force participation among men aged 65–74 over the 1930s. Yet both reduced-form regressions and an estimated life-cycle model indicate that, while a significant share of this reduction in labor supply was due to substitution effects from the high implicit tax rates of OAA's earnings test, the reduction in the value of benefits to recipients associated with the earnings test was quite small. Predictions based on our regression estimates and our estimated life-cycle model both suggest that Social Security accounted for at least one-half of the large mid-century decline in late-life labor supply. Taken as a whole, our results suggest that government old-age support programs can have large effects on labor supply, through both their transfer and taxation components, but that in the case of OAA circa 1940, the costs to recipients of the implicit taxation of work were quite small.

## REFERENCES

**Afriat, S. N.** 1967. "The Construction of Utility Functions from Expenditure Data." *International Economic Review* 8: 67–77.

**Angrist, Joshua D., and Jörn-Steffen Pischke.** 2009. *Mostly Harmless Econometrics: An Empiricist's Companion.* Princeton, NJ: Princeton University Press.

**Atalay, Kadir, and Garry F. Barrett.** 2015. "The Impact of Age Pension Eligibility Age on Retirement and Program Dependence: Evidence from an Australian Experiment." *Review of Economics and Statistics* 97 (1): 71–87.

**Auerbach, Alan J., and Laurence J. Kotlikoff.** 1987. *Dynamic Fiscal Policy.* Cambridge, UK: Cambridge University Press.

**Baker, Michael, and Dwayne Benjamin.** 1999. "Early Retirement Provisions and the Labor Force Behavior of Older Men: Evidence from Canada." *Journal of Labor Economics* 17 (4): 724–56.

**Boskin, Michael J.** 1977. "Social Security and Retirement Decisions." *Economic Inquiry* 15 (1): 1–25.

**Brown, Kristine M.** 2013. "The Link between Pensions and Retirement Timing: Lessons from California Teachers." *Journal of Public Economics* 98: 1–14.

**Burtless, Gary, and Robert A. Moffitt.** 1984. "The Effect of Social Security Benefits on the Labor Supply of the Aged." In *Retirement and Economic Behavior*, edited by Henry J. Aaron and Gary Burtless, 135–71. Washington, DC: Brookings Institution.

**Burtless, Gary, and Robert A. Moffitt.** 1985. "The Joint Choice of Retirement Age and Postretirement Hours of Work." *Journal of Labor Economics* 3 (2): 209–36.

**Carter, Susan B., Scott Sigmund Gartner, Michael R. Haines, Alan L. Olmstead, Richard Sutch, Gavin Wright, Price V. Fishback, and Melissa A. Thomasson.** 2006. *Historical Statistics of the United States Millennial Edition Online.* New York: Cambridge University Press.

**Chetty, Raj.** 2012. "Bounds on Elasticities with Optimization Frictions: A Synthesis of Micro and Macro Evidence on Labor Supply." *Econometrica* 80 (3): 969–1018.

**Chetty, Raj, John N. Friedman, Tore Olsen, and Luigi Pistaferri.** 2011. "Adjustment Costs, Firm Responses, and Micro vs. Macro Labor Supply Elasticities: Evidence from Danish Tax Records." *Quarterly Journal of Economics* 126 (2): 749–804.

**Clingman, Michael, Kyle Burkhalter, and Chris Chaplain.** 2014. *Replacement Rates for Hypothetical Retired Workers.* Baltimore: *Social Security Administration.*

**Coile, Courtney C.** 2015. "Economic Determinants of Workers' Retirement Decisions." *Journal of Economic Surveys* 29 (4): 830–53.

**Coile, Courtney, and Jonathan Gruber.** 2007. "Future Social Security Entitlements and the Retirement Decision." *Review of Economics and Statistics* 89 (2): 234–46.

**Costa, Dora L.** 1995. "Pensions and Retirement: Evidence from Union Army Veterans." *Quarterly Journal of Economics* 110 (2): 297–319.

**Costa, Dora L.** 1998. *The Evolution of Retirement: An American Economic History, 1880–1990.* Chicago: University of Chicago Press.

**Currie, Janet, and Jonathan Gruber.** 1996. "Health Insurance Eligibility, Utilization of Medical Care, and Child Health." *Quarterly Journal of Economics* 111 (2): 431–66.

**Diamond, Peter, and Jonathan Gruber.** 1999. "Social Security and Retirement in the United States." In *Social Security and Retirement around the World*, edited by Jonathan Gruber and David A. Wise, 437–73. Chicago: University of Chicago Press.

**Elo, Irma T., and Samuel H. Preston.** 1994. "Estimating African-American Mortality from Inaccurate Data." *Demography* 31 (3): 427–58.

**Feldstein, Martin, and Jeffrey B. Liebman.** 2002. "Social Security." In *Handbook of Public Economics,* Volume 4, edited by Alan J. Auerbach and Martin Feldstein, 2245–324. Amsterdam: Elsevier.

**Fetter, Daniel K.** 2017. "Local Government and Old-Age Support in the New Deal." *Explorations in Economic History* 66: 1–20.

**Fetter, Daniel K., and Lee M. Lockwood.** 2018. "Government Old-Age Support and Labor Supply: Evidence from the Old Age Assistance Program: Dataset." *American Economic Review.* https://doi.org/10.1257/aer.20160921.

**Fishback, Price.** 2007. "The New Deal." In *Government and the American Economy: A New History*, edited by Price Fishback, 384–430. Chicago: University of Chicago Press.

**French, Eric.** 2005. "The Effects of Health, Wealth, and Wages on Labour Supply and Retirement Behaviour." *Review of Economic Studies* 72 (2): 395–427.

**Friedberg, Leora.** 1999. "The Effect of Old Age Assistance on Retirement." *Journal of Public Economics* 71 (2): 213–32.

**Friedberg, Leora.** 2000. "The Labor Supply Effects of the Social Security Earnings Test." *Review of Economics and Statistics* 82 (1): 48–63.

**Gelber, Alexander, Adam Isen, and Jae Song.** 2016. "The Effect of Pension Income on Elderly Earnings: Evidence from Social Security and Full Population Data." Unpublished.

**Gelber, Alexander M., Damon Jones, and Daniel W. Sacks.** 2017. "Estimating Earnings Adjustment Frictions: Method and Evidence from the Social Security Earnings Test." NBER Working Paper 19491.

**Goda, Gopi Shah, John B. Shoven, and Sita Nataraj Slavov.** 2007. "A Tax on Work for the Elderly: Medicare as a Secondary Payer." NBER Working Paper 13383.

**Goda, Gopi Shah, John B. Shoven, and Sita Nataraj Slavov.** 2009. "Removing the Disincentives in Social Security for Long Careers." In *Social Security Policy in a Changing Environment*, edited by Jeffrey R. Brown, Jeffrey B. Liebman, and David A. Wise, 21–38. Chicago: University of Chicago Press.

**Grove, Robert D., and Alice M. Hetzel.** 1968. *Vital Statistics Rates in the United States 1940–1960.* Washington, DC: US Department of Health, Education, and Welfare.

**Gruber, Jonathan.** 2013. *Public Finance and Public Policy.* 4th ed. New York: Worth Publishers.

**Imbens, Guido, and Karthik Kalyanaraman.** 2012. "Optimal Bandwidth Choice for the Regression Discontinuity Estimator." *Review of Economic Studies* 79 (3): 933–59.

**Kleven, Henrik J., and Mazhar Waseem.** 2013. "Using Notches to Uncover Optimization Frictions and Structural Elasticities: Theory and Evidence from Pakistan." *Quarterly Journal of Economics* 128 (2): 669–723.

**Krueger, Alan B., and Bruce D. Meyer.** 2002. "Labor Supply Effects of Social Insurance." In *Handbook of Public Economics,* Vol. 4, edited by Alan J. Auerbach and Martin Feldstein, 2327–92. Amsterdam: Elsevier.

**Laitner, John, and Dan Silverman.** 2012. "Consumption, Retirement and Social Security: Evaluating the Efficiency of Reform That Encourages Longer Careers." *Journal of Public Economics* 96 (7–8): 615–34.

**Lansdale, Robert T., Elizabeth Long, Agnes Leisy, and Byron T. Hipple.** 1939. *The Administration of Old Age Assistance.* Chicago: Public Administration Clearing House.

**Lee, Chulhee.** 1998. "The Rise of the Welfare State and Labor-Force Participation of Older Males: Evidence from the Pre-Social Security Era." *American Economic Review* 88 (2): 222–26.

**Liebman, Jeffrey B., Erzo F. P. Luttmer, and David G. Seif.** 2009. "Labor Supply Responses to Marginal Social Security Benefits: Evidence from Discontinuities." *Journal of Public Economics* 93 (11–12): 1208–23.

**Manoli, Day, and Andrea Weber.** 2016. "Nonparametric Evidence on the Effects of Financial Incentives on Retirement Decisions." *American Economic Journal: Economic Policy* 8 (4): 160–82.

**Margo, Robert A.** 1993. "Employment and Unemployment in the 1930s." *Journal of Economic Perspectives* 7 (2): 41–59.

**Moffitt, Robert.** 1986. "The Econometrics of Piecewise-Linear Budget Constraints: A Survey and Exposition of the Maximum Likelihood Method." *Journal of Business and Economic Statistics* 4 (3): 317–28.

**Moffitt, Robert.** 1987. "Life-Cycle Labor Supply and Social Security: A Time-Series Analysis." In *Work, Health, and Income among the Elderly*, edited by Gary Burtless, 183–220. Washington, DC: Brookings Institution.

**Moffitt, Robert A.** 2003. "The Temporary Assistance for Needy Families Program." In *Means-Tested Transfer Programs in the United States*, edited by Robert A. Moffitt, 291–363. Chicago: University of Chicago Press.

**Moffitt, Robert A., ed.** 2016. *Economics of Means-Tested Transfer Programs in the United States, Volume I*. Chicago: University of Chicago Press.

**Neumark, David, and Elizabeth Powers.** 2000. "Welfare for the Elderly: The Effects of SSI on Pre-Retirement Labor Supply." *Journal of Public Economics* 78 (1–2): 51–80.

**Neumark, David, and Elizabeth T. Powers.** 2006. "Supplemental Security Income, Labor Supply, and Migration." *Journal of Population Economics* 19 (3): 447–79.

**Olivetti, Claudia, and M. Daniele Paserman.** 2015. "In the Name of the Son (and the Daughter): Intergenerational Mobility in the United States, 1850–1940." *American Economic Review* 105 (8): 2695–724.

**Parker, Florence E.** 1936. "Experience under State Old-Age Pension Acts in 1935." *Monthly Labor Review* 34 (4): 811–37.

**Parsons, Donald O.** 1991. "Male Retirement Behavior in the United States, 1930–1950." *Journal of Economic History* 51 (3): 657–74.

**Quadagno, Jill.** 1988. *The Transformation of Old Age Security: Class and Politics in the American Welfare State.* Chicago: University of Chicago Press.

**Ransom, Roger L., and Richard Sutch.** 1986. "The Labor of Older Americans: Retirement of Men on and off the Job, 1870–1937." *Journal of Economic History* 46 (1): 1–30.

**Rose, Jonathan D.** 2014. "The Prolonged Resolution of Troubled Real Estate Lenders during the 1930s." In *Housing and Mortgage Markets in Historical Perspective*, edited by Eugene N. White, Kenneth Snowden, and Price Fishback, 245–84. Chicago: University of Chicago Press.

**Rosenbloom, Joshua L., and William A. Sundstrom.** 1999. "The Sources of Regional Variation in the Severity of the Great Depression: Evidence from U.S. Manufacturing, 1919–1937." *Journal of Economic History* 59 (3): 714–47.

**Ruggles, Steven, Katie Genadek, Ronald Goeken, Josiah Grover, and Matthew Sobek.** 2017. "Integrated Public Use Microdata Series: Version 7.0 [Dataset]." *University of Minnesota*, Minneapolis. https://usa.ipums.org/usa/cite.shtml.

**Saez, Emmanuel.** 2010. "Do Taxpayers Bunch at Kink Points?" *American Economic Journal: Economic Policy* 2 (3): 180–212.

**United States Bureau of the Census.** 1975. *Historical Statistics of the United States, Colonial Times to 1970.* Washington, DC: US Government Publishing Office.

**United States Social Security Board.** 1939a. *Social Data on Recipients of Public Assistance Accepted in 1937–1938.* Bureau of Research and Statistics Memorandum No. 34.

**United States Social Security Board.** 1939b. *Social Data on Recipients of Public Assistance Accepted in 1938–1939.* Bureau of Research and Statistics Memorandum No. 42.

**United States Social Security Board.** 1940a. *Characteristics of State Plans for Old-Age Assistance.* Washington, DC: US Government Publishing Office.

**United States Social Security Board.** 1940b. *Social Security Yearbook for the Calendar Year 1939.* Washington, DC: Federal Security Agency.

**United States Social Security Board.** 1940c. *Trends in Public Assistance, 1933–1939.* Bureau of Research and Statistics Report No. 8.

**United States Social Security Board.** 1941. *Social Data on Recipients of Public Assistance Accepted in 1939–1940.* Bureau of Public Assistance Research Memorandum No. 1.

**Varian, Hal R.** 1982. "The Nonparametric Approach to Demand Analysis." *Econometrica* 50 (4): 945–73.

**Wallis, John Joseph.** 1989. "Employment in the Great Depression: New Data and Hypotheses." *Explorations in Economic History* 26 (1): 45–72.

**Ziliak, James P.** 2016. "Temporary Assistance for Needy Families." In *Economics of Means-Tested Transfer Programs in the United States, Vol. 1*, edited by Robert A. Moffitt, 303–93. Chicago: University of Chicago Press.