Large Incentives, Small Responses at the Social Security Eligibility Notch*

Elira Kuka†

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Abstract

Social Security requires 40 quarters of coverage (QCs) for retirement eligibility, creating a large incentive to work at least 40 QCs. Using SSA administrative records, I show that crossing the threshold raises net annual SS benefits by $1,985—with retirement gains partially offset by SSDI and spousal-benefits—which translates to a 14% jump in lifetime income. Using bunching methods, I study the labor supply response to this incentive. Individuals bunch at 40 QCs, with excess mass growing to 1.50 by age 70. Nevertheless, the implied elasticity is very small at 0.015, consistent with low labor market attachment and optimization frictions.

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†Email: ekuka@gwu.edu

1 Introduction

Social Security (SS) is the largest federal program in the United States. It is both widespread, with 85.9% of persons aged 65 or older receiving SS retirement benefits in 2010 (Whitman et al., 2011), and generous, providing the majority of income for about half of beneficiaries aged 65 and older (Dushi et al., 2017). Yet more than 1.5 million people—around 4% of the aged population—are not eligible for retirement benefits because of insufficient work history (Whitman et al., 2011). To be eligible for these benefits, individuals must be "fully insured," or have accumulated at least 40 quarters of coverage (QCs) over their working life. In this paper, I show that despite a large and salient financial incentive to earn a few thousand more dollars to qualify for retirement benefits, marginal workers' labor supply response is surprisingly small.

Workers earn a QC by reaching an earnings threshold ($1,810 in 2025), up to a maximum of four per year, so that 40 QCs amount to roughly ten years of covered work. This rule generates a sharp notch in the lifetime budget set: a worker who reaches the threshold becomes fully insured and gains a large stream of retirement benefits, while a worker one quarter short receives zero. Studying how workers respond to this incentive requires observing complete, accurately measured quarter-of-coverage histories over an entire career—policy variation that is essentially impossible to exploit without administrative data. I therefore use Social Security Administration (SSA) records for a 25% random sample of all individuals born between 1937 and 1950, with employer-reported earnings and quarter-of-coverage histories.

I first document that the SS benefits individuals receive are indeed discontinuous at the QC threshold. Crossing the 40-QC threshold is associated with a sharp increase in own-record retirement benefits—about $2,121 per year for men and $4,271 per year for women. These gross gains, however, are substantially attenuated by how retirement interacts with other SS benefits—a margin I am the first to unpack. For men, the dominant offset is

that many below 40 QCs already receive disabled-worker or survivor benefits; crossing the threshold largely reclassifies these as retirement benefits, reducing the gain by about $335 per year. For women, the dominant offset is that many receive spousal benefits, which SSA replaces with their own-record retirement benefit once they qualify, reducing the gain by about $2,301 per year. Netting out all of these interactions, total annual SS benefits rise by about $1,985 on net ($1,648 for men and $2,177 for women), a jump of about 51.5% relative to individuals just below the threshold. Cumulated over their lifetime, this amounts to an average increase of about $35,600 in total lifetime income, or roughly 14%—a very substantial incentive to accrue additional QCs.

I then use bunching methods to estimate the labor supply response to such a large incentive. Because reaching 40 QCs is what triggers the benefit jump, workers have an incentive to locate exactly at the threshold, producing excess mass at 40 QCs. The size of this excess mass reflects both the elasticity of work with respect to the net wage and optimization frictions such as imperfect information and adjustment costs. My data let me track how bunching evolves with age: it is very small at age 60 and grows to approximately 1.50 by age 70, with slightly larger estimates for men relative to women (1.84 vs. 1.44). All of these are precisely estimated, with bootstrap standard errors below 0.07. Combined with the estimated change in lifetime income, this bunching implies elasticities of quarters of coverage with respect to the net wage that are correspondingly small and tightly estimated, reaching only about 0.015 at age 70. Across cohorts, bunching has fallen for men and risen for women, but the implied elasticities remain negligible (0.01–0.04) throughout. Overall, individuals respond to the QC criteria but these responses are very small.

My paper makes three contributions. First, I provide the first evidence on how the Social Security eligibility requirement shapes the incentive to work and the labor supply response to it. Prior work has studied how retirement program incentives shape work behavior through the earnings test and the way benefits accrue with additional years of work and delayed

claiming,[1] but not the 40-quarter fully-insured threshold—an all-or-nothing requirement on which lifetime retirement benefits hinge. I find the incentive is large but its response is near zero, with implied elasticities of 0.013–0.023, roughly 10–30 times smaller than responses to the same program's earnings test (Gelber et al., 2021). This asymmetry recurs across other pension systems (Brinch et al., 2017; Hernæs et al., 2016). My estimates are instead of the same order as the elasticities of Manoli and Weber (2016)[2] and Brown (2013). These are the closest studies to mine in method, but both examine steadily employed workers—Austrian private-sector employees, career California teachers—deciding *when* to retire; I instead ask whether workers with marginal labor force attachment work enough to qualify for benefits at all.

Second, and more broadly, my paper contributes to a literature documenting weak behavioral responses to large financial incentives. In retirement savings, workers often fail to adjust contributions when subsidies change (Chetty et al., 2014), forgo employer 401(k) matches that offer very high returns (Choi et al., 2011), and respond far more to default enrollment than to price incentives (Madrian and Shea, 2001). In the bunching literature, wage earners respond little to income-tax kinks (Saez, 2010), and Chetty (2012) shows that such small elasticities are consistent with much larger structural parameters once optimization frictions are present. My setting is a particularly stark case: the incentive is not a marginal change in the return to work but a discrete jump worth about 14% of lifetime income, yet the response remains near zero.

Finally, my findings shed light on the population of workers who fail to qualify for Social Security retirement benefits—and on an active policy concern. Recurring proposals would extend Social Security to workers with short or interrupted careers, by restructuring the

[1] On the earnings test, see Friedberg (2000); Gelber et al. (2020, 2021, 2022); on retirement responses to benefit accrual and benefit levels, see Asch et al. (2005); Coile and Gruber (2007); Liebman et al. (2009); Mastrobuoni (2009).

[2] Their Appendix B, which uses the same Kleven–Waseem framework as mine, reports elasticities of 0.01–0.02. These are sensitive to the reference scale $R^\star$: that value is obtained when $R^\star$ is the retirement age (≈60 years), whereas a shorter, decision-relevant horizon would raise it up to an order of magnitude. My $q^\star = 40$ threshold is not subject to such ambiguity.

Special Minimum Benefit (Congressional Research Service, 2021) or granting coverage credits for unpaid caregiving (U.S. Congress, 2023), reflecting a view that many workers fall short of 40 QCs for reasons beyond their control. The near-zero behavioral response I document means the 40-QC rule operates less as an incentive that draws marginal workers into covered employment and more as a threshold that leaves a substantial group outside the retirement system. I caution, however, that I do not observe the broader safety net, and so cannot speak to these workers' overall economic security or to the net welfare consequences of expanding eligibility.

The remainder of the paper proceeds as follows. Section 2 presents the institutional background and theoretical framework. Section 3 describes the data and empirical strategy. Section 4 reports the first-stage, bunching, and elasticity estimates, together with robustness checks. Section 5 concludes.

2 Background and Theory

2.1 Institutional Background

To be eligible for Social Security retirement benefits in old age, individuals must be "fully insured". For individuals born from 1929 onward, this means that they must have accumulated at least 40 quarters of coverage (QCs)—also called SS credits—during their work history.[3] The 40-QC requirement amounts to roughly ten years of covered work and reflects Social Security's founding design as contributory social insurance, in which benefits are an earned right tied to sustained labor force attachment rather than a means-tested transfer (DeWitt, 2010).[4]

Quarters of coverage accumulate according to statutory earnings rules. Before 1978, a

[3]Individuals born before 1929 require fewer quarters of credit to be fully insured. I do not use data from these cohorts since data on their quarters of coverage earned is measured with error.

[4]The threshold also serves an anti-windfall purpose: because the benefit formula replaces the lowest earnings at a 90 percent rate, workers with very short covered careers would otherwise receive disproportionately high benefits relative to their contributions (Advisory Council on Social Security, 1938).

worker earned one QC for each calendar quarter with covered earnings above a threshold; since 1978, QCs have been awarded on the basis of total annual earnings—in 2025, one QC per $1,810 of annual earnings, up to a maximum of four per year—so most full-time workers earn all four credits in a single year. This annual rule produces pronounced heaping of the QC distribution at multiples of four, a feature I account for explicitly in my analysis (Section 3).

When an individual applies for retirement benefits, SSA first determines if they are fully insured, and thus deemed eligible for own-record benefits. If eligible, SSA then calculates the "primary insurance amount" (PIA)—the benefit the individual is eligible for if they claim benefits at the normal retirement age—as a non-linear function of their earnings history. Individuals can also apply for spousal benefits. If an individual is married, SSA calculates both own benefit eligibility and spousal benefit eligibility, which can be as much as half of the main worker's PIA. The SSA then pays the highest of the two (own vs. spousal) benefits. Finally, benefits paid are a function of the PIA and the age in which the benefits are paid, with lower benefits for those claiming them before the normal retirement age, and higher benefits for those claiming them after.

The 40-QC rule creates a discrete jump in retirement benefits at the threshold: a worker who reaches 40 QCs becomes entitled to own-record retirement benefits, whereas an otherwise identical worker one quarter short receives none. The rule also changes the marginal value of an additional quarter: below 40 QCs, an extra quarter brings no own-record benefits, whereas above 40 QCs each additional quarter of covered earnings raises the benefit, because earnings increase the benefit only once the worker is fully insured. I quantify the size of this benefit jump—and of the net incentive that remains after accounting for the disability, survivor, and spousal benefits these workers would otherwise receive—in Section 4.

Individuals can only respond to the QC rule if they are aware of it. In 1995, SSA began mailing annual statements informing workers of their progress toward eligibility, reporting both QCs accumulated and the total needed, likely making the requirement more salient.

The cohorts I analyze are therefore at least somewhat informed about the rule.

2.2 Theoretical Framework

I model the response to the 40-QC eligibility threshold using the bunching framework of Kleven (2016).[5] I assume individuals maximize the following quasi-linear and iso-elastic utility function:

$$U(c, q) = c - \frac{n}{1 + 1/e} \cdot \left(\frac{q}{n}\right)^{1+1/e} \tag{1}$$

subject to the budget constraint $c = (w + t_0) \cdot q$. Here, c is total lifetime consumption, q is total number of quarters of coverage worked, n is an ability parameter, w is the (after-tax) wage, and t_0 captures proportional income transfers that scale with quarters worked, such as SSDI and spousal benefits, where t_0 can be negative.[6] Working more quarters yields disutility that varies by ability, but also higher earnings and hence more consumption. e is the elasticity of quarters of coverage with respect to the net wage $(w + t_0)$. This quasi-linear utility function rules out income effects. Utility is then maximized when:

$$q = n \cdot (w + t_0)^e \tag{2}$$

I assume that ability n follows a smooth density distribution $f(n)$, which generates a smooth distribution of q.

Now assume that Social Security awards retirement benefits to those that have earned at least a total of $q^\star$ quarters, and that these benefits are a function of total earnings. The new budget constraint is:

$$c = (w + t_0) \cdot q + t_1 \cdot q \cdot \mathbb{I}(q \geq q^\star), \tag{3}$$

[5]The bunching literature originates with Saez (2010), who showed that excess mass at budget-constraint kinks identifies the elasticity of earnings with respect to the net wage; Kleven and Waseem (2013) and Kleven (2016) extend this to notches; see Kleven et al. (2014) and Ruh and Staubli (2019) for further notch applications.

[6]Note that a quarter of coverage is not a literal three-month period of work but a Social Security accounting unit, awarded whenever annual earnings cross a statutory dollar threshold (up to four per year); w should thus be interpreted as the return to earning enough to cross one such threshold, not a wage paid per calendar quarter.

where t_1 is the additional return to each quarter earned above the threshold. The parameter t_1 simultaneously creates a *notch* (discrete level jump in consumption) and a *kink* (slope increase). The notch magnitude is $t_1 q^\star$. Relative to pre-crossing income $(w + t_0)q^\star$, this gives $\Delta b = \frac{t_1 q^\star}{(w+t_0)q^\star} = \frac{t_1}{w+t_0}$, the net SS gain expressed as a fraction of baseline earnings.[7] Panel (a) of Appendix Figure A.1 illustrates this budget constraint.

Because the marginal buncher's best alternative lies just below $q^\star$ on the unchanged budget segment (Kleven, 2016), her indifference condition depends only on Δb, not the slope above. This condition is derived from her optimization, together with the assumption that ability is distributed as $n^\star - \Delta n^\star = \frac{q^\star - \Delta q^\star}{(w+t_0)^e}$. This yields:

$$\left(1 - \frac{\Delta q^\star}{q^\star}\right) + e\left(1 - \frac{\Delta q^\star}{q^\star}\right)^{-1/e} - (1+e)(1+\Delta b) = 0 \tag{4}$$

This equation shows that the elasticity of quarters worked depends on two observables: the bunching estimate $\Delta q^\star / q^\star$ and the notch parameter Δb. While I cannot solve for e explicitly, I solve numerically once I have estimated both. With homogeneous elasticity e, Equation (4) recovers the parameter directly. With heterogeneous e (the empirically relevant case), the bunching estimate $\Delta q^\star / q^\star$ should be interpreted as $E[\Delta q^\star / q^\star]$ and the equation recovers the elasticity at the average response (Kleven, 2016). Panel (b) of Appendix Figure A.1 shows the implied QC distribution under heterogeneous elasticity: a spike at $q^\star$ and a deficit in $[q^\star - \Delta q, q^\star)$.

My estimated elasticity combines the structural preference parameter e with optimization frictions (imperfect information, adjustment costs) and is therefore an *observed* elasticity. It is also a local average treatment effect for marginal bunchers—a thin, weakly attached group near 40 QCs, distinct from the average worker—rather than an economy-wide labor supply elasticity.

[7] The SS formula is in reality non-linear, and high-income people receive a lower share of their earnings in retirement benefits. However, the linear formula above is a good approximation for individuals with fewer than 20 years of work, the sample I will analyze.

3 Data and Empirical Strategy

3.1 Data

3.1.1 Data Sources

My analysis relies on administrative data from the Social Security Administration. I draw data from four main sources: the Numident, the Master Earnings File (MEF), the Master Beneficiary Record (MBR), and the Supplemental Security Record (SSR).

The Numident is the source for individuals' demographic information, including first, middle, and last names, sex, date of birth, date of death, and citizenship status. This information comes from three main sources: the application for a Social Security number, Social Security claims files, and the Master Death File.

The MEF is the source for individuals' annual earnings, which are defined as wages from which Federal Insurance Contributions Act (FICA), i.e. Social Security, taxes have been withheld. The MEF also contains information on annual quarters of coverage (QCs). For both outcomes, I have information from 1951-2020.[8]

The MBR is the source for individuals' claim information. The MBR contains information on individuals' monthly benefits as well as all the inputs that are needed to calculate such benefits, such as the average indexed monthly earnings (AIME) amount and the Primary Insurance Amount (PIA). The MBR also contains variables pertaining to initial and current entitlement as well as benefit termination, usually at death. Finally, the MBR also contains information on the type of payment, usually either retired worker, survivor, or disability.

The last source of SSA data that I draw from is the SSR, which includes data on all individuals that have ever applied for SSI benefits. The SSR provides monthly data on both federal and state SSI payments, starting in 1972. Moreover, it contains information on whether the SSI applicant is aged or a child, and whether the SSI eligibility is based on

[8]The MEF also contains information on total quarters of coverage in 1937–1946 and 1947–1951, but these data are likely measured with error.

blindness or disability.

3.1.2 Sample Construction

To construct my sample, I started by extracting a 25% random sample of all individuals born between 1937–1950 from the Numident file, which yielded 12.9 million records. I then merged these records to the MEF data and calculated individuals' total quarters of coverage in each year. For each age of analysis (60, 65, 70, and 75), I then restrict to individuals who are alive and have 1–80 QCs at that age—those for whom the fully insured threshold was potentially relevant.[9] These analysis samples contain between roughly 1.4 and 3.2 million individuals, depending on the measurement age (Appendix Table A.1).

Second, I drew two sets of MBR records. For retirement benefits, I restricted to primary claimants recorded as retired workers who possessed entitlement information, had at least one year of positive PIA or Monthly Benefit Paid (MBP), and whose age of current eligibility was 62 or older. I also excluded workers covered under Social Security Totalization agreements, who face different QC requirements.[10] For non-retirement SS benefits, I used the full MBR without age or claim-type restrictions: disability insurance and survivor benefits are identified from both primary and secondary claimants, and spousal benefits from secondary claimants only.[11]

Finally, I merged my final MEF sample to the cleaned MBR files and to the SSR using SSN. All dollar values are converted to 2020 dollars using CPI adjustments from the 2020 Social Security Trustees Report. From the merged file I construct cumulative QC counts and total earnings (pre- and post-measurement-age) at ages 60, 65, 70, and 75, for individuals not yet deceased. I also construct total lifetime income as cumulative pre-measurement-age

[9] Because the full dataset was too large to process, I first applied an intermediate individual-level screen, keeping those with 1–80 QCs at some point between ages 55 and 70. This pre-filter binds only for high-QC workers well above the 40-QC eligibility margin, so it has a negligible effect on the analysis samples.

[10] Workers insured under Totalization are identified by Primary Insurance Factor (PIFC) label 'K'. For background see "Social Security Totalization Agreements," Jackson and Cash (2018), *Social Security Bulletin* 78(4).

[11] Data on these non-retirement SS benefits (DI/survivor, spousal) are only available for ages 65 and 70.

earnings plus SS benefits—disability insurance, survivor, retirement, and spousal.[12,13] For all analyses, I collapse the data to cells defined by quarters of coverage (at ages 60, 65, 70, and 75), birth cohort, and sex, computing both cell means and observation counts.

Appendix Table A.1 reports summary statistics for the analysis sample by the age at which quarters of coverage are measured.[14] About 45–49% of individuals are fully insured at each age. About two-thirds are female, reflecting the lower labor-force attachment of the 1–80 QC population. Pre-measurement earnings decline with measurement age, consistent with negative selection: as age increases, the survivors in the low-QC range are increasingly those with weaker lifetime earnings. Where data on benefit type is available (ages 65 and 70), DI/survivor and spousal benefits each account for roughly half of retirement benefits—underscoring that total SS income is substantially larger than retirement benefits alone. SSI receipt is small, averaging $161–258 per year.

3.2 Empirical Strategy

The empirical strategy proceeds in two steps. First, I measure the relationship between the 40-QC requirement and SS benefit eligibility, receipt, and total lifetime consumption, estimating regression-discontinuity-type models:

$$Y_{qcs} = \beta_0 + \beta_1 Insured_{qcs} + \beta_2 \left(QC_{qcs} - 40\right) + \beta_3 Insured_{qcs} \cdot \left(QC_{qcs} - 40\right) + \gamma_c + \delta_s + u_{qcs} \quad (5)$$

where the unit of observation is a cell indexed by quarters of coverage q, birth cohort c, and sex s, estimated separately for each age. Y_{qcs} represents the outcome of interest, $Insured_{qcs}$ is an indicator equal to one if $q \geq 40$, and QC_{qcs} is the value of q, which I center at the

[12] DI and survivor benefits are observed as complete lifetime totals through the end of my sample window, including any receipt after the measurement age; retirement and spousal benefits begin near or after the full retirement age and must be projected forward by cohort life-table expected years on Social Security (SSA 2026 Trustees Report).

[13] Post-measurement-age labor earnings are excluded because the observation window varies across cohorts and, more importantly, because crossing the 40-QC threshold could itself affect subsequent earnings, contaminating the incentive measure.

[14] Individual counts at age 75 are lower because only nine birth cohorts (1937–1945) had reached age 75 by the time of the data extract.

threshold so that the running variable enters as $q - 40$. γ_c and δ_s are fixed effects for birth cohort and sex. β_1 represents the change in Y at the QC threshold, and β_3 represents the change in the relationship between quarters of coverage and total consumption at the QC threshold. β_1 and β_3 should not be interpreted causally: bunching may alter selection around the threshold and bias them. However, because the bunching response I estimate is small, any selection-induced bias is correspondingly limited, and I read β_1 and β_3 as approximate changes in retirement benefits at the threshold. I estimate equation (5) on cells with QC 15–65, a symmetric window around the threshold.

Second, I estimate bunching (or excess mass) at the 40-QC threshold by comparing the observed QC distribution to a counterfactual—the distribution that would prevail absent SS retirement benefits. To construct the counterfactual, I fit a 4^{th}-degree polynomial with a binary indicator for multiples of four to control for heaping, using cells with QC 5–80 and excluding observations in a range $[q^L, q^U]$ around $q^\star = 40$.[15,16] The upper bound is set to $q^U =$ 50 QCs, and the lower bound q^L is chosen within the range [25, 39] to equate estimated excess and missing mass. This region is where bunching and missing mass occur. I then predict the counterfactual over all QCs, including the excluded region, and estimate bunching as the difference between the actual and predicted distributions over $[q^\star, q^U]$. Following Manoli and Weber (2016), I compute standard errors on $\Delta q^\star$ via individual-level bootstrapping (N=1,000 draws with replacement). I then obtain standard errors on implied elasticities via the delta method, treating Δb as known.

The identifying assumption is that, absent the eligibility rule, the density of accumulated quarters of coverage would evolve smoothly through $q^\star = 40$. The running variable is subject to mechanical heaping at multiples of four (since workers earn 0–4 QCs per year), which could create non-smoothness in the distribution independent of the eligibility rule. I address this

[15] I use a wider window here than in the first-stage RD (QC 15–65) because the polynomial counterfactual is a global fit: more of the distribution on either side of the excluded region helps pin down its shape. Appendix Figure A.9 shows bunching and elasticity estimates are stable to this choice of window.

[16] The heaping correction indicator is estimated only from observations outside the excluded region $[q^L, q^U]$, ensuring that multiples of four inside the excluded window do not influence the polynomial fit.

through a heaping correction in the main specification and conduct several robustness checks below to ensure heaping is not significantly biasing my results.

4 Results

4.1 Relationship between SS Benefits and QCs

Figure 1(a) plots average annual SS benefits received by QC bin at age 70, decomposed into retirement, DI/survivor, and spousal components,[17] while Panel (b) plots total lifetime income with and without Social Security. Panel (a) of Table 1 reports the estimated discontinuities. Retirement benefits are almost zero below 40 QCs and jump by $3,570 per year at the 40-QC threshold.[18] However, this gross gain is substantially attenuated by offsetting changes in spousal benefits. Netting out these offsets, total annual SS rises by $1,985—a 51.5% increase relative to individuals just below the threshold. The gap between lifetime income with and without Social Security widens sharply at QC 40, raising total lifetime income by approximately $35,600, or 14%.[19]

Panels (b) and (c) of Table 1 and Appendix Figure A.2 show that these patterns differ by sex. For men, retirement receipt rises by $2,121 but is partly offset by a $335 fall in DI/survivor benefits, yielding a net total SS gain of $1,648 per year. The DI/survivor fall largely reflects SSDI-to-retirement reclassification at Full Retirement Age: disabled men below 40 QCs who cross the threshold have their DI payments reclassified as retirement at FRA. For women, retirement receipt jumps by $4,271 per year, but spousal benefits fall

[17] I exclude SSI from the main analysis as it operates under a separate means-testing regime unrelated to QC accumulation. Nevertheless, Appendix Table A.2 shows that the estimated jump is not sensitive to including SSI.

[18] Mean retirement benefits just below the threshold (QC 37–39) are not exactly zero—$235 pooled, $462 for men, $140 for women (Table 1). At application, workers short on posted QCs can submit pay stubs or W-2s to credit earnings not yet on their record, retroactively pushing their insured QC count above 40. My QC measure, based on posted earnings as of the data extract, misses these corrections. The resulting measurement error is if anything conservative for my estimates.

[19] Table 1 also documents a co-located kink: above 40 QCs, total annual SS accrues approximately $51 more per additional QC than below the threshold, equivalent to roughly $2,800 in lifetime income per additional QC. As I discuss in Section 2.2, this does not affect the elasticity recovery.

by \$2,301, yielding a net total SS gain of \$2,177 per year. This reflects dual entitlement substitution: women below 40 QCs often receive spousal benefits; once they gain a higher own-record PIA by crossing the threshold, SSA switches them to own-record retirement and the spousal benefit falls. Estimating the benefit gain from retirement receipt alone therefore overstates the net income change at the threshold by about 29% for men and 96% for women.

One potential concern is that these RD estimates could be biased by selection near the threshold—workers who selected into QCs 37–39 may differ systematically from those just above 40—or by the choice of estimation window. Section 4.3 shows both jumps are stable to donut exclusions around the threshold and to the width of the estimation window.

4.2 Bunching and Elasticity Estimates

Figure 2 shows the QC distribution (left column) along with the formal bunching estimates (right column) at ages 60, 65, and 70, restricting the figures to QCs 15–65 (a symmetric 25-QC window around the threshold).[20] The distributions show clear peaks at multiples of four due to annual earnings thresholds, with a visual spike at exactly 40 QCs. The bunching estimates confirm this pattern: bunching is much smaller at age 60 ($b = 0.58$) than at older ages, growing to 1.10 by age 65 and reaching 1.50 by age 70. Appendix Figure A.3 reports age 75 results ($b = 1.64$), slightly above the age-70 estimate, consistent with continued QC accumulation into the early 70s.[21] Bootstrap standard errors of 0.03–0.04 confirm the estimates are precise. This age gradient is consistent with workers responding more strongly to the QC requirement as retirement approaches and the benefit becomes increasingly salient.

Bunching at the threshold shows that workers respond to the QC incentive, but b alone does not identify the magnitude of the response: the same excess mass can arise from a large elasticity paired with a small financial incentive, or vice versa. To recover the elasticity, I

[20] The underlying polynomial fit and excess-mass calculation use all QC bins above 4, as described in Section 3.2; only the displayed window is restricted here for legibility.

[21] This comparison is only suggestive: the age-75 sample is limited to the nine birth cohorts (1937–1945) old enough to have reached age 75 by the data extract, and only those still alive at age 75, whereas the age-70 sample includes all fourteen cohorts and a different survivor population. Differential cohort composition and survivorship across the two samples could also contribute to the difference in bunching estimates.

follow Kleven (2016) and combine b with the net benefit rate Δb—the proportional jump in total lifetime income at the 40-QC threshold, directly visible in Figure 1. Specifically, Δb equals the RD-estimated jump in lifetime earnings plus SS (retirement, DI/survivor, and spousal) at QC 40 divided by mean total lifetime income at QC 37–39. I plug both into the notch indifference condition, Equation (4) below, and solve it numerically for e.

Table 2 presents the bunching estimates, net benefit rates, and implied elasticities at ages 60, 65, 70, and 75. Panel A shows the pooled estimates: the implied elasticity grows with age, mirroring the bunching pattern in Figure 2, from near zero at age 60 to 0.015 by age 70. Appendix Figure A.4 and Panels B and C show the by-sex results: men bunch more ($b = 1.84$) than women ($b = 1.44$), and the lower net benefit rate for men ($\Delta b \approx 0.104$ vs. 0.161 for women) widens the gap further. The implied elasticity is 0.023 for men, 0.013 for women. These are extremely small overall. A 100% increase in total lifetime income near the 40 QC threshold is associated with only a 1–3% increase in total quarters of coverage.[22]

I next examine cohort-level heterogeneity in bunching and elasticities to study how the behavioral response has evolved over time. Figure 3 plots cohort-by-cohort estimates of the RD jump in total lifetime income (Panel a), the bunching estimate (Panel b), and their implied elasticity (Panel c). Panel (a) shows that the lifetime income gain from crossing the threshold is generally larger for women, with women's gain rising markedly through the mid-1940s cohorts before partially reversing, and men's showing no clear trend. Panel (b) shows that bunching has increased for women and decreased for men on net—though noisily—narrowing substantially by the 1950 cohort. Hence, younger cohorts of women both have higher gains from crossing the threshold and are more likely to bunch. Panel (c) shows that implied elasticities are not flat: women's roughly doubles across cohorts, mirroring the

[22] The RD jump underlying Δb includes a small, insignificant jump in pre-measurement-age earnings alongside the SS jump, which could reflect selection at the threshold rather than the notch itself. As a robustness check, I recompute Δb using only the SS component of the jump in the numerator (excluding the earnings jump) while keeping total lifetime income in the denominator, consistent with the model's definition of c. At age 70 pooled, this lowers Δb from 0.139 to 0.105 (a 24% reduction) and raises the implied elasticity from 0.015 to 0.017 (a 13% increase). The implied elasticity therefore remains small under this alternative specification.

rising bunching trend in Panel (b), while men's declines, mirroring men's falling bunching in Panel (b), albeit noisily.[23] The narrowing gap between men and women is consistent with the secular convergence in female labor force participation: as women's labor market attachment increasingly came to resemble men's, so did their bunching response. Alternative explanations for the cohort trends are growing awareness of the threshold following SSA's introduction of annual benefit statements in 1995 and differential macroeconomic conditions across cohorts. However, fourteen cohorts are too few to test these explanations satisfactorily. Regardless of mechanism, implied elasticities remain well below 0.05 for either sex in every cohort.

My estimates place the labor supply response to the Social Security eligibility notch at the low end of the literature on financial incentives for work. The implied elasticities of 0.013–0.023 at age 70 are an order of magnitude or more below the responses that Gelber et al. (2020) and Gelber et al. (2022) estimate for the same program's earnings test, reinforcing my central message that the large US elasticities to Social Security incentives do not extend to the low-attachment workers near the eligibility margin. They are, however, of the same order of magnitude as the static notch elasticities of Manoli and Weber (2016) for the Austrian retirement system, suggesting that near-zero responsiveness is a feature of eligibility and benefit-accrual margins more broadly rather than of this setting alone. Finally, the contrast between the sizable incentive at the threshold and the muted behavioral response is consistent with a broad body of work documenting that optimization frictions blunt responses to financial incentives (Chetty, 2012; Kleven and Waseem, 2013)—frictions that are likely especially binding in a population with limited flexibility over the margin of covered work.

[23] Men's cohort estimates are noisier than women's in part because low-attachment men form a smaller subsample: male cell sizes in the estimation window are roughly half those of women throughout the cohort range, reflecting the gender gap in part-time and low-earnings employment histories among workers born 1937–1950.

4.3 Robustness Checks

Two parts of my design could in principle be sensitive to specification choices: the regression-discontinuity estimates of the first-stage benefit jump, and the bunching estimator's counterfactual density. I address each in turn below and report full results in the Appendix.

4.3.1 Jump in SS Benefits

Donut RD. One concern is that the first-stage RD estimates could be biased by selection near the threshold: workers who selected into QCs 37–39 may differ systematically from those just above 40. Appendix Figure A.5 addresses this with a donut RD, progressively excluding QC bins within d steps of QC 40 for $d \in [0, 10]$. Both the SS benefits received and lifetime income discontinuities are stable across all values of d, indicating the estimates are not driven by workers in the bins immediately adjacent to the threshold.[24]

Estimation bandwidth. My baseline first-stage specification uses a symmetric window of QC 15–65 ($\pm$25 QCs around the threshold). Appendix Figure A.6 shows both the annual SS received jump and the total lifetime income jump as this window narrows to $\pm$5 QCs or widens to $\pm$35 QCs. The lifetime income jump is essentially flat, remaining within \$32,000–\$37,000 across the entire range. The annual SS jump rises from about \$1,570 at $\pm$5 QCs to a plateau near \$2,000 by $\pm$15 QCs—always positive and large across these bandwidths.

4.3.2 Bunching Estimator

Constructing the bunching counterfactual involves three choices: how much of the QC distribution to use in fitting it, the degree of the polynomial, and the width of the region excluded around the threshold. A separate, unrelated concern is that the running variable piles up mechanically at multiples of four—since a full year of covered work yields exactly four QCs—which could inflate the estimated spike at 40 QC regardless of the counterfactual

[24] Restricting to QC bins at least d steps from the threshold ($d \in [0, 10]$), the pooled jump in total lifetime income stays within roughly \$35,000–\$44,000 (2020\$).

specification. I address each in turn.

Polynomial degree. My baseline analysis uses a 4th-degree polynomial to estimate the counterfactual, which yields a pooled elasticity of 0.015 at age 70. Appendix Figure A.7 presents sensitivity to using degrees 3–8. Across degrees 4–8, implied elasticities range from 0.013 to 0.017; degree 3 yields a higher estimate (0.028), consistent with a cubic being less flexible in capturing curvature in the distribution near the threshold.

Excluded window. My baseline analysis sets the upper bound of the excluded window at $q^U = 50$ and selects the lower bound q^L to equate estimated excess and missing mass. Appendix Figure A.8 shows bunching estimates and implied elasticities as q^U varies from 44 to 56 QCs, with q^L re-selected for each value. Implied elasticities range from 0.008 to 0.016 with no clear trend across this range, fluctuating around the baseline of 0.015.

Estimation window. My baseline bunching specification uses nearly the full available range of QCs (5–80). Appendix Figure A.9 tests sensitivity to symmetric windows of half-width 18 to 35 QCs around the threshold; narrower windows leave too few bins below the excluded region to reliably re-select the lower bound. Bunching ranges from 1.35 to 1.78 and the implied elasticity from 0.013 to 0.019 across this range, comfortably consistent with the baseline estimates.

Heaping correction. My baseline accounts for heaping by including a binary indicator for multiples of four, estimated on non-excluded cells, which shifts the counterfactual up at round-number QC bins. Appendix Figure A.10 compares this baseline (A) against two alternatives: (B) no heaping correction at all; and (C) a specification in which the heaping bonus is allowed to vary quadratically with the QC level, estimated off the non-excluded multiples of four. For this check, I show results separately for men and women, since men exhibit stronger heaping behavior in my data. Both alternatives move the implied elasticity only slightly, and not at all for women, consistent with the figures showing less heaping among women. For men, omitting the correction (B) yields a marginally larger elasticity ($e \approx 0.031$) while the quadratic variant (C) yields a marginally smaller one ($e \approx 0.019$),

bracketing the baseline estimate of 0.023.

Years of coverage. An alternative way to sidestep the multiple-of-four heaping issue entirely is to aggregate the running variable from quarters to *years* of coverage, defined as the QC count divided by four and rounded down to the nearest integer. This is a mechanical rebinning of the QC count into groups of four so within-bin quarter accumulation is absorbed by construction. This aggregation collapses four QC bins into a single year bin, so the resulting b is measured in units of excess year-bins rather than excess QC-bins and is not directly comparable in level to the QC-space baseline. Appendix Figure A.11 re-estimates bunching in this coarser space at ages 60, 65, 70, and 75, where the threshold is 10 years (= 40 QCs at 4 per year). Bunching remains positive, precisely estimated, and grows sharply from near zero at age 60 to $b \approx 0.34$ (SE = 0.01) by age 70—equivalent to roughly 1.35 excess QC-bins (0.34×4), comparable in magnitude to the QC-space estimate of 1.50—before leveling off at age 75. The consistent sign and age gradient confirm that the QC-level bunching is a genuine behavioral response rather than an artifact of quarter-level discretization.

5 Conclusion

While Social Security is a large federal program, a significant share of the elderly remain ineligible because they never accumulate the required 40 quarters of coverage (QCs). This requirement creates a large notch in individuals' budget sets, providing an incentive to work a few additional quarters. I show that despite this large financial incentive, the behavioral response is surprisingly small.

I show that the jump in lifetime income at the eligibility threshold is large—though substantially smaller than the retirement benefit discontinuity alone, once SSDI reclassification and spousal benefit substitution are accounted for. Individuals do respond to the QC criteria: bunching is much smaller at age 60 ($b = 0.58$) than at older ages and grows steadily, reaching $b = 1.50$ by age 70, with men exhibiting larger bunching than women ($b = 1.84$ vs. $b = 1.44$).

Despite significant bunching, implied elasticities of quarters of coverage with respect to the net wage remain extremely small—approximately 0.015 at age 70 (0.023 for men, 0.013 for women)—an order of magnitude or more below the responses estimated for workers exposed to the same program's earnings test. These estimates indicate that the large US labor supply elasticities documented for the earnings test do not extend to the eligibility notch—though my design cannot determine whether this reflects binding constraints on workers near the threshold, the inherently smaller responses that all-or-nothing eligibility margins elicit relative to continuous incentives, optimization frictions such as limited attention to distant benefits, or some combination of these.

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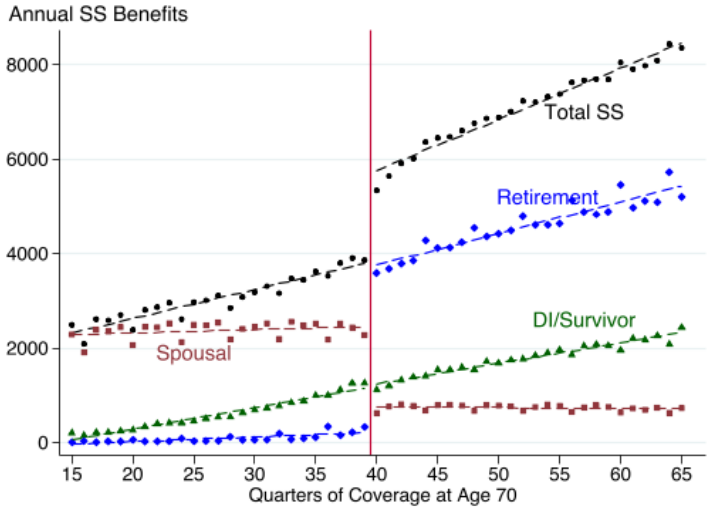
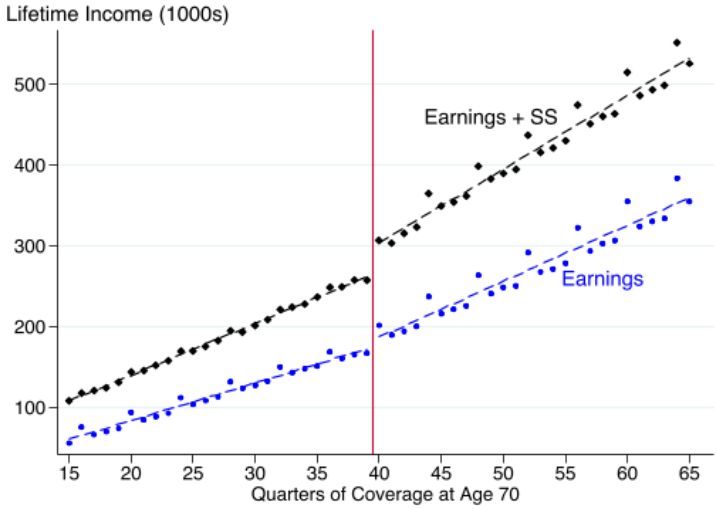
Figure 1: Relationship between Quarters of Coverage and Social Security Benefits

(a) Annual SS Benefits



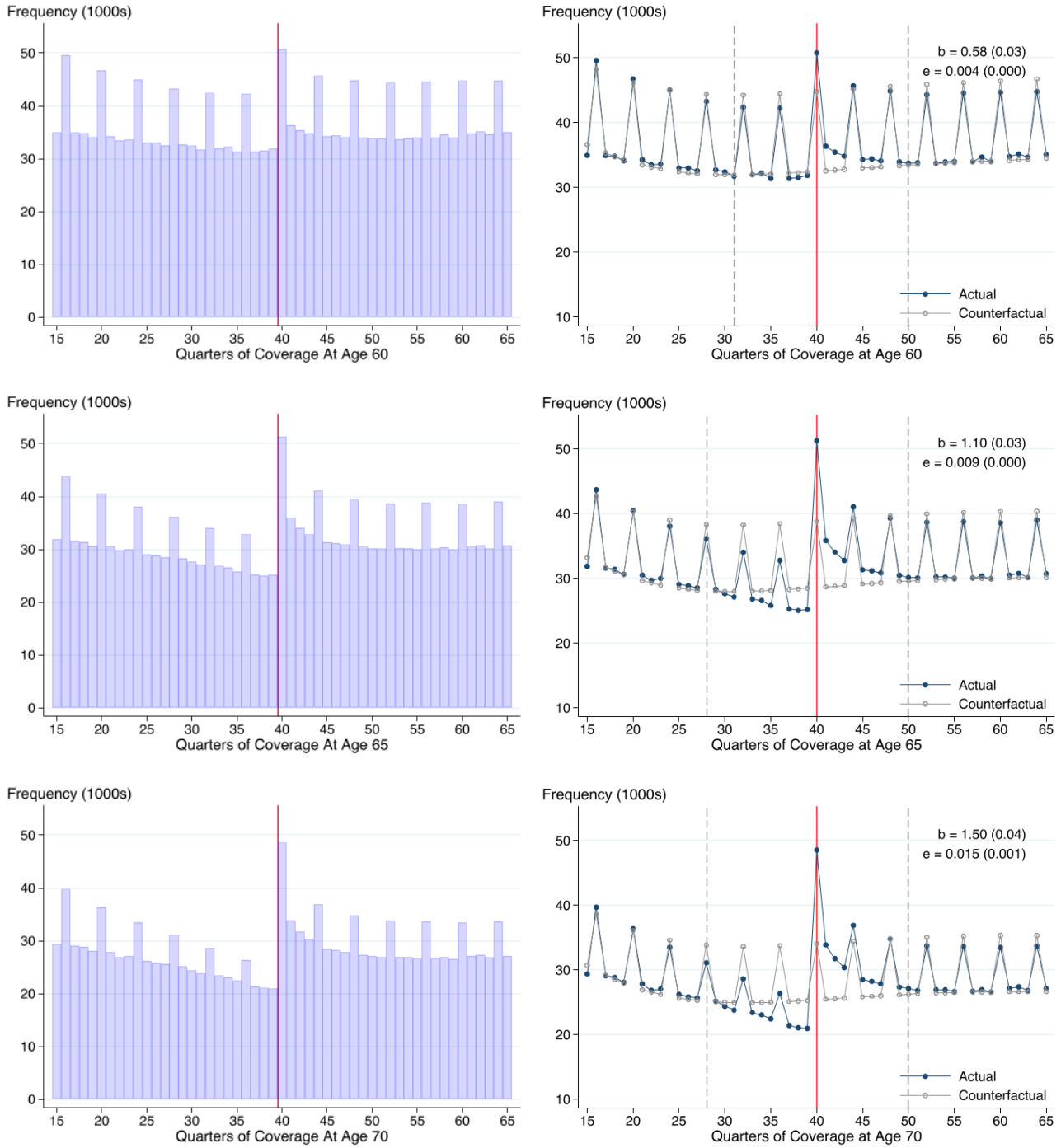
(b) Lifetime Income



Notes: This figure presents the relationship between quarters of coverage (QCs) and Social Security benefits at age 70. Panel (a) presents average annual SS benefits received (black), decomposed into own-record retirement (blue), DI/survivor (green), and spousal (red) benefits. Panel (b) presents total lifetime earnings (blue), measured as cumulative pre-age-70 earnings, and lifetime income including SS (black), measured as lifetime earnings plus lifetime SS benefits, constructed as described in Section 3.1. All dollar amounts are in 2020 dollars. In both panels, each point is the cell-size-weighted mean across birth cohorts within a QC bin, and the dashed lines show separate linear fits below and above the threshold. *Sample:* The sample is a 25% random sample of individuals born 1937–1950 who were alive and had 15–65 QCs at age 70, drawn from SSA administrative records.

Figure 2: QC Distribution and Bunching Around Insured Status

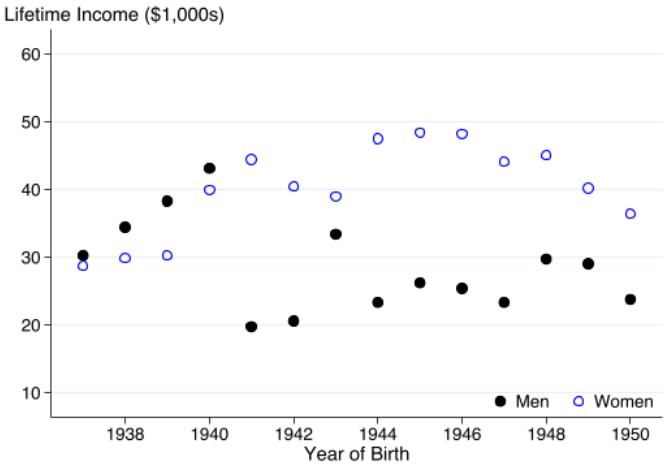
(a) QC Distribution (b) Bunching and Elasticity Estimates



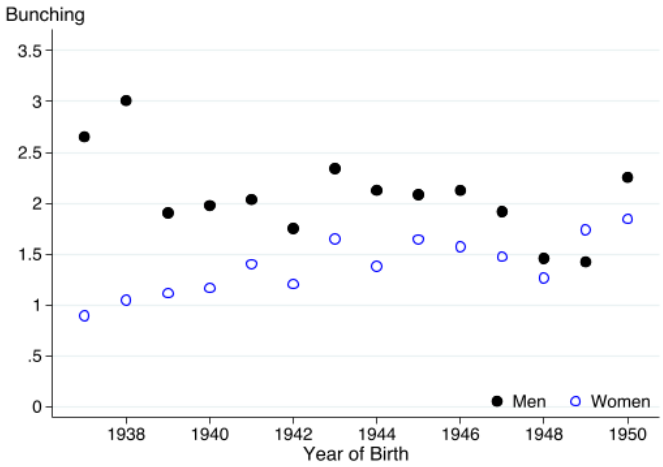
Notes: This figure presents, for ages 60, 65, and 70 (top to bottom rows), histograms of the quarters-of-coverage (QC) distribution in the left panels and the corresponding bunching estimates in the right panels. The bunching panels show navy connected circles for the actual frequency and gray connected circles for the counterfactual frequency. To construct the counterfactual, I fit a 4th-degree polynomial to the QC distribution with a binary indicator for multiples of four to correct for heaping, excluding bins in $[q^L, 50]$ around the threshold, and I estimate bunching as the excess mass over $[40, 50]$ relative to this counterfactual (see Section 3.2). The polynomial fit and the excess-mass calculation use all QC bins above 4 at the corresponding age, but both panels are displayed over the QC 15–65 window for legibility. The solid red vertical line marks the 40 QC threshold and the dashed vertical lines mark the bounds of the excluded region. I also report the bunching estimate b and its bootstrap standard error (N=1,000 draws), together with the implied elasticity e. *Sample:* The sample is a 25% random sample of individuals born 1937–1950, drawn from SSA administrative records, restricted in each row to individuals alive and with 5–80 QCs at the corresponding age.

Figure 3: Lifetime Income, Bunching, and Implied Elasticity – By Birth Cohort and Sex

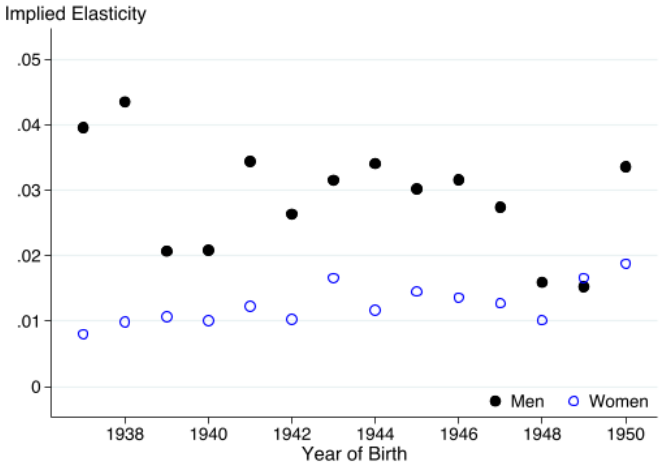
(a) Lifetime Income



(b) Bunching Estimate



(c) Implied Elasticity



Notes: This figure presents estimates at age 70 by year-of-birth cohort (1937–1950) and sex. Panel (a) presents the RD jump in total lifetime income (thousands of 2020$) at the 40 QC threshold, estimated as in Figure 1 (see its notes for the exact specification). Panel (b) presents the bunching estimate b, estimated as in Figure 2 (see its notes for the exact specification). Panel (c) presents the implied elasticity of quarters of coverage with respect to the net wage, obtained for each cohort using the Δb from Panel (a) and the bunching estimate from Panel (b). *Sample:* The sample is a 25% random sample of individuals born 1937–1950, drawn from SSA administrative records, restricted to individuals alive and with 5–80 QCs at age 70.

Table 1: Change in Social Security Benefits and Lifetime Income at Insured Status

	Annual SS Benefits				Lifetime Income (1000s)	
	Retirement	DI/Survivor	Spousal	Total	Earnings	Earnings+SS
Panel A: All						
Insured	3569.7***	32.0	-1617.0***	1984.7***	8.5	35.6***
	(76.6)	(51.9)	(56.7)	(91.4)	(5.1)	(4.6)
QCs × Insured	60.2***	-0.7	-8.8**	50.7***	2.2***	2.8***
	(6.3)	(3.8)	(4.1)	(6.2)	(0.4)	(0.4)
Mean Y (QC 37–39)	235.5	1208.2	2409.9	3853.6	164.4	256.4
Observations	1428	1428	1428	1428	1428	1428
Panel B: Men						
Insured	2120.6***	-335.0***	-137.8***	1647.7***	18.2*	28.2**
	(177.5)	(87.1)	(8.9)	(158.2)	(10.5)	(10.7)
QCs × Insured	69.4***	-9.7	-3.0***	56.7***	3.3***	3.6***
	(14.6)	(6.7)	(0.6)	(11.0)	(0.8)	(0.8)
Mean Y (QC 37–39)	461.8	1838.6	142.1	2442.6	192.6	270.9
Observations	714	714	714	714	714	714
Panel C: Women						
Insured	4271.4***	207.3***	-2301.4***	2177.3***	4.6*	40.4***
	(62.1)	(39.8)	(72.9)	(110.4)	(2.6)	(2.3)
QCs × Insured	52.2***	3.0	-8.6*	46.6***	1.7***	2.4***
	(4.1)	(2.8)	(5.1)	(7.0)	(0.2)	(0.2)
Mean Y (QC 37–39)	140.3	943.3	3362.9	4446.6	152.5	250.2
Observations	714	714	714	714	714	714

Notes: This table presents the change in Social Security benefits and lifetime income at the 40 QC insured-status threshold, measured at age 70. The columns indicate the outcome variable: average annual own retirement, DI/survivor, and spousal benefits received and their total; and cumulative earnings up to age 70 and total lifetime income (cumulative earnings plus expected lifetime SS benefits). All dollar amounts are in 2020 dollars. Panel A pools both sexes, and Panels B and C present men and women separately. For all results I estimate equation (5), and Panel A additionally includes a sex fixed effect. "Mean Y (QC 37–39)" is the cell-size-weighted mean of the outcome just below the threshold. Observations are weighted by cell size, and standard errors clustered at the QC-bin level (51 clusters) are in parentheses. *Sample:* The sample is a 25% random sample of individuals born 1937–1950 who were alive and had 15–65 QCs at age 70, drawn from SSA administrative records. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 2: Implied Elasticities of Quarters of Coverage with Respect to the Net Wage

	Age 60	Age 65	Age 70	Age 75
Panel A: All				
Bunching ($\Delta q^\star$)	0.58	1.10	1.50	1.64
	(0.03)	(0.03)	(0.04)	(0.05)
Net benefit rate (Δb)	0.145	0.145	0.139	0.139
Implied Elasticity	0.004	0.009	0.015	0.017
	(0.000)	(0.000)	(0.001)	(0.001)
Panel B: Men				
Bunching ($\Delta q^\star$)	0.43	1.20	1.84	2.33
	(0.05)	(0.06)	(0.06)	(0.09)
Net benefit rate (Δb)	0.096	0.096	0.104	0.104
Implied Elasticity	0.003	0.013	0.023	0.034
	(0.000)	(0.001)	(0.001)	(0.002)
Panel C: Women				
Bunching ($\Delta q^\star$)	0.56	1.14	1.44	1.32
	(0.05)	(0.05)	(0.05)	(0.06)
Net benefit rate (Δb)	0.175	0.175	0.161	0.161
Implied Elasticity	0.004	0.009	0.013	0.012
	(0.000)	(0.001)	(0.001)	(0.001)

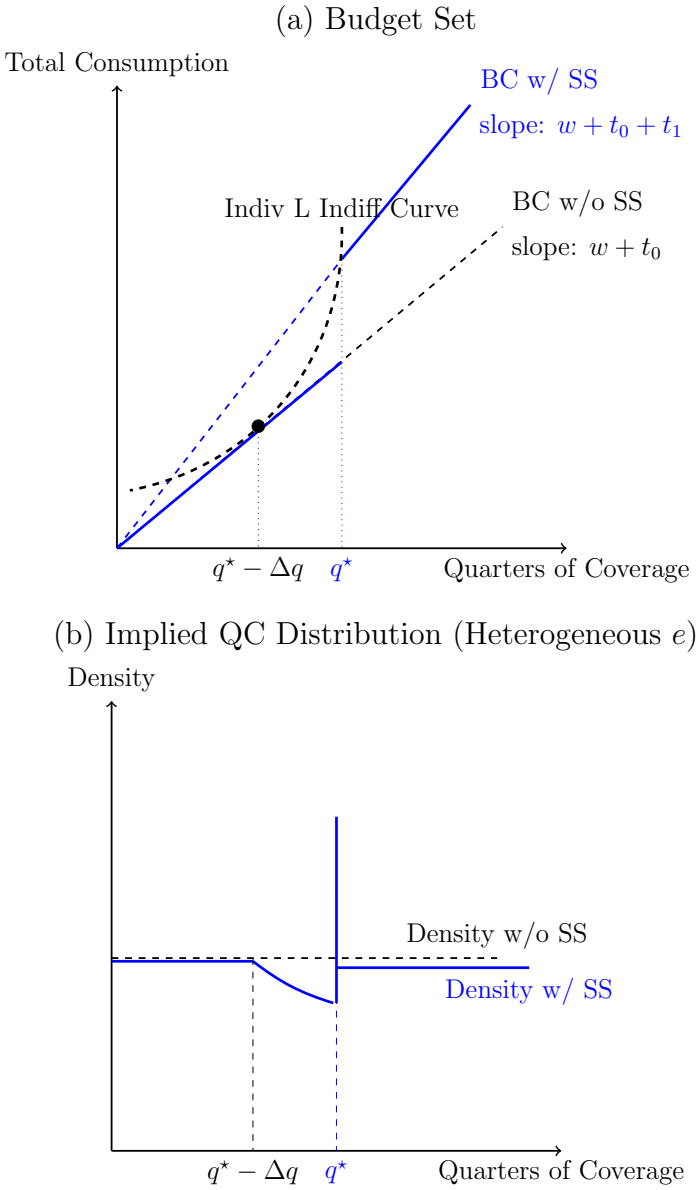
Notes: This table presents implied elasticities of quarters of coverage with respect to the net wage, by age and sex. $\Delta q^\star$ is the bunching estimate, constructed as in Figure 2. Δb is the net benefit rate: the RD-estimated jump in total lifetime income at 40 QCs divided by mean lifetime income just below the threshold (QC 37–39), as in Table 1. The elasticity e solves equation (4) numerically. Because the benefit-type data underlying Δb are available only at ages 65 and 70, I use the age-65 Δb for the age-60 row and the age-70 Δb for the age-75 row. Panel A pools both sexes, and Panels B and C present men and women separately. Standard errors on $\Delta q^\star$ are the standard deviation of N=1,000 individual-level bootstrap draws; standard errors on e are computed via the delta method applied to $\Delta q^\star$, holding Δb fixed. *Sample:* The sample is a 25% random sample of individuals born 1937–1950, drawn from SSA administrative records, restricted to individuals alive and with 5–80 QCs at that age.

ONLINE APPENDIX

Large Incentives, Small Responses
at the Social Security Eligibility Notch

A Additional Results

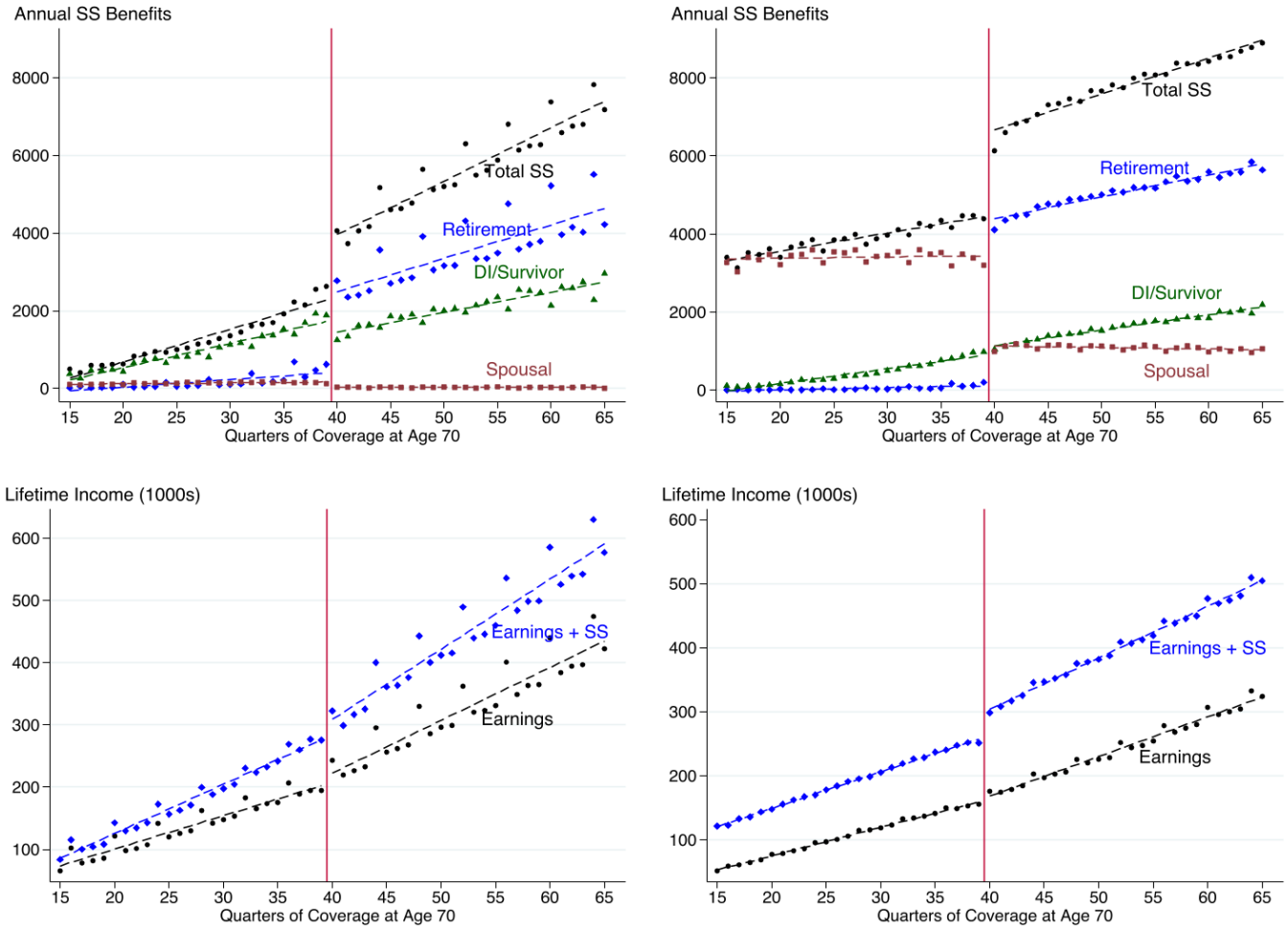
Figure A.1: Budget Set and QC Distribution with and without SS Retirement Benefits



Notes: This figure illustrates how the 40 QC eligibility rule shapes the lifetime budget set and the resulting QC distribution. Panel (a) presents the budget set relating total lifetime consumption to quarters of coverage. Without SS retirement benefits, consumption rises linearly in quarters worked with slope $w+t_0$ (dashed line); crossing the 40 QC threshold $q^\star$ produces a discrete upward jump in consumption and a steeper slope $w+t_0+t_1$ thereafter (solid blue). A worker with the indifference curve shown is drawn from her interior optimum at $q^\star - \Delta q$ toward the threshold. Panel (b) presents the QC density implied when the elasticity is heterogeneous across workers: relative to the smooth counterfactual density that would prevail absent SS (dashed), the eligibility rule shifts mass from just below the threshold (missing mass) into a spike at $q^\star$ (excess mass, or bunching). This figure is illustrative and uses no data.

Figure A.2: Relationship between Quarters of Coverage and Social Security Benefits—By Sex

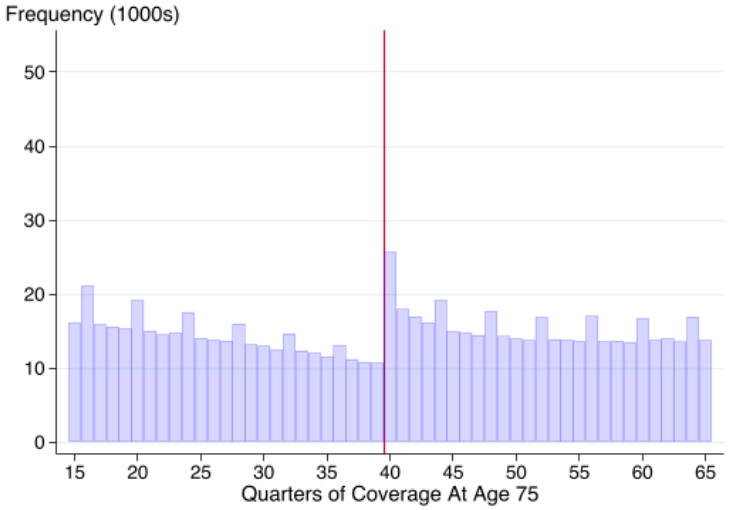
(a) Men (b) Women



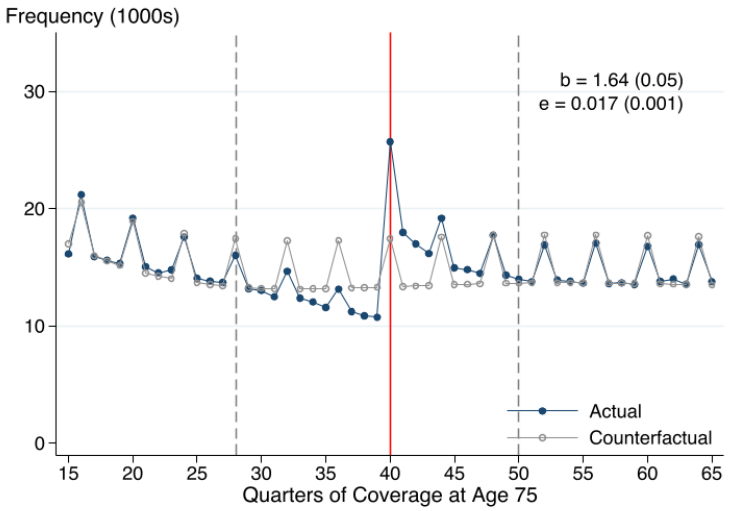
Notes: This figure presents the relationship between quarters of coverage (QCs) and Social Security benefits at age 70, shown separately by sex: column (a) is men and column (b) is women. The top row presents average annual SS benefits received (black), decomposed into own-record retirement (blue), DI/survivor (green), and spousal (red) benefits. The bottom row presents total lifetime earnings (blue), measured as cumulative pre-age-70 earnings, and lifetime income including SS (black), measured as lifetime earnings plus lifetime SS benefits, constructed as described in Section 3.1. All dollar amounts are in 2020 dollars. In all panels, each point is the cell-size-weighted mean across birth cohorts within a QC bin, and the dashed lines show separate linear fits below and above the threshold. *Sample:* The sample is a 25% random sample of individuals born 1937–1950 who were alive and had 15–65 QCs at age 70, drawn from SSA administrative records.

Figure A.3: QC Distribution and Bunching at Age 75

(a) QC Distribution



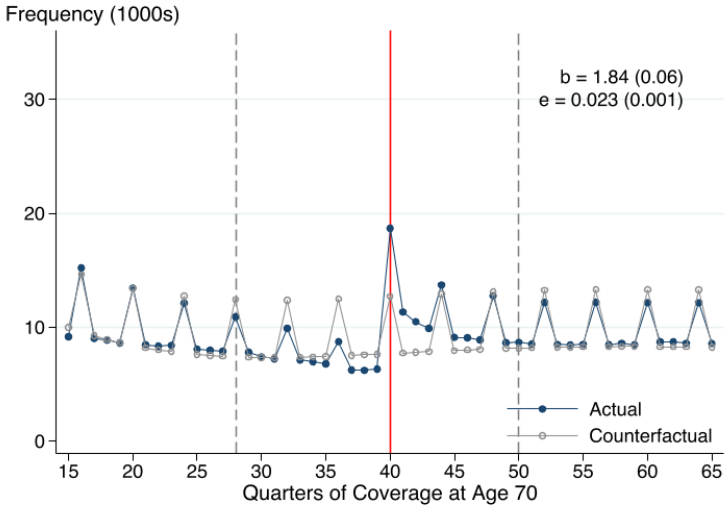
(b) Bunching Estimate



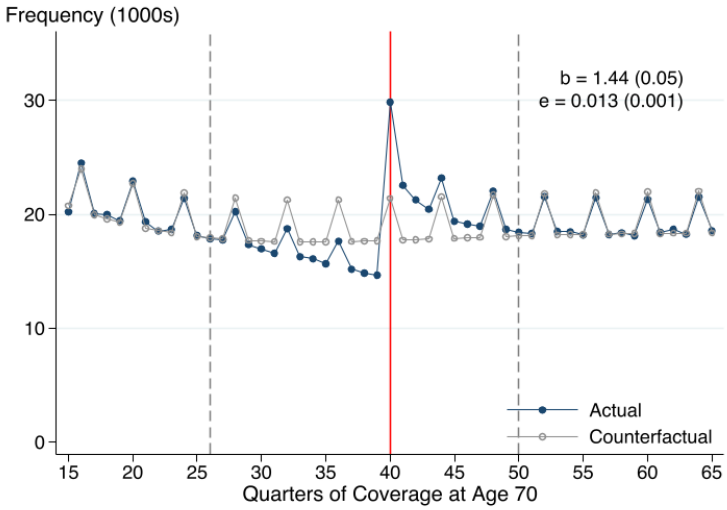
Notes: This figure presents, for age 75, a histogram of the quarters-of-coverage (QC) distribution (Panel (a)) and the corresponding bunching estimate (Panel (b)). The bunching panel shows navy connected circles for the actual frequency and gray connected circles for the counterfactual frequency. To construct the counterfactual, I fit a 4th-degree polynomial to the QC distribution with a binary indicator for multiples of four to correct for heaping, excluding bins in $[q^L, 50]$ around the threshold, and I estimate bunching as the excess mass over $[40, 50]$ relative to this counterfactual (see Section 3.2). The polynomial fit and the excess-mass calculation use all QC bins above 4 at age 75, but both panels are displayed over the QC 15–65 window for legibility. The solid red vertical line marks the 40 QC threshold and the dashed vertical lines mark the bounds of the excluded region. I also report the bunching estimate b and its bootstrap standard error (N=1,000 draws), together with the implied elasticity e. *Sample:* The sample is a 25% random sample of individuals born 1937–1945—the cohorts old enough to have reached age 75 by the data extract—who were alive and with 5–80 QCs at age 75, drawn from SSA administrative records.

Figure A.4: Bunching Around Insured Status at Age 70—By Sex

(a) Men

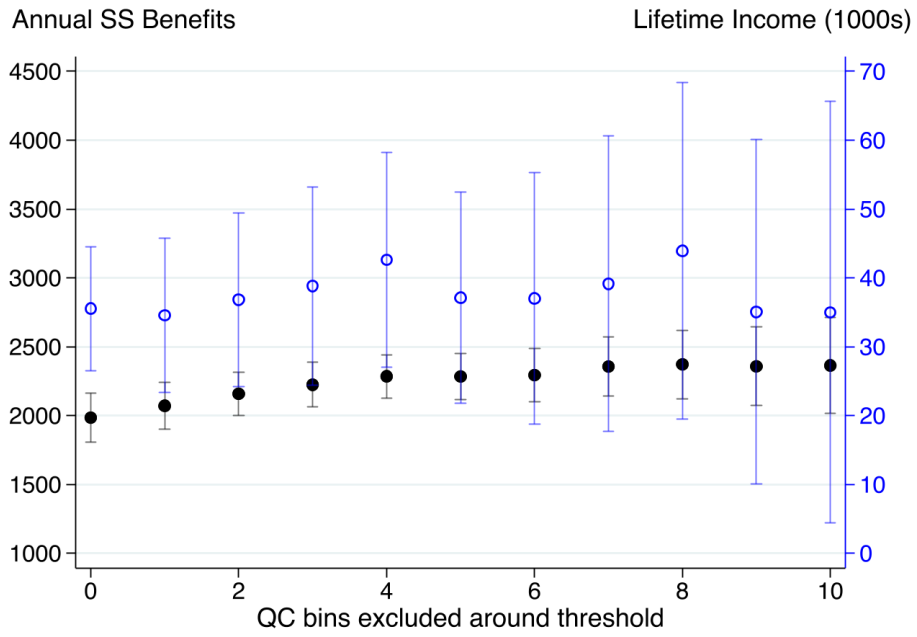


(b) Women



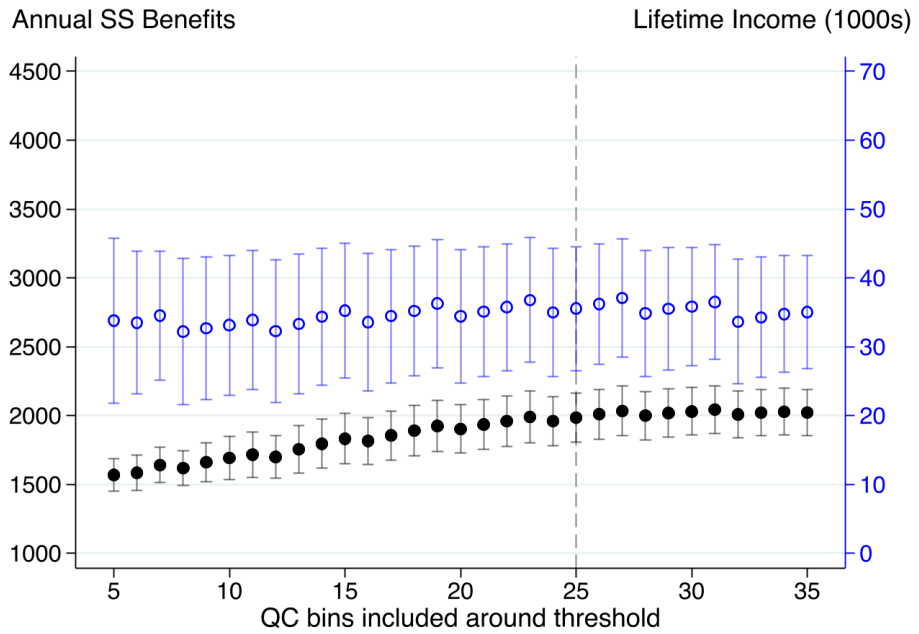
Notes: This figure presents the bunching estimate at age 70 separately for men (Panel (a)) and women (Panel (b)), in the same format and specification as the right panels of Figure 2. *Sample:* The sample is a 25% random sample of individuals born 1937–1950 who were alive and had 5-80 QCs at age 70, drawn from SSA administrative records.

Figure A.5: Change in SS Benefits and Lifetime Income at Insured Status at Age 70 – Sensitivity to Excluding QCs Around Threshold



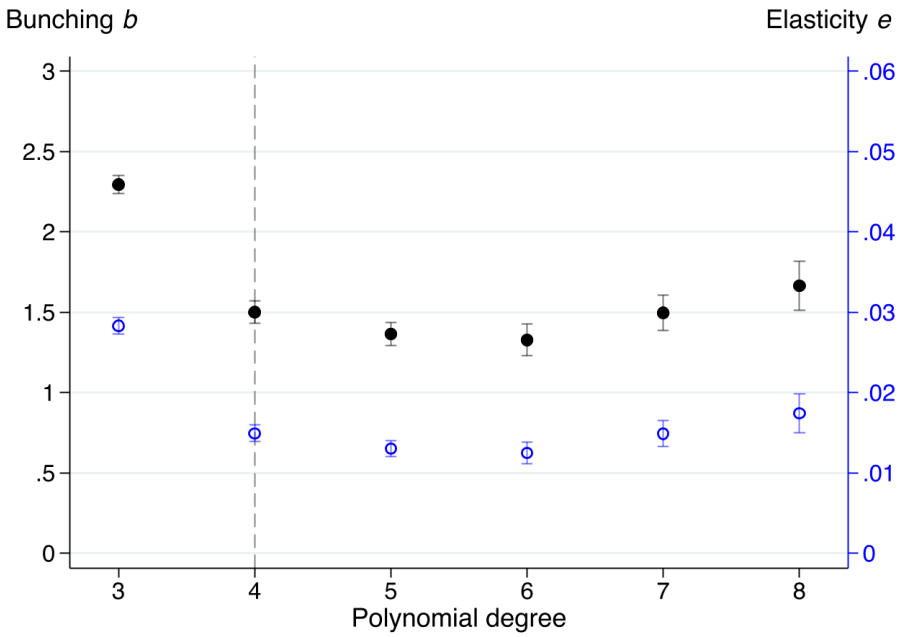
Notes: This figure presents a "donut" robustness check for the first-stage jump at 40 QCs at age 70. Each point shows the RD-estimated jump when QC bins within d steps of the threshold are progressively dropped from the regression: at $d = k$, bins $[40 - k, 39 + k]$ are excluded and equation (5) is estimated on the remaining bins in $[15, 65]$. The annual SS received jump is shown on the left axis (black) and the total lifetime income jump on the right axis (blue, thousands of 2020$); both use capped lines for 95% confidence intervals with standard errors clustered at the QC-bin level. *Sample:* The sample is a 25% random sample of individuals born 1937–1950 who were alive and had 15–65 QCs at age 70, drawn from SSA administrative records.

Figure A.6: Change in SS Benefits and Lifetime Income at Insured Status at Age 70 – Sensitivity to Estimation Bandwidth



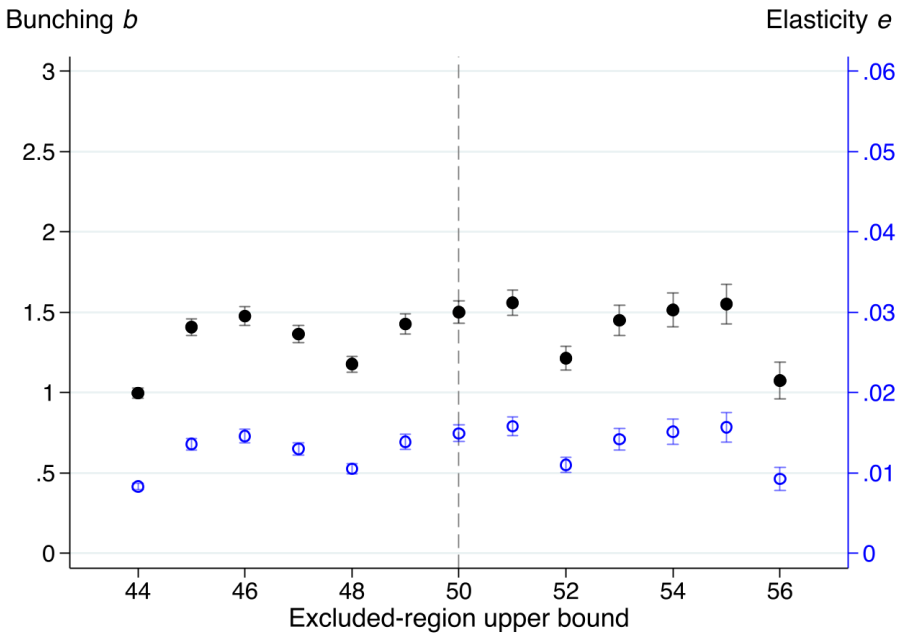
Notes: This figure presents the sensitivity of the first-stage jump at 40 QCs at age 70 to the width of the estimation window. Each point sets the estimation window to $[40 - w, 40 + w]$ for half-width w from 5 to 35 QCs, and equation (5) is re-estimated on that window (baseline $w = 25$, i.e., QC 15–65, marked by the dashed vertical line). The annual SS received jump is shown on the left axis (black) and the total lifetime income jump on the right axis (blue, thousands of 2020$); both use capped lines for 95% confidence intervals with standard errors clustered at the QC-bin level. *Sample:* The sample is a 25% random sample of individuals born 1937–1950 who were alive and had 15–65 QCs at age 70, drawn from SSA administrative records.

Figure A.7: Bunching and Elasticities at Age 70 – Sensitivity to Polynomial Degree



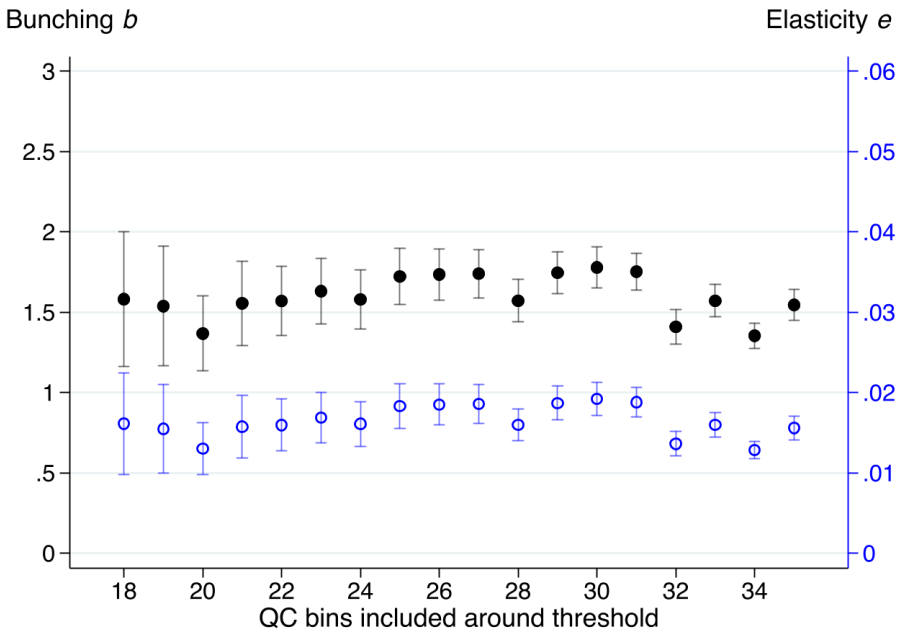
Notes: This figure presents the sensitivity of the age-70 bunching estimate b (black, left axis) and the implied elasticity e (blue, right axis) to the degree of the counterfactual polynomial. Each point uses a polynomial of degree 3 through 8; capped lines show ± 1.96 bootstrap standard errors (N=500 draws). The baseline specification (dashed vertical line) uses a 4th-degree polynomial. *Sample:* The sample is a 25% random sample of individuals born 1937–1950 who were alive and had 5–80 QCs at age 70, drawn from SSA administrative records.

Figure A.8: Bunching and Elasticities at Age 70—
Sensitivity to Excluded Window Upper Bound



Notes: This figure presents the sensitivity of the age-70 bunching estimate b (black, left axis) and the implied elasticity e (blue, right axis) to the upper bound of the excluded region. Each point sets the upper bound q^U to a value from 44 to 56 QCs; for each q^U the lower bound q^L is re-selected to equate estimated excess and missing mass. Capped lines show ±1.96 bootstrap standard errors (N=500 draws). The baseline specification (dashed vertical line) uses $q^U = 50$. *Sample:* The sample is a 25% random sample of individuals born 1937–1950 who were alive and had 5–80 QCs at age 70, drawn from SSA administrative records.

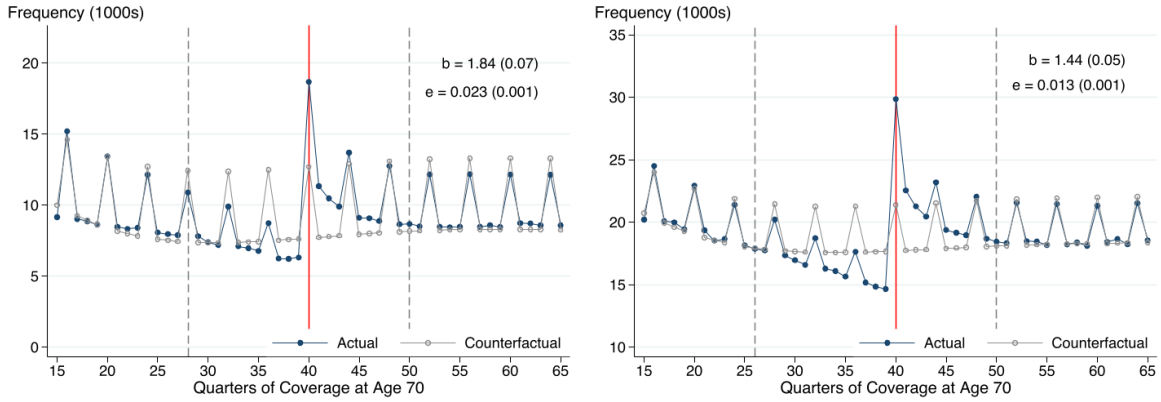
Figure A.9: Bunching and Elasticities at Age 70—
Sensitivity to Estimation Window



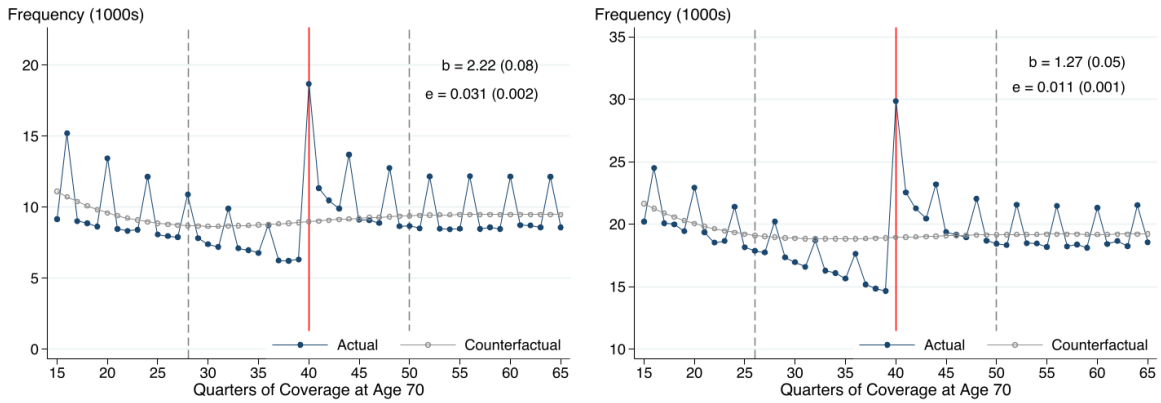
Notes: This figure presents the sensitivity of the age-70 bunching estimate b (black, left axis) and the implied elasticity e (blue, right axis) to the width of the QC distribution used to fit the counterfactual. Each point restricts the estimation sample to $[40 - w,\ 40 + w]$ for half-width w from 18 to 35 QCs (the lower bound q^L is re-selected within $[25, 39]$ for each w). Capped lines show ± 1.96 bootstrap standard errors (N=500 draws). The baseline specification uses nearly the full available range of QCs (5–80). *Sample:* The sample is a 25% random sample of individuals born 1937–1950 who were alive at age 70, drawn from SSA administrative records.

Figure A.10: Bunching and Elasticities at Age 70—
Sensitivity to Heaping Corrections

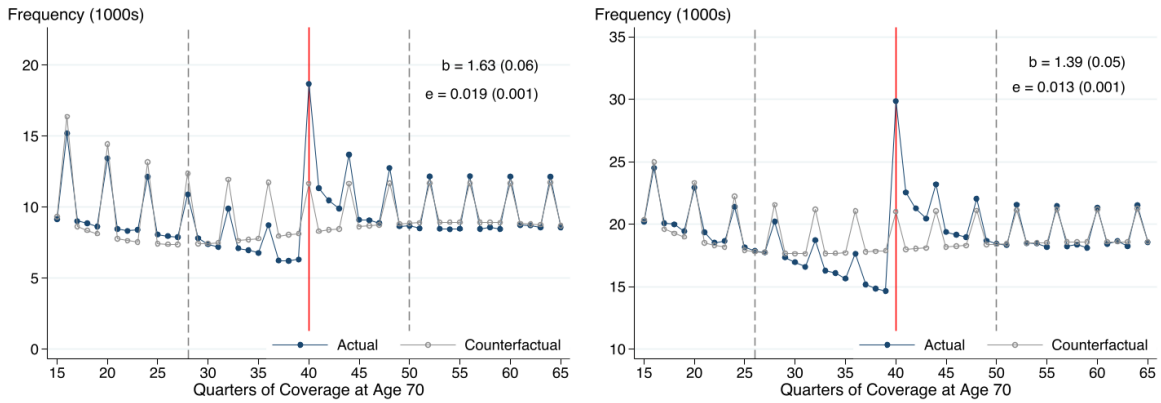
(a) Males (b) Females



(i) Controlling for Multiples of Four (Baseline)



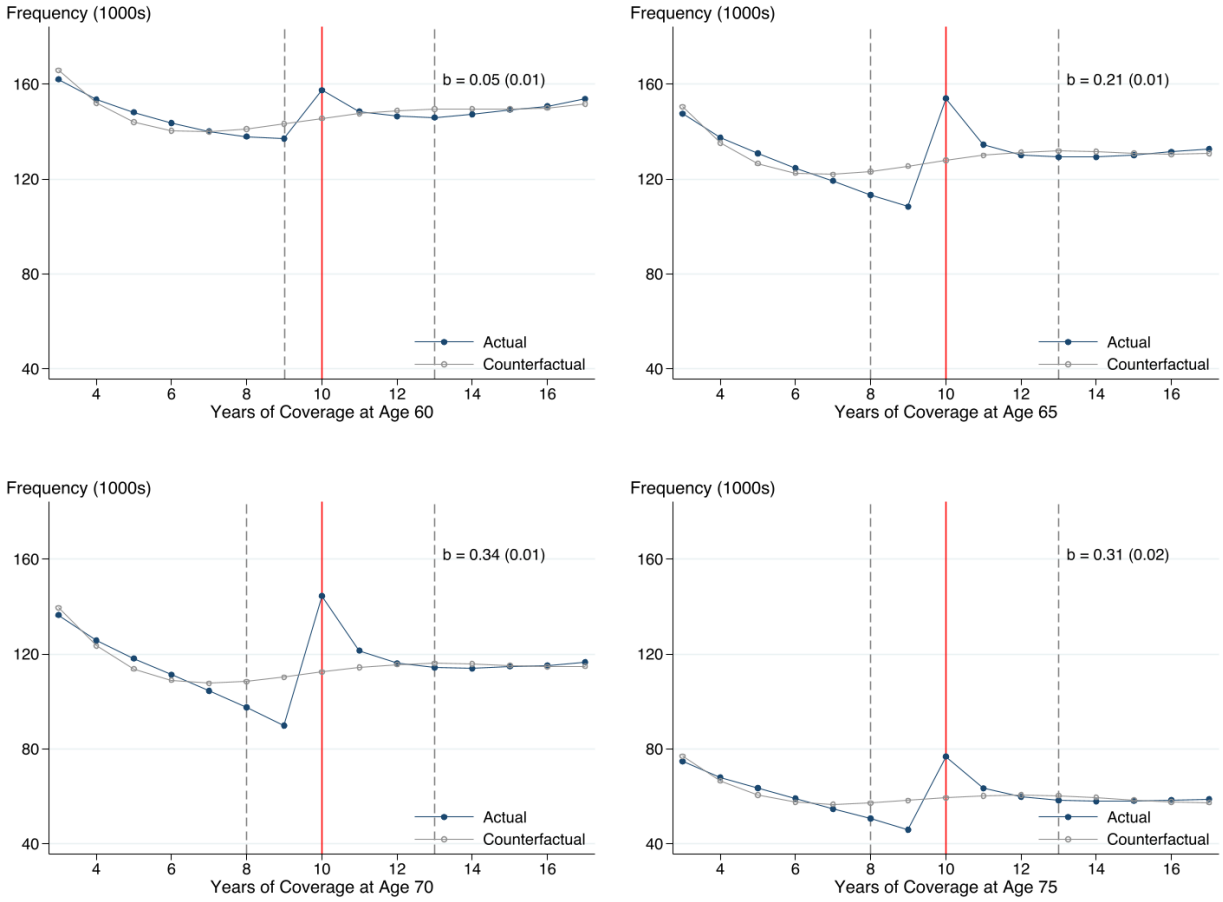
(ii) No Heaping Correction



(iii) Heaping Bonus Allowed to Vary Quadratically

Notes: This figure presents the age-70 bunching estimate under three corrections for the mechanical heaping at multiples of four, with men in the left column and women in the right. Variant A (baseline) includes a binary indicator for multiples of four, estimated from non-excluded bins. Variant B applies no heaping correction. Variant C allows the heaping bonus at multiples of four to vary quadratically with the QC level, estimated from non-excluded bins. The bunching estimate b and implied elasticity e are reported in the upper right of each panel; each panel is displayed over the QC 15–65 window for legibility, though the fit uses all QC bins above 4. *Sample:* The sample is a 25% random sample of individuals born 1937–1950 who were alive and had 5–80 QCs at age 70, drawn from SSA administrative records.

Figure A.11: Bunching Around Insured Status—
Sensitivity to Using Years of Coverage



Notes: This figure presents the bunching estimate using years of coverage—QCs coarsened into bins of four (the QC count divided by four and rounded down)—as the running variable and the 10-year insured-status requirement as the notch, at ages 60, 65, 70, and 75, in the same format and specification as the right panels of Figure 2. But because collapsing quarters into four-QC bins absorbs the multiple-of-four heaping, no heaping correction is applied. Both the polynomial fit and the excess-mass calculation use all years of coverage 1–19 at the corresponding age; each panel is displayed over the 3–17 year window for legibility. The bunching estimate b and its bootstrap standard error (N=500 draws) are reported in the upper right of each panel. *Sample:* The sample is a 25% random sample of individuals born 1937–1950, drawn from SSA administrative records, restricted in each panel to individuals alive and with 1–19 years of coverage at the corresponding age.

Table A.1: Summary Statistics by Measurement Age

	Age at which QCs are measured			
	Age 60	Age 65	Age 70	Age 75
Total quarters of coverage	38.1	37.3	36.6	35.3
Insured (≥40 QCs, %)	48.5	48.1	47.3	45.3
Female (%)	64.9	64.8	65.2	67.4
Pre-measurement earnings ($, 1000s)	203.4	197.0	191.7	182.8
Annual SS received ($)	—	5,116	4,846	—
Retirement	2,971	2,576	2,401	2,497
DI/Survivor	—	1,235	1,122	—
Spousal	—	1,305	1,324	—
Annual SSI received ($)	161	202	225	258
Individuals	3,232,857	2,876,871	2,600,232	1,389,140
Cells (observations)	2,240	2,240	2,240	1,440

Notes: This table presents summary statistics for the analysis sample at each measurement age (60, 65, 70, and 75)—the age at which quarters of coverage are counted. "Insured" is the share with 40 or more QCs. "Pre-measurement earnings" is cumulative earnings before the measurement age (thousands of 2020$). "Annual SS received" is total average annual Social Security benefits (retirement + DI/survivor + spousal). I do not have the DI/survivor and spousal components, or the total, at ages 60 and 75 (shown as "—"); the total row is therefore also left blank at those ages rather than reporting retirement benefits alone. The "Retirement" row, by contrast, is observed directly at all four ages—it is not a projected or annualized value. "Annual SSI received" is average annual Supplemental Security Income. All dollar amounts are in 2020 dollars. "Individuals" is the total number of sample members (sum of cell sizes) and "Cells" the number of sex × birth-cohort × QC cells. The data are collapsed to sex × birth-cohort × QC cells and all statistics are weighted by cell size. *Sample:* The sample is a 25% random sample of individuals born 1937–1950, drawn from SSA administrative records, with each column restricted to individuals alive and with 1–80 QCs at the corresponding measurement age.

Table A.2: Change in SS Benefits at Age 70 – Sensitivity to Including SSI

	Men		Women	
	Excl. SSI	Incl. SSI	Excl. SSI	Incl. SSI
Insured	1647.7***	1648.1***	2177.3***	2287.6***
	(158.2)	(160.8)	(110.4)	(81.8)
QCs × Insured	56.7***	40.9***	46.6***	40.0***
	(11.0)	(11.1)	(7.0)	(5.1)
Mean Y (QC 37–39)	2442.6	2841.5	4446.6	4635.8
Observations	714	714	714	714

Notes: This table presents a robustness check on the first-stage jump in total annual SS received at the 40 QC threshold at age 70, comparing dependent variables that exclude versus include SSI. "Excl. SSI" is total SS = retirement + DI/survivor + spousal and is identical to the "Total SS" column of Table 1; "Incl. SSI" adds average annual SSI received to the dependent variable. For all results I estimate equation (5) with birth-cohort fixed effects on birth-cohort × QC-bin cells weighted by cell size, and report $\hat{\beta}_1$ with standard errors clustered at the QC-bin level in parentheses. *Sample:* The sample is a 25% random sample of individuals born 1937–1950 who were alive and had 15–65 QCs at age 70, drawn from SSA administrative records. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.