Inflation's Fiscal Impact on American Households

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May 14, 2024

Abstract

The post-COVID price surge has reignited interest in inflation's impact on American households. Even if anticipated and with full market adjustments, inflation affects households through its interaction with the fiscal system, which is the focus of this paper. Inflation affects households through its interaction with the fiscal. We run the 2019 Survey of Consumer Finances (SCF), assuming different inflation rates, through the Fiscal Analyzer (TFA) – a life cycle, consumption-smoothing tool incorporating all major federal and state fiscal programs. Before doing so, we adjust the SCF data to neutralize inflation's non-fiscal effects. A permanent increase in the inflation rate from zero to 10 percent reduces median lifetime spending by 6.82 percent. This impact is smaller – 4.74 percent – when fiscal COLAs aren't lagged. But the big stories are the progressivity of inflation's increase in net taxation, its age pattern, and its heterogeneity. The 15.9 percent median lifetime spending loss of the top 1 percent from 10 percent inflation is roughly 2.5 times that of the bottom quintile. Middle aged households are hit far harder because they have more asset income, which, with inflation, is taxed at a higher effective rate. The 25th percentile of spending changes is a reduction of 9.84 percent. The 75th percentile change is still a reduction of 4.83 percent. The maximum spending decline (increase) across all households is 64.9 (46.7) percent. Thus, the distribution of welfare is highly sensitive to significant, ongoing inflation.

We thank Adrien Auclert, Deborah Lucas, Valerie Ramey, and other NBER 2024 Macro Annual Conference participants for valuable comments. We thank the Federal Reserve Bank of Atlanta, Boston University, the Goodman Institute, and Economic Security Planning, Inc. for research support. The authors are solely responsible for the paper's contents.

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1 Introduction

Understanding inflation's welfare costs is a long-standing question, interest in which is surely enhanced by the post-COVID surge in prices. This paper measures welfare in terms of households' levels of expected (over different survival paths) remaining lifetime spending. Inflation's impacts are, of course, financial as well as fiscal, where financial refers to transactions between private-sector entities and fiscal entails transactions between the private and government sectors. All else equal, inflation is zero-sum.[1] In this case, gains to net winners, present and future, are offset by losses to net losers, present and future. This zero-sum property, enforced by intertemporal budget constraints, holds whether the economy is static or dynamic or open or closed.[2]

Yet, even when inflation has no overall impact, tracing winners and losers from its financial impacts, e.g., changes in real wages or the real values of financial assets and liabilities, is a major challenge given available data.[3] In this paper, we look over the longer term when financial impacts may be less important, and limit our focus to inflation's fiscal impacts, which are more readily measured using household data and detailed information on government programs.[4] The U.S. fiscal system is far from inflation-neutral. Federal and state income taxation of nominal, not real asset income is a most important example. Another is the failure to index modified adjusted gross income thresholds beyond which Social Security benefits are subject to federal-income taxation and, in ten states, state-income taxation. A third is the choice not to index Medicare's Part-B top premium (IRMAA[5]) bracket. A fourth is the inability of corporations to deduct depreciation and inventory acquisition costs on an inflation-adjusted basis rather than at historic cost. Yet another is permitting corporations to deduct nominal rather than real interest.

There are also delays in the timing of the government's inflation adjustments. For instance, Social Security's annual Cost of Living Adjustment (COLA), which occurs on January 1st, is calculated based on inflation that arose as far back as 15 months. With ongoing inflation, Social Security recipients receive permanently lower real benefits as a result of this lag. For example, with only a one-year adjustment lag, a permanent increase in inflation from zero to 10 percent would reduce real benefits by the middle of the first year by 5 percent, and they would remain 5 percent lower, on average, forever. Inflation indexation of federal and state income-tax brackets is also lagged, albeit less severely. The same holds for federal and state benefit programs.

This paper uses the Fiscal Analyzer (TFA) to study inflation's fiscal impacts on the total expected (over potential survivor paths) remaining lifetime spending of respondents to the 2019 Survey of Consumer Finances (SCF). Each year's spending includes discretionary spending, bequests (when the household reaches a terminal state), housing expenses, and annual in-kind consumption of Medicare and Medicaid benefits. Total expected lifetime spending is the sum of the present values of these survivor-path-specific annual outlays multiplied by the path's probability plus the value of home equity.[6]

TFA is a life-cycle, consumption smoothing research tool that incorporates all major federal and state tax and transfer programs, including cash and in-kind programs.[7] It has been used to study inequality and fiscal progressivity (Auerbach et al. 2023), marginal lifetime net taxation

[1]This big if assumes no change in the course of government consumption and no change in economic incentives.

[2]see Kotlikoff (2002).

[3]For a recent analysis of the financial effects of recent inflation in Europe, see Pallotti et al. (2023).

[4]Note that we treat losses to government bond holders as financial impacts and hence exclude them from our definition of fiscal effects.

[5]Income-related monthly adjustment amount

[6]Home equity captures the present expected value of annual imputed rent on owned homes plus the present expected value of the terminal housing bequest less the current outstanding mortgage. The term expected is used for consistency since the present value of inputted rent plus the present value of the household's realized equity bequest is equal, for each survivor path, to the current value of home equity.

[7]TFA uses MaxiFi Planner's computation engine. MaxiFi Planner is an economics-based financial

(Altig et al. 2023), Social Security collection decisions (Altig et al. 2022), marriage taxation (Ilin et al. 2022), and the distribution, across states, of gains from the 2017 Tax Cuts and Jobs Act (Altig et al. 2020). We benchmark the SCF data to national aggregates and augment the survey with imputations of state residency, benefit-program participation, expected retirement age, survival probabilities, and real earnings growth. Our description of TFA, including our imputations, draws heavily and often verbatim from these studies.

TFA smooths consumption subject to borrowing constraints. To be precise, TFA smooths households' living standards, where living standard is defined as a household's discretionary spending divided by the number of household members with adjustments for economies of shared living and the relative cost of children. Smoothing, for purposes of this paper, refers to keeping the household's annual living standard constant without violating the household's annual cash-flow constraints.[8] The expected present value of remaining lifetime spending on housing plus spending arising from in-kind medical transfers are treated as non-discretionary.

Inflation's fiscal effects on the expected present value of spending – discretionary and non-discretionary – arise via two channels. The first is changes in real taxes and benefits given the tax and benefit programs the household faces. The second is changes in program eligibility. Our results capture both channels. To isolate inflation's fiscal-based effects that are not caused by financial factors, we modified all SCF observations to ensure that, absent fiscal policy, TFA's results are independent of inflation. Specifically, we fully inflation-index each household's future labor earnings, pensions, mortgage and other loan repayments, property taxes and other housing costs, real estate and other income, and retirement account benefits. This assumes that inflation is fully anticipated going forward and was fully anticipated at the time each household's financial contracts, such as their mortgages, were established. Hence, one may view our analysis as considering the long-term effects of inflation operating through the fiscal system once financial adjustments have occurred. We confirm TFA's inflation financial-neutrality by running TFA with all fiscal policies turned off and then verifying that, regardless of TFA's specified inflation rate, each sample household enjoys precisely the same lifetime as well as annual real spending, including real primary and vacation housing expenses[9] and in-kind real transfers of healthcare benefits.

Our study considers zero, five, and ten percent rates of inflation. We find, using our inflation-neutral data, that an immediate and permanent increase in inflation from zero to five percent reduces median household spending by 3.62 percent. The corresponding median reduction in moving from zero to ten percent permanent inflation is 6.82 percent. Absent lags in inflation adjustments, median expected household lifetime spending declines by 2.65 and 4.74 percent for five and ten percent inflation, respectively. Inflation, as we show, is a highly progressive form of net taxation. The average percentage lifetime spending decline when we switch to 10 percent inflation is roughly twice that for the top 1 percent as for those in the bottom quintile. Inflation also hits those in their middle ages particularly hard. This reflects the relative importance of assets in the remaining lifetime resources of this age group coupled with inflation's taxation of nominal, not real asset income.

The median losses from inflation are economically meaningful. But they mask enormous heterogenity, with some households benefiting dramatically and other losing dramatically from inflation's fiscal effects. Indeed, with 10 percent inflation, the 75th percentile spending change is -4.83 percent. The 25th percentile change is -9.84 percent. The maximum spending decline across all households is 64.9 percent and the maximum spending increase is 46.7 percent. As documented below, the 64.9 percent spending decline reflects the dramatic rise in the effective

planning tool developed by Economic Security Planning, Inc., Laurence Kotlikoff's software company.

[8]Note, TFA can smooth a household's living standard in accordance with any pre-specified age-living-standard profile.

[9]Housing expenses include mortgage payments, property taxes, insurance, maintenance, condo fees, rent, equity bequests and holding costs, i.e., imputed rent

tax rate on real asset income imposed on a household with very sizeable financial wealth, none of which is sheltered in municipal bonds. The huge, 46.7 percent gain from moving to 10 percent inflation reflects the household in question becoming eligible for Medicaid. Specifically, the decline in their real Social Security benefits due to the lag in Social Security's COLA lowers the household's income by enough to satisfy Medicaid's income test. In sum, even ignoring financial impacts, inflation is far from neutral. It represents a non-trivial and seemingly capricious net tax on American households. Moreover, inflation's net taxation is highly progresssive. The top 1 percent median declines are roughly twice as big, for both inflation experiments, as those for the bottom quintile.

Our paper proceeds as follows. Section 2 examines previous research on inflation's fiscal non-neutralities. Section 3 presents our life-cycle framework. Section 4 describes TFA's computation method and our means of verifying its accuracy. Section 5 describes our 2019 SCF data, imputations, and inflation adjustments to achieve financial neutrality. Section 6 presents results, including household-specific case studies that clarify the sources and magnitudes of inflation's fiscal impacts. Section 7 summarizes and concludes.

2 Inflation's Fiscal Impacts – Prior Studies

A limited number of prior studies seek to assess inflation's fiscal impacts. Most date to the Seventies when inflation was last a serious U.S. concern. None evaluated inflation's fiscal impacts on a comprehensive basis. Kelley et al. (1977) identified two key ways in which inflation raised real rates of taxation during this period. The first was nominal bracket creep combined with a decline in the real values of exemptions and credits. The second was the taxation of nominal, not real asset income. Federal personal income-tax brackets are now inflation-indexed, albeit with a lag. This is not the case for the two Social Security tax brackets beyond which first 50 percent and then 85 percent of benefits are subject to income taxation. These two brackets are fixed at their 1983 nominal values. The top IRMAA (Medicare Part B premium) bracket also isn't adjusted for inflation. And households and businesses are still taxed on nominal, not real interest income, and nominal, not real capital gains. In addition, inflation continues to raise businesses' real tax bills by reducing the real values of historic cost depreciation allowances and FIFO-based inventory deductions. On the other hand, businesses are able to deduct nominal rather than real interest payments. Feldstein et al. (1978), Feldstein and Summers (1979), and Auerbach (1981) are prominent studies exploring inflation-induced mis-measurement of real corporate capital income and its impact on real corporate net tax liabilities. Fischer and Modigliani (1978) consider a different issue, inflation's taxation of real money balances.

Our research goes well beyond previous studies in many respects, some previously mentioned. First, TFA incorporates, in close detail, the entire federal and state fiscal system. Second, TFA considers inflation's fiscal impact on lifetime spending, not just its impact on current-year net taxes. Third, we control for purely financial inflation-based changes in lifetime spending. Fourth, our welfare measure is the expected present value of remaining lifetime spending, where the expectation is over all household potential survival paths. In the case of married or partnered households, TFA calculates all relevant taxes and benefits for all survival paths, i.e., not just the path under which each spouse/partner lives to their maximum age of life. Fifth, expected lifetime spending incorporates bequests net of estate taxes due on those bequests.

Table 1 provides a compressed list of TFA's fiscal programs. The full list is far longer. The reason is that most benefit programs are state-specific. For example, there is not one, but 51 different Medicaid programs since each state, including the District of Columbia, has its own Medicaid provisions. The same is true of TANF, Food Stamps, and other benefit programs. Indeed, TFA incorporates the precise details of close to 1000 fiscal policies – some strictly federal, some strictly state, but most federal with state-specific provisions.

Table 1: List of Tax and Transfer Programs Included in TFA

Taxes	Personal Income Tax (federal and state) Corporate Income Tax (federal and state) Federal Insurance Contributions Act (FICA) Tax (federal) Sales Taxes (state) Medicare Part B Premiums (federal) Estate and Gift Tax (federal)
Transfer Programs	Earned Income Tax Credit (federal and state) Child Tax Credit (federal) Social Security Benefits (federal) Supplemental Security Income (SSI) (federal) Supplemental Nutritional Assistance Program (SNAP) (federal and state) Temporary Assistance for Needy Families (TANF) (federal and state) Medicaid (federal and state) Medicare (federal) The Affordable Care Act (ACA) (federal and state) Section 8 Housing Vouchers (state and county) Energy Assistance (state) Childcare Assistance (state and county)

Note: Section 8 Housing benefits and Childcare Assistance are also county-specific. ACA subsidies are also ZIP code specific. TFA lacks data on county or ZIP codes needed to calculate benefits based on county or ZIP code.

3 Our Remaining Lifetime Framework

Denote a potential survival path as i. Along path i, the intertemporal budget constraint is satisfied:

$$S_i = R_i - T_i, \tag{1}$$

where S_i is the realized present value of total remaining lifetime spending – the sum of discretionary and non-discretionary spending – along survival-path i. Non-discretionary spending includes housing costs, net taxes, repayment of loans, and other off-the-top expenses. It also includes government benefits provided on an in-kind basis, particularly Medicare and Medicaid benefits. And it includes involuntary bequests, net of estate taxes, arising when a household's last survivor dies prior to or upon reaching their maximum age of life. On the right hand side is the realized present value of lifetime net resources. Lifetime net resources is calculated as $R_i - T_i$, where R_i is path-$i's$ realized present value of remaining lifetime resources and T_i is path-$i's$ realized present value of net taxes, including estate taxes.

Note the following relationship:

$$R_i = W + H_i. \tag{2}$$

R_i is comprised of the household's current net wealth W (and so lacks subscript i), and survival path i's realized present value of future labor earnings, H_i. The expected lifetime present values of these variables is calculated for each household using survival probabilities:

$$S = \sum_i p_i S_i, \tag{3}$$

$$H = \sum_i p_i H_i, \tag{4}$$

$$T = \sum_i p_i T_i, \tag{5}$$

$$R = \sum_i p_i R_i, \tag{6}$$

where p_i is the probability the household experiences survival path i. The above equations imply:

$$R = W + H, \tag{7}$$

$$S = R - T, \tag{8}$$

4 The Fiscal Analyzer

TFA incorporates the tax and benefit programs listed in table 1 in smoothing households' living standards.[10] The relationship between a household's discretionary spending in year t, C_t, and its underlying living standard per effective adult, c_t, is given by

$$C_t = c_t(N + \lambda K)^\gamma, \tag{9}$$

where N is the number of adults in the household and K is the number of children. λ reflects how "expensive" children are relative to adults, while γ parameterizes economies of joint living. We set λ to 0.7, i.e., we assume that children are 70 percent as expensive as adults. We set γ to 0.642, which implies that 2 can live as cheaply as 1.6. TFA's default assumption is that households desire to perfectly smooth their living standards across time and survival states and do so subject to cash-flow non-negative life-insurance holdings (no annuitization) constraints. However, the program can run with any desired age-living standard profile, any age-specific child-adult equivalency factors, any degree of economies of shared living, and chosen maximum ages of life of household heads and spouses/partners. Household heads who aren't single needn't have the same maximum lifespan as their spouse/partner. Here we set maximum longevity at 100 for heads, spouses, and partners.

Our 2019 SCF data provide the TFA with values for marital status, birth dates of spouses, partners, and children, current-year labor earnings, regular and retirement account holdings (both tax-deductible and Roth accounts), regular asset holdings, contributions to retirement accounts, defined benefit pensions, housing expenses, real estate holdings, and household debts. We supplement these data with an assumed pre-all-tax nominal rate of return, an assumed inflation rate, imputed state residency, imputed future labor earnings, imputed participation in benefit programs, imputed retirement dates, imputed Social Security retirement-benefit collection dates, and imputed retirement-account withdrawal start dates. Our imputations are detailed below.

4.1 TFA's Solution Method

TFA uses dynamic programming to smooth each household's living standard per equivalent adult (c_t), subject to borrowing constraints. The program simultaneously calculates not only the household's smoothest living standard path if both the household head and spouse/partner live to their maximum ages of life, but also the household's year-specific demands for life insurance (and, thus, the life insurance premiums it will pay each year) to ensure that survivors have at least the same living standard as would otherwise have been the case.[11] The program also determines each of the household's above-referenced taxes and transfer payments along each of its potential survivor paths.

[10] Detailed TFA documentation is available at .

[11] TFA generates positive life insurance holdings only for years when the insured's death would leave survivors with a lower living standard than were the household head and, if not single, their spouse/partner to live to their maximum ages.

The problem TFA solves is computationally challenging for four reasons. First, there are tens of thousands of survivor-path-specific state variables. These are the levels of regular as well as spouse/partner-specific tax-deferred and Roth retirement accounts. Take, for example, a 40 year-old couple that could live to age 100. They have over 200,000 survivor contingent regular and retirement account state variables. Second, taxes, transfer payments, discretionary spending, and life insurance holdings must be determined for all years of all survivor paths. Third, spending, insurance amounts, and net taxes on any survivor path are interdependent. Indeed, they are also interdependent across paths. Hence, one needs a simultaneous equations solution. Fourth, the program needs to run in finite time.

TFA forms its calculations using three dynamic programs. One program does consumption smoothing subject to borrowing constraints. A second dynamic program calculates annual household taxes and benefits for all programs listed in table 1. The third dynamic program calculates the life insurance, subject to a non-negativity constraint, needed to maintain the household's living standard if survivors live to their maximum ages of life. A key byproduct of TFA's life insurance algorithm is determining the lifetime spending and net taxes of households along each survivor path. The programs run sequentially with each transmitting its results to the other two. Processing continues until the three programs precisely converge to mutually consistent solutions. Dynamic programming of intertemporal consumption choice based on kinked functions that arise from borrowing constraints introduces interpolation error that compounds as one programs backwards in time. To ensure precision to many decimal places, TFA utilizes a sparse grid method between iterations.[12]

4.2 Confirming TFA's Results

The accuracy of TFA's algorithm is easy to check. There are eight ways to confirm that TFA's calculations are correct. First, the present value of lifetime discretionary spending (including terminal bequests) equals, to the dollar, human plus non-human wealth less the present value of fixed spending less the present value of net taxes (including estate taxes). Second, the household's living standard, measured in today's dollars, is constant through time unless the household faces cash-flow constraints or TFA is told to adjust discretionary spending through time to match a specified age-living standard profile. For example, we could specify a 1 percent annual decline starting at 75.

Third, the household's difference in regular assets between years t and t+1 equals its saving in year t, i.e., flows and stocks are mutually consistent. Fourth, terminal regular assets are zero apart from specified desired bequests, equity bequests, reserve funds, and funeral expenses. Fifth, regular assets are zero in the year before the household's borrowing constraint is relieved. Sixth, non-negative life insurance amounts are, to the dollar, what survivors need to maintain their living standard through their maximum ages of life. Seventh, lifetime budget balance holds to the dollar for all survivor outcomes. Eighth, all tax and benefit amounts are correctly calculated.[13]

[12] TFA is not open source due to its reliance on ESP's MaxiFi Planner computation engine. However, the tool is available for use by academics upon request. To date, more than a dozen economists (two foreign) in academe and the Federal Reserve have used TFA for research, including modifying its source code as needed.

[13] TFA's Social Security benefit calculations are checked against the Agency's benefit calculators when such comparisons are feasible. TFA's federal and state income taxes, FICA taxes, and IRMAA values are determined by strictly following federal tax forms. MaxiFi Planner's thousands of users continually check these calculations. As for non-Social Security benefits, TFA's calculations are crossed checked with independently coded measurements produced by the Federal Reserve Bank of Atlanta in its Cliff career-choice tool.

4.2.1 Testing for Financial Neutrality Absent the Fiscal System

As stated, we adjust SCF inputs to ensure financial inflation neutrality. This entails inflation indexing all receipts, including wages, self-employment earnings, and asset income, as well as all off-the-top outlays, including mortgage payments, alimony, property taxes, loan repayments, etc. We test financial system inflation neutrality by a) setting all TFA-generated taxes and benefits to zero whether they are calculated for the base trajectory (household heads and spouses live to their maximum ages of life) or survivor trajectories, b) running TFA assuming alternative paths of inflation, and c) verifying that the present-value of lifetime discretionary spending as well as all survivor-contingent discretionary spending paths remain unchanged.

5 Benchmarking, Imputations, and Adjustments

The SCF is a cross-section survey conducted every three years. The survey over-samples wealthy households in the process of collecting data from, in the case of the 2019 Survey, 5,777 households.[14] These data include detailed information on household labor and asset income, assets and liabilities, and demographic characteristics.[15]

Running TFA requires additional information not provided by the SCF. First, it needs state identifiers to calculate state-specific taxes and transfer payments. The public-use SCF release does not provide state identifiers, so we allocate SCF households to different states based on the 2016 American Community Survey (ACS).[16] Second, TFA requires future earnings to calculate resources along survival paths and past and future covered earnings to calculate Social Security benefits. Here, we use Current Population Survey (CPS) data to backcast and forecast each SCF respondent's past and future earnings through retirement.

Third, not all SCF respondents answer questions about retirement, and those that do appear to be too optimistic. Therefore, following Altig et al. (2023), we use the 2019 ACS to impute age- and demographic-specific retirement hazards. Fourth, the SCF provides limited information about welfare program take-up. We use the TFA to directly calculate eligibility and combine SCF data with data from the Annual Social and Economic Supplement (ASEC) to the CPS to infer household- and program-specific take-up. Finally, TFA requires a measure of the pre-tax rate of return on national wealth for our savings and lifetime wealth calculations. The following subsections detail our benchmarking process and methods for these four imputations.

[14] The SCF combines an area-probability sample of households with a "list" sample of generally wealthier households from administrative tax records gleaned from the Internal Revenue Service (IRS). The SCF includes sampling weights to account for oversampling of wealthier households from inclusion of the "list" sample and for differential response rates among wealthier groups. Wealthier households have lower response rates, particularly at the highest levels. See Bricker et al. (2016). The oversampling of wealthy households allows for inference about households in the top 1 percent of the resource distribution. For the 2004 SCF, Kennickell (2007) shows that 15.8 percent of sampled households were in the top 1 percent of the net worth distribution for the U.S. with 96.4 percent of these coming from the list sample. Another 38.5 percent of the 2004 SCF-sampled households were in the bottom 50 percent of the net worth distribution with only 5.7 percent of these households coming from the list sample.

[15] Using a multiple imputation algorithm, the Fed includes each household's record in the public-use SCF data set in five so-called replicates to account for estimation of non-reported values (item non-response) or for disclosure limitations. We use the first replicate for our analysis. Auerbach et al. (2017, 2023) report no significant differences in results across replicates.

[16] Although the non public-use SCF data set includes state identifiers, its household weights are national i.e., not state-specific. This data set is, therefore, of no value for our purposes of appropriately allocating SCF households by state.

5.1 Benchmarking the 2019 SCF to National Aggregates

SCF household-weighted totals of various economic and fiscal aggregates differ from their direct counterparts in the National Income and Product Account (NIPA) and Federal Reserve Financial Accounts (FA). To assure concordance, we follow the approach outlined in Appendix A and B in Dettling et al. (2015), which benchmarks the 2016 SCF based on "conceptually equivalent" values. Specifically, we set SCF benchmark factors to ensure that SCF-weighted aggregates coincide with conceptually comparable NIPA and FA aggregates. We used FA2018 Q4 aggregates for wages, self-employment income, and assets. Benchmarking assets and net worth reported in the SCF requires several adjustments to the FA values. Using the approach outlined in Dettling et al. (2015), our first asset adjustment is to reduce SCF-reported home market value by 7.3 percent to match the 2018 Q4 FA measure. Second, we increase the SCF-reported equity in non-corporate businesses by 33.3 percent to match the 2019 Q3 FA estimate. Third, we increase reported retirement account assets by 11.3 percent to match the total reported in the FA for 2018 Q4. Table 2 details aggregate values, their sources, and our benchmark adjustments. We inflate all SCF-reported wage income by 22.3 percent to match the NIPA 2018 measure of employee compensation, and deflate all SCF-reported self-employment income by 28.4 percent to match the NIPA 2018 proprietorship and partnership income total.[17]

Table 2: SCF Benchmarking Adjustments and Targets[18]

	SCF Unadjusted	Benchmarking Coefficient	SCF Adjusted	Target	% Diff
Wages	7,382	1.22	9,027	9,027	0.0
Self Employment Income	2,237	0.72	1,601	1,601	0.0
Market Val. of Homes	28,048	0.93	25,992	25,877	0.4
Non Corp. Business Equity	9,795	1.33	13,055	13,055	0.0
Regular Assets	50,904	0.69	35,373	35,374	0.0
Retirement Accounts	14,307	1.11	15,923	15,824	0.6

5.2 Imputing State Residency

We impute state residency based on a statistical match to the ACS. Having done so, we calculate the distribution across states of ACS households with specific cell characteristics used in the match. Next, we assign each SCF household to each of the 51 states, including Washington D.C., in appropriate proportion such that the sum of each household's state-specific weights equals its original SCF weight. To be precise, we partition households into distinct cells based on the household head's age, race/ethnicity, marital status, educational attainment, as well as home ownership status, total household income in 2018, and the number of children in the household under 17 years of age.[19] For households in a given cell, we create the household's weight for each state by multiplying their SCF sample weight by the weighted fraction of the cell's households in the 2019 ACS that reside in that state. Thus, the sum of all state weights for each state will equal the population of that state. We then run TFA 51 times, once for each state plus D.C., incorporating, in the process, each state's specific tax and transfer policies.

[17] The fact that we need to inflate wage income and significantly deflate self-employment income to match national aggregates may reflect, in part, a tendency of SCF respondents to report wage earnings as self-employment income.

[18] All values are presented in billions of 2018 U.S. dollars.

[19] We generate age groups in 10-year intervals. The 10-19 age group is combined with the 20-29 group, and the 90-99 group with the 80-89 group. We bin race/ethnicity groups to white or non-white, and education to three bins: high school diploma or less, some college, and college diploma. Income groups are designated using total income quintiles. The number of under-17 children is top coded at 3.

Note that the categorization of rich and poor by resources is done at the national level. For example, California has a higher weighted fraction of its households (17.1 percent) in the top 10 percent of lifetime resources than does Mississippi (4.5 percent) and has significantly more residents. Thus, resource-rich households in the U.S. are much more likely to be located in California than in Mississippi (18.2 percent of the top decile of households are in California versus 0.4 percent in Mississippi).

5.3 Earnings Imputations

To impute annual labor earnings, we first group CPS observations by age, sex, and education. Next, we estimate annual earnings growth rates by age and year for individuals in each sex and education cell. These cell growth rates are used to backcast and forecast each individual's earnings history. Past and future cell growth rates ignore earnings heterogeneity within cells. To deal with such heterogeneity, we assume that observed individual deviations in earnings from cell means are partially permanent and partially transitory, based on an underlying earnings process in which the permanent component (relative to group-trend growth) evolves as a random walk and the transitory component is serially uncorrelated. We also assume that such within-cell heterogeneity begins in the first year of labor force participation.

In particular, suppose that, at each age, for group i, earnings for each individual j evolve (relative to the change in the average for the group) according to a shock that includes a permanent component, p, and an i.i.d. temporary component, e. Then, at age a (normalized so that age 0 is the first year of labor force participation), the within-group variance will be $\alpha\sigma_p^2 + \sigma_e^2$. Hence, our estimate of the fraction of the observed deviation of individual earnings from group earnings, $(y_{i,j}^a - \bar{y}_i^a\ )$, that is permanent, is $a\sigma_p^2/(a\sigma_p^2 + \sigma_e^2)$. This share grows with age, as permanent shocks accumulate. Using this estimate, we form the permanent component of current earnings for individual j, $\hat{y}_{i,j}^a$,

$$\hat{y}_{i,j}^a = \bar{y}_i^a + (a\sigma_p^2/(a\sigma_p^2 + \sigma_e^2))(y_{i,j}^a - \bar{y}_i^a) = (a\sigma_p^2/(a\sigma_p^2 + \sigma_e^2))y_{i,j}^a + (\sigma_e^2/(a\sigma_p^2 + \sigma_e^2))\bar{y}_i^a \qquad (10)$$

and assume that future earnings grow at the group average growth rate. Further, we make the simplifying assumption that permanent and temporary earnings shocks have the same variance. In so doing, we follow (Meghir and Pistaferri 2011; Moffitt and Gottschalk 1995). Then, (11) reduces to:

$$\hat{y}_{i,j}^a = (a/(a+1))y_{i,j}^a + (1/(a+1))\bar{y}_i^a \qquad (11)$$

For backcasting, we assume that earnings for individual j were at the group mean at age 0 (i.e., the year of labor force entry), and diverged smoothly from this group mean over time, so that the individual's estimated earnings t years prior to the current age a are

$$\bar{y}_i^{(a-t)} + ((a-t)/a)(\hat{y}_{i,j}^a - \bar{y}_i^a)(\bar{y}_i^{(a-t)}/\bar{y}_i^a) = (t/a)\bar{y}_i^{(a-t)} + ((a-t)/a)\hat{y}_{i,j}^a(\bar{y}_i^{(a-t)}/\bar{y}_i^a) \qquad (12)$$

That is, for each age we use a weighted average of the estimate of current permanent earnings, deflated by general wage growth for group i, and the estimated age-a, group-i mean also deflated by general wage growth for group i, with the weights converging linearly so that as we go back we weight the group mean more and more heavily, with a weight of 1 at the initial age, which we assume is age 20.

5.4 Imputing Retirement Hazards with American Community Survey Data

As discussed in Altig et al. (2022), SCF respondents are asked about their expected ages of retirement. Not all respond and those that do appear to be overly optimistic.[20] This squares with the tendency of workers in general to overestimate how long they will work (Center for a Secure Retirement 2019). As an alternative, we use the 2000 through 2020 waves of the ACS to impute retirement age based on two questions in the survey. The ACS asks respondents the number of weeks that they worked last year and the number of hours they are currently working in a typical week. We define a person as having "retired" when that person worked more than 26 weeks in the previous year and works less than 21 hours a week this year.[21] We segregate ACS working respondents by year of birth, age, gender, marital status, and education, assuming no retirement prior to age 50. This lets us calculate, for each cohort and combination of cell attributes, sample retirement probabilities over the twenty ACS surveys.

We smooth these values and use the resultant smoothed function to determine retirement probabilities. For cohorts retiring after 2020, we linearly project retirement hazards at each age based on 2000-2020 trends through 2040, and assume constant hazards thereafter. These cohort- and characteristics-specific retirement hazards are used to randomly assign retirement ages for each SCF respondent under age 80. We assume that all households retire at 80 if they haven't yet been probabilistically retired.[22] We also assume that collection of Social Security retirement benefits begins immediately upon retirement.

The predicted age-specific fraction of ACS respondents working after 55 increases over time. The drivers here include higher educational achievement among successive cohorts and a rise in the fraction of working women. Consequently, within each cohort we project some, but rather limited, increases in retirement ages through 2040, with married 50 year-old men with four-year college degrees or more retiring at an average age of 65.9, approximately 0.6 years later than their 2020 counterparts. Figure 1 plots our cohort-specific smoothed retirement hazard functions – the likelihood of working "full time" (more than half time) at different ages – for alternative birth cohorts. Two things are immediately clear. First, regardless of year of birth, the probability of working "full time" declines dramatically starting at age 50. Second, recent cohorts are more likely to work after age 60, but the differences are small and decrease with age.

Table 3 shows projected average retirement ages for workers age 50 in 2020 and 2040. Results are broken down by marital status and education. First, predicted average retirement ages are only slightly higher for future than for current age-50 workers. Second, single females with college educations are projected to "retire" roughly two years later, on average, than those with a high-school diploma or less. Third, for males, education makes little difference in average "retirement" ages holding fixed marital status. Fourth, married males "retire," on average, roughly two years later than single males across all levels of education. Fifth, males "retire" later than females with the difference in average ages declining from roughly four years to roughly two years as one moves from lower to higher levels of education.

[20] Among 45 to 62 year-old 2019 SCF male respondents, the average age of expected full retirement is 70.3 years old, calculated using sample weights. For females, the weighted self-reported full retirement age is 68.9 years old. In 2018, the Social Security administration (2019) reported an average retirement benefit claiming age of 64.8 among men and 64.7 among women.

[21] We include 20 hours as retired because many ACS respondents report exactly 20 hours. These respondents are likely earning less than Social Security' Earnings Test threshold and hence are likely taking Social Security retirement benefits.

[22] Summaries of average retirement ages and conditional probabilities of working at age 65 and 70 for 50 year-old workers in 2020 are provided in tables 3 and 4.

Figure 1: Fraction of Respondents Working More than 20 Hours Per Week, ACS 2000-2020

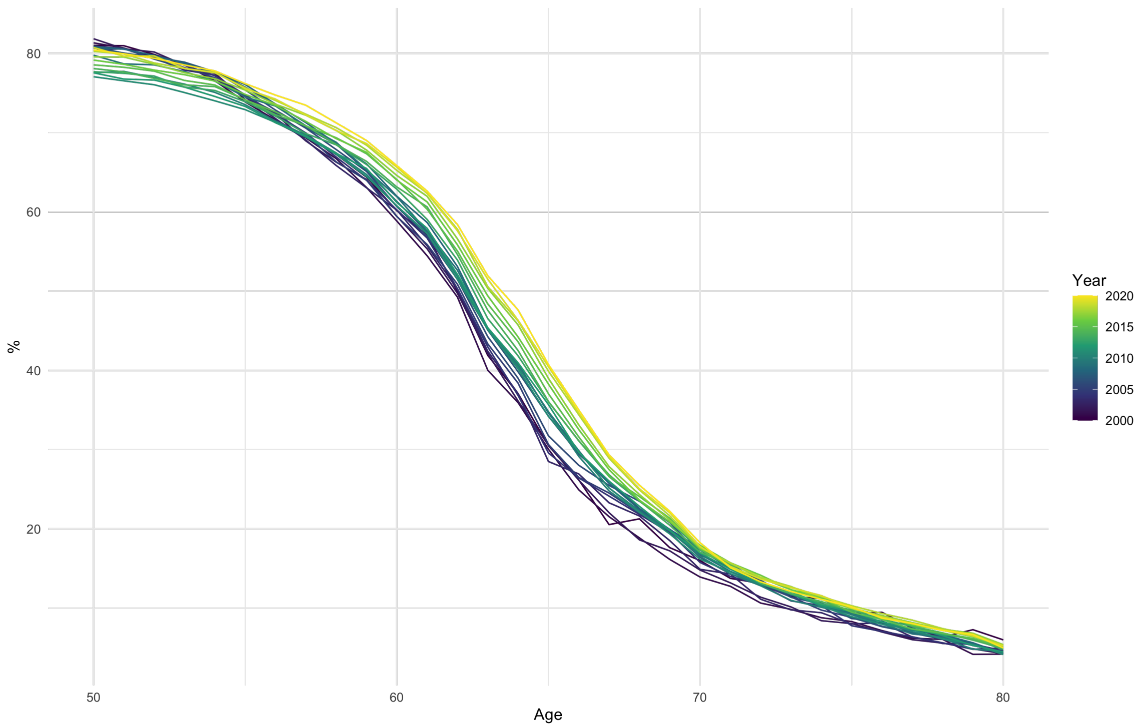


Table 3: Projected Average Retirement Age

Marital Status	Education	Age 50 Workers in 2020 Male	Age 50 Workers in 2020 Female	Age 50 Workers in 2040 Male	Age 50 Workers in 2040 Female
Single	High School or Less	63.0	59.4	63.1	59.0
	Some College	62.9	61.0	62.7	60.8
	4 yr. College or More	63.2	61.5	63.3	61.7
Married	High School or Less	64.9	58.1	65.4	58.4
	Some College	64.9	58.5	65.1	58.9
	4 yr. College or More	65.3	58.3	65.9	58.5

Table 4 reports the probability of working "full time" at ages 65 and 70 for 50 year-old workers in 2020. The table is quite revealing. First, holding education and marital status fixed, the chances of working "full time" are substantially higher at age 65 than at age 70. Take, for example, married males with some college education. Their chances of being "fully employed" are 56.0 percent at age 65 and 25.1 percent at age 70. Second, females are substantially less likely than males to work "full time." Third, married males are more likely to keep working "full time" than single males. And fourth, education significantly raises the likelihood of single, but not of married females working "full time."

Table 4: Probability of Working More than 20 Hours, Age 50 Workers in 2020

		Prob. of working more than 20 hours at age 65		Prob. of working more than 20 hours at age 70	
Marital Status	Education	Male	Female	Male	Female
Single	High School or Less	44.2	24.5	20.0	6.9
	Some College	43.2	34.0	17.3	11.0
	4 yr. College or More	45.3	35.9	18.4	10.5
Married	High School or Less	56.5	17.9	26.6	3.9
	Some College	56.0	20.3	25.1	4.7
	4 yr. College or More	58.6	18.9	26.5	3.9

5.5 Adjusting for Take-Up Rates of Benefit Programs

As is well known, not all households file for all, or indeed any of the welfare benefits for which they are eligible (Moffitt (1983),Chien 2015; Giannarelli 2019). We make a variety of adjustments, imputations, and assumptions to assign take-up of each benefit to eligible SCF respondents. The adjustments include benchmarking each program's take-up rate to accord with the program's national take-up rate as reported by relevant government agencies. These are summarized in table 5. Our analysis relies, in part, on benefit-participation data reported in the Annual Social and Economic Supplement (ASEC) to the CPS. The ASEC includes participation data for the following programs whose participation is not fully recorded by the SCF: SNAP, Section 8 Housing, the Affordable Care Act, the EITC, Adult and Child Medicaid, and the Child Tax Credit.

As for the SCF, it records household Medicaid participation, although it does not report whether participants are children, adults, or both. The SCF also indicates if the household is receiving benefits from one or more of TANF, Food Stamps, SSI, or other programs. However, it does not report the exact program, and the total amount is often unreported. The ASEC is also problematic for inferring take-up. It generally under-reports participation rates relative to official figures. For example, in the ASEC 40.0 percent of eligible households participate in SNAP while the official take-up rate is 67.6 percent. Hence, using the ASEC to predict SNAP take-up among SCF respondents requires first benchmarking SNAP participation in the ASEC to the official figure.

We do so by assigning participation to a set of ASEC respondents who did not report participating in SNAP. The set of reassigned respondents was determined based on a logit regression relating reported SNAP participation in the ASEC against respondent characteristics. The reassigned respondents are those non-SNAP participants with highest predicted SNAP participation probabilities. Thus, if we need X more ASEC respondents to participate in SNAP to equate the ASEC SNAP participation rate with the national rate, we reassign the top X ASEC non-participants, where "top" references participation probability ranking.

Next we estimate a second ASEC logit model using covariates that are common to the ASEC and SCF, specifically marital status, household size, income, education, and the amount they would receive if participating. Then, we assign SNAP program participation to SCF households based on their regression-based ranking of predicted program participation. The cutoff for SCF SNAP participation is set to achieve the national rate. We follow this procedure for benchmarking each of the other benefits whose participation is solicited in the ASEC.

We also impute take-up in the SCF for several programs not included in the ASEC. In the case of SSI and Energy Assistance, we assume full take-up by eligible SCF households. As for Childcare Defense Fund (CCDF), we randomly assign participation to eligible SCF households. For the remaining programs, we take the following approach. We know if a household is receiving benefits from either SNAP, TANF or SSI, but we do not have information on the specific pro-

Table 5: Estimated Participation and Take Up of Public Assistance Programs

	Number of Participating Individuals ('000)	Number of Eligible Individuals ('000)	Take-Up Rate (%)
SNAP	40,776	60,334	67.6
Housing Choice Voucher	5,249	46,559	11.3
Medicaid for Adults*	18,040	24,096	79.9
Medicaid for Children/CHIP**	35,953	38,370	93.7
ACA Subsidy	9,593	112,942	8.5
EITC	N/A	N/A	78.1
CTC	48,962	58,081	84.3
TANF	1,213	4,869	24.9
CCDF Childcare Subsidy	2,099	8,417	24.9

* Excluding dual Medicaid-Medicare enrollees and non-elderly adults with disabilities
** Excluding children with special needs care
Sources: Number of eligible individuals for each program are computed using the Policy Rules Database (Ilin and Terry (2021)) applied to the 2019 ASEC. SNAP enrollment numbers are from SNAP Data Tables, Food and Nutrition Service, U.S. Department of Agriculture. Section 8 Housing Voucher enrollment data is from 2019 Picture of Subsidized Households, United States Department of Housing and Urban Development. Enrollment in Medicaid and CHIP is from Open Data, Center for Medicare and Medicaid Services; ACA Premium Subsidy enrollment is from 2019 Marketplace Open Enrollment Period Public Use Files, Center for Medicare and Medicaid Services. Estimates of the EITC take up is taken directly from the Internal Revenue Services. Number of tax returns with CTC is from Estimates of Federal Tax Expenditures for Fiscal Year 2019-2023, Joint Committee on Taxation. Data on the number of participating and eligible units for TANF is taken from Giannarelli (2019). Data on the number of participating and eligible units for CCDF is taken from Chien (2019).

gram(s) from which the benefits are received. If an SCF household (1) reports receiving benefits from any of the three programs, (2) is not eligible for SSI, and (3) is eligible for SNAP, we assume that they are receiving SNAP benefits only, as very few households receive TANF. This produces close to 30 percent participation. We impute the remainder using the logit regression approach outlined above. Child Medicaid has a very high participation rate – 93.7 percent. If an SCF household reports receiving Medicaid is eligible for Child Medicaid and has children younger than 18, we assume they participate in Child Medicaid. If they report receiving Medicaid, are childless, and are eligible for Adult Medicaid, we assume they participate in Adult Medicaid. As for adults otherwise unassigned to Adult Medicaid, but who are eligible, we use our logit-based assignment method. Finally, we randomly assign TANF to those who are eligible to reach our benchmark for the program. Table 6 summarizes the results of our imputation for the programs for which we have aggregate participation rates. As shown, the procedure matches weighted participation rates for SCF respondents to within 0.2 percentage points of estimated national take-up rates.

Table 6: Summary Statistics for Welfare Program Participation Imputation

	Total Eligible	Total Assigned	Unweighted Participation Rate (%)	Weighted Participation Rate (%)	Take-up Rate Target	Difference
SNAP	905	631	69.7	67.7	67.6	0.1
Section 8	646	72	11.1	11.3	11.3	0.0
Medicaid Adult	706	579	82.0	80.1	79.9	0.2
Medicaid Child	420	392	93.3	93.8	93.7	0.1
ACA	1657	126	15.4	8.6	8.5	0.1
EITC	572	459	80.2	78.1	78.1	0.1
CTC	1351	1062	78.6	84.3	84.3	0.0
TANF	74	19	25.7	24.9	24.9	0.0
CCDF	338	85	25.1	25.1	24.9	0.2

5.6 Survival-Path Probabilities

As discussed in Auerbach et al. (2023), our survival-path probabilities are constructed from underlying mortality rates estimated by the Committee on the Long-Run Macroeconomic Effects of the Aging US Population (2015). This study sorts Health and Retirement Study (HRS) respondents between 1992 and 2010 by average wage-indexed earnings between ages 40 and 50. For married or partnered couples, average indexed earnings are divided by the square root of 2 prior to sorting. This is a rough adjustment for economies in shared living. It then estimates post age-50 mortality rates as functions of age and sex. We follow the same procedure, except we sort SCF respondents based on average wage-indexed earnings from age 25 through age 60.

5.7 Real Rate of Return

A key component of our calculations involving saving and wealth is the before-tax rate of return on household saving. Following the method detailed in Auerbach et al. (2023), we use the average return on national wealth for the period 1948-2015 based on data from the NIPA accounts and the Federal Reserve's Flow of Funds data. The real return rate in a given year is a fraction whose numerator is national income less labor income, defined as the sum of wages and salaries and the income earned by proprietors and partnerships attributable to labor.[23] The denominator is aggregate wealth of the household sector plus financial wealth (negative if a net liability) of federal, state and local government sectors. The resulting average real before-tax rate of return of 6.371 percent is used in all our TFA runs.

5.8 Inflation Indexation

Not all elements of the U.S. fiscal system are indexed for inflation, and those that are adjusted experience different delays and are based on different inflation measures. Where available, 2018 values of fiscal-system components are taken as published. There are nuances to each part of the fiscal system for indexing beyond 2018, however. In describing the indexation in detail, the specified inflation rate (0%, 5%, or 10%) in simulated years is referred to as $X\%$.

Federal income tax brackets in 2018 equal the official values in that year. 2019 federal income tax brackets are calculated by growing the 2018 brackets by one third times the inflation rate in 2019 ($X\%$) plus two thirds times the Chained Consumer Price Index for All Urban Consumers (C-CPI-U) from the data in 2018.[24] 2020 brackets cannot be calculated using $X\%$ and the 2019 C-CPI-U from the data, however. This is because given that the TFA takes the most recent year of data to be 2018, then, any values of the C-CPI-U from 2019 and onwards do not exist, from the point of view of the TFA. Instead, 2020 brackets are calculated as the 2019 brackets grown by one third times the inflation rate in 2020 ($X\%$) plus two thirds times an imputed C-CPI-U rate for 2019. The imputed C-CPI-U rate for 2019 is calculated by extending the C-CPI-U from 2018 (from the data) by $X\%$, subtracting off a factor, and converting this number to a rate. The factor is constructed such that it maintains the historical difference that has been present between the C-CPI-U and the Consumer Price Index for All Urban Consumers (CPI-U).[25] Tax brackets for $t \geq 2021$ are calculated in the same way: by extending $t-1$ tax brackets by one

[23]We assume that labor's share of proprietorship and partnership income equals the economy's overall labor share.

[24]The IRS began indexing federal income tax brackets by the C-CPI-U starting in 2018 with the implementation of the Tax Cuts and Jobs Act (TCJA).

[25]The factor is the average difference of geometric means of the C-CPI-U and CPI-U in years of data they have in common. Subtracting this factor in calculating the imputed C-CPI-U maintains the historical difference between the C-CPI-U and the CPI-U; the C-CPI-U moves in a lower trajectory than the CPI-U.

third times $X\%$ plus two thirds times the imputed C-CPI-U rate for $t-1$. These mechanisms capture indexing lags.

State income-tax brackets for 2018 are also taken as published. Starting in 2019, these brackets are adjusted in the same manner as the federal tax brackets – based on $X\%$ inflation and the same composition of lags. The only difference is that the CPI-U is used in all calculations instead of the C-CPI-U and the subtraction of the factor mentioned in the previous paragraph is unnecessary. The Federal Insurance Contributions Act (FICA) cap and property taxes grow by the specified inflation rate of $X\%$ starting in 2019 with no lag applied.

Indexing Social Security benefits is more complex. These benefits are adjusted using COLAs calculated based on changes to the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W). Published COLAs from the Social Security Administration are used prior to 2018 to determine benefits. Benefits in subsequent years are based on a sequence of imputed CPI-W numbers. To determine this sequence, the following procedure is followed. Calculate the 2018 imputed CPI-W as the 2017 CPI-W from the data, extended by three quarters times the inflation rate in 2017 (the CPI-U in 2017 from the data) plus one quarter times the inflation rate in 2016 (the CPI-U in 2016 from the data). The 2019 imputed CPI-W is calculated by extending the 2018 imputed CPI-W by three quarters times the inflation rate in 2018 ($X\%$) plus one quarter times the inflation rate in 2017 (the CPI-U in 2017 from the data). Iterating this formula forward, the 2020 imputed CPI-W is equal to the 2019 imputed CPI-W, grown by this lagged sum of inflation rates from 2019 and 2018, which are both $X\%$. Thus, from 2020 onwards, the imputed CPI-W is equal to the prior year's imputed CPI-W, extended by $X\%$. Now, given this sequence of imputed CPI-W's, the differences between each of these numbers forms the annual COLA adjustment used to determine Social Security benefits.

Medicare Part-B brackets are taken as published from 2018 data. Since the top bracket (which determines if the household must pay IRMAA) does not adjust with inflation, the associated income threshold is fixed at \$500,000 and $\$750,000$ for single and joint married filers, respectively. The lower brackets are equal to the 2018 brackets, extended each year by the corresponding year-value in the imputed CPI-W series described above. Therefore, all Medicare Part-B brackets except the top one grow by $X\%$ each year starting in 2020.

Finally, Medicare and Medicaid benefits are indexed. Since these amounts are typically only available for one year, which may not be 2018, the 2018 value is imputed where applicable. This indexing is done using CPI-U data. From 2019 onwards, $X\%$ is used to index benefits. Thus, these benefits are indexed in perfect synchronization with inflation. All other federal and state benefits are also imputed to the 2018 value where applicable by the CPI-U. Starting in 2019, they are extended by $X\%$.

5.8.1 Timely Adjustment

We also consider timely adjustment of those tax and benefit provisions that are subject to inflation indexation. The difference between our timely indexing and baseline results indicates how much of inflation's fiscal impacts reflect lagged adjustments. The TFA is a discrete-time model. Time-t labor earnings, spending (discretionary and non-discretionary, including in-kind government transfers from Medicare and Medicaid), taxes, benefits, and receipt of asset and other income all occur at the end of period t concomitant with the time-t increase in prices. Hence, timely indexing simply entails adjusting, at the end of time t, all time-t fiscal values, such as tax bracket thresholds, that are inflation-indexed.

5.9 Incorporating Inflation's Fiscal Effects on Asset Income

In addition to imperfect or lagged indexation of brackets, thresholds, and ceilings in tax and benefit programs, the other major channel through which inflation changes the real values of net tax burdens is via its various impacts on capital income tax bases, at both the individual and business levels. The key components at the individual level are the taxation of nominal interest income and capital gains. At the business level, firms' taxable income is overstated by the use of historical cost deductions for depreciation and inventories, and understated by the deductiblity of nominal interest payments. We incorporate each of these effects in the manner described by the following subsections.

5.9.1 Nominal Interest Income

We assume that the nominal interest rate obeys Fisher's Law. Since our inflation experiments hold the real return fixed, the nominal interest rate adjusts according to the standard formula.[26] Since all TFA tax calculations are done in nominal returns before being deflated into current end-of-year dollars, the TFA automatically taxes inflation-induced higher nominal asset income. This, of course, raises the effective taxation of real asset income.

5.9.2 Nominal Capital Gains

We assume that inflation has no impact on firm dividend yields, consistent with our assumption that there are no purely financial effects of inflation. Thus, the inflation-induced increase in nominal equity income that individuals receive takes the form of capital gains. We assume that these additional gains are taxed at the same effective rate as real gains, i.e., that individuals realize inflation-induced gains following the same pattern as underlying real gains over time. The TFA is designed to defer the realization of capital gains until they are needed to limit or fully mitigate cash-flow constraints. The program includes settings for the share of regular assets invested in municipal bonds, the share of non-muni regular asset income received in the form of dividends and realized capital gains, the share of non-muni regular asset income received in the form of realizations of unrealized long-term capital gains, and the share of non-muni regular asset income received in the form of interest and other ordinary asset income. The TFA also inputs amounts of unrealized capital gains or losses.

5.9.3 Business-Level Inflation Effects

For both corporate and non-corporate businesses, the effects of inflation on tax liabilities translate into changes in net taxes at the individual level, whether through the ownership of corporate equity (directly, through mutual funds, or through retirement accounts) or direct business ownership (in the case of pass-through entities, including partnerships, sole proprietorships, and S corporations). There are two main channels through which inflation alters taxable business income. First, depreciation deductions and, for firms using FIFO inventory accounting, the costs of goods sold, are measured based on historical cost, which generally understates costs and overstates income when there is inflation. Second, as the taxes on interest received and tax deductions for interest paid are based on nominal interest, i.e., including the inflation premium, increases in the inflation premium reduce the tax base of a business to the extent that it is a net debtor.

In Appendix A, we detail our calculation of inflation-induced adjustments to income for the corporate and non-corporate sectors as well as how these adjustments are integrated into our analysis. For the corporate sector, we find that, relative to a 0 percent rate of inflation, a 5

[26] I.e., one plus the nominal rate equals one plus the inflation rate times one plus the real rate.

percent rate of inflation increases the tax base by 0.16 percent of equity. For the non-corporate sector, we find a *drop* of 0.66 percent of equity for the same experiment. The effects for a 10 percent rate of inflation are simply twice as large. The difference in sign is attributable to both the capital consumption adjustment (CCA) and inventory valuation adjustment (IVA) being higher (as a share of equity) in the corporate sector and the net interest-bearing debt as a share of corporate equity being lower.[27]

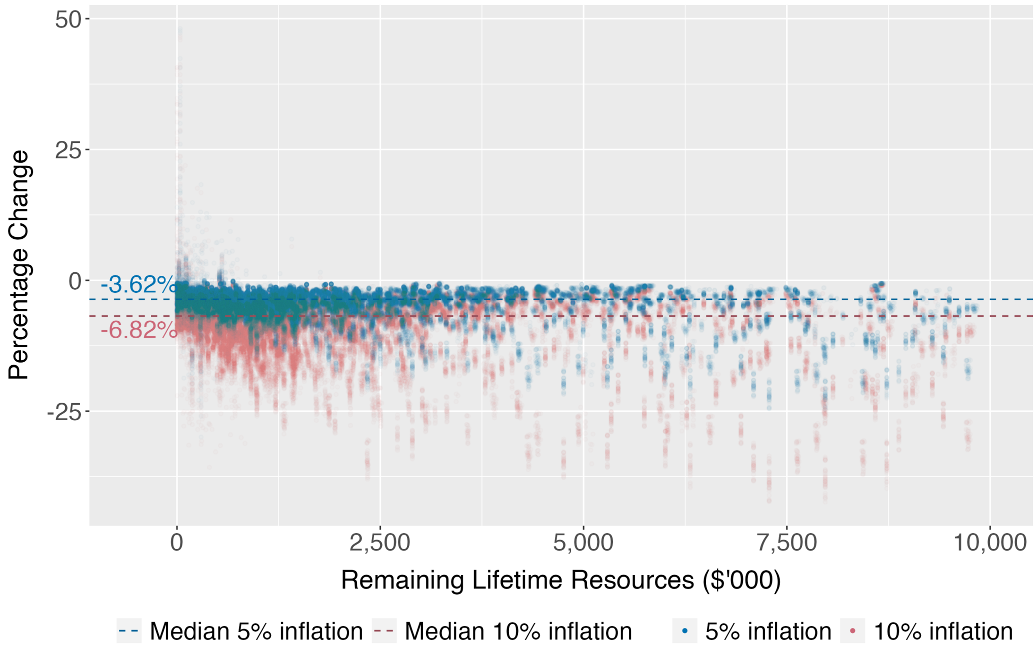
6 Results

Section 6.1 presents results from TFA using our inflation-neutral data. Section 6.2 shows alternate results assuming the fiscal system is adjusted on a timely manner for inflation and compares results with those based on actual lagged adjustments. Section 6.3 presents case studies that decompose extreme changes to lifetime spending resulting from inflation's fiscal impact.

6.1 Baseline Results

Figure 2 plots, for given levels of lifetime resources, the percentage change in lifetime spending from 5 percent and 10 percent permanent inflation. The 5 and 10 percent weighted-median changes are -3.62 and -6.82 percent, respectively. Hence, typical households are almost twice as worse off when inflation is 10 percent rather than 5 percent.

Figure 2: Percentage Change in Remaining Lifetime Spending, Ages 20 - 79



Virtually all households are hurt by inflation. But richer households typically face larger percentage losses thanks to their higher share of asset income relative to labor income. Figures 3 and 4 show median and mean percentage changes in lifetime spending. The top 1 percent median values are nearly 2.5 times as big, for both inflation experiments, as those for the bottom

[27]The impact of inflation on the taxation of business income lowers median lifetime spending by an additional 0.73 percent for an increase from 0 to 5 percent inflation and an additional 1.13 percent when inflation rises from 0 to 10 percent.

quintile. The top 1 percent's 5 and 10 percent inflation spending losses are 8.5 percent and 15.9 percent, respectively. Under 5 percent inflation, the other quintiles face losses between 3 and 6 percent. Under 10 percent inflation, their losses are between 6 and 12 percent. As for mean impact, in the 10 percent inflation case the mean loss for the richest 1 percent of households is remarkably large – over 18 percent. This is over 2.5 times the corresponding mean lifetime spending decline among those in the lowest quintile. The fact that the ratio of means to medians rises with resources indicates that inflation's fiscal impacts are greater for the rich.

Figure 3: Median Percentage Change in Remaining Lifetime Spending by Resource Quintile, Ages 20 - 79

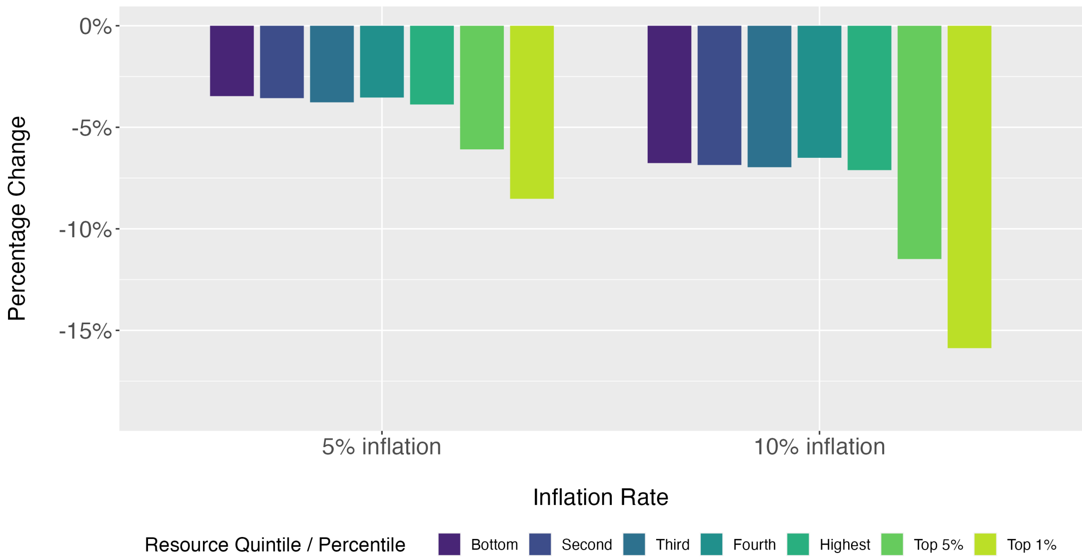


Figure 4: Average Percentage Change in Remaining Lifetime Spending by Resource Quintile, Ages 20 - 79

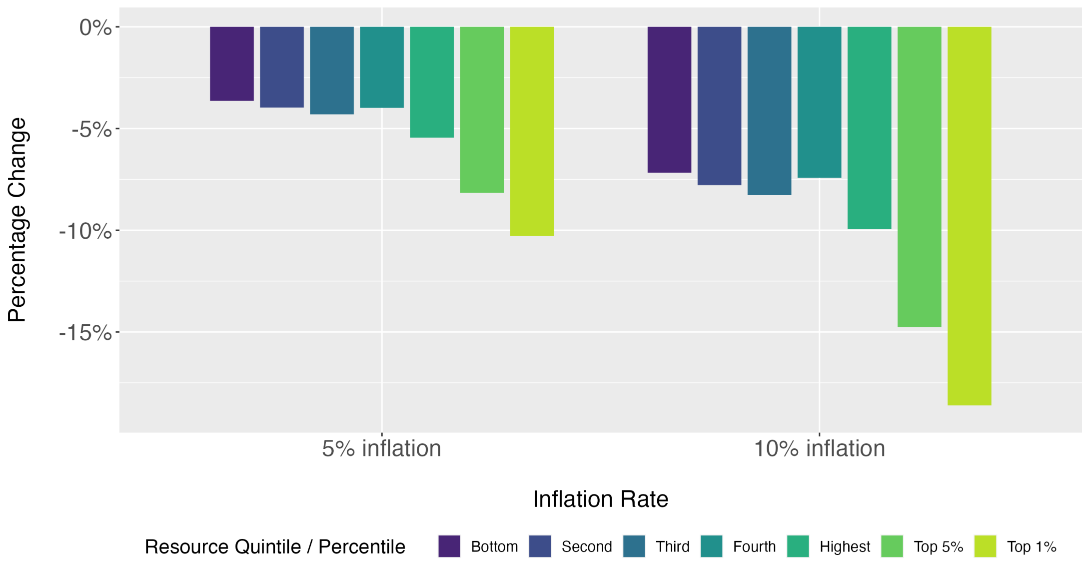
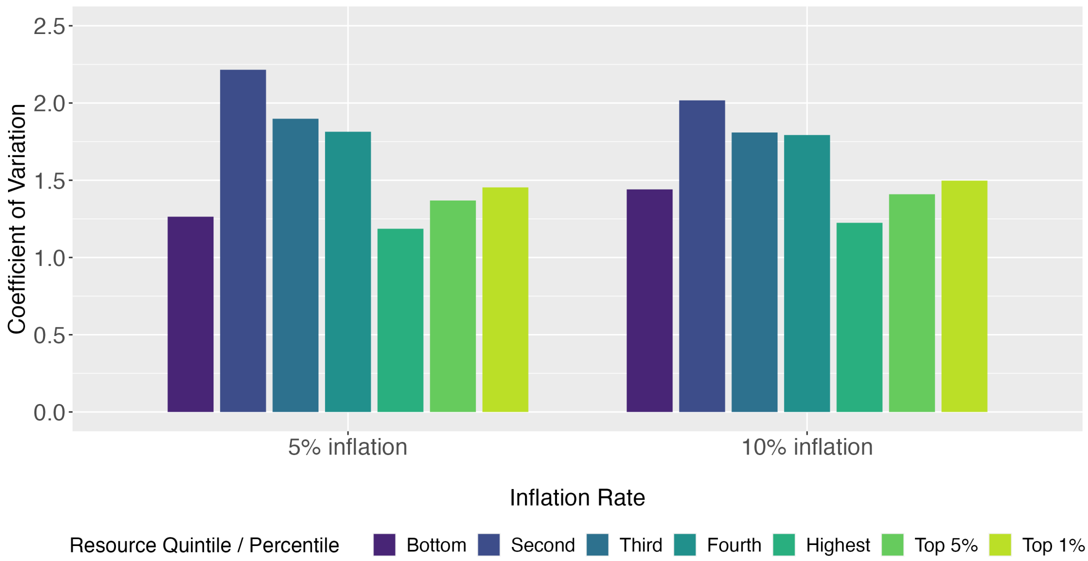


Figure 2's most remarkable feature may be the dispersion of impacts. As detailed in figure 5, coefficients of variation are substantial for all resource groups. For the second, third, and fourth quintiles, they exceed 1.75. For the 10 percent inflation case, the impact on certain households exceeds 30 percent. On the other hand, a small fraction of low-resource households experience higher lifetime spending when inflation is either 5 or 10 percent. Section 6.3 explores the underlying dynamics of such cases in detail.

Figure 5: Coefficients of Variation, Lifetime Spending by Resource Quintile, Ages 20 - 79



Figures 6 and 7 decompose figure 2 at the age-cohort level, revealing significant cross-cohort variation. The age 50-59 cohort is hurt most by inflation. This is expected since a larger share of the resources of this cohort comprises financial assets. The reverse is true for young workers in the 20-29 cohort with their lower savings limiting the impact of inflation.

Figure 6: Median Percentage Change in Remaining Lifetime Spending by Age Cohort

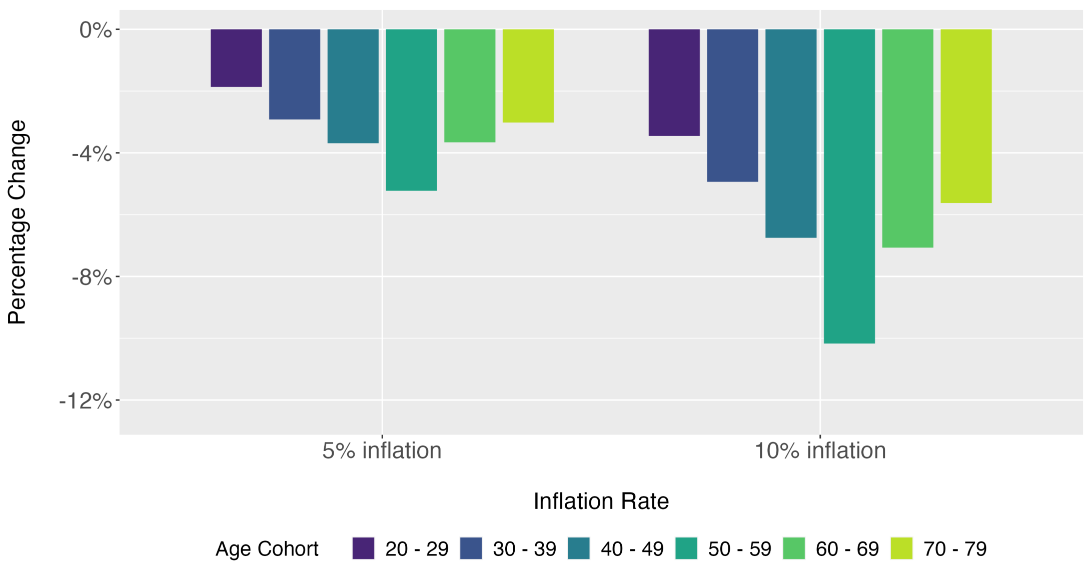
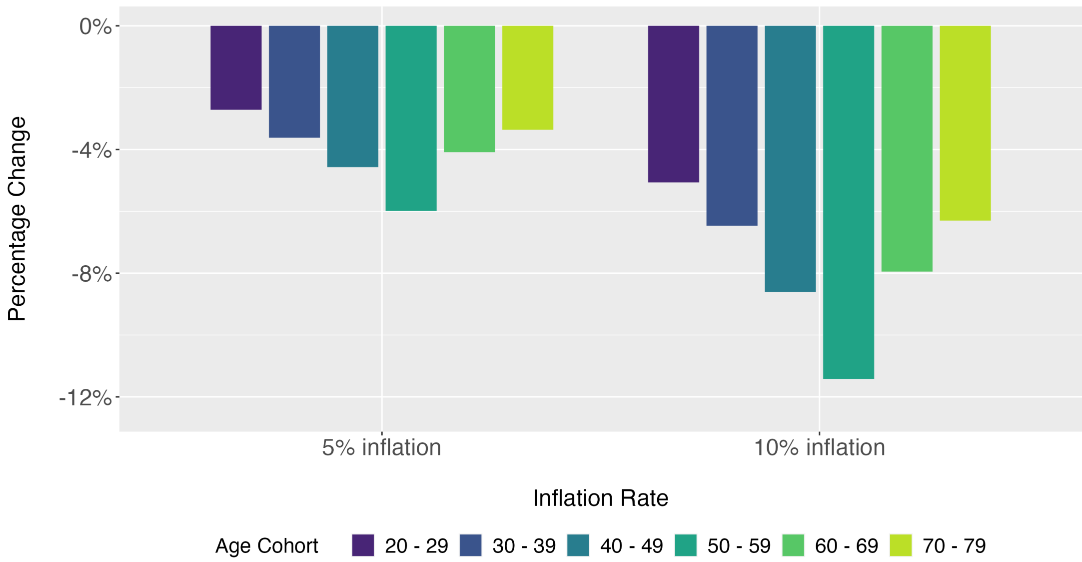


Figure 7: Average Percentage Change in Remaining Lifetime Spending by Age Cohort

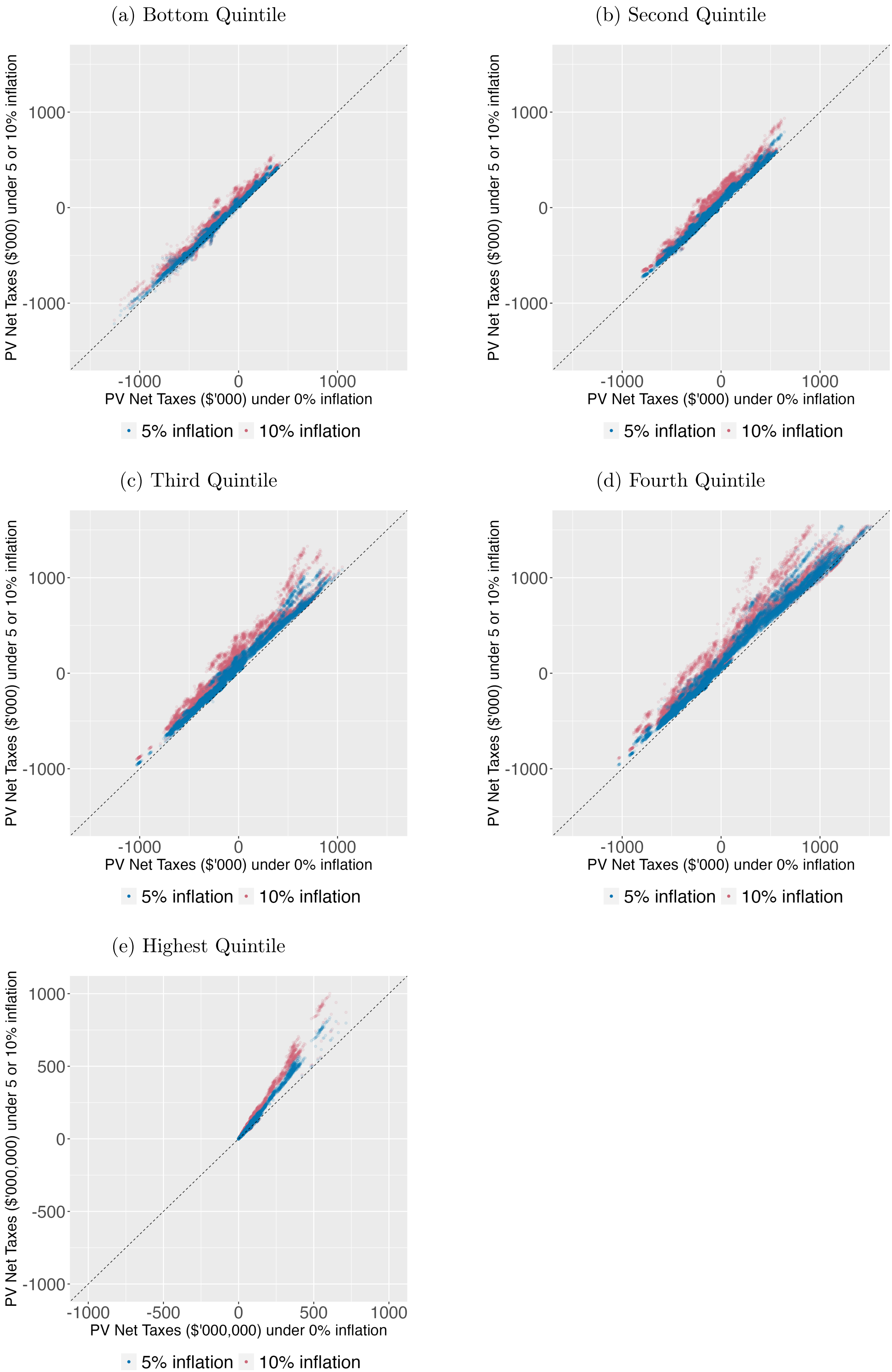


Appendix B shows the average decomposition of lifetime spending by resource quintile. Several common patterns arise. Federal and state income taxes go up and benefits decline.[28] Consequently, average net taxes increase with inflation. For households in the third quintile, average net taxes increase to the extent that households in this group change from being owed money by the government to owing money to the government on net. Households, particularly those in the top quintile, also experience a decline in sales taxes as a result of reductions to cash expenditures.

Figure 8 shows inflation's impact on lifetime net taxes. There is considerable heterogeneity in the net tax response of bottom-quintile households. Households below the 45-degree line correspond to households that have lower net taxes in the face of inflation. The number of households below the line decreases with lifetime resource: for those in the highest quintile, almost all households are subject to higher net taxes. What is driving this heterogeneity? Inflation increases lifetime federal and state income taxes for nearly every household. Yet it does so to a larger degree for rich households. This is the message of figures 14a and 15a.

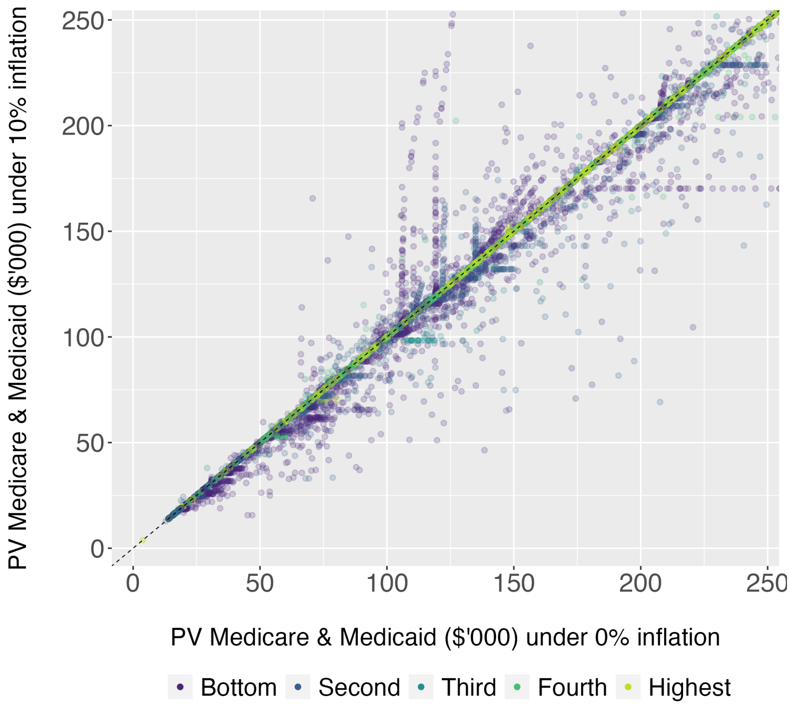
[28]The decline in Social Security benefits, which comprise a non-trivial component of households' spending budget, is especially important.

Figure 8: Net Taxes by Resource Quintile, Ages 20 - 79



Finally, while not a component of net taxes, in-kind benefits (Medicare and Medicaid) adjust very differently across resource quintiles in the face of inflation. This is a key driver of total spending. From figure 9, it is clear that lower resource quintiles see the most variation in changes to Medicare and Medicaid benefits. Higher resource quintiles see relatively little change being mostly located along the 45 degree line.[29] Detailed explanations of why these benefits change, for select households, are presented in section 6.3.

Figure 9: In-kind Benefits by Resource Quintile, Ages 20 - 79



6.2 Timely Indexing

Figure 10 is otherwise identical to figure 2, but with timely indexing. As expected, inflation is more benign, yet the difference is moderate. The median change in lifetime spending is −2.65 percent under 5 percent inflation and is -4.74 percent under 10 percent inflation. These values are not dramatically different from the -3.62 percent and -6.82 percent baseline results. Patterns across resources groups are also very similar. As with the results in section 6.1, there is considerable variation in lifetime spending response by age cohort, shown in figures 11 and 12. Age cohort 50 - 59 is, similarly, the most affected, as measured by both weighted-median changes and weighted-average changes.

[29]This figure excludes households above the top 95th percentile of in-kind benefits for ease of viewing.

Figure 10: Percentage Change in Remaining Lifetime Spending with Timely Adjustment by Lifetime Resources, Ages 20 - 79

Figure 11: Median Percentage Change in Remaining Lifetime Spending with Timely Adjustment by Age Cohort

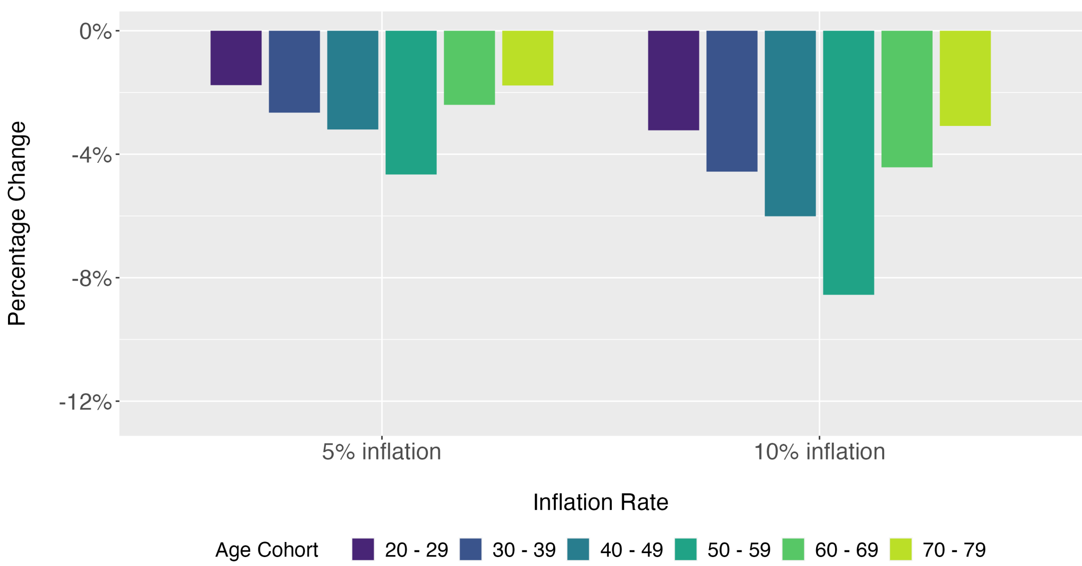


Figure 12: Average Percentage Change in Remaining Lifetime Spending with Timely Adjustment by Age Cohort

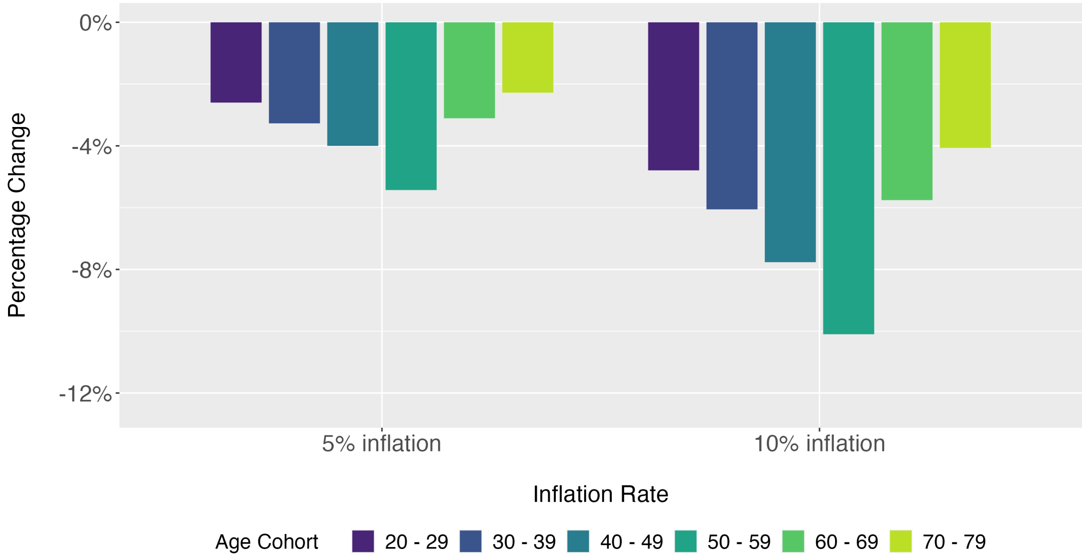


Figure 13 decomposes figure 10 by household positions in the lifetime-resource distribution. Clearly, as measured by median percentage decline, households in the highest quintile of the resource distribution suffer most. The results for mean changes and for coefficients of variation in Appendix C also show patterns similar to those in our baseline analysis.

Figure 13: Median Percentage Change in Remaining Lifetime Spending with Timely Adjustment by Resource Quintile, Ages 20 - 79

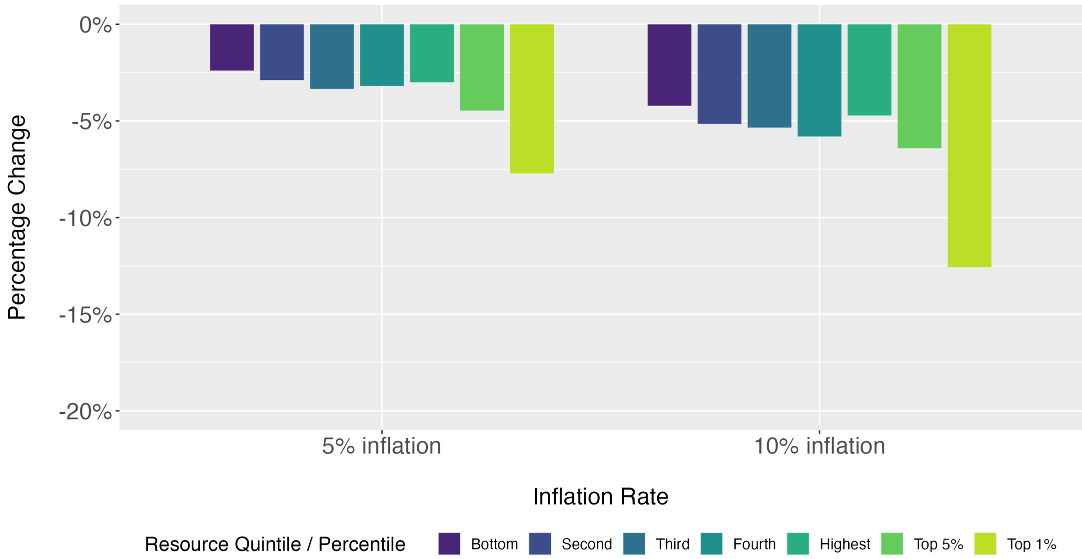
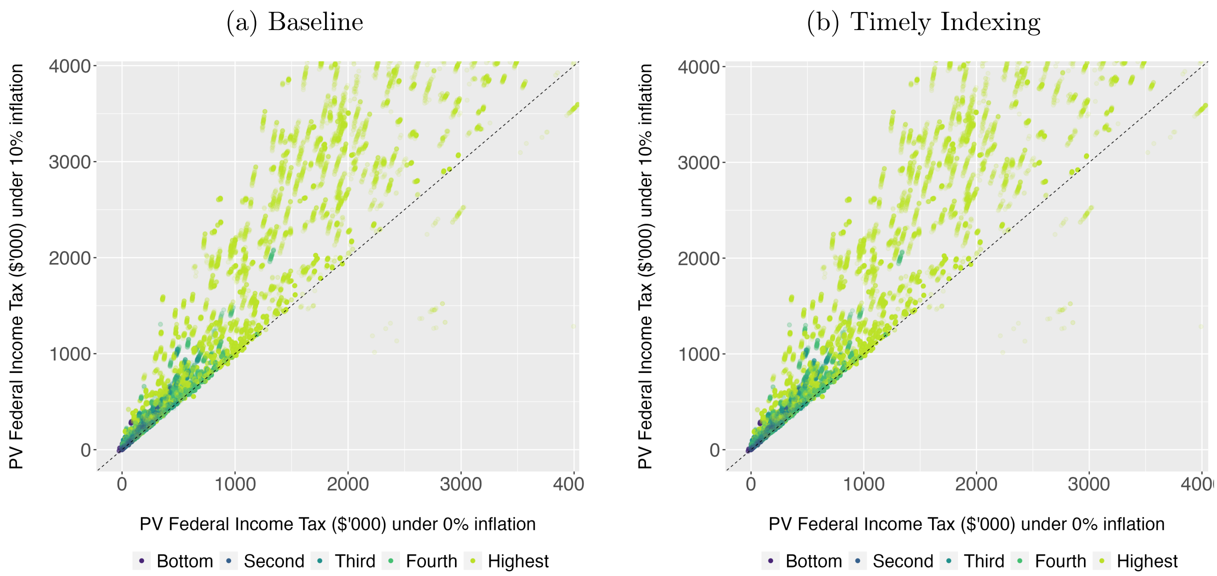


Figure 3 in Appendix C shows changes to lifetime net taxes by resource quintile. The patterns are similar to those in figure 8. As expected, the removal of lags dampens the effects of inflation. Compared to the baseline case, however, the absence of lags in indexing the fiscal system makes little difference to the distribution of spending impact across age cohorts and resource quintiles.

Inflation's fiscal effect on spending can be seen by comparing key components of the fiscal system with and without timely indexing. Figure 14 compares the distribution of federal income taxes across baseline and timely indexing cases in the presence of 10% inflation. The 45 degree line is plotted to emphasize that federal income taxes almost uniformly increase when households face inflation. Figure 15 repeats the exercise for state income taxes.[30] From these two figures, there are no pronounced differences on the distribution of the inflation shock. Finally, figure 16 compares Social Security benefits. Again, there are no major differences in the distribution of benefit changes across quintiles, however, the effects of the COLA lags on Social Security benefits are visible. Social Security benefits for nearly all households decline in the presence of inflation, but more so in the baseline case.

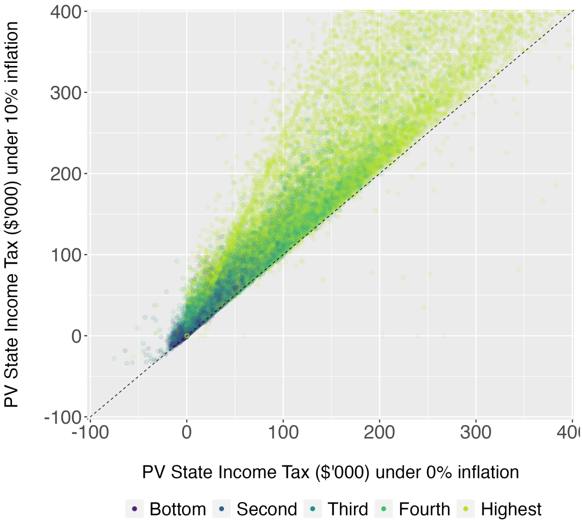
Figure 14: Federal Income Tax by Resource Quintile, Ages 20 - 79



[30]Both of these figures exclude households above the top 75th percentile in respective income taxes for ease of viewing.

Figure 15: State Income Tax by Resource Quintile, Ages 20 - 79

(a) Baseline



(b) Timely Indexing

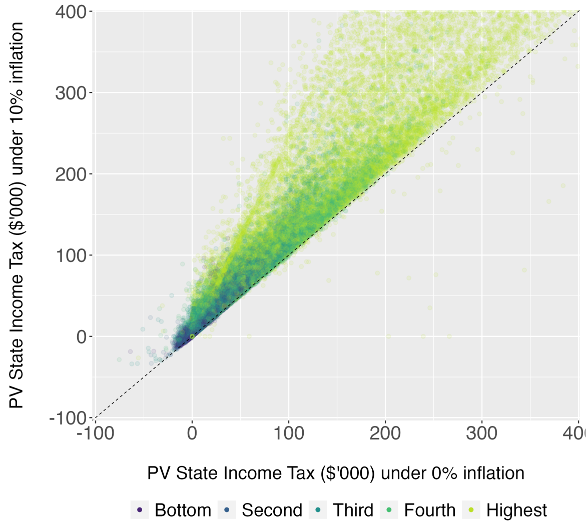
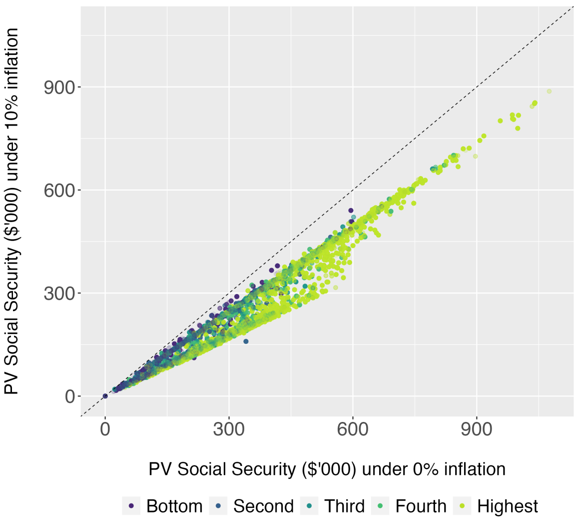
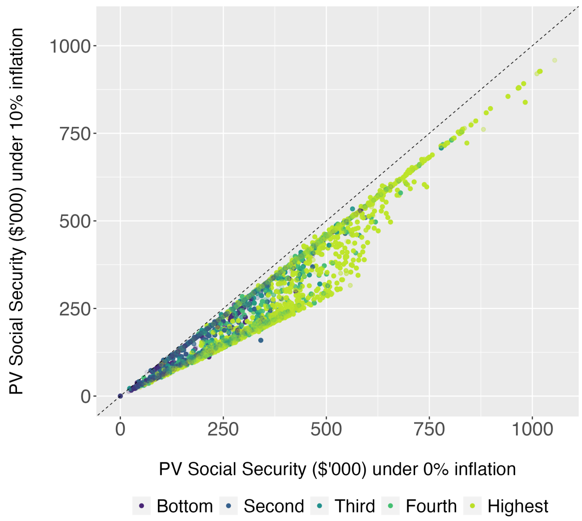


Figure 16: Social Security Benefits by Resource Quintile, Ages 20 - 79

(a) Baseline



(b) Timely Indexing



6.3 Case Studies

This section examines the impact of 10 percent inflation on two households each that 1) experience approximately the median increase in remaining lifetime spending among households that experience increases, 2) experience the greatest increase in remaining lifetime spending, 3) same as 1), but for households experiencing decreases, and 4) experience the greatest reduction. The decomposition of spending of each household characterized by 1) and 2) is shown in table 7a. Those for 3) and 4) are shown in table 7b.

Household 5,289 in Massachusetts
This single-person household's lifetime total spending increases by 3.18 percent. They receive only pension income and Social Security. Inflation lowers the real value of Social Security benefits through the system's lagged COLA. Consequently, the household becomes eligible, on an ongoing basis, for 18 more years of Medicaid, Food Stamps, and SSI. The additional Medicaid amounts to approximately $30,000. The household also owes over $2,000 less in taxes, comprised primarily of declines in Medicare Part-B premiums and sales taxes. Medicare Part-B premiums are tied to household overall income, including the household's reduced Social Security benefits. Sales taxes fall with lower cash expenditures. The aggregate change entails an increase in lifetime spending of $24,000.

Household 4,047 in District of Columbia
This age-78 household experiences a 3.19 percent increase in lifetime spending. Their only income is Social Security benefits, which erode. This makes them eligible for energy assistance and 10 more years of Medicaid. The additional $49,000 of Medicaid offsets the $58,000 Social Security income decline. While the household has approximately $140,000 in assets, they are poor enough to owe zero income taxes. They do owe sales tax, federal excise taxes, and Medicare Part-B premiums, however, which decline in aggregate by more than $5,000. The result is a nearly $40,000 increase in lifetime spending.

Household 4,314 in North Dakota
This North Dakota household experiences a dramatic, seemingly implausible 40.7 percent increase in lifetime spending. Yet the explanation is straightforward. All expenditures of this age-68 individual, apart from housing, are covered by Social Security benefits. The same mechanism from case 4,047 applies: Social Security benefits drop, making the household eligible for 17 additional years of Medicaid and other income-tested benefits. Increased Medicaid participation leads to almost $140,000 more in lifetime benefits. This is over 13 times the amount that was received in the 0% case. Medicaid also covers the respondent's Medicare Part-B premium. Over the household's remaining lifetime, the respondent receives, in present expected value, approximately $135,000 more in Medicaid benefits. The household also becomes eligible for 10 more years of food stamps, receives more in Section 8 benefits, and becomes eligible for SSI. Paying lower sales taxes and federal excise taxes follows as a consequence of having lower cash expenditures. In total, these changes more than compensate for the decline in Social Security payments.

Household 2,290 in Delaware
This household experiences the largest increase: 46.7 percent. This is a 69-year-old divorced female with no children in the bottom resource quintile. Her only income after 2018 comes from Social Security benefits and a small pension. She owes no federal or state income tax. However, other taxes decrease by roughly $1,300, mostly driven by declines in Medicare Part-B premiums. On the benefits side, Social Security benefits decline. This makes her eligible for SSI, food stamps, and 15 more years of Medicaid eligibility. The change in Medicaid eligibility generates $110,055 more in lifetime benefits. Given that the household is in the bottom resource quintile (its total lifetime spending equals only $441,247 in the 0% inflation case), its percentage increase

in lifetime spending is very large.

Household 5,751 in Illinois
This household, comprised of a married couple with no children, experiences a 6.83 percent reduction – approximately the median among worse-off households. They have $609,000 in remaining lifetime wages and $2.9 million in non-stock assets. Since the nominal rate of return on these assets is nearly 17 percent each year, the amount of taxable income, none of which is derived from munis, increases substantially year after year. Consequently, they face much higher real taxation due to income taxation of the inflation component of nominal asset income. As a result, federal income taxes increase by over $85,000. Holding stock dampens the tax increase. Recall section 5.9.3 – for the non-corporate sector, 10 percent inflation decreases the tax base by 1.32 percent of equity. If the couple did not hold their money in stock, federal taxes would have increased even further.[31] Additionally, they face a $9,000 net increase in other taxes. Sales and federal excise taxes decrease due to reduced cash expenditures, but this is insufficient to counter increases in Medicare Part-B premiums and higher corporate taxation. Social Security benefits also decline. In total, they lose over $230,000 in lifetime spending.

Household 4,449 in Tennessee
This household also experiences a 6.83 percent reduction in lifetime spending, the bulk from owing $1.4 million more in taxes. The household is exceptionally asset-heavy with over 100 times more assets than lifetime wages ($20 million versus $180,000). Bracket creep more than doubles their federal and state income taxes. Other taxes go down, in net, by $27,000. Of these, corporate taxes increase by over $75,000 due to the household's huge stock-holdings. This burden is partially reduced by a reduction in Medicare Part-B premiums, federal excise taxes, and sales taxes. The decline in Social Security benefits deepens the blow. In total, they lose over $1.5 million in remaining lifetime spending.

Household 1,458 in California
This household experiences the second largest reduction: 60.7 percent. Similar to household 4,449, they are in the top quintile, holding $45 million in assets and $1.5 million in lifetime wages. They hold no stock. Bracket creep results in their federal and state income taxes increasing by over $12 million and $4 million, respectively. Declines in other taxes are relatively minor. Social Security benefits also decline. The losses total over $15 million in lifetime spending. The large discrepancy between household 4,449 and 1,458 in how income taxes behave can be attributed to asset composition. Household 4,449 holds 70% of their assets in stock, while 1,458 holds none. Had household 4,449 held zero assets in stock, then their federal and state income taxes would have increased by $3.7 million and $47,000, respectively.

Household 2,045 in California
This household sees the largest decline – 64.9 percent – in lifetime spending. They are extremely wealthy, with almost $195 million in assets, which is substantial relative to their $976,000 in lifetime wages. Virtually all of their taxable income is asset income and they hold no municipal bonds or stock. As a result, they face much higher taxation. Under zero inflation, their current-year taxable income is $12.2 million. With 10 percent inflation, this nearly triples to $32.6 million. Reductions in other taxes are small in comparison. As usual, Social Security benefits decline.

[31] Simulating this counterfactual leads to an increase in federal taxes of $100,290.

Table 7a: Decomposition of Level Changes in Total Spending for Select Better-Off Households

Household/State	5,289, MA	4,047, DC	4,314, ND	2,290, DE
Federal Income Tax	0	0	0	0
State Income Tax	-4	0	0	0
Other Taxes	-2,382	-5,314	-3,248	-1,278
Total Taxes	-2,386	-5,314	-3,248	-1,277
Social Security	-38,864	-57,772	-41,541	-28,584
ACA	0	0	0	0
Medicaid	29,848	49,458	136,121	110,055
Medicare	0	0	0	0
Section 8	0	0	10,827	8,364
SSI	120	0	2,247	3,479
Other Transfers	786	-9,100	-11,235	1,607
Transfer Payments	-8,110	-17,414	96,420	94,920
Net Taxes & In-Kind Benefits	-24,124	-37,358	-235,789	-206,252
Total Spending	**24,124**	**37,358**	**235,789**	**206,252**

Table 7b: Decomposition of Level Changes in Total Spending for Select Worse-Off Households

Household/State	5,751, IL	4,449, TN	1,458, CA	2,045, CA
Federal Income Tax	85,580	1,446,763	12,407,995	56,823,448
State Income Tax	20,259	17,766	4,249,723	18,659,611
Other Taxes	8,785	-27,164	-1,279,710	-6,607,645
Total Taxes	114,625	1,437,365	15,378,008	68,875,413
Social Security	-117,429	-80,445	-88,221	-77,280
ACA	0	0	0	0
Medicaid	0	0	0	0
Medicare	0	0	0	0
Section 8	0	0	0	0
SSI	0	0	0	0
Other Transfers	-21	0	0	0
Transfer Payments	-117,450	-80,445	-88,221	-77,280
Net Taxes & In-Kind Benefits	232,075	1,517,811	15,466,230	68,952,693
Total Spending	**-232,075**	**-1,517,811**	**-15,466,229**	**-68,952,693**

Note: All numbers shown are calculated as the present value in the inflation-run minus the present value in the base-run. "Total Spending" refers to the sum of discretionary spending, non-discretionary spending, and in-kind benefits.

7 Conclusion

This paper uses The Fiscal Analyzer, a life-cycle consumption smoothing tool, in conjunction with the 2019 Survey of Consumer Finances to study inflation's impact through the fiscal system on the level and distribution of expected remaining lifetime spending. We focus on the fiscal system's interaction with inflation for two reasons. First, tracing the financial impacts of inflation on the course of wages and the valuations of particular stock holdings would necessarily be highly speculative given data limitations or highly episode-dependent were we to consider a specific historical inflation occurrence. Second, inflation's interaction with the fiscal system can be readily examined using the TFA's detailed coding of all major federal and state fiscal policies.

To isolate inflation's fiscal impacts, we adjust our SCF data to make it inflation-neutral. I.e., absent fiscal policy, our 2019 SCF households experience no impact whatsoever on their annual path of annual or lifetime spending from inflation. Using these adjusted data ensures that our results tell us just about inflation's interaction with elements of the fiscal system – some of which are indexed, albeit with longer or shorter lags, and some of which, such as the taxation of Social Security benefits and asset income, are not.

As we show, depending on the household's age, resource level, resource composition, and participation in welfare programs, inflation can substantially decrease or, indeed, increase lifetime living standards. A permanent increase in the rate of inflation from zero to either 5 or 10 percent percent reduces median lifetime spending by 3.62 and 6.82 percent, respectively. While a share of these effects is due to the lagged adjustment of tax and benefit programs to inflation, most impacts reflect other channels, including changes in benefit-program eligibility. Inflation-induced declines in real Social Security benefits arising from the lagged nature of its COLA is, paradoxically, a key trigger for household eligibility for Medicaid and other income-tested benefits. For households experiencing the largest reduction in lifetime spending, the main factor is their large net wealth relative to human wealth coupled with their failure to invest in municipal bonds or inability to fully defer capital gains taxation.

Inflation's net taxation is highly progressive with the richest 1 percent experiencing nearly 2.6 times the average percentage decline in lifetime spending as those in the bottom quintile. And those in their middle ages are particularly hard hit. Both findings reflect the fact that the rich and middle age are disproportionate asset holders and, therefore, suffer disproportionately from inflation's increase in the effective rate of taxation of real asset income. Our study's other major finding regards heterogeneous impacts. For an increase in the rate of inflation from 0 to 10 percent, the 25th percentile spending change is -9.84 percent, while the 75th percentile change -4.83 percent. A small fraction of households experience extreme changes in lifetime spending, with the maximum reduction equalling 64.9 percent. The maximum increase equals 46.7 percent.

In summary, even were inflation fully anticipated and, thus, financially neutral, it would have a major and quite progressive impact, via the fiscal system, on the average level and distribution of Americans' lifetime spending.

References

Altig, D., Auerbach, A. J., Higgins, P. C., Koehler, D. R., Kotlikoff, L. J., Leiseca, M., Terry, E., and Ye, Y. (2020). Did the 2017 tax reform discriminate against blue state voters? *National Tax Journal*, 73(4):1087–1108.

Altig, D., Auerbach, A. J., Kotlikoff, L. J., Ilin, E., and Ye, V. (2023). The marginal net taxation of americans' labor supply. *National Bureau of Economic Research.*

Altig, D., Kotlikoff, L. J., and Ye, V. Y. (2022). How much lifetime social security benefits are americans leaving on the table? Technical report, National Bureau of Economic Research.

Auerbach, A. J. (1981). Inflation and the tax treatment of firm behavior. *American Economic Review*, 71(2):419–423.

Auerbach, A. J., Kotlikoff, L. J., Koehler, D., and Yu, M. (2017). Is Uncle Sam inducing the elderly to retire? *Tax Policy and the Economy*, 31:1–42.

Auerbach, A. J., Kotlikoff, L. J., and Koehler, D. R. (2023). U.S. inequality, fiscal progressivity, and work disincentives: an intragenerational accounting. *Journal of Political Economy*, 131(5):1249–1293.

Bricker, J., Henriques, A., Krimmel, J., and Sabelhaus, J. (2016). Measuring income and wealth at the top using administrative and survey data. *Brookings Papers on Economic Activity*, 2016(1):261–331.

Center for a Secure Retirement (2019). A growing urgency: Retirement care realities for middle-income boomers.

Chien, N. (2015). Estimates of child care eligibility and receipt for fiscal year 2012. *Parameters*, 14(2,177,000):15.

Chien, N. (2019). Factsheet: Estimates of child care eligibility & receipt for fiscal year 2015. *Washington, DC: US Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation.*

Committee on the Long-Run Macroeconomic Effects of the Aging US Population (2015). *The Growing Gap in Life Expectancy by Income: Implications for Federal Programs and Policy Responses.* National Research Council.

Dettling, L., Devlin-Foltz, S., Krimmel, J., Pack, S., and Thompson, J. (2015). Comparing micro and macro sources for household accounts in the united states: Evidence from the survey of consumer finances. *SSRN Electronic Journal.*

Feldstein, M., Green, J., and Sheshinski, E. (1978). Inflation and taxes in a growing economy with debt and equity finance. *Journal of Political Economy*, 86(2, part 2):S53–S70.

Feldstein, M. and Summers, L. (1979). Inflation and the taxation of capital income in the corporate sector. *National Tax Journal*, 32(4):445–470.

Fischer, S. and Modigliani, F. (1978). Towards an understanding of the real effects and costs of inflation. *Review of World Economics.*, 114(4):810–833.

Giannarelli, L. (2019). What was the tanf participation rate in 2016. *Urban Institute.*

Ilin, E., Kotlikoff, L. J., and Pitts, M. (2022). Is our fiscal system discouraging marriage? a new look at the marriage tax. Technical report, National Bureau of Economic Research.

Ilin, E. and Terry, E. (2021). The Policy Rules Database.

Kelley, W. A., Hall, J. H., Aronsohn, A. J. B., Hickman, F. W., Sweeney, H., and Carroll, L. (1977). Indexing for inflation. *The Tax Lawyer.*, 31(1):17–35.

Kennickell, A. B. (2007). Look and listen, but don't stop: Interviewers and data quality in the 2007 scf. *Proceedings of the Survey Research Methods Section. American Statistical Association. www. amstat. org/Sections/Srms/Proceedings/y2007/Files/JSM2007-000648. pdf.*

Kotlikoff, L. J. (2002). Generational policy. In *Handbook of Public Economics*, volume 4, pages 1873–1932. Elsevier.

Meghir, C. and Pistaferri, L. (2011). Earnings, consumption and life cycle choices. In *Handbook of Labor Economics*, volume 4, pages 773–854. Elsevier.

Moffitt, R. (1983). An economic model of welfare stigma. *The American economic review*, 73(5):1023–1035.

Moffitt, R. A. and Gottschalk, P. ((1995)). *Trends in the Autocovariance Structure of Earnings in the US, 1969-1987.* Johns Hopkins University, Department of Economics.

Pallotti, F., Paz-Pardo, G., Slacalek, J., Tristani, O., and Violante, G. L. (2023). Who bears the costs of inflation? euro area households and the 2021–2022 shock.

Rosenthal, S. M. and Mucciolo, L. (2024). Who's left to tax? grappling with a dwindling shareholder tax base. *Tax Notes Federal*, 183:91–107.

Social Security Administration (2019). Annual statistical supplement.

Appendix

A Calculating the Effects of Inflation on Business Income

Here, we provide details regarding the calculation of the changes in business income due to inflation and how these estimated changes are used to calculate the impact of inflation on tax burdens. There are two main components to changes in measured business income. The first is the sum of the inventory valuation adjustment (IVA), which accounts for input costs not being valued at current prices, and the capital consumption adjustment (CCA), which accounts for depreciation deductions not being based on current capital costs.[32] The second is the change in net interest due to the inflation premium on debt. Generally, the first component will increase taxes and the second will reduce taxes (because the business sector in the aggregate is a net debtor). We calculate these two adjustments for both the noncorporate and the corporate sectors.

To compute the inflation component of the CCA, we start with figures for both corporate and noncorporate sectors from the National Income and Product Accounts (NIPA), table 7.6.[33] For the IVA, we use NIPA table 6.14D.[34] The corporate and noncorporate values are in rows 2 and 14, respectively.

Because S corporations are taxed as noncorporate (i.e., pass-through) businesses but are treated as corporations in the NIPA data, we need to shift their share of the CCA and IVA corrections to the noncorporate sector. We can do this using the Federal Reserve's Release Z.1, the Flow of Funds (FOF) data, which also groups S corporations with other corporations.[35] In FOF table L.224 (Corporate Equities), total corporate equity in the domestic sector at market value is in line 2. S corporation equity at market value is in line 31, so we divide the latter by the former to get the S corporation share, and then multiply this fraction by the CCA and IVA corrections to form adjusted corporate and noncorporate IVA and CCA corrections.[36]

To compute the adjusted corporate CCA and IVA corrections as a share of equity values, we divide by the market value of domestic corporations adjusted to remove S corporations (line 2 minus line 31 in the Table L.224 of the FOF data). To replicate this step for noncorporate business, we need a market value of noncorporate equity, adjusted to include S corporate equity. To compute this, we add line 31 (S corporation equity) in FOF Table L.224, Line 27 (Equity in noncorporate business) in Table L.104 (Nonfinancial Noncorporate Business) and Line 32 (Equity in noncorporate business) in Table L.130 (Brokers and Dealers).[37]

To calculate the increase in the corporate and noncorporate tax bases due to the CCA and IVA from inflation, as a fraction of equity values, we multiply the adjusted CCA and IVA ratios for the corporate and noncorporate sectors derived above by the ratio of the inflation rate assumed in our simulations (either 5 or 10 percent) to the actual inflation rate during the period when the CCA and IVA are measured. Given that the CCA and the IVA fluctuate from year to year

[32] A second component of the capital consumption adjustment relates to the fact that depreciation deductions are accelerated relative to economic depreciation. We ignore this component in our calculations.

[33] Note that the inflation component of the noncorporate CCA is available only for nonfarm sole proprietorships and partnerships. To cover all noncorporate firms, we calculate the ratio of the inflation component to the full CCA for noncorporate nonfarm sole proprietorships and partnerships (line 18 divided by line 16) and multiply this by the overall noncorporate CCA (line 13).

[34] This is for nonfarm incomes, as the the method of calculating the cost of goods sold for farm businesses does not give rise to an IVA.

[35] All of the FOF tables we use are in levels, rather than flows.

[36] This assumes that the CCA and IVA as a share of equity are the same for S corporations as for the corporate sector as a whole.

[37] According to FOF Table L.225b, Noncorporate business equity equals the sum of these last two items. Following this, we will assume that the financial sector except for brokers and dealers is corporate (C + S).

(even with little change in the inflation rate), we use the average of 2017, 2018, and 2019 for adjusted CCA and IVA values and inflation factors in computing the numerators of these ratios to equity values.

Turning now to the effect of inflation on net deductible interest payments, we begin by calculating the net interest-bearing debt for the corporate and noncorporate sectors, starting with FOF tables L.103 (Nonfinancial Corporate Business) and L.104 (Nonfinancial Noncorporate Business). For corporations, we define net interest-bearing debt as gross taxable interest-bearing debt [line 28 (Debt securities) – line 30 (Municipal securities)[38] + line 32 (Loans) + line 36 (Intercompany debt)] – gross taxable interest-bearing assets [line 4 (Time and savings deposits) + line 5 (Money market fund shares) + line 7 (Debt securities) – line 11 (Municipal securities) + line 13 (Loans) + line 16 (Intercompany debt)]. For noncorporate business, the corresponding calculation from table L.104 is line 18 (Loans) + line 22 (Intercompany debt) – line 3 (Time and savings deposits) – line 4 (Money market fund shares) – line 5 (Debt securities) + line 7 (Municipal securities) – line 8 (Loans). Note that these calculations are for the nonfinancial sector. Comparable calculations for the financial sector would be much more difficult, because of the many special tax regimes that apply and the complexity of determining the impact of inflation on net income for different classes of assets and liabilities beyond simple debt obligations. Therefore, we do not attempt to include a measure of the impact of inflation on the taxable financial income of financial companies.[39] With these calculations of net debt for the corporate and noncorporate sectors in hand, we again make an adjustment for S corporations, to move the net debt of the S corporate sector to the noncorporate sector. To do this, we assume that S corporations' share of total corporate net debt is the same as their share of total corporate equity.

Next, we divide this adjusted net debt in the corporate and noncorporate sectors by the respective adjusted values of corporate and noncorporate equity derived above. This gives us net debt as a share of equity value in both the corporate and noncorporate sectors. To calculate the decrease in the corporate and noncorporate tax bases as a fraction of equity values due to the deduction of the inflation premium on net interest-bearing debt, we multiply the corporate and noncorporate ratios just computed by the inflation rate assumed in our calculations.

Adding the results for the CCA and IVA and net debt together for both corporate and noncorporate sectors, we now have inflation-induced net changes in the tax base as a share of corporate and noncorporate equity values. For corporations, one final adjustment is required. Because some equity held by households is in foreign corporations, whose taxable earnings we do not expect to be directly affected by the US inflation rate, we wish to apply the corporate ratio only for domestic US equities. We do this by multiplying the corporate ratio just computed by 0.72, based on a recent estimate by Rosenthal and Mucciolo (2024) of the share of US held equity that is foreign-issued.[40]

Finally, we integrate our estimates of the impact of inflation on business income (as a share of business equity) into our TFA simulations. For the corporate sector, we multiply the combined federal and state marginal corporate tax rate for 2018 taken from the OECD tax database [.2584] by the inflation induced change in income as a share of equity, +0.16 percent for 5 percent inflation and + 0.32 percent for 10 percent inflation, to get the increased corporate taxes as a share of corporate equity. The TFA then automatically calculates the reduced level of individual

[38]We exclude municipal securities here and in the following calculations because they are wholly tax exempt for federal purposes and substantially tax exempt for state purposes.

[39]To the extent that the taxable financial sector as a whole is a net creditor, and assuming similar effects of inflation on income and deductions, this omission may cause us to understate the increase in taxes due to inflation.

[40]This adjustment implicitly assumes that US corporations have income solely in the United States and foreign corporations have income solely abroad. In reality, there are cross-holdings that would have offsetting effects on our calculations.

consumption that results, based on individual holdings of corporate equity directly, through mutual funds, and through retirement savings accounts. For the noncorporate sector, the change in business income due to inflation for each household is -0.66 percent of equity for 5 percent inflation and -1.32 percent of equity for 10 percent inflation, so we multiply these percentages by the value of the household's noncorporate business assets and add this (negative) adjustment to taxable income.[41]

[41]For the noncorporate sector, the change is negative, as the increase in interest deductions exceeds in magnitude the increase in the tax base associated with the CCA and IVA.

B Decomposition of Spending by Resource Quintile

Appendix Table 1: Breakdown of Spending, Lowest Resource Quintile

	0%	5% inflation	10% inflation
Federal Income Tax	38,982	43,701	50,795
State Income Tax	5,713	6,922	8,629
Other Taxes	52,324	52,116	53,966
Total Taxes	97,018	102,738	113,391
Social Security	187,796	165,094	147,399
ACA	9,416	9,510	9,214
Medicaid	10,475	10,007	9,928
Medicare	113,798	113,798	113,798
Section 8	5,034	5,883	6,223
SSI	7,804	7,642	7,499
Other Transfers	3,847	3,197	3,011
Transfer Payments	338,170	315,130	297,071
Net Taxes & In-Kind Benefits	-365,424	-336,197	-307,406
Total Spending	**894,212**	**864,601**	**835,794**

Note: All numbers are in present value terms. Weighted mean values are presented. In Appendix Tables 1 - 5, "Total Spending" refers to the sum of discretionary spending, non-discretionary spending, and in-kind benefits. Changes in net taxes & in-kind benefits need not equal changes in total spending due to employer-paid FICA and employer-paid health insurance. These may change due to Social Security rules and lagged-indexing.

Appendix Table 2: Breakdown of Spending, Second Resource Quintile

	0%	5% inflation	10% inflation
Federal Income Tax	79,312	88,735	100,848
State Income Tax	12,197	14,630	17,729
Other Taxes	78,592	79,142	82,253
Total Taxes	170,101	182,508	200,830
Social Security	213,546	184,212	162,087
ACA	4,037	3,623	3,043
Medicaid	1,415	1,274	1,292
Medicare	112,368	112,368	112,368
Section 8	929	948	1,012
SSI	802	822	828
Other Transfers	1,198	677	572
Transfer Payments	334,295	303,924	281,202
Net Taxes & In-Kind Benefits	-277,977	-235,059	-194,032
Total Spending	**1,156,800**	**1,113,835**	**1,072,773**

Note: All numbers are in present value terms. Weighted mean values are presented.

Appendix Table 3: Breakdown of Spending, Third Resource Quintile

	0%	5% inflation	10% inflation
Federal Income Tax	150,205	170,035	190,215
State Income Tax	23,593	28,346	33,653
Other Taxes	119,346	120,511	123,906
Total Taxes	293,144	318,892	347,774
Social Security	274,754	235,065	204,856
ACA	1,513	1,007	797
Medicaid	216	208	208
Medicare	130,756	130,756	130,756
Section 8	238	238	244
SSI	116	144	165
Other Transfers	297	153	120
Transfer Payments	407,890	367,571	337,146
Net Taxes & In-Kind Benefits	-245,719	-179,643	-120,336
Total Spending	**1,627,953**	**1,561,389**	**1,500,469**

Note: All numbers are in present value terms. Weighted mean values are presented.

Appendix Table 4: Breakdown of Spending, Fourth Resource Quintile

	0%	5% inflation	10% inflation
Federal Income Tax	293,725	319,070	343,344
State Income Tax	46,307	54,153	61,748
Other Taxes	192,664	193,534	194,087
Total Taxes	532,696	566,757	599,179
Social Security	334,484	285,499	248,241
ACA	1,510	918	768
Medicaid	231	35	32
Medicare	144,241	144,241	144,241
Section 8	2	2	3
SSI	19	18	16
Other Transfers	117	54	37
Transfer Payments	480,604	430,768	393,338
Net Taxes & In-Kind Benefits	-92,381	-8,287	61,568
Total Spending	**2,338,169**	**2,250,440**	**2,176,245**

Note: All numbers are in present value terms. Weighted mean values are presented.

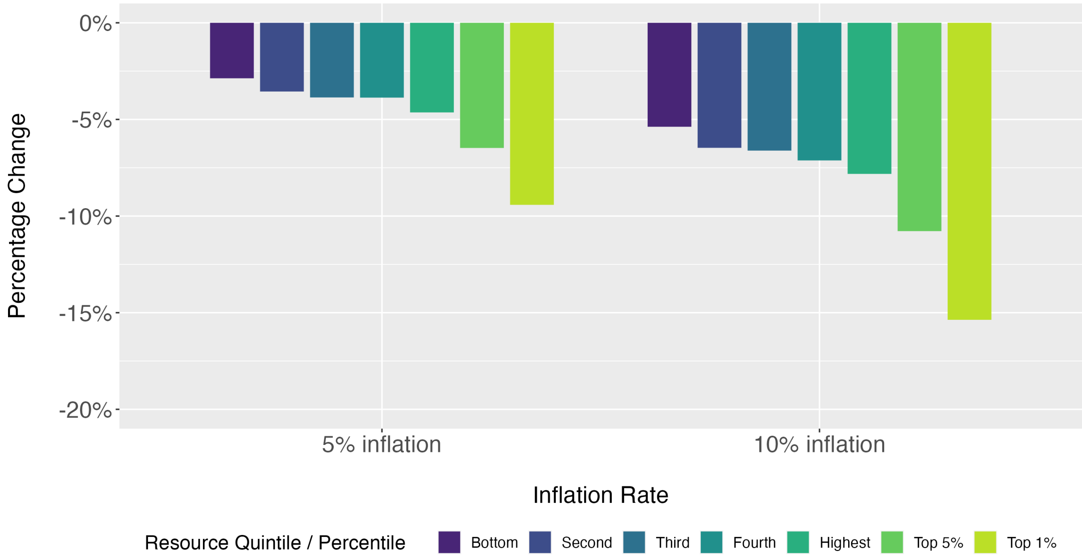
Appendix Table 5: Breakdown of Spending, Fifth Resource Quintile

	0%	5% inflation	10% inflation
Federal Income Tax	1,628,769	2,029,170	2,357,605
State Income Tax	244,135	309,408	363,911
Other Taxes	664,191	641,302	618,604
Total Taxes	2,537,095	2,979,880	3,340,119
Social Security	398,689	340,813	296,442
ACA	146	18	15
Medicaid	16	11	12
Medicare	149,162	149,162	149,162
Section 8	0	0	5
SSI	1	1	1
Other Transfers	38	23	23
Transfer Payments	548,051	490,028	445,660
Net Taxes & In-Kind Benefits	1,839,867	2,340,680	2,745,285
Total Spending	**7,205,076**	**6,697,324**	**6,286,326**

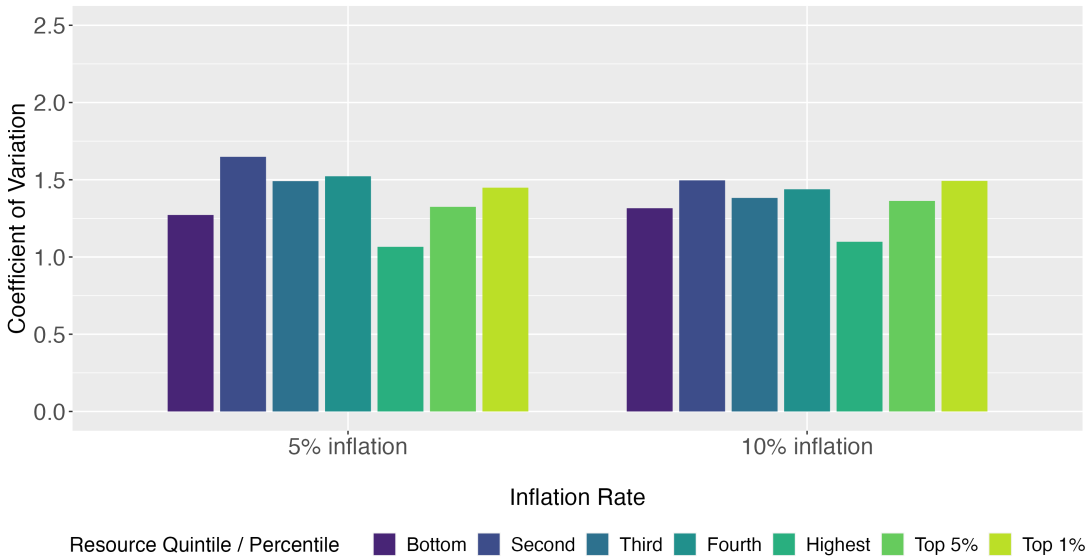
Note: All numbers are in present value terms. Weighted mean values are presented.

C Timely Indexing Results

Appendix Figure 1: Average Percentage Change in Remaining Lifetime Spending with Timely Adjustment by Resource Quintile, Ages 20 - 79

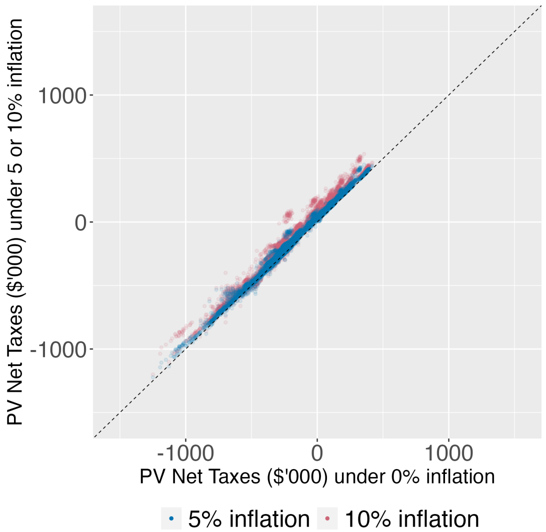


Appendix Figure 2: Coefficients of Variation with Timely Adjustment by Resource Quintile, Ages 20 - 79

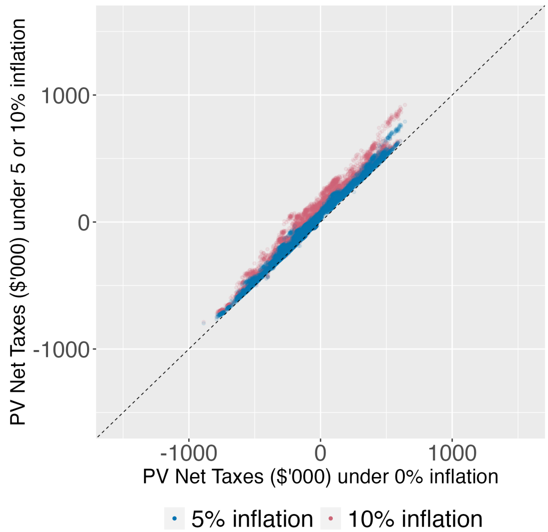


Appendix Figure 3: Net Taxes with Timely Adjustment by Resource Quintile, Ages 20 - 79

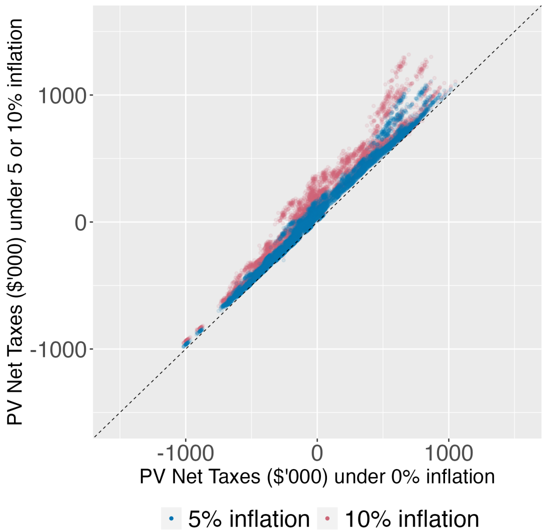
(a) Bottom Quintile



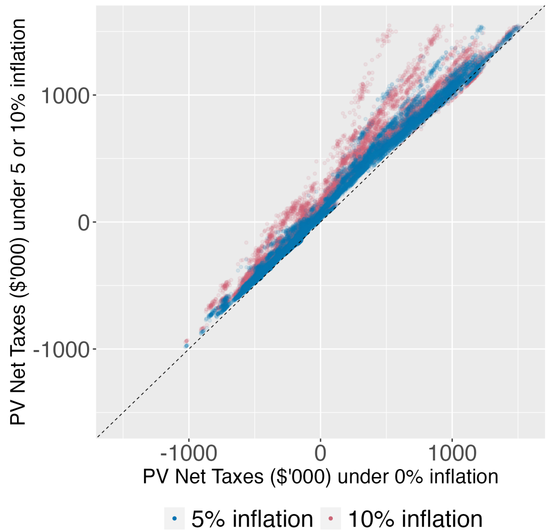
(b) Second Quintile



(c) Third Quintile



(d) Fourth Quintile



(e) Highest Quintile