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Social Security's Five OASI Inflation Indexing Problems

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Abstract
This paper examines five problems with the indexing procedures used by the Social Security Administration of the United States in taking inflation into account when calculating Old Age and Survivor Insurance (OASI) Benefits. Because of the commingling of unindexed with indexed earnings, a retiree born in 1930 who continued in a high earning career until age 75 receives an annual benefit more than $1,800 larger than would have been generated with full indexing. While the inflation indexing problems identified in this paper do not attract much attention in normal times, they can contribute to serious short-run financial instability for the OASI trust fund in periods of substantial inflation or deflation. They make the percentage increase in your inflation adjusted (CPI-W) benefit if you elect to postpone retirement and the start of OASI benefits depend in part on the pace of inflation. This paper explains how these problems could be resolved in a way that would not hurt and might help resolve Social Security's longrun solvency problems.

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Contents

1 Introduction

This paper examines five problems with the inflation indexing procedures used by the Social Security Administration in calculating Old Age and Survivors Insurance (OASI) Benefits. Because of these indexing problems, a proper evaluation of how progressive OASI actually is—who benefits the most—requires that the pace of inflation be explicitly taken into account. These problems also mean that inflation can affect the incentives provided for delaying retirement and the start of OASI benefits. Although indexing problems do not attract much attention in normal times, they will generate serious short-run financial instability for the OASI trust fund if our economy again experiences stagflation like that generated during the OPEC oil price surges almost a third of a century ago.

This paper shows that how an index is used or misused may be just as important as which index or combination of indexes is used in adjusting OASI benefits for inflation. The most serious problem involves the commingling of the worker's earnings adjusted for wage inflation up through age 60 with unadjusted earnings from age 61 to retirement. As a result, a successful lawyer born in 1930 who earned at or above the taxable maximum cap on earnings subject to OASI taxes ($90,000 in 2005) and postponed full retirement until her 75th birthday might enjoy an annual benefit of $25,812 instead of the $24,000 that would be received if the earnings were fully adjusted for wage inflation in calculating benefits. This $1,812 annual bonus is 7.0% of the annual benefit. In contrast to this $1,812 annual bonus, a worker who always earned the minimum wage over an equally long career receives a benefit of $10,296 instead of $10,164 with full wage indexing—a $132 annual bonus amounting to only 1.3% of the annual benefit. These bonuses, adjusted for inflation with the consumer price index (CPI-W), are received in every year of retirement, and beyond if claimed by the worker's surviving spouse.[1]

Social Security has evolved over the years since President Roosevelt signed it into law in 1935 into a program that must be judged to be in many ways a tremendous success: It has contributed to the dramatic reduction in the rate of poverty among the elderly. And it is remarkably efficient—OASI administrative expenses in FY 2007 were only 0.6% of benefit payments. But it also has serious problems. As everyone knows, it is underfunded and its trust funds are threatened with eventual exhaustion. But there are also serious problems with the way in which the program indexes for inflation.

Attempting to modify the way in which Social Security Benefits are adjusted for inflation can turn into a political minefield. A case in point is provided by the serious political controversy generated in the 1970s when Social Security was first indexed for inflation. The initial attempt at indexing, signed into law in 1972, was flawed—it overcompensated for inflation to such an extent that it is said to have threatened to exhaust the trust funds. After the indexing procedure was revised in 1978, those born

[1] Disclosure: the author was surprised to find that because of indexing problem #1 his OASI benefits for 2008 were more than $700 higher than they would have been with proper indexing.

between 1917 and 1921 become known as the "Notch Generation" because their benefits fell short of those received by both the immediately preceding and following birth cohorts (Duggan et al., 1996). In response to their protests, over the years more than 100 legislative bills attempting to redress the problems of the Notch Generation were introduced in both houses of Congress. A bipartisan Commission on the Social Security 'Notch Issue' (1994) concluded after extensive hearings that no remedial action should be taken. That report may have put the Notch Issue more or less to rest, but serious underlying problems with the indexing procedures are still not resolved.

The next section of this paper reviews how OASI benefits are calculated. Section 3 investigates five indexing problems and recommends steps that would contribute to their resolution. Computer experiments in Section 4 test how well alternative indexing procedures respond to accelerated inflation or deflation. Section 5 explains how the price and wage indices used by the SSA are constructed. Section 6 examines the task of phasing in reform, Section 7 summarizes how the choice of index affects retirement incentives and Section 8 concludes.

Throughout we shall be focusing on the wage earnings and OASI benefits of workers but will not consider how the financial wellbeing of workers and retirees may be influenced by the income tax, the Earned Income Tax Credit, Supplementary Social Security payments, pensions, inheritances, personal saving and investments.

2 Calculating OASI Benefits

Before we can appreciate OASI indexing problems we must examine the procedure for calculating a retiree's benefits. First we will calculate the worker's Average Indexed Monthly Earnings (AIME), then we will show how the Primary Insurance Amount (PIA) is derived from the AIME, and finally we will explain how the benefits are calculated from the PIA.[2]

2.1 Calculating a Worker's Average Indexed Monthly Earnings (AIME)

The OASI benefit is based on earnings reported on the worker's W-2 forms, E_t^{w-2}, but only up to the Taxable Maximum (aka the *Contribution and Benefit Base*) ceiling C_t on earnings subject to the OASI payroll tax; e.g., C_{2008} = \$102,000. Earnings above C_t are not subject to the payroll tax and are nor tabulated in computing OASI benefits. These capped earnings,

$$E_t = \min(E_t^{w\text{-}2}, C_t), \tag{1}$$

are adjusted for wage inflation with w_t, the Average Wage Index. This index, plotted along with the consumer price index (CPI-W) on *Figure 1*, is based on $\overline{E}_t^{w-2}$, the average of all workers' W-2 income, and is normalized to equal 100 in the workers 60[th] year,

[2] The Appendix presents an alternative to this section's explanation of how benefits are calculated that is illustrated with tables from AnyPIA, the SSA personal computer benefit calculating program. See also http://www.ssa.gov/OACT/ProgData/retirebenefit1.html.

$$w_t = \overline{E}_t^{w-2} / \overline{E}_{t^b+60}^{w-2}, \tag{2}$$

where t^b is the year of birth. But our worker's "indexed earnings", ${}^I E_t$, are in fact only indexed up through the year of the worker's 60th birthday; subsequent earnings are not adjusted for inflation:

$${}^I E_t = E_t / w_t^*, \text{ where } w_t^* = w_t \text{ if } t \le t^b + 60, \text{ else } 1. \tag{3}$$

Next the worker's indexed earnings in the highest 35 years prior to date t are summed:

$${}^I E_t^{35} = \sum_{R({}^I E_\tau) \le 35,\ \tau < t} {}^I E_\tau, \tag{4}$$

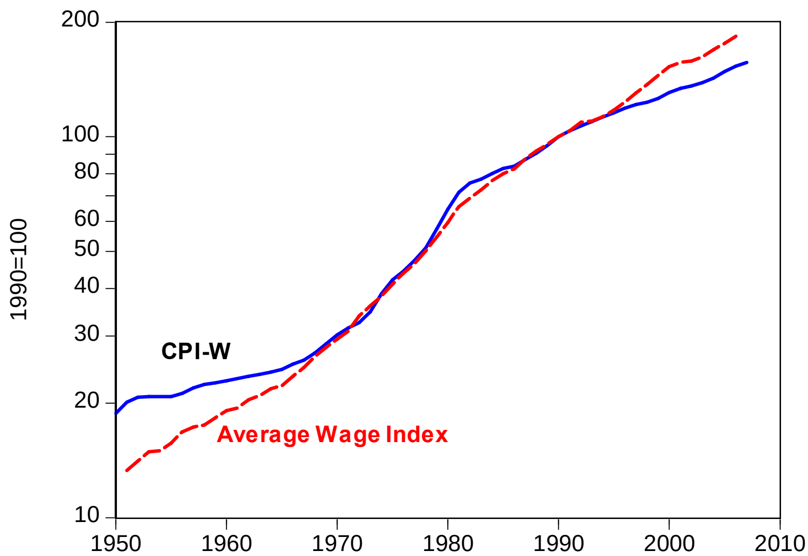
where $R({}^I E_\tau)$ is the descending rank of earnings up to year *t*. Earnings that are too small to be included in the top 35, although subject to the OASI wage tax, do not count in computing OASI benefits.

The worker's Average Indexed Monthly Earnings (AIME) is this 35 year sum divided by 35×12:

$$\overline{E}_t = {}^I E_t^{35} / (35 \times 12). \tag{5}$$

If there are fewer than 35 years of employment, the sum is still divided by 35x12.

Figure 1: Alternative Inflation Indexes: AWI versus the CPI-W



2.2 Calculating the Primary Insurance Amount (PIA)

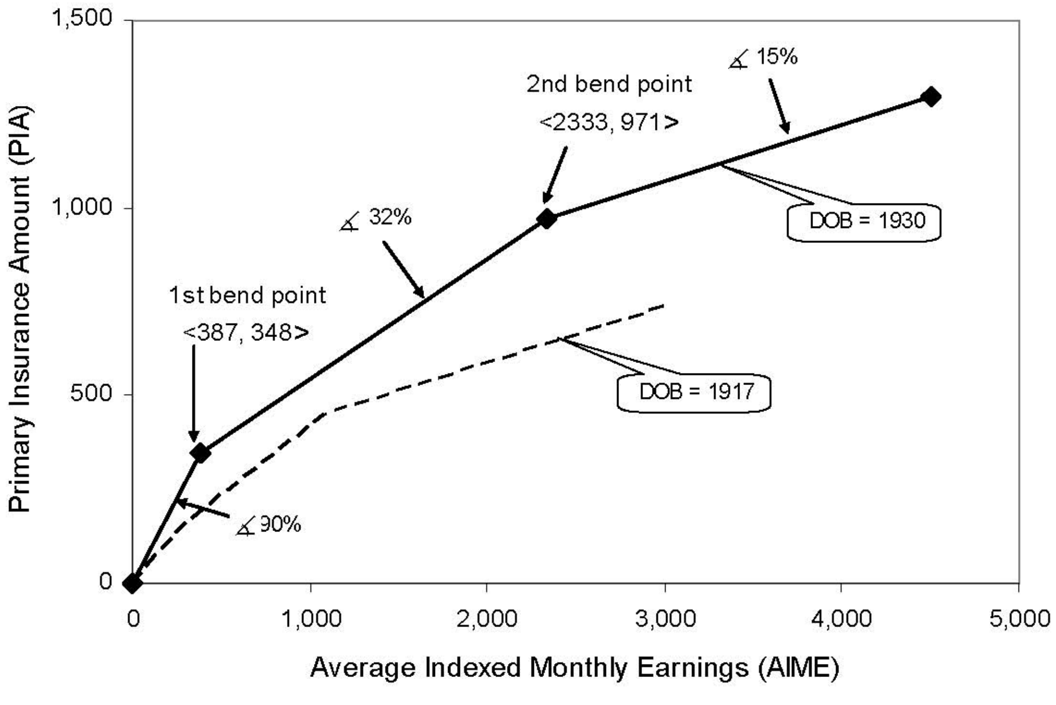
Workers become eligible to receive OASI benefits at age 62. The Primary Insurance Amount, a piecewise linear function of Average Indexed Monthly Earnings ($\overline{E}_t$), is plotted on Figure 2 for a worker born in year $t^b = 1930$. For any t^b, the PIA in year $t \geq t^b+62$ is

$$\begin{aligned} P_t^{IA}(t, t^b, p_{t-1}/p_{t^b+61}, \overline{E}_a, w_{t^b+60}) = (p_{t-1}/p_{t^b+61})\{0.9\min(\overline{E}_t, b_1) + \\ + 0.32\max[0, \min(\overline{E}_t - b_1, b_2 - b_1)] + 0.15\max(0, \overline{E}_t - b_2)\}. \end{aligned} \quad (6)$$

Here the ratio p_{t-1}/p_{t^b+61}, where p_t, the CPI-W price index, adjusts the PIA for inflation. The bend point coefficients b_1 and b_2 are adjusted for inflation according to the level of the wage index in the year of the worker's 60th birthday.[3] The bendpoint kinks on the graph have coordinates $<b_1, 0.9b_1>$ and $<b_2, 0.9b_1+0.32(b_2-b_1)>$. The dashed line is the original PIA function, which applied for workers born in 1917 and enjoying their 60th birthday in 1979. Because the wage index increased by 115% from 1977 to 1990, the bend points for workers reaching 60 in 1990 are 115% larger than they were for the 1917 age cohort.

The PIA is a progressive function of earnings because the ratio of benefits to earnings, PIA/AIME, declines with AIME, as can be observed on Figure 2. However,

Figure 2: Primary Insurance Amount (PIA)—DOB 1930



[3] The bend points were initially established at \$180 and \$1,085 for 1977 for workers born in 1917. For subsequent age cohorts they are adjusted for inflation with the Average Wage Index with a two year lag: i.e.,

$b_1(t^b+60) = (w_{t^b-2}/w_{1977}) = 180$ and $b_2(t^b+60) = (w_{t^b-2}/w_{1977}) = 1{,}085$.

the progressive feature of the function linking annual benefits to AIME is more or less offset because life expectancy increases with socioeconomic status and is sensitive to both race and life style.[4]

Note that the worker's PIA will increase over time for two reasons: First, it is adjusted for price inflation by the ratio p_{t-1} / p_{t^b+61}. Second, the PIA increases with the passage of time if the beneficiary continues to work after the 62nd birthday, but only if the earnings are large enough to increase the AIME, which means they must count among the best 35 years.

2.3 Benefit Calculation

The monthly OASI benefit that a worker born in year t^b will receive at age *a,* according to SSA statutes, depends partly on that year's PIA, as determined by (6), but subject to an adjustment factor $A(t^b,a^s)$ that penalizes workers if the age a^s at which they initially claimed benefits is before the normal retirement age and rewards those who delay the start of benefits beyond the normal retirement age:

$$B_a^{SSA}(t^b, a^s, p_{t-1}/p_{t^b+61}, \bar{E}_a, \mathrm{w}_{t^b+60}) = A(t^b, a^s) P^{IA}(t, t^b, p_{t-1}/p_{t^b+61}, \bar{E}_a, w_{t^b+60}) \quad \text{for } a \geq 62, \text{ 0 otherwise.} \tag{7}$$

For example, a worker born in 1930 who started benefits when first becoming eligible at age 62 will receive only $A(1930,62)$ = 80% of the benefit that would be received if the start of benefits were postponed until age 65. which is the normal retirement age for that age cohort; i.e., $A(1930,65)$ =1. But the adjustment factor would be $A(1930,70)$ = 122.5% if the worker decided to refrain from drawing benefits until age 70, receiving a larger benefit over a shorter remaining lifetime. As indicated by Table 1, the adjustment factors have been modified over time, in part to reflect the increased longevity of the population.

The Average Indexed Monthly Earnings, the Primary Insurance Amount and the benefit are updated in each year after age 62 in which our worker has W-2 earnings, but the worker's PIA function bend points do not change and the wage index remains normalized at 100 in the worker's 60th year. The maximum benefit that can be received by anyone who always earned at or above the taxable maximum depends on the year of retirement, for that limits the sum of the capped earnings that is used in calculating the AIME. For a worker born in 1930 who retires at 62, the maximum AIME is $2,985 and the resulting cap on the PIA is $1,069.

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4 Gustman and Steinmeier (2001) report that there is significant income redistribution when only own benefits are taken into account; but progressivity is substantially reduced when spouse and survivor benefits are included and redistribution is measured among families. A Congressional Budget Office (2006) study reports that the degree of progressivity is strengthened when OASI and Disability Insurance benefits are combined and when benefits are measured net of the personal income tax.

Table 1: $A(t^b, a^s)$ ~ Benefit Adjustment Factors

Year of birth (t^b)	Normal Retirement Age	Benefit, as a percentage of PIA, beginning at age (a^s) 62	65	67	70 & above
1924	65	80	100	106	115
1930	65	80	100	109	122 1/2
1937	65	80	100	113	132 1/2
1939	65, 4 mo.	78 1/3	97 7/9	111 2/3	132 2/3
1940	65, 6 mo.	77 1/2	96 2/3	110 1/2	131 1/2
1941	65, 8 mo.	76 2/3	95 5/9	110	132 1/2
1943-54	66	75	93 1/3	108	132
≥ 1960	67	70	86 2/3	100	124

Source: http://www.socialsecurity.gov/OACT/ProgData/ar_drc.html

Married workers receive a benefit equal to ½ that of their spouse if it is larger than the benefit based on their own earnings.[5] Dependent children may also receive a benefit based on the retiree's earnings record. Surviving marital partners receive a benefit equal to that of their deceased spouse if it is larger than the benefit based on their own earnings.[6]

3 Indexing Problems

We will illustrate the effects of various indexing problems by considering how they affect the OASI benefits received by four quite differently situated workers:

- The Maximum Wage Earner always earned at or above the taxable maximum cap. This category includes successful accountants, lawyers, physicians, business school professors, and many other professionals and business leaders. Some may continue to earn above the taxable maximum cap even in part-time retirement (http://www.socialsecurity.gov/cgi-bin/netcomp.cgi?year=2006).
- The Average Wage Earner enjoyed the average (mean) W-2 income of all workers subject to the Social Security tax throughout their careers.
- The Median Wage Earner always earned the median of the W-2 earnings distribution, half of the population earning more and half less. Because the distribution of income is highly skewed, the median wage is substantially below

[5] The maximum family benefit caps the sum of retirement or survival benefits that can be paid to a worker's spouse and eligible children, usually equals 150% to 180% of the basic benefit. Any benefits paid to a surviving divorced spouse do not count against the maximum family benefit.

[6] A divorced spouse who does not remarry before age 60 may still elect the survivor benefit, provided the marriage had lasted at least 10 years. A divorced spouse who remarried after age 60 could still collect survivor benefits on the former spouse's record or choose instead to receive retirement benefits based on the record of the new spouse. Several former wives of a serially marrying spouse may be able to claim benefits on the basis of that former spouse's earning history, provided each marriage lasted at least 10 years. The Social Security Administration accepts common law marriages if recognized by the state where the couple resides. Gay Marriages are not accepted even if recognized in the state of residence (e.g., Massachusetts or Connecticut).

the average. For example, average income in 1990 was $21,028, or 45% above the median of $14,499. By 2007 the average had increased to the point where it was 54% above the median.[7]

- The Minimum Wage Earner always earned the Federal minimum wage while working a 40 hour week 50 weeks of the year. Minimum Wage Earners are the least advantaged.

In order to learn about the OASI benefit experience of workers who occupy quite different positions on the income distribution, we will be analyzing how the benefits of these four hypothetical workers are affected by inflation.

The income histories of these four stylized classes of workers are reported on Table 2 and plotted on Figure 3. Their incomes deflated with the CPI-W (1990=100) are plotted on Figure 4 and with the Average Wage Index on Figure 5. In 2006 our minimum wage worker's W-2 income was in the 35th percentile of all workers, including part timers. The median worker was, by definition, at the 50th percentile, our average worker was in the 73rd percentile and the maximum in the 94th percentile; only about 6% of W-2 earners having an income at or above the taxable maximum cap. In 1979, the earliest year for which data are readily available, 13.4 percent of hourly workers were paid at or below the minimum wage; by 2006 that percentage had declined to 2.3%.[8] In order to keep the analysis tractable, it is assumed that each of the four hypothetical workers earned the specified amount throughout their careers.[9]

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7 Alternative measures of median income are examined in detail by L. Scott Muller (2008). The median figures referred to in the text are from www.socialsecurity.gov/OACT/COLA/central.htm, but this series only goes back to 1990. Elsewhere this study uses the series compiled by Muller from back issues of the *Annual Statistical Supplements*, *Social Security Bulletin* because it covers the entire historical period of interest. While not fully comparable to the Average Wage Index, it is close enough for the purposes of this study.

8 http://www.bls.gov/cps/minwage2007tbls.htm#10

9 In practice, a worker's relative position in the income distribution tends to change over the years, rising early in their careers as they develop skills and obtain seniority and dropping in later years if they suffer a decline in physical stamina or their human capital suffers from obsolescence. Clingman and Nichols (2006) of the Social Security Administration suggest that earnings typically peak at age 48 or 49. They have developed "scaled factors" to take this age-earning profile complication into account, but only through age 64, which is too short for our study. This is not a problem for either the maximum or minimum wage earners. High income workers earning rewards in excess of the taxable maximum do have their income time path for OASI tax and benefit calculations accurately captured by the cap. And our minimum wage earner reflects the position of those who are frozen in minimum wage jobs throughout their career. But the complication does mean that the Average and Median Wage Earner income paths only approximate the typical earning histories of the majority of workers near the center of the income distribution. More may be learned in future research based on micro data sets.

Table 2: Earnings, Inflation and Interest Rates

	Earnings………………………				Inflation………………………………………					Trust fund interest rates….		
	MinWage	Median	Average	TaxMax	CPI-W	AWI	Annual Inflation Rates			nominal	real………………	
Year	Income	Wage	Wage		1990=100		CPI-W	AWI	difference	r	r – CPI	r - AWI
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1950	920	1,926		3,000	18.8							
1951	1,500	2,097	2,799	3,600	20.1	13.3	7.24			2.9	-4.3	
1952	1,500	2,258	2,973	3,600	20.7	14.1	2.80	6.22	-3.4	2.2	-0.6	-4.0
1953	1,500	2,400	3,139	3,600	20.8	14.9	0.62	5.59	-5.0	2.3	1.7	-3.3
1954	1,500	2,425	3,156	3,600	20.8	15.0	0.00	0.52	-0.5	2.3	2.3	1.8
1955	1,500	2,438	3,301	4,200	20.8	15.7	-0.37	4.62	-5.0	2.2	2.6	-2.4
1956	1,875	2,599	3,532	4,200	21.2	16.8	1.98	6.99	-5.0	2.4	0.4	-4.6
1957	2,000	2,651	3,642	4,200	21.9	17.3	3.52	3.10	0.4	2.5	-1.0	-0.6
1958	2,000	2,674	3,674	4,200	22.4	17.5	2.22	0.88	1.3	2.5	0.3	1.6
1959	2,000	2,837	3,856	4,800	22.6	18.3	0.92	4.95	-4.0	2.6	1.7	-2.4
1960	2,000	2,894	4,007	4,800	22.9	19.1	1.48	3.92	-2.4	2.6	1.1	-1.3
1961	2,100	2,938	4,087	4,800	23.2	19.4	1.12	1.99	-0.9	2.7	1.6	0.7
1962	2,300	3,058	4,291	4,800	23.5	20.4	1.11	5.01	-3.9	2.8	1.7	-2.2
1963	2,367	3,149	4,397	4,800	23.8	20.9	1.42	2.45	-1.0	2.9	1.5	0.4
1964	2,500	3,298	4,576	4,800	24.1	21.8	1.19	4.09	-2.9	3.1	1.9	-1.0
1965	2,500	3,414	4,659	4,800	24.5	22.2	1.71	1.80	-0.1	3.2	1.5	1.4
1966	2,500	3,566	4,938	6,600	25.3	23.5	3.25	6.00	-2.8	3.5	0.3	-2.5
1967	2,775	3,716	5,213	6,600	25.9	24.8	2.64	5.57	-2.9	3.7	1.1	-1.9
1968	3,167	3,945	5,572	7,800	27.1	26.5	4.45	6.87	-2.4	3.9	-0.6	-3.0
1969	3,200	4,173	5,894	7,800	28.6	28.0	5.59	5.78	-0.2	4.4	-1.2	-1.4
1970	3,200	4,375	6,186	7,800	30.2	29.4	5.65	4.96	0.7	5.0	-0.7	0.0
1971	3,200	4,605	6,497	7,800	31.5	30.9	4.33	5.02	-0.7	5.2	0.9	0.2
1972	3,200	4,870	7,134	9,000	32.5	33.9	3.09	9.80	-6.7	5.3	2.2	-4.5
1973	3,200	5,184	7,580	10,800	34.7	36.0	6.87	6.26	0.6	5.7	-1.2	-0.6
1974	3,733	5,536	8,031	13,200	38.7	38.2	11.45	5.94	5.5	6.2	-5.2	0.3
1975	4,200	5,803	8,631	14,100	42.1	41.0	8.75	7.47	1.3	6.6	-2.1	-0.9
1976	4,600	6,235	9,226	15,300	44.4	43.9	5.42	6.90	-1.5	6.7	1.3	-0.2
1977	4,600	6,630	9,779	16,500	47.4	46.5	6.71	5.99	0.7	6.9	0.2	0.9
1978	5,300	7,204	10,556	17,700	51.1	50.2	7.91	7.94	0.0	7.2	-0.7	-0.7
1979	5,800	7,930	11,479	22,900	57.3	54.6	12.05	8.75	3.3	7.4	-4.6	-1.3
1980	6,200	8,549	12,513	25,900	64.6	59.5	12.77	9.01	3.8	8.5	-4.3	-0.5
1981	6,700	9,361	13,773	29,700	71.5	65.5	10.73	10.07	0.7	9.9	-0.8	-0.2
1982	6,700	9,914	14,531	32,400	75.6	69.1	5.67	5.51	0.2	10.9	5.2	5.4
1983	6,700	10,318	15,239	35,700	77.4	72.5	2.41	4.87	-2.5	10.9	8.5	6.0
1984	6,700	10,704	16,135	37,800	80.1	76.7	3.51	5.88	-2.4	11.8	8.3	5.9
1985	6,700	11,265	16,823	39,600	82.6	80.0	3.14	4.26	-1.1	11.3	8.2	7.0
1986	6,700	11,831	17,322	42,000	83.7	82.4	1.27	2.97	-1.7	11.3	10.0	8.3
1987	6,700	12,327	18,427	43,800	87.2	87.6	4.20	6.38	-2.2	10.1	5.9	3.7
1988	6,700	12,824	19,334	45,000	90.7	91.9	4.00	4.93	-0.9	9.8	5.8	4.9
1989	6,700	13,392	20,100	48,000	94.9	95.6	4.70	3.96	0.7	9.6	4.9	5.6
1990	7,460	13,910	21,028	51,300	100.0	100.0	5.32	4.62	0.7	9.3	4.0	4.7
1991	8,360	14,278	21,812	53,400	103.7	103.7	3.70	3.73	0.0	9.1	5.4	5.4
1992	8,500	14,739	22,935	55,500	106.8	109.1	3.02	5.15	-2.1	8.7	5.7	3.5
1993	8,500	15,000	23,133	57,600	109.6	110.0	2.59	0.86	1.7	8.3	5.7	7.4
1994	8,500	15,560	23,754	60,600	112.7	113.0	2.83	2.68	0.1	8.0	5.2	5.3
1995	8,500	16,108	24,706	61,200	115.7	117.5	2.62	4.01	-1.4	7.9	5.3	3.9
1996	8,750	16,712	25,914	62,700	119.0	123.2	2.93	4.89	-2.0	7.7	4.8	2.8
1997	9,767	17,562	27,426	65,400	121.5	130.4	2.09	5.84	-3.7	7.6	5.5	1.8
1998	10,300	18,513	28,861	68,400	123.2	137.3	1.35	5.23	-3.9	7.3	5.9	2.1
1999	10,300	19,265	30,470	72,600	126.2	144.9	2.46	5.57	-3.1	7.0	4.5	1.4
2000	10,300	20,225	32,155	76,200	130.6	152.9	3.52	5.53	-2.0	6.9	3.4	1.4
2001	10,300	20,905	32,922	80,400	134.1	156.6	2.61	2.39	0.2	6.7	4.1	4.3
2002	10,300	21,194	33,252	84,900	135.9	158.1	1.40	1.00	0.4	6.4	5.0	5.4
2003	10,300	21,622	34,065	87,000	138.8	162.0	2.11	2.44	-0.3	6.0	3.9	3.6
2004	10,300	22,308	35,649	87,900	142.5	169.5	2.66	4.65	-2.0	5.7	3.0	1.1
2005	10,300	22,887	36,953	90,000	148.3	175.7	4.11	3.66	0.4	5.4	1.3	1.7
2006	10,300	23,775	38,651	94,200	153.2	183.8	3.30	4.60	-1.3	5.3	2.0	0.7
2007	10,883		-	97,500	156.7		2.28			5.2	2.9	5.2
Summary statistics, 1952 to 2006												
Minimum	1,500	2,258	2,973	3,600	20.7	14.1	-0.4	0.5	-6.7	2.2	-5.2	-4.6
Maximum	10,300	23,775	38,651	94,200	153.2	183.8	12.8	10.1	5.5	11.8	10.0	8.3
Average	5,597	9,779	14,871	32,987	68.4	70.7	3.8	4.9	-1.1	6.2	2.4	1.3
$\bar{S}$	3,177	6,801	11,065	30,405	45.3	52.2	2.9	2.1	2.3	2.8	3.3	3.2
Median	5,800	7,930	11,479	22,900	57.3	54.6	3.0	5.0	-1.0	6.4	1.9	0.9

Figure 3: Income History

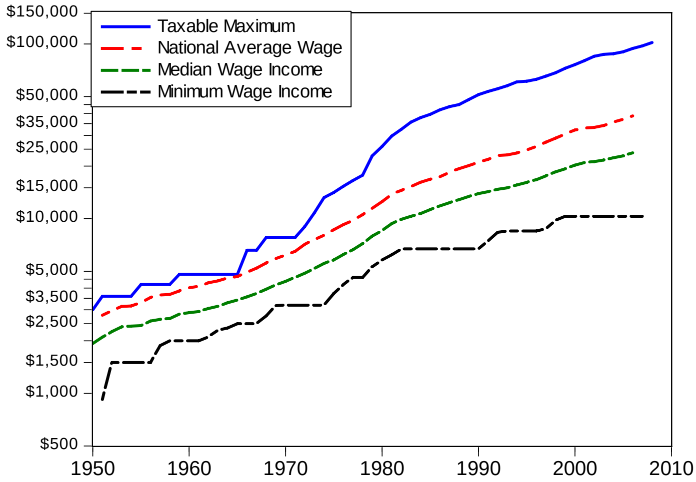


Figure 4: CPI-W Deflated Incomes (1990 = 100)

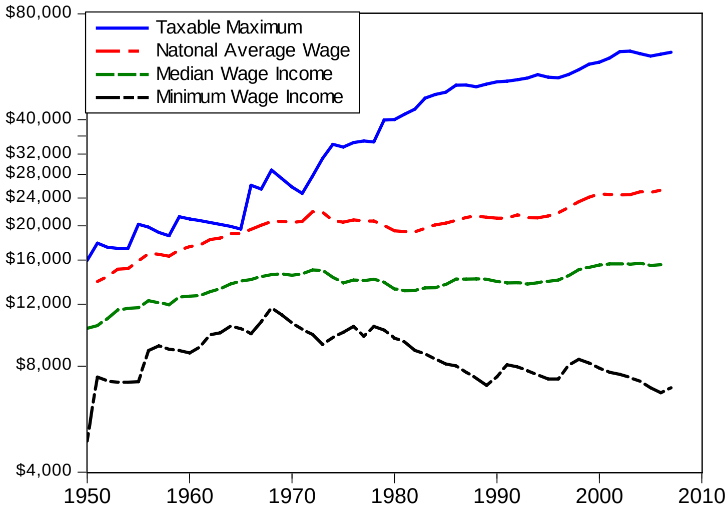
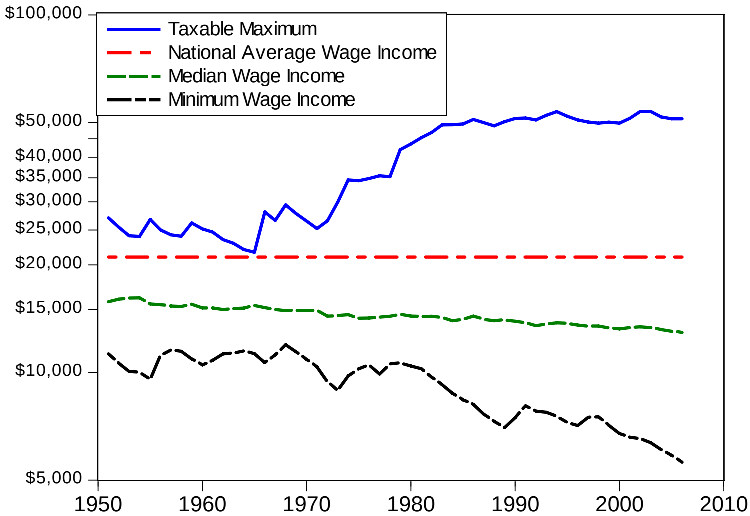


Figure 5: Average Wage Index Deflated Incomes (1990 = 100)



3.1 Indexing Problem #1: Incomplete Wage Indexing

Because earnings adjusted for wage inflation up through the 60th year are commingled with undeflated earnings in subsequent years, as shown by (3), many workers are credited with exaggerated Average Index Monthly Earnings. This results in an enlarged Primary Insurance Amount, leading to a larger OASI benefit than would be awarded if the entire earning history were wage indexed. We shall consider how three alternatives to this incomplete indexing procedure would affect workers in different income classes. After first considering the extreme case of wage earners who continue working until age 75, we shall look at how the choice of retirement date affects the benefits generated by alternative inflation indexing procedures.

The top four rows of Table 3 contrasts the benefit of the Maximum Wage Earner under the current incomplete wage indexing procedure with three alternatives: (1) indexing earnings after age 60 with the Average Wage Index, (2) wage indexing of earnings to age 60 and the CPI-W in subsequent years, and (3) indexing all earnings with the CPI-W. Because the choice of deflation procedure for calculating benefits does not change the income paths of the four classes of workers, the same amount of tax revenue is raised regardless of the indexing procedure.[10]

Table 3: Effect of Full Indexing on the Annual Benefits of Workers Retiring at Age 75

Date of Birth: 1930; postponed benefits until age 70; worked until 75 birthday	Benefit	SSA Bonus $	SSA Bonus %	Spouse Benefit	Primary + Spouse Benefit	SSA Bonus
Maximum Wage Earner						
SSA: Wage Indexing only until 60	25,812	0	0%	12,906	38,718	0
Full wage indexed earnings	24,000	1,812	7.0%	12,000	36,000	2,718
Wage indexed to 60, then CPI-W	24,468	1,344	5.2%	12,234	36,702	2,016
CPI-W indexed earnings	24,084	1,728	6.7%	12,042	36,126	2,592
Average Wage Earner						
SSA: Wage Indexing only until 60	17,424	0	0%	8,712	26,136	0
Full wage indexed earnings	15,852	1,572	9.0%	7,926	23,778	2,358
Wage indexed to 60, then CPI-W	16,260	1,164	6.7%	8,130	24,390	1,746
CPI-W indexed earnings	16,080	1,344	7.7%	8,040	24,120	2,016
Median Wage Earner						
SSA: Wage Indexing only until 60	13,392	0	0%	6,696	20,088	0
Full wage indexed earnings	12,564	828	6.2%	6,282	18,846	1,242
Wage indexed to 60, then CPI-W	12,696	696	5.2%	6,348	19,044	1,044
CPI-W indexed earnings	12,204	1,188	8.9%	6,102	18,306	1,782
Minimum Wage Earner						
SSA: Wage Indexing only until 60	10,296	0	0%	5,148	15,444	0
Full wage indexed earnings	10,164	132	1.3%	5,082	15,246	198
Wage indexed to 60, then CPI-W	10,164	132	1.3%	5,082	15,246	198
CPI-W indexed earnings	9,540	756	7.3%	4,770	14,310	1,134

Note: Full CPI-W indexing includes CPI-W adjustment of bend points

10 The possible secondary effects of changes in benefits on the incentives to work and to save and the tertiary effect of such changes on capital accumulation and worker productivity in future years are beyond the scope of this paper. In the full CPI-W row the bend points determining the position of the PIA function that was plotted on Figure 2 are also indexed with the CPI-W instead of the wage index, but this happens to have only a small effect on the benefits of workers born in 1930 because the increase in the CPI-W from 1977 to 1990 was almost identical to that of the wage index, as can be seen from Figure 1.

As an extreme example, consider a maximum wage earner who continued working until age 75. With wage indexing only until age 60, the maximum wage earner's annual benefit is $25,812 per year (see Table 3). If, however, full wage indexing were extended to W-2 income earned after age 60, this worker would receive $24,000. Thus our worker enjoys an undeflated OASI benefit bonus of $1,812 in the first year of retirement. Or to put it another way, the adoption of full wage indexing would save the Social Security Administration $1,812 in the first year of retirement. This benefit bonus continues, indexed for inflation with the CPI-W, throughout the retirement years. If the spousal benefit is also claimed during retirement, the combined benefit for worker and spouse would be $38,718 with incomplete indexing versus $36,000 with full wage indexing, a difference of $2,718. This annual undeflated benefit bonus will continue until one or the other of the marital partners dies—at age 65 the life expectancy of the first to die is 80. More than this, a surviving partner may continue to claim a bonus because a widow(er)'s benefit equals that of the deceased spouse if it is higher than that based on one's own earning history—the life expectancy of the second to die at age 65 is 91.[11]

The experience of the Average Wage Earner, the Median Wage Earner and the Minimum Wage Earner are presented in subsequent rows of this table. Note that the maximum wage earner's case is extreme. The minimum wage earner would lose only $132 per year from a shift from incomplete wage indexing to either mixed earnings/CPI-W indexing or full earnings indexing. However, a shift from the current incomplete indexing procedure to full CPI-W indexing would result in a $672 reduction in the minimum wage earner's annual benefit, which in percentage terms looms larger than the reduction for the maximum income worker.

As was reported on Table 1, workers who retire before the normal retirement age are penalized by a reduction in OASI benefits while those working later in life are rewarded. Thus a worker born in 1930 who elects to retire at age 62 is scheduled to receive only 80% of the PIA. According to the schedule on Table 1, that worker could receive a 122.5% of the PIA by postponing the start of retirement benefits until age 70. But the worker's PIA itself may be affected by how late in life our worker continues to earn W-2 income. Extra large benefits may result from postponing retirement until age 75, but only if those extra current dollar earnings are large enough to count among the highest 35 years.

Table 4 shows in successive columns how the benefits depend on how late in life our worker continued to work and when she started to receive benefits. In all cases, benefits after the first year of retirement continue to be indexed by the CPI-W to the initial benefit. Panel A reports benefits when W-2 income is indexed only through age 60, the current procedure. Thus the first three entries in the top row show the benefits with partial wage indexing for the first year of retirement for maximum wage earners who began receiving benefits at age 62, at age 65 or at age 70; and the fourth entry in that row reports the benefit for a worker who continued working to age 75 but started benefits at age 70. Panel B shows what the benefits for these workers would be with complete wage indexing. The columns of Panel C are wage indexed until 60 and then indexed with the CPI-W. Those of Panel D are fully indexed by the CPI-W;

[11] Life expectancy estimates for 2nd to die from Mahaney and Carlson (2007), p 39.

Table 4: Annual OASI Benefits—Earned Income Indexing Alternatives

Date of birth = 1930

	A. SSA: Wage indexed only until 60				B. Wage Indexed Earnings			
Age Retirement Started:	62	65	70	75	62	65	70	75
Age Benefits Started:	62	65	70	70	62	65	70	70
Nominal (at age benefit started)								
Maximum Wage Earner	10,260	14,400	21,048	25,812	10,248	14,316	20,436	24,000
Average Wage Earner	7,536	10,308	14,568	17,424	7,536	10,236	14,040	15,852
Median Wage Earner	5,964	8,136	11,388	13,392	5,964	8,112	11,124	12,564
Minimum Wage Earner	4,824	6,564	9,060	10,296	4,824	6,564	9,000	10,164
Real, CPI-W, year 2005 = 100	72.0	77.9	88.1	100.0				
Maximum Wage Earner	14,244	18,475	23,901	25,812	14,228	18,367	23,206	24,000
Average Wage Earner	10,462	13,225	16,542	17,424	10,462	13,132	15,943	15,852
Median Wage Earner	8,280	10,438	12,931	13,392	8,280	10,407	12,632	12,564
Minimum Wage Earner	6,697	8,421	10,288	10,296	6,697	8,421	10,220	10,164
Real, relative to benefit at age of entitlement (62)								
Maximum Wage Earner	1.00	1.30	1.68	1.81	1.00	1.29	1.63	1.68
Average Wage Earner	1.00	1.26	1.58	1.67	1.00	1.26	1.52	1.52
Median Wage Earner	1.00	1.26	1.56	1.62	1.00	1.26	1.53	1.52
Minimum Wage Earner	1.00	1.26	1.54	1.54	1.00	1.26	1.53	1.52

	C. Wage Indexed to 60, then CPI				D. CPI indexed Earnings			
Age Retirement Started:	62	65	70	75	62	65	70	75
Age Benefits Started:	62	65	70	70	62	65	70	70
Nominal (at age benefit started)								
Maximum Wage Earner	10,248	14,328	20,568	24,468	9,900	13,908	20,160	24,084
Average Wage Earner	7,536	10,236	14,160	16,260	7,176	9,888	13,872	16,080
Median Wage Earner	5,964	8,112	11,148	12,696	5,628	7,680	10,656	12,204
Minimum Wage Earner	4,824	6,564	9,000	10,164	4,512	6,144	8,448	9,540
Real, CPI-W, year 2005 = 100								
Maximum Wage Earner	14,228	18,382	23,356	24,468	13,744	17,843	22,892	24,084
Average Wage Earner	10,462	13,132	16,079	16,260	9,963	12,686	15,752	16,080
Median Wage Earner	8,280	10,407	12,659	12,696	7,814	9,853	12,100	12,204
Minimum Wage Earner	6,697	8,421	10,220	10,164	6,264	7,882	9,593	9,540
Real, relative to benefit at age of entitlement (62)								
Maximum Wage Earner	1.00	1.29	1.64	1.72	1.00	1.30	1.67	1.75
Average Wage Earner	1.00	1.26	1.54	1.55	1.00	1.27	1.58	1.61
Median Wage Earner	1.00	1.26	1.53	1.53	1.00	1.26	1.55	1.56
Minimum Wage Earner	1.00	1.26	1.53	1.52	1.00	1.26	1.53	1.52

furthermore, the bend points for that panel are indexed with the CPI-W instead of the wage index.

The increase in nominal benefits for workers who delay retirement results in part from the additional earnings after age 62, provided they are large enough to be counted among the 35 highest income years. But as is clear from the real benefit figures on Panel A of Table 4, the reward for postponing retirement is far from uniform. Why is it that under the current SSA procedure of wage indexing only until age 60, the maximum wage earner receives an 81% increase in CPI-W deflated benefits for delaying retirement and continuing to work until 75, the average wage earner a 67% gain, the median earner a 62% gain and the minimum wage earner only 54%? And why is the incentive to delay retirement less with complete wage indexing, particularly for high income workers? Why do late working high income workers fair better with CPI than with wage indexed earnings (Panel B versus Panel D)? Are these variations in the incentive to retire the unintended consequence of arcane provisions in the Social Security statutes rather than the result of intelligent design or legislative intent? To answer such questions we will have to look closely at the earning history of our representative workers.

Table 5: The Maximum Wage Earners 35 Best Years—Alternative Indexing Procedures

date of birth: 1930

		A. SSA: Wage indexed earnings until 60; then not ……					B. Wage Indexed …….		C. Wage Indexed until 60; then CPI		D. CPI indexed	
age	year	partly indexed earnings	rank	Retire at 62 high 35 earnings	Retire at 65 high 35 earnings	Retire at 75 high 35 earnings	indexed earnings	Retire at 75 high 35 earnings	indexed earnings	Retire at 75 high 35 earnings	indexed earnings	Retire at 75 high 35 earnings
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
21	1951	27,044	23	27,044	27,044		27,044		27,044		17,849	
22	1952	25,460	29	25,460	25,460		25,460		25,460		17,384	
23	1953	24,113	35	24,113			24,113		24,113		17,256	
24	1954	23,989	37				23,989		23,989		17,256	
25	1955	26,751	24	26,751	26,751		26,751		26,751		20,207	
26	1956	25,002	32	25,002	25,002		25,002		25,002		19,839	
27	1957	24,252	34	24,252			24,252		24,252		19,143	
28	1958	24,040	36				24,040		24,040		18,748	
29	1959	26,177	28	26,177	26,177		26,177		26,177		21,208	
30	1960	25,189	31	25,189	25,189		25,189		25,189		20,923	
31	1961	24,698	33	24,698			24,698		24,698		20,715	
32	1962	23,520	38				23,520		23,520		20,443	
33	1963	22,957	39				22,957		22,957		20,179	
34	1964	22,056	40				22,056		22,056		19,921	
35	1965	21,666	41				21,666		21,666		19,608	
36	1966	28,103	21	28,103	28,103	28,103	28,103	28,103	28,103	28,103	26,138	
37	1967	26,621	25	26,621	26,621		26,621		26,621		25,440	
38	1968	29,437	20	29,437	29,437	29,437	29,437	29,437	29,437	29,437	28,785	28,785
39	1969	27,829	22	27,829	27,829	27,829	27,829	27,829	27,829	27,829	27,237	27,237
40	1970	26,513	27	26,513	26,513		26,513		26,513		25,782	
41	1971	25,245	30	25,245	25,245		25,245		25,245		24,713	
42	1972	26,529	26	26,529	26,529		26,529		26,529		27,704	27,704
43	1973	29,960	19	29,960	29,960	29,960	29,960	29,960	29,960	29,960	31,107	31,107
44	1974	34,563	17	34,563	34,563	34,563	34,563	34,563	34,563	34,563	34,089	34,089
45	1975	34,353	18	34,353	34,353	34,353	34,353	34,353	34,353	34,353	33,484	33,484
46	1976	34,870	16	34,870	34,870	34,870	34,870	34,870	34,870	34,870	34,445	34,445
47	1977	35,479	14	35,479	35,479	35,479	35,479	35,479	35,479	35,479	34,851	34,851
48	1978	35,259	15	35,259	35,259	35,259	35,259	35,259	35,259	35,259	34,627	34,627
49	1979	41,948	13	41,948	41,948	41,948	41,948	41,948	41,948	41,948	39,983	39,983
50	1980	43,523	12	43,523	43,523	43,523	43,523	43,523	43,523	43,523	40,100	40,100
51	1981	45,344	11	45,344	45,344	45,344	45,344	45,344	45,344	45,344	41,529	41,529
52	1982	46,885	10	46,885	46,885	46,885	46,885	46,885	46,885	46,885	42,859	42,859
53	1983	49,261	8	49,261	49,261	49,261	49,261	49,261	49,261	49,261	46,144	46,144
54	1984	49,263	7	49,263	49,263	49,263	49,263	49,263	49,263	49,263	47,168	47,168
55	1985	49,500	6	49,500	49,500	49,500	49,500	49,500	49,500	49,500	47,941	47,941
56	1986	50,986	3	50,986	50,986	50,986	50,986	50,986	50,986	50,986	50,191	50,191
57	1987	49,984	5	49,984	49,984	49,984	49,984	49,984	49,984	49,984	50,217	50,217
58	1988	48,943	9	48,943	48,943	48,943	48,943	48,943	48,943	48,943	49,622	49,622
59	1989	50,217	4	50,217	50,217	50,217	50,217	50,217	50,217	50,217	50,569	50,569
60	1990	51,300	2	51,300	51,300	51,300	51,300	51,300	51,300	51,300	51,300	51,300
61	1991	53,400	1	53,400	53,400	53,400	51,482	51,482	51,497	51,497	51,497	51,497
62	1992	55,500			55,500	55,500	50,884	50,884	51,941	51,941	51,941	51,941
63	1993	57,600			57,600	57,600	52,359	52,359	52,544	52,544	52,544	52,544
64	1994	60,600			60,600	60,600	53,647	53,647	53,770	53,770	53,770	53,770
65	1995	61,200				61,200	52,090	52,090	52,929	52,929	52,929	52,929
66	1996	62,700				62,700	50,878	50,878	52,683	52,683	52,683	52,683
67	1997	65,400		**Not**		65,400	50,143	50,143	53,803	53,803	53,803	53,803
68	1998	68,400		**Indexed**		68,400	49,835	49,835	55,532	55,532	55,532	55,532
69	1999	72,600				72,600	50,103	50,103	57,540	57,540	57,540	57,540
70	2000	76,200				76,200	49,832	49,832	58,329	58,329	58,329	58,329
71	2001	80,400				80,400	51,353	51,353	59,988	59,988	59,988	59,988
72	2002	84,900				84,900	53,689	53,689	62,449	62,449	62,449	62,449
73	2003	87,000				87,000	53,704	53,704	62,681	62,681	62,681	62,681
74	2004	87,900				87,900	51,849	51,849	61,687	61,687	61,687	61,687
Sum through age 60				1,200,601	1,127,539	867,007		867,007		867,007		843,952
Sum from age 61 to retirement				53,400	227,100	973,800		721,849		787,371		787,371
TOTAL (Best 35 years)				1,254,001	1,354,639	1,840,807		1,588,857		1,654,379		1,631,324
AIME (Total/35*12)				2,985	3,225	4,382		3,782		3,938		3,884.00
PIA at eligibility				1,069	1,105	1,278		1,188		1,212		1,192.6
Annual benefit				10,260	14,400	25,812		24,000		24,468		24,084

Maximum Wage Earner

Column 1 of Table 5, reports the partially indexed earnings of a worker who always earned at the taxable maximum cap as calculated with (3) in accordance with the OASI procedure by indexing the earnings at the cap (column 4 of Table 2) with the Average

Wage Index (column 6 of Table 2) only through the worker's 60^{th} birthday. Assuming there is inflation, each year worked beyond age 60 by our high income worker results in a high undeflated year replacing an earlier year which had been inflated only to age 60. Columns 3 through 5 on Table 5 shows that the number of unindexed years included among the highest 35 that count in determining benefits depends upon when the worker retires. All this means that under the provisions of the Social Security statutes, the number of unindexed years that are commingled with wage indexed years in calculating the sum of the top 35 depends upon how late in life the worker earns substantial income.[12]

The two rows after the age 74 row decompose the sum of the best 35 years into earnings through age 60 and earnings from age 61 to retirement. Observe from columns (5), (7) and (9) that the sum through age 60 is the same for the first three indexing procedures. The second half of the sum in the next row, age 61 to retirement, depends upon whether these observations are not indexed, are wage indexed, or are CPI-W indexed. Comparing column 5 with column 3 reveals that working to age 75 instead of to 62 replaces thirteen low earning years in the 1950s, 1960s and early 1970's with higher unindexed earnings from 1991 on. That explains why the benefits of long career workers are more sensitive to the choice of index than shorter career workers whose post 60 earnings make up a smaller share of their 35 highest earning years.

As a result of the partial indexing procedure, less than half of the total earnings for the worker who continues to earn the cap to age 75, column 5, are indexed. The PIA at eligibility, used in calculating the worker's benefits, is 7.6% higher with incomplete wage indexing than would be generated by the case of full wage indexing of column 7. Columns 9 and 11 show how the PIA and hence the benefit for a worker retiring at 75 would be affected by the adoption of alternative full indexing procedures.

Minimum Wage Earner

A worker who earned only the minimum wage throughout an equally long career has a quite different outcome. As was reported on Table 4, with only two exceptions, the Minimum Wage Earner's benefits are the same with wage indexing only to age 60, full wage indexing, or wage indexing to age 60 then CPI; the exception is partial indexing for a worker who manages to postpone retirement until 70 or 75. Why? Table 6 shows that with that one exception our worker's earnings after age 60 are dropped rather than counted among the 35 highest earning years of (4). This happens because the minimum wage was allowed to fall so far behind inflation—see columns (3), (4), (7) and (9). Indeed, the real minimum wage, indexed with either the wage index or CPI-W (columns 6 or 10), was lower in 2004 than it was in 1951.

Average Earner

The average workers indexed income is recorded in column (12) of Table 6. It is a constant \$21,028 through our worker's 60^{th} birthday because it is deflated with the wage

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[12] The table may over or understate the contribution to the OASI benefit of earnings after age 62 for women who were not in the labor force when their children were young. It will understate the benefit of a women who had worked fewer than 35 years before reaching age 62 because then the dropped years involve zero rather than positive earnings. But the spousal benefit complicates the story: delaying retirement from the workforce will not increase her OASI retirement benefit if her husband's benefit remains more than twice the benefit based on the women's own earnings history.

index constructed with the same nominal series. After the 60th birthday the undeflated wage data is used by the SSA. Because of the wage inflation, the income for all years worked after age 60 is included among the 35 highest. None the less, the gain in benefits from postponing retirement is not as great as that of the maximum income worker because of the increased skewness of the income distribution.

Recommendation:

Partial indexing is hard to defend. It obviously contributes to Social Security's financial problems, although a precise estimate of its total impact must be left for future research

Table 6: Selecting the 35 Best Years for Minimum and Average Wage Workers

date of bireth: 1930

		Minimum Wage Worker										Average Income	
		A. SSA: Wage indexed earnings until 60, then not ……………………………				B. Wage Indexed …….		C. Wage Indexed until 60; then CPI		D. CPI indexed ……..		A. SSA: Wage Indexed until 60, then not	
		partly	Retire at 62	Retire at 65	Retire at 75		Retire at 75		Retire at 75		Retire at 75		Retire at 75
	earnings	indexed	high 35	high 35	high 35	indexed	high 35	indexed	high 35	indexed	high 35	indexed	high 35
year		earnings	earnings	earnings	earnings	earnings	earnings	earnings	earnings	earnings	earnings	earnings	earnings
		(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1951	1,500	11,268	11,268	11,268	11,268	11,268	11,268	11,268	11,268	7,437		21,028	21,028
1952	1,500	10,608	10,608	10,608	10,608	10,608	10,608	10,608	10,608	7,243		21,028	
1953	1,500	10,047	10,047	10,047	10,047	10,047	10,047	10,047	10,047	7,190		21,028	21,028
1954	1,500	9,995	9,995	9,995	9,995	9,995	9,995	9,995	9,995	7,190		21,028	21,028
1955	1,500	9,554	9,554	9,554		9,554	9,554	9,554	9,554	7,217		21,028	
1956	1,917	11,410	11,410	11,410	11,410	11,410	11,410	11,410	11,410	9,054	9,054	21,028	
1957	2,000	11,548	11,548	11,548	11,548	11,548	11,548	11,548	11,548	9,116	9,116	21,028	
1958	2,000	11,448	11,448	11,448	11,448	11,448	11,448	11,448	11,448	8,928	8,928	21,028	
1959	2,000	10,907	10,907	10,907	10,907	10,907	10,907	10,907	10,907	8,837	8,837	21,028	
1960	2,000	10,495	10,495	10,495	10,495	10,495	10,495	10,495	10,495	8,718	8,718	21,028	
1961	2,100	10,805	10,805	10,805	10,805	10,805	10,805	10,805	10,805	9,063	9,063	21,028	21,028
1962	2,300	11,270	11,270	11,270	11,270	11,270	11,270	11,270	11,270	9,796	9,796	21,028	
1963	2,367	11,319	11,319	11,319	11,319	11,319	11,319	11,319	11,319	9,949	9,949	21,028	21,028
1964	2,500	11,487	11,487	11,487	11,487	11,487	11,487	11,487	11,487	10,375	10,375	21,028	
1965	2,500	11,284	11,284	11,284	11,284	11,284	11,284	11,284	11,284	10,212	10,212	21,028	21,028
1966	2,500	10,645	10,645	10,645	10,645	10,645	10,645	10,645	10,645	9,901	9,901	21,028	21,028
1967	2,775	11,193	11,193	11,193	11,193	11,193	11,193	11,193	11,193	10,697	10,697	21,028	
1968	3,167	11,951	11,951	11,951	11,951	11,951	11,951	11,951	11,951	11,686	11,686	21,028	21,028
1969	3,200	11,417	11,417	11,417	11,417	11,417	11,417	11,417	11,417	11,174	11,174	21,028	21,028
1970	3,200	10,877	10,877	10,877	10,877	10,877	10,877	10,877	10,877	10,577	10,577	21,028	21,028
1971	3,200	10,357	10,357	10,357	10,357	10,357	10,357	10,357	10,357	10,139	10,139	21,028	
1972	3,200	9,432	9,432	9,432		9,432	9,432	9,432	9,432	9,850	9,850	21,028	21,028
1973	3,200	8,877	8,877	8,877		8,877	8,877	8,877	8,877	9,217	9,217	21,028	21,028
1974	3,733	9,775	9,775	9,775	9,775	9,775	9,775	9,775	9,775	9,641	9,641	21,028	21,028
1975	4,200	10,233	10,233	10,233	10,233	10,233	10,233	10,233	10,233	9,974	9,974	21,028	21,028
1976	4,600	10,484	10,484	10,484	10,484	10,484	10,484	10,484	10,484	10,356	10,356	21,028	
1977	4,600	9,891	9,891	9,891	9,891	9,891	9,891	9,891	9,891	9,716	9,716	21,028	21,028
1978	5,300	10,558	10,558	10,558	10,558	10,558	10,558	10,558	10,558	10,369	10,369	21,028	
1979	5,800	10,624	10,624	10,624	10,624	10,624	10,624	10,624	10,624	10,127	10,127	21,028	
1980	6,200	10,419	10,419	10,419	10,419	10,419	10,419	10,419	10,419	9,599	9,599	21,028	
1981	6,700	10,229	10,229	10,229	10,229	10,229	10,229	10,229	10,229	9,368	9,368	21,028	21,028
1982	6,700	9,695	9,695	9,695		9,695	9,695	9,695	9,695	8,863	8,863	21,028	
1983	6,700	9,245	9,245	9,245		9,245	9,245	9,245	9,245	8,660	8,660	21,028	21,028
1984	6,700	8,732	8,732	8,732		8,732	8,732	8,732	8,732	8,361	8,361	21,028	21,028
1985	6,700	8,375	8,375			8,375	8,375	8,375	8,375	8,111	8,111	21,028	
1986	6,700	8,134				8,134		8,134		8,007	8,007	21,028	
1987	6,700	7,646				7,646		7,646		7,682		21,028	21,028
1988	6,700	7,287				7,287		7,287		7,388		21,028	
1989	6,700	7,009				7,009		7,009		7,059		21,028	21,028
1990	7,375	7,375				7,375		7,375		7,375		21,028	21,028
1991	8,275	8,275				7,978		7,980		7,980	7,980	21,812	21,812
1992	8,500	8,500		8,500		7,793		7,955		7,955		22,935	22,935
1993	8,500	8,500				7,727		7,754		7,754		23,133	23,133
1994	8,500	8,500				7,525		7,542		7,542		23,754	23,754
1995	8,500	8,500				7,235		7,351		7,351		24,706	24,706
1996	8,750	8,750				7,100		7,352		7,352		25,914	25,914
1997	9,767	9,767	**Not**			7,488		8,035		8,035	8,035	27,426	27,426
1998	10,300	10,300	**Indexed**		10,300	7,504		8,362		8,362	8,362	28,861	28,861
1999	10,300	10,300			10,300	7,108		8,163		8,163	8,163	30,470	30,470
2000	10,300	10,300			10,300	6,736		7,884		7,884		32,155	32,155
2001	10,300	10,300			10,300	6,579		7,685		7,685		32,922	32,922
2002	10,300	10,300			10,300	6,514		7,576		7,576		33,252	33,252
2003	10,300	10,300			10,300	6,358		7,421		7,421		34,065	34,065
2004	10,300	10,300			10,300	6,076		7,228		7,228		35,649	35,649
Sum through age 60			366,457	358,082	302,547		366,457		366,457		298,439		441,587
Sum from age 61 to retirem			0	8,500	72,100		0		0		32,541		397,052
TOTAL (Best 35 years)			366,457	366,582	374,647		366,457		366,457		330,980		838,640
AIME (Total/35*12)			872	872	892		872		872		788		1,996
PIA at eligibility			504	504	510		504		504		473		863
Annual benefit			4,824	6,564	10,296		10,164		10,164		9,540		17,424

based on a detailed analysis of micro data sets.[13] As shown on Table 3, in some cases it awards the largest benefit bonus to the highest income earners. Correcting this problem would probably not affect a worker's decision as to when to retire because it is doubtful that many contemplating delayed retirement either know about the bonus or can predict its magnitude with much precision.

3.2 Indexing Problem #2: Skipped 61st Year Inflation Adjustment

In computing benefits, a worker's earnings are adjusted for wage inflation with an index normalized to equal 100 in the year of the workers 60th birthday ($t = t^b+60$). But the inflation adjustment ratio p_{t-1} / p_{t^b+61} in (6) starts in the year of the 61st birthday. Hence the inflation from age 60 to age 61 is skipped and as a result the Primary Insurance Amount determined by that equation is understated by the ratio p_{t^b+61} / p_{t^b+60}.

Skipping the 61st year inflation means that our worker's OASI is less not only in that year but in every year of retirement. More than this, the spousal and survivor benefits, if exercised are reduced by the same percentage. It is a Social Security lottery, for how much a worker loses from the skipped inflation of the 61st year depends entirely on what the rate of CPI-W inflation happens to be in that year. Those born in 1930 should consider themselves lucky, for prices increased only 3.7% in the year of their 61st birthday, just below the long-run 1952–2006 average of 3.8%. Those born a year earlier were not so fortunate, for their 61st year inflation rate was 5.32%. If in the future we encounter an inflation rate on the order of 12.77%, such as the U.S. experienced in 1980, workers 61 years of age will suffer a 12.77% reduction in the purchasing power of their benefits in every year of their retirement.[14]

Recommendation:

The obvious remedy is to make the calculation include the CPI-W inflation that is experienced in the 61st year. Historically, inflation as measured by the SSA has averaged about 3.8% over the years. This suggests that the omission of the 61st year in computing OASI benefits saves 3.8% of the OASI benefit budget on average, which it can ill afford to lose. Given the financial pressures on the SSA, it might be most appropriate to maintain budget neutrality when making the correction by coupling the "reform" with a proportional reduction of benefits across the board, as has been suggested by Diamond and Orszag (2005:112). Essentially, this replaces the skipped 61st year inflation lottery with an estimate of average inflation, which is an obvious benefit for the risk averse.

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13 Diamond and Orszag briefly mention the incomplete indexing problem (2005: 274, fn 24), but its budget implications were not evaluated by either the Social Security Administration or the Congressional Budget Office(2004) in estimating the long run financial implications of the program changes they proposed.

14 Workers who were 61 in 1980 did not suffer this big a reduction in real benefits because the 1977 Amendments to the Social Security Act to Correct the Original Indexing Procedures included a special "Transitional Guarantee Method" for calculating benefits for workers born in 1917–21 (McKay, 1980). Nevertheless, the reductions were substantial, leading to the formation of the politically active "Notch Generation."

3.3 Indexing Problem #3: The One Year Indexing Lag

As can be seen from (6), there is a one year lag in adjusting benefits for price inflation because inflation is missed in the benefit year for the obvious reason that it has yet to be experienced—the current year p_t will not be known until near the end of that year.[15]

Because the one year inflation indexing lag treats equally every age cohort of those currently receiving OASI benefits, the erratic year-to-year fluctuation in the purchasing power of OASI benefits is not nearly as serious as the Skipped 61[st] year problem, which penalizes those who had the misfortune to experience particularly severe inflation in their 61[st] year. Furthermore, retirees generally have expenditures with sticky prices, such as real estate taxes, Medicare payments and rents. Therefore, the one year indexing lag is not too serious as long as inflation does not become intense.

Recommendation:

The problem is that benefits are determined in advance when obviously the rate of inflation that will prevail is not known. It would be possible to use a predicted rate of inflation, $\hat{p}_t$, together with a simple error-correction adjustment to correct for the prediction error of the preceding year. Here is how such a procedure might operate for a worker born in year t^b who started to draw benefits at age a^s. For the first year of retirement:

$$B_{t^b+a^s} = (\hat{p}_{t^b+a^s} / p_{t^b+a^s-1})(p_{t^b+61} / p_{t^b+60}) B^{SSA}_{t^b+a^s}, \tag{8}$$

where $B^{SSA}_{t^b+a_s}$ denotes the benefit for the 62 year old worker as determined under current Social Security statutes by (7) from the PIA of (6). The first ratio replaces the previous year's price level with an estimate of the level of prices in year a^s and the second ratio corrects the skipped 61[st] year inflation adjustment problem. But this benefit suffers from the $p_{t^b+a^s} - \hat{p}_{t^b+a^s}$ prediction error. For each subsequent year of the worker's life we include a correction for the prior year's prediction error:

$$B_{t^b+k} = [(\hat{p}_{t^b+k} / p_{t^b+k-1}) + (p_{t^b+k-1} - \hat{p}_{t^b+k-1}) / p_{t^b+k-2}](p_{t^b+61} / p_{t^b+60}) B^{SSA}_{t^b+62},\ k > a^s. \tag{9}$$

However, this would not correct for a prediction error made for the final year of the worker's life.

With the simplest forecast, same as last year ($\hat{p}_t = p_{t-1}$), equation (9) reduces to

$$B_{t^b+k} = (p_{t^b+k-1} / p_{t^b+k-2})(p_{t^b+k-1} / p_{t^b+62}) B^{SSA}_{t^b+62}. \tag{10}$$

This differs from $B^{SSA}_{t^b+a^s}$, which can be interpreted as using the p_{t-1} forecast, in that it corrects for both the prior year prediction error and the skipped 61year problem.

It would be better to use a Box-Jenkins forecast of p_t instead of p_{t-1} or, alternatively, a forecast provided by an accepted authority, such as the Chairman of the Federal Reserve Board or the Commissioner of Labor Statistics. The same revision procedure

[15] More precisely, the 3[rd] quarter to 3[rd] quarter change in the CPI-W, as will be explained in Section 5: Wage and Price Indices.

might also be used to avoid the two year lag involved in the adjustment of the PIA function bend points, (6), for changes in the Average Wage Index.

The adoption of a revision procedure has an additional benefit: it will allow the fixed weight CPI-W index, which has as its primary advantage that it is seldom revised, to be replaced with a more appropriate superlative index recognizing that in response to price changes consumers adjust the composition of their market basket of purchases, substituting away from commodities that increase most in price. The National Research Council's Panel on Conceptual, Measurement, and Other Statistical Issues in Developing Cost-of-Living Indexes, proposed in *At What Price* (2002, Conclusion #7.1:194):

> "It would be feasible and appropriate to calculate cost-of-living allowances provided for by social security and other programs from an advance estimate of the BLS published superlative index. Any divergence between that estimate and the superlative that appears 2 years later could be incorporated as a correction to the cost-of-living allowance provided for that year."

3.4 Indexing Problem #4: The 60th Year Wage Index Bounce

It may seem counterintuitive, but OASI benefits are hypersensitive to what the level of average wage income happens to be in the worker's 60th year. To see why, recall that as one of the very first steps in calculating OASI benefits, annual earnings up to the worker's 60th year are indexed with the Average Wage Index, which is normalized to equal 100 in the workers 60th year. Differentiating (2) defining the wage index with respect to the average wage in the worker's 60th year, yields

$$\frac{\partial w_t}{\partial \overline{E}^{w-2}_{t_b+60}} = -\overline{E}_t / \overline{E}^2_{t_b+60} = -w_t / \overline{E}_{t_b+60} < 0 \tag{11}$$

and elasticity

$$\eta = -\frac{\partial w_t}{\partial \overline{E}^{w-2}_{t_b+60}} \frac{\overline{E}^{w-2}_{t_b+60}}{w_t} = 1 . \tag{12}$$

Consequently, the percentage change in indexed earnings up to year 60 is also equal to the percentage change in $\overline{E}^{w-2}_{t^b+60}$. However, indexed earnings in year t^b+60 do not change because by construction $w_{t^b+60} = 1$. Further, post age 60 earnings are not affected by the wage index bounce because earnings after age 60 are not deflated. Therefore, a worker's AIME will not change by as large a percentage as the increase in the average wage in the 60th year. However, benefits derived from the new AIME will increase because the bend points defining the function plotted on Figure 2 will shift upwards in proportion to the wage inflation.

To illustrate the index bounce problem, consider an experimental shift of \$480 from the National Average Wage income of 1991 to 1990; i.e., we increase the 1990 average wage from \$21,028 to \$21,508 (2.3%) and decrease the 1991 level from \$21,812 to \$21,332, as illustrated on column E1 of Table 7. This perturbation is equal to the standard deviation of annual changes in the NAW. It is small relative to the $1,208 jump in the NAW from 1995 to 1996. It does not affect the total undeflated lifetime income or the total OASI tax payments of the Average Wage Earner born in 1930. And there is no change in either the income or the taxes of the Maximum Income or the Minimum Wage Worker. Nevertheless, the perturbation does make quite a difference to the worker's OASI benefit throughout retirement.

Table 7 shows how the wage index used for calculating the benefits for this and all other workers of the same age, because they are normalized to equal 100 in the 60th year, will be lower in all the other working years (Compare experiment column E6 with control column C6). When the worker's nominal earnings for all years prior to the 60th are divided by the revised index, the indexed earnings will be about 2.3% higher than if the shift had not occurred (column E10). Also, the change in the National Average Wage in 1990 increases the bend points of the PIA function, which provides a further push to benefits. As can be seen from the bottom line of Table 7, the income shift plus the Bend Point adjustments increases our M<aximum Wage Earner's annual benefit by $432, or 1.7%, if she continues working to age 75.

Table 8 shows that the magnitude of the effect of the wage index bounce on retirement benefits depends on the age of retirement, the indexing procedure used in computing benefits, and the income history of the worker. The bounce has a larger percentage effect on the benefits of workers whose income is below the top break point on the piecewise linear PIA function plotted on Figure 2. If wages are fully CPI indexed, the bounce will be small as it reflects only the shift in the bend points because the CPI index is not affected by the bounce in the average worker's 60^{th} year income (it would be affected by revisions of the CPI in the 60^{th} year).

The shift would cause an increase in the OASI benefit throughout the retirement for all workers turning 60 in 1990—the 1930 birth cohort. This stream of higher benefits would be approximately offset in subsequent years by lower payments to workers in the 1931 birth cohort. And assuming roughly equal mortality rates, in the long run the revisions would approximately cancel out so that there is no serious effect on OASI's fiscal posture. The problem is that it is manifestly unfair to have benefits vary between different birth cohorts of workers because the calculation procedure is hypersensitive to movements in income in the year of one's 60^{th} birthday. In our $480 shift experiment the change in annual benefits with partial wage indexing ranges from 1.3% to 1.9%. This would not be deemed insignificant, at least by the minimum wage earner. And its size is roughly proportional to the size of the shift.

Table 7: Experiment ~ Shift $480 of Average Worker's Annual Income: 1991 to 1990

Effect on Maximum Wage Earner who retires at 75; Wage Indexed only until age 60, then not

age	year	CPI 1990=100 (1)	Max earnings (2)	CONTROL: Average Wage index 1990=100 (C2)	partly indexed earnings (C3)	rank (C4)	Retire at 75 high 35 index earn (C5)	EXPERIMENT: Shift $480 from 1991 to 1990: Perturbed National Average Wage (E1)	Average Wage index 1990=100 (E2)	partly indexed earnings (E3)	rank (E4)	Retire at 75 high 35 index earn (E5)	DIFFERENCE percent
21	1951	20.2	3,600	13.3	27,044	36		2,799	13.0	27,661	36		2.3%
22	1952	20.7	3,600	14.1	25,460	42		2,973	13.8	26,041	42		2.3%
23	1953	20.9	3,600	14.9	24,113	48		3,139	14.6	24,663	48		2.3%
24	1954	20.9	3,600	15.0	23,989	50		3,156	14.7	24,537	50		2.3%
25	1955	20.8	4,200	15.7	26,751	37		3,301	15.3	27,362	37		2.3%
26	1956	21.2	4,200	16.8	25,002	45		3,532	16.4	25,573	45		2.3%
27	1957	21.9	4,200	17.3	24,252	47		3,642	16.9	24,805	47		2.3%
28	1958	22.4	4,200	17.5	24,040	49		3,674	17.1	24,589	49		2.3%
29	1959	22.6	4,800	18.3	26,177	41		3,856	17.9	26,775	41		2.3%
30	1960	22.9	4,800	19.1	25,189	44		4,007	18.6	25,764	44		2.3%
31	1961	23.2	4,800	19.4	24,698	46		4,087	19.0	25,262	46		2.3%
32	1962	23.5	4,800	20.4	23,520	51		4,291	20.0	24,057	51		2.3%
33	1963	23.8	4,800	20.9	22,957	52		4,397	20.4	23,481	52		2.3%
34	1964	24.1	4,800	21.8	22,056	53		4,576	21.3	22,559	53		2.3%
35	1965	24.5	4,800	22.2	21,666	54		4,659	21.7	22,160	54		2.3%
36	1966	25.3	6,600	23.5	28,103	34	28,103	4,938	23.0	28,745	34	28,745	2.3%
37	1967	25.9	6,600	24.8	26,621	38		5,213	24.2	27,228	38		2.3%
38	1968	27.1	7,800	26.5	29,437	33	29,437	5,572	25.9	30,109	33	30,109	2.3%
39	1969	28.6	7,800	28.0	27,829	35	27,829	5,894	27.4	28,464	35	28,464	2.3%
40	1970	30.3	7,800	29.4	26,513	40		6,186	28.8	27,119	40		2.3%
41	1971	31.6	7,800	30.9	25,245	43		6,497	30.2	25,821	43		2.3%
42	1972	32.5	9,000	33.9	26,529	39		7,134	33.2	27,134	39		2.3%
43	1973	34.7	10,800	36.0	29,960	32	29,960	7,580	35.2	30,644	32	30,644	2.3%
44	1974	38.7	13,200	38.2	34,563	30	34,563	8,031	37.3	35,352	30	35,352	2.3%
45	1975	42.1	14,100	41.0	34,353	31	34,353	8,631	40.1	35,137	31	35,137	2.3%
46	1976	44.4	15,300	43.9	34,870	29	34,870	9,226	42.9	35,666	29	35,666	2.3%
47	1977	47.3	16,500	46.5	35,479	27	35,479	9,779	45.5	36,289	27	36,289	2.3%
48	1978	51.1	17,700	50.2	35,259	28	35,259	10,556	49.1	36,064	28	36,064	2.3%
49	1979	57.3	22,900	54.6	41,948	26	41,948	11,479	53.4	42,906	26	42,906	2.3%
50	1980	64.6	25,900	59.5	43,523	25	43,523	12,513	58.2	44,517	25	44,517	2.3%
51	1981	71.5	29,700	65.5	45,344	24	45,344	13,773	64.0	46,379	24	46,379	2.3%
52	1982	75.6	32,400	69.1	46,885	23	46,885	14,531	67.6	47,956	23	47,956	2.3%
53	1983	77.4	35,700	72.5	49,261	21	49,261	15,239	70.9	50,385	21	50,385	2.3%
54	1984	80.1	37,800	76.7	49,263	20	49,263	16,135	75.0	50,387	20	50,387	2.3%
55	1985	82.6	39,600	80.0	49,500	19	49,500	16,823	78.2	50,630	19	50,630	2.3%
56	1986	83.7	42,000	82.4	50,986	16	50,986	17,322	80.5	52,150	15	52,150	2.3%
57	1987	87.2	43,800	87.6	49,984	18	49,984	18,427	85.7	51,125	18	51,125	2.3%
58	1988	90.7	45,000	91.9	48,943	22	48,943	19,334	89.9	50,060	22	50,060	2.3%
59	1989	94.9	48,000	95.6	50,217	17	50,217	20,100	93.5	51,363	16	51,363	2.3%
60	1990	100.0	51,300	100.0	51,300	15	51,300	**21,508**	100.0	51,300	17	51,300	0.0%
61	1991	103.7	53,400	103.7	53,400	14	53,400	**21,332**	99.2	53,400	14	53,400	0.0%
62	1992	106.9	55,500	109.1	55,500	13	55,500	22,935	106.6	55,500	13	55,500	0.0%
63	1993	109.6	57,600	110.0	57,600	12	57,600	23,133	107.6	57,600	12	57,600	0.0%
64	1994	112.7	60,600	113.0	60,600	11	60,600	23,754	110.4	60,600	11	60,600	0.0%
65	1995	115.6	61,200	117.5	61,200	10	61,200	24,706	114.9	61,200	10	61,200	0.0%
66	1996	119.0	62,700	123.2	62,700	9	62,700	25,914	120.5	62,700	9	62,700	0.0%
67	1997	121.6	65,400	130.4	65,400	8	65,400	27,426	127.5	65,400	8	65,400	0.0%
68	1998	123.2	68,400	137.3	68,400	7	68,400	28,861	134.2	68,400	7	68,400	0.0%
69	1999	126.2	72,600	144.9	72,600	6	72,600	30,470	141.7	72,600	6	72,600	0.0%
70	2000	130.6	76,200	152.9	76,200	5	76,200	32,155	149.5	76,200	5	76,200	0.0%
71	2001	134.0	80,400	156.6	80,400	4	80,400	32,922	153.1	80,400	4	80,400	0.0%
72	2002	136.0	84,900	158.1	84,900	3	84,900	33,252	154.6	84,900	3	84,900	0.0%
73	2003	138.8	87,000	162.0	87,000	2	87,000	34,065	158.4	87,000	2	87,000	0.0%
74	2004	142.5	87,900	169.5	87,900	1	87,900	35,649	165.7	87,900	1	87,900	0.0%
Sum through computation year (age 60)							867,007					885,627	2.1%
Sum post indexing year (age 61 to retirement)							973,800					973,800	0.0%
TOTAL (Best 35 years)							1,840,807					1,859,427	1.0%
Average Indexed Monthly Earnings (Total/35*12)							4,382.80					4,427.20	1.0%
Annual Benefit							25,812.00					26,244.00	1.7%

Not Indexed

Note: The data in columns (1), (2), and (C2) are from Table 2; (C3) is from Table 5

Table 8: Experiment ~ Effects of a $480 Shift of Average Income from 1991 to 1990

Date of birth = 1930

date of birth: 1930	A. SSA: Wage indexed only until 60				B. Wage Indexed Earnings			
Age Retirement Started:	62	65	70	75	62	65	70	75
Age Benefits Started:	62	65	70	70	62	65	70	70
Nominal (at age benefit started)								
Maximum Wage Earner	10,488	14,700	21,444	26,244	10,488	14,640	20,904	24,552
Average Wage Earner	7,704	10,512	14,832	17,688	7,704	10,464	14,364	16,212
Median Wage Earner	6,108	8,304	11,604	13,608	6,108	8,292	11,376	12,852
Minimum Wage Earner	4,944	6,708	9,264	10,500	4,944	6,708	9,204	10,404
Real, CPI-W, year 2005 = 100	72.0	77.9	88.1	100.0				
Maximum Wage Earner	14,561	18,859	24,350	26,244	14,561	18,782	23,737	24,552
Average Wage Earner	10,696	13,486	16,842	17,688	10,696	13,425	16,311	16,212
Median Wage Earner	8,480	10,654	13,177	13,608	8,480	10,638	12,918	12,852
Minimum Wage Earner	6,864	8,606	10,520	10,500	6,864	8,606	10,451	10,404
DIFFERENCE ~ Experiment Results less Control Results from Table 4								
Nominal (at age benefit started)								
Maximum Wage Earner	228	300	396	432	240	324	468	552
Average Wage Earner	168	204	264	264	168	228	324	360
Median Wage Earner	144	168	216	216	144	180	252	288
Minimum Wage Earner	120	144	204	204	120	144	204	240
Real, CPI-W, year 2005 = 100								
Maximum Wage Earner	317	385	450	432	333	416	531	552
Average Wage Earner	233	262	300	264	233	293	368	360
Median Wage Earner	200	216	245	216	200	231	286	288
Minimum Wage Earner	167	185	232	204	167	185	232	240
Percent								
Maximum Wage Earner	2.2%	2.0%	1.8%	1.6%	2.3%	2.2%	2.2%	2.2%
Average Wage Earner	2.2%	1.9%	1.8%	1.5%	2.2%	2.2%	2.3%	2.2%
Median Wage Earner	2.4%	2.0%	1.9%	1.6%	2.4%	2.2%	2.2%	2.2%
Minimum Wage Earner	2.4%	2.1%	2.2%	1.9%	2.4%	2.1%	2.2%	2.3%
	C. Wage Indexed to 60, then CPI				D. CPI indexed Earnings			
Age Retirement Started:	62	65	70	75	62	65	70	75
Age Benefits Started:	62	65	70	70	62	65	70	70
Nominal (at age benefit started)								
Maximum Wage Earner	10,476	14,628	20,964	24,900	9,900	13,908	20,160	24,084
Average Wage Earner	7,704	10,464	14,436	16,548	7,176	9,888	13,872	16,080
Median Wage Earner	6,108	8,292	11,388	12,948	5,628	7,680	10,656	12,204
Minimum Wage Earner	4,944	6,708	9,204	10,404	4,512	6,144	8,448	9,540
Real, CPI-W, year 2005 = 100	72.0	77.9	88.1	100.0				
Maximum Wage Earner	14,544	18,767	23,805	24,900	13,744	17,843	22,892	24,084
Average Wage Earner	10,696	13,425	16,393	16,548	9,963	12,686	15,752	16,080
Median Wage Earner	8,480	10,638	12,931	12,948	7,814	9,853	12,100	12,204
Minimum Wage Earner	6,864	8,606	10,451	10,404	6,264	7,882	9,593	9,540
DIFFERENCE ~ Experiment Results less Control Results from Table 4								
Nominal (at age benefit started)								
Maximum Wage Earner	228	300	396	432	0	0	0	0
Average Wage Earner	168	228	276	288	0	0	0	0
Median Wage Earner	144	180	240	252	0	0	0	0
Minimum Wage Earner	120	144	204	240	0	0	0	0
Real, CPI-W, year 2005 = 100								
Maximum Wage Earner	317	385	450	432	0	0	0	0
Average Wage Earner	233	293	313	288	0	0	0	0
Median Wage Earner	200	231	273	252	0	0	0	0
Minimum Wage Earner	167	185	232	240	0	0	0	0
Percent								
Maximum Wage Earner	0.9%	1.2%	1.6%	1.7%	0.0%	0.0%	0.0%	0.0%
Average Wage Earner	0.7%	0.9%	1.1%	1.2%	0.0%	0.0%	0.0%	0.0%
Median Wage Earner	0.6%	0.7%	1.0%	1.0%	0.0%	0.0%	0.0%	0.0%
Minimum Wage Earner	0.5%	0.6%	0.8%	1.0%	0.0%	0.0%	0.0%	0.0%

Recommendation:

It is not easy to devise a remedy for the 60th year bounce, but it would mitigate the problem somewhat if the SSA, instead of indexing to just age 60, would smooth the wage index, perhaps by using a three year average (ages 59 through 61), as is the practice of the BLS in constructing CPI indexes.[16] Also, employing a Median Wage Index instead of the Average (arithmetic mean) Wage Index might help because it may be more stable than the average.[17]

3.5 Indexing Problem #5: Taxing OASI Benefits

The IRS has collected income taxes on OASI benefits since 1983. Initially, only 50% of OASI benefits were counted in taxable income by the IRS, and then only if the married couple's combined income was more then $32,000; for single tax payers the income threshold was $25,000. In 1993, the tax rate was imposed on 85% of OASI benefits for joint-filers with combined income above $44,000; for single taxpayers this second threshold is $34,000.

Because the OASI tax paid by a worker from after-tax income is matched by the employer, which is before-tax income, the tax on 50% of OASI benefits that was imposed in 1983 is roughly comparable to the tax imposed on a worker who places equal amounts in a Roth IRA purchased with after tax money and a traditional IRA financed with before-tax money. In this sense, taxing 85% of OASI benefits appears to involve less favorable tax treatment than is currently available with an even mix of Roth and traditional IRA's.

Although tax bracket thresholds for the personal income tax have been indexed since 1985, the thresholds for the tax on OASI benefits have not been adjusted for inflation. This means that the income tax imposed on OASI benefits has gradually reached further and further down the income distribution. If the $32,000, $25,000 brackets established in 1983 had been indexed to the CPI, by 2008 they would have been adjusted to $64,805 for married and $50,629 for single tax fillers because the CPI-W slightly more than doubled during that 25 year time span. Burman and Saleem (2004) estimate that the percentage of households paying taxes on their OASI benefits will increase from 36% in 2004 to 40% in 2014. See also Munnell and Muldoon (2008).

Recommendation:

The income thresholds for imposing the personal income tax on OASI benefits should be indexed for inflation. The failure to index tax brackets for inflation has allowed rising prices to impose what amounts to a new tax on middle income retirees. The fact that the income tax revenue collected from taxing OASI benefits is dedicated to the Medicare Trust Fund does not justify failing to index the exemption thresholds.

[16] A three-year centered moving average would have reduced the variance of the Average Wage Index over the years 1961–2004 by 19% and of the CPI-W by 10%.

[17] The median is that value which minimizes the Mean Absolute Deviation = $\sum |x_t - x_{median}| / n$ while the mean is that value that minimizes the variance = $\sum (x_i - \overline{x})^2 / n$. The variance may be more sensitive to extreme values because the deviations from the mean are squared. It might also be argued that the median is a better measure of wellbeing because maximizing the median is the same as maximizing average utility *if* income is approximately log normally distributed and utility(x_i) = log(x_i).

4 Inflation Experiments

Compared to many countries, the United States has enjoyed fairly stable prices over the years. But suppose the long run rate of inflation were to accelerate? How would this affect different income groups? And how would it affect the financial viability of the Old Age and Survivor Trust Funds? Incomplete indexing of OASI benefits means that the system is exposed to financial disruption from fluctuations in the rate of inflation. Three experiments will show how the choice of deflator affects the sensitivity of real benefits to changes in the trend inflation rate. For comparison, the results for counterfactual inflation trends will be contrasted with the control provided by the historical inflation experience reported on Table 4.

4.1 Experiment #1: 5% More Inflation

The first experiment, reported on Table 9, involves tilting both the CPI-W and the AWI by an extra 5% of inflation per annum, starting in 1991. This superimposes a steeper

Table 9: Replaying Benefit History: 5% Higher Inflation Rate versus Control

Date of birth = 1930

	A. SSA: Wage indexed only until 60				B. Wage Indexed Earnings			
Age at Retirement:	62	65	70	75	62	65	70	75
Age Benefits Started:	62	65	70	70	62	65	70	70
Nominal (at age benefit started)								
Maximum Wage Earner	10,260	16,836	32,700	55,536	10,248	16,572	30,204	45,252
Average Wage Earner	7,548	12,072	22,944	37,836	7,536	11,844	20,736	29,904
Median Wage Earner	5,976	9,504	17,724	29,016	5,964	9,384	16,440	23,688
Minimum Wage Earner	4,836	7,632	13,776	21,108	4,824	7,596	13,296	19,176
Real, CPI-W, actual year 2005 = 100	79.4	99.5	143.4	207.9				
Maximum Wage Earner	12,920	16,924	22,796	26,714	12,905	16,659	21,056	21,767
Average Wage Earner	9,505	12,135	15,995	18,200	9,490	11,906	14,456	14,384
Median Wage Earner	7,525	9,554	12,356	13,957	7,510	9,433	11,461	11,394
Minimum Wage Earner	6,090	7,672	9,604	10,153	6,075	7,636	9,269	9,224
Real, relative to benefit at age of entitlement (62)								
Maximum Wage Earner	1.00	1.31	1.76	2.07	1.00	1.29	1.63	1.69
Average Wage Earner	1.00	1.28	1.68	1.91	1.00	1.25	1.52	1.52
Median Wage Earner	1.00	1.27	1.64	1.85	1.00	1.26	1.53	1.52
Minimum Wage Earner	1.00	1.26	1.58	1.67	1.00	1.26	1.53	1.52
Real comparison: experiment relative to control (Table 4)								
Maximum Wage Earner	91%	92%	95%	103%	91%	91%	91%	91%
Average Wage Earner	91%	92%	97%	104%	91%	91%	91%	91%
Median Wage Earner	91%	92%	96%	104%	91%	91%	91%	91%
Minimum Wage Earner	91%	91%	93%	99%	91%	91%	91%	91%

	C. Wage Indexed to 60, then CPI				D. CPI indexed Earnings			
Age at Retirement:	62	65	70	75	62	65	70	75
Age Benefits Started:	62	65	70	70	62	65	70	70
Nominal (at age benefit started)								
Maximum Wage Earner	10,248	16,584	30,396	46,152	9,900	16,104	29,796	45,420
Average Wage Earner	7,536	11,856	20,916	30,672	7,176	11,448	20,496	30,324
Median Wage Earner	5,964	9,384	16,476	23,940	5,628	8,892	15,744	23,016
Minimum Wage Earner	4,824	7,596	13,296	19,176	4,512	7,116	12,480	17,988
Real, CPI-W, actual year 2005 = 100								
Maximum Wage Earner	12,905	16,671	21,190	22,200	12,467	16,188	20,771	21,848
Average Wage Earner	9,490	11,918	14,581	14,754	9,036	11,508	14,288	14,586
Median Wage Earner	7,510	9,433	11,486	11,516	7,087	8,939	10,975	11,071
Minimum Wage Earner	6,075	7,636	9,269	9,224	5,682	7,153	8,700	8,653
Real, relative to benefit at age of entitlement (62)								
Maximum Wage Earner	1.00	1.29	1.64	1.72	1.00	1.30	1.67	1.75
Average Wage Earner	1.00	1.26	1.54	1.55	1.00	1.27	1.58	1.61
Median Wage Earner	1.00	1.26	1.53	1.53	1.00	1.26	1.55	1.56
Minimum Wage Earner	1.00	1.26	1.53	1.52	1.00	1.26	1.53	1.52
Real comparison: experiment relative to control (Table 4)								
Maximum Wage Earner	91%	91%	91%	91%	91%	91%	91%	91%
Average Wage Earner	91%	91%	91%	91%	91%	91%	91%	91%
Median Wage Earner	91%	91%	91%	91%	91%	91%	91%	91%
Minimum Wage Earner	91%	91%	91%	91%	91%	91%	91%	91%

trend on the two series but preserves the historical fluctuations in the gap between them. Because the increased inflation did not start until 1991, the wage index is at the original historical level of 1990, which means that precisely the same bend points could be utilized as before and Figure 2 still shows how the PIA is determined by the AIME. In this experiment the CPI-W (1990 = 100) had increased to 308 by 2005, substantially above the control level of 148 for that year. As a result, the CPI deflated benefit data (real) are more revealing, particularly when they are compared with the real outcomes of the control.

Almost everybody loses from the higher inflationary trend. The primary exceptions are maximum, average and median earners who continue working to age 75 while their earnings, under current SSA procedures, are indexed only through age 60—their increased incomplete indexing bonus more than offsets their loss from the skipped 61st year and the one year indexing lag. Further, the reward for postponing retirement from 62 to 75 is magnified, as can be seen by comparing the results on Panel A with those of Table 4 With any of the three alternatives to the SSA's incomplete indexing procedure, everyone's real benefit is reduced by the skipped 61st year indexing problem to 91% of the control benefit.

4.2 Experiment #2: 10% More Inflation

Table 10 reports that with 10% inflation the maximum wage earner who continues to receive the cap through to age 75 is the big winner, gaining 13% per annum under incomplete indexing; the average earner gains 6%, the median 14% and the minimum wage earner 2%. With any of the three complete indexing procedures, real income is reduced by 17%.

4.3 Experiment #3: Deflation

With a reduction in the inflation rate to 5% below its historic value, every thing is reversed: the undeflated earnings bonus turns negative while the skipped 61st year and one year indexing lag contribute to an increase in benefits. As a result, every OASI recipient gains from the deflation, as reported on Table 11. This time the maximum wage earner who continues working until age 75 experiences the smallest real gain, only one percent, because falling wages yield a sizable undeflated earnings *penalty* that counters the gain workers enjoy from the skipped 61st year and the one year indexing lag.

Summary

Observe on Table 11 that the 5% reduction in inflation caused a uniform 11% increase in the real value of benefits for all except the incompletely indexed SSA benefits of Panel A. Similarly, 5% increased inflation caused a uniform 9% reduction in benefits and 10% inflation a uniform 17% reduction in benefits. This unexpected result is due to the skipped 61st year inflation adjustment and one year indexing lag problems, as can be verified by looking back to PIA (6). The price ratio in that equation for a retiree of age a who was born in year t^b is p_{t-1} / p_{t^b+61}, where $t = t^b+a$, which results in the skipped 61st

year and the one year indexing lag problems. Full indexing requires p_t / p_{t^b+60} throughout retirement. With inflation constant at rate $\dot{p}$, the effect of under-indexing at age a is

$$\frac{p_{t-1}}{p_t} \times \frac{p_{t^b+60}}{p_{t^b+61}} = \frac{1}{(1+\dot{p})^2}, \text{where } \dot{p} = \frac{p_t - p_{t-1}}{p_{t-1}}. \qquad (13)$$

Thus our 5% inflation experiment generated a reduction in real benefits to 90.2% and the 10% experiment generated a reduction to 83%. A 5% reduction in inflation results in a benefit increase to 111% as reported on the tables. These under-indexing distortions could be mitigated by using a predicted rate of inflation together with the error correction procedure of equations (8) and (9). Thus our experiments show that while the correction of the incomplete wage indexing problem would substantially reduce inflationary distortions, inflation would still have a substantial impact on the purchasing power of OASI benefits.

Table 10: Replaying Benefit History: 10% Higher Inflation Rate

Date of birth = 1930

	A. SSA: Wage indexed only until 60				B. Wage Indexed Earnings			
Age at Retirement:	62	65	70	75	62	65	70	75
Age Benefits Started:	62	65	70	70	62	65	70	70
Nominal (at age benefit started)								
Maximum Wage Earner	10,272	19,572	50,460	121,524	10,248	19,056	43,824	82,860
Average Wage Earner	7,548	14,064	35,964	77,328	7,536	13,620	30,096	54,744
Median Wage Earner	5,976	11,052	27,432	64,032	5,964	10,800	23,856	43,380
Minimum Wage Earner	4,836	8,844	20,904	44,004	4,824	8,736	19,296	35,112
Real, CPI-W, actual year 2005 = 100	87.2	125.5	228.4	417.7				
Maximum Wage Earner	11,786	15,591	22,091	29,092	11,758	15,180	19,186	19,836
Average Wage Earner	8,660	11,204	15,745	18,512	8,647	10,850	13,176	13,105
Median Wage Earner	6,857	8,804	12,010	15,329	6,843	8,603	10,444	10,385
Minimum Wage Earner	5,549	7,045	9,152	10,534	5,535	6,959	8,448	8,406
Real, relative to benefit at age of entitlement (62)								
Maximum Wage Earner	1.00	1.32	1.87	2.47	1.00	1.29	1.63	1.69
Average Wage Earner	1.00	1.29	1.82	2.14	1.00	1.25	1.52	1.52
Median Wage Earner	1.00	1.28	1.75	2.24	1.00	1.26	1.53	1.52
Minimum Wage Earner	1.00	1.27	1.65	1.90	1.00	1.26	1.53	1.52
Real comparison: experiment relative to control (Table 4)								
Maximum Wage Earner	83%	84%	92%	113%	83%	83%	83%	83%
Average Wage Earner	83%	85%	95%	106%	83%	83%	83%	83%
Median Wage Earner	83%	84%	93%	114%	83%	83%	83%	83%
Minimum Wage Earner	83%	84%	89%	102%	83%	83%	83%	83%

	C. Wage Indexed to 60, then CPI				D. CPI indexed Earnings			
Age at Retirement:	62	65	70	75	62	65	70	75
Age Benefits Started:	62	65	70	70	62	65	70	70
Nominal (at age benefit started)								
Maximum Wage Earner	10,248	19,068	44,112	84,492	9,900	18,516	43,224	83,160
Average Wage Earner	7,536	13,632	30,348	56,172	7,176	13,164	29,748	55,536
Median Wage Earner	5,964	10,800	23,916	43,836	5,628	10,224	22,848	42,144
Minimum Wage Earner	4,824	8,736	19,296	35,112	4,512	8,184	18,108	32,940
Real, CPI-W, actual year 2005 = 100								
Maximum Wage Earner	11,758	15,190	19,312	20,227	11,359	14,750	18,923	19,908
Average Wage Earner	8,647	10,859	13,286	13,447	8,234	10,487	13,024	13,295
Median Wage Earner	6,843	8,603	10,470	10,494	6,457	8,145	10,003	10,089
Minimum Wage Earner	5,535	6,959	8,448	8,406	5,177	6,520	7,928	7,886
Real, relative to benefit at age of entitlement (62)								
Maximum Wage Earner	1.00	1.29	1.64	1.72	1.00	1.30	1.67	1.75
Average Wage Earner	1.00	1.26	1.54	1.56	1.00	1.27	1.58	1.61
Median Wage Earner	1.00	1.26	1.53	1.53	1.00	1.26	1.55	1.56
Minimum Wage Earner	1.00	1.26	1.53	1.52	1.00	1.26	1.53	1.52
Real comparison: experiment relative to control (Table 4)								
Maximum Wage Earner	83%	83%	83%	83%	83%	83%	83%	83%
Average Wage Earner	83%	83%	83%	83%	83%	83%	83%	83%
Median Wage Earner	83%	83%	83%	83%	83%	83%	83%	83%
Minimum Wage Earner	83%	83%	83%	83%	83%	83%	83%	83%

Table 11: Replaying Benefit History: 5% Reduction in the Inflation Rate

Date of birth = 1930

	A. SSA: Wage indexed only until 60				B. Wage Indexed Earnings			
Age at Retirement:	62	65	70	75	62	65	70	75
Age Benefits Started:	62	65	70	70	62	65	70	70
Nominal (at age benefit started)								
Maximum Wage Earner	10,248	12,240	13,428	12,072	10,248	12,276	13,560	12,312
Average Wage Earner	7,536	8,772	9,312	8,136	7,536	8,772	9,312	8,136
Median Wage Earner	5,964	6,948	7,380	6,444	5,964	6,948	7,380	6,444
Minimum Wage Earner	4,824	5,628	5,964	5,220	4,824	5,628	5,964	5,220
Real, CPI-W, actual year 2005 = 100	65.0	60.3	52.7	46.3				
Maximum Wage Earner	15,765	20,294	25,467	26,057	15,765	20,354	25,717	26,575
Average Wage Earner	11,593	14,544	17,661	17,561	11,593	14,544	17,661	17,561
Median Wage Earner	9,175	11,520	13,997	13,909	9,175	11,520	13,997	13,909
Minimum Wage Earner	7,421	9,331	11,311	11,267	7,421	9,331	11,311	11,267
Real, relative to benefit at age of entitlement (62)								
Maximum Wage Earner	1.00	1.29	1.62	1.65	1.00	1.29	1.63	1.69
Average Wage Earner	1.00	1.25	1.52	1.51	1.00	1.25	1.52	1.51
Median Wage Earner	1.00	1.26	1.53	1.52	1.00	1.26	1.53	1.52
Minimum Wage Earner	1.00	1.26	1.52	1.52	1.00	1.26	1.52	1.52
Real comparison: experiment relative to control (Table 4)								
Maximum Wage Earner	111%	110%	107%	101%	111%	111%	111%	111%
Average Wage Earner	111%	110%	107%	101%	111%	111%	111%	111%
Median Wage Earner	111%	110%	108%	104%	111%	111%	111%	111%
Minimum Wage Earner	111%	111%	110%	109%	111%	111%	111%	111%

	C. Wage Indexed to 60, then CPI				D. CPI indexed Earnings			
Age at Retirement:	62	65	70	75	62	65	70	75
Age Benefits Started:	62	65	70	70	62	65	70	70
Nominal (at age benefit started)								
Maximum Wage Earner	10,248	12,276	13,644	12,564	9,900	11,928	13,380	12,360
Average Wage Earner	7,536	8,772	9,384	8,352	7,176	8,484	9,204	8,256
Median Wage Earner	5,964	6,948	7,392	6,516	5,628	6,588	7,068	6,264
Minimum Wage Earner	4,824	5,628	5,964	5,220	4,512	5,268	5,604	4,896
Real, CPI-W, actual year 2005 = 100								
Maximum Wage Earner	15,765	20,354	25,877	27,119	15,229	19,777	25,376	26,679
Average Wage Earner	11,593	14,544	17,797	18,028	11,039	14,067	17,456	17,820
Median Wage Earner	9,175	11,520	14,019	14,065	8,658	10,923	13,405	13,521
Minimum Wage Earner	7,421	9,331	11,311	11,267	6,941	8,735	10,628	10,568
Real, relative to benefit at age of entitlement (62)								
Maximum Wage Earner	1.00	1.29	1.64	1.72	1.00	1.30	1.67	1.75
Average Wage Earner	1.00	1.25	1.54	1.56	1.00	1.27	1.58	1.61
Median Wage Earner	1.00	1.26	1.53	1.53	1.00	1.26	1.55	1.56
Minimum Wage Earner	1.00	1.26	1.52	1.52	1.00	1.26	1.53	1.52
Real comparison: experiment relative to control (Table 4)								
Maximum Wage Earner	111%	111%	111%	111%	111%	111%	111%	111%
Average Wage Earner	111%	111%	111%	111%	111%	111%	111%	111%
Median Wage Earner	111%	111%	111%	111%	111%	111%	111%	111%
Minimum Wage Earner	111%	111%	111%	111%	111%	111%	111%	111%

Recommendation:

These experiments strengthen the case for correcting Indexing Problem #1: Incomplete Wage Indexing. But just changing from incomplete wage indexing to full indexing still allows inflation to have a substantial impact on benefits. Indexing with the wage index, the CPI or a blend does not stop inflation from imposing a proportional reduction in the purchasing power of the benefits received by practically all beneficiaries, regardless of the age when benefits start or income class. Full indexing requires in addition the correction of the skipped 61st year and the one year indexing problem. It also requires the indexing of the brackets in the income tax imposed on OASI benefits.

Unanticipated Inflation

While the resolution of the five indexing problems discussed in this paper would help insulate the real value of OASI benefit payout from inflation, which does not mean that the inflation would not have other consequences for the OASI trust funds. Those funds are invested with an average maturity of 7.3 years. A bout of inflation, unless it is anticipated, will cause a sustained reduction in the real rate of interest earned on those investments.[18]

5 Wage and Price Indices

The two indexes used by the Social Security Administration in adjusting nominal figures for inflation were recorded on columns (5) and (6) of Table 2. The Average Wage Index (AWI) is used to index earnings up to the year of the worker's 60th birthday and a modified version of the Bureau of Labor Statistics CPI-W price index is used to adjust benefits for workers from the year of the 61st birthday through retirement.[19] Both were plotted on Figure 1.

On Table 2 we have the level and annual inflation rates for both indexes from 1960 to 2007. Table 2 also reports the effective interest rate r earned on Social Security's OASI trust fund and two implied *ex post* real rates of interest, defined as $r-\dot{p}$ where $\dot{p}$ is the rate of change in either the CPI-W or AWI.[20] The OASI procedure for computing the sum of indexed earnings in the highest years implicitly uses a zero *real* AWI interest rate, while in practice the trust funds have earned a real rate of about 1.3% relative to the AWI or 2.4% relative to the CPI-W, as indicated on Table 2. In contrast to Social Security, when individuals place some of their retirement funds in a private savings account or purchase bonds, their savings in earlier years make a larger contribution toward retirement, cumulating more interest earnings because they are invested for a longer period of time.

5.1 Index Construction

Consumer Price Index (CPI-W):

The *Consumer Price Index for Urban Wage Earners and Clerical Workers* (CPI-W), compiled by the Bureau of Labor Statistics, is used in slightly modified form by the SSA in annually adjusting benefit figures for changes in the cost of living (COLA). The annual CPI-W index cannot be used without modification because of the need to have the figure available before the end of the year. Instead, the SSA compiles an index based on the average of the index in the 3rd quarter—July, August and September.

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18 The accelerated inflation experiments reported in this paper have the CPI-W and the wage index both increase by the same percentage, which might be the case if the rate of productivity growth was unaffected. The complications generated when this assumption is relaxed must be left for future research.

19 *At What Price* (2002, ch. 7), a study produced by an expert panel chaired by Charles L. Schultze for the National Research Council, presents a comprehensive analysis of the issues involved in the construction of wage and price indexes appropriate for adjusting Social Security benefits for inflation. That study emphasized the advantage of using a superlative index recognizing that consumers substitute away from commodities that have the largest price increases. In contrast, the primary focus of this study is on the way in which the indexes are used.

20 The effective interest rate on OASI trust funds was downloaded from

http://www.socialsecurity.gov/OACT/ProgData/effectiveRates.html

Average Wage Index (AWI):

The wage index used in calculating Social Security benefits is based on the average income reported on W-2 forms for workers subject to Social Security Taxes. The Social Security web site explains:

> "In keeping with the legal term 'average wage index' (AWI), we often loosely refer to the basis for the index as average wages. To be more precise, however, the index is based on compensation (wages, tips, and the like) subject to Federal income taxes, as reported by employers on Form W-2. Beginning with the AWI for 1991, compensation includes contributions to deferred compensation plans, but excludes certain distributions from plans where the distributions are included in the reported compensation subject to income taxes. We call the result of including contributions, and excluding certain distributions, net compensation."[21]

While the AWI now incorporates employer contributions to retirement plans, it excludes many forms of worker compensation, including employer provided health benefits. And it does not include the income sole proprietors report to the IRS on Schedule C, although such income is subject to OASI taxes (IRS Schedule SE). Needless to say, it also excludes the compensation of hedge fund managers (who are taxed at the 15% capital gains rate by the IRS even when they do not have their own capital at risk) and the "carried interest" of private placement specialists.

Employers do not have to submit the W-2 tax forms used by the SSA in calculating the average wage index until as late as March 31 of the following year, provided they file electronically. As a result, there is a lag in the availability of the average earnings index used in calculating bend points. Thus the National Average Wage for 2006 of $38,651.41 from which the average earnings index is calculated was not posted on the SSA website until October 17, 2007.

A number of non-inflationary factors can influence the path of the Average Wage Index, including demographic trends in the age structure of the labor force, the current recession, and financial sector restructuring. The decline in the teenage fraction of total employment from a peak of 8.6% in 1974 to 4% in 2007 would tend to reduce the index. The index would be boosted by an increase in the proportion of the work force composed of part-time workers, which might occur if the aging of the population led to an increase in the proportion of the workforce composed of seniors who had cut back on hours worked. The index will have a downward bias in recession because the cutback of workers to a shorter work week will reduce the numerator of the index but will cause a corresponding reduction in the denominator only to the extent that laid off workers are unemployed throughout a full calendar year. It will climb if there is an increase in W-2 incomes of high earning workers that is not matched by similar increases for the majority of the work force. In fact, mean income has risen much more rapidly then the median in the last decade and a half, reflecting at least in part the increased skewness of

21 http://www.ssa.gov/OACT/COLA/netcomp.html The growing popularity of deferred compensation pension plans in the 1980s meant that the wage index, because it excluded this expanding component, did not grow as fast as Social Security tax revenue, which did reflect it (Clingman and Kunkel, 2008). The inclusion of deferred compensation plans after 1991 may partly explain the rapid rise in the wage index after that date.

the income distribution, the ratio of median to mean income declining between 1990 and 2006 from 72% to 67%. The OASI benefits might be lower today if a *Median* Wage Index instead of the Average Wage Index had been used, but that could be a temporary effect if the trend toward a more highly skewed income distribution were to reverse.

5.2 Comparisons

Figure 1 compared the time path of the Average Wage Index (AWI), used to inflate wages up to the worker's 60th birthday, with the CPI-W, which is used to inflate benefits in step with rising prices during the retirement years. Observe that the upward trend in wages has averaged out above that of prices, yielding an upward trend in the standard of living that reflects the rise in worker productivity. The primary exception is the decline in real wages during productivity slowdown of the 1970s and early 1980s.

The use of the wage index up to the 60th year allows each generation of workers to enjoy in retirement the fruits of rising productivity that occurred during the bulk of the time they were in the work force. It helps to stabilize the replacement ratio—the ratio of retirement income to the worker's average income. [22]

Evidence that the choice of deflator makes a difference is provided by a comparison of Figure 3 with Figure *4* and Figure 5. Figure 3 reported the income streams for a taxable maximum earner, an average wage earner, a median wage earner, and a worker who always earned at the federal minimum wage. Figure *4*, utilizing the CPI-W deflator, indicates that workers earning the Taxable Maximum enjoyed a substantial increase in real income, that the Average Wage earner had only a moderate gain since the 1970s but did better than workers at the median. Workers earning only the federal minimum wage throughout their careers have suffered a decline in purchasing power since its peak in the late 1960s. Note on Figure 5 that the wage deflated earnings of a worker receiving the National Average Wage are represented by a horizontal line, as must be the case by construction because the Average Wage Index is the deflator.

The Taxable Maximum, adjusted by the wage deflator, increased dramatically in the 1970s and 80s. The immediate effect of an increase in the Taxable Maximum is to raise OASI tax revenue. The Congressional Budget Office (2004, Appendix A) has commented as follows:

> "Since 1982, the taxable maximum—the level above which earnings are not subject to the Social Security payroll tax—has been indexed to overall wage growth. However, due to increasing earnings inequality, the portion of covered wages that are subject to tax has declined since then, from about 89 percent to about 83 percent."

Even with indexing, the Taxable Maximum has been subject to considerable variation since 1982, in part because the indexation is executed with a two year lag necessitated

[22] Age 60 provides a convenient base for calculations because it allows time for the compilation of relevant data about wage inflation before the worker turns 62, which is the earliest age at which workers can claim OASI benefits. A case can be made for indexing to the year in which the worker first claims OASI benefits, although this would introduce the complication of correcting initial payments that had to be made on the basis of preliminary data with the revision procedure of (8) and (9).

by the delay involved in the construction of the wage index, which is based on W-2 tax information.

Be that as it may, the fall in covered wages that are subject to the OASI tax to 83% implies that if the payroll cap were removed, as is already the case for Medicare, OASI tax revenue might increase by 17%/83% = 20.5%! This would be a gain in the short run, but it would be at least partially offset when the high income workers paying the tax on their full W-2 earnings retired because their benefit payments are also based on their taxable earnings, and this effect is compounded because of the longer expected lifespan of higher income workers. If the Taxable Maximum cap remained on employee contributions but was removed from employer contribution, the revenue gain would be cut to 10.25%, but there would be no offsetting increase in benefit payments down the road if they were still based on the unmodified Taxable Maximum.

5.3 Which Index?

Because this paper focuses on data for only the single cohort of retirees born in 1930, it leaves for subsequent research the task of determining the most appropriate index or combination of indexes to use in adjusting OASI for inflation. The choice should not be limited to the Average Wage Index versus the CPI-W. The primary advantage of CPI-W is that it is seldom revised, but (8) provides a procedure for coping with revisions that would also facilitate the adoption of a superlative price index. Because the median rather than the mean is likely to be less subject to erratic year to year movements and less sensitive to the growing income inequality that has contributed to the upward surge in the taxable maximum, consideration should also be given to shifting from using the National Average Wage to a National Median Wage in the construction of the wage index, in adjusting bend points, and in calculating the taxable maximum. Whether based on the average (mean) or median, it would also be somewhat more stable—and hence reduce the seriousness of Problem #4, the 60th year bounce—to have the wage index normalized to equal 100 not in the worker's 60th year, but on the average of wages in the adjacent years (ages 59–61= 100), just as the Bureau of Labor Statistics CPI is normalized: (1982–84 = 100).

6 Phasing in Reform

Easing the transition into a reform is not easy. When SS indexing procedures were revised in 1978, a special Transition Benefit procedure was included to protect workers who attained the age of 62 between the years 1979–83. It did not work, giving rise to the famous Notch Generation controversy. When President George W. Bush promulgated his Social Security reform, he stressed that there would be no changes for those already over 55[23]—implicit in his pronouncement was a warning to those under 55, the majority of voters, that they had better look out.

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23 President George W. Bush State of the Union Address, February 2, 2005, http://www.whitehouse.gov/stateoftheunion/2005/.

Using an index that gradually reduces benefits over time might minimize political repercussions if the slippage is so slow as to fall below the representative voter's horizon—so much for transparency.[24] This is the argument for replacing wage indexing with CPI-W price indexing in dealing with the serious longrun financial problems of OASI.

Shifting from wage to price indexing during the working years might reduce financial pressure on the trust funds, provided that on average the CPI continues to rise less rapidly than wages. But the adjustment toward financial viability might well be by fits and starts, judging by the historical comparison of the CPI-W and the AWI on Figure 1. Further, Biggs et al. (2005) point out that a switch to price-indexing in computing benefits might be destabilizing, leading to a divergence over time between the path of expenditures and revenue, because benefits would depend on price movements while the OASI tax revenue is based on wage income. Biggs et.al. (2005:29) explain that "the same level of expected cost savings could be achieved without decreasing stability by simply choosing a predetermined path by which PIA factors are reduced that is not conditional on ex post realizations of wage and price growth." More than this, adopting a predetermined schedule will mean that discussions of how best to index benefits can focus on the proper task of insulating benefits from the vicissitudes of inflation.

A predetermined schedule for phasing in adjustments has several advantages. It will minimize the disruption of the financial plans that workers may have developed based on the good faith assumption that scheduled benefits would be received while at the same time facilitating adjustments that might contribute to financial equilibrium. Furthermore, the primary effect will be upon younger voters at a stage of life when they will be less certain about what their health and marital status will be when they reach retirement age, which means that they will be able to make a judgment that will not be dominated by their own personal situation on eve of retirement. They will be closer to making an impartial judgment based on probabilities, operating closer to John Rawls' "veil of ignorance," rather than making a judgment clouded by their own personal situation. And older voters, because they will not feel the full thrust of the change, will also be able to reach a judgment that will be less clouded by their own position in life.

Here is one way of generating a predetermined schedule that would gently phase in an OASI "reform." Each worker's benefit would be calculated twice: Let $B_{i,t}^{a}$ denote the benefit calculated with the pre-reform procedure and $B_{i,t}^{b}$ the benefit computed with the post-reform procedure. Then a weighted average of the two could be calculated based on the proportion of the i^{th} worker's career that had been pre-reform versus post-reform. For example, if 18 were the normal starting age, 62 the year of first entitlement,

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24 It would also be possible to use indexes indirectly to gradually slow the growth of benefits generated by wage-indexing, as in the PIA Factor Indexing procedure considered by Biggs, Brown and Springstead (2005). This procedure would adjust the 90%, 32% and 15% parameters of the equation plotted on Figure 2 from the value in the preceding year by the ratio $(p_t / p_{t-1})/(w_t / w_{t-1})$ in the beneficiary's 60th year; bend points would still be adjusted by current procedures. This would adjust the benefits of all workers in the same birth cohort by the same percentage, but it could make benefits for workers with similar wage histories vary rather erratically from one age cohort to the next. For example, the ratio was 100% in 1991, 99.0% in 1992 but 101.7% in 1993. During the OPEC disruptions of the 1970s, their ratio switched from 93.9% in 1972 to 105.2% in 1974.

and a_i^r is the worker's age when the reform was introduced, we might calculate the ith worker's benefit as follows:

$$B_{i,t} = w_i B_{i,t}^b + (1 - w_i) B_{i,t}^a,$$
$$\text{where } w_i = \begin{cases} 0 \text{ if } a^r \le 18, \\ \left(\dfrac{a_i^r - 18}{44} \right)^{\rho} \text{ if } 18 \le a_i^r \le 62, \\ 1 \text{ otherwise.} \end{cases} \tag{14}$$

The parameter ρ affects the speed of adjustment: with $\rho = 1$, the case of linear interpolation, weighting is proportional to the years spent before and after reform; for example, $w_i = ½$ for a worker who was 40 when the reform measure was instituted. The reform is phased in more rapidly with $\rho > 1$; for example, with $\rho = 2$, a worker who was aged 49 when the reform was passed would have $w_i = ½$. While this equation takes 44 years fully to complete the adjustment process, it can easily be modified to shorten the adjustment period.

7 Retirement Incentives

Workers receive higher OASI benefits if they postpone retirement beyond age 62, the first year of eligibility. Part of the increase arises from their after age 62 earnings adding to their Average Indexed Monthly Earnings, provided they are large enough to count among their highest 35 earning years. And part of the increase is deliberate built in by the OASI statutes in order to encourage workers to postpone their departure from the labor force, pay more taxes, and have a more adequate income when they do retire—this is the $A(t^b, a^s)$ factor, tabulated in Table 1, that enters into (7) for the Primary Insurance Amount.

Calculations presented in this paper show that in practice the reward for postponing retirement depends in part on both ones position in the income distribution and the pace of inflation. Table 12 summarizes the results from Tables 4, 9, 10 and 11 for the extreme case of workers born in 1930 who kept working full time until age 75 rather than retiring at 62. The first column of Panel A of the table shows the gain with the actual inflation experience as reported on Table 4 and the next three columns report the gain with 5% more, 10% more or 5% less inflation, as was reported on Table 9, Table 10 and Table 11.

The top four entries in the first column of the table reveal that under current procedures the percentage benefit gain from delaying retirement has been much larger for those at the top of the income distribution. This result arises at least in part because maximum wage earners born in 1930 enjoyed an exceptional increase in earnings near the end of their careers. Subsequent columns reveal that accelerated inflation would substantially increase the incentive. And Sections B, C and D of the table show that a switch from the current incomplete indexing procedure to any one of the three full wage

Table 12: Deflated (CPI-W) Benefit Gain from Postponing Retirement from 62 to 75

Date of birth: 1930

Inflation Rate	Actual	+5%	+10%	-5%
A: Wage Indexed to age 60; then not				
Maximum Wage Earner	81%	107%	147%	65%
Average Wage Earner	67%	91%	114%	51%
Median Wage Earner	62%	85%	124%	52%
Minimum Wage Earner	54%	67%	90%	52%
B: Wage Indexed Earnings				
Maximum Wage Earner	68%	69%	69%	69%
Average Wage Earner	52%	52%	52%	51%
Median Wage Earner	52%	52%	52%	52%
Minimum Wage Earner	52%	52%	52%	52%
C: Wage Indexed to 60, then CPI				
Maximum Wage Earner	72%	72%	72%	72%
Average Wage Earner	55%	55%	56%	56%
Median Wage Earner	53%	53%	53%	53%
Minimum Wage Earner	52%	52%	52%	52%
D: CPI Indexed Earnings				
Maximum Wage Earner	75%	75%	74%	75%
Average Wage Earner	61%	61%	61%	61%
Median Wage Earner	56%	56%	56%	56%
Minimum Wage Earner	52%	52%	52%	52%

indexing procedures would help equalize the percentage benefit gain among different income classes.

The estimates on Table 12 reveal only the direct effects of alternative indexing procedures on OASI benefits. The possible effects of the shift in the incentive for delaying retirement on the choice of retirement dates, on private savings, and worker productivity are complex topics that cannot be explored here but must be left for subsequent research. In fact, high earners do tend to retire later. While it is tempting to conclude that high earners retire later because of the greater incentive, such an argument, which assumes that the substitution effect is stronger than the income effect, would rest on the presumption that those approaching retirement perceive with considerable precision the gain in benefits that they will realize if they postpone retirement. But the table does make clear that the size of the incentive that will be enjoyed by an age cohort depends in part on what happens to the taxable maximum cap and the speed of inflation after the 60th year.

Table 12, like the preceding tables on which it is based, does not state the gain from postponing retirement for workers whose earnings do not track one of the four specified income paths throughout their careers. Consider, for example, a college professor who received a substantial raise to the Taxable Maximum when promoted to full at the age of 40. And suppose that from then on her salary increased from year to year in proportion to increases in the National Average Wage Index; i.e., her income coincided with that of the Taxable Maximum path on Figure 3 only from age 40 on. As a result, each year that she works after 60 will displace an earlier year's income that is substantially below that for the worker on Table 5. This means that each year she decides to continue working full time will yield a net increase in her Average Indexed Monthly Earnings that is bigger than was reported on the tables. As a result, delaying retirement will yield a larger increase in OASI benefits than was indicated on Table 12.

Note that earnings in the last year of employment, while subject to tax, are not counted in computing OASI benefits. This means that if our college professor stops work at the end of the first semester of an academic year she will have nothing to show for a full year of taxed income. If she does stop full-time teaching in December she should consider saving that final year of teaching by taking a temporary position in the new year, even if it only involves retrieving shopping carts at the supermarket.

Our professor's OASI picture will be further complicated if she decides to cut back to part time later in her career. During her part-time years the OASI tax on her earnings will not yield any increase in OASI benefits if they are too low to displace the earnings of any of her earlier working years.

8 Summary and Conclusions

This paper demonstrates that full wage, mixed wage/CPI and full CPI indexing are all better at avoiding the distortions of inflation than the incomplete wage indexing procedure currently used by the Social Security Administration in computing OASI benefits. And Section 3 recommends strategies for addressing the other four indexing problems of the procedure currently used to calculate OASI benefits.

How would resolving the five indexing problems examined in this paper affect the financial viability of OASI? A precise estimate must be left for future study because it will require the examination of detailed survey data sets instead of just the experiences of the four representative workers, all born in 1930, that were evaluated in this paper. But examination of Table 4 does reveal that resolving Indexing Problem #1, the commingling of indexed with unindexed earnings, would reduce the retirement benefits of all four classes of workers. The exception is workers retiring at 62, who would be held harmless. Thus switching from incomplete to the full indexing of earnings could help resolve OASI's financial problems. We also saw that Problem #2, the skipped 61st year inflation adjustment, and Problem #3, the one year indexing lag, could be resolved in a financially neutral way. And mitigating Problem #4, the 60th year wage index bounce, would reduce the erratic variance of benefits among different age cohorts but not average annual benefit expenditures. Indexing for inflation the brackets of the income tax imposed on OASI benefits would resolve Problem #5 without affecting OASI's budget.[25] Thus it seems reasonable to conclude, pending further study, that correcting these five indexing problems could help resolve OASI's financial problems.

Adopting CPI-W indexing instead of wage indexing might help resolve OASI's longrun financial problem by gradually reducing most benefits over time. But the adjustment would not be smooth, judging by the rather erratic historical movement in the gap between the CPI-W and the wage index displayed on Figure 1. Instead, a predetermined schedule, generated perhaps with (14), could be used to provide a smooth phasing in of a reform while retaining the advantages of wage indexing of earnings.

The various experiments presented in this paper provide ample reason for making the procedure for calculating OASI benefits inflation neutral by resolving the five indexing problems. Not only will the resolution of these five problems eliminate certain

25 Because the revenue from this tax is allocated to Medicare, it would prevent inflation from gradually increasing Medicare's funding by reaching further down the income distribution.

capricious and regressive effects of inflation on the distribution of retiree benefits. It will make it easier for workers to evaluate more accurately the effect of delaying retirement on their OASI benefits. It will help insulate the financial viability of the trust funds from the vicissitudes of inflation.

Appendix: Calculating Benefits with *Any*PIA

A*ny*PIA, a program on the SSA website, calculates OASI benefits on the basis of actual or experimental earnings data entered by the user:

http://www.ssa.gov/OACT/anypia/download.html.

Working step-by-step through the tables produced by A*ny*PIA will reveal the details of the procedure by which benefits are calculated and confirm the validity of the equations presented in Section 2: Calculating OASI Benefits. The A*ny*PIA program was used to test the validity of the Excel spreadsheet benefit calculations presented in this paper.

Let us consider the extreme case of a worker born on January 2, 1930, who did not retire until his 75th birthday and whose W-2 income was always at or above the taxable maximum ceiling on earnings subject to the OASI tax.

Step #1: Tabulating Earnings Data (Page 4 of AnyPIA Output)

Each year the SSA records each worker's earnings as reported by employers on W-2 forms, but capped at the taxable maximum (aka the Contribution and Benefit Base) ceiling on earnings subject to the OASI tax. The capped earnings of a high income worker are reported in column 1 of Table 13, which reproduces the output of page 4 of A*ny*PIA in columns 1 through 4. The text in italics has been added to the A*ny*PIA output.

Step #2: Adjusting Earnings for Inflation

The worker's W-2 earnings for each year are adjusted for inflation to the level of wages prevailing in the year in which the worker attains age 60, or 1990 for our hypothetical worker. A*ny*PIA uses an especially constructed wage index called the Average Wage Indexing Series, which is based on average earnings of all workers. Column 2 of Table 13 is used by A*ny*PIA in calculating the indexed earnings that are recorded in column 3.[26]

[26] Column 2 is the product $E_t \bar{E}_{t^b+60}$, where E_t is the worker's capped earnings in column 1, t^b is the year of birth, and $\bar{E}_{t^b+60}$ is the value of the Average Wage Indexing Series (the average of all incomes reported for year t on Internal Revenue Service W-2 forms) in the worker's 60th year. Column 3 is this product divided by $\bar{E}_t$. This is equivalent to calculating indexed earnings ${}^{I}E_t = E_t / w_t$, where $w_t = \bar{E}_t / \bar{E}_{t^b+60}$ is the Average Wage Index based on average W-2 income of all workers, with w_t = 100 in the year of the worker's 60th birthday (*t^b+60)*. The average wage indexing series and the wage index have been added as columns 5 and 6 to the *AnyPIA* table.

Table 13: *AnyPIA* Output, Page 4

		Social Security partially indexed earnings……				Fully Wage Indexed Earnings……				
age	year	earnings	* earnings 21027.98	indexed earnings	high n years	Average wage Indexing series	Wage index 1990=100	indexed earnings	rank	highest 35 indexed earnings
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
21	1951	3,600.00	75,700,728.00	27,044.09		2,799.16	13.3	27,044	36	
22	1952	3,600.00	75,700,728.00	25,460.00		2,973.32	14.1	25,460	42	
23	1953	3,600.00	75,700,728.00	24,112.81		3,139.44	14.9	24,113	48	
24	1954	3,600.00	75,700,728.00	23,989.03		3,155.64	15.0	23,989	50	
25	1955	4,200.00	88,317,516.00	26,751.21		3,301.44	15.7	26,751	37	
26	1956	4,200.00	88,317,516.00	25,002.41		3,532.36	16.8	25,002	45	
27	1957	4,200.00	88,317,516.00	24,251.59		3,641.72	17.3	24,252	47	
28	1958	4,200.00	88,317,516.00	24,039.83		3,673.80	17.5	24,040	49	
29	1959	4,800.00	100,934,304.00	26,177.27		3,855.80	18.3	26,177	41	
30	1960	4,800.00	100,934,304.00	25,188.74		4,007.12	19.1	25,189	44	
31	1961	4,800.00	100,934,304.00	24,697.88		4,086.76	19.4	24,698	46	
32	1962	4,800.00	100,934,304.00	23,520.13		4,291.40	20.4	23,520	51	
33	1963	4,800.00	100,934,304.00	22,957.15		4,396.64	20.9	22,957	52	
34	1964	4,800.00	100,934,304.00	22,055.78		4,576.32	21.8	22,056	53	
35	1965	4,800.00	100,934,304.00	21,665.67		4,658.72	22.2	21,666	54	
36	1966	6,600.00	138,784,668.00	28,103.39	28,103.39	4,938.36	23.5	28,103	34	28,103.39
37	1967	6,600.00	138,784,668.00	26,620.56		5,213.44	24.8	26,621	38	
38	1968	7,800.00	164,018,244.00	29,437.42	29,437.42	5,571.76	26.5	29,437	33	29,437.42
39	1969	7,800.00	164,018,244.00	27,829.14	27,829.14	5,893.76	28.0	27,829	35	27,829.14
40	1970	7,800.00	164,018,244.00	26,513.40		6,186.24	29.4	26,513	40	
41	1971	7,800.00	164,018,244.00	25,244.92		6,497.08	30.9	25,245	43	
42	1972	9,000.00	189,251,820.00	26,528.89		7,133.80	33.9	26,529	39	
43	1973	10,800.00	227,102,184.00	29,960.08	29,960.08	7,580.16	36.0	29,960	32	29,960.08
44	1974	13,200.00	277,569,336.00	34,563.27	34,563.27	8,030.76	38.2	34,563	30	34,563.27
45	1975	14,100.00	296,494,518.00	34,352.60	34,352.60	8,630.92	41.0	34,353	31	34,352.60
46	1976	15,300.00	321,728,094.00	34,870.08	34,870.08	9,226.48	43.9	34,870	29	34,870.08
47	1977	16,500.00	346,961,670.00	35,478.68	35,478.68	9,779.44	46.5	35,479	27	35,478.68
48	1978	17,700.00	372,195,246.00	35,259.02	35,259.02	10,556.03	50.2	35,259	28	35,259.02
49	1979	22,900.00	481,540,742.00	41,948.03	41,948.03	11,479.46	54.6	41,948	26	41,948.03
50	1980	25,900.00	544,624,682.00	43,523.11	43,523.11	12,513.46	59.5	43,523	25	43,523.11
51	1981	29,700.00	624,531,006.00	45,344.26	45,344.26	13,773.10	65.5	45,344	24	45,344.26
52	1982	32,400.00	681,306,552.00	46,885.32	46,885.32	14,531.34	69.1	46,885	23	46,885.32
53	1983	35,700.00	750,698,886.00	49,260.91	49,260.91	15,239.24	72.5	49,261	21	49,260.91
54	1984	37,800.00	794,857,644.00	49,262.73	49,262.73	16,135.07	76.7	49,263	20	49,262.73
55	1985	39,600.00	832,708,008.00	49,499.63	49,499.63	16,822.51	80.0	49,500	19	49,499.63
56	1986	42,000.00	883,175,160.00	50,986.28	50,986.28	17,321.82	82.4	50,986	10	50,986.28
57	1987	43,800.00	921,025,524.00	49,983.72	49,983.72	18,426.51	87.6	49,984	16	49,983.72
58	1988	45,000.00	946,259,100.00	48,942.65	48,942.65	19,334.04	91.9	48,943	22	48,942.65
59	1989	48,000.00	1,009,343,040.00	50,217.20	50,217.20	20,099.55	95.6	50,217	13	50,217.20
60	**1990**	**51,300.00**	**0**	**51,300.00**	**51,300.00**	**21,027.98**	**100.0**	**51,300**	**9**	**51,300.00**
61	1991	53,400.00		53,400.00	53,400.00	21,811.60	103.7	51,482	7	51,481.51
62	**1992**	**55,500.00**		**55,500.00**	**55,500.00**	**22,935.42**	**109.1**	**50,884**	**11**	**50,884.30**
63	1993	57,600.00		57,600.00	57,600.00	23,132.67	110.0	52,359	4	52,359.35
64	1994	60,600.00		60,600.00	60,600.00	23,753.53	113.0	53,647	3	53,646.58
65	**1995**	**61,200.00**		**61,200.00**	**61,200.00**	**24,705.66**	**117.5**	**52,090**	**5**	**52,089.78**
66	1996	62,700.00		62,700.00	62,700.00	25,913.90	123.2	50,878	12	50,878.27
67	1997	65,400.00		65,400.00	65,400.00	27,426.00	130.4	50,143	14	50,143.29
68	1998	68,400.00		68,400.00	68,400.00	28,861.44	137.3	49,835	17	49,835.14
69	1999	72,600.00		72,600.00	72,600.00	30,469.84	144.9	50,103	15	50,103.03
70	2000	76,200.00		76,200.00	76,200.00	32,154.82	152.9	49,832	18	49,831.78
71	2001	80,400.00		80,400.00	80,400.00	32,921.92	156.6	51,353	8	51,353.31
72	2002	84,900.00		84,900.00	84,900.00	33,252.09	158.1	53,689	2	53,689.12
73	2003	87,000.00		87,000.00	87,000.00	34,064.95	162.0	53,704	1	53,704.30
74	2004	87,900.00		87,900.00	87,900.00	35,648.55	169.5	51,849	6	51,849.50

	Sum: Age 21 through Age 60, wage indexed	***867,007.52***	*Sum: Age 21 through Age 60*	***867,007.52***
	Sum: Age 61 to retirement, not indexed	***+ 973,800.00***	*Sum: Age 61 through to retirement*	***+ 721,849.27***
TOTAL	*Sum: Age 21 to retirement*	***∑ 1,840,807.52***	*Sum: Age 21 through to retirement*	***∑ 1,588,856.78***

Wage Indexed

Not indexed

SSA Mixed Indexed Sum

Wage Indexed Sum

Step #3: Summing the 35 Best Years

The Social Security benefit is calculated from the sum of indexed earnings for the 35 highest years; earnings in remaining years do not count. Column 4 of the A*ny*PIA output selects the highest 35 years from column 3. The sum of this column, $1,840,807.52, will be carried over to the next table for the subsequent steps in calculating our worker's retirement benefit. As indicated by the bottom italicized rows that have been added to the A*ny*PIA output, more than half this sum for this late retiring worker has not been indexed for inflation. The fully indexed best 35 year sum reported at the bottom of column 9 is only $1,588,856.78, which would yield substantially lower retirement benefits for our high income worker.

Step #4: Calculating Average Indexed Monthly Earnings (Page 5 of AnyPIA output)

At the beginning of the second line of Table 14, *AnyPIA* calculates the worker's Average Indexed Monthly Earnings (AIME) by dividing the sum of indexed earnings for the best 35 years from the bottom of the preceding table by 35x12: AIME = $1,840,807.52/(35x12) = $4,382. The columns added to the right of the verticsl line show the effects of full indexing. As shown near the top of the rightmost column, full wage indexing of earnings yields AIME = $3,782, or only 86% of the figure obtained with incomplete indexing.

Step #5: Calculating the Primary Insurance Amount at Eligibility (Page 5 of AnyPIA output)

Age 62, the first year one may elect to start receiving OASI benefits, is called the year of eligibility. The PIA at eligibility is a piecewise linear function of the AIME, as graphed on Figure 2 for a worker born in 1930. The PIA function is the same for all workers born in the same year, but it shifts from birth cohort to birth cohort because the bend points shift in response to changes in the Average Wage Index.

Table 14: Primary Insurance Amount (Page 5 of *AnyPIA* Output)

(1)	(2)	(3)	(4)
Base year for indexing = 1990	*Mixed sum from column 4 of AnyPIA output (Table 4)*	*Fully wage indexed sum from column 9 of AnyPIA output (Table 4)*	
		SSA recalculated	***Full Wage Indexing***
Number of computation years = 40 - 5 = 35		*1,840,807.52*	*1,588,856.78*
AIME = 1,840,807.52/(35*12) = 4,382		***4,382***	***3,782***
PIA formula bend points = 387 and 2,333			
PIA at eligibility =			
0.90 * 387 +	0.90x387 +	*348.30*	*348.30*
0.32 * 1,946 +	0.32x1,946 +	*622.72*	*622.72*
0.15 * 2,049 = 1,278.30	0.15 x 2,049	*307.35*	*217.35*
(*PIA Rounds down to nearest 10 cents)*		***1,278.30***	***1,188.30***
CPI increases applied:	p_t / p_{t-1}		
3.0 % for December 1992: 1,316.60	*1.0302*	*1,316.89*	*1,224.18*
2.6 % for December 1993: 1,350.80	*1.0259*	*1,351.06*	*1,255.93*
2.8 % for December 1994: 1,388.60	*1.0283*	*1,389.33*	*1,291.52*
2.6 % for December 1995: 1,424.70	*1.0262*	*1,425.71*	*1,325.33*
2.9 % for December 1996: 1,466.00	*1.0293*	*1,467.47*	*1,364.15*
2.1 % for December 1997: 1,496.70	*1.0209*	*1,498.15*	*1,392.67*
1.3 % for December 1998: 1,516.10	*1.01351*	*1,518.40*	*1,411.49*
2.4 % for December 1999: 1,554.00	*1.02458*	*1,555.72*	*1,446.19*
3.5 % for December 2000: 1,608.30	*1.0352*	*1,610.45*	*1,497.06*
2.6 % for December 2001: 1,650.10	*1.0261*	*1,652.52*	*1,536.17*
1.4 % for December 2002: 1,673.20	*1.0140*	*1,675.61*	*1,557.64*
2.1 % for December 2003: 1,708.30	*1.0211*	*1,711.04*	*1,590.58*
2.7 % for December 2004: 1,754.40	*1.0266*	*1,756.59*	*1,632.92*
PIA at benefit date = 1,754.40		***1,756.50***	***1,632.90***
Alternative Calculation of the PIA at benefit date:			
The CPI-W was 134.7 in 1991 and 185.1 in 2004 (1982-84=100, 3rd quarter ave); therefore, the PIA at benefit date is (185.1/134.7) ×1,278.30 =		***1,756.50***	***1,632.90***

PIA at benefit date figures are rounded off to the nearest 10 cents.
The SSA Recalc column figure of 1,756.50 for the PIA at benefit date differs slightly from AnyPIA's PIA because of rounding and differences for the 1998 and 1999 inflation factors.

As indicated about a quarter of the way down column 3 of Table 14, our worker's PIA at eligibility as calculated by the SSA, is $1,278.30. Column 4 reveals that with fully wage indexed earnings, it would have been $1,188.30, or about 7% less.

Step #6: Calculating the PIA at a Benefit Date (e.g., 2005)

The Consumer Price Index, CPI-W, is used to determine the Primary Insurance Amount (PIA) at a benefit date (age 75 for this example) from the PIA at age of eligibility by an iterative year-to-year procedure recorded on successive lines of the *AnyPIA* output. As shown halfway down the left side of Table 14, each successive year's inflation adjusted PIA is obtained by multiplying the preceding year's inflation adjusted figure by p_t / p_{t-1}, where p_t is the Bureau of Labor Statistics' Consumer Price Index for Urban Wage Earners and Clerical Workers, seasonally unadjusted (CPI-W). *AnyPIA* reports that if our worker continued working until his 75th birthday, the PIA at age 75 would be

$$PIA = 1,278.30 \times (p_{2004} / p_{2003}) \times (p_{2003} / p_{2002}) \times ... \times (p_{1992} / p_{1991}) = \$1754.40 . \qquad (1)$$

Because of rounding to the nearest 10 cents at each stage of this iterative process, a slightly different number is obtained (column 3) with the simple algebraic equivalent

$$PIA = 1,278.30 \times (p_{2004} / p_{1991}) = \$1,756.50. \qquad (2)$$

With full wage indexing (column 4), the PIA at benefit date 2005 would be $1,632.90, or 7% less than with incomplete indexing.

Step #7: Determining the Benefit (Page 1 of AnyPIA output)

How our maximum earner's monthly benefit is affected by the choice of when to retire from work and when to start claiming OASI benefits is revealed by Table 15. Thanks to the delayed increment factor, workers who delay starting benefits until 70 enjoy benefits that are 22.5% higher than they would have been if they had started taking benefits at age 65. Working beyond age 70 will involve enjoying a higher benefit as a result of paying more taxes, but the delayed increment factor will remain at 22.5%.

Table 15: OASI Benefits for Maximum Wage Earner (Page 1 of *AnyPIA* Output)

Date of birth: January 02, 1930 Retired in January 2005 at age 75 and 0 months	*Alternative Indexing Strategies*		
	(1) *SSA recalculated: wage indexing to age 60; then not*	*(2)* *Full Wage Indexing*	*(3)* *Difference*
Average Indexed Monthly Earnings = 4,382	*4,382.00*	*3,782.00*	*600.00*
Primary Insurance Amount = 1,754.40	*1,756.50*	*1,632.90*	*123.60*
Number of months increment = 60	*60.00*	*60.00*	-
Delayed increment factor = 1.225	*1.225*	*1.225*	-
Monthly Benefit after rounding = 2,149.00	*2,151.00*	*2,000.00*	*151.00*
Annual Benefit	*25,812.00*	*24,000.00*	*1,812.00*

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