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Preliminary Draft; Comments Please

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Abstract

This paper examines five problems with the inflation indexing procedures used by the Social Security Administration in taking inflation into account when calculating Old Age and Survivors Insurance (OASI) Benefits. Several of these problems have capricious and perverse distributional consequences. For example, as a result of Problems #2 and #4 your OASI check will be larger if wage inflation happens to be extra high in your 60th year or if price inflation is exceptionally low in your 61st year. And because of Problem #1, the size of the benefit increase you will receive if you elect to postpone retirement and the start of OASI benefits depends in part on the pace of inflation. While indexing problems do not attract much attention in normal times, they can contribute to serious short-run financial instability for the OASI trust funds in periods of substantial inflation.

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Email: mlovell@wesleyan.edu; Webpage: http://mlovell.web.wesleyan.edu While I am fully responsible for remaining errors, I am tremendously indebted to Barbara Bergmann, Estelle James, Joyce Manchester, Marnie W. Mueller, L. Scott Muller, Charles L. Schultze, András Simonovits, Van Doorn Ooms and members of the Wesleyan Economics Workshop for helpful comments on an earlier draft of this paper. A preliminary version of this paper was presented at the Eastern Economics Association Annual Meetings, March 8, 2008.

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 inflation be explicitly taken into account. With appropriate indexing it would not be necessary to take the future pace of inflation into account in properly specifying the incentives provided for delaying retirement and the start of OASI benefits. Although indexing problems do not attract much attention in normal times, they could contribute to 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 a quarter of a century ago.

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 enjoys 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, or a $1,812 annual bonus. In contrast to this $1,812 annual bonus, a worker who always earned the minimum wage and was able to keep working until age 75 receives a benefit of $10,284 instead of $10,152, or an annual bonus of $132. These bonuses, adjusted for inflation with the CPI-W, are received in every year of retirement, and beyond if claimed by the worker's surviving spouse.

Social Security as it 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 is indexed 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 between 1917 and 1921 become known as the "Notch Generation" because their benefits were reduced below those of both the immediately preceding and following birth cohorts. 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. And the event was of such significance as to warrant mention by George Borjas in the latest edition of his *Labor Economics* [2005, p 83]. A bipartisan Commission on the Social Security Notch Issue, established by Congress in 1992, concluded after extensive hearings that no remedial action should be taken (http://www.ssa.gov/history-/notchfile1.html). 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.

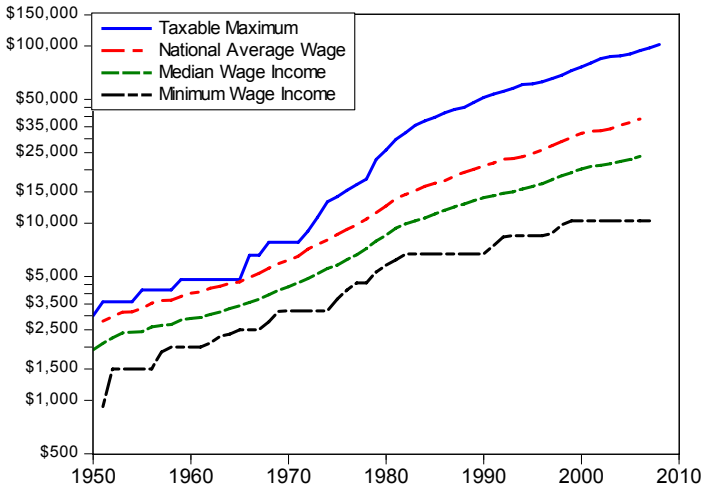
The next section of this paper explains how the OASI benefits are calculated. Section 3 examines the way in which the price and wage indices used by the SSA are constructed. Section 4 investigates the five indexing problems and recommends steps that would contribute to their resolution. Computer experiments in Section 5 examine how well the indexing procedures respond to accelerated inflation or deflation. Section 6 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, inheritances, personal saving and investments,

2. Calculating OASI Benefits – Seven Steps

OASI indexing problems are most easily explained by working step-by-step through the calculations involved in determining the benefits of a particular worker using the *AnyPIA* benefit calculation program, version 8.1, downloaded from the Social Security web site: http://www.socialsecurity.gov/OACT/*AnyPIA*/*AnyPIA*.html. We shall focus initially on 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 W-2 earnings subject to the OASI tax . A successful lawyer, a business school professor, and a Bill Gates for that matter, may all earn at or above the taxable maximum throughout their careers. Figure 1 plots the earning history of this worker, labeled Taxable Maximum, along with three other earning paths that will be examined later.

Figure 1: Income History



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 1, which reproduces the output of page 4 of *AnyPIA* in columns 1 through 4.

Table 1: *AnyPIA* output, Page 4

Page 4

		Social Security partially indexed earnings				!	*Wage Indexed Earnings*				
age	year	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*
CY *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*
FYE *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*
FRA *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***		**Wage Indexed**	Sum: Age 21 through Age 60			***867,007.52***
		Sum: Age 61 to retirement, not indexed			***+ 973,800.00***		**Not indexed**	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***
		SSA Mixed Indexed Sum						**Wage Indexed Sum**			

Note: CY is the calculation year, FYE is the first year of entitlement, and FRA is the full retirement age for a worker born in 1930.

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. *AnyPIA* uses an especially constructed wage index called the Average Wage Indexing Series, which is based on average W-2 earnings instead of a price index in order to capture the secular rise in living standards generated by the interplay of capital accumulation, technological progress and changes in the terms of trade that may allow money wages on average to rise more rapidly than

the rate of price inflation. Column 2 of the table is used by *AnyPIA* in calculating the indexed earnings that are recorded in column 3.[1]

Indexing Problem #1: Partially indexed earnings: As can be seen from the table, the data in column 3, labeled "indexed earnings", are in fact *not* adjusted for inflation for any of the years following the year in which our worker turned 60 (1990 for a worker born in 1930); that is, the unindexed earning figures from column 1 after 1990 through to retirement are carried over to columns 3 without adjustment. Thus column 3, labeled "indexed earnings" by *AnyPIA*, actually commingles inflation adjusted data with unadjusted data. That is to say, it sums data from wage earnings up to age 60 that have been inflated with the wage index to the wage level in the year of the worker's 60th birthday plus current dollar wage data for the post age 60 earnings; i.e., it adds apples and pears.

The columns to the right of the vertical line on Table 1 have been added to the *AnyPIA* output in order to show the effects of fully indexing earnings. Column 5 reports the level of average wages, column 6 is the wage index constructed from that series (1990 = 100), and column 7 reports our worker's indexed wages. All the data in column 7 have been adjusted to the wage level of 1990. It coincides with column 3 only through 1990.

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 *AnyPIA* output selects the highest 35 years from column 3. The sum of this column, $1,840,807.52, will be carried over for the subsequent steps in calculating our worker's retirement benefit. As indicated by the bottom italicized rows that have been added to the *AnyPIA* 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 will yield substantially lower retirement benefits for our high income worker.

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

Next, near the upper left-hand corner of Table 2, *AnyPIA* calculates the worker's Average Indexed Monthly Earnings (AIME) by dividing the sum of indexed earnings for the best 35 years from the preceding step by 35x12: AIME = $1,840,807.52/(35x12) = $4,382. The columns added to the right of the dashed 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.

[1] Column 2 is the product $E_t \bar{E}_{60}$, where E_t is the earnings in column 1 and $\bar{E}_{60}$ is the National Average Wage Indexing Series (the average of all incomes reported for year t on Internal Revenue Service W-2 forms). Column 3 is this product divided by E_t, This is equivalent to calculating indexed earnings ${}^{i}E_t = E_t / w_t$, where $w_t = \bar{E}_t / \bar{E}_{60}$ is the National 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. The average wage indexing series and the wage index have been added as columns 5 and 6 on the table.

Table 2: Primary Insurance Amount (Page 5 of *AnyPIA* Output)

page 5

(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 +		*348.30*	*348.30*
0.32 * 1,946 +		*622.72*	*622.72*
0.15 * 2,049 = 1,278.30		*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.

Step #5: Calculating the PIA 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 *Primary Insurance Amount* (PIA^e) at eligibility is a piecewise linear function of the AIME, as graphed on Figure 2 for a worker born in 1930. The kinks in the graph are known as "bend points."

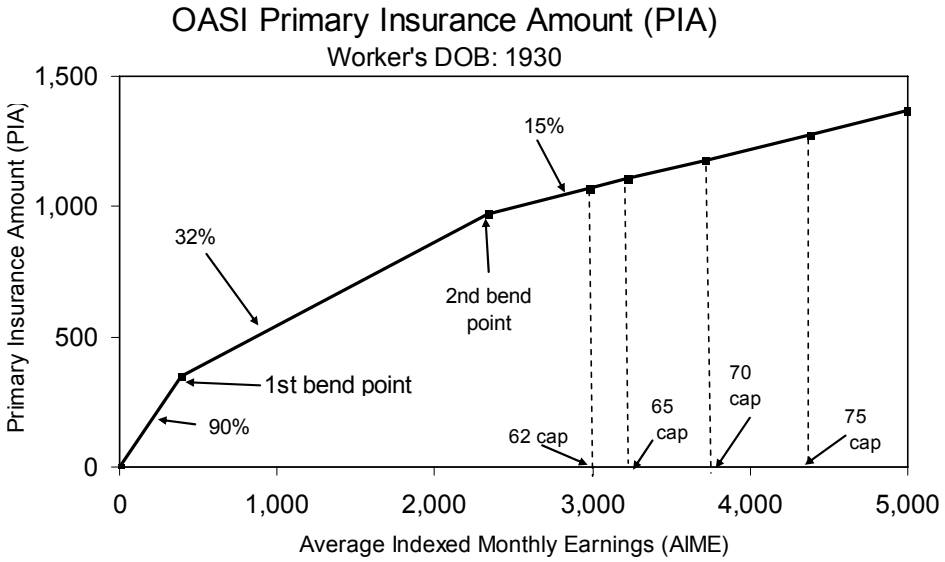
The PIA function is the same for all workers born in the same year, but it shifts from birth cohort to birth cohort in response to wage inflation, the bend points (kinks in the curve) marching to the right for successive birth cohorts in proportion to increases in the National Average Wage Indexing series.

The PIA is bounded above for each birth cohort by the fact that each year's earnings are capped by the Taxable Maximum in Step #1 and because only the best 35 years of these capped earnings count in Step #2. The resulting ceiling on AIME, and hence on the PIA, moves to the right. How far depends on the age at which the capped income worker retires, as indicated by the dashed lines on Figure 2 for a worker born in 1930.

Observe from the graph that the ratio of benefits to earnings declines with AIME, making the PIA^e a progressive function of earnings. However, 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.[2] As indicated about a quarter of the way down column 3 of Table 2, 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.

Figure 2: Primary Insurance Amount: Year of Eligibility (Age 62; DOB 1930)



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 2, 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 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 3, which reproduces page 1 of *AnyPIA*'s output, supplemented with columns to the right of the vertical line indicating the effects of complete indexing. The worker's benefit would be calculated by reducing the PIA at Benefit Date by an Actuarial Reduction Factor if the worker had started benefits before full retirement age (65 for

[2] Gustman and Steinmeier [2001] report that there is significant redistribution when only own benefits are taken into account but 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 the benefits are measured net of the personal income tax.

a worker born in 1930) or increasing it with a Delayed Retirement Credit if the worker postponed the start of benefits. Thanks to the delayed increment factor, workers who delay starting benefits until age 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 3: 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*

AnyPIA's calculations of the benefits of our maximum income worker are reported on the left side of Table 3. The subsequent columns show that this worker's benefits would be substantially reduced with full indexing over the entire working lifespan. A later table will report benefits for an average income, a median income, and a minimum wage worker.

Married workers have the choice of enjoying their own benefit or one-half of their spouse's benefit, which ever is greater.[3] If our maximum earnings worker is single, the annual benefit is $25,812 with the incomplete indexing procedure of SSA. If our maximum earning worker is married, the spouse might claim a spousal benefit of $12,906 if it is larger than that based on his own earning history. Thus the couple might receive a combined benefit of $38,718 on the basis of the taxes paid by only one of them. Surviving marital partners may choose to continue receiving their deceased spouse's benefit if it is larger than their own.

Recapitulation

The entire complex process is reviewed on Table 4.

[3] A divorced spouse who does not remarry before age 60 may still elect the survivor benefit, provided their marriage had lasted at least 10 years. A divorced spouse who remarried after age 60 could still collect benefits on his former spouse's record or choose instead to get retirement benefits on the record of the new spouse or his own record. The Social Security Administration accepts common law marriages if recognized in the state where the couple resides. Gay Marriages are not accepted even if recognized in the state of residence (e.g., Massachusetts and San Francisco).

Table 4: Summary: OASI Benefit Calculation

Table 4: Summary of OASI Benefit Calculations

t, a, b, a^s, t^b	Subscripts for year, age, birth date, age when worker first claims OASI benefits, and year benefit received r = t^b – b	Birth date is year of birth Note: t = a + b & b+r = year of benefit at age r
Step 1: Tabulating Earnings Data		
E_t^{w-2}	Earnings reported on worker's W2 form	
C_t	Taxable Maximum Earnings; aka the Contribution and Benefit Base or Cap	e.g., $102,000 in 2008
E_t	E_t = min(E_t^{w-2} , C_t)	Earnings above C_t are ignored
Step 2: Adjusting Earnings for Inflation		
w_t	National Average Wage index at date t w_t normalized to equal = 100 in worker's 60th year.	Index based on average of all worker's W-2 income;
${}^iE_t$	${}^iE_i = E_t / w_t *,\ w_t^* = w_t$ if $t \le 60 + b$, else 1.	Indexed earnings; actually indexed only to year of the 60th birthday; then current dollar earnings.
Step 3: Summing the 35 Best Years (other years are discarded)		
$R_a({}^iE_a)$	Rank of indexed earnings at age a	Descending rank
${}^iE^{35}$	${}^iE^{35} = \sum_{R_a({}^iE_a)\le 35} {}^iE_a$	Only the best 35 years of the worker's entire career are counted in computing benefits
Step 4: Calculating Average Indexed Monthly Earnings		
$\bar{E}$	$\bar{E}$ = ${}^iE^{35}$ /(35x12)	Average Indexed Monthly Earnings (AIME)
Step 5: Calculating the Primary Insured Amount (PIA) at age of eligibility		
$P^{62}(b, \bar{E})$	PIA at Age of Eligibility P^{62} is a piecewise linear function of $\bar{E}$; see Figure 1.	62 is the earliest age at which a worker qualifies to receive OASI benefits.
Step 6: Calculating the Primary Insured Amount for a Benefit Year $t^b \ge 62 + b$		
p_t	Price index at date t	Bureau of Labor Statistics CPI-W (3rd quarter average)
P_{t^b}	$P_{t^b} = (p_{t^b-1} / p_{b+61}) P^{62}(b, \bar{E})$	Primary insurance amount for benefit at date t_b
Step 7: Calculating the Benefit at date t ≥ b + 62		
$A(a^s)$	Adjustment factor (actuarial reduction or delayed retirement credit) reduces benefits for early start or augments benefits for the late start of benefits:	*A(62)* = 80%; *A(65)* = 100%; *A(70)* = 122.5% for *b* = 1930 . See http://www.socialsecurity.gov/ – OACT/ProgData/ar_drc.html
$B(b, a, a^s) = \begin{cases} A(a^s)(p_{t^b-1} / p_{b+61}) P^{62}(b, \bar{E}) \text{ for } a \ge 62, \\ 0 \text{ otherwise} \end{cases}$		Benefit at age a for a worker born in year *b* who starts benefits at age a^s.

The benefit at age *r* for a worker born in year b who started benefits at age a^s with W-2 earnings E_t^{W-2} is calculated as follows, utilizing the notation of Table 4:

$$B(b, a, a^s) = A(a^s)(p_{b+r-1} / p_{b+61}) P^{62}[b, \sum_{R_a(E_a)\le 35} {}^i \min(E_t^{W-2},\ C_t) / (420 w_t^*)], \qquad (3)$$

where $w_t^* = w_t$ if $t \le 62 + b$, else 1.

The entire set of calculations is updated each year after age 62 for which our worker has W-2 earnings, but the bend points for the PIA function used in Step 5 are unchanged and the wage index remains normalized at 100 in the worker's 60th year.

Evaluating the effect of Indexing Problem #1, partial indexing, is complicated in part because PIA function $P^{62}[\ ]$ is non-linear and in part because only the 35 highest income years enter

into its argument. The effect may be larger the longer our beneficiary keeps working, for that will increase the number of undeflated years that potentially enter into the sum of the 35 highest earning years. And it also depends upon how high the undeflated earnings are in those years, which is determined in part by whether our worker continues to receive as high a real income as in his younger years and in part upon the extent of inflation. These factors may be particularly favorable for workers who earned above the Cap during their careers. Thus a successful professional might cut back on her practice as she ages but find that her reduced income is still above the taxable maximum cap. Note also that the benefit would be the same even if she had not been employed until after her 35th year because those early income years did not count among the highest 35 – see Table 1.

Later in this paper we will see how the effect of inflation on the benefits received by our Taxable Maximum worker contrasts with those of average and median income workers and of a worker who earned only the federal minimum wage. We will also examine how the benefits of these workers would be affected by various modifications of the indexing procedure, such as wage or price indexing earnings received after the 60th year. First, however, we must look more closely at the indexes used in adjusting benefits for inflation.

3. Wage and Price Indices

The two indexes used by the Social Security Administration (SSA) in adjusting nominal figures for inflation are recorded on the first two columns of Table 5. The National Average Wage Index (NAWI) 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.[4] Both are plotted on Figure 3.

On Table 5 we have the level and annual inflation rates for both indexes. Table 5 also reports the effective interest rate r earned on the Social Security's OASI trust fund and two implied real rates of interest, defined as $r - \dot{p}$ where $\dot{p}$ is the rate of change in either the CPI-W or NAWI.[5] The procedure for computing the sum of indexed earnings in the 35 highest years implicitly uses a zero real NAWI interest rate, while in practice the trust funds have earned a real rate of about 1.9% relative to the NAWI or 2.7% relative to the CPI-W. In contrast to Social Security, when individuals make contributions to retirement funds, add to a private savings account, or purchase bonds, their savings in earlier years make a larger contribution toward retirement, earning more interest because they are invested for a longer period of time.

[4] *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 and pointing out the advantage of using a superlative index recognizing that consumers substitute away from commodities that rise most in price. In contast, the primary focus of this study is on the way in which the indexes are used.

[5] The effective interest rate on OASI trust funds was downloaded from http://www.socialsecurity.gov/OACT/ProgData/effectiveRates.html

Table 5: Wage and CPI-W Inflation; Interest Rates

	CPI-W	NAWI	Annual Inflation Rates			trust fund	real interest rates	
Year	1990=100		CPI-W	NAWI	difference	interest rate	r – CPI	r - NAWI
1960	22.9	19.1	1.48	3.92	2.4	2.6	1.1	-1.3
1961	23.2	19.4	1.12	1.99	0.9	2.7	1.6	0.7
1962	23.5	20.4	1.11	5.01	3.9	2.8	1.7	-2.2
1963	23.8	20.9	1.42	2.45	1.0	2.9	1.5	0.4
1964	24.1	21.8	1.19	4.09	2.9	3.1	1.9	-1.0
1965	24.5	22.2	1.71	1.80	0.1	3.2	1.5	1.4
1966	25.3	23.5	3.25	6.00	2.8	3.5	0.3	-2.5
1967	25.9	24.8	2.64	5.57	2.9	3.7	1.1	-1.9
1968	27.1	26.5	4.45	6.87	2.4	3.9	-0.6	-3.0
1969	28.6	28.0	5.59	5.78	0.2	4.4	-1.2	-1.4
1970	30.2	29.4	5.65	4.96	-0.7	5.0	-0.7	0.0
1971	31.5	30.9	4.33	5.02	0.7	5.2	0.9	0.2
1972	32.5	33.9	3.09	9.80	6.7	5.3	2.2	-4.5
1973	34.7	36.0	6.87	6.26	-0.6	5.7	-1.2	-0.6
1974	38.7	38.2	11.45	5.94	-5.5	6.2	-5.2	0.3
1975	42.1	41.0	8.75	7.47	-1.3	6.6	-2.1	-0.9
1976	44.4	43.9	5.42	6.90	1.5	6.7	1.3	-0.2
1977	47.4	46.5	6.71	5.99	-0.7	6.9	0.2	0.9
1978	51.1	50.2	7.91	7.94	0.0	7.2	-0.7	-0.7
1979	57.3	54.6	12.05	8.75	-3.3	7.4	-4.6	-1.3
1980	64.6	59.5	12.77	9.01	-3.8	8.5	-4.3	-0.5
1981	71.5	65.5	10.73	10.07	-0.7	9.9	-0.8	-0.2
1982	75.6	69.1	5.67	5.51	-0.2	10.9	5.2	5.4
1983	77.4	72.5	2.41	4.87	2.5	10.9	8.5	6.0
1984	80.1	76.7	3.51	5.88	2.4	11.8	8.3	5.9
1985	82.6	80.0	3.14	4.26	1.1	11.3	8.2	7.0
1986	83.7	82.4	1.27	2.97	1.7	11.3	10.0	8.3
1987	87.2	87.6	4.20	6.38	2.2	10.1	5.9	3.7
1988	90.7	91.9	4.00	4.93	0.9	9.8	5.8	4.9
1989	94.9	95.6	4.70	3.96	-0.7	9.6	4.9	5.6
1990	100.0	100.0	5.32	4.62	-0.7	9.3	4.0	4.7
1991	103.7	103.7	3.70	3.73	0.0	9.1	5.4	5.4
1992	106.8	109.1	3.02	5.15	2.1	8.7	5.7	3.5
1993	109.6	110.0	2.59	0.86	-1.7	8.3	5.7	7.4
1994	112.7	113.0	2.83	2.68	-0.1	8.0	5.2	5.3
1995	115.7	117.5	2.62	4.01	1.4	7.9	5.3	3.9
1996	119.0	123.2	2.93	4.89	2.0	7.7	4.8	2.8
1997	121.5	130.4	2.09	5.84	3.7	7.6	5.5	1.8
1998	123.2	137.3	1.35	5.23	3.9	7.3	5.9	2.1
1999	126.2	144.9	2.46	5.57	3.1	7.0	4.5	1.4
2000	130.6	152.9	3.52	5.53	2.0	6.9	3.4	1.4
2001	134.1	156.6	2.61	2.39	-0.2	6.7	4.1	4.3
2002	135.9	158.1	1.40	1.00	-0.4	6.4	5.0	5.4
2003	138.8	162.0	2.11	2.44	0.3	6.0	3.9	3.6
2004	142.5	169.5	2.66	4.65	2.0	5.7	3.0	1.1
2005	148.3	175.7	4.11	3.66	-0.4	5.4	1.3	1.7
2006	153.2	183.8	3.30	4.60	1.3	5.3	2.0	0.7
2007	156.7		2.28		-2.3	5.2	2.9	5.2
Minimum			1.1	0.9	-5.5	2.6	-5.2	-4.5
Maximum			12.8	10.1	6.7	11.8	10.0	8.3
Average			4.2	5.0	0.8	6.8	2.7	1.9
Standard Deviation			2.9	2.1	2.2	2.6	3.4	3.1

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 to annually adjust 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.

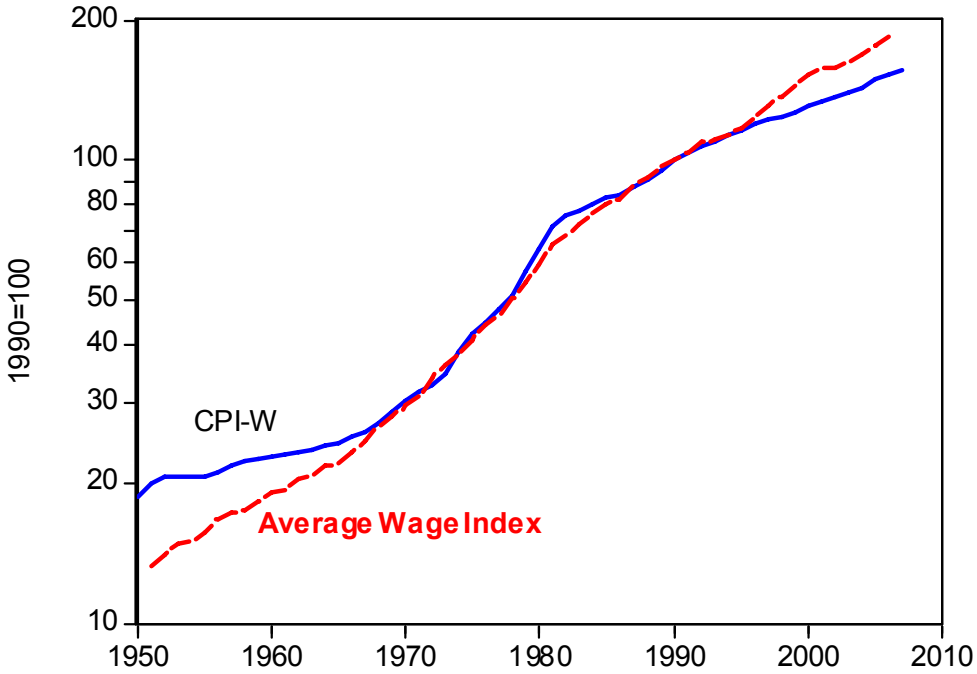
National Average Wage Index (NAWI):

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 'national 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."[6]

[6] 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 [Michael 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.

Figure 3: Alternative Inflation Indexes: NAWI versus the CPI-W



While the NAWI now includes 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 gain rate by the IRS even though 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 until October 17, 2007

A number of non-inflationary factors can influence the path of the National Average Wage Index. For example, the index would be boosted by a decline in the proportion of the work force composed of part-time workers, which might occur as a result of the aging of the population or a shift in the labor force participation rate of teenagers. And indeed, the teenage fraction of total employment declined from a peak of 8.6% in 1974 to 4% in 2007. The index will have a downward bias in recession because the cut back 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 among the majority of the work force. In fact, in the last decade the mean income has risen much more rapidly then the median as a result of the increased skewness of 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 National *Median* Wage Index instead of the National Average Wage Index had been used, but that could be a temporary effect if the trend toward a more highly skewed income distribution is reversed.

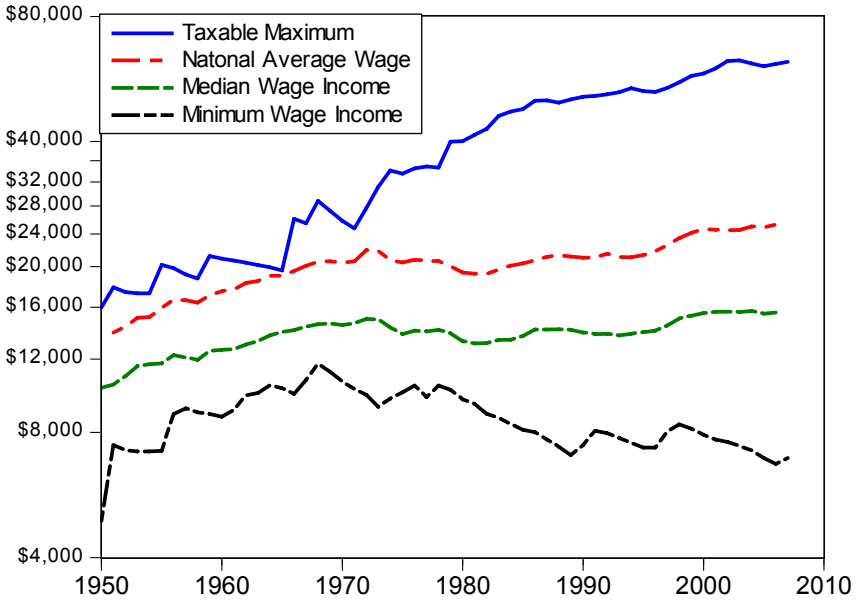
Comparisons

Figure 3 compared the time path of the National Average Wage Index (NAWI), used in inflating 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 productivity slowdown of the 1980's, when real wages declined.

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 serves to stabilize the replacement ratio – the ratio of retirement income to the worker's average income – near the end of the worker's career. [7]

Evidence that the choice of deflator makes a difference is provided by a comparison of Figure 1 with Figure 4 and Figure 5. Figure 1 reported the income streams for a Taxable Maximum, 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, and that workers who earned only the federal minimum wage throughout their careers suffered a decline in purchasing power. In Figure 5 we observe 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 National Average Wage Index is the deflator.

Figure 4: CPI-W Deflated Incomes



[7] 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, but this would introduce the complication of correcting initial payments that had to be made on the basis of preliminary data.

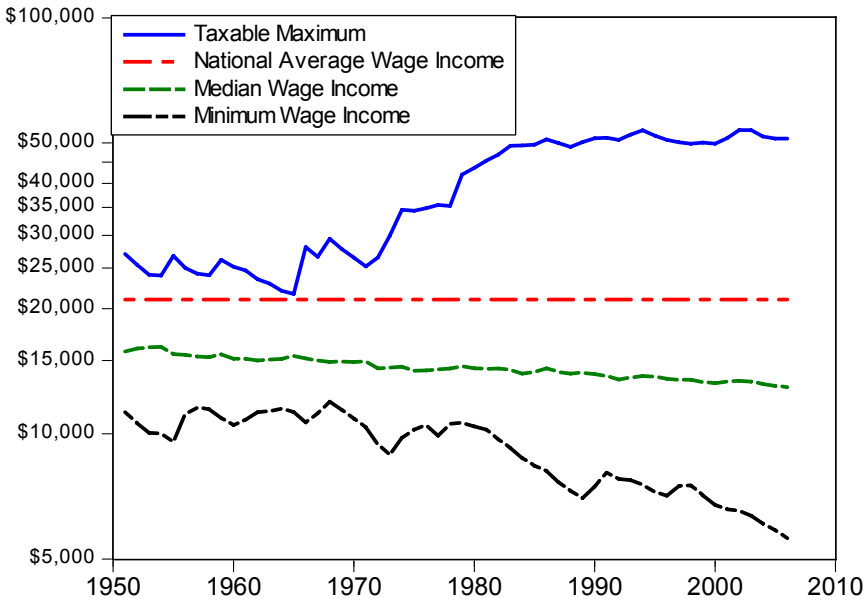
The Taxable Maximum, adjusted by the wage deflator, increased dramatically in the 1970s and 80s. The immediate effect of an increase in the Taxable Maximum is to raise OASI tax revenue. The Congressional Budget Office [2004, Appendix A] has commented as follows:

> "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 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 remained on employee contributions but the cap were removed on the 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.

Figure 5: National Average Wage Index deflated incomes



4. Indexing Problems

We will illustrate the effects of various indexing problems by considering how the OASI benefits received by four quite differently situated hypothetical workers are affected:[8] Two are at the extreme ends of the income distribution and two represent two alternative concepts of the center of that distribution.

- Maximum Wage Earners always earned at or above the taxable maximum cap. This category includes successful accountants, lawyers and physicians, business school professors, many other professions and business leaders. Some may continue to earn above the taxable maximum even in part-time retirement. In 2006 only about 6% of W-2 earners had income at or above the taxable maximum cap http://www.socialsecurity.gov/cgi-bin/netcomp.cgi?year=2006)
- Average Wage Earners enjoyed the average (mean) wage (W-2 income) of all workers subject to the Social Security tax throughout their careers.
- Median Wage Earners always earned the median of the W-2 earnings distribution. Because the distribution of income is skewed, the average wage is substantially above the median. In 1990 the mean was $21,028 while the median was $14,499. From 1990 to 2007 the mean increased from 45% above to 55% above the median.[9]
- Minimum Wage Earners always earned the Federal minimum wage while working a 40 hour week 50 weeks of the year. They are the least advantaged. The BLS reports (that the percent of hourly paid workers earning at or below the Federal minimum wage declined from 13.4% in 1979 to 2.2% in 2006. (http://www.bls.gov/cps/minwage2006tbls.htm#7)

The income histories of these four classes of workers were plotted on Figure 1. 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 national average worker was in the 73rd percentile and the maximum in the 95th percentile. In 1979, the earliest year for which data is readily available, 13.4 percent of hourly workers were paid at or below the minimum wage; by 2006 thayt percentage was down to 2.3%.[10]

Indexing Problem #1: The Undeflated Earnings Bonus

Table 6 presents the benefit that these four workers would receive in their 75th year for the extreme case in which they delayed the start of benefits until age 70 and worked until their 75th birthday.

With wage indexing only until age 60, the maximum wage earner's annual benefit is $25,812 per year. 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 earnings bonus of $1,812

[8] It is assumed that workers earned the specified amounts in their 35 highest real earning years. In practice, workers' 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. A Social Security Administration study suggests that earnings typically peak at age 48 or 49. See Clingman and Nichols [2006]. They have developed "scaled factors" to take this complication into account, but only through age 64, which is too short for this study.

[9] Three alternative measures of median income are examined in detail by by L. Scott Muller [2006]. The above median figures 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 the annual supplements to the *Social Security Bulletin* because it is the only one covering the entire historical period of interest. While not fully comparable to the Avearge Wage Index, it is close enough for the purposes of this study.

10 http://www.socialsecurity.gov/cgi-bin/netcomp.cgi?year=2006%20 and
http://www.bls.gov/cps/minwage2007tbls.htm#10

in each year of retirement, and beyond if claimed by a surviving spouse. Or to put it another way, the adoption of full wage indexing would save the Social Security Administration $1,812 per year. If the spousal benefit is also claimed during retirement, the combined benefit for worker and spouse would be $38,718 with incomplete indexing or $36,000 with full wage indexing, a difference of $2,718. This annual overpayment 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, surviving widow(er)s may continue to enjoy the bonus because they have a choice of either a benefit based on their own earning history or a survival benefit equal to their deceased spouse's retirement benefit – the life expectancy of the second to die at age 65 is 91.[11]

The maximum wage earner's case is extreme. As can be seen from Table 7, the average wage earner does not gain as much from incomplete indexing in terms of dollars but more as a percentage of the benefit under incomplete indexing. The minimum wage earner would gain very little from a shift from incomplete wage indexing to either 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 $756 reduction in the minimum wage earner's annual benefit, which in percentage terms looms larger than the reduction for the maximum income worker.

Table 6: Effect of full indexing on annual benefits of workers retiring at age 75

DofB: 1930; postponed benefits until age 70; worked until 75 birthday

		SSA Premium		Spouse	Primary +	SSA
	Benefit	$	%	Benefit	Spouse Benefit	Premium
Maximum Wage Earner						
SSA: Incomplete Wage Indexing	25,812	0	0%	12,906	38,718	0
With Full earnings indexing	24,000	1,812	7.0%	12,000	36,000	2,718
With earnings/CPI-W indexing	24,480	1,332	5.2%	12,240	36,720	1,998
With full CPI-W indexing	24,084	1,728	6.7%	12,042	36,126	2,592
Average Wage Earner						
SSA: Incomplete Wage Indexing	17,424	0	0.0%	8,712	26,136	0
With Full earnings indexing	15,852	1,572	9.0%	7,926	23,778	2,358
With earnings/CPI-W indexing	16,260	1,164	6.7%	8,130	24,390	1,746
With full CPI-W indexing	16,080	1,344	7.7%	8,040	24,120	2,016
Median Wage Earner						
SSA: Incomplete Wage Indexing	13,392	0	0%	6,696	20,088	0
With Full earnings indexing	12,564	828	6.2%	6,282	18,846	1,242
With earnings/CPI-W indexing	12,696	696	5.2%	6,348	19,044	1,044
With full CPI-W indexing	12,204	1,188	8.9%	6,102	18,306	1,782
Minimum Wage Earner						
SSA: Incomplete Wage Indexing	10,284	0	0%	5,142	15,426	0
With Full earnings indexing	10,152	132	1.3%	5,076	15,228	198
With earnings/CPI-W indexing	10,152	132	1.3%	5,076	15,228	198
With full CPI-W indexing	9,528	756	7.4%	4,764	14,292	1,134

Notes: Bend points for full CPI-W indexing recomputed with CPI-W

The extra benefits resulting from the current practice of wage indexing only through the 60th year are particularly large for the exceptional case of beneficiaries who postpone retirement until age 75. Table 7 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, subsequent benefits continue to be indexed by the CPI-W to the initial benefit. Panel A reports benefits when wages are 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 of maximum wage earners who began receiving benefits at age 62, at age 65 or at age 70; and the fourth entry 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 if wages were wage indexed

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

throughout. . The columns of Panel C are wage indexed until 60 and then indexed with the CPI-W and those of Panel D are fully indexed by the CPI-W.

Table 7: Annual OASI Benefits –Earned Income Indexing Alternatives

	A. SSA: Wage indexed only until 60				B. Wage Indexed Earnings			
	Benefit starting at specified age				Benefit starting at specified age			
Age	62	65	70	75	62	65	70	75
Nominal								
Maximum Wage Earner	10,260	14,400	21,060	25,812	10,248	14,316	20,448	24,000
Average Wage Earner	7,536	10,308	14,580	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	10,284	4,824	6,552	9,000	10,152
Real, CPI-W, 1990 = 100	106.8	115.7	130.6	148.3				
Maximum Wage Earner	9,604	12,451	16,121	17,400	9,593	12,378	15,652	16,179
Average Wage Earner	7,054	8,913	11,161	11,746	7,054	8,851	10,747	10,686
Median Wage Earner	5,583	7,035	8,717	9,028	5,583	7,014	8,515	8,469
Minimum Wage Earner	4,516	5,676	6,935	6,932	4,516	5,665	6,889	6,844
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	1.69
Average Wage Earner	1.00	1.26	1.58	1.66	1.00	1.25	1.52	1.51
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	1.25	1.53	1.52

	C. Wage Indexed to 60, then CPI				D. CPI indexed Earnings			
	Benefit starting at specified age				Benefit starting at specified age			
Age	62	65	70	75	62	65	70	75
Nominal								
Maximum Wage Earner	10,248	14,328	20,580	24,480	9,900	13,908	20,172	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	6,552	9,000	10,152	4,512	6,144	8,436	9,528
Real, CPI-W, 1990 = 100								
Maximum Wage Earner	9,593	12,389	15,753	16,502	9,267	12,026	15,441	16,235
Average Wage Earner	7,054	8,851	10,839	10,961	6,717	8,550	10,619	10,840
Median Wage Earner	5,583	7,014	8,533	8,558	5,268	6,641	8,157	8,227
Minimum Wage Earner	4,516	5,665	6,889	6,844	4,224	5,312	6,457	6,423
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	1.55	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	1.25	1.53	1.52	1.00	1.26	1.53	1.52

Notes: The 75 year columns reports workers who began receiving benefits at age 70 but worked until 75

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. Further, the Social Security statutes specify that workers born in 1930 who began receiving OASI benefits at age 62 (the year of initial entitlement) are subjected to a 20% reduction in benefits from what they would be if one works to the full retirement age of 65 (See Step 7 on Table 4). Furthermore, postponing the receipt of benefits until age 70 and beyond yields a delayed retirement credit of 22.5%. Or to put it another way, the gain from postponing retirement from age 62 to 70 would be 122.5/.8 = 53.1% plus the effect of any post 62 earnings that are substantial enough to be included in the best 35 years. But as is clear from the real benefit figures on Table 7, the reward for postponement is far from uniform. Why is it that under the current SSA procedure of wagbe indexing only until age 60, the maximum wage earner receives an 81% increase in real benefits for delaying retirement and continuing to work until 75, the average wage earner a 66% gain, the median earner a 62% gain and the minimum wage earner only 54%? Surely this is not the result of intelligent design. And why is the incentive to delay retirement less with complete indexing, particularly for high income workers? Why do late working high income workers fair better with wage than with

CPI indexed earnings? To answer such questions we will have to look at the earning history of our representative workers.

Maximum Wage Earner

Let us first consider the maximum wage earner's work history. Turning back to Table 1, column 1 reveals that the earnings at the taxable maximum cap, which is indexed to the average wage index with a two year lag, has grown dramatically over the years. As a result, the sum of the 35 highest earning years is much higher with incomplete wage indexing than is generated by the full wage indexing of column 9. How this process plays out if our worker retires earlier is reported on Table 8. Comparing column 5 with column 3 on Table 8 reveals that working to age 65 instead of 62 replaces the low indexed earnings of 1953, 1957 and 1961 with the high unindexed earnings of 1992, 1993 and 1994, which yields a substantial increase in the PIA at eligibility and ultimately the gain reported on the first three entries on the top line of Table 7.[12] Columns 8, 10 and 12 of Table 8 show how the PIA and hence the benefit for a worker retiring at 75 would be affected by the adoption of one of the alternative deflators.

[12] The calculations are similar to those reported on Table 3.

Table 8: The Maximum Worker's 35 best years under alternative indexing procedures

			A. SSA: Wage indexed earnings until 60; then not						B. Wage Indexed		C. Wage Indexed until 60; then CPI		D. CPI indexed	
		CPI			Retire at 62		Retire at 65	Retire at 70		Retire at 75		Retire at 75		Retire at 75
age	year	990=100	indexed earnings	rank	high 35 index earn	rank	high 35 index earn	high 35 index earn	indexed earnings	high 35 index earn	indexed earnings	high 35 index earn	indexed earnings	high 35 index earn
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
21	1951	20.1	27,044	23	27,044	26	27,044	27,044	27,044		27,044		17,872	
22	1952	20.7	25,460	29	25,460	32	25,460		25,460		25,460		17,384	
23	1953	20.8	24,113	35	24,113	38			24,113		24,113		17,277	
24	1954	20.8	23,989	37		40			23,989		23,989		17,277	
25	1955	20.8	26,751	24	26,751	27	26,751	26,751	26,751		26,751		20,232	
26	1956	21.2	25,002	32	25,002	35	25,002		25,002		25,002		19,839	
27	1957	21.9	24,252	34	24,252	37			24,252		24,252		19,166	
28	1958	22.4	24,040	36		39			24,040		24,040		18,748	
29	1959	22.6	26,177	28	26,177	31	26,177		26,177		26,177		21,232	
30	1960	22.9	25,189	31	25,189	34	25,189		25,189		25,189		20,923	
31	1961	23.2	24,698	33	24,698	36			24,698		24,698		20,692	
32	1962	23.5	23,520	38		41			23,520		23,520		20,466	
33	1963	23.8	22,957	39		42			22,957		22,957		20,179	
34	1964	24.1	22,056	40		43			22,056		22,056		19,942	
35	1965	24.5	21,666	41		44			21,666		21,666		19,608	
36	1966	25.3	28,103	21	28,103	24	28,103	28,103	28,103	28,103	28,103	28,103	26,112	
37	1967	25.9	26,621	25	26,621	28	26,621	26,621	26,621		26,621		25,440	
38	1968	27.1	29,437	20	29,437	23	29,437	29,437	29,437	29,437	29,437	29,437	28,785	28,785
39	1969	28.6	27,829	22	27,829	25	27,829	27,829	27,829	27,829	27,829	27,829	27,262	27,262
40	1970	30.2	26,513	27	26,513	30	26,513	26,513	26,513		26,513		25,804	
41	1971	31.5	25,245	30	25,245	33	25,245		25,245		25,245		24,733	
42	1972	32.5	26,529	26	26,529	29	26,529	26,529	26,529		26,529		27,682	27,682
43	1973	34.7	29,960	19	29,960	22	29,960	29,960	29,960	29,960	29,960	29,960	31,084	31,084
44	1974	38.7	34,563	17	34,563	20	34,563	34,563	34,563	34,563	34,563	34,563	34,089	34,089
45	1975	42.1	34,353	18	34,353	21	34,353	34,353	34,353	34,353	34,353	34,353	33,484	33,484
46	1976	44.4	34,870	16	34,870	19	34,870	34,870	34,870	34,870	34,870	34,870	34,465	34,465
47	1977	47.4	35,479	14	35,479	17	35,479	35,479	35,479	35,479	35,479	35,479	34,832	34,832
48	1978	51.1	35,259	15	35,259	18	35,259	35,259	35,259	35,259	35,259	35,259	34,627	34,627
49	1979	57.3	41,948	13	41,948	16	41,948	41,948	41,948	41,948	41,948	41,948	39,983	39,983
50	1980	64.6	43,523	12	43,523	15	43,523	43,523	43,523	43,523	43,523	43,523	40,100	40,100
51	1981	71.5	45,344	11	45,344	14	45,344	45,344	45,344	45,344	45,344	45,344	41,529	41,529
52	1982	75.6	46,885	10	46,885	13	46,885	46,885	46,885	46,885	46,885	46,885	42,874	42,874
53	1983	77.4	49,261	8	49,261	11	49,261	49,261	49,261	49,261	49,261	49,261	46,128	46,128
54	1984	80.1	49,263	7	49,263	10	49,263	49,263	49,263	49,263	49,263	49,263	47,183	47,183
55	1985	82.6	49,500	6	49,500	9	49,500	49,500	49,500	49,500	49,500	49,500	47,926	47,926
56	1986	83.7	50,986	3	50,986	6	50,986	50,986	50,986	50,986	50,986	50,986	50,191	50,191
57	1987	87.2	49,984	5	49,984	8	49,984	49,984	49,984	49,984	49,984	49,984	50,232	50,232
58	1988	90.7	48,943	9	48,943	12	48,943	48,943	48,943	48,943	48,943	48,943	49,622	49,622
59	1989	94.9	50,217	4	50,217	7	50,217	50,217	50,217	50,217	50,217	50,217	50,556	50,556
60	1990	100.0	51,300	2	51,300	5	51,300	51,300	51,300	51,300	51,300	51,300	51,300	51,300
61	1991	103.7	53,400	1	53,400	4	53,400	53,400	51,482	51,482	51,497	51,497	51,497	51,497
62	1992	106.8	55,500			3	55,500	55,500	50,884	50,884	51,954	51,954	51,954	51,954
63	1993	109.6	57,600			2	57,600	57,600	52,359	52,359	52,556	52,556	52,556	52,556
64	1994	112.7	60,600			1	60,600	60,600	53,647	53,647	53,770	53,770	53,770	53,770
65	1995	115.7	61,200					61,200	52,090	52,090	52,917	52,917	52,917	52,917
66	1996	119.0	62,700					62,700	50,878	50,878	52,671	52,671	52,671	52,671
67	1997	121.5	65,400					65,400	50,143	50,143	53,814	53,814	53,814	53,814
68	1998	123.2	68,400					68,400	49,835	49,835	55,532	55,532	55,532	55,532
69	1999	126.2	72,600					72,600	50,103	50,103	57,528	57,528	57,528	57,528
70	2000	130.6	76,200						49,832	49,832	58,329	58,329	58,329	58,329
71	2001	134.1	80,400						51,353	51,353	59,977	59,977	59,977	59,977
72	2002	135.9	84,900						53,689	53,689	62,461	62,461	62,461	62,461
73	2003	138.8	87,000						53,704	53,704	62,681	62,681	62,681	62,681
74	2004	142.5	87,900						51,849	51,849	61,687	61,687	61,687	61,687
Sum through to the indexing year (age 60)					1,200,601		1,127,539	1,000,466		867,008		867,008		843,934
Sum from age 61 to retirement					53,400		227,100	557,400		721,849		787,373		787,373
TOTAL (Best 35 years)					1,254,001		1,354,639	1,557,866		1,588,857		1,654,381		1,631,307
AIME (Total/35*12)					2,985		3,225	3,709		3,782		3,939		3,884
PIA at eligibility					1,069		1,105	1,177		1,188		1,212		1,193

Minimum Wage Example

A worker with the same birth date who earned only the minimum wage throughout an equally long career has a quite different outcome. As can be seen by comparing the 1st and 3rd rows of Table 7, this least advantaged worker's benefits are not affected as much by the unde-flated earnings problem. Why? Because as can be seen from Table 9, his earnings during his post age 60s working years, with or without indexing, do not count as strongly among the 35 highest earning years of Step 1 because the minimum wage was allowed to fall so far behind inflation.

Table 9: Selecting the 35 best years for Minimum and Average Wage Workers

		Minimum Wage Earner											Average Income	
			A. SSA: Wage indexed earnings to 60; then not				B. Wage Indexed		C. Wage Indexed to 60 then CPI-W		D. CPI indexed		A. SSA: Wage indexed until 60; then not	
				Retire at 62	Retire at 65	Retire at 75	Retire at 75		Retire at 75		Retire at 75		Retire at 75	
age	year	earnings	indexed earnings	high 35 index earn	high 35 index earn	high 35 index earn	indexed earnings	high 35 index earn	indexed earnings	high 35 index earn	indexed earnings	high 35 index earn	indexed earnings	high 35 index earn
			(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
21	1951	1,500	11,268	11,268	11,268	11,268	11,268	11,268	11,268	11,268	7,446		21,028	21,028
22	1952	1,500	10,608	10,608	10,608	10,608	10,608	10,608	10,608	10,608	7,243		21,028	21,028
23	1953	1,500	10,047	10,047	10,047	10,047	10,047	10,047	10,047	10,047	7,199		21,028	21,028
24	1954	1,500	9,995	9,995	9,995	9,995	9,995	9,995	9,995	9,995	7,199		21,028	21,028
25	1955	1,500	9,554	9,554	9,554		9,554	9,554	9,554	9,554	7,226		21,028	21,028
26	1956	1,875	11,162	11,162	11,162	11,162	11,162	11,162	11,162	11,162	8,857	8,857	21,028	21,028
27	1957	2,000	11,548	11,548	11,548	11,548	11,548	11,548	11,548	11,548	9,126	9,126	21,028	21,028
28	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	21,028
29	1959	2,000	10,907	10,907	10,907	10,907	10,907	10,907	10,907	10,907	8,847	8,847	21,028	21,028
30	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	21,028
31	1961	2,100	10,805	10,805	10,805	10,805	10,805	10,805	10,805	10,805	9,053	9,053	21,028	21,028
32	1962	2,300	11,270	11,270	11,270	11,270	11,270	11,270	11,270	11,270	9,806	9,806	21,028	21,028
33	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
34	1964	2,500	11,487	11,487	11,487	11,487	11,487	11,487	11,487	11,487	10,386	10,386	21,028	21,028
35	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
36	1966	2,500	10,645	10,645	10,645	10,645	10,645	10,645	10,645	10,645	9,891	9,891	21,028	21,028
37	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	21,028
38	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
39	1969	3,200	11,417	11,417	11,417	11,417	11,417	11,417	11,417	11,417	11,184	11,184	21,028	21,028
40	1970	3,200	10,877	10,877	10,877	10,877	10,877	10,877	10,877	10,877	10,586	10,586	21,028	21,028
41	1971	3,200	10,357	10,357	10,357	10,357	10,357	10,357	10,357	10,357	10,147	10,147	21,028	21,028
42	1972	3,200	9,432	9,432	9,432		9,432	9,432	9,432	9,432	9,842	9,842	21,028	
43	1973	3,200	8,877	8,877	8,877		8,877	8,877	8,877	8,877	9,210	9,210	21,028	
44	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	
45	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	
46	1976	4,600	10,484	10,484	10,484	10,484	10,484	10,484	10,484	10,484	10,362	10,362	21,028	
47	1977	4,600	9,891	9,891	9,891	9,891	9,891	9,891	9,891	9,891	9,711	9,711	21,028	
48	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	
49	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	
50	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	
51	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	
52	1982	6,700	9,695	9,695	9,695		9,695	9,695	9,695	9,695	8,866	8,866	21,028	
53	1983	6,700	9,245	9,245	9,245		9,245	9,245	9,245	9,245	8,657	8,657	21,028	
54	1984	6,700	8,732	8,732	8,732		8,732	8,732	8,732	8,732	8,363	8,363	21,028	
55	1985	6,700	8,375	8,375			8,375	8,375	8,375	8,375	8,109	8,109	21,028	
56	1986	6,700	8,134				8,134		8,134		8,007	8,007	21,028	
57	1987	6,700	7,646				7,646		7,646		7,684		21,028	
58	1988	6,700	7,287				7,287		7,287		7,388		21,028	
59	1989	6,700	7,009				7,009		7,009		7,057		21,028	
60	1990	7,460	7,460				7,460		7,460		7,460		21,028	
61	1991	8,360	8,060				8,060		8,062		8,062	8,062	21,812	21,812
62	1992	8,500	8,500		8,500		7,793		7,957		7,957		22,935	22,935
63	1993	8,500	8,500				7,727		7,756		7,756		23,133	23,133
64	1994	8,500	8,500				7,525		7,542		7,542		23,754	23,754
65	1995	8,500	8,500				7,235		7,350		7,350		24,706	24,706
66	1996	8,750	8,750				7,100		7,350		7,350		25,914	25,914
67	1997	9,767	9,767				7,488		8,036		8,036	8,036	27,426	27,426
68	1998	10,300	10,300			10,300	7,504		8,362		8,362	8,362	28,861	28,861
69	1999	10,300	10,300			10,300	7,108		8,162		8,162	8,162	30,470	30,470
70	2000	10,300	10,300			10,300	6,736		7,884		7,884		32,155	32,155
71	2001	10,300	10,300			10,300	6,579		7,684		7,684		32,922	32,922
72	2002	10,300	10,300			10,300	6,514		7,578		7,578		33,252	33,252
73	2003	10,300	10,300			10,300	6,358		7,421		7,421		34,065	34,065
74	2004	10,300	10,300			10,300	6,076		7,228		7,228		35,649	35,649
Sum through to age 60				366,209	357,835	302,299		366,209		366,209	0	298,279		441,588
Sum from age 61 to retirement				0	8,500	72,100		0		0	0	32,623		397,052
TOTAL (Best 35 years)				366,209	366,335	374,399		366,209		366,209	0	330,901		838,640
AIME (Total/35*12)				871	872	891		871		871	0	787		1,996
PIA at eligibility				503	504	510		503		503	0	472		863

Average income earner

The average workers indexed income is recorded in column (12) of Table 9. It is a constant $21,028 through our worker's 60th birthday because it is deflated with the wage 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 indefensible. It clearly makes a substantial contribution to Social Security's financial problems, although a precise estimate of its total impact must be left for future research based on a detailed analysis of micro data sets.[13] It is regressive, giving the largest benefit bonus to the highest income earners, as shown on Table 6. Correcting this problem would probably not affect the decision as to when to retire because it is doubtful that many workers contemplating delayed retirement know about the bonus.

Indexing Problem #2: Skipped 61st Year Inflation Adjustment

The *AnyPIA* program adjusts earnings up through the computation year with the wage index to the level of wages at age 60, but the Primary Insurance Amount at year of retirement is calculated by multiplying with a chain of annual inflation correction factors. The annual inflation correction factor for year t is p_t / p_{t-1} , where p_t is the level of the CPI-W for year t.[14] Unfortunately, *AnyPIA* skips inflation during our worker's 61st year, (p_{1991} / p_{1990}),[15] as is clear from both Table 2 and equation (1), page 6.

Skipping the 61st year inflation factor means that our worker's OASI is less by the 61st year rate of inflation not only in that year but in every year of retirement. More than this, the spousal benefit and survivor benefit (if exercised) are reduced by the same percentage. It is a Social Security lottery, for how much workers lose from this OASI lottery depends entirely on what the rate of CPI-W inflation happens to be in the year of their 61st birthday. Table 5 shows the historical distribution of annual CPI-W inflation rates. Anyone born in 1930 attained the age of 61 in 1991 might consider herself lucky, for this was a moderate inflation year with prices rising at only 3.70%, slightly below the long-run (1951-2007) average of 3.86%. If our worker had been born a year earlier, the reduction would have been more substantial, because the inflation rate was 5.32%. Workers who had the misfortune to be born a decade earlier, becoming 61 in 1980 when the inflation rate hit 12.77%, would suffer a 12.77% reduction in benefits every year of their remaining lifespans.

Recommendation:

The obvious remedy is to make the calculation incorporating the CPI-W inflation for the 61st year. Historically, inflation as measured by the SSA has averaged about 4.2% over the years, as reported on Table 5, This implies that the omission of the 61st year in computing OASI benefits saves 4.2% 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

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

[14] To be precise, p_t is the third quarter (average of July, August and September) of CPI-W. Using 3rd quarter averages means that the index for the current year is available before the end of the year. The Bureau of Labor Statistics seldom revises the CPI-W.

[15] Diamond and Orszag [2004] p 112, discuss the skipped year problem, remarking that there is a two-year gap between ages 60 and 62, in the protection against inflation. The Congressional Budget Office [2004, p4], in commenting on Diamond and Orszag, also assume there is a two year skip. The conclusion that there is a two year gap rests on their observation that for any year after the worker turns 62, benefits are increased by the inflation rate from the year of turning 62 until that year, p 112. In fact, benefits are increased from the year the worker turns 61, as is clear from Table 4 (page 5 of the *AnyPIA* printout).

has been suggested by Peter A. Diamond and Peter R. Orszag [2004, p 112]. Essentially, this replaces the skipped 61st year inflation lottery with an estimate of average inflation, which is an obvious benefit for the risk adverse.

Indexing Problem #3: The one year indexing lag

The *AnyPIA* program lags by one year in adjusting benefits for inflation, missing inflation in the benefit year for the obvious reason that it has yet to be experienced. Thus the benefit for our worker's first year of retirement, 2005, is adjusted for inflation only through year 2004. But the current year of inflation, or more precisely the 3rd quarter to 3rd quarter change in the CPI-W, will not be known until near the end of the year.

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 as serious as the Skipped 61st year problem, which unfairly discriminates arbitrarily among beneficiaries on the basis of how severe the inflation happened to be in their 61st year, imposing a penalty in every year of their retirement and, potentially, that of a surviving spouse. Furthermore, since retirees generally have expenditures with sticky prices, such as real estate taxes or rents, this problem is not too serious as long as the inflation does not become intense.

Recommendation:

The problem is that benefits must be determined in advance when obviously the rate of inflation that will prevail is not known. It might be possible to use a predicted rate of inflation together with a simple fine-tuning error-correction adjustment to allow for the prediction error of the preceding year, such as

$$B_t = (\hat{p}_t / p_{t-1})B_{t-1} - (\hat{p}_{t-1} - p_{t-1} / p_{t-2})B_{t-2}, \quad (4)$$

where B_t is the benefit in year t, $\hat{p}_t$ is anticipated price level, and p_t the actual price level.

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

$$B_t = B_{t-1} + (p_{t-1} - p_{t-2} / p_{t-2})B_{t-2} \quad (5)$$

It might be better to use a Box-Jenkins forecast of $\hat{p}_t$ or, alternatively, one provided by an accepted authority, such as the Chairman of the Federal Reserve Board or the Commissioner of Labor Statistics.

The adoption of a revision procedure, such as equation (4), has an additional advantage: It would 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 change 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*:

> "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." (Conclusion #7.1, p 194)

Indexing Problem #4: The 60th year National Average Wage Index Bounce

As one of the very first steps in the calculation of OASI benefits, *AnyPIA* inflates the worker's annual earnings up to the wage level of the worker's 60th year, utilizing the National Average Wage Index, which is normalized to equal 100 in the workers 60th year. It is the resulting sum of the (partially) indexed wages for the best 35 years of the worker's career that is used in calculating Average Indexed Monthly Earnings and, ultimately, the worker's benefits. It may be counterintuitive, but this procedure can make benefits hypersensitive to what the level of National Average Wage income happens to be in the worker's 60th year.

To illustrate the index bounce problem, we 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 decreases the 1991 level from $21,812 to $21,332 as illustrated on column E1 of Table 10. 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 Worker. 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 a substantial difference.

Table 10 shows how the wage index used for calculating the benefit for this and all other workers of the same age, because it is normalized to equal 100 in the 60th year, will be lower in all the other working years (Compare columns E6 with C6). When the workers' 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. And this happens for all the workers' earnings in every year up to the 60th birthday year. Also, the change in the National Average Wage in 1990 changes the Bend Points of the PIA function. As can be seen from the bottom line of Table 10, the income shift plus the Bend Point adjustments cause a 1.6% increase in the PIA at eligibility of about 1⅓% for our maximum income worker, which yields an increase in the annual benefit of $432 if she continues working to age 75.

Table 11 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 is larger if income is wage indexed after the 60th year. But if wages are fully CPI indexed there is no bounce because that index is not affected by the bounce in the average worker's 60th year income (it would be affected by revisions of the CPI in the 60th year). 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.

Table 10: Experiment ~ Shift $480 of Average Worker's annual income from 1991 to 1990

				CONTROL (See Table 1).....				EXPERIMENT: Shift $480 from 1991 to 1990					
					partly	Retire at 75		Purturbed		partly	Retire at 75		
		CPI	Max	Wage index	indexed		high 35	National	Wage index	indexed		high 35	percent
age	year	1990=100	earnings	1990=100	earnings	rank	index earn	Average Wage	1990=100	earnings	rank	index earn	change
			(C1)	(C6)	(C7)	(C8)	(C9)	(E1)	(E6)	(E7)	(E8)	(E9)	(E10)
21	1951	20.1	3,600	13.3	27,044	36		2,799	13.0	27,661	36		
22	1952	20.7	3,600	14.1	25,460	42		2,973	13.8	26,041	42		
23	1953	20.8	3,600	14.9	24,113	48		3,139	14.6	24,663	48		
24	1954	20.8	3,600	15.0	23,989	50		3,156	14.7	24,537	50		
25	1955	20.8	4,200	15.7	26,751	37		3,301	15.3	27,362	37		
26	1956	21.2	4,200	16.8	25,002	45		3,532	16.4	25,573	45		
27	1957	21.9	4,200	17.3	24,252	47		3,642	16.9	24,805	47		
28	1958	22.4	4,200	17.5	24,040	49		3,674	17.1	24,589	49		
29	1959	22.6	4,800	18.3	26,177	41		3,856	17.9	26,775	41		
30	1960	22.9	4,800	19.1	25,189	44		4,007	18.6	25,764	44		
31	1961	23.2	4,800	19.4	24,698	46		4,087	19.0	25,262	46		
32	1962	23.5	4,800	20.4	23,520	51		4,291	20.0	24,057	51		
33	1963	23.8	4,800	20.9	22,957	52		4,397	20.4	23,481	52		
34	1964	24.1	4,800	21.8	22,056	53		4,576	21.3	22,559	53		
35	1965	24.5	4,800	22.2	21,666	54		4,659	21.7	22,160	54		
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		
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	30.2	7,800	29.4	26,513	40		6,186	28.8	27,119	40		
41	1971	31.5	7,800	30.9	25,245	43		6,497	30.2	25,821	43		
42	1972	32.5	9,000	33.9	26,529	39		7,134	33.2	27,134	39		
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	47.4	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	106.8	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	115.7	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	121.5	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	134.1	80,400	156.6	80,400	4	80,400	32,922	153.1	80,400	4	80,400	0.0%
72	2002	135.9	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%
		148.3											
Sum through computation year (age 60)							867,008					885,627	2.1%
Sum post indexing year (age 61 to retirement)							973,800					973,800	0.0%
TOTAL (Best 35 years)							1,840,808					1,859,427	1.0%
Average Indexed Monthly Earnings (Total/35*12)							4,382					4,427	1.0%
PIA at eligibility							1,278					1,299	1.6%

This bounce would cause an increase in OASI expenditures for year 1990. In subsequent years, the higher payments to workers of the 1930 birth cohort would be approximately offset by the lower payments to workers in the 1931 birth cohort, and assuming roughly equal mortality rates, in the long run it would approximately cancel out. 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 60th birthday. In our experiment the bounce in annual benefits, with any of the three procedures involving 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.

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 National Median Wage Index instead of the National Average (arithmetic mean) Wage Index might help because it may be more stable than the average.[17]

Table 11: Experiment ~ Summary of the Effect of a $480 Pip in Year 1990 Income

	A. SSA: Wage indexed only until 60 Benefit starting at specified age				B. Wage Indexed Earnings Benefit starting at specified age			
Age	62	65	70	75	62	65	70	75
Nominal								
Maximum Wage Earner	10,476	14,700	21,444	26,244	10,488	14,640	20,916	24,552
Average Wage Earner	7,704	10,512	14,832	17,688	7,704	10,464	14,364	16,212
Median Wage Earner	6,096	8,304	11,604	13,608	6,096	8,292	11,376	12,840
Minimum Wage Earner	4,932	6,708	9,252	10,500	4,932	6,708	9,204	10,392
Real, CPI-W, 1990 = 100	107	116	131	148				
Maximum Wage Earner	9,807	12,710	16,415	17,691	9,818	12,659	16,011	16,551
Average Wage Earner	7,212	9,089	11,353	11,924	7,212	9,048	10,995	10,929
Median Wage Earner	5,706	7,180	8,882	9,173	5,706	7,170	8,708	8,656
Minimum Wage Earner	4,617	5,800	7,082	7,078	4,617	5,800	7,045	7,005
DIFFERENCE ~ Experiment Results - Control								
Nominal								
Maximum Wage Earner	216	300	384	432	240	324	468	552
Average Wage Earner	168	204	252	264	168	228	324	360
Median Wage Earner	132	168	216	216	132	180	252	276
Minimum Wage Earner	108	144	192	216	108	156	204	240
Real, CPI-W, 1990 = 100								
Maximum Wage Earner	202	259	294	291	225	280	358	372
Average Wage Earner	157	176	193	178	157	197	248	243
Median Wage Earner	124	145	165	146	124	156	193	186
Minimum Wage Earner	101	125	147	146	101	135	156	162
Percent								
Maximum Wage Earner	2.1%	2.1%	1.9%	1.8%	2.4%	2.3%	2.3%	2.3%
Average Wage Earner	2.2%	2.0%	1.8%	1.6%	2.3%	2.3%	2.3%	2.2%
Median Wage Earner	2.2%	2.1%	1.9%	1.7%	2.3%	2.3%	2.4%	2.3%
Minimum Wage Earner	2.2%	2.2%	2.1%	2.1%	2.4%	2.5%	2.4%	2.5%

(Table continued on next page)

[16] A three-year centered moving average would have reduced the variance of the National 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).

Table 11, Continued: Experiment ~ Summary of the Effect of a $480 Pip in Year 1990 Income

	C. Wage Indexed to 60, then CPI Benefit starting at specified age				D. CPI indexed Earnings Benefit starting at specified age			
Age	62	65	70	75	62	65	70	75
Nominal								
Maximum Wage Earner	10,476	14,616	20,964	24,888	9,900	13,908	20,172	24,084
Average Wage Earner	7,704	10,464	14,436	16,548	7,176	9,888	13,872	16,080
Median Wage Earner	6,096	8,292	11,388	12,948	5,628	7,680	10,656	12,204
Minimum Wage Earner	4,932	6,708	9,204	10,392	4,512	6,144	8,436	9,528
Real, CPI-W, 1990 = 100								
Maximum Wage Earner	9,807	12,638	16,047	16,777	9,267	12,026	15,441	16,235
Average Wage Earner	7,212	9,048	11,050	11,155	6,717	8,550	10,619	10,840
Median Wage Earner	5,706	7,170	8,717	8,728	5,268	6,641	8,157	8,227
Minimum Wage Earner	4,617	5,800	7,045	7,005	4,224	5,312	6,457	6,423
DIFFERENCE								
Nominal								
Maximum Wage Earner	228	288	384	408	0	0	0	0
Average Wage Earner	168	228	276	288	0	0	0	0
Median Wage Earner	132	180	240	252	0	0	0	0
Minimum Wage Earner	108	156	204	240	0	0	0	0
Real, CPI-W, 1990 = 100	-	-	-	-	0	0	0	0
Maximum Wage Earner	213	249	294	275	0	0	0	0
Average Wage Earner	157	197	211	194	0	0	0	0
Median Wage Earner	124	156	184	170	0	0	0	0
Minimum Wage Earner	101	135	156	162	0	0	0	0
Percent								
Maximum Wage Earner	2.2%	2.0%	1.8%	1.6%	0.0%	0.0%	0.0%	0.0%
Average Wage Earner	2.2%	2.2%	1.9%	1.7%	0.0%	0.0%	0.0%	0.0%
Median Wage Earner	2.2%	2.2%	2.1%	1.9%	0.0%	0.0%	0.0%	0.0%
Minimum Wage Earner	2.2%	2.3%	2.2%	2.3%	0.0%	0.0%	0.0%	0.0%

Indexing Problem #5: Taxing OASI Benefits

The IRS has collected income taxes on OASI benefits since 1983. When first imposed in 1983, at most 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 the second threshold is $34,000.

Because the OASI tax paid by a worker from after tax income is matched by the employer, which is pre tax income, the tax on 50% of OASI benefits that was imposed in 1993 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 imvolve 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 are 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 since the CPI-W slightly more than doubled during that 25 year time span. If indexed to the National Average Wage Index, by 2008 the thresholds would have been about $70,153 and $89,795. The failure to index tax brackets for inflation has allowed rising prices to impose what is in effect a new tax on middle income retirees.

Recommendation:

The fact that the income tax revenue collected from taxing OASI benefits is dedicated to the Medicare Trust Fund does not justify the failure of the IRS to index the exemption amounts on the income tax imposed on Social Security Benefits.

5. Inflation Experiments

Compared to many countries, the United States has enjoyed fairly stable prices over the years. But suppose that 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. Four experiments will show how the choice of deflator affects the sensitivity of real benefits to changes in the trend inflation rate. For comparisons, the results for counterfactual inflation trends will be contrasted with the control provided by historical inflation experience reported on Table 7.

Table 12: Replaying History: Control versus 5% higher inflation rate

	A. SSA: Wage indexed only until 60				B. Wage Indexed Earnings			
	Benefit starting at specified age				Benefit starting at specified age			
Age	62	65	70	75	62	65	70	75
Nominal								
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	20,748	29,904
Median Wage Earner	5,976	9,504	17,724	29,016	5,964	9,384	16,440	23,688
Minimum Wage Earner	4,824	7,632	13,776	21,108	4,824	7,584	13,296	19,152
Real, CPI-W, 1990 = 100	117.8	147.6	212.8	308.4				
Maximum Wage Earner	8,711	11,406	15,367	18,008	8,701	11,227	14,194	14,673
Average Wage Earner	6,409	8,179	10,782	12,269	6,399	8,024	9,750	9,697
Median Wage Earner	5,074	6,439	8,329	9,409	5,064	6,357	7,726	7,681
Minimum Wage Earner	4,096	5,171	6,474	6,844	4,096	5,138	6,248	6,210
Real comparison: 5% higher inflation relative to control								
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			
	Benefit starting at specified age				Benefit starting at specified age			
Age	62	65	70	75	62	65	70	75
Nominal								
Maximum Wage Earner	10,248	16,584	30,408	46,152	9,900	16,104	29,796	45,420
Average Wage Earner	7,536	11,856	20,928	30,672	7,176	11,448	20,508	30,324
Median Wage Earner	5,964	9,384	16,488	23,940	5,628	8,892	15,744	23,016
Minimum Wage Earner	4,824	7,584	13,296	19,152	4,512	7,116	12,480	17,976
Real, CPI-W, 1990 = 100								
Maximum Wage Earner	8,701	11,235	14,290	14,965	8,406	10,910	14,002	14,728
Average Wage Earner	6,399	8,032	9,835	9,946	6,093	7,756	9,637	9,833
Median Wage Earner	5,064	6,357	7,748	7,763	4,779	6,024	7,399	7,463
Minimum Wage Earner	4,096	5,138	6,248	6,210	3,831	4,821	5,865	5,829
Real comparison: 5% higher inflation relative to control								
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%

Notes: The 75 year columns reports workers who began receiving benefits at age 70 but worked until 75.
The Taxable Maximum Cap and hence the earnings of the Maximum Wage Earner and tax revenues are unchaged by the change in deflation procedures.

The first experiment, reported on Table 12, involves tilting both the CPI-W and the NAWI indexes by an extra 5% per annum of inflation, starting in 1991.[18] This superimposes a steeper trend on them but preserves the historical fluctuations in the gap between the two series. To preserve comparability, the series were normalized so as to be at the original historical level in 1990, which meant that precisely the same nominal bend points could be utilized as before and Figure 2 still presents the relationship between the PIA and 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 deflated data are more revealing, particularly when they are compared with the real outcomes of the control. Almost everybody loses from the higher inflationary trend. The two exceptions are maximum, average and median earners who continue working to age 75 when their earnings under current SSA procedures, wages being indexed only through age 60. With any of the three alternatives to current incomplete indexing practice, everyone's benefits are reduced to 90.7% of their control benefits.

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 complete indexing procedure the loss is uniform

[18] Precisely the same results are obtained if instead of starting the inflation in 1991, the year when the wage earners are 61, it had started before the beginning of the workers' careers.

Table 13: Replaying History: 10% higher Inflation Rate

	A. SSA: Wage indexed only until 60 Benefit starting at specified age				B. Wage Indexed Earnings Benefit starting at specified age			
Age	62	65	70	75	62	65	70	75
Nominal								
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	30,108	54,744
Median Wage Earner	5,976	11,052	27,432	64,032	5,964	10,800	23,856	43,380
Minimum Wage Earner	4,824	8,844	20,904	44,004	4,824	8,724	19,284	35,076
Real, CPI-W, 1990 = 100	129.3	186.3	338.8	619.7				
Maximum Wage Earner	7,947	10,508	14,892	19,611	7,928	10,231	12,933	13,372
Average Wage Earner	5,839	7,551	10,614	12,479	5,830	7,312	8,886	8,834
Median Wage Earner	4,623	5,934	8,096	10,333	4,614	5,798	7,040	7,000
Minimum Wage Earner	3,732	4,748	6,169	7,101	3,732	4,684	5,691	5,660
Real comparison: 10% higher inflation relatrive to control								
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 Benefit starting at specified age				D. CPI indexed Earnings Benefit starting at specified age			
Age	62	65	70	75	62	65	70	75
Nominal								
Maximum Wage Earner	10,248	19,068	44,112	84,504	9,900	18,516	43,236	83,160
Average Wage Earner	7,536	13,632	30,360	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	8,724	19,284	35,076	4,512	8,184	18,108	32,928
Real, CPI-W, 1990 = 100								
Maximum Wage Earner	7,928	10,237	13,018	13,637	7,659	9,941	12,760	13,420
Average Wage Earner	5,830	7,319	8,960	9,065	5,552	7,068	8,779	8,962
Median Wage Earner	4,614	5,798	7,058	7,074	4,354	5,489	6,743	6,801
Minimum Wage Earner	3,732	4,684	5,691	5,660	3,491	4,394	5,344	5,314
Real comparison: 10% higher inflation relatrive to control								
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%

Notes: The 75 year columns reports workers who began receiving benefits at age 70 but worked until 75
The Taxable Maximum Cap and hence the earnings of theMaximum Wage Earner and tax revenues are unchaged by the change in deflation procedures

With a reduction in the inflation rate to 5% below its historic value, there is a reversal of fortunes, every OASI recipient gains from the deflation. This time it is the maximum wage earner who continues working until age 75 experiences the smallest gain from deflation.

Table 14: Replaying History: 5% reduction in the inflation rate

	A. SSA: Wage indexed only until 60				B. Wage Indexed Earnings			
	Benefit starting at specified age				Benefit starting at specified age			
Age	62	65	70	75	62	65	70	75
Nominal								
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	5,616	5,964	5,208	4,824	5,616	5,964	5,208
Real, CPI-W, 1990 = 100	96.4	89.5	78.2	68.7				
Maximum Wage Earner	10,630	13,677	17,167	17,565	10,630	13,718	17,336	17,914
Average Wage Earner	7,817	9,802	11,905	11,838	7,817	9,802	11,905	11,838
Median Wage Earner	6,186	7,764	9,435	9,376	6,186	7,764	9,435	9,376
Minimum Wage Earner	5,004	6,276	7,625	7,578	5,004	6,276	7,625	7,578
Real comparison: 5% reduction in inflation, relatrive to control								
Maximum Wage Earner	111%	110%	106%	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			
	Benefit starting at specified age				Benefit starting at specified age			
Age	62	65	70	75	62	65	70	75
Nominal								
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	9,396	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	5,616	5,964	5,208	4,512	5,268	5,604	4,896
Real, CPI-W, 1990 = 100								
Maximum Wage Earner	10,630	13,718	17,443	18,281	10,269	13,329	17,106	17,984
Average Wage Earner	7,817	9,802	12,013	12,152	7,443	9,480	11,767	12,013
Median Wage Earner	6,186	7,764	9,450	9,481	5,838	7,362	9,036	9,114
Minimum Wage Earner	5,004	6,276	7,625	7,578	4,680	5,887	7,165	7,124
Real comparison: 5% reduction in inflation, relatrive to control								
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%

Notes: The 75 year columns reports workers who began receiving benefits at age 70 but worked until 75

The uniform nature of the benefit changes with the three alternatives to SSA indexing is easily explained by looking back to equation (3) on page 10. The price ratio in the equation describing the current indexing procedure is p_{b+r-1} / p_{b+61}, which results in the skipped 61st year and the one year indexing lag problems. Full indexing requires p_{b+r} / p_{b+60} instead of p_{b+r-1} / p_{b+61}. With uniform inflation at rate $\dot{p}$, the resulting under-indexing is

$$\frac{p_{b+r-1}}{p_{b+r}} \times \frac{p_{60}}{p_{61}} = (1+\dot{p})^{-2}. \qquad (6)$$

With 5% inflation this yields a reduction in real benefits to 90.7%; 10% yields 82.3% and 5% deflation results in a benefit increase to 110.3%.

Recommendation:

These experiments strengthen the case for changing from the current incomplete wage indexing procedure to full indexing. Only with full indexing – whether with the wage index, the CPI or a blend – do inflationary trends impose a proportional reduction in the benefits received by all beneficiaries. And this is true regardless of whether the CPI-W, the wage index or a mixture

of the two is employed. Full indexing can be achieved if, in addition, the skipped 61st year and current year indexing problems are corrected.

6. Conclusions

This paper shows that how an index is used or misused may be just as significant as which index or combination of indexes is used in adjusting OASI benefits for inflation. It demonstrates that full wage, mixed wage/CPI and full CPI indexing all cope better with the uncertainties of inflation than the incomplete wage indexing procedure currently used in computing OASI benefits.

Which Index?

This paper, focusing on data for the single cohort of retirees born in 1930, must obviously leave for further study the task of deciding on the most appropriate index or combination of indexes to use in adjusting OASI for inflation. The choice should not be limited to the National Average Wage Index versus the CPI-W. The one advantage of CPI-W is that it is seldom revised, but equation (4), page 23 provides a procedure for coping with revisions.[19] 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).

Phasing in Reform

When President George W. Bush promulgated his Social Security reform, he stressed that there would be no changes for those over 55.[20] – implicit in this pronouncement was a warning to those under 55, the majority of voters, that they should look out.

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.[21] This is the argument for replacing wage indexing with price indexing. Given the long run financial problems of OASI, it certainly is tempting to pick the index that would contribute most to financial solvency.

Shifting from wage to price indexing during the working years might reduce financial pressure on the trust funds, provided the CPI continues to rise less rapidly than average wages. Biggs, Brown and Springsteed [2005] point out that a switch to price-indexing in computing

[19] *At What Price?: Conceptualizing and Measuring Cost-of-Living and Price Indexes* [2002], presents a comprehensive examination of the issues involved in constructing appropriate price indexes.

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

[21] 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 would make benefits for workers with similar wage histories vary rather erratically from one year to the next. For example, the ratio was 97.6% in 1992 but 102.0% in 1993. It would avoid invidious comparisons, help retirement planning, and contribute to stability to establish a fixed schedule for reducing PIA factors in advance, as Biggs et. al. suggest [2005, p 29].

benefits might be destabilizing, leading to a divergence over time between the path of expenditures and revenue, because the OASI tax revenue is based on wage income. They argue 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."

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 workers 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 benefits could be calculated twice: once with the annual benefit before reform, B^b, and again with the benefit computed with the after reform procedure, B^a. Then a weighted average of the two could be calculated based on the proportion of the ith 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, and a^p the worker's age when the reform was introduced, we might calculate the initial benefit as follows:

$$B = wB^b + (1-w)B^a,$$
$$\text{where } w = \begin{cases} 0 \quad \text{if } a^p \le 18 \\ \left(\dfrac{a^p - 18}{44}\right)^{\rho} \text{ if } 18 \le a^p \le 62 \\ 1 \quad \text{otherwise.} \end{cases} \tag{7}$$

The parameter ρ adjusts the speed of adjustment: with ρ = 1, the case of linear interpolation, adjustment is proportional to the years spent before and after reform; the reform is phased in more rapidly with ρ > 1. But of course, a number of alternative weighting schemes should be carefully evaluated.

Financial Implications

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 micro data sets instead of just the four representative workers considered in this paper. But examination of Table 7 does reveal that resolving Indexing Problem #1, undeflated earnings after 60, would reduce the retirement benefits of practically all categories of workers we have considered. The only exceptions are some early retiring workers, who would be held harmless. Thus it is reasonable to conclude that switching from incomplete to the full indexing of earnings would help resolve OASI's financial problems. We also saw that Problem #2, the skipped 61st year inflation adjustment and #3, the one year indexing lag, could be resolved in a financially neutral way. And the 60th year wage index bounce affects the variance of benefits among different age cohorts,

but not the mean of benefit expenditures. Thus it seems reasonable to conclude, pending further study, that correcting these indexing problems would help solve OASI's financial problems.

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 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 the level of OASI benefits. It may also help insulate the financial viability of the trust funds from the vicissitudes of inflation. But the trust funds would still be sensitive to inflation: because OASI trust funds are invested with an average maturity of 7.3 years, accelerated inflation could lead to a substantial reduction in the real rate of return earned on the OASI trust funds.

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Tables

Figures