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Abstract

This paper investigates how increases in the level of maximum earnings subject to the Social Security payroll tax have affected Social Security benefits and taxes. The analysis uses data from the Health and Retirement Study to ask how different the present value of own benefits and taxes would be for the cohort born from 1948 to 1953 (ages 51 to 56 in 2004) if they faced the lower cap on the payroll tax that faced those born 12 and 24 years earlier, but otherwise had the same earnings stream and faced the same benefit formula. We find that for those in the Early Boomer cohort of the Health and Retirement Study, ages 51 to 56 in 2004, that after adjusting for nominal wage growth, benefits were increased by 1.5 percent by the increase in the payroll tax ceiling compared to the cohort 12 years older, and by 3.7 percent over the benefits under the payroll tax ceiling for the cohort 24 years older. Tax receipts were increased by 5.3 and 10.6 percent over tax receipts that would have been collected under the tax ceilings that applied to the cohorts 12 and 24 years older respectively. About 22 percent of the additional tax revenues created by the increase in the payroll tax cap between the Early Boomer cohort and those 12 years older led to increased benefits. Similarly, about 27 percent of the additional tax revenues created by the increase in the payroll tax cap between the Early Boomer cohort and those 24 years older led to increase benefits.

Results are also presented separately for men and women, for those in the top quartile of earners, and for those at the tax ceiling throughout their work lives.

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When considering how to narrow the funding gap facing Social Security, policy makers continue to consider the option of raising the maximum salary subject to the payroll tax (U.S. Senate, Special Committee on Aging, 2010). In this paper we attempt to improve our understanding of how changes in the maximum level of earnings subject to the payroll tax have affected Social Security taxes and benefits. We use data from the Health and Retirement Study to separate the changes in taxes and benefits resulting from changes in the cap on income subject to payroll taxes from the effects of other complex changes that have occurred contemporaneously with the rise in the cap. Our strategy is to ask what benefits and taxes would have been for members of the HRS cohort ages 51 to 56 in 2004 if they faced the same maximum income subject to the payroll tax that applied to members of cohorts who were 12 and 24 years older.

An increase in maximum covered earnings has an immediate effect on payroll tax revenues. But unlike an across the board increase in the payroll tax rate, an increase in maximum covered earnings restricts the tax increase to those with highest earnings. It has no effect on many workers, raising tax costs only for those with earnings at or above the new effective cap.

In addition, as opposed to an increase in the payroll tax rate, raising the tax ceiling creates a leak in the (future) finances of the system in the form of an increase in future obligations to be paid to those at the top of the earnings distribution. Those who have earnings above the old cap have more of their total lifetime earnings covered by Social Security when the cap is increased. As a result, they are entitled to higher benefits. Although one could increase the cap on covered earnings without raising Social Security benefits, some are loathe to do this because it violates the insurance principle underlying Social Security. In keeping with the redistributive motivation of Social Security, for those at the cap benefits rise by only 15 percent of the increase in covered earnings.

From 1951 through 2004, maximum taxable earnings increased from \$3,600 to \$87,900, an increase of 24.4 times. Over the same period average annual covered earnings increased from \$2,799 to \$35,649, an increase of 12.7 times.² Thus the rate of increase in maximum taxable earnings has been about twice the rate of increase of average earnings

Our empirical analysis takes as an earnings baseline the covered earnings for the youngest cohort thus far included in the Health and Retirement Study (HRS), the Early Boomer Cohort.³ We use these data to study how increases in maximum taxable earnings have affected the benefits of members of this cohort relative to members of cohorts that are 12 and 24 years older. We estimate how the benefits of the younger cohort would have changed had they faced the lower ceiling on taxable earnings that faced members of the original HRS cohort, who are 12 years older, and the ceiling for the CODA (Children of the Depression) cohort, who are 12 years older than that.⁴ In making our calculations, all we change is the ceiling on earnings subject the payroll tax that was in place when the person was of a particular age. Otherwise we risk confounding our findings with the effects of other contemporaneous changes that have also

² There is a small element of simultaneity here as part of the increase in average covered earnings is the result of the increase in the earnings cap.

³ The HRS survey was in the field as of the writing of this paper. It is now collecting data for a new cohort, the Mid Boomers, who are ages 51 to 56 in 2010.

⁴ In calculating benefits we hold earnings history constant at the level observed for the Early Boomer cohort, and use the benefit formula in place in 2004. Benefits for the Early Boomer cohort are based on Average Indexed Monthly Earnings (AIME), computed from covered earnings, increased by a wage index up to the year the individual turns age 60. The AIME is averaged over the highest 35 years of covered, indexed earnings. Earnings after age 60 will enter into the AIME calculation if they exceed indexed earnings in the lowest of the 35 years previously counted toward the AIME. From Average Indexed Covered (Monthly) Earnings, the Primary Insurance Amount (PIA) is calculated. For a person turning age 60 in 2004, the PIA replaced 90 percent of the first \$612 in monthly earnings, 32 percent of the next \$3,077, and 15 percent of the amount above \$3,689. This same formula is applied to the same earnings history for each member of the HRS cohort, but the level of maximum covered earnings is changed when the simulation pertains to those born 12 and 24 years earlier.

affected benefits. For example, members of the Early Boomer cohort had a higher normal retirement age than did members of the HRS cohort. At least in this respect, the benefit formula applicable to the HRS cohort was more generous than the benefit formula for Early Boomers.

Our analysis utilizes Social Security earnings records for those HRS respondents who gave explicit permission to allow their earnings records to be matched to the basic survey instrument, while imputing benefits for those without a matched earnings record.⁵ Social Security benefits are calculated from data on yearly covered earnings using the Social Security Administration's ANYPIA program. In analyzing the effect of changes in the Social Security earnings cap, we ask how benefits would have changed (for the cohort of Early Boomers, those ages 51 to 56 in 2004) if the maximum taxable earnings that applied to the HRS cohort of 51 to 56 year olds instead had applied to the Early Boomer cohort. To simulate the effects of a lower ceiling on covered earnings for members of older cohorts, while holding all other factors constant, we artificially truncate the level of (real) earnings inserted into the ANYPIA program by the earnings cap that applied 12 or 24 years earlier, adjusting for differences in average earnings over the period. Using this methodology, we simulate the effects of the increase in the payroll tax ceiling as experienced between the cohorts aged 51 to 56 in 2004 and in 1992 and between those 51 to 56 in 2004 vs. 1980.

To determine how changes in the earnings cap have affected the distribution of benefits, and in particular how these changes have affected those in the top of the earnings distribution,

⁵ In the past two years, Social Security benefits have provided an important buffer to the decline in the stock market. In part because of the dominating presence of Social Security, the recent decline in the stock market reduced total retirement wealth by about 5 percentage points for the population approaching retirement age (Gustman, Steinmeier and Tabatabai, 2010). The cushion provided by Social Security is especially important for those in the lower half of the income and wealth distributions, the usual targets of social policy. But those in the lower half of the earnings distribution are largely unaffected by the increase in the ceiling on taxable earnings.

we examine the changes in benefits for those falling in different earnings quartiles, focusing a good deal of our attention on those falling in the highest earnings quartile.

Section II of the paper discusses the cap on earnings subject to the payroll tax and describes more fully how that cap has changed over time. Section III uses HRS data for the Early Boomer cohort to summarize changes in monthly Social Security benefits due to the change in the maximum level of covered earnings between the Early Boomer cohort and those in a cohort 12 years older, and then compared to a cohort 24 years older. In Section IV we examine the effects on both benefits and taxes of increases in the ceiling on taxable earnings for those with earnings at or above the earnings cap throughout their lifetimes. Section V uses HRS data to investigate the effects of changes in the earnings cap on the present values of benefits and taxes over the lifetime of members of the Early Boomer cohort, while Section VI discusses the implications of our findings.

II. Maximum taxable earnings subject to the payroll tax

From 1937 to 1949, annual maximum earnings subject to the payroll tax was \$3,000. Once the real value of the \$3,000 cap was eroded by rising earnings, the share of total earnings covered by Social Security began to decline, and continued down for decades. A reversal in policy was implemented in the mid 1970s and the cap climbed relative to average earnings, before stabilizing in the 1980s.

Suppose we are dealing with a member of the original HRS cohort who was 56 in 1992 and who worked on a long term job until age 60 in 1996. For simplicity, this individual's yearly earnings always increased over his lifetime, and earnings from 1961 are the lowest of his annual earnings counted when computing AIME (Average Indexed Monthly Earnings). In 1961, the cap on yearly earnings subject to the payroll tax was \$4,800, about 17 percent greater than average

annual earnings in private employment for that year. Roughly speaking, any earnings above average earnings were not subject to the payroll tax and would not generate future benefits. Now consider a person who was 56 in 2004, leaving a long term job in 2008 at age 60, with earnings from 1973 the lowest earnings counting toward AIME. In 1973, earnings up to \$10,800 were covered by Social Security and subject to a payroll tax. Since earnings in the private sector averaged about \$7,580, earnings up to 42 percent above the average level were taxed and generated benefits. Of course, many of those with relatively low earnings were not affected by the increase in maximum covered earnings, but many with moderate or high earnings found their AIME increased by the application of a higher ceiling.

Any change in the earnings cap over time should be adjusted for changes in average earnings over time. To make that adjustment, we use the calculated wage growth used to index for earnings growth in the AIME calculation. Members of the Early Boomer cohort, born from 1948 to 1953, would have reached age 25 between 1973 and 1978. Members of the original HRS cohort, born from 1936 to 1941, reached age 25 between 1961 and 1966. After indexing, \$4,800, the earnings cap for those age 25 in 1961, amounts to \$8,880 12 years later.⁶ Thus over the 12 year period from 1961 to 1973, the real cap on earnings increased by 21.6 percent ($10,800/8,880$). Similarly, adjusting the \$6,600 cap on earnings in 1966 by the index applicable over the next 12 years increases the real cap to \$14,124. Comparing the actual ceiling in 1978 with the ceiling from 1966 after adjusting by the wage index, the cap on maximum covered

⁶ As noted above, the cap on covered earnings does have an effect on average covered earnings. When the cap is increased, that raises average earnings. Thus the simple adjustment for indexing used here overstates the adjustment that should be applied to the cap in earnings from the earlier year. Of course, most of the increase in average earnings is due to the increase in wages observed as a result of productivity growth, changes in the underlying wage structure and inflation, with modification due to the changing mix in employment in favor of more women, whose wages still fall below those of men.

earnings is 25.3 percent (17,700/14,124) higher in 1978 than in 1966. Thus the real earnings cap is higher for members of younger cohorts.

Now consider in more detail how the cap on taxable earnings has changed over time relative to the average annual wage covered by Social Security. Table 1 reports these data for the period 1951 through 2004. As can be seen, over time policy makers have increased maximum covered earnings more rapidly than the increase in average earnings. For the decades of the 1950s and 1960s, the maximum level of earnings subject to the payroll tax was a bit greater than the average wage.⁷ The ratios of maximum taxable earnings to average annual wages ranged between 1.0 and 1.4. It was in the early and mid 1970s that the cap on taxable earnings began to rise much more rapidly than the average wage. By 1983, the ratio of maximum earnings to average covered wage roughly stabilized, and has since varied between 2.3 and 2.55.

Roughly speaking, if members of the Early Boomer cohort, ages 51 to 56 in 2004, had earnings between ages 25 and 60 count as their high 35 years of earnings, for those in the middle of this cohort, covered earnings between 1975 and 2010 would count toward their AIME. Thus for this cohort, counted earnings would not include earnings from the period with a very low cap, where the ratio of the cap to average earnings was between 1 and 1.5. Almost all the earnings counted in determining their AIME would have been within periods after 1983, when there was a high cap on covered earnings and a ratio of the cap to average earnings of 2.3 to 2.55. (We treat the period after 2004 as if the relation between the earnings cap and average earnings remains within this range.)

⁷ In the early years of Social Security, maximum taxable earnings exceeded the earnings of almost all workers. Ninety seven percent of all workers in 1937 and 1940 had earnings below the taxable maximum. By 1945, 86 percent of workers had earnings below the maximum. (Source: *Social Security Bulletin*, 2007, Table 4.B4)

For those ages 51 to 56 in 1992, included as part of the original HRS cohort, earnings from roughly 1963 to 1998 count in determining their AIME. Compared to the Early Boomer cohort, that adds in a period of 12 years from 1963 to 1975. During this period, the earnings cap was low, with a ratio of the earnings cap to average earnings ranging from 1.03 to 1.64. At the same time, compared to the Early Boomer cohort, earnings over a period of 12 years from 1998 to 2010 would no longer count. During this period, the ratio of the cap to average earnings was high, ranging from 2.37 to 2.55.

The difference in the earnings cap between the Early Boomer cohort and the CODA (Children of the Depression) Cohort is even wider. Consider members of the CODA cohort born from 1924 to 1929, ages 51 to 56 in 1980. 1951 is approximately the first year of earnings to be included in their AIME calculation. From 1951 to 1963, the ratio of maximum covered earnings to the average wage ranges from 1.09 to 1.29. Removing the period from 1986 to 1998, the last years counted in determining the AIME for member of the HRS cohort, eliminates a 12 year period where the ratio of the cap on covered earnings ranged from 2.33 to 2.55.

Table 1: Maximum Taxable Earnings and Average Annual Wage

Year	Maximum Taxable Earnings	Average Annual Wage	Maximum Earnings/Average Wage	Year	Maximum Taxable Earnings	Average Annual Wage	Maximum Earnings/Average Wage
1951	3600	2799	1.29	1978	17700	10556	1.68
1952	3600	2973	1.21	1979	22900	11479	1.99
1953	3600	3139	1.15	1980	25900	12513	2.07
1954	3600	3156	1.14	1981	29700	13773	2.16
1955	4200	3301	1.27	1982	32400	14531	2.23
1956	4200	3532	1.19	1983	35700	15239	2.34
1957	4200	3642	1.15	1984	37800	16135	2.34
1958	4200	3674	1.14	1985	39600	16823	2.35
1959	4800	3856	1.24	1986	42000	17322	2.42
1960	4800	4007	1.20	1987	43800	18427	2.38
1961	4800	4087	1.17	1988	45000	19334	2.33
1962	4800	4291	1.12	1989	48000	20100	2.39
1963	4800	4397	1.09	1990	51300	21028	2.44
1964	4800	4576	1.05	1991	53400	21812	2.45
1965	4800	4659	1.03	1992	55500	22935	2.42
1966	6600	4938	1.34	1993	57600	23133	2.49
1967	6600	5213	1.27	1994	60600	23754	2.55
1968	7800	5572	1.40	1995	61200	24706	2.48
1969	7800	5894	1.32	1996	62700	25914	2.42
1970	7800	6186	1.26	1997	65400	27426	2.38
1971	7800	6497	1.20	1998	68400	28861	2.37
1972	9000	7134	1.26	1999	72600	30470	2.38
1973	10800	7580	1.42	2000	76200	32155	2.37
1974	13200	8031	1.64	2001	80400	32922	2.44
1975	14100	8631	1.63	2002	84900	33252	2.55
1976	15300	9226	1.66	2003	87000	34065	2.55
1977	16500	9779	1.69	2004	87900	35649	2.47

Source: *Social Security Bulletin* (2007) Table 2.A8. From 1937 to 1950, maximum taxable earnings was \$3000.

Table 2: Percentage of Workers with Earnings Below Annual Maximum Taxable

Year	All Workers			Year	All Workers		
	Total	Men	Women		Total	Men	Women
1937	96.9	95.8	99.7	1976	85.1	76.3	97.5
1940	96.6	95.4	99.7	1977	85.2	76.3	97.5
1945	86.3	78.6	98.9	1978	84.6	75.4	97.1
1950	71.1	59.9	94.6	1979	90.0	83.6	98.6
1951	75.5	64.6	96.7	1980	91.2	85.5	98.8
1952	72.1	60.0	95.4	1981	92.4	87.4	99.0
1953	68.8	55.5	93.8	1982	92.9	88.3	98.9
1954	68.4	55.4	93.0	1983	93.7	89.6	99.0
1955	74.4	63.4	95.9	1984	93.6	89.4	98.9
1956	71.6	59.7	94.5	1985	93.5	89.3	98.8
1957	70.1	58.7	93.1	1986	93.8	89.7	98.7
1958	69.4	58.4	91.8	1987	93.9	89.9	98.6
1959	73.3	62.7	94.3	1988	93.5	89.4	98.3
1960	72.0	60.9	93.5	1989	93.8	90.1	98.3
1961	70.8	59.6	92.4	1990	94.3	90.9	98.4
1962	68.8	57.1	91.1	1991	94.4	91.1	98.3
1963	67.5	55.5	90.0	1992	94.3	91.0	98.1
1964	65.5	53.1	88.5	1993	94.4	91.3	98.1
1965	63.9	51.0	87.3	1994	94.6	91.4	98.1
1966	75.8	64.4	95.6	1995	94.2	91.0	97.9
1967	73.6	61.5	94.2	1996	93.9	90.6	97.7
1968	78.6	68.0	96.3	1997	93.8	90.5	97.6
1969	75.5	62.8	96.0	1998	93.7	90.3	97.5
1970	74.0	61.8	93.5	1999	93.9	90.7	97.5
1971	71.7	59.1	91.7	2000	93.8	90.6	97.4
1972	75.0	62.9	93.9	2001	94.1	91.0	97.5
1973	79.7	68.9	96.2	2002	94.6	91.8	97.7
1974	84.9	76.2	97.8	2003	94.5	91.8	97.5
1975	84.9	76.4	97.5	2004	94.1	91.2	97.2

Source: Annual Statistical Supplement, Table 4.B.4.

Having considered how maximum taxable earnings related to average earnings, consider how the fraction of workers whose total earnings were *above and below* the annual taxable maximum has changed over time. Table 2 reports the share of the population with earnings *below* the taxable earnings cap. In 1937, 96.9 percent of workers had earnings below the cap, so that only 3.1 percent of workers had earnings above the cap. After rising, and reaching a third of workers in the 1960s, the fraction with earnings above the cap began to fall. By 1979, only 10 percent of earners had earnings above the cap. In the following years the cap rose to the point where only 5 or 6 percent of workers had earnings above the cap. From these data, we also see that male workers are more likely than female workers to have earnings above the cap. In 1950, about 40 percent of male workers and about 5 percent of female workers had earnings above the maximum taxable level. By 2004, 8.8 percent of men and 2.8 percent of women had earnings above the cap.

III. Measuring the Effects on Monthly Benefits of Changes in the Social Security Earnings Cap

To isolate the effects on benefits of changes in the cap on earnings subject to the Social Security payroll tax, the most straight-forward approach is to begin with a single cohort. We choose the Early Boomer cohort of the Health and Retirement Study, ages 51 to 56 in 2004. We then use the Social Security Administration's ANYPIA program to calculate monthly benefits for this cohort. Next we impose lower earnings caps that would apply to cohorts 12 and 24 years older. This procedure leaves earnings and the benefit formula unchanged. Benefits can then be calculated under the lower earnings cap and compared with benefits under the actual earnings cap each individual faced, while holding all other factors influencing benefits the same.

Consider first the calculation of monthly benefits for those in the Early Boomer cohort, ages 51 to 56 in 2004. We use the Social Security earnings histories matched for members of the Early Boomer cohort, together with projections of earnings, and then compute their Social Security benefits. (As discussed below, earnings records are imputed for those who do not have a matched earnings record.)

Then to simulate the effects of the lower maximum on taxable earnings facing those from older cohorts, we simply truncate the earnings stream submitted to the ANYPIA program. For example, for covered earnings in 2004, a first calculation would use covered earnings up to the actual maximum taxable earnings in place in 2004, \$87,900. If an HRS respondent had higher earnings than \$87,900, the effect of the cap on covered earnings is to reduce the earnings submitted to the benefit calculation to the amount of the cap. When simulating the effects of the lower (nominal) cap facing those born 12 years earlier, we would take the actual earnings in 2004 observed for the members of the Early Boomer cohort, but subject them to the cap on covered earnings that applied in 1992. The cap that would have applied to members of the older cohort was \$55,500. Similarly, the cap that would have faced a member of the Early Boomer cohort 24 years earlier (than 2004) was \$25,900.

The next step is to adjust the nominal cap from 12 years earlier for the growth in wages between 1992 and 2004. We use the data from Table 1 to calculate the growth in average wage, multiplying the nominal cap in place 12 years earlier by the growth in the average annual wage over the 12 year period. A cap from the 1980s adjusted for the change in average annual wages does not differ much from the cap that applied 12 years later. But once the lower caps in place in 1970 enter into the calculation, there is a substantial effect of the change in the earnings cap on benefits.

Table 3: Estimates of AIME and PIA with Caps Experienced by 2004, 1992 and 1980 Cohorts, for Individuals Ages 51-56 in 2004

Households	2004 Caps		1992 Caps		Adjusted 1992 Caps		1980 Caps		Adjusted 1980 Caps	
	AIME	PIA_NR	AIME	PIA_NR	AIME	PIA_NR	AIME	PIA_NR	AIME	PIA_NR
All Rs**	2825 (2223)***	1432 (719)	2217 (1450)	1274 (578)	2724 (2065)	1410 (694)	1254 (583)	916 (304)	2576 (1806)	1380 (652)
Males	3378 (2437)	1606 (745)	2486 (1493)	1382 (579)	3200 (2217)	1568 (710)	1332 (573)	957 (283)	2982 (1892)	1524 (656)
Females	2372 (1917)	1289 (664)	1997 (1377)	1186 (562)	2333 (1843)	1280 (653)	1189 (584)	882 (316)	2243 (1660)	1261 (624)

* AIME is average indexed monthly earnings. PIA is primary insurance amount.

** The number of observations with either a matched or imputed earnings record who are insured is 2,476. There are 1,116 males, and 1,360 females.

*** Standard deviations are in parentheses.

Note: Quarters of coverage are reported in the Social Security record. After 2005, when earnings are projected, quarters of coverage are based on the relationship between total annual covered earnings and the amount of earnings needed to earn one quarter of coverage.

One other adjustment we make is to impute benefits for those without a matched Social Security earnings history. We use a nearest neighbor approach. A regression is run for those who have a matched earnings record, where the Primary Insurance Amount computed from the earnings record is the dependent variable. Independent variables are taken from the respondent reports to the HRS.⁸ The nearest neighbor is then selected on the basis of the predicted PIA, including in the sample both those with and without matched earnings records. We then replace the missing record with the entire Social Security record of the donor and treat the observation for which a value was imputed as if the earnings record had never been missing.

From Table 3, row 1, columns 1 and 5, Average Indexed Monthly Earnings are increased by about 3.7 percent (2825/2724) when the payroll tax cap that applied to the Early Boomer cohort is used instead of the cap that applied to the HRS cohort, whose members were 12 years older. Given the progressivity of the benefit formula, the primary insurance amount is only 1.6 (1432/1410) percent greater when the cap from 2004 (row 1, column 2) is used instead of the adjusted cap that applied to the 1992 cohort (row 1, column 6). For men, the difference in AIME is 5.6 percent (3378/3200), wider than the difference for women of 1.7 percent (2372/2333). As expected, women are much less likely to have earnings near the cap, and thus are much less likely to be affected by an increase in the cap. The corresponding effects on benefits of raising the earnings cap between the HRS and Early Boomer cohorts are 2.4 percent (1606/1568) for men, and 0.7 percent (1289/1280) for women.

⁸ Covariates used in imputing earnings records are taken from respondent reports to the HRS. They include annual earnings from current job, household income from last calendar year, demographic characteristics, indicators of marital status and history, age, work history, including reported work in each HRS wave, tenure on longest and current job, total number of years worked, number of jobs, number of jobs worked five or more years, industry and occupation from current job, union membership, whether public employee, if U.S. born, home ownership, number of children, if the individual is insured for benefits at normal retirement age, labor force and disability status, self employment status in 2004, and veteran's status.

The last two columns of Table 3 make the analogous calculations regarding the increase in the real earnings cap over 24 years, essentially comparing the effects of the real caps in place for members of the Early Boomer cohort, 51 to 56 in 2004, with the real caps for members of the Children of the Depression (CODA) cohort, 51 to 56 in 1980. Over the entire population, the difference in benefits generated by raising the maximum level of earnings subject to the payroll tax is a much more substantial 3.8 (1432/1380) percent. For men, there is a 5.4 percent (1606/1524) increase in benefits from raising the earnings cap between the Early Boomer and CODA cohorts. For women, the difference is 2.2 percent (1289/1261).

Table 4 presents the analogous results after sorting the population by AIME quartile. Tables 5 and 6 present the same results by AIME quartile separately for men and women.

Table 4: Average PIA at Normal Retirement Age by AIME Quartiles for Individuals Ages 51-56 in 2004, with 2004, 1992 and 1980 Caps

AIME Quartiles From 2004 caps	2004 Caps	1992 Caps	Adjusted 1992 Caps	1980 Caps	Adjusted 1980 Caps	Growth Rate from 1992 Caps to 2004 Caps	Adjusted Growth Rate from 1992 Caps to 2004 Caps	Growth Rate from 1980 Caps to 2004 Caps	Adjusted Growth Rate from 1980 Caps to 2004 Caps
First Quartile	610	589	608	513	608	4%	0%	19%	0%
Second Quartile	1087	1030	1082	884	1081	6%	0%	23%	1%
Third Quartile	1582	1435	1566	1082	1553	10%	1%	46%	2%
Fourth Quartile	2452	2044	2386	1186	2278	20%	3%	107%	8%

Table 5: Average PIA at Normal Retirement Age by AIME Quartiles for Males Ages 51-56 in 2004, with 2004, 1992 and 1980 Caps

AIME Quartiles From 2004 caps	2004 Caps	1992 Caps	Adjusted 1992 Caps	1980 Caps	Adjusted 1980 Caps	Growth Rate from 1992 Caps to 2004 Caps	Growth Rate from Adjusted 1992 Caps to 2004 Caps	Growth Rate from 1980 Caps to 2004 Caps	Growth Rate from Adjusted 1980 Caps to 2004 Caps
First Quartile	732	701	730	593	730	4%	0%	23%	0%
Second Quartile	1230	1120	1215	918	1213	10%	1%	34%	1%
Third Quartile	1840	1583	1800	1118	1771	16%	2%	65%	4%
Fourth Quartile	2632	2132	2535	1203	2389	23%	4%	119%	10%

Table 6: Average PIA at Normal Retirement Age by AIME Quartiles for Females Ages 51-56 in 2004, with 2004 and 1992, 1980 Caps

AIME Quartiles From 2004 caps	2004 Caps	1992 Caps	Adjusted 1992 Caps	1980 Caps	Adjusted 1980 Caps	Growth Rate from 1992 Caps to 2004 Caps	Growth Rate from Adjusted 1992 Caps to 2004 Caps	Growth Rate from 1980 Caps to 2004 Caps	Growth Rate from Adjusted 1980 Caps to 2004 Caps
First Quartile	529	512	527	460	527	3%	0%	15%	0%
Second Quartile	1001	968	999	847	997	3%	0%	18%	0%
Third Quartile	1413	1331	1407	1061	1401	6%	0%	33%	1%
Fourth Quartile	2218	1934	2191	1164	2123	15%	1%	91%	4%

We focus on columns 7 and 9 of each of these tables. From the first row of Table 4, columns 7 and 9, for those in the bottom quartile of the AIME distribution, there is no effect on the Primary Insurance Amount from raising the cap between the HRS and either the Early Boomer or Children of the Depression cohorts. Benefits are increased by 0 and 1 percent for those in the second quartile, and 1 and 2 percent for those in the third quartile. As expected, there are much larger effects from changing the caps for those in the fourth AIME quartile, bottom row of Table 4. If those in the upper quartile of the AIME distribution in 2004 were subject to the real caps imposed on those 12 years older, their primary insurance amount would be roughly 3 percent lower. Imposing the real cap on earnings that would have obtained for a cohort 51 to 56 in 1980 increases the benefits of those in the fourth AIME quartile by 8 percent.

Comparing Tables 5 with 6, the effects of raising the caps are much larger for men than for women. For example, comparing those in the top quartile of men and women, focusing on the change created by raising the cap from the level that applied to those 51 to 56 in 1992 to the cap from 2004, benefits for men increase by 4 percent, while women's benefits increase only by 1 percent (bottom row, column 7 of each table). Focusing on the difference in the caps that applied to those in the Early Boomer and CODA cohorts, the increase in the cap from 1980 to 2004 increases benefits for men in the top quartile by 10 percent, while increasing the benefits of women in the top quartile by 4 percent.

IV. Effects of Changes in Maximum Earnings Subject to the Payroll Tax on Taxes and Benefits for Those Whose Earnings Are at or Above the Maximum.

Next we would like to see how past increases in maximum earnings subject to the payroll tax affected the present values of both tax and benefit streams for those with maximum earnings.

For purposes of example, we begin by examining the effects of changes in the earnings maximum over time for a man from the Early Boomer cohort who represents a person with maximum covered earnings. This man was born in 1948 and survived at least to age 56 in 2004. He began working in 1969 at age 21, and if he survived until 2009, stopped working after 2009 at age 61. He will claim benefits at age 66 in 2014. We first assume that each year's earnings are at the maximum covered by the payroll tax throughout his work history. Thus from Table 1, in 2004 his earnings are \$87,900; in 2003 they are \$87,000, etc.

Two things should be noted about the tax rates we use. First we use the sum of the OASI and DI tax rates paid by respondents and their employers. Because we do not include disability payments as part of benefits, (in our work below with HRS data, we do not model participation in the DI program), this means we are going to overstate the value of taxes relative to benefits. Second, the tax rates have been changing over time. Thus the payroll tax rates paid in earlier years of work differ from those charged later on. (See Social Security Administration, 2007, Table 2.A3).⁹

Next we impose the caps on earnings that would have applied had this individual been 12 years older, born in 1936. However, while the cap is determined as if he were born 12 years earlier, his actual earnings are taken to be those described above, equal to the caps experienced throughout his working life for a person born in 1948. Thus in 2004 his earnings are \$87,900, but the payroll tax is capped at the level from 12 years earlier, in 1992, so that only \$55,500 of those earnings are subject to the payroll tax. In 2003, of his \$87,000 in earnings, \$53,400, the earnings cap in 1991, is subject to the payroll tax. We then adjust the earnings caps from the remaining years as if he were born 12 years earlier.

⁹ Note we hold the tax rates constant between cohorts, allowing only the ceiling on taxable earnings to change from one cohort to the next.

The earnings caps are stated in nominal terms. To adjust the caps from 12 years earlier to real terms, once again caps on earnings from 12 years earlier are increased by the growth in wages. For example, the growth in wages is 55.4 percent ($35,649/22,935$) between 1992 and 2004; and 56.2 percent ($34,065/21,812$) between 1991 and 2003, and so on.

Once we complete the analysis of the effect of imposing the earnings caps that would have applied to a man 12 years older, we repeat the calculation for an individual who is 24 years older. Thus we impose the caps that would have applied to a person born in 1924, but otherwise *leave earnings at the level of the caps that applied to a person born in 1948*, and keep all other factors the same.

The first thing to notice in Table 7 is how poor a deal Social Security is for a person with earnings at or above the cap. The present value of the basic benefit in 2004 is \$226,462, while the present value of taxes paid is \$521,581. As we know, the benefit formula is designed to redistribute benefits among those with different levels of earnings. The replacement rates specified by the formula determining Social Security benefits in 2004 decline from 90 percent of the first \$7,344 of annual earnings, to 32 percent of the next \$36,924, down to 15 percent of any remaining earnings through the covered maximum. Nevertheless, the relation between benefits and taxes is better than indicated in the table. There are two reasons for this. First, the deal faced by our representative individual would be greatly improved by counting spouse and survivor benefits, which are more important for those with higher earnings (Gustman and Steinmeier, 2001). Second, as noted previously, the tax rate we use includes taxes to support disability insurance, but we do not count disability benefits in our benefit calculation.

Nevertheless, increasing the earnings cap does raise benefits and taxes. The remainder of the data in Table 7 tells us just how much benefits and taxes were increased for this high earner

as the ceiling on covered earnings was raised to the level that applied to a person born in 1948 from a person born in 1936, 12 years earlier, and then to a person born in 1924, 24 years earlier. After adjusting the cap in real terms, from columns 1 and 3, the present value of benefits increase due to the increase in the payroll tax cap over the 12 years from \$207,301 to \$226,462, or 9.2 percent. The present value of payroll taxes paid increase much more, from \$412,054 to \$521,581, or by 26.6 percent. Comparing columns 1 and 5, which report comparable figures over 24 years, the present value of benefits increase due to the increase in the cap on earnings subject to the payroll tax from \$198,340 to \$226,462, or 14.2 percent. The present value of payroll taxes paid increase from \$385,638 to \$521,581, or by 35.2 percent.

A number of interest for policy is the leakage in benefits created by the increase in the payroll tax cap. This number indicates the share of the tax increase that is used to support higher benefits. Comparing first the Early Boomer and HRS cohorts, the change in the present value of benefits divided by the change in the present value of taxes from raising the ceiling on the payroll tax amounts to about 17 percent, as reported in column 7 of Table 7. Between the CODA and Early Boomer cohorts, from the last column in the table, the change in the present value of benefits divided by the change in the present value of taxes from raising the ceiling on the payroll tax, after adjusting the change in the caps for changes in the wage, amounts to about 21 percent.

Thus our example suggests that for a person earning at the maximum level covered by Social Security, about a fifth of the additional taxes collected due to the increase in the earnings cap are used to pay for increased benefits, reducing the incremental funds available for addressing the Social Security revenue shortfall by about a fifth. When we use HRS data, the share of increased taxes that leaks back in the form of additional benefits will be slightly higher.

Table 7: Estimates of Present Values of Social Security Benefits and Taxes with 2004, 1992 and 1980 Caps for an Individual with Maximum Covered Earnings, and Ratios of Changes in Benefits Over Changes in Taxes: Age 56 in 2004

Present Values	2004 Caps	1992 Caps	Adjusted 1992 Caps	1980 Caps	Adjusted 1980 Caps	2004 Caps to 1992 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to Adjusted 1992 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to 1980 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to Adjusted 1980 Caps, Ratio of Changes in Benefits Over Changes in Taxes
Social Security Benefits	226,462	154,864	207,301	90,733	198,340	0.24	0.17	0.32	0.21
Social Security Taxes	521,581	225,781	412,054	102,272	385,638				

Note:

- 1- Uses real interest rate when computing discounted present value of benefits as of normal retirement age.
- 2- Uses nominal interest rate when discounting that benefit from normal retirement age to 2004.
- 3- Uses nominal interest rate for calculating the present value of taxes paid up to 2004.
- 4- Uses nominal interest rate for discounting taxes paid after 2004 back to 2004.
- 5- Uses 2*(OASI+DI) tax rates for individuals in calculating total taxes paid.

V. Effects of Changes in Maximum Earnings Subject to the Payroll Tax on Benefits and Taxes for the Early Boomer Cohort

Now we turn to the data from the HRS and apply those data as we did in Section III, here accounting for the effects of changes in the ceiling on covered earnings on both benefits and taxes. Our baseline is the Early Boomer cohort. In examining the effect of changes in the ceiling on taxable earnings, we once again ask how benefits and taxes would change if we change only the maximum earnings subject to the payroll tax, holding earnings and other aspects of the tax and benefit rules, such as the payroll tax rate, constant between the Early Boomer cohort and older cohorts.¹⁰

Table 8 follows the format of the tables in the previous section. Comparing the effects of the earnings caps that applied to the Early Boomer cohort and the HRS cohort 12 years older, we see from columns 1 and 3 that the present value of benefits is increased by 1.5 percent (120,991/119,190) due to the higher cap applying to the members of the early boomer cohort. Taxes are increased by 5.3 percent (162,692/154,570). So the increase in benefits from the higher cap on covered payroll amounts to 22 percent of the increase in taxes, $(120,991 - 119,190)/(162,692 - 154,570)$.

¹⁰ Once again, we apply a tax rate that includes the portion used to support DI benefits, while not adding disability payments to the benefit side. One might try to adjust benefits by simply eliminating those who receive DI benefits from the sample. This would require a deeper analysis of DI benefit determination than we undertake here. For one thing, the sample includes those ages 51 to 56. A number of these individuals will become eligible for disability benefits before they reach normal retirement age, but without a full model of disability determination, we cannot identify which ones they are. For another, once they become eligible for normal retirement benefits, the disability case is converted from the disability roles to the Social Security roles.

Table 8: Estimates of Present Values of Social Security Benefits and Taxes with 2004, 1992 and 1980 Caps For All Individuals, Including Imputations: Ages 51-56 in 2004

Present Values	2004 Caps	1992 Caps	Adjusted 1992 Caps	1980 Caps	Adjusted 1980 Caps	2004 Caps to 1992 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to Adjusted 1992 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to 1980 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to Adjusted 1980 Caps, Ratio of Changes in Benefits Over Changes in Taxes
Social Security Benefits	120,991	107,903	119,190	77,922	116,730	0.31	0.22	0.46	0.27
Social Security Taxes	162,692	120,418	154,570	69,253	147,055				

Note: Respondents who are insured for benefits at normal retirement age are included. Number of observations is 2,475. The sample includes respondents with matched Social Security records. Records are imputed for those with missing records. Social Security benefits are the present value of benefits at normal retirement age discounted to 2004 dollars. Social Security taxes are present value of taxes paid up to the year prior to the entitlement year, in 2004 dollars. Present values of benefits and taxes are not weighted. Weighted averages are similar to un-weighted.

Comparable figures for the differences created by the caps experienced by the Early Boomer and Children of the Depression cohort, in columns 5 and 1, suggest that the effect of the increase in the payroll tax ceiling over 24 years was to raise benefits by 3.7 percent (120,991/116,730), while raising taxes by 10.6 percent (162,692/147,055). Thus the leakage from taxes to benefits amounted to 27 percent $[(120,991 - 116,730)/(162,692 - 147,055)]$ of the increase in taxes received.

The Appendix contains four tables that decompose the benefit and tax changes first between men and women (Table 9), then by quartile (Table 10). As expected, these tables show that the changes in benefits and taxes were concentrated, but not exclusively located, in the top quartiles, and were much larger for men than for women. Tables 11 and 12, further disaggregate the results, focusing on the distributions within quartiles of men and women, and the changes in benefits and taxes within quartile, by gender.

There are two basic findings from these results. First, as expected, most of the increases in taxes and benefits are concentrated in the men who fall in the top quartile of earners. As seen in Table 11, bottom row, their taxes are increased by 12.6 percent (406,893/361,456) over the taxes of those in a cohort 12 years older, and by 26.4 percent (406,896/321,863) relative to the taxes of those who are 24 years older. The comparable increases for their benefits, shown in row 7, are 3.9 percent (196,633/189,273) and 10.2 percent (196,633/178,393). Overall, the ratio of the increase in benefits to the increase in taxes for men falling in the top quartile of earners is 16 percent and 21 percent compared to those in cohorts 12 and 24 years older.

Increases in the ceiling on covered earnings also affects the taxes and benefits of men in the third quartile, but the effect is much smaller than it is for members of the top quartile of earners. For example, for men in the fourth quartile, taxes increase by almost \$90,000 due to the

increase in the payroll tax ceiling, while for members of the third quartile, taxes increase by only \$13,000.

Similarly, benefits and taxes reported in Table 12 are seen to be increased for women in the top quartile of female earners as a result of the increase in the ceiling on earnings covered by the payroll tax. But the taxes paid by women in the top quartile increase by only \$27,000 (278,876 - 251,896) as a result of the increase in the payroll tax ceiling over 24 years.

VI. Conclusions:

This paper has analyzed how changes in the level of maximum earnings subject to the Social Security payroll tax have affected Social Security benefits and taxes paid. For those in the Early Boomer cohort of the Health and Retirement Study, ages 51 to 56 in 2004, benefits increased by 1.5 percent due to the increase in the real payroll tax ceiling compared to the cohort 12 years older, and by 3.7 percent compared to the cohort 24 years older. Tax receipts increased by 5.3 and 10.3 percent over tax receipts that would have been collected under the tax ceilings that applied to the cohorts 12 and 24 years older respectively. Thus about 22 percent of the additional tax revenues created by increasing the payroll tax cap between the Early Boomer cohort and those 12 years older is used to increase benefits. Similarly, about 27 percent of the additional tax revenues created by the increase in the payroll tax cap between the Early Boomer cohort and those 24 years older is used to increase benefits.

There are two important differences between the effect of raising a given amount of tax dollars by increasing the payroll tax rate, as compared to increasing the maximum earnings subject to the payroll tax. First, because increasing the maximum income subject to the payroll tax increases both tax revenues and benefit payments, an increase in the ceiling on income

subject to the payroll tax that generates the same addition to taxes as does an increase in the payroll tax rate, nevertheless generates less net revenue. Second, since both the tax increase and benefit increase from raising the ceiling on earnings subject to the payroll tax applies only to those in the top income brackets, distributional differences result in both tax payments by income group and benefit receipt by income group. In particular, only high earners receive a benefit increase.

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Appendix

Table 9: Estimates of Present Values of Social Security Benefits and Taxes at Normal Retirement Age with Caps for 2004, 1992 and 1980 Cohorts, All Individuals by Sex, Including Imputations: Ages 51-56 in 2004

Present Values	2004 Caps	1992 Caps	Adjusted 1992 Caps	1980 Caps	Adjusted 1980 Caps	2004 Caps to 1992 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to Adjusted 1992 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to 1980 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to Adjusted 1980 Caps, Ratio of Changes in Benefits Over Changes in Taxes
All									
Benefits	120,991 (58,005)*	107,903 (46,761)	119,190 (56,140)	77,922 (25,012)	116,730 (52,839)	.31	.22	.46	.27
Taxes	162,692 (128,980)	120,418 (74,418)	154,570 (114,860)	69,253 (31,246)	147,055 (102,252)				
Males									
Benefits	122,469 (55,000)	105,311 (41,969)	119,516 (52,161)	73,046 (20,180)	116,207 (48,133)	.27	.20	.39	.24
Taxes	201,490 (143,281)	138,148 (76,050)	187,030 (123,572)	76,155 (30,855)	175,921 (107,899)				
Females									
Benefits	119,779 (60,350)	110,030 (50,269)	118,922 (59,233)	81,923 (27,742)	117,159 (56,424)	.39	.29	.56	.35
Taxes	130,882 (105,871)	105,868 (69,789)	127,933 (99,615)	63,590 (30,425)	123,368 (90,795)				

*Standard deviation.

Table 10: Averages of Present Values of Social Security Benefits and Taxes at Normal Retirement Age by AIME Quartiles for Respondents Ages 51-56 in 2004 with Caps for 2004, 1992 and 1980 Cohorts

AIME Quartiles From 2004 caps	2004 Caps	1992 Caps	Adjusted 1992 Caps	1980 Caps	Adjusted 1980 Caps	2004 Caps to 1992 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to Adjusted 1992 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to 1980 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to Adjusted 1980 Caps, Ratio of Changes in Benefits Over Changes in Taxes
First Quartile									
Benefits	54,539	52,799	54,424	46,056	54,434	.87	*	1.05	*
Taxes	37,446	35,457	37,334	29,385	37,342				
Second Quartile									
Benefits	94,473	89,583	94,022	76,900	93,974	.42	*	.52	*
Taxes	92,503	80,785	91,322	58,718	91,329				
Third Quartile									
Benefits	136,231	123,720	134,939	92,863	133,802	.41	.40	.50	.45
Taxes	173,704	143,159	170,479	86,488	168,336				
Fourth Quartile									
Benefits	198,873	165,688	193,565	96,018	184,901	.27	.19	.42	.25
Taxes	347,267	222,489	319,406	102,564	291,475				

*Ratios of differences only reported when both tax and benefit changes exceed \$1,000.

Table 11: Average Present Value Social Security Benefits and Taxes at Normal Retirement Age by AIME Quartiles for Males Ages 51-56 in 2004 with Caps for 2004, 1992 and 1980 Cohorts

AIME Quartiles From 2004 caps	2004 Caps	1992 Caps	Adjusted 1992 Caps	1980 Caps	Adjusted 1980 Caps	2004 Caps to 1992 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to Adjusted 1992 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to 1980 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to Adjusted 1980 Caps, Ratio of Changes in Benefits Over Changes in Taxes
First Quartile									
Benefits	57,348	54,931	57,195	46,485	57,229	.53	*	.68	*
Taxes	52,865	48,271	52,523	36,972	52,596				
Second Quartile									
Benefits	95,525	86,969	94,402	71,253	94,243	.38	.35	.44	.38
Taxes	120,777	98,146	117,610	66,157	117,399				
Third Quartile									
Benefits	140,958	120,994	137,858	85,227	135,627	.36	.36	.43	.40
Taxes	226,354	170,322	217,697	95,436	212,986				
Fourth Quartile									
Benefits	196,633	158,923	189,273	89,664	178,393	.22	.16	.36	.21
Taxes	406,893	236,748	361,456	106,577	321,863				

*Ratios of differences only reported when both tax and benefit change exceed \$1,000.

Table 12: Average Present Values of Social Security Benefits and Taxes at Normal Retirement Age by AIME Quartiles for Females Ages 51-56 in 2004 with Caps for 2004, 1992 and 1980 Cohorts

AIME Quartiles From 2004 caps	2004 Caps	1992 Caps	Adjusted 1992 Caps	1980 Caps	Adjusted 1980 Caps	2004 Caps to 1992 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to Adjusted 1992 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to 1980 Caps, Ratio of Changes in Benefits Over Changes in Taxes	2004 Caps to Adjusted 1980 Caps, Ratio of Changes in Benefits Over Changes in Taxes
First Quartile									
Benefits	50,732	49,184	50,575	44,197	50,591	1.20	*	1.33	*
Taxes	30,791	29,503	30,661	25,872	30,683				
Second Quartile									
Benefits	93,172	90,124	92,964	78,768	92,821	.50	*	.67	*
Taxes	72,860	66,745	72,415	51,395	72,179				
Third Quartile									
Benefits	131,427	123,669	130,892	98,159	130,257	.46	.46	.55	.51
Taxes	141,250	124,423	140,076	80,516	138,958				
Fourth Quartile									
Benefits	204,036	177,383	201,505	106,772	195,214	.35	.25	.53	.33
Taxes	278,876	203,019	268,826	96,728	251,896				

*Ratios of differences are only reported when both tax and benefit changes exceed \$1,000.