Technical appendix

Phase I. Generate earnings profiles

Estimates are generated by pooling earnings data for 2001, 2002, and 2003 from the
Current Population Survey of the following year. For each individual aged 26-54,
earnings are calculated as the sum of wage earnings and earnings from self-employment.
Earnings in 2001 and 2002 are inflation adjusted to 2003 dollars using the CPI-U. Data
for 2001 and 2002 are treated as if collected for 2003 so that a 28 year old in the March
2002 survey is included as if she were a 28 year old in 2003.

To construct earnings profiles, we use stylized scale factors created by the SSA to model
a typical worker's age-earnings profile[1]. For each worker, we construct lifetime earnings
from age 21 to 64. Given current reported earnings levels, we backcast and forecast
reported income by the growth in the average wage index to account for increases in
overall wages and the growth in the scale factors to generate an age-appropriate level of
earnings. For example, if person A is 25 in 2003 (the March, 2004 CPS), we will create
an earnings history of 43 years for this worker, backcasting 4 years and forecasting 39
years. To calculate earnings for this worker when he/she is 24, the following calculation
is performed:

$$E_{2002,24} = E_{2003,25} \cdot \left(\frac{1}{\frac{SC_{25}}{SC_{24}}} \right) \left(\frac{1}{\frac{AWI_{2003}}{AWI_{2002}}} \right),$$

where $E_{2002,24}$ is earnings in 2002 at age 24, SC_{25} is the scale factor for age 25, and
AWI_{2003} is the average wage index in 2003. To forecast earnings for 2004 when the
worker will be 26 compute

$$E_{2004,26} = E_{2003,25} \cdot \left(\frac{SC_{26}}{SC_{25}} \right) \left(\frac{AWI_{2004}}{AWI_{2003}} \right).$$

More generally, to calculate any year i's earnings from year j's earnings, solve:

$$E_{i,age+(i-2003)} = E_{j,age+(j-2003)} \cdot \left(\frac{SC_i}{SC_j} \right) \left(\frac{AWI_i}{AWI_j} \right).$$

Phase II: Compute Social Security benefits

After each individual has been assigned an age-earnings profile based on their current
reported wage, salary, and self-employment earnings, we compute a worker's AIME—
average indexed monthly earnings—that is necessary in computing monthly social
security benefits. This is done by taking each year's estimated earnings and indexing it

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[1] Clingman, Michael and Orlo Nichols. 2004. "Scaled Factors for Hypothetical Earnings Examples Under
the 2004 Trustees Report Assumptions." Baltimore, MD: Social Security Administration, Office of the
Chief Actuary.

by the change in the average wage index from that year until the worker is 60. Earnings from 61-64 are taken at face value. The AIME is computed by taking the highest 35 years of earnings and taking a monthly average.

Based on the AIME for each worker and their spouse (if present), we compute the monthly Social Security benefit that any given worker will receive upon retirement[2]. In order to calculate the primary insurance amount (PIA), we use the bend points and bend point factors that are predicted in the 2004 Social Security Trustees' report (as used in the Pozen memo[3]). The PIA formula is as follows:
   (1) 90% of all income up to the first bend point, BP1.
   (2) 32% of income between the first and second bend point, BP2.
   (3) 15% of all income above the second bend point.
The .9, .32, and .15 slopes are the bend point factors that would be subject to price indexing. Bend points and bend point factors are used at age 62, the first year of eligibility. PIA's are adjusted for inflation from 62 until the normal age of retirement.

In order to calculate PIA's under progressive price indexing, we use SSA's estimates for the new bend points and bend point factors. Progressive price indexing works as follows.
   1) Calculate the reduction imposed on the maximum wage earner under pure price indexation. For the maximum earner, this results in a reduction of $\left(\dfrac{\% \Delta CPI}{\% \Delta AWI} \right)^{t}$,

   where t is the number of years that price indexation is in effect (from 2012 until the year of eligibility).
   2) Generate a new bend point at the 30th percentile of individual wage earners in each year. Call this BP-PPI for the progressive price indexing bend point.
   3) Reduce the .32 factor that applies between BP-PPI and BP2 and the .15 factor that applies for all earnings after BP2 by a new reduction factor that will preserve the benefit cut of pure pricing indexation for the maximum earner. This results in a phased in, "sliding scale," price indexing.
Now, the PIA-PPI is calculated as follows:
   (1) 90% of all income up to the first bend point, BP1
   (2) 32% of income between BP1 and the new BP-PPI
   (3) $32\% \cdot x$ of income between BP-PPI and BP2
   (4) $15\% \cdot x$ for all income above BP2,
where x is the new reduction factor. For our purposes, we have used the bend points and bend point factors used by the SSA solvency memorandum to Robert Pozen.
       Once the PIA under current law and the PIA-PPI are calculated, we index these amounts by projected growth in prices in the 2004/2005 Social Security Trustee's report to when the worker will reach the normal retirement age.
       In order to determine spousal benefits, we follow current Social Security provisions and assign the higher of two values. If the wife's (husband's) benefit is less

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[2] We have assumed that each worker will retire at the normal retirement age. The normal retirement age is currently 65, but is notched up over several years until it reaches 67.
[3] Goss, Stephen C. 2005 "Estimated Financial Effects of a Comprehensive Social Security Reform Proposal Including Progressive Price Indexing." Baltimore, MD: Social Security Administration, Office of the Chief Actuary.

than one-half of the husband's (wife's) benefit, then we give the wife (husband) half her (his) husband's (wife's) benefit. If not, the wife (husband) receives her (his) estimated benefit. For couples who retire in different years, we use the CPI to correct the benefit to reflect one-half of the real value of the projected benefits.

The President has not specified what to do with married couples of different ages. So, we have omitted the spouse of workers age 54 or younger, if the spouse is age 55 or over.

We calculate a cumulative benefit cut by deflating a worker's benefit at retirement into real 2005 dollars. Using gender specific life expectancy at retirement as projected by the Social Security Trustee's report, we calculate an expected cumulative loss in benefits as

$$(PIA_{2005\$} - PIA_{PPI_{2005\$}}) \cdot \text{Life expectancy at NRA} = \text{Cumulative Benefit loss}$$

Phase III: Comparing estimates

Estimates from the Social Security Administration rely on internal data not available for public use. To check for the robustness of our state-by-state analysis, we compare SSA data[4] to the CPS data used for our study. We calculate each state's average income as a percent of the national average and use the Spearman Rank Correlation test to compare the rank orders of both datasets. The Spearman statistic is .9430 and the significance level is less than .001. Therefore, the distributions of incomes by state for SSA data dn the CPS are not statistically different.

The SSA memo on the Pozen plan includes estimates for benefit cuts for medium workers in ten year intervals starting in 2015. In order to benchmark our estimates, we provide the closest matching years from our analysis.

Year	SSA estimates for medium worker	EPI estimates for average worker	EPI estimates for average of middle quintile
2015	0.7	0.1%	0.3%
2025	6.4	5.5%	6.7%
2035	11.5	10.0%	12.4%
2044	--	14.6%	19.7%
2045	16.4	--	--

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[4] SSA data available from: 2004 Annual Statistical Supplement of the OASDI program. www.ssa.gov/policy. Table 4.B.10.