Is Health Care an Individual Necessity? Evidence from Social Security Notch*

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December 22, 2014

Abstract

This paper exploits Social Security legislation changes to identify the causal effect of Social Security income on out-of-pocket medical expenditures of the elderly. Using the household-level consumption data from the 1986-1994 Consumer Expenditure Survey and an instrumental variables strategy, the empirical results show that the estimated income elasticities of out-of-pocket total medical costs, medical service expenses, and prescription drug expenses are about 0.89, 1.03, and 0.91, respectively. The estimated elasticities increase substantially and are statistically significant for elderly individuals with less than a high school education. The corresponding income elasticities are 2.40, 3.46, and 1.41, respectively. These findings are in sharp contrast to existing studies and provide empirical evidence that health care expenditures are highly income sensitive among the low education elderly.

Keywords: Income elasticity, health care expenditures, Social Security benefits

JEL Codes: I10, J14, H55

*The content of this paper does not reflect the official opinion of Centers for Disease Control and Prevention. Responsibility for the information and views expressed in the paper lies entirely with the author.

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1 Introduction

Determining the income elasticity of health care expenditures has an important implication on the role of government in the provision and finance of health care. Greater government involvement in the health care system could be justified if health care is determined to be a necessity good, i.e., the income elasticity of health care spending is less than 1; in contrast, if health care is a luxury good, i.e., the income elasticity is greater than 1, health care ought to be viewed as a market commodity and the best outcome could be reached through the invisible hand of a free market (Culyer, 1988). A large amount of literature has been devoted to determining the income elasticity of health care expenditures (Acemoglu et al., 2013; Barros, 1998; Brown, 1987; Di Matteo and Di Matteo, 1998; Di Matteo, 2004; Fogel, 1999; Freeman, 2003; Gerdtham et al., 1992; Gerdtham and Jonsson, 2000; Kleiman 1974; Leu, 1986; Manning et al., 1987; Maxwell, 1981; Moscone and Tosetti, 2010; Newhouse and Phelps, 1976; Newhouse, 1977; Parkin et al., 1987). Their results, however, are not consistent. In general, income elasticities of health care expenditures at the national level are greater than 1 while the income elasticity at the individual/household level is typically near zero (Getzen, 2000).

There are relatively few studies in the literature that use micro-level data in part due to the virtue that income is usually not a policy instrument to affect the demand for health care and also due to limited data availability of both the income and health care expenditure variables. The primary reason, however, is the potential endogeneity of individual/household income. To my knowledge, none of the existing studies that uses micro-level data has addressed this issue. These studies compare health care expenditures by differences in household income or by poverty status. Therefore, omitted-variable bias is an important concern in these studies as income is likely to correlate with unobservable characteristics that associate with health care spending. One example is that healthy individuals are likely to have higher income while their health care spending is likely to be low. Thus, not controlling for the health status of the individual would lead to a downward bias in estimating the effect of income on health care expenditures. Accordingly, omitted-variable bias is likely to contribute to the small income elasticity consistently found in previous studies that

use micro-level data.

The goal of this study is to estimate the responsiveness of household health care expenditures to changes in income, focusing exclusively on the elderly population and on the Social Security portion of their income. To my knowledge, none of the existing studies has estimated the income elasticity of health care expenditures of the elderly even though they are the most intensive consumers of health care compared to other age groups. According to the National Health Expenditure data, personal health care spending per capita for the 65 and older population was $14,797 in 2004, 5.6 times higher than spending per child ($2,650) and 3.3 times higher than spending per working-age individual ($4,511). In addition, Social Security is the primary income source for many of the retired. Among elderly Social Security beneficiaries (i.e., those aged 65 and older), about 64% received 50% or more of their income from Social Security and about 35% received 90% or more of their income from Social Security (Fast Facts & Figures about Social Security, 2013). Thus, changes in Social Security benefits would most certainly affect how the elderly consumes medical care.

The solvency of Social Security has drawn vast public attention. In 2010, Social Security ran a deficit with its costs exceeding non-interest income for the first time in more than a quarter-century. The deficit was about $49 billion in 2010, $45 billion in 2011, and $55 billion in 2012 (2013 Social Security Trustees Report) and it is likely to continuously grow as a large wave of the baby boomers started reaching the retirement age in 2011. Policymakers and researchers have proposed ways to reform Social Security, including raising the retirement age, increasing payroll taxes, limiting the annual cost-of-living adjustments, and reducing benefits. Understanding how and to what extent changes in Social Security benefits affect the medical care spending of the elderly is crucial as this issue has important implications for the well-being of the elderly, for the provision of medical care, and for the health care system and Social Security reforms.

The study of the impact of Social Security income on medical care expenditures inevitably runs into the problem of omitted variables bias. Social Security benefits are calculated based on the retiree's lifetime earnings, which could correlate with unobserved factors that are correlated

with retirees' health care expenditures. As described above, individuals in good health are likely to have higher lifetime earnings and lower health care spending. The estimated effect of Social Security payment on medical care expenditures would be biased downward if individual health is not taken into account. To address the endogeneity concern, I exploit the exogenous variations in Social Security income stemming from two legislation changes during the 1970s, known as *Social Security Notch*. In the mid-1960s, inflation began to soar and reached more than 14% in 1980, a phenomenon known as *the Great Inflation*. Public concerns over benefit erosion had led to the 1972 Social Security Act, which provided automatic cost-of-living adjustments (COLAs) based on the Consumer Price Index (CPI). However, the formula used to calculate COLAs was flawed, causing benefit levels to increase at twice the rate of inflation. In 1977, Congress passed legislation to correct the formula, which substantially reduced the benefit level. The new law, however, only applied to future beneficiaries, i.e., those born in 1917 or later, retirees born in 1910-1916 were grandfathered under the 1972 law. Accordingly, individuals with similar earnings histories born in different years could receive substantially different Social Security income as a result of these law changes.

Previous studies have used *Social Security Notch* to estimate the effect of income on a variety of outcomes of the elderly, including labor supply (Krueger and Pischke, 1992), living arrangements (Engelhardt et al., 2005), mortality (Snyder and Evans, 2006), prescription drug use (Moran and Simon, 2006), homeownership (Engelhardt,2008), formal home care and nursing home use (Goda et al., 2011), and informal home care use (Tsai, 2014).[1]

To my knowledge, this is the first study to use *Social Security Notch* to estimate the causal effect of changes in retirement income on household medical care expenditures. I use data from the 1986-1994 Consumer Expenditure Survey (CEX) and an instrumental variables (IV) strategy to address the endogeneity of Social Security income. The IV estimates show that a $100 increase in Social Security payment would increase spending on out-of-pocket medical costs, medical care services, and prescription drugs by about $12, $8, and $4, respectively. The income elasticities,

[1]For a more detailed discussion on the study design and data sources of these studies, see Tsai (2014).

measured at the means of the sample, are approximately 0.89, 1.03, and 0.91, respectively. None of the estimated effects, however, is statistically significant at less than the 10% level. The estimated effects increase substantially and reach statistical significance at the 5% level among elderly individuals with less than a high school education. Specifically, a $100 increase in household Social Security income would increase expenses on out-of-pocket medical costs, medical care services, and prescription drugs by approximately $31, $24, and $7, respectively. The corresponding estimated elasticities are 2.40, 3.46, and 1.41, respectively. These findings provide empirical evidence that medical care is not only a normal good but also a luxury good (i.e., highly income sensitive) among low-educated seniors. The result is in sharp contrast to the existing studies that show a nearly zero income elasticity of medical care spending at the individual/household level and strongly suggests that treating income as exogenous would produce a serious downward bias in estimating the responsiveness of health care expenditures to changes in income.

The rest of the paper is organized as follows: Section 2 provides a brief discussion of the background of the Social Security legislation changes during the 1970s; section 3 provides a detailed discussion of the CEX data and the empirical strategy; section 4 presents the estimation results for the full sample and the low-educated subsample and provides various robustness tests; and section 5 concludes.

2 The 1972 and 1977 Social Security Amendments

In 1972, Congress introduced cost-of-living adjustments (COLAs) to automatically increase Social Security benefits each year by the amount of inflation based on the Consumer Price Index (CPI). The law took effect in 1975 and affected retirees who began to collect retirement income in 1972 (i.e., those born in 1910 and later).[2] Unfortunately, the formula designed to construct COLAs was flawed as it increased benefits based on projections of increases in both prices and wages, a situation commonly referred to as *double indexation*. As a result of double indexing for inflation,

[2]Prior to the 1972 amendments, Congress adjusted Social Security benefits on an ad hoc basis and had to amend the law in order to make adjustments.

COLAs increased at an unsustainable rate, causing benefits to rise more than inflation and jeopardizing the solvency of the Social Security Trust Funds. The 1977 Social Security amendments decoupled the COLA formula from wage increases, resulting in substantially lower benefits. The new benefit rules, however, applied to individuals who were at age 62 on or after January 1, 1979 (i.e., those born in 1917 and after).[3] Retirees born in 1910-1916 were able to receive benefits calculated based on the old formula. These legislation changes were unanticipated to retirees and created an exogenous and permanent differences in Social Security benefits among adjacent birth cohorts with similar lifetime earnings.[4]

3 Data and Empirical Strategy

The sample is constructed from the 1986-1994 Consumer Expenditure Survey (CEX), which is a rotating panel survey representative of the US civilian noninstitutional population and has been conducted by the Bureau of Labor Statistics (BLS) since 1980. The CEX consists of two separate components. The weekly Diary survey contains detailed expenditure data for small items purchased on a daily or weekly basis by consumer units (CUs) during a two-week period.[5] The quarterly Interview Survey, which I use in this study, collects data on CUs' characteristics, income, and expenditures on major items. In the Interview Survey, CUs are interviewed once every three months over a 15-month period and about 5,000 CUs are interviewed each quarter (80% of these are re-interviewed and the remaining 20% are replaced by a new group). The initial interview collects information on CUs' characteristics and on the demographic background and earnings of

[3]To avoid abrupt changes, a transitional payment strategy was developed for retirees born between 1917 and 1921, the so-called "notch generations." Social Security benefits for the notch generation are far less generous than the preceding cohorts due to the new benefit formula and the high inflation during the 1970s and early 1980s.

[4]For a more detailed discussion on the 1972 and 1977 Social Security amendments, see Krueger and Pischke (1992) and Snyder and Evans (2006).

[5]According to BLS, a consumer unit consists of any of the following: (1) All members of a particular household who are related by blood, marriage, adoption, or other legal arrangements; (2) a person living alone or sharing a household with others or living as a roomer in a private home or lodging house or in permanent living quarters in a hotel or motel, but who is financially independent; or (3) two or more persons living together who use their incomes to make joint expenditure decisions.

the reference person and of the spouse.[6] The information is updated in the fifth interview to reflect changes in CU composition. In the second through fifth interview, expenditure information for the three calendar months prior to the interview is reported. Income variables are reported at annual values which refer to the twelve months prior to the interview and are only collected in the second and fifth interview.

The Interview Survey includes summary expenditure variables on health care spending and includes a question regarding Social Security income, which reads "Amount of Social Security and Railroad Retirement income prior to deductions for medical insurance and Medicare received by all CU members in past 12 months" With the response to this question I am able to study the effect of a marginal increase in household Social Security income on medical care expenditures among the elderly households.

I pool together the 1986-1994 CEX, which provides 160,507 observations.[7] However, I do not use all of these observations in the baseline sample because of the following restrictions that I impose: First, I impose a minimum respondent age of 65 (i.e., excluding 127,208 observations). Second, I exclude households with quarterly nondurable expenditures less than $1000 (i.e., excluding 7,707 observations). Following previous studies, I exclude respondents with household Social Security income less than $100 per month (i.e., excluding 1,851 observations) and restrict the sample to individuals in households in which the primary Social Security beneficiary was born between 1900 and 1930 (i.e., excluding 544 observations).[8] After excluding observations with missing values for the chosen set of control variables that I describe below, a final sample of 23,197 observations remains.

To estimate the elasticity of health care expenditures with respect to Social Security income, I use the following specification,

$$Y_i = \alpha_0 + \alpha_1 SS_i + \alpha_2 X_i + \varepsilon_i \tag{1}$$

[6]The reference person is identified by the response to the question who owns or rents the house.

[7]Although the CEX started in 1980, I include the 1986-1994 survey to maximize the number of respondents born in 1900-1930.

[8]The definition of the primary Social Security beneficiary is described below.

where Y_i represents outcomes of respondent i. The outcome variables include CUs' out-of-pocket (OOP) total medical expenses and OOP expenses on medical services and prescription drugs.[9] The variable SS_i represents quarterly household Social Security income (measured in hundreds), X_i is a vector of control variables that include the characteristics of the respondent listed in Table 1 and in addition include a set of year dummies to control for aggregate shocks that might impact medical care spending, and ε_i is the error term.

The parameter α_1 indicates the change in health care spending for every \$100 change in Social Security income. The estimation of equation (1), however, is problematic due to the potential endogeneity of Social Security benefits, SS_i. As described above, Social Security payment is based on beneficiaries' lifetime earnings, which most certainly correlates with unobserved variables that would affect medical care spending and therefore would bias the estimation of α_1. To address the endogeneity problem, I implement an IV strategy based on the Social Security law changes. The double indexation mistake stemming from the 1972 Social Security act resulted in an unexpected and permanent windfall in Social Security benefits for the 1910-1916 cohort but retirees born in 1917 or later have substantially lower benefits compared to previous cohorts as a result of the 1977 amendments. These law changes provide a natural experiment to estimate the causal effect of income changes on medical care spending.

To exploit the exogenous change in Social Security income, it is necessary to identify whether a household is affected by the 1972 or 1977 amendments. Thus, I need to identify the beneficiary's birth year in each household. To do this, I follow Moran and Simon (2006) and Goda et al. (2011) to designate a primary beneficiary of Social Security income in a household.[10] I designate the male member as the primary beneficiary in households with a male member as most married women in these birth cohorts are likely to receive Social Security benefits based on their husbands

[9]OOP health care expenses are the sum of expenditures on medical services and supplies and prescription drugs. In the CEX, OOP expenditures indicate any unreimbursed expenses paid directly to the provider of care or to a third party insurer. Medical service expenditures include spending on services provided by physicians, practitioners, and other medical professionals, dental care, eye exams, lab tests, X-rays, nursing services, therapeutic treatments, hospital room and meals, and care received in nursing home and retirement community.

[10]The approach is reasonable as the majority of the sample is made up of single- (32%) and two-person households (54%).

earnings history. For households without a male member, I designate the never-married female as the primary beneficiary for households consisting of a never-married female and designate the deceased/former husband as the primary beneficiary in households consisting of a widowed or a divorced female. Because the birth year of the deceased/former husband is not available in the CEX, I impute the information by subtracting three years from the widowed or divorced female's birth year as three years was found to be the median spousal age difference for widowed or divorced elderly (Engelhardt et al., 2005).

In Figure 1, I display the mean quarterly household Social Security income by the birth year of the primary beneficiary. As a result of the law changes, household Social Security income, SS_i, is expected to be higher if the primary beneficiary was born during 1910-1916. This is confirmed in Figure 1. According to the figure, Social Security income is higher among the 1910-1916 cohort and drops about $200 moving from the 1916 to the 1917 cohort and continues to decline for the notch years. Hence, it is apparent that household Social Security income is higher for those whose benefits were calculated using the 1972 formula and is lower for those who applied benefits after the 1977 amendments took effect. To implement the IV strategy, I create an instrument, Z_i, that takes the value of 1 if respondent i is in a household in which the primary Social Security beneficiary was born during the years of 1911-1917, and zero if the primary beneficiary was born in other years. The reason that I choose the 1911-1917 cohort is because they are the cohorts that benefit the most from double indexation.[11]

The natural next step would be to implement a typical two-stage least squares estimator. In the first stage, Z_i would be used as an instrument for Social Security income. The first stage regression is written as

$$SS_i = \delta_0 + \delta_1 Z_i + \delta_2 X_i + \eta_i \tag{2}$$

where Z_i is the instrument and X_i is the vector of controls. In the second stage the instrumented

[11] Goda et al. (2011) present the simulated annual Social Security income by birth cohort, which is solely generated based on the 1972 and 1977 amendments. The figure shows that Social Security benefits for retirees born in 1911-1917 are significantly above the trend line. In the sensitivity analysis, I also use the period 1915-1917 to define the instrumental variable as these years represent the peak of the benefits and are used in Goda et al. (2011) and Moran and Simon (2006).

Social Security benefits, which by assumption is not correlated with any unobserved factors in equation (1), could be used as an independent variable in a regression that predicts medical care expenditures. The IV estimation strategy should produce unbiased estimates of the causal effect of Social Security income on medical care spending under the assumption that the instrument Z_i only affects medical care spending indirectly through its effect on Social Security income, SS_i, and therefore, is not correlated with any unobserved factors that affect medical care expenses of the elderly (the residual in equation (1)).

Table 1 displays summary statistics for the full sample of respondents. I also break down the summary statistics by whether the primary beneficiary was born in 1911-1917, or equivalently by whether the respondent is assigned a 1 or 0 value for the Z_i variable. The respondents' characteristics displayed in the table are all included in the covariate sets of the regressions. All dollar amounts are translated to 1991 dollars based on the CPI and all analyses presented in the paper are weighted using the weight provided by CEX.

In the full sample, the mean household Social Security income is $2,552 per quarter. On average, the quarterly spending on OOP medical costs, medical services, and prescription drugs is about $340, $197, and $118, respectively. The mean age of the sample is 73 and the majority of the sample is white (92%), male (68%), married (58%), and has less than a high school education (42%). As expected, quarterly Social Security income is about $267 higher for the 1911-1917 cohort compared to cohorts born in other years. Expenditures on all three of the medical care spending measures are also higher for the 1911-1917 cohort compared to cohorts born in other years; however, only the discrepancy in prescription drug spending is statistically significant at conventional levels. Of course, these numbers are simply raw averages, and should be treated with caution as these discrepancies may be due to factors unrelated to Social Security law changes. For example, the 1911-1917 cohorts are older, less likely to be male, and have lower educational level, after-tax income, and fewer household members.

To gain some insights regarding the differences in medical care expenditures by the birth year of the primary beneficiary, I perform a reduced-form estimation, which includes the instrument

directly in equation (1) rather than estimating two stages. The reduced-form coefficients indicate that spending on OOP costs ($20), medical services ($14), and prescription drugs ($7) are higher for individuals in households in which the primary beneficiary was born in 1911-1917 compared to individuals in households in which the primary beneficiary was born in adjacent years. This pattern is consistent with the summary statistics presented in Table 1.

4 Results

Table 2 displays the estimation results from the IV regression that uses the dummy variable indicating whether the primary beneficiary was born in 1911-1917 as an instrument for Social Security income. The odd columns in the table display results from OLS, which corresponds to a simple linear regression model. Results for three different health care expenditure measures are shown in each panel, including OOP expenses on total medical care costs, medical services, and prescription drugs. Although the estimated OLS coefficients are positive and reach statistical significance at conventional levels, the magnitudes are very small. Depending on the outcome measure, increasing Social Security benefits by $100 would increase medical care spending by between $1 and $4. This would translate into an income elasticity of approximately 0.3 at the mean of medical care expenses and Social Security income in the full sample. The OLS estimation results are consistent with previous studies, indicating that health care is a necessity good at the individual/household level.

The IV estimates are reported in the even columns of the table. The results from the first stage indicate that the correlation between the instrument and Social Security income is positive, as expected, and it is highly statistically significant. Quarterly household Social Security income is approximately $170 higher if the primary beneficiary was born in 1911-1917. This is consistent with the pattern in Figure 1. The first stage F-statistic on the instrument is equal to 18.65 and the F-statistic from the first stage regression (65.92) is significantly above the critical value (16.38) obtained from the Stock and Yogo (2005) test for weak instruments using limited information

maximum likelihood estimation (assuming a 10 percent size threshold). The results from the second stage indicate a stronger, positive effect of Social Security income on medical care spending. According to the coefficient estimates, out-of-pocket medical costs, medical service expenses and prescription drug spending would increase by $12, $8, and $4, respectively for a $100 increase in Social Security benefits. The corresponding income elasticities based on the IV estimates are 0.89, 1.03, and 0.91 at the sample means. The estimated effects, however, are imprecisely measured. The coefficient estimates associated with the control variables reveal that there is no obvious discrepancy in medical care expenditures across different demographic variables. A few exceptions are that white respondents tend to spend more on health care while males and those with lower education tend to spend less on prescription drugs.

Studies have documented that benefits resulted from double indexation is greater for low-income households (Engelhardt et al., 2005) and medical care utilization varies by income level (Safran et al., 2002). Accordingly, one might expect that the estimated income effect on medical care expenditures is greater among lower-income households. To validate the hypothesis, I use education as a proxy for income and perform the same analysis with a restricted sample, individuals with less than a high school education. The estimation results are presented in Table 3.

The OLS estimates reported in the odd columns of the table reveal a small influence of Social Security income on health care spending. An additional $100 benefit would increase total medical care expenditures by less than $1 and the corresponding income elasticity is 0.05; the estimated effect on medical service spending is negative and the magnitude of the effect is small as well. The IV estimates reported in the even columns, however, reveal a different picture. First, as expected the first stage coefficient on the instrument is positive and statistically significant. Quarterly Social Security income for the 1911-1917 cohorts is about $190 higher compared to cohorts born in adjacent years. The F-statistic for weak instrument test (38.63) is above the critical value suggested by Stock and Yogo (2005). According to the estimated marginal effect, a $100 increase in Social Security payment increases OOP medical costs by $31, medical service expenses by $24, and prescription drug spending by $7. The estimated effects are statistically significant at conventional

levels and are economically meaningful. In addition, evaluated at the means of the restricted sample, the corresponding income elasticities are 2.40, 3.46, and 1.41, respectively. These findings provide strong evidence that health care expenditures are highly income sensitive among low-educated elderly households.

Based on the differences between the OLS and IV results, it is clear that omitted-variable bias is an important concern in estimating the income elasticity of health care spending with respect to Social Security income. And the bias appears to be greater among the low-educated sample. OLS estimation shows little influence of Social Security income on health care spending, however, when the dummy variable indicating the 1911-1917 cohorts is used to instrument Social Security income, I find that elderly individuals respond greatly to changes in Social Security payments. OLS estimates appear to be biased downward, implying that individuals whose health care expenditures are low tend to have higher Social Security payments in unobserved ways, so that when one controls for this, the impact of Social Security income on medical care expenditures become substantially greater.

4.1 Robustness Analysis

In this section, I focus on the low-educated sample and perform robustness analyses on the sensitivity of the results. First, I exclude widowed and divorced females as the birth year of the primary beneficiary in these households is imputed. I also perform two additional tests to address factors that may potentially invalid the IV identification strategy. I drop respondents in household in which the primary beneficiary was born in 1918 or 1919. According to Almond (2006), cohorts in utero during the 1918-1919 flu years are significantly more likely to have lower education, higher rates of physical disability, lower income and socioeconomic status, and higher transfer payments compared to other birth cohorts. Accordingly, the instrument Z_i may correlate with unobserved factors (i.e., the error term in equation (1)) that may affect medical care spending (e.g., physical disability). Furthermore, the study sample includes individuals whose primary beneficiary was born in 1900-1930. The wide range of birth year may introduce some cohort-specific factors that lead to

a correlation between the instrument and error term. Thus, I use a narrower range, including individuals whose primary beneficiary was born in 1905-1920. Finally, I use the years 1915-1917 to define the instrumental variable Z_i, as these years represent the peak of the benefit notch (Goda et al., 2011 and Moran and Simon, 2006).[12]

Table 4 presents the robustness results for the low-educated sample. In general, the results are robust to the specifications described above. The income elasticities of health care expenditures across three different measures are all above one, indicating that health care spending is highly responsive to changes in retirement income. However, the estimated effects fall short of statistical significance when widowed and divorced females are excluded from the sample.

Donald and Lang (2007) indicate that estimation sample includes small groups may generate standard errors that are biased downward dramatically and the standard cluster-robust approach may be quite unreliable in this case. They proposed using the t_{G-L} distribution, where G is the number of groups and L is the number of regressors that are invariant within groups. Cameron et al. (2008) suggest that a t_{G-2} distribution works reasonably well in the range of 20 clusters. Using the more conservative critical values for the t_{28} distribution, the estimated effects of Social Security income presented in Table 3 still reach statistical significance.

5 Conclusion

In this paper I use an instrumental variables strategy for identifying the causal effect of Social Security payments on out-of-pocket health care expenditures of the elderly. The results show that the estimated income elasticities of out-of-pocket medical costs, medical service expenses, and prescription drug expenses are about 0.89, 1.03, and 0.91, respectively. The estimated effects

[12]To validate the use of the 1911-1917 cohort in this study, I perform an additional sensitivity analysis. I restrict the sample to those aged 72 years and create a dummy variable indicating the years after 1989 (i.e., 1990-1994). Since those aged 72 were in the treatment group during 1986-1989 while they were in the control group after 1989, I should observe their medical care spending to decline after 1989. The situation is the opposite for the 79 age cohort as they were in the control group during 1986-1989 and became the treatment group after 1989. Therefore, medical care spending for the 79 age cohort should start rising after 1989. I run two regressions separately for the 72 and 79 age cohorts and the estimated results are consistent with the expectations.

increase substantially and reach statistical significance for the low-educated elderly households. Specifically, the increase in health care spending for an additional $100 Social Security payment is between $7 and $31 and the income elasticity is between 1.41 and 3.46, depending on the outcome measures. These findings are in sharp contrast to previous studies which suggest that health care expenses are unresponsive to changes in individual/household income. The results provide empirical evidence that treating the income variable as exogenous would create a serious downward bias on the effect of income on health care expenditures and lead to an erroneous conclusion that health care is an individual necessity.

The interpretation of health care as a luxury good among elderly households contradicts to one's intuition as in the US elderly individuals are covered by Medicare and health insurance would reduce the income constraint on the consumption of health care, which would result in a small income elasticity of health care spending. The large income elasticity of health care expenditures found in this study could be justified by the following perspectives: First, Medicare coverage is not comprehensive and many medical services are not covered (e.g., dental, vision, hospital services that exceed Medicare length of stay limitations, and most long-term care services and supports). Moreover, Medicare beneficiaries are required to pay premiums, deductibles, and coinsurance out of pocket. According to Kaiser Family Foundation, OOP medical spending by Medicare beneficiaries as a percentage of their income has risen sharply to about 16.4% in 2010 and the oldest and poorest beneficiaries spent about one-quarter of their incomes on health care (the Medicare Current Beneficiary Survey, the 2010 Cost and Use File). In addition, OOP spending on Medicare premiums and cost-sharing for Part B and Part D consumed about 27% of the average Social Security benefit payment in 2010 (Social Security and Medicare Boards of Trustees). Previous studies have documented that the burden of high OOP costs has caused Medicare beneficiaries to forego necessary medical services and treatments and the effect is disproportionately greater among beneficiaries with lower socioeconomic status. For example, Mojtabai and Olfson (2003) found that approximately 7% of the elderly Medicare beneficiaries in their sample did not adhere to drug treatment regimens because of costs and the cost-related poor adherence was especially

pronounced among lower-income beneficiaries. Accordingly, *ability to pay* is still a serious concern among Medicare beneficiaries. The findings in this study are also consistent with Moran and Simon (2006), which use the 1993 wave of the Assets and Health Dynamics among the Oldest Old (AHEAD) to examine how Social Security income affects the number of prescription medications that each household uses in a month among low education elderly households. Their findings reveal that the income elasticity of prescription drug use is about 1.32 at the sample means, suggesting that prescription drug use is highly income sensitive among the low-educated elderly.

The finding of a large income elasticity of health care expenditures among the elderly population implies that Social Security reforms aiming at cutting benefits would greatly reduce health care expenditures of the low-educated elderly households. This may exacerbate the scope of cost-related nonadherence to treatments and of the avoidance of necessary medical services resulting from rising Medicare out-of-pocket payments, which in turn may severely reduce the physical well-being of the elderly.

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Table 1: Summary Statistics

	Full		1911-1917 cohorts			
			Yes		No	
	N = 23,197		N = 7,791		N = 15,406	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Outcome Variables						
Out-of-pocket costs						
Total medical care expenses	339.71	821.78	348.54	886.54	335.37	787.98
Medical service expenses	197.26	763.06	201.50	830.94	195.17	727.38
Prescription drug expenses	117.54	187.16	123.38	197.89	114.68	181.60
Control Variables						
Quarterly Social Security income, $100s	25.52	11.40	27.31	12.41	24.64	10.76
Age	73	6	74	3	73	7
Age squared	5402	890	5539	503	5334	1022
Age cubed	401008	101054	413547	56218	394841	116469
White	0.92	0.27	0.93	0.26	0.92	0.27
Male	0.68	0.47	0.64	0.48	0.69	0.46
Married	0.58	0.49	0.55	0.50	0.59	0.49
Education						
Less than high school	0.42	0.49	0.43	0.50	0.41	0.49
High school	0.29	0.45	0.31	0.46	0.28	0.45
Some college	0.15	0.36	0.14	0.35	0.16	0.36
>= College	0.14	0.34	0.12	0.32	0.15	0.35
Size of CU	1.91	0.95	1.82	0.85	1.95	1.00
# of children under 18 in CU	0.07	0.40	0.05	0.31	0.08	0.43
Quarterly household after-tax income, $100s	52.54	46.42	51.63	50.01	52.99	44.55
Home owner	0.86	0.35	0.86	0.35	0.86	0.35
Region						
Northeast	0.20	0.40	0.21	0.40	0.19	0.40
Midwest	0.20	0.40	0.20	0.40	0.20	0.40
South	0.25	0.43	0.25	0.43	0.25	0.43
West	0.18	0.38	0.18	0.38	0.18	0.38
Rural areas	0.17	0.38	0.17	0.37	0.17	0.38

This table reports sample means of the outcome and control variables included in the estimation equation. Year dummies are included as control variables. The numbers are weighted. All dollar amounts are translated to 1991 dollars based on the CPI.

Table 2: Effect of Social Security Income on Medical Care Expenses, Full Sample

	Total medical expenses		**Medical service expenses**		**Prescription drug expenses**	
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	IV	OLS	IV	OLS	IV
Quarterly Social Security benefits, $100s	**3.51*** **	**11.86**	**1.80** **	**7.95**	**1.46*** **	**4.19***
	(0.74)	(11.22)	(0.66)	(10.39)	(0.16)	(2.29)
Elasticity	**0.26**	**0.89**	**0.23**	**1.03**	**0.32**	**0.91**
First-stage						
First-stage coefficient on IV		1.74***		1.74***		1.74***
		(0.40)		(0.40)		(0.40)
F-statistic on IV		18.65		18.65		18.65
F-statistic for weak IV test		65.92		65.92		65.92
Age	-199.64	-407.38	-53.63	-206.56	-219.64*	-287.59**
	(625.79)	(492.17)	(601.18)	(476.74)	(121.56)	(129.74)
Age squared	2.20	4.61	0.26	2.03	2.96*	3.75**
	(8.39)	(6.69)	(8.08)	(6.51)	(1.61)	(1.67)
Age cubed	-0.01	-0.02	0.00	-0.01	-0.01*	-0.02**
	(0.04)	(0.03)	(0.04)	(0.03)	(0.01)	(0.01)
White	85.48***	61.30**	59.86***	42.04	21.61***	13.70*
	(19.58)	(30.13)	(16.66)	(28.99)	(5.85)	(7.17)
Male	-28.55	-42.94	-7.24	-17.84	-23.25***	-27.96***
	(17.33)	(27.21)	(16.16)	(26.00)	(4.99)	(6.05)
Married	157.41***	96.94	101.23***	56.68	48.92***	29.14*
	(29.62)	(87.90)	(27.06)	(80.43)	(6.40)	(17.44)
Education						
High school	12.95	2.91	15.67	8.27	-9.16**	-12.45***
	(18.24)	(27.62)	(16.76)	(25.38)	(3.38)	(4.81)
Some college	54.88*	41.51	55.56*	45.70	-5.22	-9.59
	(30.46)	(44.32)	(27.74)	(41.12)	(6.33)	(6.36)
>= College	47.70*	30.70	60.80**	48.28	-17.15***	-22.71***
	(24.82)	(33.71)	(22.25)	(30.80)	(5.33)	(7.53)
Size of CU	-10.52	-17.40	-15.44	-20.51	5.12	2.87
	(14.12)	(16.68)	(12.47)	(15.37)	(3.23)	(3.73)
# of children under 18 in CU	15.21	32.16	29.72	42.20	-14.12**	-8.57

Table 2: Effect of Social Security Income on Medical Care Expenses, Full Sample

	Total medical expenses		**Medical service expenses**		**Prescription drug expenses**	
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	IV	OLS	IV	OLS	IV
	(22.75)	(31.07)	(19.82)	(28.26)	(5.94)	(7.75)
Quarterly household after-tax income, $100s	0.43	0.14	0.40	0.18	-0.06	-0.15*
	(0.28)	(0.49)	(0.26)	(0.46)	(0.04)	(0.09)
Home owner	48.43***	43.83**	50.53***	47.14***	-2.63	-4.14
	(15.77)	(18.33)	(13.58)	(15.96)	(4.19)	(4.39)
Region						
Northeast	-3.97	-25.41	50.40***	34.61	-45.52***	-52.53***
	(20.13)	(33.62)	(17.43)	(30.15)	(5.17)	(8.32)
Midwest	-8.29	-29.19	12.54	-2.85	-13.38**	-20.21***
	(16.44)	(34.99)	(13.35)	(31.11)	(6.01)	(7.81)
South	45.59**	36.39**	50.26***	43.49***	-0.64	-3.65
	(19.48)	(18.53)	(18.22)	(16.29)	(4.83)	(5.84)
West	28.04	14.03	74.80***	64.48*	-44.07***	-48.66***
	(28.93)	(39.99)	(24.28)	(35.04)	(5.74)	(7.13)
Constant	5,661.02	11,460.37	2,032.07	6,301.74	5,400.90*	7,297.93**
	(15,474.16)	(12,081.58)	(14,828.08)	(11,637.60)	(3,040.22)	(3,333.94)
Observations	23,197	23,197	23,197	23,197	23,197	23,197

All regressions are weighted. Year dummies are included as control variables. Robust standard errors are listed in parenthesis and are clustered at the birth year of the primary beneficiary. The endogenous variable of interest is Social Security income, and the instrument is an indicator variable for respondents in households in which the primary beneficiary was born in 1911-1917. The elasticity of medical expenses with respect to Social Security income is calculated at the means of dependent variables and Social Security income of the sample. ***, **, * Corresponds to statistical significance at the 1%, 5%, and 10% level, respectively.

Table 3: Effect of Social Security Income on Medical Care Expenses, the Low-educated Sample

	Total medical expenses		**Medical service expenses**		**Prescription drug expenses**	
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	IV	OLS	IV	OLS	IV
Quarterly Social Security benefits, $100s	**0.71**	**31.19****	**-1.12**	**24.13****	**1.53*****	**7.30*****
	(1.48)	(12.40)	(1.46)	(12.11)	(0.28)	(2.68)
Elasticity	**0.05**	**2.40**	**-0.16**	**3.46**	**0.30**	**1.41**
First-stage						
First-stage coefficient on IV		1.94***		1.94***		1.94***
		(0.48)		(0.48)		(0.48)
F-statistic on IV		16.00		16.00		16.00
F-statistic for weak IV test		38.63		38.63		38.63
Age	1,160.49	906.23	1,467.33	1,256.73	-369.58***	-417.73***
	(981.93)	(880.50)	(992.93)	(894.46)	(132.37)	(139.34)
Age squared	-16.27	-13.82	-20.26	-18.23	4.85***	5.32***
	(13.19)	(11.86)	(13.35)	(12.08)	(1.75)	(1.80)
Age cubed	0.08	0.07	0.09	0.09	-0.02**	-0.02***
	(0.06)	(0.05)	(0.06)	(0.05)	(0.01)	(0.01)
White	111.52***	40.31	77.84***	18.85	26.97***	13.48
	(27.92)	(36.06)	(22.54)	(35.35)	(8.28)	(9.02)
Male	-75.96***	-148.97***	-29.32	-89.79**	-39.98***	-53.81***
	(24.85)	(38.25)	(23.15)	(38.86)	(7.11)	(9.67)
Married	213.90***	24.43	138.60***	-18.34	62.32***	26.44
	(36.32)	(72.97)	(34.67)	(68.26)	(8.98)	(18.47)
Size of CU	-29.32	-21.79	-32.99*	-26.76*	5.55	6.98*
	(17.62)	(16.55)	(16.28)	(14.97)	(3.84)	(3.74)
# of children under 18 in CU	37.34	56.38*	48.66*	64.43**	-12.81	-9.21
	(29.24)	(34.03)	(25.77)	(31.03)	(8.28)	(8.03)
Quarterly household after-tax income, $100s	0.54	-2.03**	0.61	-1.52*	-0.17**	-0.65**
	(0.50)	(0.93)	(0.52)	(0.84)	(0.07)	(0.28)
Home owner	45.79**	24.29	45.37**	27.55	2.48	-1.59
	(21.37)	(29.21)	(17.59)	(26.01)	(5.60)	(6.37)
Region						
Northeast	-45.10*	-120.12***	16.15	-45.98	-52.39***	-66.59***

Table 3: Effect of Social Security Income on Medical Care Expenses, the Low-educated Sample

	Total medical expenses		**Medical service expenses**		**Prescription drug expenses**	
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	IV	OLS	IV	OLS	IV
	(23.12)	(35.22)	(19.86)	(31.60)	(6.20)	(10.65)
Midwest	-14.29	-89.36**	12.19	-50.00	-23.34**	-37.55***
	(25.08)	(41.54)	(20.65)	(36.05)	(9.60)	(12.26)
South	78.22**	44.60	80.30**	52.45*	0.84	-5.53
	(36.48)	(33.23)	(35.71)	(30.27)	(8.35)	(9.62)
West	7.95	-28.39	60.15**	30.05	-52.43***	-59.31***
	(35.15)	(43.06)	(28.48)	(37.47)	(8.47)	(10.11)
Constant	-27,511.56	-19,637.45	-35,320.38	-28,798.08	9,325.45***	10,816.73***
	(24,286.21)	(21,739.78)	(24,526.20)	(22,012.22)	(3,318.44)	(3,574.99)
Observations	9,512	9,512	9,512	9,512	9,512	9,512

The Sample includes respondents with less than a high school education. All regressions are weighted. Year dummies are included as control variables. Robust standard errors are listed in parenthesis and are clustered at the birth year of the primary beneficiary. The endogenous variable of interest is Social Security income, and the instrument is an indicator variable for respondents in households in which the primary beneficiary was born in 1911-1917. The elasticity of medical expenses with respect to Social Security income is calculated at the means of dependent variables and Social Security income of the sample. ***, **, * Corresponds to statistical significance at the 1%, 5%, and 10% level, respectively.

Table 4: Robustness Analysis, the Low-educated Sample

	Total medical expenses	**Medical service expenses**	**Prescription drug expenses**
The low-educated sample, N = 9,512	31.19**	24.13**	7.30***
	(12.40)	(12.11)	(2.68)
Elasticity	2.40	3.46	1.41
F-statistics for weak IV test	38.63	38.63	38.63
Stock-Yogo critical value (10% LIML size)	16.38	16.38	16.38
Drop widowed and divorced females	24.47	19.85	5.47
N = 6,698	(15.89)	(15.44)	(3.45)
Elasticity	1.91	2.84	1.11
F-statistic for weak IV test	23.38	23.38	23.38
Drop if the primary beneficiary was born in 1918-1919	24.57***	16.41**	8.61***
N = 8,426	(8.90)	(8.32)	(2.37)
Elasticity	1.83	2.25	1.65
F-statistic for weak IV test	54.16	54.16	54.16
Restricted to HHs with the primary beneficiary born in 1905-1920	34.89**	28.25*	7.43**
N = 6,661	(16.60)	(15.76)	(3.04)
Elasticity	2.81	4.40	1.45
F-statistic for weak IV test	19.10	19.10	19.10
Use the 1915-1917 cohort as the instrument	43.64**	32.62	10.32***
N = 9,512	(19.80)	(20.45)	(3.78)
Elasticity	3.34	4.68	1.99
F-statistic for weak IV test	18.82	18.82	18.82

All regressions are weighted. The set of covariates in all estimations includes year dummies and the control variables listed in Table 1. Robust standard errors are listed in parenthesis and are clustered at the birth year of the primary beneficiary. The endogenous variable of interest is Social Security income, and the instrument is an indicator variable for respondents in households in which the primary beneficiary was born during 1911-1917. ***, **, * Corresponds to statistical significance at the 1%, 5%, and 10% level, respectively.

Figure 1: Social Security Income by Year of Birth