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INCOME AND THE UTILIZATION OF LONG-TERM CARE SERVICES: EVIDENCE FROM THE SOCIAL SECURITY BENEFIT NOTCH

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ABSTRACT

This paper estimates the impact of income on the long-term care utilization of elderly Americans using a natural experiment that led otherwise similar retirees to receive significantly different Social Security payments based on their year of birth. Using data from 1993 and 1995 waves of the AHEAD, we estimate instrumental variables models and find that a positive permanent income shock lowers nursing home use but increases the utilization of paid home care services. We find some suggestive evidence that the effects are due to substitution of home care for nursing home utilization. The magnitude of these estimates suggests that moderate reductions in post-retirement income would significantly alter long-term utilization patterns among elderly individuals.

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I. Introduction

The financing of long-term care is an increasingly important issue for the elderly. Nearly 70% of individuals living to age 65 will require some long-term care assistance, with over one-third requiring some time in a nursing home (Kemper, Komisar, and Alecxih 2005). On average, the present discounted value of lifetime long-term care expenditures is $47,000 (in 2005 dollars), but the distribution is heavily skewed with 16% of elderly individuals incurring over $100,000 in lifetime expenditures and 5% incurring over $250,000. Although many individuals receive some long-term care coverage under Medicaid and a small number of individuals purchase private coverage, long-term care represents, on average, the largest source of out-of-pocket health care spending for elderly individuals.

In this context, future reductions in post-retirement income could dramatically alter elderly individuals' patterns of long-term care service utilization. Moreover, individuals generally prefer long-term care in the least restrictive, most home-like setting possible (Kane and Kane 2001), suggesting important welfare effects as individuals transition across long-term care settings. For example, Mattimore and colleagues (1997) found that 30% of elderly survey respondents would rather die than enter a nursing home and an additional 26% indicated they were very unwilling to move to an institutional setting. Similarly, Grabowski and Gruber (2007) have shown that state Medicaid payment rules have no effect on overall nursing home utilization, suggesting that demand for nursing home care is relatively inelastic with respect to public program generosity.

Surprisingly however, little is known about how income influences long-term care utilization. Using data from the Channeling Demonstration, higher income was found to be associated with a greater probability of formal care use and a lower probability of informal care

(Kemper 1992). Using National Long-Term Care Survey data, income did not have a statistically meaningful effect on nursing home entry, but it had a positive association with paid home care and a negative association with unpaid informal care (Ettner 1994). However, a potential problem with these earlier studies is unobserved characteristics may be correlated with both an individual's income and the propensity to use long-term care services. For example, an individual in poorer health may have both lower income and higher long-term care utilization, or individuals with higher incomes may have unobservable preferences for living independently. In this study, we address this issue of endogeneity by relying on a natural experiment that generated large, plausibly exogenous variation in permanent Social Security income for otherwise similar individuals based on their year of birth. The Social Security benefits "notch", which is described in detail below, has been used by others to examine the effect of income on labor supply (Krueger and Pischke 1992), prescription drug use (Moran and Simon 2006), mortality (Snyder and Evans 2006) and elderly living arrangements (Engelhardt, Gruber, and Perry 2005). The goal in this study is to use the variation based on the notch to examine the effect of permanent income on long-term care utilization across settings.

We develop estimates of the effect of a permanent income shock on long-term care utilization among households headed by beneficiaries with less than a high school education, approximately 45 percent of our sample. Using data from the 1993 and 1995 waves of the Assets and Health Dynamics Among the Oldest Old (AHEAD), our IV estimates suggest that permanent income had a moderate but statistically insignificant effect on overall formal long-term care utilization.

However, we find this overall effect masks the effects of income on different types of long-term care utilization. When we decompose the total effects, we find evidence that positive income shocks had a negative effect on nursing home entry, but a positive effect on the use of paid home care. Specifically, a $1,000 (or 10.2 percent) increase in annual Social Security income for those in this low-education group would decrease the likelihood of any nursing home use by 22%-30% (relative to mean) and increase the likelihood of receiving any paid home care use by 24%-34%. Social Security income was not systematically related to the receipt of any informal (unpaid) care across the different specifications.

Although several pathways may lead to the increased use of home care and lower use of nursing home care, we find some support for the hypothesis that higher permanent income causes individuals to substitute home care for nursing home care rather than inducing new recipients of home care use. The magnitude of the results suggest that a $1,000 increase in annual Social Security income is associated with a 3- to 7-fold increase in the rate of home care use relative to nursing home care use. The substitution hypothesis behind our findings appears more likely than explanations related to income-induced improvements in health or resulting changes in Medicaid eligibility.

This paper is organized as follows. In Section II, we provide a brief description of the Social Security benefits notch. In Section III, we describe our data and empirical strategy. In Section IV, we present our results, and in Section V, we test the hypothesis that higher permanent income leads individuals to substitute different types of care for one another. In Section VI, we discuss the implications of our results for Social Security reform. Finally, Section VI provides a brief conclusion.

II. Social Security Benefits Notch

This section provides a brief overview of the Social Security benefits notch (see papers cited in the previous section for more detailed accounts). Social Security payments are based on lifetime earnings. Prior to 1972, neither lifetime earnings nor post-retirement payments were indexed for inflation, but rather periodically adjusted by the Congress. In 1972, Congress amended the Social Security Act to provide automatic indexation of credited earnings for those workers who had not yet retired, which created an unanticipated windfall for workers from certain birth cohorts because of an error that led the prior earnings of these workers to be doubly indexed for inflation. The high rate of inflation over the following years led to a large increase in benefits for the affected cohorts. In 1977, Congress passed another law to eliminate the double indexation for future cohorts of retirees. This law change created a large reduction in Social Security payments for those cohorts born in 1917 or later relative to the preceding cohorts. Importantly however, cohorts born prior to 1917 (near retirement in 1977) retained doubly indexed benefits under a grandfather provision. Taken together, these law changes and the high rate of inflation over the mid 1970s created a large and permanent difference in Social Security payments across birth cohorts, which came to be called the Social Security Benefits Notch. Because these benefits changes were unanticipated and otherwise outside the control of retirees, they are a valid natural experiment for examining income/wealth effects among elderly individuals.

Figure 1 displays a measure of Social Security benefits that differ across birth cohort only due to legislative changes in benefits rather than differences in observable characteristics by birth cohort. Each birth cohort's benefits were computed with identical real earnings histories and the Social Security Administration's ANYPIA program as detailed in Engelhardt et al. (2005). For both high and low education individuals, the figure clearly shows that beneficiaries who differed only in birth cohort received significantly different levels of Social Security benefits due to these legislative changes to the Social Security Act.

The 1977 law raised the covered earnings maximum such that the fraction of earnings used to calculate Average Indexed Monthly Earnings (AIME) was greater for high-income workers with no change in the AIME for low-income workers. This law introduced earnings-level-by-year-of-birth variation in Social Security benefits. This variation can be observed in Figure 1 with the relatively large increase in average annual Social Security income for high education individuals beginning with cohorts born after 1920. Indeed, individuals born in 1930 have roughly equal Social Security income to the notch cohorts. Given this issue, the notch is much more powerful for low-wage earners when including a broader set of birth cohorts (1900-1930) in the sample. We formally test the predictive power of the notch in Section III.

III. Data and Empirical Strategy

A. Data

The Asset and Health Dynamics among the Oldest Old (AHEAD) is a longitudinal survey of community-based elderly individuals born in 1923 or earlier and their spouses, regardless of age. The baseline data that comprise the 1993 wave of the AHEAD survey were collected between October 1993 and July 1994 on 8,222 individuals from 6,047 households for a response rate of just over 80%. African Americans, Mexican-Hispanics, and residents of the state of Florida were sampled at about 1.8 times the probability of the general population, but sample weights are available to adjust for this and other non-representative aspects of the sample design. A follow-up AHEAD survey was conducted in 1995, and exit interviews were conducted by relatives of AHEAD respondents who died before the 1995 survey.

For our analyses of paid home care and informal care, we use only the initial wave of the survey due to variable concordance issues. That is, the reference period for service use changes after the first wave. However, because the first wave of AHEAD sampled only community-dwelling individuals, our analyses of nursing home use incorporate the second wave to create a measure of any nursing home use over the 1993 through 1995 period.

B. Estimation Sample

Because AHEAD collects information from both respondents and their spouses, we have multiple observations in certain households. The unit of observation in our analyses is the individual, but the key independent variable in our study, Social Security income, is measured at the level of the household based on the primary Social Security beneficiary. In terms of constructing our benefits notch instrument, the key issue is the year of birth for the primary beneficiary. Thus, we employed a series of rules for identifying the primary beneficiary (Moran and Simon 2006; Snyder and Evans 2006). Because the majority of married women in these cohorts qualified for benefits through their husband's earnings history, the male member of two-person households was designated as the primary beneficiary and his birth year was used to assign individuals within those households to our treatment and control groups. In the case of widowed/divorced females, the deceased or former husband was designated as the primary beneficiary. However, because AHEAD does not provide information on the birth year of deceased/former husbands, we subtracted three years from the female's year of birth to generate a birth year for the deceased/former husband.[1] For never-married females, the female is designated as the head of the household and her year of birth is used to establish whether she is in the treatment or control group.

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[1] Based on the 1982 New Beneficiary Survey, three years was found to be the median difference in spousal ages for widowed/divorced elderly as calculated by Engelhardt and colleagues (2005).

Following previous research, we also restricted our sample to individuals in households in which the primary Social Security beneficiary was born between 1901 and 1930 (Krueger and Pischke 1992; Moran and Simon 2006). We also excluded a small number of individuals in households that report Social Security income below $100 per month (in 1993/1994 dollars). Thus, these restrictions, along with other observations lost to missing data, resulted in a sample of 5,592 individuals from 4,146 households.

C. Empirical Specification

In order to examine the effect of permanent income on long-term care utilization, we estimate equations of the following form:

$$U_{hi} = \beta I_h + \delta X_h + \varepsilon \qquad (1)$$

where U refers to the long-term care utilization measure for individual *i* in household *h*, **I** refers to annual household Social Security income, **X** includes an intercept and a set of exogenous controls, and ε is the residual. Following earlier studies examining the notch (Moran and Simon 2006; Snyder and Evans 2006), we use Social Security income rather than total income. As Synder and Evans (2006) argue, the notch may have led to other behavioral changes that affected total income such as post-retirement employment.

In this study, long-term care utilization **U** is represented by several measures. We first examine the use of formal long-term care services (including nursing home use and paid home care use) between the first and second AHEAD waves. This measure combines responses from the core 1995 AHEAD survey about nursing home use and paid home care use since 1993, along with responses from the 1995 exit interview for those who died between 1993 and 1995.[2]

[2] We use these measures instead of variables in the 1993 wave because the 1993 measure may be biased due to the community-dwelling sample in the first AHEAD wave.

We then consider different types of long-term care use separately to investigate the composition of long-term care services and how they changed for those with a positive income shock. First, we created an indicator for whether the individual had any nursing home use over the two-year period between the first and second AHEAD waves. Next, using the first wave of AHEAD, we created two indicators for use of paid home care services. The first measure encompasses any home care service use from a paid helper for care related to ADL/IADL limitations over the four weeks prior to the survey. The second home care measure is based on whether any medically-trained person assisted the respondent at home over the past 12 months. Finally, based on the first wave, we created an indicator for the receipt of any informal (unpaid) care related to ADL/IADL limitations over the four weeks prior to the survey.

A series of exogenous variables **X** at the household level were included as controls in this study. In particular, we included indicators for the type of household (male head—married or cohabitating; male head—single; female head—never-married; female head—widowed; and female head—divorced), age of the head, race of the head (white, African American or other), Hispanic ethnicity of the head, whether the household is located in a metropolitan statistical area, and location (indicators for each of the nine census regions). Similar to our coding of the birth cohort variable, we define education based on the education of the household head. For households of widowed or divorced women, we use survey information on the schooling of their former husbands to assign the household education level. Other potential covariates, such as physical functioning, work status or Medicaid coverage, were excluded because they were thought to be endogenous to Social Security income. As such, our estimates of β can be thought of as the total effect of a positive income shock on long-term care utilization, including all the behavioral changes following a shift in permanent income.

We first estimate equation 1 using a probit model. However, this approach may suffer from bias due to the suspected endogeneity of permanent income and long-term care utilization. As such, we next estimate equation 1 using an instrumental variables probit estimator. Assume that Social Security income **I** has the following reduced form:

$$I_h = \lambda N_h + \gamma X_h + \mu_h \qquad (2)$$

where **X** is the same set of variables that appeared in the utilization equation, **N** is a variable correlated with income but not the error term in the utilization equation, and μ is the residual. Our instrument **N** is an indicator variable that takes on the value of “one” for household with a primary Social Security beneficiary who was born during the notch years of 1915-17, and a “zero” for households in which the primary beneficiary was born in any other year between 1901 and 1930. Following previous researchers (e.g., Moran and Simon 2006), we used the period 1915-1917 because these years represent the peak of the benefits notch (see Figure 1). Thus, the identifying assumption is that the benefits notch N is correlated with I, Social Security income, but is not correlated with ε, the error term in the utilization equation. The quality of our instrument is discussed below.

Given our use of a single cross-section for the majority of our analyses, presence in the Benefits notch (based on birth-year) and age are collinear. Previous research has addressed this issue by employing large datasets with lots of individuals near the notch (Snyder and Evans 2006) or by exploiting variation in age by year of birth (Krueger and Pischke 1992; Engelhardt, Gruber, and Perry 2005). The AHEAD is a relatively small sample and we do not know the exact birth date to exploit variation in age by birth year. As such, we follow the approach of Moran and Simon (2006) by presenting results based on different specifications of the age variable. Specifically, we enter age as a polynomial function with the order ranging from one (linear) to three (cubic). As additional methodological points, all analyses presented in this paper are weighted using the AHEAD person-level weights. We adjust our standard errors for clustering based on year of birth of the household head.

Table 1 summarizes the long-term care utilization and exogenous variables in the AHEAD that we use in our analysis by the completed education of the household head. Approximately 17 percent of the full sample received care in a nursing home between the first and second waves of the AHEAD survey, with approximately 7.5 percent receiving care in a nursing home. Overall, almost 9 percent received paid home care over the 12 months prior to the survey, and 3.5 percent received home care in the previous 4 weeks for an ADL/IADL limitation. The proportion of the sample receiving informal care over the past four weeks before the survey is higher, roughly 23 percent. The average annual Social Security income is $10,940 (in 1993 dollars) but this figure is higher for the high education group than the low education group. Overall, 19 percent of the respondents were born in the notch years of 1915-1917. The average age is 77 years old, and 59 percent of the sample completed high school or more. The majority of our sample consists of two-person households and the remaining are either never-married, widowed, or divorced.

D. Effect of the Notch: Specification Tests

Problems with weak instruments are well-known (Staiger and Stock 1997; Stock and Yogo 2005) and Bound and colleagues (1995) have argued that the use of instruments that jointly explain little of the variation in the endogenous variables can do more harm than good. Previous research using the Social Security benefits notch as exogenous variation in permanent income has shown that the notch is a much more powerful instrument for low-income relative to high-income beneficiaries (Engelhardt, Gruber, and Perry 2005; Moran and Simon 2006).

This point can be illustrated by splitting the sample based on those households whose heads have less than high school education and those heads have at least a high school diploma (see Table 2). For the low education group, the instrument meets the standard of Staiger and Stock, with the F-statistics ranging from 18.32 to 32.26 depending on the specification. These estimates suggest that beneficiaries born during the peak notch years had between $1,121 and $1,436 higher annual Social Security income in 1993/1994 dollars. Relative to a mean annual household Social Security income of $9,960 for this group, this suggests roughly a 11-14 percent increase in permanent Social Security income for the notch cohorts. By comparison, the high education group has a relatively low F-statistic (less than 1), and presence in the notch cohort only increased household Social Security income by between $0 and $341 (2.9 percent). Given these results, we focus our analyses on only those households in which the primary beneficiary has less than a high school education, resulting in 2,429 individuals in our sample.

In addition to the assumption regarding the instruments being strongly associated with the endogenous variable, there is also the requirement that the instrument must not be correlated with the error term in the second stage of IV estimation. If it is still correlated, then the instrumented variable will still be endogenous. Although it is impossible to confirm the null hypothesis that these instruments are uncorrelated with the error term in the utilization equation, a standard practice within the literature is to report whether the instrument is correlated with those observable factors believed to be correlated with the unobservable factors that affect the second-stage error term. Thus, Table 3 divides the variables used within this study by those observations that are in the notch cohort and those that are not. Table 3 presents the means for Social Security income, explanatory and utilization measures across these two groups for the low education subsample. As expected, Social Security income is $1,443 higher for the notch cohort.

The table shows that there are statistically significant differences across the two groups in nursing home use and informal care use. Correcting for the difference in ages across the two groups, we find that the samples are more balanced. We also perform robustness checks using a more extensive set of health controls to account for any health differences among the two groups not captured by age and other control variables (described in section IV.B.).

IV. Results

A. Main Results

The estimates of the effect of permanent income on long-term care utilization are presented in Tables 4-8. In each table, we present both the standard probit models that treat income as exogenous, and the IV probit models that treat income as endogenous. The results are dramatically different across these two sets of models. Across all our outcomes, the probit findings suggest a negative correlation between (endogenous) income and long-term care use, which is consistent with the idea that poorer health is correlated with both lower Social Security income and greater LTC utilization.

We first examine the effect of positive income shocks on any formal long-term care use between Waves 1 and 2 of the AHEAD (Table 4). With this broad outcome variable, we find a statistically significant negative correlation between income and any formal long-term care use. However, once we instrument for income, we obtain a positive point estimate of the effect of income on formal long-term care use on the order of 12 percent of formal long-term care utilization. This effect is marginally significant at the 10 percent level for the linear age specification, but statistically insignificant when age is included as a quadratic or cubic.

The weak results for any long-term care use may mask offsetting effects for the components of formal long-term care services, home care and nursing home care. We therefore investigate the effects of different types of care separately. Treating income as exogenous, we find a statistically significant negative effect of permanent income on paid home care for an ADL/IADL limitation (Table 5) and on paid home care by a medically-trained caregiver (Table 6). However, once we instrument for income, we obtain a statistically significant positive effect of income on paid home care (Table 6, all paid home care). Specifically, the quadratic age specification shows that a $1,000 permanent income shock raises the likelihood of home care by 3.4 percentage points (or 30.3% relative to the mean). Importantly, although we get a positive effect of instrumented income on both of our paid home care outcomes in Tables 5 and 6, we only get a statistically meaningful estimate in Table 6. The difference in precision across the two paid home care outcomes may relate to the construction of the dependent variables. The outcome in Table 5 measures any paid assistance for an ADL or IADL over the previous four weeks, while the outcome in Table 6 measures any paid assistance by a medically-trained caregiver over the past 12 months. The IADLs—assistance with such tasks as driving, preparing meals, shopping and managing finances—may be less sensitive to changes in permanent income. Moreover, a four-week look back period is noisier than a 12-month look back period.

Table 7 presents results based on nursing home utilization between the first two AHEAD waves. In this specification, we obtain a statistically significant effect of permanent income on nursing home utilization. Specifically, a $1,000 increase in annual Social Security income decreases the likelihood of nursing home use by three percentage points (or 33.6% of the mean).[3]

[3] We also perform the estimation using a measure of nursing home utilization from the first wave of the AHEAD survey that asks about use of care over the previous 12 months. The probit results suggest a statistically significant negative effect of permanent income on nursing home use, but no statistically meaningful results when we

These results, combined with those in Tables 5 and 6, indicate that while positive income shocks appear to have a weak positive effect on overall formal long-term care utilization, they have opposite effects on nursing home and home care use.

Turning to unpaid home care, the probit model indicates a negative and statistically significant effect of permanent income on the likelihood of informal care use (see Table 8). However, once we instrument for income, this result falls away in the quadratic age specification, and we obtain a positive effect of permanent income on informal care utilization, although this result is not statistically meaningful. Taken with the linear and cubic age specification results, we cannot conclude that there is a causal effect of permanent income shocks on the likelihood of informal care use. Once again however, a limitation is that we can only measure informal care by any unpaid assistance for an ADL or IADL over the previous four weeks.

All of the above results evaluate long-term utilization along the extensive margin (whether the individual used any long-term care), but utilization along the intensive margin (how much care the individual used) may also be important. In order to assess this issue, we ran two-stage residual inclusion (2SRI) generalized linear models examining the effect of permanent income on nursing home days, and formal and informal care hour measures. The results for all three sets of long term care use measures were generally consistent with the results reported above in sign and magnitude but they lacked statistical precision. These results are available upon request from the authors.

B. Robustness checks

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instrument for income. Due to the community-dwelling nature of this sample, we suspect these results suffer from sample selection bias so we report only the estimates from the alternative measure of nursing home utilization.

Though we exclude covariates that are potentially endogenous to permanent income such as Medicaid eligibility and health status variables (i.e., number of ADLs; number of IADLs; self-rated health; hypertension; diabetes; cancer; lung disease; heart disease; stroke; psychiatric problems), we perform robustness checks including these covariates and find that the signs and magnitudes of the coefficients and marginal effects are very similar. The results are also robust to eliminating spouses from the analysis and performing the analysis without the weights from the HRS. We also examine robustness to an alternate method of accounting for endogeneity of Social Security income using the two-stage residual inclusion (2SRI) method for nonlinear models as outlined in Terza, Basu and Rathouz (2008). This method is implemented by including the residuals from the first stage income equation into the second stage utilization equation to control for endogeneity of income rather than the first stage predicted values. The results from these regressions are qualitatively and quantitatively consistent with the results from the IV probit estimation.

In addition, we perform robustness checks to various sample restrictions, following Moran and Simon (2006). For instance, our method of imputing birth year for the household head of widowed and divorced women may introduce measurement error into our analysis. Excluding these two groups provides results that are similar to those reported here, though the magnitude of the home care utilization effects are smaller and no longer statistically significant. We also examine the sensitivity of our results to the specific birth cohorts included in our study. First, we exclude cohorts born during the flu pandemic in 1918 and 1919. Next, we limit the range of the cohorts included in the study to those born between 1910 and 1920 due to possible cohort effects in long-term care utilization for reasons unrelated to differences in permanent income stemming from changes in Social Security legislation. In both of these cases, we find results (available upon request) that are qualitatively and quantitatively similar to our base results.

V. Mechanisms behind Reported Effects

Our results indicate that a positive income shock would lead seniors to increase their utilization of home care services, and reduce nursing home stays. In this section, we briefly explore several mechanisms which may underlie these findings. One hypothesis is that increased income leads to substitution away from nursing home care and towards home care use. Another pathway that may lead to the results we observe is improved health. That is, an increase in income will lead to better health which ultimately decreases the need for nursing home care. A third explanation relates to Medicaid: more income could lead to less reliance on Medicaid and therefore more home care. We visit each of these hypotheses in turn.

A. Substitution between Types of Care

The results in the previous section suggest that a positive permanent income shock decreases nursing home use but increases home care use. However, the estimates do not clearly indicate whether individuals substitute home care for nursing home care or those who would not have received care increase home care use. To address this question, we explore long-term care utilization within a consistent time period (between the first and second waves of the AHEAD survey) and categorize individuals into one of four categories: no long-term care use, only home care use, only nursing home use, and both home care and nursing home care use. We then perform a multinomial logit regression while accounting for the endogeneity of income using the 2SRI method by including the residuals from the first-stage income equation in the multinomial logit as an additional regressor.

Table 9 summarizes our results. We report both the estimated coefficients as well as the relative risk ratios, where no long-term care use is the base category. The results provide some support for the hypothesis that the increase in the use of home care due to higher permanent income was largely a result of individuals substituting away from nursing home care. The estimated odds ratio for choosing home care use over nursing home care use from an increase in $1,000 in annual household Social Security income varies from 3.655 = 1.228/0.336 in the linear age specification to 7.096 = 1.256/0.177 in the cubic age specification and is statistically significant with p-values ranging from 0.032 to 0.093. By contrast, the estimated odds ratio for choosing home care relative to no long-term care for the same increase in permanent income varies from 1.228 to 1.265, and is only statistically significant at the 10% level in the linear age specification. The results also suggest that a positive permanent income shock significantly reduces the odds that an individual chooses nursing home care use relative to no long-term care use, with the odds ratio ranging from 0.177 to 0.336. Overall, it seems less likely that higher income causes home care to increase among individuals who otherwise would not have received care, or those who opted for home care in addition to nursing home care.

These results provide suggestive evidence that higher income reduces demand for nursing home care when home care is an available substitute. These results, together with the finding from Engelhardt and colleagues (2005) that greater income increased the likelihood of elderly individuals living alone, are consistent with the idea that privacy is a valued good. Given the preference for care in the least restrictive setting possible, we find this hypothesis quite plausible.

B. Effects through Improved Health

An alternate pathway of income leading to increased home care use and reduced nursing home use might be through improved health. That is, an increase in income could lead to better health and a less severe need for long-term care which may be more easily provided through home care services rather than in a nursing home. This explanation is less plausible due to the evidence of the causal link between income or wealth and health which suggests modest effects (e.g., Meer, Miller, and Rosen 2003; Lindahl 2005; Adda, Banks, and von Gaudecker 2009), or even negative effects (Snyder and Evans 2006). However, we investigate this hypothesis by examining whether positive income shocks from the Social Security notch led to improvements in self-reported health status or declines in the presence of ADL/IADL limitations.

Table 10 reports our results. Although higher income is correlated with a lower probability of disability in the probit results, positive income shocks have no clear statistically powerful effects on either ADL or IADL limitations. The same pattern is visible in self-reported health status. Moreover, the direction of the results is generally opposite the intuition that higher income would improve health outcomes. These results, combined with our earlier finding that our estimates were insensitive to including extensive health status covariates, make it unlikely that the results we see in the Section IV were due to improved health or reduced disability.

C. Effects through Changes in Medicaid Eligibility

Finally, we acknowledge the possibility that our results may work through Medicaid in that more income will lead to less reliance on Medicaid and therefore result in more home care. Although state Medicaid programs have increased their coverage of home- and community-based services in recent years, the coverage of these services was relatively minimal during our study period. Thus, the strong institutional bias in the Medicaid benefit during the early 1990s may be part of the explanation for how greater income led to less nursing home care. However, given that the majority of states have a "medically needy" program with no restrictions on income for eligibility, we believe this explanation is less likely because assets, rather than income, generally present the biggest barrier to Medicaid eligibility (Norton 1995). In models where Medicaid enrollment was the dependent variable, we found no statistically significant effect of the notch.[4] Combined with our robustness checks that included Medicaid enrollment in our models which did not alter our main results on long-term care utilization, we conclude that Medicaid eligibility is unlikely to be an important mechanism for explaining our findings.

VI. Implications for Decrease in Post-Retirement Income

In order to examine the effects of a change in Social Security benefits on long-term care utilization, we first convert our preferred coefficient estimates from Table 6 and Table 7 of the effect of an increase in income on home and nursing home care (IV Probit estimates from the quadratic age specification) to 2009 dollars. This involves dividing our estimates by 1.485, the cumulative change in the CPI between 1993 and 2009.[5] After doing so, our estimates suggest that a $1,000 increase in annual household Social Security benefits (in 2009 dollars) leads to a 2.3 percentage point increase in the use of home care, and a 2.9 percentage point decrease in the use of nursing home care. Although many aspects of our long-term care system have changed since the early waves of the AHEAD survey, our results suggest that a moderate change in annual retirement income would still have important effects on long-term care utilization.

A key issue is the plausibility of the magnitude of these estimates. For comparison, Van Houtven and Norton (2004) find that a 10 percent increase in hours of informal care lead to a 0.77 percentage point reduction in the probability of home care use and a 0.83 percentage point

[4] These tables are available upon request.
[5] See http://www.bls.gov/cpi/home.htm.

reduction in the probability of nursing home use after taking into account the endogeneity of informal caregiving. However, a key point in interpreting our estimates is that the $1,000 in additional income is an annual amount. Using our first stage estimates from Table 2 coupled with Social Security data, we can calculate the present discounted value of being in the notch cohort for an individual at age 65. The annuity value for a 65 year old born in 1916 is 10.91 for males and 13.33 for females.[6] Thus, a $1,200 annual increase (from Table 2) in Social Security income amounts to a $13,092 lump sum for men and a $15,996 lump sum for women. Because Social Security pays 100% of the primary earner's benefit to the surviving spouse, the correct annuity value is a joint, second-to-die annuity that pays until the second death. Thus, $16,000 is a good estimate of the present discounted value for a 65-year old of being in the notch cohort. As a benchmark, the average present discounted value of projected lifetime *out-of-pocket* long-term care expenditures for individuals turning 65 in 2005 was $21,100 out of the total expenditures of $47,000 (Kemper et al., 2005). When evaluated in this context, the magnitude of our estimates of the effect of income on long-term care utilization is quite plausible.

VI. Conclusion

This study exploits an arguably exogenous change in income that led retirees born in different years to receive significantly different amounts of income to determine the effect of income on the amount and composition of long-term care utilization. Our results indicate that while overall formal long-term care use is only weakly higher, a positive income shock would lead seniors to significantly increase their utilization of home care services and reduce nursing home stays. We explore several mechanisms which may underlie these findings, including

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[6] This value assumes a 2.9% interest rate and "Alternative 2" mortality probabilities (the middle scenario) that Social Security used in their 2007 Trustees Report.

substitution from nursing home care to home care, changes in health, and changes in Medicaid eligibility. Our findings suggest that the most likely explanation for these effects is that privacy is a valued good which leads elderly individuals to choose less restrictive settings for long-term care services when afforded by higher income.

An important caveat is that our results pertain only to low-wage workers. Due to the 1977 law raising the covered earnings maximum, the notch is relatively weak for high wage workers when using a wider set of birth cohorts (1900-1930). Unfortunately, the AHEAD survey does not have large enough sample directly around the notch to isolate the effect of the notch for high-wage workers. Presumably, a different set of mechanisms may be important for high-wage earners such as the role of private long-term care insurance.

Nevertheless, we have found an important effect of income on long-term care utilization for low wage workers. These findings suggest that Social Security benefit cuts could have a large impact of the utilization of long-term care services, leading more individuals to stay in nursing homes over receiving care in their homes. Moreover, these results may also have indirect implications for changes in other sources of retirement income such as pensions and asset income.

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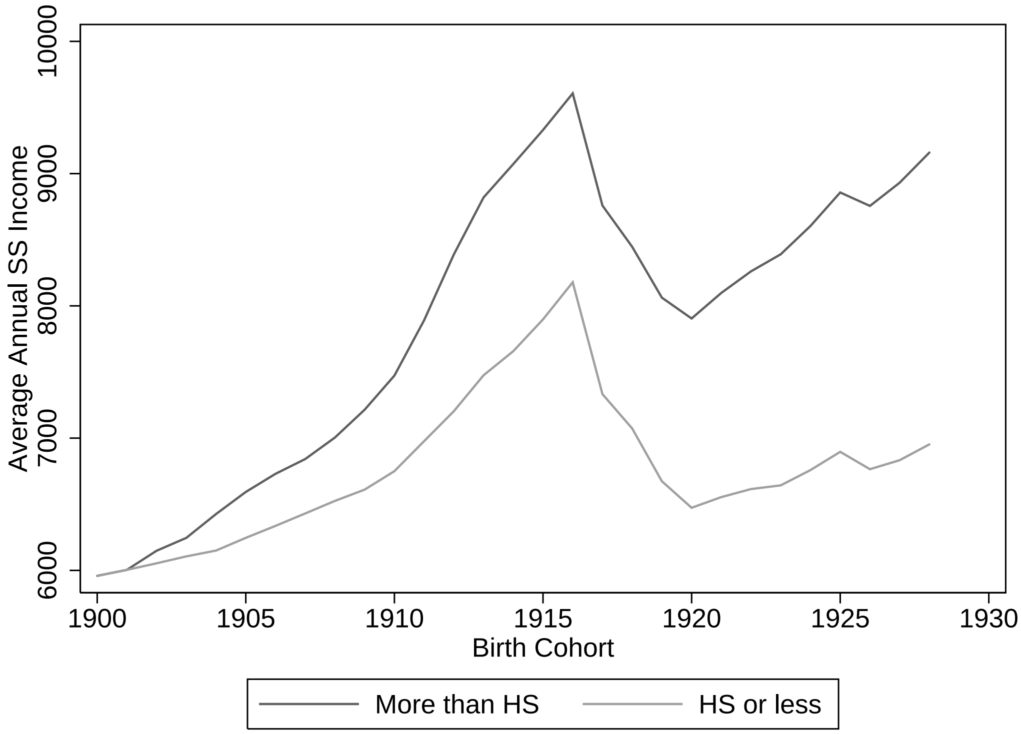
Figure 1



Note: Each birth cohort's benefits were computed with identical real earnings histories and the Social Security Administration's ANYPIA program as detailed in Engelhardt, Gruber, and Perry (2005). Benefits differ across birth cohort only due to legislative changes in benefits.

Table 1: Summary Statistics by Education of Household Head

Variable	Low Education Group: Less than High School (N=2,429)				High Education Group: High School or More (N=3,163)			
	Mean	Standard Deviation	Min	Max	Mean	Standard Deviation	Min	Max
Any Formal Long-Term Care Use (between Waves 1 and 2)[a]	0.205	0.403	0	1	0.144	0.351	0	1
Nursing Home Use (between Waves 1 and 2)[b]	0.089	0.285	0	1	0.066	0.248	0	1
Home Care Use (prior 12 mos.)[c]	0.111	0.314	0	1	0.073	0.260	0	1
Home Care Use for ADL/IADL (prior 4 weeks)	0.040	0.197	0	1	0.031	0.174	0	1
Informal Care Use (prior 12 months)	0.295	0.456	0	1	0.184	0.388	0	1
Household Social Security Income (1993 $)	9,962	4,430	1,308	30,000	11,629	5,427	1,392	48,000
Head born between 1915-1917	0.181	0.385	0	1	0.196	0.397	0	1
Age of Head	77.7	5.4	63	93	76.7	5.1	64	92
Head is married male	0.558	0.497	0	1	0.578	0.494	0	1
Head is single male	0.111	0.314	0	1	0.088	0.284	0	1
Head is never-married female	0.014	0.119	0	1	0.022	0.145	0	1
Head is female widow	0.293	0.455	0	1	0.287	0.452	0	1
Head is divorced female	0.024	0.154	0	1	0.025	0.155	0	1
Head's race is white	0.870	0.337	0	1	0.961	0.194	0	1
Head's race is African American	0.108	0.310	0	1	0.030	0.170	0	1
Head's race is other	0.022	0.148	0	1	0.009	0.095	0	1
Head's ethnicity is Hispanic	0.061	0.239	0	1	0.014	0.119	0	1
Household is located in a MSA	0.626	0.484	0	1	0.769	0.421	0	1

Note: All variables are weighted using the AHEAD household weights. Indicators for nine Census regions are not shown but are included in the regressions. [a] N=2,142 (low education) and 2,898 (high education). [b] N=2,283 (low education) and 3,022 (high education). [c] N=2,426 (low education).

Table 2: Effect of the Benefits Notch on Social Security Income by Educational Attainment

	Low Education Group: Less than High School			High Education Group: High School or More		
	Linear Age Specification	Quadratic Age Specification	Cubic Age Specification	Linear Age Specification	Quadratic Age Specification	Cubic Age Specification
Notch Cohort: Head born between 1915-1917	1.436***	1.121***	1.192***	0.341	-0.012	0.030
	(0.253)	(0.250)	(0.279)	(0.454)	(0.461)	(0.477)
F-statistic on notch indicator	32.26	20.16	18.32	0.563	0.001	0.004
Observations	2,429	2,429	2,429	3,163	3,163	3,163

Note: The dependent variable is annual household Social Security income measured in thousands of 1993 dollars. The notch cohort indicator equals one if the household head was born in 1915, 1916, or 1917. The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 3: Summary Statistics by Notch Cohort

	Outside of Notch Cohort (N=2,008)		Notch Cohort (N=421)		Test for Difference in Means (p-value)	
Variable	Mean	Standard Deviation	Mean	Standard Deviation	No Age Adjustment	Quadratic Age Adjustment
Any Formal Long-Term Care Use (between Waves 1 and 2)[a]	0.2033	0.402	0.210	0.407	0.780	0.365
Nursing Home Use (between Waves 1 and 2)[b]	0.099	0.298	0.046	0.210	0.000	0.092
Home Care Use (prior 12 mos.)[c]	0.109	0.311	0.122	0.327	0.500	0.125
Home Care Use for ADL/IADL (prior 4 weeks)	0.042	0.201	0.031	0.175	0.268	0.724
Informal Care Use (prior 12 months)	0.307	0.461	0.243	0.429	0.010	0.837
Household Social Security Income (1993 $)	9,700	4,196	11,143	5,198	0.000	0.000
Age of Head	78.1	5.9	76.1	1.6	0.000	---
Head is married male	0.561	0.496	0.543	0.498	0.546	0.637
Head is single male	0.111	0.314	0.110	0.313	0.948	0.253
Head is never-married female	0.014	0.119	0.015	0.121	0.926	0.687
Head is female widow	0.293	0.455	0.293	0.455	0.985	0.419
Head is divorced female	0.021	0.143	0.038	0.192	0.103	0.245
Head's race is white	0.862	0.345	0.907	0.290	0.001	0.003
Head's race is African American	0.113	0.317	0.083	0.276	0.019	0.013
Head's race is other	0.025	0.157	0.010	0.100	0.005	0.094
Head's ethnicity is Hispanic	0.065	0.246	0.042	0.200	0.009	0.015
Household is located in a MSA	0.634	0.482	0.586	0.493	0.096	0.128

Note: All variables are weighted using the AHEAD household weights. Indicators for nine Census regions are not shown but are included in the regressions. [a] N=1,757 (non-notch cohort) and 385 (notch cohort). [b] N=1,888 (non-notch cohort) and 395 (notch cohort). [c] N=2,005 (non-notch cohort).

Table 4: Effect of Social Security Income on Any Formal Long-Term Care Use between AHEAD Waves 1 and 2

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
Household Social Security income (1,000s of 1993$)	-0.0259**	0.0862*	-0.0284**	0.0879	-0.0286**	0.0830
	(0.0116)	(0.0482)	(0.0115)	(0.0599)	(0.0116)	(0.0614)
Marginal Effects (1,000s of 1993$)	-0.00697	0.02506	-0.00762	0.02554	-0.07667	0.02403
Dependent Variable Mean	0.2046	0.2046	0.2046	0.2046	0.2046	0.2046
Observations	2,142	2,142	2,142	2,142	2,142	2,142

Note: The dependent variable is any nursing home or formal home care use in the two years between waves 1 and 2 of the AHEAD survey (1993 through 1995). The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Effect of Social Security Income on Paid Home Care Use for ADL/IADL Limitation

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
Household Social Security income (1,000s of 1993$)	-0.0568***	0.0468	-0.0583***	0.0632	-0.0584***	0.0834
	(0.0157)	(0.0538)	(0.0164)	(0.0627)	(0.0164)	(0.0626)
Marginal Effects (1,000s of 1993$)	-0.00426	0.00447	-0.00437	0.00656	-0.00438	0.00968
Dependent Variable Mean	0.0404	0.0404	0.0404	0.0404	0.0404	0.0404
Observations	2,429	2,429	2,429	2,429	2,429	2,429

Note: The dependent variable is any paid home care for an ADL/IADL limitation use over the 4 weeks prior to the survey. The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Effect of Social Security Income on Paid Home Care Use

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
Household Social Security income (1,000s of 1993$)	-0.0251*	0.109***	-0.0258*	0.139***	-0.0259*	0.135***
	(0.0137)	(0.0413)	(0.0139)	(0.0441)	(0.0138)	(0.0506)
Marginal Effects (1,000s of 1993$)	-0.00452	0.0247	-0.00464	0.0336	-0.00466	0.0324
Dependent Variable Mean	0.111	0.111	0.111	0.111	0.111	0.111
Observations	2,426	2,426	2,426	2,426	2,426	2,426

Note: The dependent variable is any paid home care from a medically-trained caregiver over the previous 12 months prior to the survey. The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 7: Effect of Social Security Income on Nursing Home Use between AHEAD Waves 1 and 2

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
Household Social Security income (1,000s of 1993$)	-0.0168	-0.131**	-0.0180	-0.166***	-0.0177	-0.157***
	(0.0115)	(0.0509)	(0.0113)	(0.0575)	(0.0114)	(0.0604)
Marginal Effects (1,000s of 1993$)	-0.00244	-0.0216	-0.00261	-0.0300	-0.00257	-0.0278
Dependent Variable Mean	0.0892	0.0892	0.0892	0.0892	0.0892	0.0892
Observations	2,283	2,283	2,283	2,283	2,283	2,283

Note: The dependent variable is any nursing home use in the two years between waves 1 and 2 of the AHEAD survey (1993 through 1995). The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 8: Effect of Social Security Income on Informal Care Use

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
Household Social Security income (1,000s of 1993$)	-0.0369***	-0.0363*	-0.0347***	0.000312	-0.0344***	0.0301
	(0.00750)	(0.0207)	(0.00770)	(0.0268)	(0.00762)	(0.0273)
Marginal Effects (1,000s of 1993$)	-0.0117	-0.0116	-0.0110	0.000101	-0.0109	0.00980
Dependent Variable Mean	0.295	0.295	0.295	0.295	0.295	0.295
Observations	2,429	2,429	2,429	2,429	2,429	2,429

Note: The dependent variable is any informal (unpaid) care use for an ADL/IADL limitation use over the 4 weeks prior to the survey. The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 9: Effect of Social Security Income on Type of Long-Term Care Use between AHEAD Waves 1 and 2
2SRI Multinomial Logit Model

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	Coefficient	Risk Ratio	Coefficient	Risk Ratio	Coefficient	Risk Ratio
Household Social Security income (1,000s of 1993$)						
Home Care Use Only	0.205*	1.228*	0.235	1.265	0.228	1.256
	(0.115)	(0.141)	(0.149)	(0.189)	(0.147)	(0.185)
Nursing Home Care Use Only	-1.089*	0.336*	-1.389*	0.249*	-1.731**	0.177**
	(0.087)	(0.216)	(0.845)	(0.211)	(0.795)	(0.141)
Both Home Care and Nursing Home Care	0.087	1.091	0.005	1.005	0.112	1.118
	(0.206)	(0.224)	(0.319)	(0.320)	(0.356)	(0.398)
Observations	2,142		2,142		2,142	

Note: Results shown are coefficients and risk ratios for annual household Social Security income (in 1,000s of 1993$) from multinomial logit regressions. Omitted category is "No Long-Term Care Use." The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 10: Effect of Social Security Income on ADL/IADL Limitations and Self-Reported Health Status

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
			Panel A: Any ADL Limitations			
Household Social Security income (1,000s of 1993$)	-0.0251***	0.0217	-0.0251***	0.0400	-0.0252***	0.0349
	(0.0092)	(0.0468)	(0.0094)	(0.0610)	(0.0094)	(0.0574)
Marginal Effects (1,000s of 1993$)	-0.00715	0.00634	-0.00714	0.01180	-0.00716	0.01027
Dependent Variable Mean	0.227	0.227	0.227	0.227	0.227	0.227
Observations	2,429	2,429	2,429	2,429	2,429	2,429
			Panel B: Any IADL Limitations			
Household Social Security income (1,000s of 1993$)	-0.0506***	-0.0497*	-0.0485***	-0.0147	-0.0481***	0.0301
	(0.0079)	(0.0296)	(0.0083)	(0.0314)	(0.0082)	(0.0302)
Marginal Effects (1,000s of 1993$)	-0.01434	-0.01409	-0.01371	-0.00423	-0.01358	0.00891
Dependent Variable Mean	0.244	0.244	0.244	0.244	0.244	0.244
Observations	2,429	2,429	2,429	2,429	2,429	2,429
			Panel C: Self-Reported Health Status Fair or Poor			
Household Social Security income (1,000s of 1993$)	-0.0397***	0.0362	-0.0414***	0.0385	-0.0413***	0.0473
	(0.0082)	(0.0448)	(0.0086)	(0.0618)	(0.0085)	(0.0584)
Marginal Effects (1,000s of 1993$)	-0.01498	0.01382	-0.01561	0.01469	-0.01558	0.01800
Dependent Variable Mean	0.430	0.430	0.430	0.430	0.430	0.430
Observations	2,429	2,429	2,429	2,429	2,429	2,429

Note: The dependent variable is as indicated in the panel. The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses. *** p<0.01, ** p<0.05, * p<0.1