The Role of Informal Care in Modeling Ownership of Long-term Care Insurance

Abstract

We explore whether a person is less likely to own long-term care (LTC) insurance when she expects children to supply informal care in the future. Using a two-stage approach, we find that a parent's expected supply of informal care increases when there is greater reciprocity in her relationship with her child, her child has a lower opportunity cost of time, and, as Becker's Rotten Kid Theorem predicts, when financial market shocks increase the value of her assets. Second-stage results confirm that ownership of LTC insurance falls as the expected supply of informal care increases.

JEL codes: D12, D13

I. Introduction

As people age, their physical and cognitive abilities decline. Researchers characterize the decline in terms of whether a person reports that it is difficult or not difficult to perform activities of daily living (ADL). Researchers differentiate between "normal" ADL and "instrumental" activities of daily living (IADL). When people find it difficult to perform ADL/IADLs, they can either endure a lower quality of life or mitigate the burden by paying others to care for them. People can hire individuals formally trained to provide care (hereafter formal long-term care) or they can rely on getting extra care from family members or friends (informal care). Here we study the factors that determine whether people choose formal or informal care. In particular we investigate whether a supply of informal care "crowds out" demand for formal care.

Researchers suggest that people opt for informal care as a way to explain why more people suffer ADLs than own insurance policies that cover the costs of providing long-term care (LTC) through formal labor markets. Approximately 22 percent of the US elderly aged 65 or older report difficulties in performing at least one ADL but only 12.7 percent report that they own a LTC policy.[1] A straightforward hypothesis is that people with ADLs will not buy LTC insurance policies when they count on being able to get informal care from relatives and family members. Our results highlight the conditions under which people expect to get informal care from relatives.

People may also opt for informal care because LTC is expensive and many people have not saved enough to pay formal LTC providers. In 2014, the median rate for a semi-private room in a nursing home was $212 per day (Genworth 2014). Unless people are economically destitute

[1] Estimates based on samples from the 1994-2014 Health and Retirement Study (HRS).

and qualify for Medicaid, they must pay these costs (with insurance or out-of-pocket). The study of the determinants of the choice of informal care is also interesting because people with lower income have an extra way to afford LTC by spending or giving away assets to qualify for Medicaid nursing home benefits (Brown, Coe, and Finkelstein 2007).[2]

Society spends substantial public funds to pay for formal LTC. Researchers at the Congressional Budget Office estimate that, in 2011, Medicare and Medicaid spent $128 billion to pay for formal LTC (CBO (Congressional Budget Office) 2013). Further, CBO economists forecast that, by 2023, aggregate Medicare and Medicaid expenditures for formal LTC will increase by 80 percent to $230 billion. Projected expenditures will increase not only because of price inflation but also because the size of the elderly US population will increase in absolute and relative terms as the so-called "baby boom" generation ages.

Although it is tempting to think that informal care costs less than formal care, informal caregivers pay substantial direct and indirect costs. Informal caregivers give up time, experience high levels of stress, are more likely to disrupt their normal work schedules, and are more likely to spend substantial sums of money – often depleting savings or putting family finances in jeopardy (MetLife Mature Market Institute, & LifePlans, Inc. 2006). Even ignoring the costs associated with higher stress and the associated degradation of health, CBO researchers estimate that, in 2011, informal caregivers devoted time and effort worth $234 billion (CBO 2013). Thus informal care providers spent an amount that was 82.8 percent bigger than the amount Medicaid and Medicare spent in 2011 to provide formal care. Researchers have not established whether informal care providers (or the recipients) accurately forecast those costs. Our results show that

[2] Medicare does not pay for long-term care. But it pays for up to 100 days of "skilled nursing care" when people get sick.

individuals with closer relationships to children forecast a higher chance that those children will provide informal care in the future.

We follow a well-defined theoretical literature that models whether or not a person's demand for LTC insurance varies systematically with the supply of informal care a person expects her children to provide (Pauly 1990). We follow the literature that frames choices using the basic framework described in Becker's Rotten Kid's Theorem (1974, 1981) and Bernheim, Shleifer, and Summers (1985). Under that approach, a parent strategically withholds bequests to affect whether or not her child cares for her in old age. Although Pauly (1990) predicts that informal care crowds out demand for LTC insurance, the prediction finds ambiguous support in the existing empirical evidence – perhaps because of limitations in how researchers characterize the supply of informal care.

Our main contribution is to use a rich set of factors associated with each child's opportunity cost of time to predict the supply of informal care a parent expects from all of her children. We also include factors associated with "reciprocity" between parent and child because others have shown that it increases the amount of informal care children provide aging parents. Although sociologists and demographers use the term, economists might consider reciprocity as a type of non-tradeable capital that people may save. Essentially a person may "bank" goodwill with children when there exists a social norm to "repay" a parent for care they provided early in a child's life (Silverstein et al. 2002). We include in our model factors that are plausibly correlated with reciprocity. We also retain Becker's idea that parents may withhold bequests to induce children to later care for their aging parent. Our evidence on factors that increase the probability

that people get (or expect to get) care from family members is relevant to studies of how much individuals and society need to save to pay for LTC.

To implement the model, we use data from the 1998-2010 surveys of the Health and Retirement Study (HRS). The HRS data are ideal for studying the type of LTC older people choose. The longitudinal HRS follows multiple cohorts of nationally representative samples of the population age 50 and older. The long panel on multiple cohorts allows us to exploit time-series data on exogenous shocks to financial and housing markets that occur at different life-cycle points as a way to test one of the main predictions of the Rotten Kid Theorem. The richness of the HRS data also allows us to control in multiple ways for factors related to the provision of informal care. For example, we exploit multiple measures of the opportunity cost a child pays when she provides informal care and for factors that proxy for the degree of reciprocity that operates in the relationship between a parent and her child.

To improve on previous literature, we control for a richer combination of the demographic characteristics and behavior of respondents' children and we do so for each living child. Previous research uses child characteristics in a limited way to characterize the potential supply of informal care. Most studies include one variable that counts the number of children alive on the survey date and another to count the number of children who live within 10 miles of the respondent. Van Houtven et al. (2015) use slightly more information by including indicators that separately flag aspects of the relationship between the respondent and living children. For example, they include indicators that equal one if at least one of the living children is a biological child, stepchild, and/or a coresident child. We follow a two-stage approach. In the first stage, we use demographic characteristics of each child to estimate, for each child, a respondent's

subjective probability that the child will provide care for her in the future. We include the predicted probabilities in the second-stage model of whether or not a person owns LTC insurance.

Our results broadly support the predictions of Becker's Rotten Kid Theorem. Financial market shocks that increase asset values cause parents to assign a higher probability to the provision of future informal care from a given child. Factors associated with the opportunity cost of time affect the parent's assessed probability of getting future care. Parents are less likely to own a LTC insurance policy when they assign a higher probability to any child and to multiple children providing them future informal care. Overall, parents who have a higher the expected probability of getting future informal care are less likely to own a LTC insurance policy. Informal care crowds out formal care.

Below we review relevant previous literature in section II. In section III we specify and describe our empirical model. Section IV describes our data. In section V we present results from our main analyses and from robustness checks. In section VI we conclude, discuss the limitations of our study, and indicate directions we think future research might profitably develop.

II. Literature Review

Researchers suggest that people demand less private LTC insurance because they have a supply of informal care that researchers do not observe or fully measure (Pauly 1990). Becker's Rotten Kid Theorem observes that informal care is endogenously determined and that parents can elicit long-term care even when their children are completely selfish by strategically withholding bequests (Becker 1974, 1981; Bernheim et al. 1985). As constructed, the model

assumes that parents derive utility from time spent with children and thus predicts that parents will opt to have their child care for them rather than an unrelated worker from the formal market. This model points to asset ownership as the feature that distinguishes the group that will be more likely to be able to afford informal care. In a related line of reasoning, Pauly (1990) suggests that informal care crowds-out demand for LTC insurance because parents recognize that, if they purchase private insurance coverage, their children may be more susceptible to intra-family moral hazard. That is, LTC insurance releases children from responsibility of caring for their parents in old age. Essentially this line of reasoning recognizes that the "rotten kid" strategy has less force when parents own a LTC insurance policy.

To gain insights about the source of heterogeneous demand for LTC insurance, Zweifel and Strüwe (1996; 1998) relax Becker's assumption that parents are altruistic and children are selfish. They develop an overlapping generations model in a principal-agent framework to model how parental demand for LTC insurance varies with specific characteristics of children. A parent maximizes her expected utility conditional on the utility-maximizing consumption bundle her child chooses. A child also chooses consumption strategically. The model predicts that if parents hold bequests strategically to induce their children to provide informal care, parents will optimally purchase little LTC insurance (Zweifel and Strüwe 1996). The model also predicts that a parent's demand for private insurance varies systematically with the child's relative wages (Zweifel and Strüwe 1998). If a child has a low opportunity cost of time (i.e., low market wages, not employed), the parent will be less likely to buy LTC insurance. This model points to earnings of children (and implicitly to their physical distance from parents) as a key feature that distinguishes heterogeneity of demand for LTC insurance among parents.

Existing literature provides contradictory empirical evidence on the role that informal care plays in determining demand for LTC. The findings vary with how researchers characterize the potential supply of informal care. For example, Kumar, Cohen, Bishop, and Wallack (1997) find that parents are less likely to buy private LTC insurance if at least one child lives within 25 miles. Sloan and Norton (1997) characterize the supply of informal care by the number of surviving children. Using Study of Asset and Health Dynamics (AHEAD) and Health and Retirement Study (HRS) data, they find that parents' demand for private LTC insurance is uncorrelated with the number of children. Mellor (2001) finds no evidence that parents are less likely to own or intend to buy LTC insurance when they count, as potential suppliers of informal care, not only respondents' children but also other family members and friends. This mixed evidence might arise because samples are unrepresentative (Kumar et al. 1997). For example, Kumar et al. used data generated by a mail survey an insurance company administered to potential customers. Their sample was in better health and was wealthier than the general population. These studies also fail to account for the possibility that residential location decisions are endogenous. Children who are inclined to provide care may live closer to their parents either because they selectively relocate to be close to their aging parents or because aging parents relocate to be near children they know will provide informal care.

Some empirical studies using representative samples also show inconclusive results. For instance, Van Houtven et al. (2015) use the 1996-2010 HRS to investigate whether a person's decision to purchase LTC insurance varies with family structure and the opportunity cost of potential caregivers. The authors assume a person bought a LTC insurance policy if the person reported that she did not own a policy in the previous HRS wave but report in the current wave that she does own one. Using this measure, they find that a person is less likely to have bought

LTC insurance when a person's spouse is younger and when he/she works. Only one measure of children was correlated with the probability a person bought a policy. A respondent was less likely to buy LTC insurance if at least one child co-resided with her in the previous wave.

Researchers also suggest that the degree of reciprocity between a parent and her child in earlier years is associated with the child's provision of informal care to aging parents in later life (Silverstein et al. 2002). Using data from the University of Southern California Longitudinal Study of Generations, they find that adult children who spent more time with their parents and who received more financial support in 1971 provided more informal care to aging parents between 1985 and 1997.

This study will follow and improve on these studies. We will add more data plausibly correlated with the shadow price of an adult child's time (Kumar et al. 1997; Mellor 2001; Sloan and Norton 1997) and with the degree of reciprocity between a parent and her child (Silverstein et al. 2002). We exploit exogenous shocks in financial and housing markets to test the Rotten Kid Theorem's key assumptions. Most importantly, we model the supply of future informal care a parent expects to receive from each one of her living children. We then include several alternative measures of the predicted supply of future informal care to test whether informal care crowds out formal care.

III. Empirical model

We estimate a two-stage model of the probability that someone owns LTC insurance. In the first stage we estimate the supply of informal care a parent expects each child to provide as a function of the child's opportunity costs of time, degree of reciprocity in the relationship, and a

set of shocks to financial and housing markets that likely affect the bequest a child expects to receive. In the second stage we estimate the probability a parent owns a LTC insurance policy as a function of the predicted (total) supply of informal care from all children, financial and housing market shocks and the tax benefit associated with owning a LTC insurance policy. We estimate:

$$IC_{ikt+1} = \alpha_0 + \alpha_1 kid\ price_{ikt} + \alpha_2 reciprocity_{ikt} + \alpha_3 asset\ shock_{st} + \alpha_4 ADLs_{it} + \alpha_5 IADLs_{it} + i_i + \varepsilon_{ikt} \quad (1)$$

$$LTCI_{it} = \gamma_0 + \gamma_1 \widehat{IC_{it+1}} + \gamma_2 X_{it} + \gamma_3 asset\ shock_{st} + \gamma_4 tax\ benefit_{st} + s_s + \epsilon_{it} \quad (2)$$

Where IC_{ikt+1} is the respondent's subjective probability that her child's will provide informal care in the future. IC_{ikt+1} equals one if a respondent reports that her child would be willing and able to help with basic personal care activities over a long period if/when she needs it in the future. In (2) $LTCI_{it}$ equals one if a person reports that she owns a LTC insurance policy in year *t*.

We estimate (1) and (2) on the sample of respondents who are not yet receiving care from at least one child. We include a respondent-child pair in the sample we use to estimate (1) if, with reference to the child in question, the respondent got no help from that child. We select a respondent into this sample if the respondent said that child a) does not help her with ADLs; b) does not help her with IADLs; c) is not listed in the HRS "helper" file; and the child reports that she is not a helper. In each year *t* that we observe person *i*, we estimate (1) separately for all *k* of her children. As robustness checks, we also estimate the same model using a smaller sample of respondents. This sample keeps only respondents where *none* of her children help with any difficulties associated with ADLs or IADLs.

The variable $kid\ price_{ikt}$ is a vector that includes factors correlated with the shadow price of each child's time. The vector includes a child's sex, income, marital status, working status, years of schooling, number of children, whether or not the child lives within 10 miles, and the number of times the child sees her parent each year. To capture how labor market conditions might affect her child's opportunity cost, we also include the unemployment rate in the child's state of residence in the year of the interview.

The vector $reciprocity_{ikt}$ includes factors correlated with the degree of reciprocity between a parent and her child. It includes birth order, whether the child is related to the parent by blood or marriage, and the number of living children a parent has. The vector $asset\ shock_{st}$ includes factors that affect the resources a parent might use to induce "rotten" kids to provide care. It includes the percentage change in the value of the S&P 500 stock market index from the current month and year to the S&P 500 index value one year earlier and the value of the real Freddie Mac housing market index five years in the future, adjusted for year, month, and state dummies.

$ADLs_{it}$ and $IADLs_{it}$ are single index values that each represent the sum of six indicator variables. Each indicator variable measure responses to questions about whether or not it is difficult for a person to perform each of six different activities of daily living (ADLs) and each of six *instrumental* activities of daily living (IADLs). The ADLs include whether a person has difficulty walking across a room; dressing; bathing or showering; eating; getting in/out of bed; and using the toilet. $IADLs_{it}$ measure whether it is difficult for a person to use a map; telephone; manage money; take medications; shop for groceries; and prepare hot meals. The variables range in value from zero to six. We also specify a version of (1) and (2) that includes all 12 indicators

separately. These models reveal whether people who suffer from particular functional limitations are also more likely to expect a child to provide informal care. The vector $asset\ shock_{st}$ in (2) is as described above. i_i denotes parent-specific fixed effects. We estimate all first-stage models using fixed-effect linear probability models.

In the second stage, we estimate a model of an individual's decision to buy LTC insurance. Our main explanatory variable of interest is the expected probability a parent holds about getting future care from her children. With the coefficients from (1) we predict the probability a parent assigns to each child's willingness to care for her in the future, $\widehat{IC_{ikt+1}}$. In (2) we code $\widehat{IC_{it+1}}$ as zero if respondent *i* has no living children. If the respondent has one child we assign the predicted value. If a respondent has more than one child, we assign the highest predicted probability as the value for $\widehat{IC_{it+1}}$. We also estimate two other models as a robustness check of this way of characterizing expected provision of future informal care. In those models we measure the number of a parent's children whose predicted probability lies to the right of the 75th (and 90th) percentile of the predicted probability distribution.

We include vector X_{it} to control for demographic characteristics of each respondent (age, age-squared, race/ethnicity, sex, marital status, self-reported health, the presence of diagnosed health conditions) and variables associated with the ability to buy LTC (educational attainment, income, self-assessed value of illiquid assets, employment status).[3] We also control for whether or not a respondent's state legislated tax incentives, $tax\ benefit_{st}$, through the Health Insurance Portability and Accountability Act (HIPAA) of 1996. States that did so potentially affect the cost

[3] Motivated by Pence (2004), we use an inverse hyperbolic sine to transform the net value of illiquid assets because there are some non-positive values and because the distribution of the data is highly skewed.

of owning a LTC policy because they allow people to treat insurance premiums as medical expenses. In the average year of our sample period (1998-2010), 14.9 (S.D.=3.68) states allowed their citizens to deduct their insurance premium from state tax payments and 6.23 (S.D.=1.96) states gave citizens a tax credit for those payments. Research shows that demand for LTC insurance responds to the tax treatments (Courtemanche and He 2009; Goda 2011).

We estimate three versions of (2) using two different ways to characterize the set of ADLs and IADLs with which a person experiences difficulties. In the first set we measure ADLs and IADLs by the count of the six conditions in each that a person reports having difficulty. Specification 1 excludes the tax incentives and does not control for state fixed-effects; specification 2 adds state tax incentives but not state fixed effects; specification 3 includes both the state tax incentives and state-fixed effects. We then reestimate these three specifications but enter separate indicators for each of the six ADLs and each of the six IADLs. We estimate all second-stage models using random effects probit with robust standard errors clustered on individuals (in stata - vce(robust) using xtprobit).

IV. Data

We use restricted access data from the 1998-2010 Health and Retirement Survey (HRS), available through the data enclave.[4] The biennial HRS began in 1992 with a survey of people age 50 and older born between 1931 and 1941 and their spouses. Since then the HRS has added people from six other birth cohorts. HRS administers a base-year and then re-interviews all

[4] MiCDA Enclave maintained by the Michigan Center on the Demography of Aging and the Michigan Retirement Research Center. The data can be obtained by filing applications directly with the centers.

surviving respondents biennially. Our sample selection rule yields 14,462 unique respondents. In Table 1 we report the percent of our sample with particular characteristics. Below the sample mean of continuously distributed characteristics we report the standard deviation in parentheses.

A majority of the sample is female and married but a substantial fraction is widowed, divorced, or separated (27.6 percent). The average respondent has almost four living children, of which one lives within ten miles of where the respondent lives. Between 2.7 and 8.7 percent of the sample reports difficulties with one of the activities of daily living (ADLs). Slightly more of the sample reports difficulties with one of the instrumental activities of daily living (IADLs). Between 3 and 10.1 percent of the sample report difficulty with one of the IADLs. Since most of the sample reports being in good, very good, or excellent health, the average respondent reports only having .3 ADLs and .2 IADLs. 11.8 percent of respondents own LTC insurance.

We draw data on state- and year-specific unemployment rates from the U.S. Bureau of Labor Statistics. We merge those data using each child's state of residence and years of the interview. Because the HRS reports a child's state of residence only for the years of 2004, 2006, and 2008, we fill in a missing state of residence with the last observed state (the state reported in the previous wave). Over our sample period, state unemployment rates averaged 4.1 percent.

[Insert Table 1 about here]

In Figure 1 and Figure 2 we plot the time series of the S&P stock index and the Freddie Mac housing index between 1975 and 2010. Although there is a clear upward trend in both series, both series also show substantial and increasing variation over time as various macro economic shocks unfolded. Over this period the year-on-year change in the real S&P 500 index

averaged 13 percent. The mean value of the real housing price index was 67.13 (December 2000=100). We exploit this variation.

[Insert Figures 1 and 2 about here]

V. Results

A. Multivariate Results from the First-stage Models

Table 2 presents results from the first-stage model of the probability a respondent believes that her child will be willing and able to help her with care in the future. We restrict the sample to respondents who expect to receive no care (if she has only one child) or for which a respondent has at least one child (among two or more) from whom she expects to receive no care. Note that across all child-respondent pairs, the average probability a parent assigns to getting future care is 20 percent.

Results show that a parent's health state affects the probability she puts on getting future informal care from any given child. Consider a parent in good health - that is, a parent who can perform all six activities of daily living and all six instrumental activities of daily living (ADL=0 and IADL=0). As the health of a parent declines, she reduces her forecasted chance that a child will provide future informal care. Each additional ADL she develops lowers the forecast by one percentage point (about five percent of the mean predicted probability). Each additional IADL reduces the forecast by five percentage points. This effect is huge - a reduction in the mean predicted probability of 25 percent. The results from Model 2 indicate that particular ADLs have a bigger marginal impact than others. Ranked by size of the point estimates, a parent lowers her

forecast of future informal care by 5, 3.6, 2.7, and 2.3 percentage points when a healthy parent develops difficulty bathing, dressing, getting in/out of bed and walking respectively. Among the IADLs, only one has a statistically significant marginal effect. When a healthy parent develops difficulties taking medication, she lowers her forecasted supply of future informal care by 1.9 percentage points.

We are cautious about interpreting these findings as evidence of the actual change in the supply of informal care because the dependent variable is the parent's *expectation* about a child's willingness to provide future care not the actual care the child is willing to provide. The distinction is important because a child might be perfectly willing to provide future care, but a parent may lower her own forecast of the probability of getting that care after developing an ADL/IADL if the parent doesn't want to be a burden on her child. This possibility is not, for example, included in the model of Bernheim et al. (1985) because a parent's utility does depend on whether or not she perceives herself as a burden on her child's life. With our data, we cannot determine if the actual supply of labor falls as parents develop ADLs/IADLs or if only the parent's expectations change because she wants to avoid being a burden on her child's future life.

Also note that these results compare forecasted future informal labor supply of a child across samples of parents of different ADL/IADL numbers but that also hold constant the child's sex, birth order, marital status, work status, education, proximity, household income, and the frequency with which the child sees the parent.

Our results replicate the well-established finding that a parent expects a daughter to be more likely to provide care than she expects from sons (by 7.3 percentage points). Our findings partly support the notion that expected future informal care varies systematically with a child's

opportunity of time. A parent thinks a child will be more likely to provide future informal care if she is married (2 percentage points), works only part-time (2.2 percentage points), and lives within 10 miles (7.5 percentage points). A parent assigns a lower probability of getting informal care from a child living in a state with a higher unemployment rate. Because the model controls for the child's employment status, education, and household income, this result may reflect risk aversion on the part of the child. If a child is risk averse and less secure in her job when the state unemployment rate is higher, she will be less likely to take time off from work to care for an aging parent. One result runs counter to expectations. Relative to the children who have household incomes in the 0-10,000 category, a parent believes a child will be more likely to provide informal care if her household income is higher. The bump in the probability of care is highest in the middle of the child's household income distribution.

In general the factors associated with reciprocity support the idea that greater reciprocity increases the expected future supply of informal care. A parent expects any given child to be .6 percentage points less likely to provide future informal care for each additional sibling the child has and 11.9 percentage points more likely to provide care if the child is biologically hers. There is also a strong correlation between the frequency a child visits her parent and the parents forecasted probability that the child will provide future care. A parent will increase the probability she assigns to getting future informal care by 1.2 percentage points if a child increases the number of times she visits each year by 100 (about 10 extra visits per month). Of course visits are endogenously chosen so one must be cautious about interpreting this result. To the extent that visits reflect an investment in the relationship, this correlation is consistent with the idea that reciprocity affects the supply of informal care.

Finally, the main prediction of Becker's Rotten Kid Theorem gets mixed support. Recall the theorem predicts that a child will provide more care when a parent can hold out a bigger future bequest. The prediction gets strong support from our finding that a parent believes a child will be more likely to provide future informal care in years the S&P 500 index increased more over the past year. However, we also find that a parent believes a child will be *less likely* to provide future informal care if the five year forecast of the HPI index is higher. This result runs counter to the predictions of the Rotten Kid Theorem because a higher future HPI implies a child stands to inherit a home that is worth more.

In sum, results generally support the idea that a parent expects a greater chance of getting informal care from a child who has a lower opportunity cost of time, with whom she has a closer relationship, and when the size of her potential bequest is growing.[5] We next report results about whether a parent's expected receipt of informal care from children affects the probability that she owns a LTC insurance policy.

[Insert Table 2 about here]

B. Multivariate Results from the Second-stage Models

We present results from the second stage model in Table 3. The dependent variable in all models is LTC insurance ownership. Our sample includes respondents who are not currently receiving any help from her child (if she has only one) or not receiving care from at least of her children (if she has two or more children). Our main explanatory variable is the highest predicted probability of receiving care among all living children. The assumption underlying this

[5] Results did not change when we reran both models on the sample of respondents who got no help from any of their children (as opposed to no help from a least one child). Those results are available on request.

specification is that a parent decides whether or not to own an LTC policy based on the highest forecast she has about the probability of getting informal care in the future from at least one of her children. We also explore an alternative specification that counts the number of children she has whose predicted probability of providing future care lies in the right tail of the predicted probability distribution.

In models 1, 2, and 3 we control for the number difficulties in ADLs and IADLs. In model 4, 5, and 6 we include 12 indicators for each of the six ADL and the six IADL activities. Because we report probit coefficients and not marginal predicted effects, we will only discuss the sign and statistical significance of the results in Table 3.

Our basic result is that a parent is less likely to own a LTC policy when she assigns a higher probability that at least one of her children will provide future informal care. In our most demanding specification - columns 3 and 6 that control for state tax incentives and state fixed effects, the results strongly suggest that a person's expectations about future informal care affect the probability of owning an LTC insurance policy. This relationship conforms with Pauly's (1990) prediction that a person likely substitutes informal care for formal care when possible.

The estimated effect of race/ethnicity and marital status are also consistent with a substitution effect. Non white respondents are all less likely to own an LTC insurance policy. This result could arise because we fail to adequately control for the resources a person has to buy those policies, but it is also consistent with notions that there is a normative difference between the informal labor supply that White respondents expect from family members and the informal labor supply expected by members of these racial/ethnic groups. Relative to married partners, a person who has a partner is less likely to own a LTC insurance policy.

Although we do not observe the price of LTC insurance policies, several results suggest that a person decides to own an LTC insurance policy based on the price, earnings potential, household income, and wealth. People who are in good, very good, and excellent health are more likely to own an LTC policy with the highest association for people in very good but not excellent health. This pattern likely reflects the pricing of policies. Premiums rise with age and declining health. In addition, a person is more likely to own a LTC policy if she is more educated, has higher household income, and greater wealth. All of these reflect an ability to afford a LTC policy. The result on educational attainment might reflect behavior of better informed individuals. Or, as Finkelstein and McGarry (2006) suggest, risk-averse people are less likely to find themselves in conditions covered by insurance because, in general, they engage in activities that improve their health. Risk-averse individuals are also more likely to buy the insurance to buffer the losses they might experience in case they develop conditions that require LTC. The result on wealth may also reflect a desire to protect that wealth. The latter conjecture is also supported by the result that a person is more likely to own a LTC insurance policy when the five year future HPI is higher. People buy insurance to protect themselves against an unexpected future liability. This finding is consistent with that idea.

Unlike Courtemanche and He (2009) and Goda (2011) we find no evidence that state tax credits affect the probability a person owns an LTC policy.

[Insert Table 3 about here]

C. Robustness checks

In Table 4 we report probit coefficients from the six models of LTC ownership but with two different measures of the potential supply of informal care. In particular we explore whether

a parent bases the decision to own a LTC policy on number of children she has from whom she expects to get informal care. In Panel A, we include the number of children whose predicted probability of providing care is in the upper quartile (above the 75 percentile) of the distribution of the predicted probability of providing informal care of all children. In Panel B we count the number of a respondent's children whose predicted probability puts them in the upper 10 percent of that distribution (above the 90th percentile).

Results in Table 4 suggest that a parent is risk averse. Having only one child who has a high predicted probability of providing informal does not affect a parent's decision to own a LTC insurance policy. But having two children with high predicted probability of providing future informal care significantly reduces the probability that a person owns a LTC insurance policy. These results suggest that informal care crowds out (provisions for) formal care as Pauly (1990) suggests.[6]

[Insert Table 4 about here]

VI. Conclusion and discussion

In this study, we use an economic approach to determine whether a person is more or less likely to own a LTC insurance policy when she has a bigger potential supply of future informal care. We use a nationally representative sample using Health and Retirement Study (HRS) data. We use Becker's Rotten Kid Theorem and extensions thereof to inform our empirical specifications. In general, we find evidence that supports the theorem's predictions. The main

[6] We estimate the same models on the sample of respondents who do not get help for ADLs or IADLs from none of their children. Results do not change.

contribution of this study is to include a richer set of factors that plausibly influence the supply of informal care that parents expect children to provide. In contrast to existing literature, we take advantage of information about all living children. We include three main factors to measure the probability that a person expects to receive care from her child in the future: proxies for the degree of reciprocity between a parent and her child; the opportunity cost a child pays when the child provides care; and exogenous shocks in the stock and housing markets that affect the value of a parent's assets.

In general, the higher the degree of reciprocity between a parent and her child, the greater the probability that she expects that she will receive care in the future. To be specific, if she has a fewer children, has a biologically related child, and interact more frequently with that child then she is more likely to receive care from her child. The parent's forecasted the probability of receiving future care also varies systematically with her child's cost of providing informal care. If her child's cost of providing care is higher, then she is less likely to receive care from her child. But we also find that a parent more likely expects future care when her child works part-time (relative to not working) and when she has higher household income. These results are not consistent with our expectation based on the Becker's theorem. The percentage change in the S&P 500 stock index between the previous and current year is positively associated with the probability that a parent expects her child to provide care. This result is consistent with Becker's observation that a parent can elicit desired behavior from a "rotten" kid by essentially bribing them with the promise of a future payoff. In contrast, we find the opposite result when we use a five year forecast of the value of housing in a given market. However, that finding needs to be explored further because the increase in house values affects not only the value of the parent's home but also the value of the child's home. If the HPI increases for the parent, it likely increases

as well for the child. If the child's own home is worth more, the child may be more optimistic about her own wealth accumulation in general, and thus be less interested in the bequest she might receive from her parent. Thus, the higher values may weaken the mechanism through which the Rotten Kid Theorem operates. It is also possible that we misspecified our model because we do not we treat declines in the HPI during the housing crisis symmetrically with HIP increases. In future work we will explore the idea that there is a nonlinear relationship and possibly asymmetric effect of declines and increases in home values.

The estimated expected probability that a parent will receive care from her child in the future is negatively related to LTC insurance ownership. This result is consistent with the main lesson of the Becker's theorem that parents strategically withhold their wealth to elicit informal care and the availability of informal care drives out the demand for the insurance. The theorem suggests that parents rationally use their wealth to signal their children that they plan to leave bequests as long as they receive care and if this is accepted as an effect strategy, then the informal care partially substitutes the demand for the insurance. Our empirical results show that having multiple children with the higher probability of providing care may be a better proxy for the potential supply of care than having only one child with the highest probability. Those results suggest that parents are risk averse when trying to forecast the potential supply of future informal care.

In future work, we can improve this study by controlling for other variables that potentially affect a person's LTC insurance ownership and by exploring possible explanations for the anomalous results. For example, we do not include data on premiums of the insurance. Economic theories predict that if prices of the insurance increase then people demand less

coverage. Our empirical results may be limited because we do not control for the premiums of policies. In order to mitigate this potential bias, we control for individuals' various characteristics that insurance companies utilize to identify preexisting conditions and their risk types and determine discrimination blocks of the premiums. We also include variables to measure whether a state reduces a person's tax burden when they own a policy and state-fixed effects to control for time-invariant but unobserved and state-specific factors. We also note that we do not predict whether a respondent is eligible (or close to eligible) for Medicaid. Previous literature shows that Medicaid crowds out demand for LTC insurance (Brown, Coe, and Finkelstein 2007; Brown and Finkelstein 2004; Kim 2010). In future work we will do so.

Overall, we find evidence for the idea that a higher supply of future informal care crowds out ownership of LTC insurance policies. Our finding supports Pauly's (1990) prediction. It also points to the next set of relevant questions. Given that the CBO estimates that informal care costs 80 percent more than formal care, are people forecasting those costs accurately if/when they strategically induce their "rotten" children to provide future informal care? The answer to the question remains for future research.

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Table 1

Sample Characteristics HRS 1998-2010 (N= 14,462), Unweighted

Variable	%	Variable	%	Variable	%
Gender		Contacts with child	141 (248)	# children who are (cont.)	2.7 (1.7)
Male	42.3			…working full-time	0.9 (1.2)
Female	57.7			…living within 10 miles	6.0
Race/ethnicity		Work status	17.6	ADLs - difficulties…	8.7
White	77.7	Full-time	3.6	walking across room	5.9
Black	12.4	Part-time	5.4	dressing	2.7
Hispanic	8.1	Self-employed	58.7	bathing	5.5
Other	1.9	Retired	14.8	eating	4.9
		Not working	82.3	getting in/out bed	0.3 (0.9)
Education		Homeowner	73,750 (128,213)	using the toilet	
<High school	23.3	HH income (2012 $)	281,363 (859,443)	…number (prevalence)	
High school	36.3				
Some college	21.2	Value Illiquid assets (2012 $)	505,195 (1,213,742)		10.1
BA	11.3			IADLs - difficulties…	3.9
Post BA	7.9	Wealth (2012 $)		using a map	4.8
				using a telephone	3.0
Marital status		# children who are	3.8 (2.2)	managing money	7.5
Married	68.8			taking meds	5.2
Partnered	2.9	…living	1.9 (1.5)	grocery shopping	0.2 (0.8)
Div./Sep./Wid.	27.6			preparing hot meals	
Single	0.7	…daughters	0.6 (1.3)	…number (prevalence)	
					11.8
Health status		…step-children	2.5 (1.7)		
Poor	7.9			Own LTC policy	
Fair	18.8				
Good	31.5				
Very good	29.9				
Excellent	11.9				
Age	67.9 (9.8)	…married			

Notes: For continuously distributed variables the value represents the mean, standard deviation in parentheses.

Table 2

First Stage Estimates - Parent's Subjective Probability that Child will Provide Future Informal Care

Variables	Specification (1)	Specification (2)
Activities of daily living (ADLs)		
Number ADLs perform with difficulty	-0.010 (0.003)***	
Difficulties with		
walking		-0.023 (0.008)**
dressing		-0.036 (0.007)***
bathing		-0.050 (0.009)***
eating		-0.019 (0.012)
getting in/out of bed		-0.027 (0.008)**
using the toilet		0.014 (0.008)
Instrumental activities of daily living (IADLs)		
Number IADLs perform with difficulty	-0.051 (0.003)***	
Difficulties with		
using a map		-0.001 (0.001)
using a telephone		-0.0004 (0.002)
managing money		-0.002 (0.001)
taking medications		-0.019 (0.006)**
grocery shopping		-0.002 (0.001)
preparing hot meals		-0.0004 (0.001)

# of respondent's living children	-0.006	-0.004
	(0.003)*	(0.003)
Characteristics of child		
Birth order (ref. group - first born)		
Second	-0.005	-0.005
	(0.004)	(0.004)
Third	-0.001	-0.002
	(0.004)	(0.004)
Fourth	0.003	0.003
	(0.005)	(0.005)
Fifth and latter	-0.004	-0.005
	(0.005)	(0.005)
Step child	-0.119	-0.119
	(0.005)***	(0.005)***
Female	0.073	0.074
	(0.003)***	(0.003)***
Marital status (ref. group pooled sample of divorced, widowed, separated and single respondents)		
Married	0.020	0.019
	(0.003)***	(0.003)***
Partnered	0.007	0.007
	(0.007)	(0.007)
Work status (ref. group pooled sample of are self-employed, retired, and not working respondents)		
Full time	-0.001	-0.001
	(0.004)	(0.004)
Part time	0.022	0.020
	(0.006)***	(0.006)***
Household income (ref. group households with income between 0-10K; real 2012$)		
10K-35K	0.016	0.018
	(0.004)***	(0.004)***
35K-70K	0.019	0.022
	(0.004)***	(0.004)***
35K and more	0.016	0.018
	(0.006)**	(0.006)**
70K and more	0.025	0.029
	(0.005)***	(0.005)***
Years of schooling	-0.0001	-0.0001
	(0.001)	(0.001)
Lives within 10 miles	0.075	0.075
	(0.005)***	(0.006)***

Times per year child sees respondent ('00s)	0.012	0.012
	(0.001)***	(0.001)***
Number of children	-0.002	-0.002
	(0.001)	(0.001)
State unemployment rate	-0.005	-0.005
	(0.002)**	(0.002)**
Changes in S&P 500 index	0.049	0.047
	(0.007)***	(0.007)***
Predicted HPI in 5 years	-0.082	-0.110
	(0.018)***	(0.018)***
Constant	6.598	8.729
	(1.349)***	(1.378)***
N (respondent-child pairs)	37,525	37,525
N (respondents)	14,462	14,462

Notes: Standard errors in parentheses. Coefficients that statistically differ from zero denoted by + p<.10, * p<.05, ** p<.01, and *** p<.001. Sample includes respondents for whom at least one child provided no help with ADLs and IADLs. We estimate all models as fixed-effects linear probability models.

Table 3

Probit Coefficients from Model of Probability Respondent Owns LTC Insurance (N= 14,462)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Pred. prob. receive care	-0.534	-0.535	-0.636	-0.476	-0.478	-0.578
	(0.318)+	(0.319)+	(0.323)*	(0.326)	(0.326)	(0.330)+
Number of ADLs	-0.078	-0.077	-0.080			
	(0.036)*	(0.036)*	(0.036)*			
ADL: Have difficulty with						
Walking				-0.102	-0.102	-0.101
				(0.114)	(0.114)	(0.114)
dressing				0.034	0.035	0.026
				(0.091)	(0.091)	(0.091)
bathing				-0.189	-0.189	-0.208
				(0.124)	(0.124)	(0.125)
eating				-0.015	-0.015	-0.019
				(0.167)	(0.167)	(0.169)
getting in/out of bed				-0.147	-0.148	-0.138
				(0.119)	(0.119)	(0.119)
using the toilet				0.042	0.043	0.038
				(0.113)	(0.113)	(0.114)
Number of IADLs	0.031	0.030	0.025			
	(0.041)	(0.041)	(0.041)			
IADL: Having difficulty						
using a map				-0.028	-0.027	-0.032
				(0.072)	(0.072)	(0.073)
using a telephone				-0.060	-0.063	-0.053
				(0.143)	(0.143)	(0.143)
managing money				0.124	0.124	0.120
				(0.127)	(0.127)	(0.128)
taking medications				0.143	0.144	0.129
				(0.145)	(0.145)	(0.145)
Grocery shopping				0.091	0.089	0.087
				(0.108)	(0.108)	(0.108)
preparing hot meals				-0.053	-0.052	-0.041
				(0.134)	(0.134)	(0.135)
Female	0.261	0.261	0.256	0.254	0.254	0.248
	(0.062)***	(0.062)***	(0.062)***	(0.063)***	(0.063)***	(0.063)***
Age	0.195	0.195	0.192	0.197	0.197	0.192
	(0.032)***	(0.032)***	(0.032)***	(0.033)***	(0.033)***	(0.033)***
Age-squared	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.0002)***	(0.0002)***	(0.0002)***	(0.0002)***	(0.0002)***	(0.0002)***
Race/ethnicity (ref. group Whites)						
Black	-0.347	-0.347	-0.272	-0.343	-0.343	-0.270
	(0.098)***	(0.099)***	(0.101)***	(0.100)**	(0.101)**	(0.103)**
Hispanic	-0.919	-0.918	-0.824	-0.913	-0.912	-0.816
	(0.155)***	(0.155)***	(0.155)**	(0.157)***	(0.157)***	(0.159)***

Other	-0.667	-0.667	-0.602	-0.659	-0.659	-0.579
	(0.233)**	(0.234)**	(0.234)*	(0.239)**	(0.239)**	(0.238)*
Marital status (ref. group married)						
Partnered	-0.291	-0.292	-0.285	-0.309	-0.309	-0.303
	(0.146)*	(0.146)*	(0.146)	(0.148)*	(0.148)*	(0.149)*
Sep/Div/Widowed	-0.117	-0.116	-0.110	-0.118	-0.118	-0.109
	(0.065)	(0.065)	(0.065)	(0.066)	(0.066)	(0.067)
Never married	-0.368	-0.372	-0.375	-0.280	-0.282	-0.277
	(0.331)	(0.332)	(0.330)	(0.341)	(0.341)	(0.339)
Education attainment (ref. group HS dropouts)						
High school	0.398	0.397	0.358	0.402	0.401	0.362
	(0.089)***	(0.089)***	(0.088)***	(0.091)***	(0.091)***	(0.090)***
Some college	0.633	0.632	0.615	0.643	0.643	0.624
	(0.097)***	(0.097)***	(0.097)***	(0.099)***	(0.099)***	(0.099)***
Bachelor's degree	1.120	1.121	1.112	1.097	1.097	1.083
	(0.111)***	(0.111)***	(0.112)***	(0.114)***	(0.114)***	(0.114)***
Graduate degree	1.673	1.677	1.699	1.675	1.674	1.69
	(0.123)***	(0.123)***	(0.124)***	(0.125)***	(0.125)***	(0.126)***
Log of HH income (2012$)	0.146	0.146	0.141	0.160	0.159	0.154
	(0.023)***	(0.023)***	(0.023)***	(0.024)***	(0.024)***	(0.024)***
Homeowner	0.091	0.092	0.116	0.106	0.107	0.134
	(0.081)	(0.081)	(0.081)	(0.083)	(0.083)	(0.084)
Value of illiquid assets[a]	0.037	0.037	0.036	0.037	0.037	0.036
	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***
Employment status (ref. group not working)						
Full-time	-0.093	-0.092	-0.111	-0.086	-0.086	-0.105
	(0.084)	(0.084)	(0.085)	(0.086)	(0.086)	(0.087)
Part-time	-0.325	-0.325	-0.343	-0.295	-0.296	-0.312
	(0.128)*	(0.128)*	(0.129)**	(0.130)*	(0.130)*	(0.131)*
Self-employed	-0.240	-0.241	-0.259	-0.199	-0.199	-0.216
	(0.115)*	(0.115)*	(0.116)*	(0.117)	(0.117)	(0.118)
Retired	0.193	0.192	0.179	0.193	0.193	0.180
	(0.066)**	(0.066)**	(0.067)**	(0.068)**	(0.068)**	(0.068)**
Self-reported health (ref. group poor health)						
Fair	0.156	0.156	0.148	0.148	0.148	0.140
	(0.098)	(0.099)	(0.099)	(0.100)	(0.100)	(0.101)
Good	0.238	0.237	0.216	0.234	0.234	0.212
	(0.100)*	(0.100)*	(0.101)*	(0.102)*	(0.102)*	(0.103)*
Very good	0.343	0.342	0.322	0.338	0.337	0.317
	(0.104)**	(0.104)**	(0.105)**	(0.106)**	(0.106)**	(0.107)**
Excellent	0.281	0.280	0.276	0.283	0.282	0.276
	(0.115)*	(0.115)*	(0.116)*	(0.118)*	(0.118)*	(0.119)*
Health conditions						
High blood pressure	0.053	0.053	0.065	0.042	0.042	0.052
	(0.052)	(0.052)	(0.053)	(0.053)	(0.053)	(0.054)
Diabetes	-0.052	-0.052	-0.076	-0.050	-0.050	-0.074
	(0.073)	(0.073)	(0.074)	(0.074)	(0.074)	(0.074)
Cancer	-0.032	-0.032	-0.037	-0.034	-0.034	-0.037
	(0.075)	(0.075)	(0.076)	(0.076)	(0.076)	(0.077)

Lung problem	-0.192	-0.192	-0.181	-0.193	-0.193	-0.183
	(0.098)	(0.098)	(0.099)	(0.099)	(0.100)	(0.100)
Stroke	-0.023	-0.023	-0.028	-0.017	-0.017	-0.023
	(0.100)	(0.100)	(0.101)	(0.102)	(0.102)	(0.102)
Psychological problem	-0.176	-0.175	-0.183	-0.159	-0.159	-0.165
	(0.084)*	(0.084)*	(0.085)*	(0.085)	(0.085)	(0.086)
Arthritis	0.058	0.058	0.059	0.058	0.058	0.060
	(0.053)	(0.053)	(0.053)	(0.054)	(0.054)	(0.054)
Heart problem	0.123	0.123	0.119	0.113	0.113	0.109
	(0.091)	(0.091)	(0.092)	(0.092)	(0.092)	(0.093)
Macro-economic variables						
Change in S&P 500	0.075	0.080	0.069	0.085	0.090	0.079
index	(0.085)	(0.086)	(0.087)	(0.087)	(0.087)	(0.089)
HPI in 5 years	0.607	0.603	0.810	0.641	0.638	0.826
	(0.171)***	(0.172)***	(0.191)***	(0.169)***	(0.170)***	(0.187)***
Tax deduction		-0.009	0.021		-0.006	0.020
		(0.061)	(0.151)		(0.062)	(0.152)
Tax credit		0.043	-0.085		0.048	-0.085
		(0.069)	(0.147)		(0.071)	(0.149)
Constant	-59.882	-59.599	-75.567	-62.631	-62.038	-78.024
	(13.150)***	(13.203)***	(14.655)***	(13.656)***	(13.6901***	(15.165)***
State fixed effects	No	No	Yes	No	No	Yes

Notes: Standard errors in parentheses. Coefficients that statistically differ from zero denoted by + p<.10, * p<.05, ** p<.01, and *** p<.001. Sample includes respondents for whom at least one child provided no help with ADLs and IADLs. For all specifications, we use random effect probit models. The dependent variable is LTC insurance ownership.

[a]Value of illiquid assets transformed using inverse hyperbolic sine.

Table 4

Probit Coefficients from Model of Probability Respondent Owns LTC Insurance; Alternative Supply of Informal Care Measure (N=14,462)

Panel A: Predicted probability that child will deliver care lies in top quartile of distribution

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Number of children who meet this conditions						
One	-0.052	-0.053	-0.063	-0.013	-0.013	-0.023
	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)	(0.049)
Two	-0.112	-0.112	-0.125	-0.166	-0.167	-0.180
	(0.070)	(0.071)	(0.071)+	(0.073)*	(0.073)*	(0.073)*
Three or more	-0.061	-0.061	-0.101	-0.152	-0.152	-0.199
	(0.118)	(0.119)	(0.119)	(0.120)	(0.120)	(0.121)
Controls						
ADLs & IADLs	No. of conditions			List of conditions		
Tax subsidy	No	Yes	Yes	No	Yes	Yes
State fixed effects	No	No	Yes	No	No	Yes

Panel B: Predicted probability that child will deliver care lies in top 10% of distribution

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Number of children who meet this conditions						
One	0.071	0.071	0.068	-0.011	-0.011	-0.012
	(0.050)	(0.050)	(0.051)	(0.052)	(0.052)	(0.052)
Two or more	-0.218	-0.220	-0.234	-0.224	-0.223	-0.248
	(0.107)*	(0.107)*	(0.108)*	(0.106)*	(0.106)*	(0.107)*
Controls						
ADLs & IADLs	No. of conditions			List of conditions		
Tax subsidy	No	Yes	Yes	No	Yes	Yes
State fixed effects	No	No	Yes	No	No	Yes

Notes: Standard errors in parentheses. Coefficients that statistically differ from zero denoted by + p<.10, * p<.05, ** p<.01, and *** p<.001. Sample includes respondents for whom at least one child provided no help with ADLs and IADLs. For all specifications, we use random effect probit models. The dependent variable is LTC insurance ownership. All models include the controls shown in Table 3.

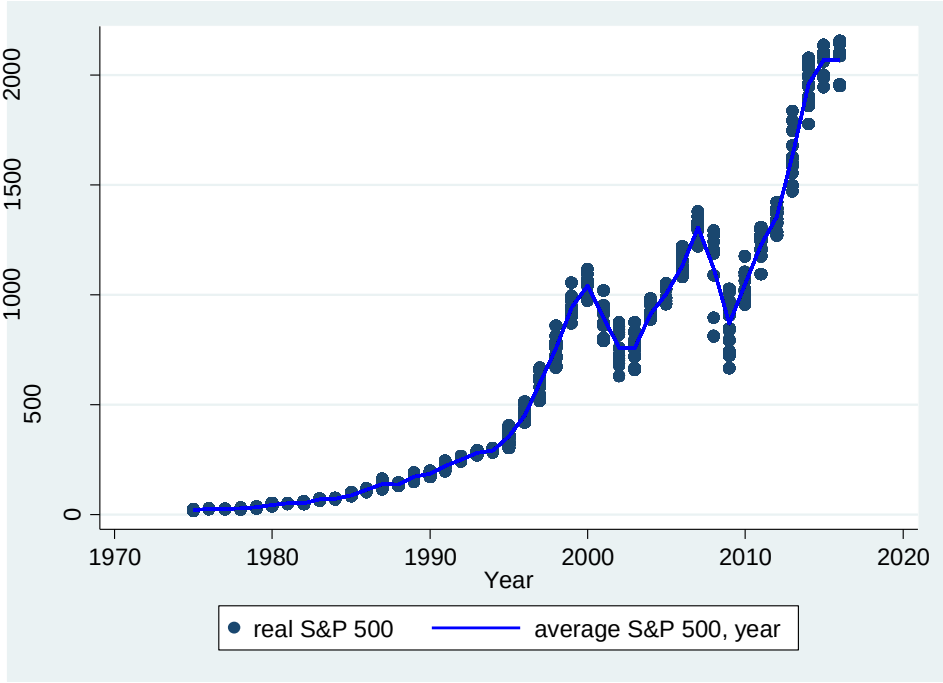

Figure 1

Historical Trends of Real S&P 500 Stock Index

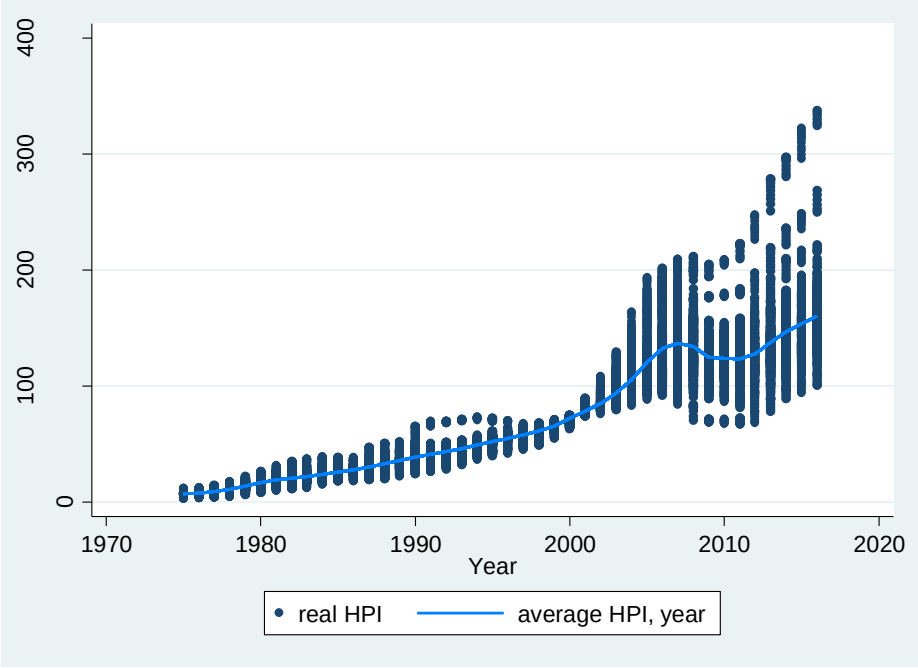

Figure 2

Historical Trends of Real Freddie Mac Housing Index