Illiquid Housing as Self-Insurance: The Case of Long Term Care

Thomas Davidoff
Haas School of Business, UC Berkeley

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Abstract

Long term care is one of the few observable triggers for home sale among the elderly. Combined with a thin reverse mortgage market, this helps rationalize weak demand for Long Term Care Insurance (LTCI). Home equity typically tapped primarily in the event of long term care reduces the gain to insurance transfers from healthy states. Households in the Health and Retirement Study with large home equity to wealth ratios have significantly weaker demand for LTCI than other households, even among those so wealthy as to face weak temptation from Medicaid.

JEL Codes: G11, G22, I11, R21

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1 Introduction

Weak demand for long term care insurance (LTCI) and home equity loans among the elderly have attracted considerable attention because both products seem to offer considerable consumption smoothing benefits.[1] In the 2004 wave of the Health and Retirement Study (HRS), only approximately 11% of respondents held LTCI, and the mean and median home equity to home value ratios among homeowning retirees were 89% and 100%.

[1]See, e.g. Ahlstrom et al. (2004), Mayer and Simons (1994), Caplin (2002), Brown and Finkelstein (2007), Finkelstein and McGarry (2003), and Spillman et al. (2001).

This paper shows that the absence of a market for home equity lending combined with disutility from moving among the elderly can undermine the market for LTCI. If home sale is unlikely without the combination of financial need and ill health related to a long term care need, and if the proceeds from the sale of the home exceed the cost of long term care and any subsequent rental housing, then there is more cash available for other consumption in the event of sale and long term care than in the event of no sale and no long term care. The marginal utility of wealth may thus be no greater in the potentially insured state than in uninsured states, so that there may be no demand even for actuarially fair insurance. More generally, with poorly priced insurance, a reasonably high level of home equity relative to other assets and the expenses generated by long term care can undermine the consumption smoothing benefits of LTCI.[2]

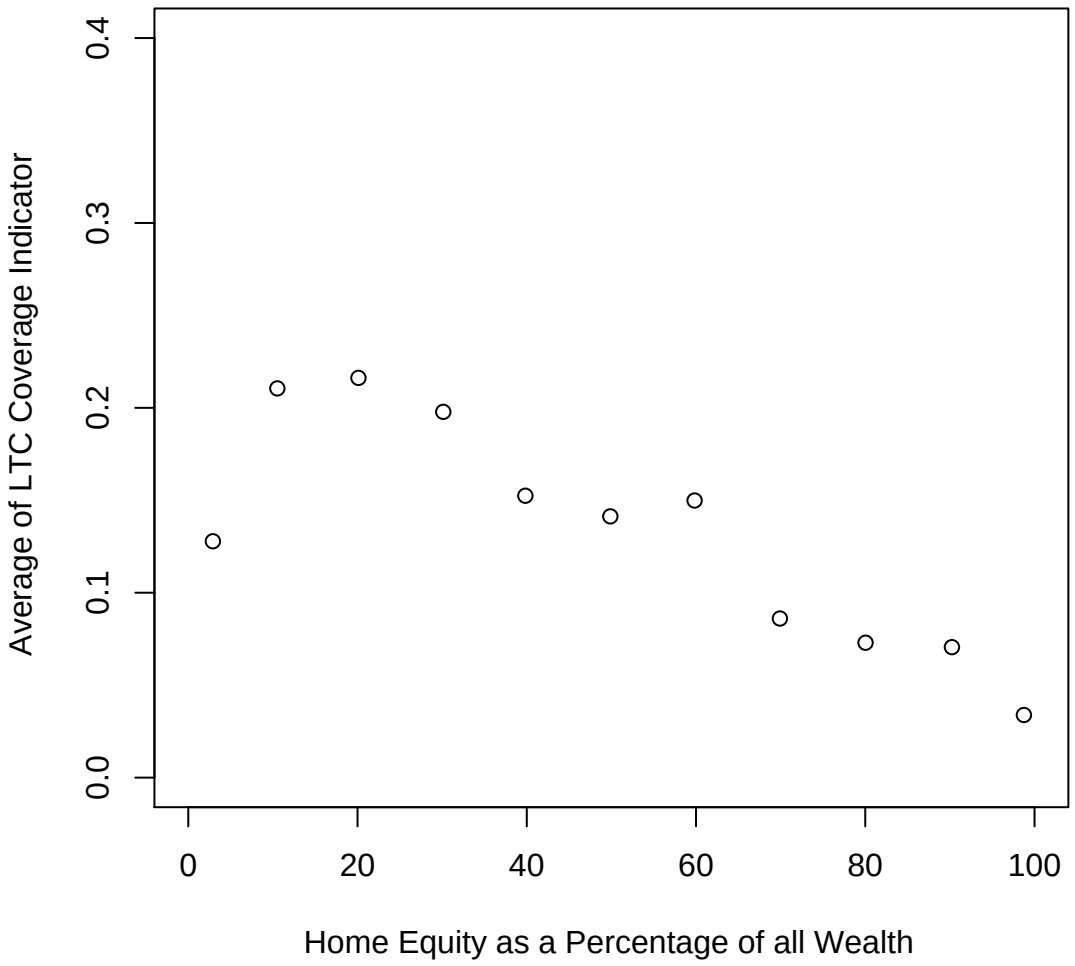
Figure 1 illustrates this effect using data from the 2004 wave of the HRS: homeowners with most of their wealth in home equity are significantly less likely to hold long term care insurance than are other households.

Pauly (1990) offers a similar rationalization of non-purchase of LTCI. There, the pivotal missing market is annuities, rather than home equity lending. With a stochastic date of death and no way to transfer money from death to the period while alive, absent a strong bequest motive, households will seek to avoid transfers from the period while alive to the period after death. Since Medicaid pays long term care expenses once assets are exhausted and expected life after long term care is relatively short, LTCI essentially transfers money from the living to their estates, further exacerbating the marginal utility gap.

Pauly's mechanism certainly undermines demand for long term care insurance among the poor and middle class (see Brown and Finkelstein (2007)). However, because the care that Medicaid buys may be inferior to the care that can be paid for with private insurance, affluent individuals may avoid Medicaid and hence be willing to pay for insurance to smooth consumption across the relevant states while alive. That consumers perceive an important

[2]This mechanism is related to one proposed by Shore and Sinai (2005), who show that the prospect of large financial losses may be associated with increased demand for illiquid housing.

Figure 1: Fraction of individuals holding long term care insurance by rounded percentage of all wealth held in home equity: 2004 wave of the Health and Retirement Study.



difference between the care that Medicaid buys and private pay care is verified with survey data in Ameriks et al. (2007). Not surprisingly, we find a very strong positive effect of wealth on LTCI demand in the HRS. A question left open in Pauly's analysis is: how much extra demand would there be for LTCI if Medicaid were eliminated?

Medicaid, by paying for poor seniors' long term care, complicates the interpretation of figure 1 in two ways. First, Medicaid's definition of assets is arguably friendlier to home equity than to other forms of wealth. Medicaid recipients typically can retain their home until death (or death of a spouse), with a lien for covered costs placed on the home. Second, a high ratio of home equity to total wealth is negatively correlated with total wealth, and Medicaid is only available to those with low wealth. Hence one suspects that Medicaid will be more attractive relative to either self-insurance or private LTCI for those households with high home equity to wealth ratios, even without the illiquidity effect proposed in this paper. Working in the opposite direction, those with high home equity ratios may expect to retain a greater fraction of their wealth up to the point of any need for long term care, given home equity's illiquidity among the elderly.

Table 1 illustrates the interactions among the need for prolonged care, Medicaid, private LTCI, and sale of the home. Of the homeowners in the 1993-1994 AHEAD survey still alive in the 2004 wave, we find that homeownership rates are very high absent nursing home care, but below 40% with nursing home care. Consistent with the well-known HRS findings of Venti and Wise (2000), this supports the notion of long term care as a critical trigger for sale of the home. Homeownership is measured as non-zero home equity. Medicaid recipients are less likely to retain their home conditional on not being in a nursing home, but conditional on being in a nursing home are more likely than non-recipients to retain their home. This is presumably in large part due to the fact that Medicaid allows some long term care patients to retain their home while alive, but not to enjoy capital gains from sale.

Section 2 of this paper formalizes the discussion of why homeowners with high ratios of home equity to liquid wealth are likely to be relatively uninterested in private LTCI. Section 3

Table 1: Homeownership rates in 2004 of HRS/AHEAD respondents owning a home and not in a nursing home in 1993-1994 by 2004 LTCI, Medicaid and residential status

	Lives in a Nursing Home in 2004?	
	No	Yes
2004 Insurance		
Medicaid	76%	37%
Private LTCI	95%	40%
Neither	90%	30%

shows that the relationship between high home equity ratios and LTCI demand portrayed in figure 1 remains significantly negative conditioning on covariates, and is no weaker when the data is restricted to households with enough non-housing wealth that Medicaid crowd-out of private insurance should be relatively unimportant. Section 4 briefly concludes.

2 Homeowners' Long Term Care Insurance Demand in Theory

Consider a retired homeowner who derives utility from consumption of housing and a composite other good in a single future period. The homeowner has total wealth w of which a fraction α is the value of the home. Taking the absence of home equity borrowing among the elderly to an extreme, $w\alpha$ is equal to both the owned homes' value and home equity. Assuming no cross sectional variation in a housing price normalized to one, $w\alpha$ is also equal to housing consumption (the empirical section briefly addresses variation in price). The homeowner thus has $w\left[1-\alpha\right]$ in non-housing wealth. Retirement income may be thought of as part of liquid wealth. The allocation of wealth α was determined before LTCI was purchased.[3]

The only way to spend the $w\alpha$ in home equity is to sell the home, and selling the home generates so much disutility that the homeowner will not do so unless hit with an adverse

[3]Coe (2007) argues that asset allocation decisions are, in fact, affected by the Medicaid environment. Spending home equity in anticipation of LTCI purchase would be consistent with the model presented here.

health shock. The health shock may trigger sale due both to financial burden and to a loss of self-sufficiency due to illness.

Before uncertainty is played out, the homeowner decides on an optimal level t of private LTCI. Each unit of insurance converts π units of non-housing wealth from the healthy state to one unit of non-housing wealth in the sick state. This leaves the homeowner with direct utility $u(w\,[1-\alpha]-t\pi, w\alpha)$ if health is good. Naturally, $u_1 > 0$, $u_{11} < 0$, and $u_{22} < 0$. A critical derivative, unsigned by primitives, is u_{12}.

In the event of sickness, the homeowner may be covered by Medicaid. This results in a particular level of care, and indirect utility $z(w\,[1-\alpha]+t, w\alpha)+m$. The marginal utility of non-housing wealth z_1 is likely to be small or even zero in this case, as all wealth above a small limit must be spent down prior to coverage. Naturally if $z_1 > 0$ then $z_{11} < 0$. z_2 is weakly positive and is likely greater than z_1, particularly for married individuals, because Medicaid typically allows the home to be retained until death of the recipient and any spouse. m is an uninsurable random variable realized if and when the health shock occurs that affects the consumers' taste for publicly available care, introduced only to simplify the application of calculus.

An alternative to Medicaid is private care, funded by a combination of liquid wealth, home equity, and private insurance proceeds. Assuming that the home is always sold (with no transaction costs) in the event of sickness, utility in the state of ill health can be written $v(w+t)$. v may be thought of as either direct utility or indirect utility with the cross-sectionally constant price of housing an unnecessary argument. Naturally, $v' > 0$ and $v'' < 0$.

Subsuming the probabilities of good and ill health in the subutility functions u, v, and z, and denoting the critical value $m* \equiv v(w+t) - z(w\,[1-\alpha]+t, w\alpha)$ at which self-pay gives way to Medicaid, expected utility U can be written:

$$U = u\left(w\left[1-\alpha\right]-t\pi, w\alpha\right) + \int_{-\infty}^{m*} v(w+t)dF(m) + \int_{m*}^{\infty}\left[z(w\left[1-\alpha\right]+t, w\alpha)+m\right]dF(m). \quad (1)$$

The first order condition for insurance can be written:

$$-\pi u_1(w\left[1-\alpha\right]-t\pi, w\alpha)+\int_{-\infty}^{m*} v'(w+t)dF(m)+\int_{m*}^{\infty} z_1(w\left[1-\alpha\right]+t, w\alpha)dF(m)=0. \quad (2)$$

Differentiating (2) and dropping arguments, the effect of the housing share α on the optimal choice of t is:

$$\frac{dt}{d\alpha} = -w\frac{\pi\left[u_{11}-u_{12}\right]+\int_{m*}^{\infty}\left[z_{12}-z_{11}\right]dF(m)-f(m*)\left[z_2-z_1\right]\left[v'-z_1\right]}{\pi^2 u_{11}+\int_{-\infty}^{m*} v''dF(m)+\int_{m*}^{\infty} z_{11}dF(m)}. \quad (3)$$

We have the following:

Result 1. *If $u_{12} > u_{11}$ and either (a) z_1, z_{11}, and z_{12} are sufficiently small in magnitude or (b) $m*$ is sufficiently large, then $\frac{dt}{d\alpha} < 0$, so that insurance demand falls with the housing share.*

Proof. Follows from the negativity of v'', and u_{11} and the positivity of v' and z_2. □

The conditions for Result 1 appear reasonable. $u_{12} > u_{11}$ essentially requires that housing is not a better substitute for non-housing consumption than non-housing consumption itself. The conditions on z_1 and its derivatives and $m*$ require that private insurance proceeds in the event of Medicaid coverage are approximately useless.

3 Homeowners' Long Term Care Insurance Demand in the HRS

Figure 1 lends clear support to the theoretical result that the home equity share of wealth makes LTCI less attractive. However, we wish to know whether this effect can be attributed to the illiquid nature of home equity that motivates this study, or whether instead the relationship can be explained away by friendly treatment of home equity under Medicaid. Regression analysis of HRS data sheds light on this question.

To see the identification problem mathematically, in equation (3), the first term, $\pi\left[u_{11}-u_{12}\right]$ is the one motivating this study. If housing is a poor substitute for non-housing consumption, then a greater ratio of home equity to total wealth means that housing itself serves to transfer non-housing consumption from healthy states with no sale to ill states with sale, obviating LTCI. However, the third term $-f(m*)\left[z_2-z_1\right]\left[v'-z_1\right]$ shows that if Medicaid's friendly treatment of housing is attractive ($f(m*)$ is large), then a large home equity to wealth ratio makes insurance unattractive relative to Medicaid.

A natural way around this problem would be to identify consumers for whom $f(m*)$ is likely to be small; that is, those who are unlikely to find themselves using Medicaid. A natural idea is to compare those with high wealth to those with low wealth. At high wealth levels, future Medicaid use should be unlikely, so the Medicaid effect $-f(m*)\left[z_2-z_1\right]\left[v'-z_1\right]$ should be small. To see the identification problem and the validity of isolating the consumption smoothing effect of home equity on LTCI by focusing on high wealth households, consider the following regression:

$$\begin{aligned} Medicaid_{i,2004} =& \beta_0+\beta_1\text{Large Ratio}_{i,1993}+\beta_2\text{Large Wealth}_{i,1993}+ \\ & \beta_3\text{Large Ratio}_{i,1993}\times\text{Large Wealth}_{i,1993}+u_i \end{aligned} \tag{4}$$

Equation (4) describes a regression of Medicaid usage for individual i in the 2004 wave of the HRS on financial characteristics of individual i in the 1993/1994 wave. Large Ratio indicates that a household's home equity to total wealth ratio is larger than the population median (.50 in 1993/1994 and .53 in 2004). Large Wealth implies that total wealth is greater than the population median (approximately 180,000 in 1993/1994 and 250,000 in 2004). Because equation (4) is "saturated" with indicator variables and given the need to cluster standard errors at the household level, I report a linear probability estimate (least squares with robust, clustered standard errors).[4] Qualitatively similar results are obtained in logit and probit models with lower confidence. Summary statistics for equation (4) are reported in the top panel of Table 4.

Throughout, I confine the HRS data to retired homeowners. Income has different economic meaning for workers and retirees, and retirement is a common time to move and thereby liquidate home equity. Renters are excluded because they are much poorer: a zero value for the home equity to home value ratio is economically very different from a small positive value. I use multiple observations per household with clustered standard errors because there is considerable variation in reported LTCI status within households.

Table 2 reports results of estimating equation (4). Column (1) estimates the unconditional effect of being in the top half of the home equity to wealth distribution (Large Ratio) in 1993/1994 on being on Medicaid in 2004, conditional on being alive and retired in 2004. We find a significantly positive effect. Column (2) shows that the significantly positive effect of a large home equity ratio on Medicaid takeup is confined to those with low wealth. In the higher half of the distribution (for whom the indicator Large Wealth is equal to one instead of zero), the estimated linear effect is equal to .0472 - .030 = .014, insignificantly different from zero. In column (3), we find that conditioning on inverse wealth and income, interacted with wealth quantile further reduces the estimated effect of a large home equity to wealth ratio on Medicaid to less than one percent, but standard errors are large. [5]

[4]See Wooldridge (2002).

[5]Sample sizes are too small to estimate the effect of high 1993/1994 home equity or total wealth on

Table 2: Estimates of the effect of having a large home value to total wealth ratio in the 1993/1994 HRS wave on being on Medicaid in 2004

	(1)	(2)	(3)
(Intercept)	0.0152**	0.038**	0.0574**
	(0.0019)	(0.006)	(0.0128)
Large Ratio	0.0537**	0.0472**	0.0413**
	(0.0045)	(0.0079)	(0.0084)
Large Wealth		-0.0303**	-0.0555**
		(0.0062)	(0.0133)
Large Ratio × Large Wealth		-0.0345**	-0.0315**
		(0.0092)	(0.0095)
1/Wealth			85.9874*
			(45.9963)
Income			-4e-07
			(3e-07)
Income/Wealth			-0.0065**
			(0.0027)
Large Wealth/Wealth			2632.372*
			(1149.133)
Large Wealth × Income			4e-07
			(3e-07)
Large Wealth × Income/Wealth			-0.006
			(0.0066)
Functional Form	Linear	Linear	Linear
Degrees of Freedom	6,295	6,293	6,287
Intercept	0.0137**	0.0279**	0.047**

Notes: Robust standard errors clustered on households in parentheses. Multiple observations within households are included because some households have different members with different LTCI and Medicaid status. * Significant at 5%, ** at 1%.

Table 3 presents estimates of regressions of the form:

$$\text{LTCI}_{i,04} = \left[\text{Large Ratio}_{i,04} + \frac{1}{\text{Wealth}_{04}} + \text{Income}_{i,04} + \frac{\text{Income}}{\text{Wealth}}_{i,04}\right] \times \text{Large Wealth}_{i,04}\eta + x_{i,04}\gamma + u_{i,04}. \quad (5)$$

In equation (5), LTCI indicates any private long term care insurance. Note that this equation estimates 2004 insurance holding on *2004* characteristics. Right hand side variables x other than the wealth and income polynomials and interactions are: an indicator for whether or not the respondent and their spouse are both retired, indicators for the respondent's gender and marital status, a set of eleven indicators for different geographical regions, indicators for different levels of self-reported health status, a continuous control for age, and the respondent's continuous estimate of the probability of leaving a bequest of at least $100,000. Some of these variables are summarized in Table 4.

The fact that a large home equity ratio is not associated with Medicaid status among the wealthy allows us to interpret a non-positive coefficient on the interaction of Large Ratio and Large Wealth as evidence that Medicaid is not the sole driver of the negative relationship between Large Ratio and LTCI coverage depicted in Figure 1. The income and wealth controls are included to address a second identification concern: the ratio of home equity to value falls on average with income and wealth, which themselves are associated with insurance demand.

Estimates of equation (5) are presented in Table 5. We find in column (1) that the probability of taking on LTCI is 13 percentage points lower for homeowners with large home equity to wealth ratios than for other homeowners. In column (2), we find that the negative effect is stronger among those with higher than median wealth.

In an unreported specification, adding only a full set of census region indicators has

Medicaid status conditional on being in a nursing home in 2004 separately for low and high wealth groups. Large Ratio has a significantly positive effect and Large Wealth a significantly negative effect.

very close to zero effect on the estimated coefficient on Large Value. Because there is some variation in mean housing prices across regions, this gives some comfort that we are finding an effect of housing quantity as modeled, as opposed to housing price.

In specification (3), demographic controls are added, as are: the inverse of wealth, income, and these variables interacted with each other and with the Large Wealth indicator. The difference in the effect of Large Ratio on LTCI is no longer statistically different between those with large and small total wealth. The main effect is significantly negative, but of smaller magnitude than in the uncontrolled specification (1). We now find that having a large ratio of home equity to total wealth is associated with a reduction in LTCI probability of 4.2 percent. Importantly, adding higher order terms in inverse wealth and income alone and interacted with Large Wealth has no effect on the coefficients on Large Ratio. The natural conclusions are that (1) the effect of a large ratio of home equity on LTCI coverage are roughly equal across wealth groups and (2) this negative effect derives in part, but not entirely from a negative relationship between the ratio and wealth, which in turn is positively associated with LTCI demand at lower wealth levels.

Specifications (4) and (5) include identical variables to those included in specification (3), but involve different functional forms. Column (4) summarizes a probit estimation. We find that the insignificant difference in the effect of Large Ratio on LTCI between high and low wealth retirees becomes positive, rather than negative. This is because the probability of LTCI is much greater among the high wealth group. In the proportional probit form, equal absolute effects on LTCI coverage imply a lower marginal effect for the wealthy.

Specification (5) is again a linear probability model, but Large Ratio is replaced with a continuous measure of the ratio of home equity to total wealth. The coefficient on the Ratio(cont.) implies that a ten percent increase in the ratio of home equity to total wealth would be associated with a roughly one percent decrease in the probability of taking on LTCI. We find an insignificantly more negative linear effect among the wealthy.

Confining the data to smaller groups, in a regression of 2004 Medicaid status on income

Table 3: Regression estimates of the effect of a large home value to wealth ratio on holding long term care insurance

	(1)	(2)	(3)	(4)	(5)
Intercept	0.2184**	0.1193**	0.1382	-1.1173	0.1756
	(0.0089)	(0.0134)	(0.2096)	(0.6951)	(0.2079)
Large Ratio	-0.129**	-0.0541**	-0.0421**	-0.2695**	
	(0.0107)	(0.0146)	(0.0146)	(0.0841)	
Large Wealth		0.1343**	0.1247**	0.4353**	0.1156**
		(0.0173)	(0.0301)	(0.1178)	(0.0338)
Large Ratio×Large Wealth		-0.0414*	-0.0106	0.0888	
		(0.0238)	(0.0245)	(0.1142)	
Ratio(cont.)					-0.0928**
					(0.0237)
Ratio(cont.)×Large Wealth					-0.0312
					(0.0435)
Degrees of Freedom	4,688	4,686	4,661	4,661	4,661
Demographics	No	No	Yes	Yes	Yes
Functional Form	Linear	Linear	Linear	Probit	Linear
Income and Wealth Interactions with Large Wealth?	No	No	Yes	Yes	Yes

Notes: Robust standard errors clustered on households in parentheses. Multiple observations within households are included because some households have different members with different LTCI and Medicaid status. The wealth and income polynomial includes the terms: the inverse of wealth, the level of wealth, the level of income, and income divided by wealth. These terms are included in levels and interacted with Large Wealth in specifications (3) through (5). Large Ratio indicates a home equity to total wealth ratio greater than the population median (.53). Large Wealth indicates total wealth greater than the population median ($250,000). Ratio(cont.) is the continuous measure of home equity to total wealth. Demographic variables included in all specifications except (1) and (2) are: the estimated probability of leaving $100,000 in bequest to heirs, age, and indicators for: self-reported health status, census region, marital status, and sex.

interacted with the inverse wealth and Large Ratio, we find a coefficient of .6 percent when the regression is confined to those in the top third of the wealth distribution in 1993/1994 and -.5 percent when the regression is confined to those in the top quartile. Considering the effect of a 2004 Large Ratio on 2004 LTCI, the conditional effect (with all demographics) is -4.6 percent for the top half of the 2004 wealth distribution, -4.8 percent for the top third, and -5.6 percent for the top quarter. We thus find an increasingly negative effect of the home equity ratio on LTCI despite a weakening and even insignificantly negative effect of the ratio on Medicaid status.

4 Conclusion

Both in theory and in the HRS, a high ratio of home equity to total wealth is associated with reduced demand for LTCI. Conditional on wealth and income, this effect has roughly equal strength among those wealthier and poorer than average. At the lower end of the wealth distribution, the negative relationship between LTCI and the home equity to wealth ratio likely relates to the choice between Medicaid and LTCI. At the higher end of the wealth distribution, however, Medicaid take-up is infrequent and the relationship between Medicaid and the home equity ratio is small and insignificantly different from zero. Because the relationship between the home equity ratio and LTCI is no less negative among the wealthy, it is reasonable to interpret the negative effect of home equity conditional on wealth and income as suggested in the Introduction. Home equity spent mostly in the event of long term care acts as a form of self insurance that crowds out demand for private insurance.

In the narrow context of the LTCI industry, the results suggest that expanding demand may require simultaneously expanding demand for home equity extraction among the elderly, an idea that has been put forward by Ahlstrom et al. (2004). Eliminating Medicaid might well fail to spur demand for LTCI, as lower wealth households have particularly large home equity shares of wealth.

More broadly, the results illustrate how the illiquidity of housing can affect attitudes towards risk. If home price appreciation and longevity are important determinants of home equity extraction, then small changes to the model presented in section 2 would presumably show that demand for insurance against these risks can be smaller than in a world with fully liquid wealth. The effect of background risk on demand for home equity products such as reverse mortgages is likely more complicated. A final contribution is that we have new evidence that the elderly do not treat home equity and liquid assets as perfect substitutes.

Table 4: Summary Statistics

Retired Homeowners in the 2004 HRS with positive wealth					
Variable	Mean	Std. Dev.	Max	Min	Obs
LTCI	0.15	0.36	1	0	5,819
Ratio(cont.)	0.54	0.29	1	0	5,819
Married	0.67	0.47	1	0	5,819
Woman	0.53	0.5	1	0	5,819
Income	46,937	73,589	2,761,657	1	5,819
Wealth	497,918	1,468,192	77,225,000	500	5,819
Home Equity	167,732	304,990	12,000,000	50	5,819
Age	71.8	8.26	101	51	5,819
Homeowners with positive wealth in 1993/1994 alive in 2004					
Variable	Mean	Std. Dev.	Max	Min	Obs
Medicaid	0.04	0.2	1	0	9,054
Wealth	289,508	489,907	14,930,000	50	9,054
Income	54,967	84,716	3,224,860	0	9,054
Home Equity	93,004	119,829	4,800,000	75	9,054
Ratio(cont.)	0.5	0.5	1	0	9,054
In Nursing Home	0.03	0.16	1	0	9,054

Note: Data are from RAND's HRS dataset panel compilation.

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