Changing the Way the Elderly Live: Evidence from the Home Health Care Market in the United States

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Abstract

There is widespread variation across countries and over time in the fraction of the elderly population who live in "shared living arrangements," living with relatives or with friends rather than living alone or with a spouse. As the percentage of the elderly in the overall population of most countries continues to increase, understanding the factors driving the living arrangements of older persons is becoming increasingly important. In this paper, I examine how changing generosity of government health coverage of home health care visits to the elderly in the United States affected living arrangements. I exploit geographic variation in the Medicare Home Health Care reimbursement rate that arose as a result of legislation passed in 1997 to identify the impact of government coverage of home health care visits on the living arrangements of older Medicare beneficiaries. I find that less generous reimbursement policies lead to a greater fraction of elderly living in shared living arrangements. Baseline model estimates suggest that a decline in reimbursement of one visit per user leads to a 0.98 percent increase in the fraction of elderly Medicare beneficiaries living in shared living arrangements. When looking at Medicare beneficiaries between 65 and 80 years old, baseline model estimates suggest that a decline in reimbursement of one visit per user leads to an increase of 1.19 percent in the fraction of elderly living in shared living arrangements. The estimates imply that the law change had a large effect on shared living arrangements. One way to see this is to consider how the reimbursement change differentially affected living arrangements in the state that was most impacted by the law relative to the median state. My results imply that the law change caused the fraction of the elderly living in shared living arrangements to increase by 8 percent more in the most impacted state relative to the increase in the median state.

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1 Introduction

Large fractions of the elderly populations of many developed countries live in "shared living arrangements", where they live with other relatives or with friends rather than living alone or with a spouse (See Table 1). One of the most common explanations for the movement of an elderly individual into a shared living arrangement is a decline in health that leads the elderly person to increasingly rely upon regular care.

Table 1 shows large cross country variation in the fraction of older individuals that live in shared living arrangements. Several factors might explain these differences, including diverse cultural norms associated with intergenerational living arrangements (UN, 2005). Moreover, Table 1 shows that there is a negative relationship between the fraction of elderly that live in shared living arrangements and the share of resources that a country devotes to home health care services. This evidence seems to suggest that formal home health care may substitute, at least in part, for informal care provided by family members and friends and might be responsible for allowing a larger fraction of the elderly population to live independently.

Trying to establish a causal relationship between the provision of formal and informal care is important because government support for home health care is expensive (Table 1), and the aging population has raised policy makers' worries about the affordability of publicly provided home health care services (Herrera et al., 2003, OECD, 2005).

This paper tries to provide an estimate of the substitutability between formal and informal care by looking at the United States, where government provision of home health care for the elderly through the Medicare program has varied widely over time. More specifically, I examine the impact of a sharp decline in the provision of formal home health care, which resulted from a change in Medicare home care reimbursement, on the fraction of elderly in the United States that live in shared living arrangements. In principle, changes in formal home health care can impact the provision of informal care without varying living arrangements, but this is very difficult to measure empirically. Moreover, it is presumably easier and less expensive to provide informal care if the elderly person needing care lives under the same roof as their informal caregivers.

Therefore, here I focus on examining the causal relationship between the provision of formal home health care and the fraction of elderly living in a shared living arrangement as one dimension of substituting between formal and informal care. To investigate the impact of the Medicare reimbursement change on the fraction of older Medicare beneficiaries living in shared living arrangements, I use a policy change introduced in 1997, which imposed a cap on the average reimbursement per patient that home care agencies were entitled to receive when treating elderly Medicare patients. The cap was based on a blend of each home health agency's average per patient cost in 1994 and the average per patient cost of home health agencies in the agency's census division. Because the cap had a regional component, even states with similar pre-policy utilization potentially faced different restrictive reimbursement limits depending on their utilization relative to the average utilization in their census division. For example, agencies in Georgia and Oklahoma provided similar average amounts of care to their users before 1997, but agencies in Georgia faced a more restrictive cap as a result of the 1997 change than did agencies in Oklahoma, because the regional average per patient cost in the South Atlantic census division prior to the law change was lower than the regional average in the West South Central census division.[1]

The peculiar reimbursement mechanism introduced by the policy change allows me to exploit the variation across time and across states to estimate a reduced form equation to identify the impact of the cap on the fraction of the elderly that live in a shared living arrangement. By relying on an exogenous source of variation in reimbursements this study improves upon the previous literature that used potentially endogenous policies (Hoeger, Picone and Sloan, 1997; Coyte and Stabile, 2001) targeted towards selected populations of elderly (Applebaum, 1988). To my knowledge, this is first study that uses a quasi experiment to estimate the impact of home care policies on living arrangements by looking at all of the non-institutionalized population of elderly in a country.

In the last part of this paper, I combine my reduced form estimate and McKnight's (2004, 2006) estimate of the impact of the reimbursement change on the number of Medicare home health care visits

[1] This example is taken from McKnight, (2004, 2006).

received by Medicare beneficiaries to provide a structural estimate of the impact of the number of Medicare home care visits on the fraction of older Medicare beneficiaries that live in shared living arrangements.

2 Literature Review

A number of papers by economists have attempted to study the role that in-kind benefits in the form of home care play in the choice of living arrangement. Probably the most comprehensive study using non experimental evidence is the one by Hoerger, Picone and Sloan (1996) that use data from the National Long Term care Survey conducted by the Census Bureau in 1989 on a population of elderly that needed help in one of more activities of daily living. [2] Both elderly in the community and those residing in institutions are part of the sample. The authors have information on Medicaid eligibility subsidies, number of nursing home beds, state subsidies of formal care in the community and public cash payments to relatives and friends for care giving at a single point in time. They use a multinomial probit model to estimate the impact of the state policies on the probability that a disabled elderly person lives independently, in an intergenerational household, or enters a nursing home. When considering home health care, the authors find that the availability of local Medicaid[3] subsidies for home health care had no effect on nursing home entrance, while it increased the probability that elderly live independently.

Although the paper is very detailed, it also presents some limitations. Two points seem worth noting. First of all, Medicaid home health care is available only to selected poor elderly. Therefore, findings for this group cannot be generalized to all the population of older individuals. Moreover, the study focuses on a reimbursement policy that is a function of unobservable characteristics of the elderly that likely impact their living arrangements. More specifically, Medicaid home and community based services are in part financed by state resources and thus are dependent on resource availability not just medical needs. In fact, there is big variation in the level of physical impairment required to be considered eligible to receive Medicaid home and community based services. It follows that, if beneficiaries in richer states are also

[2] Activities of daily living include bathing, dressing, toileting, transferring and eating.
[3] A brief description of Medicaid home health care is provided in section 6.3.

healthier on average than beneficiaries in poorer states, the finding that higher expenditures are associated with a higher percentage of elderly living independently might be due to the selection of healthier individuals into richer states rather than to the home care benefit itself.

A more recent paper using Canadian data by Coyte and Stabile (2001) looks at the impact of publicly-provided home care benefits on informal care using repeated cross sections, but the impact on living arrangements is not studied. The reliance on comparing different Canadian provinces that self-select the level of care provided makes the paper subject to the same criticism as Hoerger, Picone and Sloan (1996). When looking at papers using experimental evidence, most studies rely on the National Long Term Care (Channeling) Demonstration Project financed by the Department of Health and Human Services in the 1980s. The goal of Channeling was to see whether home and community based services could be a cost effective alternative to institutionalization. The sample included individuals that were at least 65 years old and particularly frail. The average age was 79 and most of the participants in Channeling had multiple functional limitations. Moreover, 19% of the sample needed help with all activities of daily living. People that took part in the experiment were also particularly poor. Two interventions were tested: one "basic" intervention that provided limited funding and a "financial" intervention that substantially expanded the set of home care services provided.

Christianson (1988) compares sample means and for the "financial" intervention finds that a 5% increase in the percent receiving in-home formal services was associated with a 1% point decrease in the percent receiving any informal care. Housework/laundry/shopping services, meal preparation and personal care were the measures of informal home care used to carry out the analysis. Pezzin, Kemper and Reschovsky (1996) used an ordered probit model on the data from Channeling and found that the financial intervention increased the probability of living alone for an unmarried individual by 7.1 percentage points.

The main criticism these studies are subject to is that the subpopulation studied was particularly selected, even when considering a subpopulation of elderly at the national level with the same functional limitations typical of Channeling participants. In particular, by using the National Long Term Care Survey, it has been shown that on a national level elderly that would have met Channeling functional limitation

criteria were much less likely than Channeling participants to live alone (Applebaum, 1988). Therefore, if Channeling participants were also less likely to change their living arrangements than a population of similarly impaired individuals at the national level, it follows that it is difficult to think about how to generalize the results from the experiment.

3 Background on Medicare and Medicare Home Health Care Reimbursement Change

Medicare was enacted by Congress in the United States in 1965 to meet the health insurance needs of the elderly and the disabled. During the time period considered by this study, Medicare consisted of three parts: hospital insurance, known as Part A, a supplementary medical insurance, known as part B, and a third part, known as Part C, which expanded beneficiaries' options for participating in private-sector health care plans.[4] Medicare Part A is provided automatically and free of charge to people 65 or older that are eligible to receive Social Security or Railroad Retirement Benefits,[5] whether they are claiming these monthly benefits or not. Part A covers inpatient hospital care, short-term skilled nursing facilities services, hospice care, and home health care.

Medicare home health care consists of health care services provided in the home of eligible Medicare patients through periodic visits. More precisely, Medicare home care covers six health care services: skilled nursing, physical therapy, occupational therapy, speech therapy, medical social work and home health aide.[6] In order to be eligible to receive Medicare home health care, Medicare beneficiaries need

[4] In January 2006, Medicare Part D went into effect that allowed seniors for the first time to enroll in a Medicare-sponsored prescription drug plan.

[5] Medicare does not only cover all elderly 65+ that are eligible to receive social security benefits. Through time Congress expanded eligibility also to other categories. For a more comprehensive description of coverage see Health Care Financing Administration (2000).

[6] According to the definition of occupations that is given by the Bureau of Labor Statistics at http://www.bls.gov/soc/soc_j0a0.htm, occupational therapists "assess, plan, organize, and participate in rehabilitative programs that help restore vocational, homemaking, and daily living skills, as well as general independence, to disabled persons". Physical therapists "Assess, plan, organize, and participate in rehabilitative programs that improve mobility, relieve pain, increase strength, and decrease or prevent deformity of patients suffering from disease or injury." Speech therapists "Assess and treat persons with speech, language, voice, and fluency disorders. May select alternative communication systems and teach their use. May perform research related to speech and language problems. "Medical social workers," according to Stanford School of Medicine, (at this web-site: http://smysp.stanford.edu/students/profiles/med_social_worker.html) "assist patients and their families with health-related problems and concerns. They lead support group discussions, help patients locate appropriate health

to be "home-bound" and in need of "intermittent" and "part-time"[7] skilled nursing, occupational or speech therapy. Also, patients need to be under the care of a physician in charge of prescribing and periodically reviewing the plan of care. Home health agencies are the providers that furnish home health care visits. In order to receive Medicare certification and therefore be eligible to receive Medicare reimbursement for the visits provided, home health agencies need to fulfill a series of administrative requirements that have the purpose of assuring a minimum quality of service.[8]

Home health agencies represent the agents that are directly impacted by any Medicare reimbursement change. Because of this, and in order to better frame the home health care environment that led to the reimbursement change focus of this paper, it is useful to describe the reimbursement mechanism in place before 1997 as well as the incentives it created.

The Medicare reimbursement mechanism that home health agencies were entitled to receive in the period before the policy change studied in this paper was set in 1989. Before 1989, Medicare home health care visits were subject to an annual limit and could be provided only after hospitalization. The rules enacted in 1989 significantly changed the previous regulations by eliminating the post-hospitalization requirement and the limit to the annual number of visits per user. Each home health agency only faced a limit on the maximum reimbursement for each type of visit, with the most skilled visits reimbursed at a higher rate than the lower skilled ones. However, the per visit reimbursement limit was not enough to contain the amount of services provided, because with this reimbursement scheme, each agency had the incentive to minimizing the intensity of care per visit and to increase the number of visits per patient. In fact, aggregate data show that the number of visits per beneficiary went from 1.14 in 1988 to 7.8 in 1996.

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care and other health services, and provide support to patients with serious or chronic illnesses. They help patients and their families find important resources they need to overcome unhealthy conditions such as child abuse, homelessness and drug abuse. They also help patients with finding legal resources and financial aid for paying for health services." " Home health aides performs personal care services, such as assistance with eating, bathing, and toileting; simple surgical dressing changes; assistance with certain medications; activities to support skilled therapy services; and routine care of prosthetic and orthotic devices", United States General Accounting Office, 2003.

[7] Health Care Financing Administration, 2000.

[8] These requirements are targeted towards assuring that the service is provided by qualified personnel. Moreover, there are requirements related to information disclosure to patients about their rights. Agencies must also record their data using a special software provided by the Center for Medicare Services. The list of requirements for Medicare Certification is to be found at :http://www.doh.wa.gov/hsqa/fsl/HHHACS_HomeHealth.htm.

This increase in the number of visits per beneficiary was due to two factors. The first is represented by the increase in the number of visits per user that went from 24 in 1988 to 74 in 1996. Moreover, without the requirement of providing services only after hospitalization, agencies could serve a larger population of Medicare Beneficiaries. This led to an increase in the fraction of Medicare beneficiaries that used the service from 4.9% in 1988 to 10.7 % in 1996.

The expansion in the provision of services since 1989 was accompanied by a sky-rocking increase in Medicare Home health Care expenditure that went from $1.94 billions in 1988 to $16.76 billions in 1996.[9] The average payment per Medicare beneficiary on Medicare Home health care went $72 in 1989 to $497 in 1996, and the payment per person served went from $1410 in 1989 to $4660 in 1996. The number of providers went from 5695 in 1990 to 10127 in 1996. This growth in such a short period of time was without precedent. [10]

This very quick and large growth in spending for Medicare home health care did not pass unnoticed and raised critiques of the generous reimbursement considered responsible for favoring abuses. In particular, because home health care was originally intended to furnish a skilled nursing service (Mortaugh et al., 2003), the critiques were exacerbated by the disproportionate increase in the percentage of personal care visits provided by home health aides. In fact, home health aides' visits went from 33.6% of all home health care visits in 1988 to 48.9% of all Medicare home health care visits in 1996.[11] Because beneficiaries that need only personal care services are not eligible to receive Medicare home health care services, the increase in personal care visits raised suspicions that many people were provided a limited (and maybe unnecessary) number of skilled nursing visits in order to qualify for Medicare reimbursement of their personal care needs (McCall, Korb, Peterson and Moore, 2003).

[9] In nominal dollars.

[10] Data are from the National Association for Home Care and Hospice and can be found on the web at: http://www.nahc.org/Consumer/hcstats.html.

[11] In 1988 nursing care visits were accounting for 51.1% of all Medicare home care visits, and physical therapy represented 11.5% of the visits. The remaining disciplines accounted for 3.6% of the total number of visits. In 1996 nursing care accounted for 41.1% of the visits, physical therapy was 7.3% and the other disciplines were only 2.7% of the total number of visits.

To address concerns over the increasing expenditures, Congress in 1997 enacted the Balanced Budget Act. The change introduced by the law involved two steps. First, from 1997 to 2000, an Interim Payment System was established that put a cap on how much each home care agency would be reimbursed per patient per year. The cap had two parts: 75% of the value was based on each agency's 1994 average per patient cost and 25% was based on the average per patient cost of the agency's census division.[12] The second step started in October 2000 when the Interim Payment System was changed to the Prospective Payment System (PPS) that is still in place. Under PPS, a home care agency receives a single payment for all items and services furnished during each 60-day episode of care. The payment rate is based on the national average cost of providing care in 1997, not on actual home health agency cost. To account for differences in beneficiary needs, PPS reimbursements are adjusted from a base rate.

In this paper, I concentrate on the first change in reimbursement, the Interim Payment System. The per visit reimbursement limit stayed in place after the Interim Payment System was implemented, so providers continued to have the incentive to minimize the intensity of care provided during each visit. However, the imposition of an average per patient cap created new incentives that are formally modeled by McKnight (2004). The author shows that imposing a limit on average reimbursement per user creates the incentive for agencies not to treat patients with long-term care needs.

In line with the predictions of theory, empirical results (McKnight, 2004, 2006) show that the Interim Payment System caused a drop in the average number of visits per Medicare beneficiary between 1996 and 1999 equal to 3.3.[13] With the average per patient visit cost of $63 in 1996, the value of the in-kind

[12] A Census division is a cluster of states. There are in total 10 Census divisions: the New England division (Connecticut ,Maine, Massachusetts, New Hampshire, Rhode Island, Vermont), Middle Atlantic (New Jersey, New York and Pennsylvania), the East North Central division (Illinois, Indiana, Michigan, Ohio, Wisconsin) the West North Central division (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota), the South Atlantic division (Delaware, District of Columbia, Florida, Georgia, Maryland , North Carolina, South Carolina, Virginia, West Virginia), the East South Central division (Alabama, Kentucky, Mississippi and Tennessee), the West South Central division (Arkansas, Louisiana, Oklahoma, Texas), the Mountain division (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming), the Pacific division (Alaska, California, Hawaii, Oregon, Washington).

[13] This number varies slightly depending on the specification chosen and it relies crucially on assuming that agencies facing a binding constraint after the Interim Payment System would exceed the cost limit by an average 12%. This number is taken from an estimate developed by the Health Care financing Administration based on 1999 data. In this

benefit that Medicare beneficiaries received after the policy change declined by $207. Because of the incentive to select relatively healthy patients, the decline in the number of visits per beneficiary should be due to both a decline in the fraction of Medicare beneficiaries that used the service and by a decline in the number of visits per user. In fact, the fraction of Medicare beneficiaries that used the service went from 10.7% in 1996 to 8.5% in 1999. Also, between 1996 and 1999 the number of visits per user went from 74 to 42. These downward trends in use were reflected in the decline in aggregate expenditure on Medicare home health care that went from $16.75 billion in 1996 to $7.93 billion in 1999. [14]

There is some evidence that the decline affected services that were considered valuable by Medicare Beneficiaries. In fact, empirical work by McKnight (2004, 2006) finds that beneficiaries with income above the poverty line increased their out-of-pocket expenditures on home care visit after the policy change.

However, somewhat surprisingly, McKnight (2006) does not find evidence indicating that the decline in the provision of Home Health Care had an adverse impact on the health of elderly Medicare beneficiaries.[15] McKnight's findings that home health care visits dropped substantially but elderly's health did not are puzzling. However, because informal care by friends or family members may be a reasonable substitute for part of the services covered by home health care, in particular home health aide services, it is possible that the elderly were able to substitute enough toward informal care to prevent measurable adverse health outcomes.[16] To further support this hypothesis, it is worth recalling that home health aide visits, the type of visits that can be considered the most direct substitute of informal care, represented 48.9% of the total number of visits in the pre policy period. Moreover, home health aides visits were the ones that experienced the largest drop, representing only 34.3% of the total number of home health visits in 1999.

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paper, I adopt a different framework for interpreting my results that uses the cross state measure of reimbursement generosity developed by McKnight (2004) and explained in section 4.

[14] In nominal dollars.

[15] Several health measures were used to check this possibility: mortality, Body Mass Index, difficulty with stooping or kneeling, lifting 10 pounds and walking 2-3 blocks (McKnight, 2004, 2006).

[16] Another possibility is that measures of health, other than those measured by McKnight (2004, 2006) were affected. Unfortunately, there is not much evidence that addresses this possibility.

Both theories of altruism and bargaining models of family decision making (Light and McGarry, 2003) suggest that informal care should increase when formal care does not meet the needs of the elderly. More specifically, in models of altruism children's utility function is increasing in elderly's parents well being, suggesting that the children should increase their transfers to the elderly facing adverse shocks. Bargaining models (Browning and Chiappori, 1998; Pezzin, Pollack and Schone, 2006), on the other hand, suggest that children are willing to increase informal care if induced to do so by increased transfers from the elderly. In this situation, an increase in informal care should be accompanied by an increase in *inter vivos* transfers or in changed pattern of bequests.

4 Empirical Framework

4.1 A Measure that Captures the Cross-State Variation Introduced by the Balanced Budget Act

After the policy change introduced by the Balanced Budget Act in 1997, in all 50 states the fraction of Medicare beneficiaries receiving Medicare home health care decreased sharply, and the average number of yearly visits per user plummeted.

In this paper, the outcome variable of interest is the fraction of elderly Medicare beneficiaries 65 years of age or older that live in shared living arrangements, *i.e.* that live with somebody else besides the spouse if married or with somebody else if unmarried.[17] In the empirical model outlined in the next section, the time series component of the decline in the number of visits per beneficiary after the policy change is captured by inserting year dummies in the equation that models the impact of the Interim Payment System on the fraction of elderly that live in a shared living arrangement.

However, the peculiar way the Balanced Budget Act defines the new reimbursement scheme can be used to construct a measure that captures a cross-state component of the variation implied by the Interim Payment System. McKnight (2004, 2006) constructs this measure to identify the impact of the Interim

[17] As in Gruber, Engelhardt and Perry,(2005).

Payment System introduced in 1997 by the Balanced Budget Act on the number of Medicare home care visits received by Medicare beneficiaries.

Here, I use the same measure to identify the impact of the Interim Payment System on the fraction of elderly Medicare beneficiaries that live in shared living arrangements.

The measure can be constructed by noticing that the census division component of the per patient limit creates exogenous cross-agency variation. This can be seen considering two agencies, one that has an average per patient cost in 1994 above the average per patient cost in its census division and another that has a per patient cost in 1994 below the average per patient cost in its census division. Because part of the reimbursement limit is based on the census division utilization, the first agency faces a more restrictive constraint.

It is worth stressing that, because of the generalized increase in the provision of services between 1994 and 1997, it is *likely* to expect that the limit is too restrictive also for the second agency, despite that its average per patient cost of treating Medicare patients is below the average per patient cost of treating patients in its census division.

Ideally, in order to be able to use this cross agency variation introduced by the reimbursement mechanism, I would need to have access to information on cost at the single agency level. Unfortunately, as McKnight (2004, 2006), I do not have access to these data. Instead, I have access to Medicare home health care utilization data aggregated at the state and census division level. With these data, I follow McKnight's (2004, 2006) suggestion that the reasoning applied to individual agencies should be valid, on average, when aggregating data at the state level. Therefore, with similar increasing trends between 1994 and 1997, states where aggregate home health agencies have below census division average per patient cost in 1994 face a limit in reimbursement that is less restrictive than the limit faced by states where, on average, the average per patient cost in 1994 is above the average per patient cost in their census division.

To create the variable used by McKnight (2004, 2006) to capture the cross state variation in reimbursement I need to use a measure of cost. Here I follow McKnight and identify the average number of

visits per user as the most appropriate measure of cost to use.[18] More formally, McKnight (2004, 2006) defines the following measure of restriction in reimbursement generosity:

(1) $\text{Restrictiveness}_{sc} = \bar{A}_S - \bar{A}_C$

where $\bar{A}_S$ is the average number of Medicare home care visits per user in 1994 in state s and $\bar{A}_C$ is the average number of Medicare home care visits per user in 1994 in state s' s census division. The restrictiveness measure is between -40.9 (Kentucky) and 34.7 (Utah).

Was the cap imposed by the Interim Payment System restrictive for those states with a negative $\text{Restrictiveness}_{sc}$? There are two reasons to think that this was indeed the case.

First, the cap imposed by the Interim Payment System was based upon utilization levels in 1994 and between 1994 and 1997 there was a generalized increase in average Medicare home health care utilization even in states with a negative measure. To better illustrate this point, I constructed the cap for all states and compare utilization levels in each state in 1996 with the cap. There are 33 states with a negative $\text{Restrictiveness}_{sc}$ measure. Only 9 of these in 1996 were providing an average number of visits below the cap.

However, it is very likely that the cap was binding also in these 9 states, because the cap is based on *average* utilization levels in each state. An example might be useful to illustrate this point. I consider a hypothetical state, state s. For simplicity, I assume that state s is in a census division that in 1994 was providing, on average, 25 visits per user. I also assume that in state s there are only three agencies that are treating the same number of patients. I suppose that in 1994 the three agencies provided 10, 20 and 30 visits per patient, respectively, an average of 20 visits per patient. I also assume that the three agencies in 1996 provided and 12, 22 and 32, visits per patient, respectively, an average of 22 visits per patients in the state in 1996. The average restrictiveness measure in this state is -5. The maximum reimbursement limit implied by the cap for agencies state s is 13.75, 21.25, 28.75,[19] respectively, an average of 21.25 visits per patient in the state. Therefore, even if, on average, the cap is not binding, one agency is constrained and has to comply with the cap by decreasing the number of visits per patient. The result of the compliance with the cap is going to be

[18] The reasons are due to the functioning of the indexing of the Medicare reimbursement across different localities. Appendix 1 goes more in detail in explaining why the average number of visits per user has been used here.

[19] 0.75*10+0.25*25=13.75, 0.75*20+0.25*25=21.25, 0.75*30+0.25*25= 28.75.

a decline in the average number of visits per patient in the post policy period in state s. Unfortunately, I do not have data at the state level that allows me to verify that in every state with a negative restrictiveness measure and with average utilization levels in 1996 below the caps there were constrained agencies.

However, there are 2 facts that support the idea that this was the case. First of all, after the policy change in all states (included the 9 states that on average did not find the cap binding) there was a decline in the number of visits per user and in the number of users per 1000 beneficiaries that is consistent with the idea that constrained agencies had to comply with the cap by reducing the average number of visits per user. Second, even if the cap was, on average, below utilization levels in 1996, average utilization levels were really close to the limit. For example, utilization levels in 1996 in Oregon were 4.9 visits below the cap, those in Montana were 1.6 visits below the cap, etc.[20] So it seems plausible to assume the existence of providers constrained by the cap. This suggests that in those states where average number of visits per user in 1996 was above the cap restricted providers had the largest share of the market,[21] whereas in those states where the average number of visits per user in 1996 was below the cap the constrained providers were those with the smaller share of the market.

I put together both the cross state component and the time series component of the policy change in Figures 2 and 3, that are similar to McKnight's (2004, 2006) graphs. To construct the Figures, I divided states in three groups based on the restrictiveness measure implied by Equation 1. States identified as low restricted states are states that have the lowest measure of restriction as defined in Equation 1 and where about 20% of the total population lives. States identified as high restricted states are those with the highest measure of restriction as defined by Equation 1 and where about 20% of the total population lives.[22] The remaining states are defined as medium restricted states.

[20] The other states are: Nevada, 2 visits below the cap, Arkansas 3.5 visits below the cap, Kentucky 5 visits below the cap, Maryland 7 visits below the cap, North Carolina 4.2 visits below the cap and South Carolina 1.3 visits below the cap.

[21] In fact, it is plausible to imagine that even in the states where the average number of visits per user in 1996 is above the cap there are non constrained providers.

[22] On average, according to March CPS data, during 1988-2001. A description of CPS data is provided in section 5.

Figures 2 and 3 show four facts: first, as previously anticipated, in all states there was an increase in Medicare home health care utilization between 1994 and 1997. Moreover, trends were very similar in the three types of states. Also, all states experienced a decline in utilization in the post policy period. Finally, the drop in visits per user and the drop in the number of users per 1,000 Medicare beneficiaries in the post policy period are much more severe for the high restricted states. [23] The graphs are the visual representation of the estimation strategy used by McKnight (2004, 2006) to study the impact of the Interim Payment System on the number of home care visits received by Medicare beneficiaries. This strategy is illustrated more in detail in the next section.

4.2 Structural Framework

This section outlines the 3 equations that form the empirical framework of this paper. The first equation looks at the impact of the number of home health care visits on the fraction of elderly living in shared living arrangements (structural equation). The second equation, estimated by McKnight (2004, 2006), models the impact of the reimbursement change on the number of home health care visits received by Medicare beneficiaries (first stage equation). Finally, the reduced form equation, the main focus of this paper, estimates the impact of the reimbursement change on the fraction of elderly Medicare beneficiaries that live in shared living arrangements.

More formally, the first equation, the structural equation, in its baseline specification can be written as:

$$y_{ist} = c_1 + c_2 n_{ist} + c_3 State_s + c_4 Year_t + \varepsilon_{ist} \quad (2)$$

where y_{ist} is a dummy equal to 1 when individual i in state s in year t lives in a shared living arrangement (Gruber, Engelhardt and Perry, 2005) . n_{ist} represents the number of Medicare home health care visits received by the elderly Medicare beneficiary i in state s in year t, $State_s$ and $Year_t$ are state and year dummies, respectively and ε_{ist} is the individual specific random error term. In this paper, I am interested in

[23] The hypothesis of absence of differential trends in visits has been addressed more formally by McKnight (2004, 2006).

testing whether c_2 is negative. In fact, this result would support the idea that home health care visits, by substituting for informal care, allow the elderly to live independently.

If the home health visits were randomly assigned in the population, then Equation 2 could be estimated with OLS.

However, it is plausible to think that omitted variables bias the OLS estimate of c_2. The direction of the bias is, in principle, unknown. A possible way to try to address this issue, and recover an unbiased estimate of c_2, is to use the policy change introduced by the Interim Payment System as an instrument for n_{it}. The exogenous variation created by the reimbursement change of Medicare home health Care in 1997 suggests that the law change variable, $Restrictiveness_{sc}$, interacted with a dummy variable equal to 1 in the post policy[24] period ($Post_t$) can be used as an instrument for the number of visits that an elderly receives.

There are two reasons that support the use of $Post_t$*$Restrictiveness_{sc}$ as an instrument for n_{ist}. First, it is plausible to assume that, once conditioning on other exogenous right hand side variables, like state and year dummies, $Post_t$*$Restrictiveness_{sc}$ it is orthogonal to the error term in Equation 2.This assumption seems the most appropriate in the context of the policy change studied in this paper. In particular, it seems unlikely that the reimbursement change has affected living arrangements through a decline in the intensity of care per visit. In fact, as the discussion in the previous section has recalled, each home health agency was subject to a per visit reimbursement limit even before the policy change studied here. Therefore, even before the introduction of the Interim Payment System every home health care agency had the incentive to minimize the intensity of care provided during each visit.

Moreover, $Post_t$*$Restrictiveness_{sc}$ seems a good candidate instrument for the number of Medicare home health care visits because the two variables are highly correlated. More precisely, McKnight (2004, 2006) found that $Post_t$*$Restrictiveness_{sc}$ had a statistically significant negative impact on the number of visits received by Medicare beneficiaries.

More formally, McKnight (2004, 2006) estimates the following baseline equation:

$$n_{ist} = h_1 + h_2 Post_t*Restrictiveness_{sc} + h_3 State_s + h_4 Year_t + \eta_{ist} \quad (3)$$

[24] Years 1998-2001.

where n_{ist} is the number of Medicare home health care visits received by individual i in state s during year t, $State_s$ and $Year_t$ are state and year dummies, respectively, and η_{ist} is the individual specific random error term. McKnight (2004, 2006) uses a difference in differences strategy to estimate Equation 3. The identifying assumption of McKnight's (2004,2006) model is that, absent the reimbursement change, and conditional on level differences in the number of visits, states with a higher restrictive measure and states with a less restrictive measure would have had the same trends in the number of visits provided to Medicare beneficiaries in the post policy period .

McKnight (2006) states that, "…the parameter h_2 measures the impact of living- during the post policy period- in a state that provided an additional one visit per user above the regional (census division)[25] during the pre-policy period."

However, it is possible to interpret the parameter h_2 as the impact of not reimbursing 0.25 additional visits per user in the post policy period. An example might prove useful in illustrating the reasoning beyond this interpretation. I consider 2 states, in the same census division C. I assume that the average number of visits per user in census division C and in state 2 in 1994 is equal to N-1. I also assume that the average number of visits per user in state 1 in 1994 is equal to N. Because from 1997 onwards states face a cap that is based for 25% on the average number of visits in each state's census division, starting in October 1997 state 1 is reimbursed at most N- 0.25 visits.[26] In other words, state 1, relatively to its 1994 level, is not reimbursed for 0.25 visits. On the other hand, state 2, from 1997 onwards, is reimbursed at most N-1 visits, all the visits provided in 1994. Both states faced similar increasing trends in Medicare use compared to their respective 1994 levels. More formally, the identifying assumption of lack of differential trends implies that state 1 in the post policy period faces a limit, compared to its average utilization, that is more restrictive (by a factor of 0.25 visits) than the one faced by state 2.

[25] The text in parenthesis is my addition.
[26] [0.75N+0.25(N-1)].

In other words, the parameter of interest gives the impact of precluding reimbursement of 0.25 additional visits per user, so, to recover the impact of not reimbursing one additional visit per user, h_2 must be multiplied by 4.

Unfortunately, there is not a single large dataset that contains information on both the number of visits received by Medicare Beneficiaries and living arrangement status. Because of this limitation, as explained more in detail in section 6, I need to use estimates coming from 2 different datasets. More precisely, in this paper I use March Current Population Survey data[27] to estimate the following reduced form equation:

$$y_{ist} = a_1 + a_2 Post_t * Restrictiveness_{sc} + a_3 State_s + a_4 Year_t + \upsilon_{ist} \quad (4)$$

Then, I recover a structural estimate of c_2 by combining my estimate of a_2 with McKnight's estimate of h_2 obtained by estimating Equation 3 with the Medicare Current Beneficiary Survey[28] . Implicit in estimating the reduced form Equation 4 is the assumption I make in the structural Equations 2 and 3, that tighter reimbursement limits for Medicare home care visits affect living arrangements through the decline in the provision of home care visits.

For estimating Equation 4, I compare the change in living arrangements in states that faced a more restrictive reimbursement limit with changes in living arrangements in states that face less restrictive reimbursement limits using a difference in differences methodology. To do this, I rely on the assumption that, absent the policy change, states with more restrictive limits and states with less restrictive ones would have had the same trends in living arrangements.

To investigate the plausibility of the assumption, I restrict the sample to years 1988 to 1997 and run a regression where, controlling for state and year effects, I test for the existence of differential trends in shared living arrangements across states with different restrictiveness measures. Column 1 of Table 3 shows that the coefficient of interest of a linear trend interacted with the restrictiveness measure is very small and

[27] Section 5 describes this dataset in more detail.
[28] A description of Medicare Current Beneficiary Survey Data can be found at: http://www.cms.hhs.gov/LimitedDataSets/11_MCBS.asp.

statistically insignificant. I estimate the model in Equation 4 using a linear probability model and clustering standard errors by state (Moulton 1990; Bertrand, Duflo and Mullainathan, 2004).

The parameter a_2 in the reduced form equation 4 identifies the impact of not reimbursing 0.25 additional visits per user on the fraction of elderly that live in shared living arrangements. By using the same reasoning applied to the interpretation of the parameter h_2, it is possible to recover the impact of not reimbursing one additional visit per user on the fraction of elderly that live in shared living arrangements by multiplying a_2 by 4.

5 Data

In order to estimate the reduced form Equation 4, I merge data from March Current Population Survey (CPS) from 1988 to 2001 with 1994 state level data on Medicare Home Care visits from the Health Care Financing Review Medicaid and Medicare Statistical Supplement. The CPS is a large nationally representative survey of 50,000 to 60,000 households that is conducted monthly by the Bureau of Labor Statistics. Every March, a demographic supplement is added to the basic monthly questionnaire.

Respondents are in the CPS for four, out for eight months, and then return to the sample for another four months, so there is a panel component in the CPS. Although the CPS does not contain detailed information for the full sample on health or health utilization (including the use of home health care), it is a very large sample that contains information on living arrangements.[29] It is in fact the availability of a large number of observations that make the CPS the most suitable dataset to estimate the reduced form Equation 4.

I begin my sample in March 1988, the year before the expansion occurred in 1989 and end it in March 2001. I use data until March 2001, despite the introduction of the Prospective Payment System in October 2000, because the living arrangements in March 2001 have been affected for the majority of the previous year by the Interim Payment System.

[29] It also allows me to identify the small fraction of elderly not enrolled in Medicare.

Table 2 presents summary statistics for the pooled sample and different marital status categories, and shows that married individuals are much less likely to live in a shared living arrangement. Moreover, Table 2 highlights that married individuals are more educated on average than everybody except the never married. They also tend to be disproportionately white.

6 Reduced-Form Estimation Results

6.1 Estimation Results

Table 4 to Table 9 present estimates of Equation 4. The point estimate of the parameter of interest of the baseline regression 4 is shown in the first row of Table 4, and it is statistically significant at the 5% level implying, under the identifying assumption of the model, that a decline in reimbursement of one visit per patient increases the fraction of elderly that live in shared living arrangement by 0.22 percentage points. Because 22.35% of the elderly in my sample live in a shared living arrangements, the parameter estimate implies a 0.98% increase in the fraction of elderly that live in shared living arrangements.

An example might prove useful to understanding the decline in the number of visits reimbursed that a policy change like the one studied here might imply. For this purpose, I use the cross-state distribution implied by the restrictiveness measure of Equation 1 to compare the decline in visits reimbursed in Georgia, a state that experienced a very restrictive reimbursement cap, with Pennsylvania, a state in the middle of the distribution. More specifically, Georgia in 1994 was providing 102 visits per user, 33 visits above the average number of visits per user in its census division. Pennsylvania, on the other hand, was providing 43 visits per user in 1994, the same average number of visits per user provided in its census division. Trends in the number of users per 1000 beneficiary and in the number of visits per user were very similar in the pre- policy period in Georgia and Pennsylvania, but Georgia from 1998 onwards is reimbursed for at most 93.75 visits per user,[30] implying a decline of 8.25 visits per user compared to its 1994 utilization level.

[30] 75% of the visits that it was providing in 1994 and 25% of the visits that were provided on average in Georgia's Census division, 0.75*102+0.25*69=93.75.

Pennsylvania, on the contrary, from 1998 onwards is reimbursed for all the 43 visits per user provided in 1994. Because utilization levels increased between 1994 and 1997 in both states, the reimbursement would be lower for both states, but the decline in reimbursement would be more pronounced, (by a factor of 8.25 visits per capita under the identifying assumptions), for Georgia. Within this framework, the point estimate of the parameter of interest in Table 4 suggests that a decline in reimbursement of 8.25 visits increases the fraction of elderly that live in a shared living arrangement by 1.82 percentage points,[31] an increase of 8.11% in the baseline fraction of elderly that live in a shared living arrangement.

In column 2 of Table 4 I add marital status dummies[32], as married individuals are less likely to live in shared living arrangements, maybe because the spouse acts as the first provider of informal care (Norton, 2001). The coefficient of the parameter of interest is smaller in this specification and implies that a decline in reimbursement of one visit per user increases the fraction of elderly Medicare beneficiaries that live in shared living arrangements by 0.19 percentage points. Also, a decline in reimbursement of 8.25 visits increase the fraction of elderly that live in shared living arrangements it by 1.57 percentage points. These numbers imply, respectively, an increase of 0.85% and 7% in the fraction of elderly that live in shared living arrangements. The inclusion of age dummies controls for different propensities to live alone by age as in Gruber, Enghelhardt and Perry (2005). The sex dummy allows to control for the sexual division of labor that suggests that men acquire a lower human capital than women in the production of household goods (Becker, 1991) in younger ages and therefore, everything else equal, are more likely than women to depend on somebody else's work inside the house. The race dummy is included to capture different cultural

[31] 0.0005516*4*100=0.22 gives the impact of not reimbursing one additional visit.0.22*8.25=1.82 gives the impact of not reimbursing 8.25 additional visits.

[32] It is possible to think that the policy change might impact marital status, as the decline in the provision of formal care creates an increased demand of informal care from the spouse. I tested for this possibility by running regressions with marital status categories as outcomes and I tried different specifications using as independent variables the $Post_t$*$Restrictiveness_{sc}$ and state and year dummies. Other specifications included age, education dummies and a race dummy. In no case I could reject the hypothesis of absence of impact of the policy change on marital status.

norms related to the choice of living arrangement.[33] In particular, whites are less likely than Asians and Blacks to live in intergenerational households (Kamo, 2000). This variable is also capturing, at least in part, the effect of the higher income and wealth of whites when compared to all other races together.

Column 3 of Table 4 adds age, sex and race dummies to the specification of column 2.

Because the literature on living arrangements of the elderly suggests that privacy is a normal good (Gruber, Engelhardt and Perry, 2005; Costa 1995, 1999), both the income effect and the cultural effect that the white dummy is picking up suggest that whites are less likely to live in a shared living arrangement. Consistent with expectations, the coefficient on the white dummy is negative and significant at 1% level.

The specification in column 4 of Table 4 controls for different intercepts by education. These variables are likely to pick up a direct positive effect of education on health (Cutler, Lleras-Muney, 2006) that increases ability to live independently and an indirect effect, due to the correlation between education and income, and education and wealth. The sign of the coefficients on the education dummies have the expected sign, although they are statistically significant only for people with a low education level (at most high school).

The estimate of the parameter of interest is always significant at the 5% level across all specifications, and its magnitude is not substantially altered. The most conservative estimate in column 4 of Table 4 suggests that a decline in reimbursement of one visit per user increases the fraction of elderly Medicare beneficiaries that live in shared living arrangement by 0.18 percentage points. Also, a decline in reimbursement of 8.25 visits per user increases the fraction of elderly that live in shared living arrangements by 1.48 percentage points. These numbers imply an increase of 0.8% and 6.64% in the fraction of elderly that live in a shared living arrangement, respectively.

[33] I included only one race dummy to minimize measurement error. Measurement error in race coding in the period under study is a possibility because the CPS changed in 1997 the way used to record race. Before 1997 respondents could declare to be in one of the following categories: White, Black, American Indian or Aleut Eskimo, Asian or Pacific Islander, Other. Starting in 1996 the category Other has been suppressed. This might have impacted, for example, the race coding for people of mixed race in an unknown manner. It is a possibility that this has changed the correlation between race and living arrangement for the least numerous races, Asians, American Indian and Aleut Eskimo. However, it is unlikely that the change has affected the correlation of race and living arrangements of whites relative to all other races bundled together.

In Table 5, I estimate the model specifications of Table 4 over people between 65 and 80 years old, because previous research (McKnight, 2004, 2006) suggested that heavy users of Medicare Home Care services are, on average, 76 years old.[34] The magnitude of the parameter of interest increases, implying that a decline in reimbursement of one visit per user increases the fraction of elderly Medicare beneficiary between 65 and 80 that live in a shared living arrangement between 0.23 and 0.26 percentage points, depending on the specification. In my sample, 21.84% of the elderly between 65 and 80 years old live in shared living arrangements, and therefore, the estimates of the parameter of interest in Table 5 imply an increase between 1.05% and 1.19% in the fraction of elderly that live in shared living arrangements.

In Table 6, I show estimates of the model on Medicare beneficiaries at least 80 years old. The parameter of interest is not significant for any specification used. This result might be simply driven by the smaller sample size of the oldest elderly.

In Table 7, I estimate the model on unmarried people between 65 and 80 years of age, that are more likely to be heavy users of Medicare Home care services (McKnight, 2004, 2006). The parameter of interest is significant at the 5% level across all different specifications for this group of beneficiaries, implying that a decline in reimbursement of one visit per user increases the fraction of elderly in this group that live in shared living arrangements by 0.45 percentage points. Because the percentage of unmarried elderly between 65 and 80 years old that live in shared living arrangements in my sample is equal to 30.37%, this estimate implies an increase of 1.48% in the fraction of elderly that live in shared living arrangements. I also estimated the model separately for men and women. The parameter of interest shown in the first row of Table 8 is significant only for the sample of women.[35] This result might be driven by the larger sample size of elderly women.[36]

[34] More precisely McKnight (2004, 2006) tries to identify the potential heavy users of home health care services. To do so she uses pre policy data to regress home care expenditures on a variety of health measures and uses the coefficients from this regression to predict home care usage on the sample of all beneficiaries between 1992 and 1999. Those that are at the top quartile of predicted home care expenditures are defined "heavy users" of home health care services. She looks specifically at this group as well as at the all sample to detect an increase in nursing home services use, without finding evidence of any.

[35] Table 9 reports estimation results for the sample of elderly men.

[36] There are 137,843 women and 96,021 men 65+.

The baseline model estimate of the parameter of interest for the sample of women shown in Table 8 implies that a decline in reimbursement of one visit per beneficiary increases the fraction of elderly women that live in a shared living arrangement by 0.25 percentage points. Because 23.53% of elderly women in my sample live in a shared living arrangement, the parameter estimate implies a 1.06% increase in the fraction of elderly women that live in shared living arrangements.

6.2 Alternative Explanations: Changes in the Sample of non Institutionalized Elderly

In this section I argue that my results are not driven by changes in the sample of non institutionalized elderly[37] caused by changes in utilization of skilled nursing facility services by long term care patients. In particular, I focus on two possibilities: I first look at whether the use of skilled nursing services by Medicare patients has changed because of changes in reimbursement of Medicare home health care and then I look at whether it is plausible to assume that the Medicare reimbursement of skilled nursing services occurred in 1997 has increased the fraction of long term care patients in the community.

The first aspect would create trouble to my interpretation of the results presented in the previous sections if those remaining in the community after the Medicare home care policy change are those that are more likely to live in a shared living arrangement independently of home care use. In fact, in this case my results would pick up the substitution between home care and institutional care instead of capturing the substitution between home care and informal care. However, previous literature suggests that skilled nursing facilities services and home health care are not substitutes (Cutler and Sheiner, 1993).

Moreover, even more pertinent with the policy change studied here, previous literature (McKnight,2004, 2006) has shown that the Balanced Budget Act change in reimbursement of Medicare

[37] Conversation with staff at the Census Bureau together with information found in the Census documentation at http://www.census.gov/prod/cen2000/doc/sf1.pdf clarified that institutionalized elderly that are not in the CPS sample are those that reside in a facility that provides 24 hours medical or nursing care. Those not residing in that type of facility are in the CPS sample recorded as living in group quarters. I have only 399 observations in the all sample that live in group quarters and therefore shifts from independent living to group quarters are unlikely to be driving my results.

home health care had no effect on the use of long-term nursing home care. This result held even when looking separately at the use of nursing home services by the unhealthiest Medicare beneficiaries.[38]

Considering the second aspect, the Balanced Budget Act of 1997, besides changing Medicare Home Care reimbursement, contains provisions that changed Medicare reimbursement for post-acute care facilities from a cost based system to Prospective Payment. Differently from the system in place before, the Prospective Payment system limited payment to skilled nursing facilities to predetermined levels (Wodchis, Fries and Hirth, 2004). This change in reimbursement has led to shorter length of stay in rehabilitation and physical therapy (Woodchis 2004; Yip, Wilber and Myrtle, 2002) and has increased the relative risk of discharge to home for Medicare patients compared to non Medicare ones (Wodchis, Fries and Hirth, 2004).

In principle, if Medicare reimbursement changes for skilled nursing facilities has released from institutional care the patients that are more likely to live in shared living arrangements, my results could be driven by compositional shifts in the sample of non- institutionalized elderly other than by a causal effect of Medicare Home Care reimbursement.

However, this possibility is remote because Medicare does not cover long term care in skilled nursing facilities, so it is plausible to assume that the sample of non institutionalized elderly that I am using is independent on the Medicare reimbursement change for skilled nursing facilities occurred in 1997.

6.3 Alternative explanations: Dynamics in the Medicaid Home and Community Based Care Services Market

A natural question to ask is whether my results are due to other market dynamics in the home care market and in particular in the Medicaid[39] home care market.

[38] Besides looking at utilization, it seems interesting to investigate whether Medicaid take-up changed after the BBA. I investigated this possibility using the self reported measure on Medicaid coverage during the previous 12 months. There is no correlation between self reported Medicaid coverage and $Post_t$*$Restrictiveness_{sc}$. Results are shown in Appendix 3, Table A1.

[39] Medicaid is a joint federal-state program intended to provide medical services for the poor. Differently from Medicare, Medicaid varies greatly across states. Some elderly Medicare beneficiaries might also qualify for Medicaid if they meet eligibility requirements for Medicaid in the state where they live.

By federal mandate, states are required to provide Medicaid home health services to persons entitled to receive skilled nursing services under the state's Medicaid plan. These services include skilled nursing, home health aide, medical equipment and appliances to be used in the home. Moreover, states have the option of providing additional services like physical therapy, occupational therapy speech pathology and audiology services (United States House of Representatives, 2004).

Medicaid regulations allow states to provide home and community based services under two programs: personal care services and home and community based waiver programs.

Since 1975, states have the option of providing personal care services that include help with bathing, dressing, eating, toileting, personal hygiene, light housework, laundry, meal preparation and grocery shopping. By 1998-1999, 26 states offered personal care services (Le Blanc, Tonner and Harrington, 2001).

Home and community based waiver programs, (authorized under Section 1915 c of the Social Security Act) authorized by Congress in 1981, allow the states to request waivers for certain Medicaid requirements (such as geographical coverage, for example) [40] to provide care at home for people entitled to skilled nursing services .

These programs attract federal matching funds and can cover a wide variety of services such as personal care assistance, homemaker/home health aid services, adult day care, case management, and respite for caregivers, among others (United States House of Representatives, 2004). Every state except Arizona[41] administered waivers in years 1998-1999.

Aggregate data for the elderly in Figure 3 show that total expenditures for the mandatory Medicaid home health program and the two optional programs increased during the 90s (Hagen, 2004). Unfortunately, it is very difficult to obtain state expenditures on Medicaid home and community based services only for the population of elderly Medicaid beneficiaries. However, if my results are driven by changes in Medicaid

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As a general rule, Medicaid is considered the payer of last resort, so that if a service is covered under both Medicare and Medicaid, Medicare is the first to pay for the cost of the service.

[40] Also states may cover state-selected groups of persons, rather than all persons otherwise eligible, House of Representatives, 2004.

[41] Arizona operates a 1115 managed care waiver. Fro an in depth description of The Medicaid Home and Community Based Services Waivers see Harrington et al., 1999.

policies, in aggregate, I should see a different pattern of change in the use of home care services between Medicare only patients and Medicaid - Medicare dually eligible individuals.

This suggests comparing the change in the fraction of elderly on Medicare only receiving home care with the change in the fraction of Medicare-Medicaid dually eligible that receives home care services. I can recover this information by using National Health Interview Survey[42] aggregate data that indicate that fraction of elderly Medicaid –Medicare eligible that received home care visits between 1998 and 2001 decreased by 17.97 % compared to a 15.91% decline in the fraction of Medicare only beneficiaries that received home care. The two numbers are remarkably similar, suggesting that it is unlikely that Medicaid policies might have been responsible for my results.

To further the claim that Medicaid home and community based services changes are not responsible for my results, it is worth mentioning that McKnight (2006),[43] in a regression that had Medicaid home and community based expenditure as an outcome variable, found that the coefficient of $Post*Restrictiveness_{sc}$ was not statistically significant.[44]

7 A Structural Estimate

As CPS does not have information on the number of home care visits received by Medicare Beneficiaries, I use the McKnight's (2006) first stage estimate of the parameters h_2 of Equation 3 and my estimate of the parameter a_2 of Equation 4 to recover a structural estimate of c_2. In fact, using the algebra of the Two Stages Least Square estimator[45], the structural estimate of $\hat{c}_2$ in Equation 2 is equal[46] to:

$$\hat{c}_2 = (\hat{a}_2)/ (\hat{h}_2) \quad (9)$$

[42] Appendix 2 briefly describes the National Health Interview Survey data used for this specification check.
[43] With Medicare Current Beneficiary Survey data between 1992 and 1999.
[44] Other control variables included state and year dummies, state trends, age group, gender, marital status and several other demographic variables, plus health condition variables. For a more detailed description see McKnight, 2006.
[45] Dee and Evans, 1997.
[46] When the first stage is estimated with a dataset and fitted values are created in a second dataset to recover a structural estimate, this estimate corresponds to the Two Sample Instrumental Variable estimate proposed by Angrist and Kruger (1992, 1995).

where $\hat{a}_2$ is the estimate of the law change parameter in the reduced form Equation 4 estimated with CPS data on years 1993- 2000, which is equal to 0.0003394 .[47] The estimate of $\hat{h}_2$ comes from McKnight's (2006) estimate of Equation 3 between years 1992 and 1999 with Medicare Current Beneficiary Survey data and is equal to -0.133.

Using these values and Equation 9, the structural estimate of c_2 is equal to -0.0025, suggesting that one additional visit of home health care decreases the fraction of elderly that live in shared living arrangements by 0.25 percentage points.

8 Conclusion

With the aging of populations governments are more and more concerned about the affordability of home health care policies. What will happen to the elderly should the support of publicly provided home health care decrease?

This paper suggests that informal care might substitute for publicly provided home health care services. I use time and cross-state variation introduced by a sharp decline in reimbursement of Medicare home health services in the United States to estimate reduced form equations of the impact of tighter reimbursement changes on the fraction of elderly that live in shared living arrangements. This is the first study that uses a quasi experiment to address the issue for virtually all the non- institutionalized population of elderly of a country and therefore it is less subject to selection than previous studies. I also argue that my results are not driven by changed pattern of institutionalization of the elderly or by changes in Medicaid expenditures for home and community based services.

Moreover, I use my reduced form estimate, and McKnight's (2004, 2006) estimate of the impact of the reimbursement change on the number of Medicare home health care visits to provide a structural estimate of the impact of the number of Medicare home care visits on the fraction of elderly that live in a shared living arrangement.

[47] There is a temporal mismatch between CPS and MCBS, as year t MCBS data refer to the period January to December of year t. I use CPS March year t+1 data to proxy for MCBS year t data.

Unfortunately, results presented here do not allow me to draw conclusions on the welfare of the elderly and their caregivers. However, because the increased demand on informal care might have sizable implications for the labor supply of the informal caregivers, this seems a relevant aspect to consider in further research in order to better evaluate costs and benefits from cuts in publicly provided home health care services.

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Appendix 1

This appendix motivates the use of the average number of visits per user as an appropriate measure of cost to construct the cross state measure of restrictiveness used in the empirical framework.
Another possible measure to use is the Medicare payment per user in 1994. I have access to this measure at the state and census division level.

However, Medicare payments, included the per patient limit cap, are adjusted across different localities to take into account the different wages existing in different areas. The areas used for adjustment purposes are defined by the Medicare program and do not correspond to standard geographic classifications[48]. So, for example, 2 areas can have a high per patient cost in 1994 in dollar terms for two distinct reasons (or a combination of the two): either wages are high or the number of visits provided is high. In the first case, the blended per patient limit is adjusted upward to take into account the high wages, but it is not adjusted in the second case. I cannot adjust the per patient cap, because I have only data aggregated at the state level.

As a consequence, if I were to use a restrictiveness measure in dollar terms like the following:
R_{sc}=Per patient $ cost of providing the services in 1994 in state s- Per patient $ cost of providing the services in 1994 in state s' census division
I would introduce measurement error in the cross state measure. In fact, without being able to adjust for wage levels, the restrictiveness measure could look the same for 2 states that indeed after the adjustment could actually face a very different cap. Because of this, the number of visits gives a measure that captures use across states and therefore, even if not perfect, is less subject to the type of measurement error illustrated above.

[48] For a more in depth illustration of the areas as well as the adjustment factors see for example Federal Register, 1999.

Appendix 2

National Health Interview Survey Data

National Health Interview Survey did not ask a specific question on home health care for years before 1997. Since 1997 questions on home care have been asked in the person level file and the sample adult file (composed of a randomly selected adult in respondent households).

In the sample adult file respondents are asked whether they received home from a nurse or other health care professional in the previous 12 months, while in the person level file respondents are asked whether they received care at home from a nurse or other health care professional during 2 reference weeks in the previous 12 months.

Because the question asked in the sample adult file seemed more comprehensive and less subject to measurement error, in section 6.4 I use the sample adult file to identify the weighted fractions of Medicare only elderly and Medicaid –Medicare dually eligible beneficiaries that received home health care in the previous 12 months. I recovered from the person level file the information on health insurance and I merged the person level files health insurance data with the adult file data by using the household, family and the person Identification numbers to make the merge.

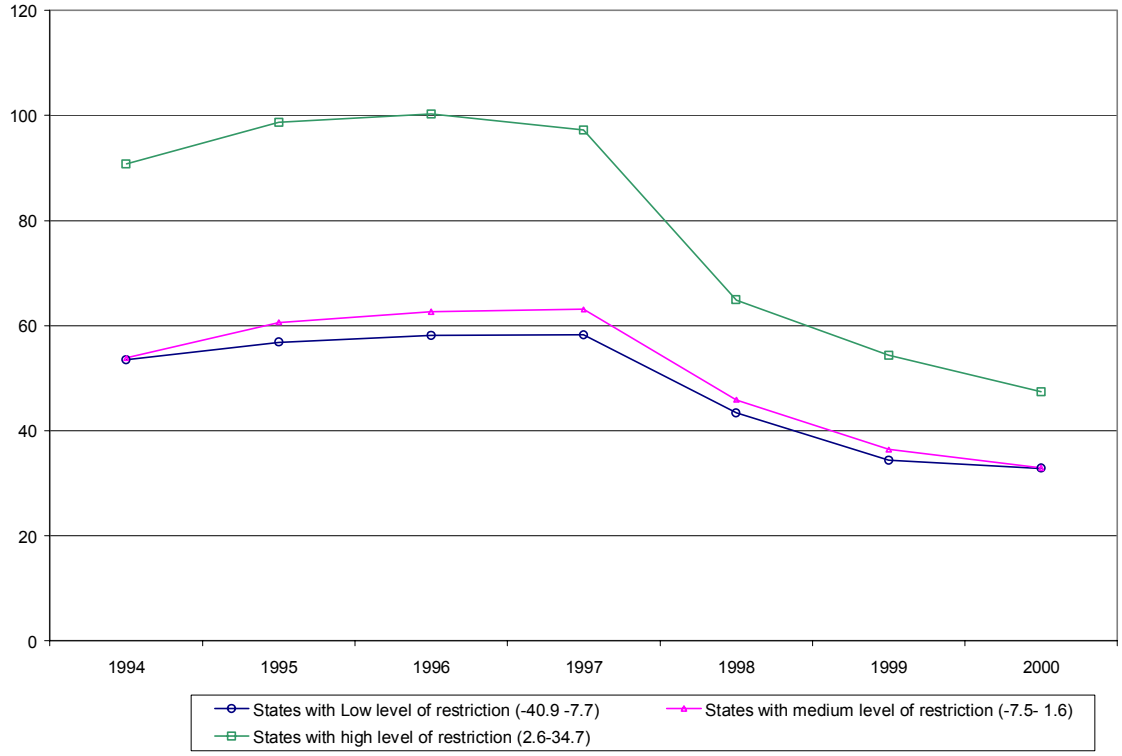
Appendix 3

Table A1: Estimation Results, 65+ pooled sample, outcome is "was covered by Medicaid in the previous 12 months"

$Post_t$*$Restrictiveness_{sc}$*100	.019	.015	.017	.011
	(.026)	(.024)	(.023)	(.022)
Separated	-	.179**	.155**	.146**
		(.016)	(.017)	(.016)
Divorced	-	.042**	.0169**	.05**
		(.004)	(.004)	(.003)
Married, spouse absent	-	.024*	.026*	.025*
		(.011)	(.01)	(.01)
Never Married	-	.048**	.053**	.058**
		(.009)	(.009)	(.008)
Married, spouse present	-	-.08**	-.066**	-.058**
		(.005)	(.0045)	(.004)
Male	-	-	-.014**	-.0183**
			(.0015)	(.002)
White	-	-	-.144**	-.121**
			(.012)	(.011)
Age dummies	-	-	Yes	Yes
less than high school	-	-	-	.108**
				(.011)
high school	-	-	-	.019**
				(.002)
some college	-	-	-	-.0003
				(.003)
Observations	233864	233864	233864	233864

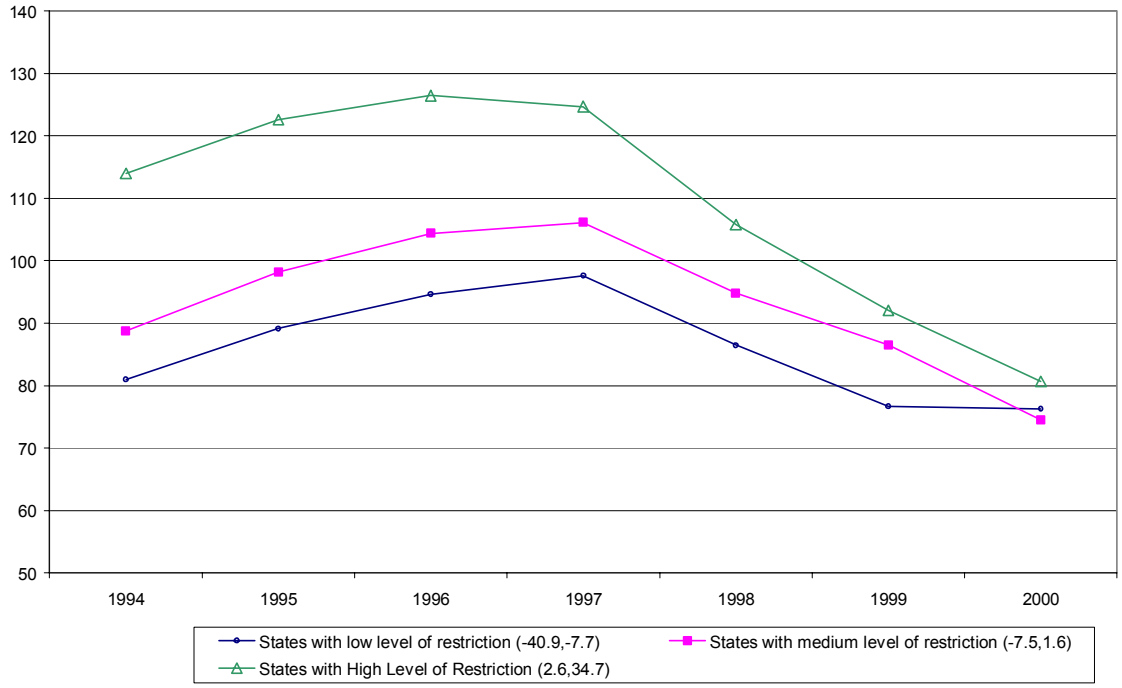
*,**: significant at the 5 and 1 percent level, respectively. $Restrictiveness_{sc}=A_s-A_c$ where A_s is the average number of Medicare home care visits per user in state s in 1994 and A_c is the average number of Medicare home care visits per user in state's census division c. State and year dummies are included in every specification. Standard errors are clustered by state and are shown in parenthesis.

Figure 1: Medicare Home Health Care visits per user



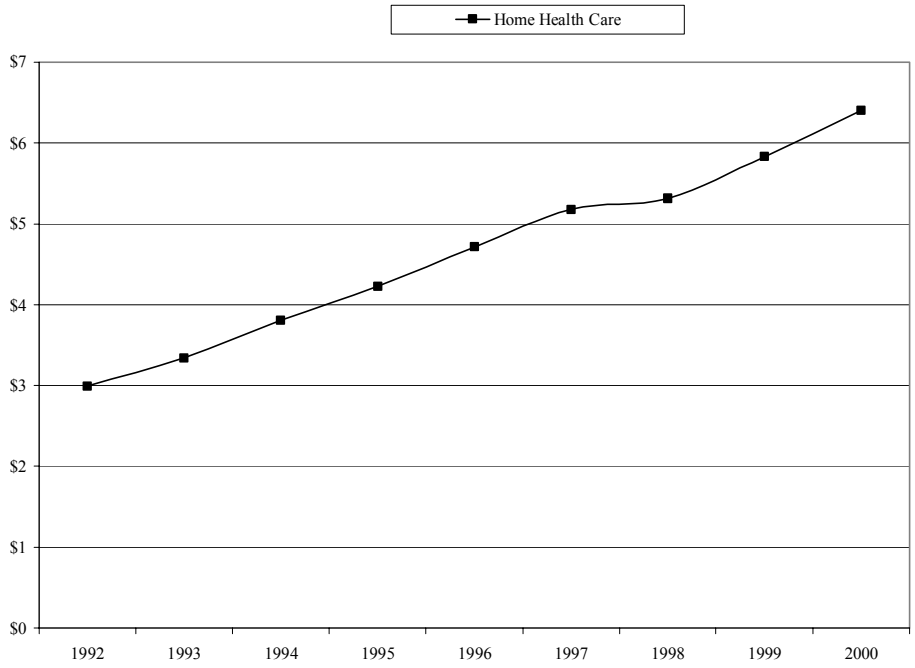
Source: Health Care Financing Review, Medicare and Medicaid Statistical Supplement, various years.

Figure 2: Medicare Home Health Care users per 1000 beneficiaries



Source: Health Care Financing Review, Medicare and Medicaid Statistical Supplement, various years.

Figure 3: Medicaid Expenditure on Home and Community Based Services for elderly 65+ (in billion dollars)



Source: Hagen (2004) and personal conversation with staff at CBO

Table 1

Living arrangements of the Elderly and Public Expenditure on Home Health Care, (% GDP), 2000

	*Fraction of elderly 65+ living in shared living arrangements**	*Public Expenditure on Home Health Care as a % of the GDP*
Sweden	8.36	0.78
Germany	10.64	0.5
Switzerland	13.27	0.2
UK	15.09	0.32
Canada	20.64	0.17
US**	23.06	0.07
Spain	42.61	0.05

* Shared living arrangement means household size>2 if the respondent is married and living with the spouse, household size>1 otherwise. All data for the living arrangements of the elderly in European countries are from the Luxemburg Income Study, data for the United States are from March Current Population Survey,2000. Data on public expenditure for home health care are from OECD, 2005 for all countries except the US. **For the US, expenditures on Medicare Home Health Care in 2000 are from the Health Care Financing Review, Medicare and Medicaid Statistical Supplement. Data on the US GDP are from the Bureau of Economic Analysis.

Table 2

Summary Statistics for selected variables. 65+ or older

	Pooled sample	Married, living with the spouse	Married, not living with the spouse	Separated	Divorced	Widowed	Never Married
Age	74.1	72.5	75.64	71.98	72.08	77.01	74.43
	(6.61)	(5.73)	(7.1)	(5.77)	(5.8)	(7)	(6.86)
living in a	.2235	.156	.30	.39	.30	.29	.37
shared living	(.42)	(.36)	(.46)	(.49)	(.46)	(.46)	(.48)
arrangement*							
Less than high	.34	.29	.44	.53	.33	.41	.35
school	(.47)	(.45)	(.5)	(.5)	(.47)	(.49)	(.48)
High school	.38	.40	.30	.3	.36	.38	.35
	(.49)	(.49)	(.46)	(.46)	(.48)	(.49)	(.48)
Some college	.14	.15	.14	.10	.18	.13	.12
	(.35)	(.36)	(.35)	(.30)	(.38)	(.33)	(.32)
College or more	.12	.15	.11	.06	.12	.07	.18
	(.33)	(.35)	(.32)	(.25)	(.33)	(.27)	(.39)
Male	.41	.56	.45	.45	.37	.17	.38
	(.49)	(.5)	(.5)	(.5)	(.48)	(.38)	(.49)
White	.90	.93	.86	.64	.86	.88	.88
	(.3)	(.26)	(.34)	(.48)	(.35)	(.32)	(.32)
Observations	233864	127701	2321	78849	2260	9982	12751

* Shared living arrangement means household size>2 if the respondent is married and living with the spouse, household size>1 otherwise.

Table 3

Test for differential trends in pre policy years 1988-1997, all 65+

$Restrictiveness_{sc}$*trend	.00007	.00007	.000066	.000064
	(.000042)	(.00004)	(.000041)	(.00004)
Separated	-	.061**	.001	-.008
		(.0141)	(.016)	(.016)
Divorced	-	-.004	-.023	-.02
		(.012)	(.012)	(.012)
Married, spouse absent	-	-.013	-.026	-.027
		(.015)	(.0137)	(.0142)
Never Married	-	.082	.072**	.077**
		(.01)	(.01)	(.01)
Married	-	-.133**	.143**	-.138**
		(.007)	(.006)	(.006)
Male	-	-	.024**	.023**
			(.002)	(.002)
White	-	-	-.187**	-.168**
			(.0097)	(.008)
Age dummies	-	-	Yes	Yes
less than high school	-	-	-	.088**
				(.0075)
high school	-	-	-	.033**
				(.004)
some college	-	-	-	-.006
				(.006)
Observations	173445	173445	173445	173445

**: significant at the 1 percent level. $Restrictiveness_{sc}=A_s-A_c$ where A_s is the average number of Medicare home care visits per user in state s in 1994 and A_c is the average number of Medicare home care visits per user in state's census division c. State and year dummies are included in every specification. Standard errors are clustered by state and are shown in parenthesis.

Table 4

Estimation Results, 65+ pooled sample

$Post_t$*$Restrictiveness_{sc}$	.0005516*	.0004854*	.0004887*	.0004478*
	(.00023)	(.00021)	(.00021)	(.00021)
Separated	-	.08**	.023	.016
		(.013)	(.014)	(.013)
Divorced	-	.0046	-.015	-.011
		(.011)	(.011)	(.01)
Married, spouse absent	-	.0098	-.0031	-.0038
		(.014)	(.011)	(.012)
Never Married	-	.072**	.0612**	.067**
		(.01)	(.01)	(.01)
Married, spouse present	-	-.136**	-.147**	-.14**
		(.006)	(.006)	(.006)
Male	-	-	.023**	.021**
			(.002)	(.002)
White	-	-	-.182**	-.164**
			(.0078)	(.0069)
Age dummies	-	-	Yes	Yes
less than high school	-	-	-	.092**
				(.0083)
high school	-	-	-	.037**
				(.0036)
some college	-	-	-	-.00075
				(.0056)
Observations	233864	233864	233864	233864

*,**: significant at the 5 and 1 percent level, respectively. $Restrictiveness_{sc}=A_s-A_c$ where A_s is the average number of Medicare home care visits per user in state s in 1994 and A_c is the average number of Medicare home care visits per user in state's census division c. State and year dummies are included in every specification. Standard errors are clustered by state and are shown in parenthesis.

Table 5

Estimation Results, 65-80 pooled sample

$Post_t$*$Restrictiveness_{sc}$	.0006505*	.0006121*	.0006453*	.0005869*
	(.0002881)	(.0002666)	(.0002663)	(.0002612)
Separated	-	.088**	.0254	.0176
		(.0145)	(.0152)	(.0145)
Divorced	-	.0118	-.012	-.0079
		(.0127)	(.012)	(.0118)
Married	-	-.125**	-.139**	-.133**
		(.0066)	(.0069)	(.0063)
Never Married	-	.084**	.069**	.073**
		(.01)	(.01)	(.01)
Married spouse absent	-	.0396*	.021	.02
		(.015)	(.013)	(.013)
Male	-	-	.0289**	.028**
			(.0022)	(.0024)
White	-	-	-.188**	-.17**
			(.007)	(.006)
Age dummies	-	-	Yes	Yes
less than high school	-	-	-	.095**
				(.0097)
high school	-	-	-	.036**
				(.0036)
some college	-	-	-	.00019
				(.0058)
Observations	190643	190643	190643	190643

*, **: significant at the 5 and 1 percent level, respectively. $Restrictiveness_{sc}=A_s-A_c$ where A_s is the average number of Medicare home care visits per user in state s in 1994 and A_c is the average number of Medicare home care visits per user in state's census division c. State and year dummies are included in every specification. Standard errors are clustered by state and are shown in parenthesis.

Table 6

Estimation Results, 80 plus pooled sample

$Post_t$*$Restrictiveness_{sc}$	.0003118	.0000625	-.0000215	5.07e-06
	(.0004028)	(.0004023)	(.0004034)	(.0004021)
Separated	-	.066*	.043	.0397
		(.03)	(.031)	(.032)
Divorced	-	-.013	-.0052	-.0019
		(.0196)	(.019)	(.019)
Married, spouse absent	-	-.064**	-.059**	-.059**
		(.019)	(.019)	(.019)
Never Married	-	.0446**	.0488**	.058**
		(.014)	(.014)	(.014)
Married	-	-.188**	-.169**	-.163**
		(.008)	(.007)	(.00651)
Male	-	-	-.004	-.006
			(.004)	(.0043)
White	-	-	-.159**	-.143**
			(.014)	(.013)
Age dummies	-	-	Yes	Yes
less than high school	-	-	-	.082**
				(.009)
high school	-	-	-	.042**
				(.01)
some college	-	-	-	-.005
				(.01)
Observations	50908	50908	50908	50908

*,**: significant at the 5 and 1 percent level, respectively. $Restrictiveness_{sc}=A_s-A_c$ where A_s is the average number of Medicare home care visits per user in state s in 1994 and A_c is the average number of Medicare home care visits per user in state's census division c. State and year dummies are included in every specification. Standard errors are clustered by state and are shown in parenthesis.

Table 7

Estimation Results, 65-80 all but married, spouse present

$Post_t$ *$Restrictiveness_{sc}$	.0011171*	.0010956*	.0011363*	.0011361*
	(.000443)	(.0004423)	(.0004513)	(.0004453)
Separated	-	.087**	.0387*	.0308*
		(.014)	(.0147)	(.014)
Divorced	-	.0085	-.0072	-.00057
		(.013)	(.013)	(.013)
Married, spouse absent	-	.038*	.027*	.028*
		(.015)	(.013)	(.014)
Never Married	-	.088**	.0803**	.087
		(.011)	(.011)	(.011)
Male	-	-	.0043	.0013
			(.0069)	(.0067)
White	-	-	-.167**	-.147**
			(.008)	(.0066)
Age dummies	-	-	Yes	Yes
less than high school	-	-	-	.119**
				(.01)
high school	-	-	-	.061**
				(.007)
some college	-	-	-	-.0011
				(.013)
Observations	76484	76484	76484	76484

*,**: significant at the 5 and 1 percent level, respectively. $Restrictiveness_{sc}=A_s-A_c$ where A_s is the average number of Medicare home care visits per user in state s in 1994 and A_c is the average number of Medicare home care visits per user in state's census division c. State and year dummies are included in every specification. Standard errors are clustered by state and are shown in parenthesis.

Table 8

Estimation Results, women 65+

$Post_t$*$Restrictiveness_{sc}$	.0006323*	.0005696*	.0005802*	.0005471*
	(.0002496)	(.0002419)	(.0002408)	(.0002422)
Separated	-	.118**	.066**	.057**
		(.015)	(.015)	(.014)
Divorced	-	-.0012	-.0108	-.0044
		(.011)	(.011)	(.011)
Married, spouse absent	-	.0074	.00565	.0054
		(.0168)	(.0154)	(.0156)
Never Married	-	.083**	.0802**	.091**
		(.011)	(.011)	(.011)
Married, spouse present	-	-.154**	-.152**	-.145**
		(.006)	(.006)	(.005)
White	-	-	-.183**	-.164**
			(.0082)	(.007)
Age dummies	-	-	Yes	Yes
less than high school	-	-	-	.107**
				(.009)
high school	-	-	-	.047**
				(.004)
some college	-	-	-	.002
				(.007)
Observations	137843	137843	137843	137843

*,**: significant at the 5 and 1 percent level, respectively. $Restrictiveness_{sc}=A_s-A_c$ where A_s is the average number of Medicare home care visits per user in state s in 1994 and A_c is the average number of Medicare home care visits per user in state's census division c. State and year dummies are included in every specification. Standard errors are clustered by state and are shown in parenthesis.

Table 9

Estimation Results, men 65+

$Post_t$*$Restrictiveness_{sc}$	.0004417	.0003664	.0003729	.000322
	(.00037)	(.0003)	(.00037)	(.00036)
Separated	-	.028	-.023	-.027
		(.015)	(.015)	(.015)
Divorced	-	.0097	-.0167	-.014
		(.015)	(.015)	(.015)
Married, spouse absent	-	.0075	-.0028	-.0033
		(.02)	(.019)	(.019)
Never Married	-	.048**	.034*	.034**
		(.014)	(.014)	(.014)
Married, spouse present	-	-.128**	-.135**	-.129**
		(.008)	(.008)	(.0076)
White	-	-	-.18	-.164
			(.0088)	(.008)
Age dummies	-	-	Yes	Yes
less than high school	-	-	-	.078**
				(.009)
high school	-	-	-	.031**
				(.005)
some college	-	-	-	.002
				(.006)
Observations	96021	96021	96021	96021

*,**: significant at the 5 and 1 percent level, respectively. $Restrictiveness_{sc}=A_s-A_c$ where A_s is the average number of Medicare home care visits per user in state s in 1994 and A_c is the average number of Medicare home care visits per user in state's census division c. State and year dummies are included in every specification. Standard errors are clustered by state and are shown in parenthesis.