

How Home Health Agencies' Ownership Affects Practice Patterns*

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Abstract

This study explores whether for-profit home health agencies responded differently from non-profit agencies to financial incentives embedded in the Medicare prospective payment system. Agencies were able to receive higher reimbursement per patient under the prospective payment system if they adjusted the number of therapy visits or the type of visits for a two-month-long episode. Agencies could also increase reimbursement by treating a patient for multiple episodes of care, because prospective payments were made on a per-episode basis. Using the Medicare Claims and Provider of Services Files from 2001 to 2009, we examine differences between for-profit and non-profit agencies in these practice patterns during the first nine years of the prospective payment system. We find that for-profit agencies were more likely to adopt most of these practice patterns than were non-profit agencies. This finding suggests that for-profit agencies were more responsive to financial incentives, and therefore disproportionately contributed to the increase in Medicare home health spending under the prospective payment system. Policymakers could consider revising the current prospective payment system that gives agencies incentives to distort practice patterns regardless of a patient's health care needs.

Policy points

- For-profit home health agencies were more likely to respond to financial incentives in the Medicare prospective payment system (PPS) than were non-profit agencies.
- Non-profit agencies were also responsive to the financial incentives of the PPS, although they changed their practice pattern less than for-profit agencies.
- Policymakers might consider revising non-linear pricing for therapy visits that provides financial incentives for agencies to distort service provision.

I. Introduction

Medicare home health care provides essential health services in the patient's home. It plays an important role in keeping patients at home instead of sending them to more expensive care settings such as inpatient hospitals or skilled nursing homes. However, Medicare home health spending has fluctuated substantially under the different payment systems.

Per-capita Medicare home health spending drastically increased under the prospective payment system (PPS), which was specifically introduced in 2000 to control rising home health spending. The rapid rise in expenditures during the 2000s was perhaps surprising given the stated claim that Medicare wanted to keep real expenditures from rising under the PPS. However, the PPS had several strong financial incentives that promoted the opposite, a rapid increase in expenditures. In particular, the incentives led to higher payment per two-month-long episode. Medicare reimburses home health agencies for each patient every other month, and the two-month-long treatment period is defined as one *episode*. Home health agencies could increase the per-episode payment by adjusting the number of therapy visits and shifting resources to therapy visits – a highly reimbursed type of visit – from other types of visits. High margins per episode made it financially attractive for agencies to continue to recertify each patient's episodes of care and treat them for additional episodes. During the first nine years under the PPS from 2001 to 2009, both per-episode spending and the number of episodes per patient increased, by 20.1 and 11.9 per cent respectively.¹

These simple overall numbers may hide an interesting pattern: differential responses to those financial incentives between for-profit and non-profit home health agencies. Agency ownership status could matter because for-profit and non-profit providers could have inherently different operational goals. For-profits distribute profits to shareholders and have stronger incentives to increase profits, while non-profits have no well-defined shareholders.² Employees in non-profits also tend to be more altruistic decision-makers and thus would be less responsive to financial incentives.³ Non-profit agencies may also aim to maximise the quantity and quality of care rather than profits.

¹MedPAC, 2012, 2013 and 2014; Kim and Norton, 2015b.

²Sloan, 2000.

³Duggan, 2000.

However, non-profit agencies might also provide services mainly driven by the profit maximisation motive, and behave exactly like for-profits.⁴ For example, for-profit and non-profit hospitals provided identical amounts of charity care after adjusting for their location.⁵ For-profit and non-profit agencies might then react similarly to the per-episode incentives and recertification incentives under the PPS.

This study begins with a simple question: ‘Did for-profit and non-profit agencies respond differently to the financial incentives of the PPS?’. We answer this question by comparing changes in practice patterns between for-profit and non-profit agencies during the first nine years of the PPS. The PPS abruptly changed how home health agencies were paid in 2001. For example, under the prior system, treating a patient for an expanded period of time was not profitable because Medicare made annual fixed payments per patient.⁶ In contrast, the PPS makes fixed payments for each patient every other month. Margins per two-month episode can be high due to the per-episode incentives mentioned above.⁷ Agencies therefore found it financially attractive to serve patients for multiple episodes under the PPS. Agencies might adopt new practice patterns gradually because of the costs involved with changing them.⁸ Changing practice patterns quickly could be challenging because it might take time for agencies to fully understand the new payment system and disperse the new practice patterns within the organisation.

Our analysis reveals that both for-profit and non-profit agencies gradually changed their practice patterns responding to the PPS financial incentives, but, overall, changes were greater among for-profit agencies. For-profits were more likely to react to per-episode incentives and recertify each patient’s episodes of care. We also find that for-profits’ practice pattern changes were different across states with and without a certificate of need programme for home health care.⁹

⁴Weisbrod, 1991.

⁵Norton and Staiger, 1994.

⁶McKnight, 2006; Porell, Liu and Brungo, 2006; Choi and Davitt, 2009; Murkofsky and Alston, 2009; Huckfeldt et al., 2014.

⁷MedPAC, 2012, 2013 and 2014; Kim and Norton, 2015b.

⁸Kim and Jung, 2015; Kim and Norton, 2015b.

⁹Certificate of need laws restrict the entry of new agencies.

Two previous studies explored for-profit and non-profit agencies' response to the PPS.¹⁰ Their main focus was, however, to compare agencies that entered the market after the PPS with those that had entered before the PPS. Both studies found that newer agencies that started their business after the PPS, regardless of their ownership status, were more responsive to the financial incentives of the PPS. This study builds on the prior two studies but extends them in four important ways. First, it uses DiNardo, Fortin and Lemieux (1996)'s decomposition to flexibly compare the distributions of therapy visits across episodes between for-profit and non-profit agencies. The decomposition attributes differences in the distributions to either patient composition or treatment patterns. Second, we include data after the 2008 revision to the PPS that shifted the single payment increase at the 10th therapy visit to more gradual payment increases. We examine for-profit and non-profit agencies' responses to this change. Third, we also examine changes in practice patterns among non-profit agencies from 2001 to 2009. This enables us to check whether non-profit agencies also responded to the PPS incentives. Finally, this paper contrasts agencies in states with and without certificate of need laws that restrict the entry of new agencies.

The goal of this study is to assess the different practice patterns of for-profit and non-profit agencies. The results can help provide insight to policies for an effective home health payment system.

Section II provides some background detail on Medicare and the PPS. Section III describes the data and Section IV our empirical strategy. Results can be found in Section V and conclusions in Section VI.

II. Background

Medicare is the federal health insurance programme in the United States, primarily for people who are 65 or older, but also for non-elderly people with disabilities or end-stage renal disease. In 2015,

¹⁰Kim and Jung, 2015; Kim and Norton, 2015b.

Medicare covered approximately 55 million Americans, 17 per cent of the total population.¹¹ Medicare covers a wide range of services including inpatient and outpatient hospital care, post-acute care and hospice care. Home health care, the focus of this paper, is one type of post-acute care service.

Medicare home health care provides six types of services: skilled nursing, physical therapy, occupational therapy, speech therapy, home health aide and medical social service visits. To be eligible for home health care, a beneficiary must be housebound and have a need for part-time skilled care. A patient's physician must also certify the patient's eligibility for home health care. Prior acute care use is not required for home health care. Medicare home health visits are free, so we focus on the agencies' response to the PPS incentives rather than the patients'.

In 2012, approximately 9.4 per cent of Medicare beneficiaries used home health care, and 34 per cent of these home health patients received visits immediately after being discharged from hospitals or skilled nursing homes.¹² In the same year, Medicare home health spending accounted for 3 per cent of total Medicare spending and 31 per cent of total Medicare post-acute care spending.¹³ At first glance, home health spending looks relatively small, but it could play an important role in curbing total health care spending because it is a substitute for other more expensive care such as skilled nursing home or hospital care.¹⁴

Medicare home health care was under the fee-for-service payment system until 1997. The fee-for-service payment system reimbursed incurred treatment costs with no limits on annual per-patient costs. Agencies provided as many visits as possible and home health spending drastically increased under the fee-for-service payment system. Between 1998 and 2000, Medicare implemented the interim payment system that put a restrictive cap on the annual per-patient costs. Agencies decreased the number of visits, particularly among highly sick patients, under this restrictive cap.¹⁵ As a result,

¹¹Kaiser Family Foundation, 2016a and 2016b.

¹²MedPAC, 2014 and 2015.

¹³MedPAC, 2014.

¹⁴Benjamin, 1993; Lichtenberg, 2012.

¹⁵McKnight, 2006.

spending on home health care plummeted, and about one-third of agencies exited the market, leaving 7,152 agencies in the market in 2000.¹⁶

In October 2000, Medicare home health care introduced the prospective payment system. The PPS makes a risk-adjusted fixed reimbursement for every 60-day episode of care. Because the PPS makes providers bear most of the risk at the margin, it was expected to control the rising home health spending that had occurred under the fee-for-service payment system. However, total spending continued to rise gradually under the PPS. Its annual real growth rate between 2001 and 2009 was 7.8 per cent, well above Medicare spending's annual growth rate of 3.7 per cent during the same period.¹⁷ The high growth arose partially because the number of home health patients increased, but also because per-patient home health spending increased.

The per-patient spending growth was mostly due to financial incentives embedded in the PPS. The PPS enabled agencies to receive higher per-episode payment amounts if they slightly adjusted practice patterns.¹⁸ For example, it made fixed per-episode payments regardless of the number of visits provided, but it reimbursed an agency about an extra \$2,000 once it had provided 10 therapy visits during one episode of care. Panel A of Figure 1 displays how reimbursement amounts per episode changed as the number of therapy visits increased. Given that the average baseline prospective payment amount per episode was about \$2,115 in 2001, the marginal revenue of \$2,000 at the 10th therapy visit was substantial. This provided a strong incentive for agencies to target the 10th therapy visit.

¹⁶National Association for Home Care and Hospice, 2010; MedPAC, 2012, 2013 and 2014.

¹⁷CMS, 2011.

¹⁸Kim and Norton, 2015a and 2015b.

[Figure 1 about here]

In 2008, Medicare revised the payment system, in part to reduce the strong incentives. Under the revised payment schedule, the payment rate increases at the 5th, 6th, 7th, 9th, 10th, 11th, 14th, 16th, 18th and 20th therapy visits, instead of the enormous jump at the 10th visit (see Panel B of Figure 1).¹⁹ Medicare chose these additional thresholds based on the empirical analysis conducted using Medicare home health claims under the PPS. As a result, targeting of the 10th visit disappeared after 2008. However, the payment rate increases at the 6th, 14th and 20th visits are relatively larger than the increases at the other thresholds. The payment rate could increase at most by about \$650 by providing the 6th visit, about \$850 by providing the 14th visit and about \$1,900 by providing the 20th visit. These increases are greater than those at other thresholds (\$300–500), providing another incentive for agencies to target the 6th, 14th and 20th therapy visits.²⁰

In contrast, all other types of visits – skilled nursing, home health aide and medical social service visits – are not compensated for extra visits. As a result, agencies have an incentive to shift their resources to therapy visits and away from other types of visits. Home health aide and medical social service visits are less directly related to patient health status: home health aide visits involve non-medical assistance related to eating, dressing and bathing; and medical social service visits provide case management and mental health services.

These listed per-episode incentives led agencies to make high margins per episode. High margins provided an incentive for agencies to continue to recertify another episode of care for patients and treat them for multiple episodes of care. Recertified patients could also be more profitable than new patients because of the sunk fixed costs agencies spend learning about patients' health care needs. The PPS allowed agencies to recertify an unlimited number of episodes of care for patients as long as patients met eligibility conditions.

¹⁹CMS, 2007.

²⁰Kim and Jung, 2015.

These high margins under the PPS attracted many new agencies to the market. Between 2000 and 2011, the number of agencies rose from 7,152 to 11,633.²¹ Relatively low entry costs for agencies further accelerated agencies' entry to the market.²² Starting an agency requires little capital investment because labour is the main input cost in the home health industry.²³ In addition, in the early years of the PPS, only a small number of agencies were operating in the market because many agencies went out of business under the interim payment system.²⁴

Most of those new entrants were for-profits (95.3 per cent based on our data). Entry by new for-profit agencies was concentrated in states with no certificate of need (CON) programme, which do not regulate the entry of new agencies. The 18 states with a CON programme, which do regulate their entry, are Alabama, Alaska, Arkansas, Georgia, Hawaii, Kentucky, Maryland, Mississippi, Montana, New Jersey, New York, North Carolina, South Carolina, Tennessee, Vermont, Washington, West Virginia and Washington DC. All the listed states implemented the CON programme before 1980. In non-CON states, the increase in home health patients under the PPS was mainly driven by the entry of new for-profit agencies and slight expansion of existing for-profits. In contrast, in CON states, the smaller increase primarily came from expansion of the capacity of existing for-profit agencies (see Figure 2).

[Figure 2 about here]

²¹National Association for Home Care and Hospice, 2010 and 2011.

²²Huckfeldt et al., 2013.

²³Polsky et al., 2014.

²⁴MedPAC, 2010.

A previous study found that new for-profit agencies that started business under the PPS were more likely to respond to the financial incentives of the PPS than were incumbent agencies.²⁵ Incumbent for-profit agencies also started to mimic new agencies' practice patterns if they were in the same market. Given the different market shares of new and incumbent for-profit agencies across CON and non-CON states, it is expected that for-profits' response to the PPS incentives relative to non-profits' could be greater in non-CON states than in CON states. Therefore, in addition to comparing for-profit agencies with non-profit agencies overall, we also compare differences by whether the state has CON laws for home health agencies, although the expected behaviour is less clear.

III. Data

We use 2001 to 2009 Medicare home health claims and provider files, which cover the first nine years of the PPS implementation. Medicare home health claims cover 5 per cent of all Medicare home health patients and provide those home health patients' demographics, health characteristics and home health service use. Provider files include all Medicare-certified home health agencies across the nation and provide agencies' basic information including ownership status and location. We combine Medicare claims and provider files and create a patient–agency linked data set.

We dropped patients who were under 65 years old. Patients enrolled in Medicare health maintenance organisations (HMOs) were also excluded because the PPS does not influence payment rates for Medicare HMOs. Finally, we dropped patients served by government home health agencies (5.9 per cent). The final data set has 1,424,839 patient-episode observations on 528,427 patients. See Table 1 for descriptive statistics of our sample in 2001 and 2009.

[Table 1 about here]

²⁵Kim and Norton, 2015b.

IV. Empirical strategy

1. Per-episode incentive

We first compare for-profit and non-profit agencies in their targeting of the 10th therapy visit. The non-linear pricing for therapy visits led agencies to target the 10th visit. The tendency for targeting could become more evident over time, and the response could be different across for-profit and non-profit agencies. For this examination, we utilise the DiNardo, Fortin and Lemieux (hereafter 'DFL') decomposition.²⁶ The DFL method is ideal for this analysis because it checks for differences in the entire distribution of the number of therapy visits between for-profit and non-profit agencies. The DFL method decomposes the difference in the distribution of the number of therapy visits between for-profit and non-profit agencies into two parts: (1) differences attributable to the observable variables affecting the number of therapy visits (*composition effects*) and (2) differences attributable to the mechanism determining the number of therapy visits (*structure effects*). In particular, we focus on the structure effects that measure the agencies' response to the payment incentives and examine whether for-profit agencies were more likely than non-profit agencies to target the 10th therapy visit. We examine the differences between for-profit and non-profit agencies in 2001, 2007 and 2008 to check how agencies changed the number of therapy visits over time. We pick the years 2007 and 2008 because Medicare revised the reimbursement schedule for therapy visits in 2008. This allows us to see whether the home health agencies' behaviours changed following the change in reimbursement.

Here we explain in detail how the DFL method decomposes the changes in the distribution of the number of therapy visits between 2007 and 2008.²⁷ This explains how Panel A of Figure 4 is derived; we discuss the graph in more detail in Section V.1.

²⁶DiNardo, Fortin and Lemieux, 1996.

²⁷DiNardo, 2002; Fortin, Lemieux and Firpo, 2010.

The actual distributions of the number of therapy visits in 2007 and in 2008 are expressed as follows:

$$(1) \int f^{2007}(V^T)dV^T \equiv \int f^{2007}(V^T|x)h(x|t=2007)dx$$

$$(2) \int f^{2008}(V^T)dV^T \equiv \int f^{2008}(V^T|x)h(x|t=2008)dx,$$

where V^T represents the number of therapy visits per episode, t refers to the year and x represents other characteristics affecting the number of therapy visits, including patient and agency characteristics, and seasonality. $f^{2007}(V^T|x)$ is the therapy visits number determination mechanism in 2007, which maps observables to the distribution of the number of therapy visits. The density $h(x|t=2007)$ is the probability density function of observables in 2007.

We then decompose the difference between equations 1 and 2:

$$(3) \int f^{2008}(V^T)dV^T - \int f^{2007}(V^T)dV^T \equiv \int f^{2008}(V^T|x)h(x|t=2008)dx \\ - \int f^{2008}(V^T|x)h(x|t=2007)dx \\ + \int f^{2008}(V^T|x)h(x|t=2007)dx \\ - \int f^{2007}(V^T|x)h(x|t=2007)dx.$$

$\int f^{2008}(V^T|x)h(x|t=2007)dx$ is the counterfactual distribution, which indicates what the distribution of the number of therapy visits would be in 2007 if the therapy visits number determination mechanism were the same as in 2008. Thus, the first two terms on the right-hand side of equation 3 describe the difference in the number of therapy visits caused by the change in observables between 2007 and 2008, holding the therapy visits number determination mechanism in 2008 fixed (composition effects). The last two terms describe the difference in the number of therapy visits between 2007 and 2008 attributable to the change in the therapy visits number determination mechanism between 2007 and 2008, holding the value of observables in 2007 fixed (structure effects). This dif-

ference measures agencies' adjustment in the number of therapy visits responding to payment incentives, assuming that there were no omitted variables affecting the number of therapy visits.²⁸

The DFL method computes the counterfactual distribution, weighting the actual distribution in 2008 with the variable ω_i :

$$(4) \int f^{2008}(V^T | x)h(x | t = 2007)dx \equiv \int \omega_i f^{2008}(V^T | x)h(x | t = 2008)dx,$$

where

$$(5) \omega_i = \frac{h(x | t = 2007)}{h(x | t = 2008)} \\ = \frac{\Pr(t = 2007 | x)_i / \Pr(t = 2007)}{\Pr(t = 2008 | x)_i / \Pr(t = 2008)},$$

where $\Pr(t = 2007 | x)_i$ and $\Pr(t = 2008 | x)_i$ are computed for each observation i based on a probit model for the probability that the sample is from 2007 and 2008 respectively. $\Pr(t = 2007)$ and $\Pr(t = 2008)$ are the unconditional probabilities that the sample is from 2007 and 2008 respectively.

To sum up, we use the DFL method to decompose the changes in the distribution of the number of therapy visits between 2007 and 2008 in the example above. We also use the DFL method to decompose the differences in the distribution of the number of therapy visits between for-profit and non-profit agencies.

In contrast to the strong incentives to provide at least 10 therapy visits, the PPS gave agencies no additional compensation for extra visits for home health aide or medical social service. To examine how for-profit and non-profit agencies changed the types of visits to provide over time, we run an

²⁸Olson, 1998.

episode-level regression (equation 6) where $\Pr(\text{TypeOfVisit})$ represents dummy variables indicating whether each patient received at least one visit of the relevant type (therapy, home health aide or medical social service) in each episode. We consider an interaction term between *Year* (year dummy variables with year 2001 as a reference group) and *FP* (indicator of episodes served by for-profit agencies) because for-profits may be more likely to increase the provision of therapy visits but to decrease aide or medical social service visits over time under the PPS. Only about 7.2 per cent of agencies changed their ownership status between 2001 and 2009, and therefore we do not exploit a change in ownership status as the main source of variation. α_3 measures the difference in the likelihood of providing each type of visit between for-profits and non-profits each year, relative to the differences in 2001. α_3 is expected to be positive if $\Pr(\text{TypeOfVisit})$ is the likelihood of receiving any therapy visits, but negative for home health aide or medical social service visits.

$$(6) \quad \Pr(\text{TypeOfVisit})_{kijt} = \alpha_0 + \alpha_1 \text{Year}_t + \alpha_2 \text{FP}_{jt} + \alpha_3 \text{Year}_t \times \text{FP}_{jt} + \alpha_4 \text{Agency}_{jt} \\ + \alpha_5 \text{Patient}_{kijt} + \alpha_6 \text{Seasonality}_{kt} + \varepsilon_{kijht},$$

where k, i, j and t represent an episode, patient, agency and year. *Agency* represents agency characteristics including institutional affiliation (free-standing versus hospital- or skilled-nursing-home-affiliated) and number of treated patients. *Patient* refers to patient demographics and health risk factors such as age, gender, race, Medicare buy-in status (a proxy for a low-income beneficiary because buy-in programmes help low-income beneficiaries pay Medicare premiums), any prior stays in a hospital or skilled nursing home, common health conditions among home health patients (diabetes, hypertension, heart failure, chronic ulcer of skin, osteoporosis, cardiac dysrhythmias, stroke, dementia, pneumonia, other forms of chronic ischaemic heart disease, cancer, mental disorders and arthritis) and Charlson comorbidity counts. We also control for quarter-of-year dummies, *Seasonality*, to capture seasonality in service provision. All regressions use a linear-probability model instead of probit regressions because the linear-probability model provides a more straightforward inference for the interaction term estimates.²⁹ Standard errors are clustered at the agency level.

²⁹Ai and Norton, 2003; Norton, Wang and Ai, 2004; Karaca-Mandic, Norton and Dowd, 2012.

2. Recertification incentive

The per-episode payments provided a strong incentive for agencies to continue to recertify each episode of care for a patient and treat them for multiple episodes of care. To compare how for-profit and non-profit agencies recertified patients, we run an episode-level regression:

$$(7) \Pr(\text{Recertification})_{kijt} = \beta_0 + \beta_1 \text{Year}_t + \beta_2 \text{FP}_{jt} + \beta_3 \text{Year}_t \times \text{FP}_{jt} + \beta_4 \text{Visit}_{kijt} \\ + \beta_5 \text{Agency}_{jt} + \beta_6 \text{Patient}_{kijt} + \beta_7 \text{Seasonality}_{kt} \\ + \varepsilon_{kijt},$$

where $\Pr(\text{Recertification})$ is a dummy variable indicating whether a patient was recertified for the next episode of care. In addition to the covariates in regression 6, we also control for *Visit*, splines of the number of visits (regardless of type of visits) where the knots are 5, 10, 15, 20, ..., 55 and 60. We control for the number of visits provided because patients who received relatively high numbers of visits could be sicker. β_3 measures the difference in the likelihood of recertification between for-profits and non-profits each year, relative to the differences in 2001. β_3 is expected to be positive. Standard errors are clustered at the agency level.

3. CON versus non-CON states

We also do all the analyses regarding the per-episode incentive and the recertification incentive separately for agencies located in states with and without CON. We then compare the results across the analyses for CON and non-CON states.

V. Results

1. Per-episode incentive

The DFL decomposition results indicate clear differences between for-profit and non-profit agencies in the number of therapy visits provided (see Figure 3). Comparing the actual distribution of non-

profit agencies and the counterfactual distribution (which illustrates what the distribution of therapy visits would have been among non-profit agencies if non-profits had determined the number of therapy visits to provide in the way for-profits did) in the DFL decomposition of both 2001 and 2007, we find that for-profit agencies were generally more likely to provide 10–14 therapy visits and less likely to provide fewer than 10 therapy visits than non-profit agencies.

[Figure 3 about here]

However, inconsistent with our expectation, the discrepancy between for-profit and non-profit agencies in targeting the 10th visit stayed almost the same over time. Comparing the counterfactual distribution with the non-profits' actual distribution from 2001 to 2007 reveals that non-profit agencies became more like for-profit agencies over time. This suggests that non-profits also increasingly adopted the targeting behaviour, although their level of adoption was still lower than that of for-profit counterparts.

The targeting of the 10th therapy visit suddenly disappeared in 2008 when Medicare modified the way the number of therapy visits was factored into reimbursement amounts (see Panel A of Figure 4). Interestingly, the actual distribution in 2008 and the counterfactual distribution (which illustrates what the distribution would be in 2007, assuming the observables of the year 2007 and the therapy visits number determination mechanism of the year 2008) are almost the same, indicating that the huge change in the actual distribution between 2007 and 2008 was mostly due to agencies' response to the change in the reimbursement schedule, not to changes in observables.

[Figure 4 about here]

Both for-profit and non-profit agencies stopped targeting the 10th visit in 2008 (see Panel B of Figure 4). Instead, for-profits started to target the 14th visit, where the average marginal revenue was \$850,

and non-profits targeted the 6th visit, where the average marginal revenue was \$650. Overall, for-profits provided more visits than non-profits even after controlling for observable characteristics. This might be because the reimbursement rate continues to increase with the number of visits under the revised PPS.

The regression analyses suggest that, as expected, both for-profit and non-profit agencies gradually adjusted the types of home health visits provided. Figure 5 displays the predicted probabilities that a patient would receive each type of visit at least once per episode. Both for-profits and non-profits increased the provision of therapy visits (which promised a substantial marginal benefit for a higher number of visits) over time, but non-profits were always more likely to provide therapy visits by up to 4.1 percentage points. Non-profit agencies' patients might have unobserved conditions requiring more therapy visits.

[Figure 5 about here]

As expected, over time, both for-profits and non-profits decreased the provision of home health aide and medical social service visits – for which they are not compensated for providing extra visits – and the changes were greater for for-profit agencies. The likelihood of a for-profit agency providing home health aide and medical social service visits decreased by 15 and 4 percentage points respectively between 2001 and 2009, but the corresponding values were 8 and 2 percentage points for non-profit agencies. These findings suggest that agencies indeed shifted their resources to therapy visits away from two other unprofitable types of visits and that the changes were greater for for-profit agencies except in the provision of therapy visits.³⁰

³⁰See Table A1 in the online appendix for full regression results.

As a robustness check, we reran the main analysis with agency fixed effects, and found substantially the same patterns of results.³¹

2. Recertification incentive

Figure 6 displays the predicted probabilities that each patient would get recertified for another episode of care. For-profit agencies gradually increased the likelihood of recertification from 0.35 in 2001 to 0.50 in 2009. In contrast, non-profit agencies' likelihood of recertification did not change much around 0.35.

[Figure 6 about here]

We also find that agencies were more likely to recertify older, black, lower-income Medicare beneficiaries. In addition, free-standing agencies were more likely to recertify patients than agencies affiliated with hospitals or skilled nursing homes. The size of agencies was not related to the likelihood of recertification.³²

3. CON versus non-CON states

We find a difference in for-profit and non-profit agencies' targeting behaviour across CON and non-CON states (see Figure 7). Comparing the actual distribution between for-profits and non-profits, their discrepancy in targeting behaviour was greater in non-CON states than in CON states, both in 2001 and in 2007. The comparison between the counterfactual and non-profits' actual distribution indicates that the discrepancy between the two groups was greater in non-CON states than in CON states in 2001. However, we find the opposite in 2007. That is partially because targeting among non-profit agencies increased to a greater degree in non-CON states than in CON states. This might be because non-profits in non-CON states quickly changed their practice patterns to survive in a

³¹See Figures A1–A4 in the online appendix.

³²See Table A2 in the online appendix for full regression results.

market where competition was rapidly increasing. Non-profits in CON states were less likely to face such pressure. It is, however, uncertain whether these differences are statistically significant.

[Figure 7 about here]

We also explore for-profit and non-profit agencies' adjustment in types of visits and recertification across non-CON and CON states (see Figures 8 and 9). We find that both for-profits and non-profits were less likely to provide home health aide and medical social service visits in non-CON states than in CON states, but we do not find any significant differences in for-profits' adjustment in types of visits or recertification relative to non-profits' across non-CON and CON states.

[Figures 8 & 9 before here]

VI. Conclusion

The Medicare home health PPS, the system that was introduced to curb rising Medicare home health spending, provided unintended financial incentives that contributed to a significant increase in per-capita home health spending. As expected, for-profit agencies were more likely to respond to PPS incentives. They were more likely to target the 10th therapy visit until 2007 and the 14th visit after 2007 to benefit from significant marginal revenue on those threshold visits. For-profit agencies were also more likely to shift resources away from home health aide and medical social service vis-

its, which do not get compensation for additional visits. A patient who was served by a for-profit agency was also more likely to get recertified for another episode of care.

Given that the start-up cost of a home health agency is relatively low, it is likely that the incentives built into the PPS attracted an increasing number of for-profit agencies. This is important because for-profit agencies prioritised profits more strongly and thus contributed to the increase in total Medicare home health spending. Had the home health industry been dominated by non-profit agencies, the increase in total spending might have been lower. However, it is also interesting that non-profit agencies were also responsive to the financial incentives of the PPS, although they changed their practice pattern less than for-profit agencies.

The current prospective payment system provides financial incentives for agencies to distort service provision, not necessarily corresponding to patients' health needs. Policymakers might consider revising the current payment system, in particular non-linear pricing for therapy visits. Medicare replaced the single payment threshold at the 10th visit with multiple thresholds in 2008, in response to agencies' targeting of the 10th therapy visit, but the revised payment system still encouraged agencies to target either the 6th or the 14th visit. To restrict agencies' targeting behaviour, Medicare also requires that agencies check whether a patient needs more therapy visits on the 13th and 19th visits.³³ However, as long as a payment system has non-linear pricing for therapy visits and thus provides financial incentives for agencies to target a certain number of visits, it might be hard to fully prevent agencies' targeting behaviours. Also, the current payment schedule incentivises agencies shift resources away from home health aide or medical social service visits, but these two types of visits could be important for the quality of a patient's health care.

Interestingly, an increase in total Medicare home health spending could be viewed as desirable. Medicare home health care holds the potential to create savings in total Medicare spending because it is substitutable with more costly health care services. Home health care can replace more expensive skilled nursing home or inpatient care by allowing patients to receive necessary medical care at home.³⁴ This substitution would lower health spending, an important benefit given the current anti-spending political environment. While such an expansion of home health care spending may be ben-

³³CMS, 2014.

³⁴Benjamin, 1993; Lichtenberg, 2012.

eficial, an increase in home health spending caused by the inadvertent inclusion of improper incentives is concerning. In future work, we hope to assess how the financial incentives embedded in the PPS affected patient health outcomes to provide a comprehensive understanding of the effects of the PPS on social welfare. Future reimbursement policies must be carefully structured to encourage home health agencies to effectively balance cost efficiency and quality of care.

Supporting information

Additional supporting information may be found in the online version of this paper on the publisher's website:

- Appendix

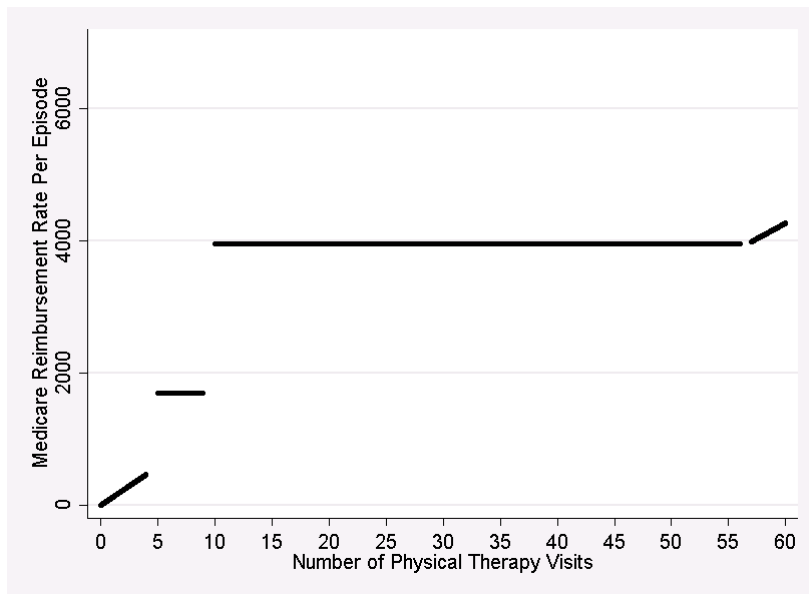
References

- Ai, C. and Norton, E. C. (2003), 'Interaction terms in logit and probit models', *Economic Letters*, vol. 80, pp. 123–9.
- Benjamin, A. (1993), 'An historical perspective on home care policy', *Milbank Quarterly*, vol. 71, pp. 129–66.
- Choi, S. and Davitt, J. (2009), 'Changes in the Medicare home health care market: the impact of reimbursement policy', *Medical Care*, vol. 47, pp. 302–9.
- CMS (2007), 'Medicare program; home health prospective payment system refinement and rate update for calendar year 2008; proposed rule', *Federal Register*, vol. 72, no. 86.
- (2011), *Medicare & Medicaid Statistical Supplement*, Centers for Medicare & Medicaid Services.
- (2014), 'Medicare program; home health prospective payment system rate update for calendar year 2010; final rule', *Federal Register*, vol. 79, no. 215.
- DiNardo, J. (2002), 'Propensity score reweighting and changes in wage distribution', prepared for the Latin American Meeting of the Econometrica Society.

- , Fortin, N. and Lemieux, T. (1996), 'Labor market institutions and the distribution of wages, 1973–1992: a semiparametric approach', *Econometrica*, vol. 64, pp. 1001–44.
- Duggan, M. G. (2000), 'Hospital ownership and public medical spending', *Quarterly Journal of Economics*, vol. 115, pp. 1343–73.
- Fortin, N., Lemieux, T. and Firpo, S. (2010), 'Decomposition methods in economics', in O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics*, volume 4A, Amsterdam: Elsevier.
- Huckfeldt, P., Sood, N., Escarce, J. J., Grabowski, D. C. and Newhouse, J. P. (2014), 'Effects of Medicare payment reform: evidence from the home health interim and prospective payment systems', *Journal of Health Economics*, vol. 34, pp. 1–18.
- , —, Romley, J., Malchiodi, A. and Escarce, J. (2013), 'Medicare payment reform and provider entry and exit in the post-acute care market', *Health Services Research*, vol. 48, pp. 1557–80.
- Kaiser Family Foundation (2016a), 'Medicare beneficiaries as a percent of total population', <http://kff.org/medicare/state-indicator/medicare-beneficiaries-as-of-total-pop/>.
- (2016b), 'Total number of Medicare beneficiaries', <http://kff.org/medicare/state-indicator/total-medicare-beneficiaries/>.
- Karaca-Mandic, P., Norton, E. C. and Dowd, B. (2012), 'Interaction terms in nonlinear models', *Health Services Research*, vol. 47, pp. 255–74.
- Kim, H. and Jung, J. K. (2015), 'New entrants' practice patterns in Medicare home health care after the prospective payment system revision in 2008', *Healthcare*, vol. 3, pp. 135–41.
- and Norton, E. C. (2015a), 'Effects of the ten percent cap in Medicare home health care on treatment intensity and patient discharge status', *Health Services Research*, vol. 50, pp. 1606–27.
- and — (2015b), 'Practice patterns among entrants and incumbents in the home health market after the prospective payment system was implemented', *Health Economics*, vol. 24, suppl. 1, pp. 118–31.
- Lichtenberg, F. (2012), 'Is home health care a substitute for hospital care?', *Home Health Care Service Quarterly*, vol. 31, pp. 84–109.
- McKnight, R. (2006), 'Home care reimbursement, long-term care utilization, and health outcomes', *Journal of Public Economics*, vol. 90, pp. 293–323.
- MedPAC (2010), *Report to the Congress: Medicare Payment Policy*, Washington DC: Medicare Payment Advisory Commission.

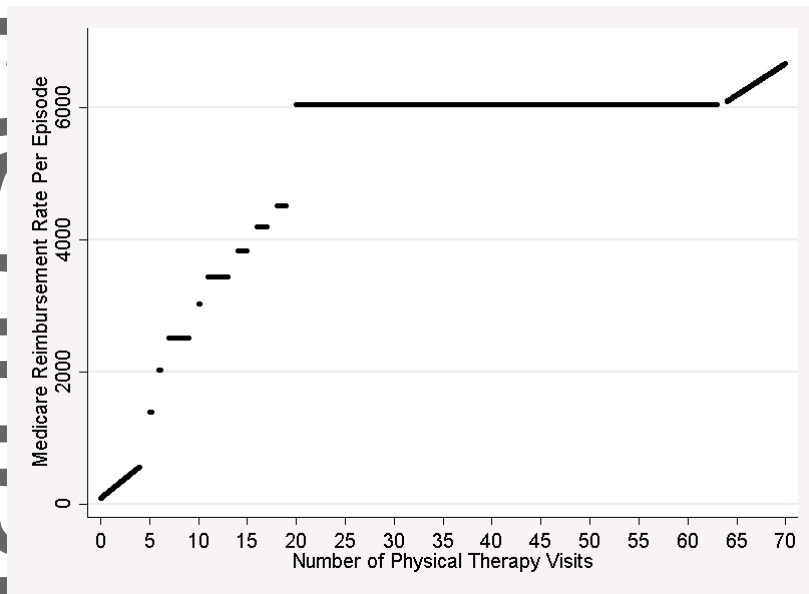
- (2012), *Report to the Congress: Medicare Payment Policy*, Washington DC: Medicare Payment Advisory Commission.
- (2013), *Report to the Congress: Medicare Payment Policy*, Washington DC: Medicare Payment Advisory Commission.
- (2014), *Report to the Congress: Medicare Payment Policy*, Washington DC: Medicare Payment Advisory Commission.
- (2015), *Report to the Congress: Medicare Payment Policy*, Washington DC: Medicare Payment Advisory Commission.
- Murkofsky, R. L. and Alston, K. (2009), 'The past, present, and future of skilled home health agency care', *Clinics in Geriatric Medicine*, vol. 25, pp. 1–17.
- National Association for Home Care and Hospice (2010), 'Basic statistics about home care, updated 2010', http://www.nahc.org/assets/1/7/10HC_Stats.pdf.
- (2011), 'Number of Medicare-certified home health agencies and hospices, as of April 21, 2011', <http://www.nahc.org/assets/1/7/2011hhas.pdf>.
- Norton, E. C. and Staiger, D. O. (1994), 'How hospital ownership affects access to care for the uninsured', *RAND Journal of Economics*, vol. 25, pp. 171–85.
- , Wang, H. and Ai, C. (2004), 'Computing interaction effects and standard errors in logit and probit models', *Stata Journal*, vol. 4, pp. 154–67.
- Olson, C. A. (1998), 'A comparison of parametric and semiparametric estimates of the effect of spousal health insurance coverage on weekly hours worked by wives', *Journal of Applied Econometrics*, vol. 13, pp. 543–65.
- Polsky, D., David, G., Yang, J., Kinosian, B. and Werner, R. M. (2014), 'The effect of entry regulation in the health care sector: the case of home health', *Journal of Public Economics*, vol. 110, pp. 1–14.
- Porell, F. W., Liu, K. and Brungo, D. P. (2006), 'Agency and market area factors affecting home health agency supply changes', *Health Services Research*, vol. 41, pp. 1847–75.
- Sloan, F. A. (2000), 'Not-for-profit ownership and hospital behavior', in A. J. Culyer and J. P. Newhouse (eds), *Handbook of Health Economics*, volume 1B, Amsterdam: Elsevier.
- Weisbrod, B. (1991), *The Nonprofit Economy*, Cambridge, MA: Harvard University Press.

FIGURE 1
Changes in payment schedule for therapy visits under the PPS
A. Before 2008 revision



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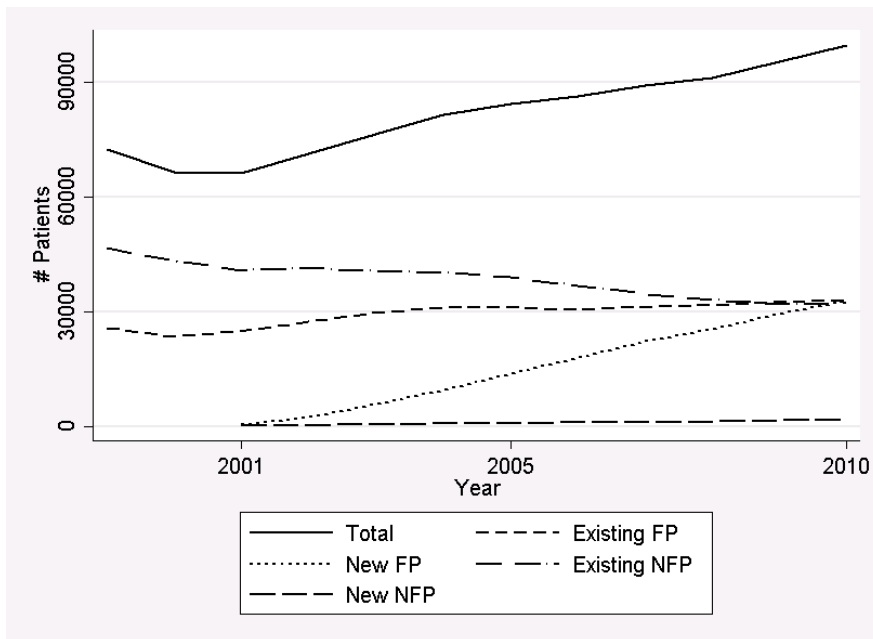
B. After 2008 revision



Note: Panel A illustrates the Medicare prospective payment schedule for a patient in 2001. Medicare would reimburse agencies for serving each patient every 60 days. This patient's case-mix group changed once the patient received the 5th and 10th visits. Panel B illustrates the Medicare prospective reimbursement schedule for the same patient in 2008. This patient's case-mix group changed at the 5th, 6th, 7th, 9th, 10th, 11th, 14th, 16th, 18th and 20th visits, instead of just the changes at the 5th and 10th visits.

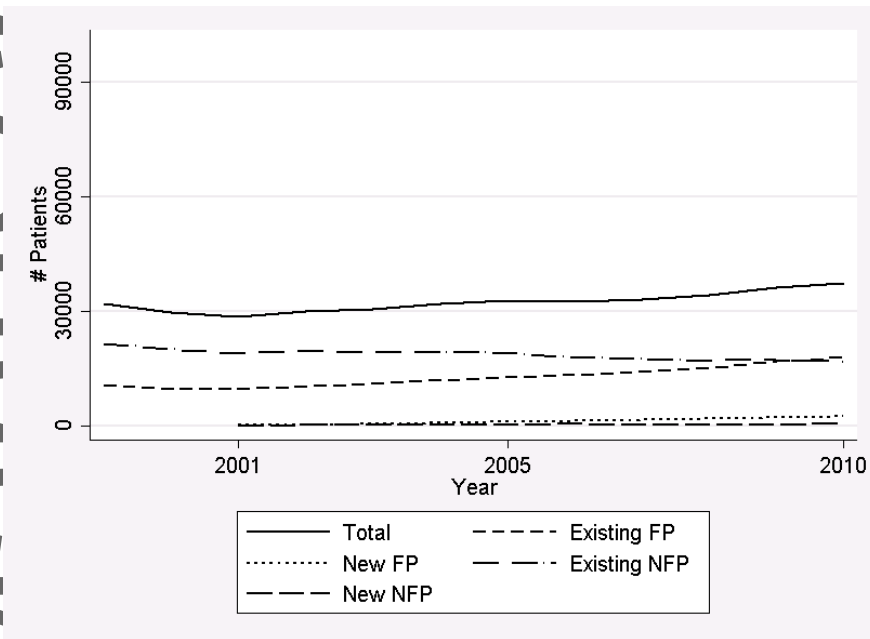
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FIGURE 2
 Agencies in states with and without certificate of need programmes
 A. States without certificate of need programmes



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B. States with certificate of need programmes



Note: 'Existing FP' and 'Existing NFP' indicate for-profit and non-profit agencies that entered the market prior to the PPS, respectively. 'New FP' and 'New NFP' indicate for-profit and non-profit agencies that entered the market under the PPS, respectively.

FIGURE 3

Number of therapy visits across for-profit and non-profit agencies in 2001 and 2007

A. For-profits and non-profits in 2001

[Insert 2001.pdf]

B. For-profits and non-profits in 2007

[Insert 2007.pdf]

Note: 'NonProfit' and 'ForProfit' represent the actual distribution of the number of therapy visits among non-profit and for-profit agencies, respectively. 'Counterfactual' illustrates what the distribution of the number of therapy visits would be among non-profit agencies, assuming the observable characteristics of non-profit agencies and the for-profit agencies' mechanism for determining the number of therapy visits. In both panels, we restrict the sample to episodes with at least one therapy visit provided.

FIGURE 4

Number of therapy visits across for-profit and non-profit agencies in 2007 and 2008

A. 2007 versus 2008

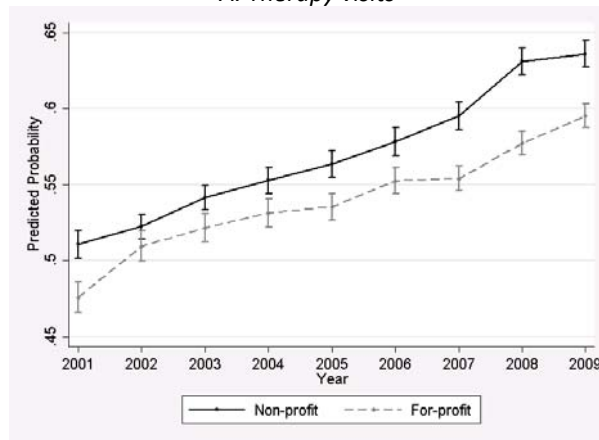
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B. For-profits and non-profits in 2008

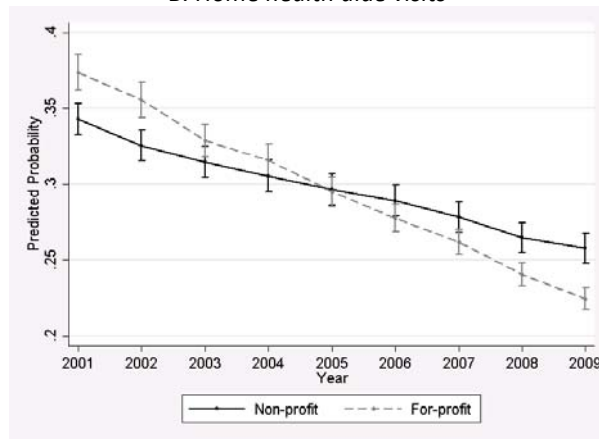
[Insert 2008.pdf]

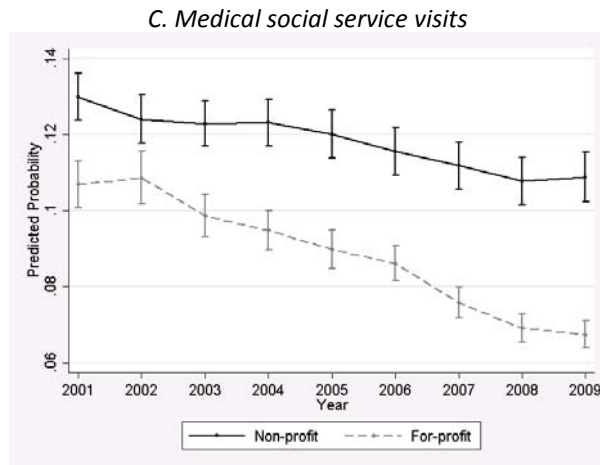
Note: In Panel A, 'Year 2007' and 'Year 2008' represent the actual distribution of the number of therapy visits in 2007 and 2008, respectively; 'Counterfactual' illustrates what the distribution of the number of therapy visits would be in 2007 with the observable characteristics of the year 2007, holding the therapy visits number determination mechanism in 2008 fixed. In Panel B, 'NonProfit' and 'ForProfit' represent the actual distribution of the number of therapy visits among non-profit and for-profit agencies, respectively; 'Counterfactual' illustrates what the distribution of the number of therapy visits would be among non-profit agencies, assuming the observable characteristics of non-profit agencies and the for-profit agencies' mechanism for determining the number of therapy visits. In both panels, we restrict the sample to episodes with at least one therapy visit provided.

FIGURE 5
Types of visits under the PPS
A. Therapy visits



B. Home health aide visits

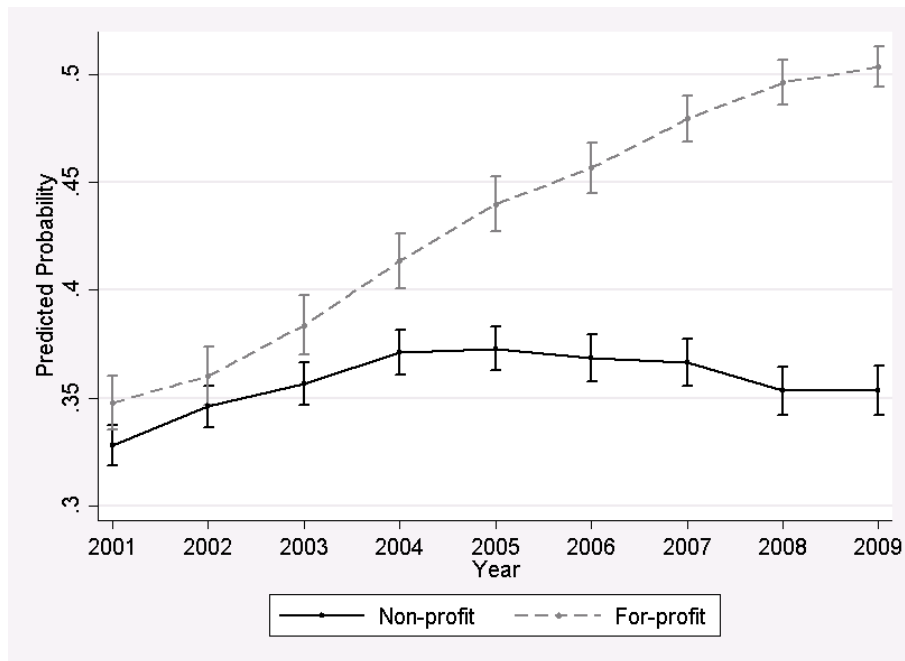




Note: Each panel displays the predicted probabilities that a patient would receive that type of visit at least once per episode.

FIGURE 6

Recertification under the PPS



Note: This graph displays the predicted probabilities that each patient would get recertified for another episode of care.

FIGURE 7

Number of therapy visits across CON and non-CON states

A. Non-CON states in 2001

[Insert noncon2001.pdf]

B. CON states in 2001

[Insert con2001.pdf]

C. Non-CON states in 2007

[Insert noncon2007.pdf]

D. CON states in 2007

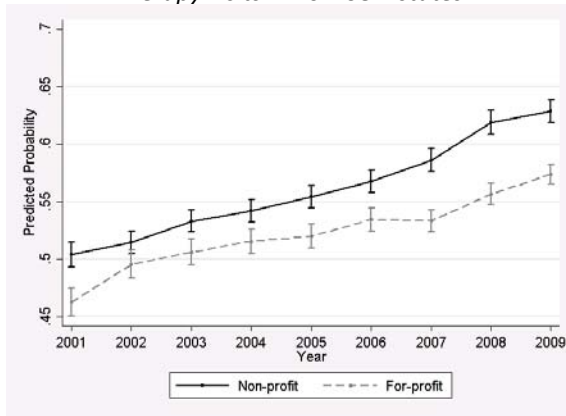
[Insert con2007.pdf]

Note: We restrict the sample to episodes with at least one therapy visit provided.

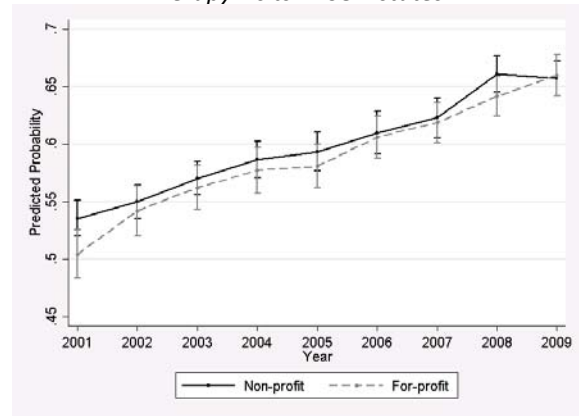
FIGURE 8

Types of visits across CON and non-CON states

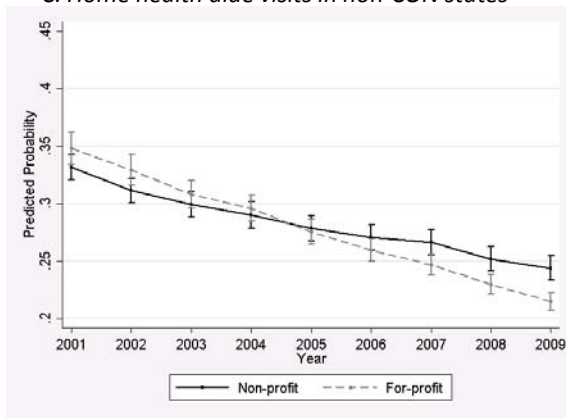
A. Therapy visits in non-CON states



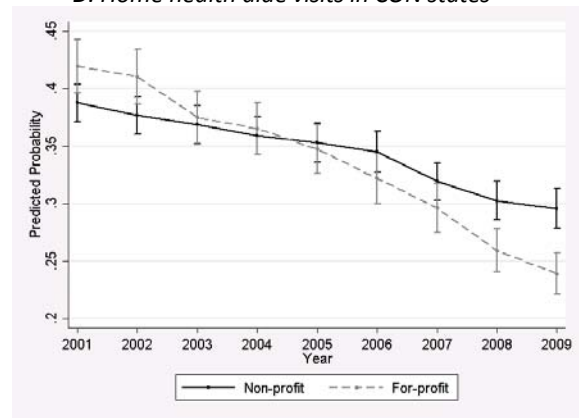
B. Therapy visits in CON states



C. Home health aide visits in non-CON states

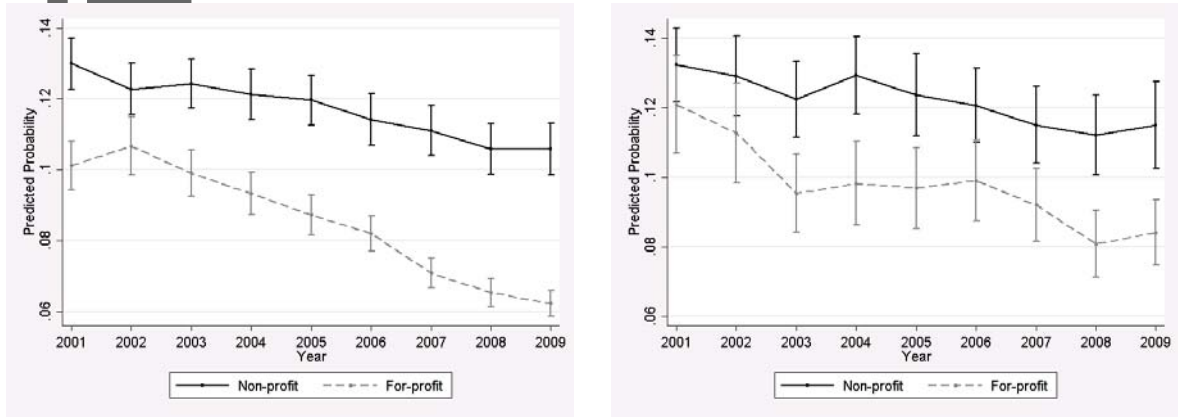


D. Home health aide visits in CON states



E. Medical social service visits in non-CON states

F. Medical social service visits in CON states



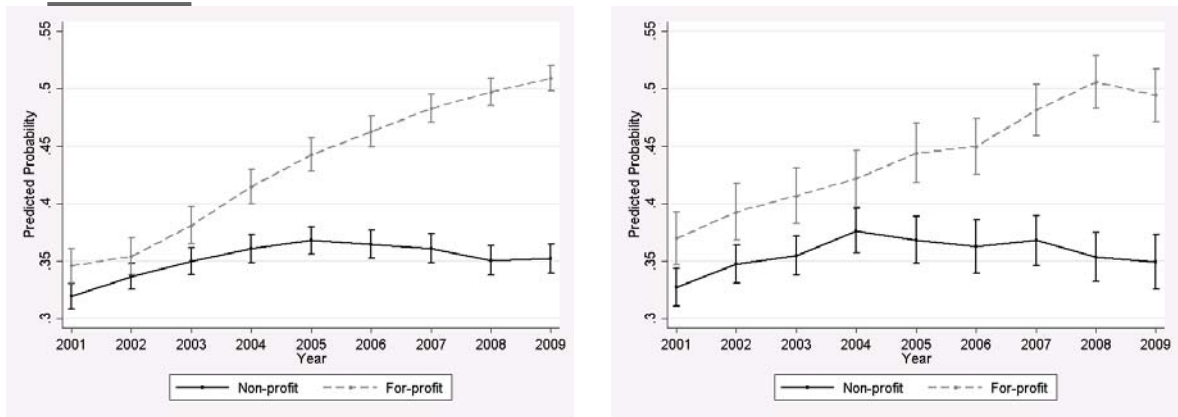
Note: Each panel displays the predicted probabilities that a patient would receive that type of visit at least once per episode.

FIGURE 9

Recertification across CON and non-CON states

A. Non-CON states

B. CON states



Note: Each panel displays the predicted probabilities that each patient would get recertified for another episode of care.

TABLE 1
Descriptive statistics in 2001 and 2009

	2001		2009	
	<i>For-profits</i>	<i>Non-profits</i>	<i>For-profits</i>	<i>Non-profits</i>
<i>Outcome variables</i>				
Type of visit (%)				
Therapy	47.3	55.8	53.1	65.6
Home health aide	37.4	33.9	23.5	26.0
Medical social service	10.2	13.3	6.8	12.0
Skilled nursing	90.0	88.0	93.2	90.0
Recertification (%)	38.9	27.1	57.5	29.8
No. of episodes	47,113	66,317	145,370	61,529
<i>Patient characteristics</i>				
Race (%)				
White	79.7	88.7	79.5	89.2
Black	14.6	8.5	13.3	7.3
Others	5.7	2.8	7.2	3.5
Female (%)	67.5	65.8	66.6	64.6
Medicare buy-in (%)	21.2	12.4	21.8	12.3
Prior acute-care stay (%)	31.9	48.8	27.8	59.1
No. of patients	29,333	47,781	69,615	42,662

Note: The unit of observation for outcome variables is each episode of care. The first four rows under 'Type of visit' show the percentage of episodes with any therapy, home health aide, medical social service or skilled nursing visit, respectively. Patients can receive multiple types of visits in each episode. The row 'Recertification' shows the percentage of episodes that were followed by another episode of care. The unit of observation for patient characteristics is each patient.