

Market Ownership Structure and Service Provision Pattern Change over Time: Evidence from Medicare Home Health Care*

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Abstract

While many economic studies have addressed the static behavior of for-profit and non-profit health care providers competing with each other in markets, few have looked at how behavior changes over time. Building on the existing economic theory of for-profit and non-profit behavior in competition, I propose three mechanisms that explain how behavior changes over time. First, health care providers continue to enter the market if they perceive opportunities for high-profit margins, and those new entrants strategically pursue profit-maximizing service provision patterns more aggressively than incumbents. Second, aggressive profit-seeking behaviors among new entrants encourage neighboring incumbents to imitate new entrants' behaviors. Third, existing, chain-affiliated health care providers learn profit-seeking behaviors from others in the chain. In particular, the second and third mechanisms suggest that health care providers learn profit-seeking behaviors from each other over time. I then test these three mechanisms using data on home health agencies that operated under the Medicare prospective payment system and find that the proposed mechanisms explain the changes in behaviors of for-profit and non-profit home health agencies over time.

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1 Introduction

Many studies have explored how a health care provider's ownership status influences its service provision patterns. More recently, recognizing that each health care provider operates in a market with the varied mix of for-profit and non-profit health care providers who might potentially compete with each other, many studies have addressed the influence of for-profit market share on service provision patterns across for-profit and non-profit health care providers (Grabowski and Hirth, 2003; Horwitz and Nichols, 2009). However, most study has addressed the cross-sectional effect of for-profit market share. Virtually no study has examined the effect of for-profit market share over time, but this is a glaring omission given that it typically takes time for health care providers to adjust service provision patterns.

This study suggests three mechanisms behind the gradual change in the influence of for-profit market share on service provision patterns over time. First, health care providers continue to enter the market if they perceive opportunities for high-profit margins, and those new entrants strategically pursue profit-maximizing service provision patterns more aggressively than incumbents. Second, aggressive profit-seeking behaviors among new entrants encourage neighboring incumbents to imitate new entrants' behaviors. Third, existing, chain-affiliated health care providers learn profit-seeking behaviors from others in the chain.

I address this issue in the context of the Medicare home health care market under the prospective payment system (PPS). In 2001, Medicare home health care introduced the PPS—which made pre-determined payments based on patient health status—to control its rapidly rising spending. However, retrospective features built into the PPS enabled home health agencies to pursue profitable service provision patterns. Using seven years of Medicare Claims and Provider of Service Files of Home Health Agencies, I examine how for-profit market share affected each agency's provision of profitable services over time under the PPS, and I further investigate whether the proposed mechanisms explain the gradual change in the influence of for-profit market share.

My study finds that the influence of for-profit market share on profitable home health

service provisions (i.e., recertifying an episode of care and aiming for 10 or more therapy visits per episode) increased gradually in for-profit and non-profit agencies over time under the PPS. In other words, agencies incrementally adopted profitable service provision patterns to compensate for losses stemming from the intense competition provoked by the behaviors of for-profit home health agencies. However, when I investigate the cross-sectional effect of for-profit market share, I find no significant influence of for-profit market share on service provision patterns (except recertifying an episode of care) in either for-profit or non-profit agencies. In this paper, I do not consider government agencies because their relatively small number.

I also find that the suggested mechanisms explain the gradual change in the influence of for-profit market share on home health service provision patterns over time under the PPS, particularly among for-profit agencies. The PPS attracted many for-profit agencies to the market, and those new for-profits adopted profit maximizing service provision practices more aggressively. In addition, the profit-seeking behaviors of new agencies led neighboring existing for-profit agencies to mimic those behaviors. Lastly, chain-affiliated existing for-profits were more likely to resemble profit-maximizing behaviors of other agencies in their chain. Regarding non-profit agencies, the first mechanism does not explain the gradual change in the influence of for-profit market share on non-profits' service provision patterns. The second and third mechanisms do explain it, but to a smaller degree than they do for for-profit agencies.

This study contributes to the extant literature in a number of ways. First, this study is the first to address changes in the magnitude of the effect of for-profit market share on service provision patterns over time. Again, examining changes in the effect over time is important because health care providers typically takes time to adjust service provision patterns. Second, this study is also the first to propose the mechanisms behind the increased effect of for-profit market share over time. These mechanisms can potentially explain behaviors of other health care providers such as hospitals or nursing homes. Third, it is the first to

examine the effect of for-profit market share on service provision patterns of health care providers with different ownership structures in the context of Medicare home health care.

2 Background

2.1 The incentives built in the PPS

Medicare home health spending increased drastically under the fee-for-service payment system that paid the incurred cost of patient care. To address this problem, Medicare home health care introduced the PPS in 2000. The PPS made fixed and predetermined payments which correspond to a patient's case-mix group that a home health agency determined based on a patient's health conditions at the start of an episode of care. An episode of 60 days is the unit Medicare home health care uses for a payment period. Because payments per episode were fixed, agencies had to bear the burden of the full cost of extra treatments. Hence, officials expected the PPS to restrict rising costs that had been occurring under the fee-for-service payment system.

However, unintended incentives built into the Medicare home health PPS enabled agencies to manipulate the reimbursement system. Specifically, many home health agencies focused on four types of home health provision patterns and thus provided excessive services, independent of patient needs. The four types of home health provision patterns include 1) increasing the likelihood of recertifying episode of care, 2) increasing the likelihood of providing 10-13 therapy visits per episode, 3) decreasing the likelihood of providing 7-9 therapy visits per episode, and 4) decreasing the likelihood of providing fewer than five visits (regardless of service type) per episode.

Specific explanations of each type of home health service provision pattern follow. First, home health agencies were increasingly likely to recertify an episode of care for each patient independent of patient health. The PPS allowed a patient to receive an unlimited number of episodes of care as long as a physician recertified episode of care. However, guidelines about recertification decisions "beneficiaries must need part-time or intermittent skilled care to

treat their illnesses or injuries and must be unable to leave their homes without considerable effort,” (MedPAC, 2011, p.177) were not well-defined. Physicians often made recertification decisions based on information provided by an agency. Therefore, agencies could easily recertify an episode of care for each patient to increase profits.

Agencies also strategically adjusted the number of service visits per episode they provided. They took advantage of retrospective features embedded in the PPS, which adjusted reimbursement amounts based on treatment levels provided. For example, agencies dramatically increased the proportion of episodes with at least 10 therapy visits and decreased the proportion of episodes with 7 to 9 therapy visits. This was because the PPS reimbursed a significantly higher amount for episodes involving 10 or more therapy visits. Moreover, agencies drastically decreased the proportion of patients who received fewer than five visits per episode (called a low-cost episode). Medicare would make a per-visit payment (called a low-cost outlier payment) for a low-cost outlier episode, instead of a standard prospective payment. However, these low-cost outlier payments were generally perceived as unprofitable because their payment rates were much lower than standard prospective payment rates. (See Figure 1 that illustrates the reimbursement schedule for an imaginary home health patient who received physical therapy visits from a home health agency located in Ann Arbor in 2001.)

In sum, home health agencies focused on these four types of home health service provision patterns to increase profits relatively easily under the PPS.

2.2 The past studies

To date, virtually no studies have examined how for-profit market share affected service provision among health care providers with different ownership structure longitudinally. Using eight years of data, Horwitz and Nichols (2009) examined the influence of for-profit hospital market share on the types of medical services provided by for-profit, non-profit, and government hospitals, but their analysis did not address time trends in the influence of

for-profit hospital market share. They found that non-profit hospitals in higher for-profit markets tended to provide more profitable services, such as open-heart surgery or magnetic resonance imaging, but fewer unprofitable services, such as HIV-AIDS or psychiatric emergency services, than did non-profit hospitals in markets with fewer for-profits. Horwitz and Nichols (2009) also found that non-profit hospitals in markets with high for-profit market share were more likely to provide home health services when the Medicare reimbursement system made home health services profitable. Likewise, they were less likely to offer home health services when reimbursement rates were restrictive. However, their findings regarding home health services were confined to hospital-based home health agencies which make up only a small fraction of all Medicare-certified home health agencies (17.44% in 2007). In addition, they only examined whether or not each hospital offered home health services given different levels of for-profit market share. In contrast, I address adjustments in four types of home health service provision patterns, which discussed above, among both hospital-based and free-standing agencies. I also go beyond the prior literature by investigating changes in the influence of for-profit market share over time, which could occur through the entry of new health care providers to the market or through the learning process.

3 Conceptual Framework

My conceptual framework addresses 1) the influence of for-profit agency market share on home health service provision patterns across for-profit and non-profit agencies over time and 2) three mechanisms behind the gradual change in the influence of for-profit market share on home health service provision patterns.

When examining agencies in isolation, home health service provision patterns across for-profit and non-profit agencies are clearly distinguishable due to their different operational goals. For-profit agencies must distribute profits to individual shareholders and thus have a strong incentive to follow profitable home health provision patterns (Sloan, 2000). In

contrast, non-profit agencies do not have well-defined shareholders and thus have a weaker incentive to maximize profits (Golberstein et al., 2009). Instead, non-profits seek to maximize the quantity and quality of health care (Horwitz and Nichols, 2009; Newhouse, 1970). Consequently, non-profits are less likely to pursue profitable home health service provision patterns.

However, this distinction in home health service provision patterns across for-profit and non-profit agencies becomes unclear once we consider competition across agencies in a market. According to the firm output maximization model, non-profit home health agencies are more likely to behave like for-profits in a market with more for-profits because non-profits face the constraint of a zero-profit condition (Horwitz and Nichols, 2009; Newhouse, 1970). For example, under the PPS, an increasing number of for-profit home health agencies entered the market, the competition among agencies rose, and consequently, non-profit agencies were predicted to lose their patients to for-profit competitors. This would have left non-profits with not only fewer but also the less profitable patients because for-profit agencies are likely to attract more profitable patients through strategies such as creaming, skimping, and dumping (Ellis, 1998; Horwitz and Nichols, 2009). Accordingly, non-profit revenues would decrease under this intense competition. Therefore, facing a zero-profit constraint, non-profits might be driven to behave more like their for-profit counterparts and adopt profitable service provision patterns. For-profit market share might also influence home health service provision patterns among for-profit agencies. That is, as home health market competition intensifies with more for-profits, each for-profit agency is more likely to follow profitable home health service provision patterns to survive.

However, the effect of for-profit market share on home health service provision patterns might not be found in the cross-sectional analysis. This is more so if an analysis focuses on the first several years after a certain policy change because it typically takes time for home health agencies to adjust service provision patterns responding to the competition provoked by behaviors of for-profit agencies. However, if I focus instead on a longer duration, then

the effect of for-profit market share might become more significant over time.

I propose three mechanisms behind the gradual change in the influence of for-profit market share on home health service provision patterns. First, the entry of new home health agencies to the market might explain this gradual adjustment in home health service provision patterns over time if new agencies behaved differently from existing ones (i.e., agencies established prior to the PPS). A substantially high number of home health agencies, mostly for-profits (95.73%), entered the market under the PPS (refer to Figure 2). New home health agencies would pursue profits more aggressively due to the following three reasons. First, new agencies might enter the home health market under the PPS because they know the PPS would enable them to achieve high-profit margins. Second, existing home health agencies might have more stable budget sources (Choi and Davitt, 2009) given that they survived the restrictive payment rates under the interim payment system. Therefore, financial incentives built into the PPS might be less attractive to existing agencies than to new ones. Third, new home health agencies tended to be inefficient firms, facing higher input-costs (e.g., higher nurse or therapy wage). Therefore, new agencies would have adopted profit-increasing service provision patterns more aggressively, but profits would be still low because the costs for the new firms tend to be higher.

In addition, new home health agencies might have influenced home health provision patterns among existing agencies. If new agencies with strong profit motive attracted profitable patients, neighboring existing agencies would have to serve less profitable patients only. If so, existing for-profit and non-profit agencies might be forced to follow profitable home health provision patterns. Alternatively, existing agencies might identify profitable home health service provision patterns by observing new agencies' behaviors and voluntarily adopting those patterns. Either through competition or learning, as new agencies pursued profits more aggressively, existing agencies' home health provision patterns would more closely resemble those of new agencies.

Furthermore, if an existing agency was affiliated with a chain, its home health provision

patterns would be influenced not only by neighboring new entrants, but also by other agencies in the same chain. Agencies in one chain would be likely to follow similar home health provision patterns because they operated under the same policies. In addition, the chain might distribute the same booklets (such as annual reports) to all agencies in the chain or might provide identical training to workers across agencies. All of these would encourage agencies affiliated with the same chain to resemble each other in terms of home health service provision patterns.

In sum, I suggest that the gradual adjustment in home health service provision patterns under the PPS is explained by three mechanisms: the entry of new home health agencies to the market, the influence of new agencies on existing agencies, and the fact that chain-affiliated agencies learned profitable service provision patterns from other agencies in the same chain.

This conceptual framework leads to the following hypotheses. First, the influence of for-profit market share on home health service provision patterns grew gradually over time under the PPS. Second, agencies that entered the market under the PPS were more likely to follow profitable home health provision patterns than existing agencies. Third, new home health agencies influenced home health provision patterns among neighboring existing agencies. Fourth, chain-affiliated agencies adjusted home health service provision patterns as a result of learning from the experiences of other agencies in the same chain.

4 Empirical Strategy

To examine these hypotheses, I must first define the market for the home health care industry. I use the Hospital Referral Region (HRR), developed by the Dartmouth Atlas of Health Care, as a local market for home health care. The Dartmouth Atlas of Health Care divided the United States into 306 HRRs such that each HRR contains major referral hospitals in which both major cardiovascular surgical procedures and neurosurgery are performed (Chandra and Staiger, 2007; ?). The HRR-level analysis has been used widely because individual HRRs

reflect patient commuting patterns, which can overcome limitations in studies that arbitrarily use a market definition of political boundaries, such as states and counties (Chandra and Staiger, 2007). Although originally developed to identify a hospital market, the HRR works well as a home health market for two reasons. First, empirical examination supports the use of the HRR as a home health market. Using my datasets, I identify the county of residence of the patients treated by each home health agency and find that the market for each home health agency closely resembles the HRR. Second, the HRR represents the market for tertiary medical care and is closely linked to geographic variation in health care usage. Given that many home health patients have had prior hospital stays, using the HRR for a home health market is justifiable.

Each of the following empirical models corresponds to one of my hypotheses.

4.1 The influence of for-profit market share over time

(Hypothesis 1) The influence of for-profit market share on home health service provision patterns grew gradually over time under the PPS.

A higher for-profit market share would increase competition, which in turn would encourage non-profit agencies to adopt profitable home health service provision patterns upon a zero-profit condition. The intense competition in a market with higher for-profit market share would also drive for-profit agencies to pursue profitable home health service provision practices more aggressively. However, the cross-sectional effect of for-profit market share on service provision patterns might be found not at all or only in later years of this study because the adjustments in service provision patterns would have occurred gradually and I examine the initial years of the PPS (2001 to 2007). By contrast, the effect of for-profit market share might be significant in the longitudinal analysis if home health agencies incrementally adopted profitable home health service provision patterns over time.

To address this hypothesis, I estimate regression (1). In particular, following Grabowski and Hirth (2003)'s approach, I estimate regression (1) by agency ownership type for each

patient, and thus exclude indicators of each home health agency’s ownership type, in order to avoid a potentially high multicollinearity between the ownership type of each home health agency and for-profit market share.

$$\begin{aligned}
Pr(Y_{ijkt}) = & \beta_0 + \beta_1 LinearYear_t + \beta_2 FPMarketShare_{ht} & (1) \\
& + \beta_{12} LinearYear_t \times FPMarketShare_{ht} + \beta_3 HHI_{ht} \\
& + \beta_4 Agency_{jt} + \beta_5 Patient_{ijkt} + \beta_6 Seasonality_k + HRR_h + \varepsilon_{ijkt}
\end{aligned}$$

where i , j , k , h , and t refer to patient, home health agency, episode, hospital referral region, and year, respectively. $Pr(Y)$ refers to four aspects of home health service provision, namely, the likelihood of recertification, the likelihood of receiving 10-13 therapy visits, the likelihood of receiving 7-9 therapy visits, and the likelihood of receiving fewer than 5 visits (regardless of service type). $LinearYear$ is a linear year variable. $FPMarketShare$ represents for-profit market share in the HRR in which an agency was located. HHI is the Herfindahl-Hirschman Index (HHI), which measures level of market concentration. HHI is calculated as the sum of the squares of each agency’s share of total episodes within each HRR in each year, and thus it ranges between 0 and 1.

$Agency$ represents a vector of each home health agency’s basic characteristics, such as number of patients treated and facility-based status. $Patient$ refers to a vector of each patient’s basic characteristics including age, race/ethnicity, gender, the Medicare buy-in program participation status (a proxy of being low-income given that the program helps pay Medicare premiums for low-income Medicare beneficiaries (?)), indicators for most frequent major health diagnoses, and level of functional limitations. I also control for $Seasonality$, an indicator variable for the first (reference group), second, third, and last quarter of each year.

I also included HRR , HRR fixed effects, to address the potentially endogenous relationship

between for-profit market share and each agency's home health service provision pattern. An HRR with a particularly business-friendly environment might attract more for-profit home health agencies to the market, and thus have relatively high for-profit market share. Those HRRs might also be more likely to condone inappropriate home health service provisions that do not necessarily correspond to patient health. Including HRR fixed effects addresses this endogenous relationship by controlling for fixed unobservable characteristics in each home health market.

One caveat with the fixed effect approach is that HRR fixed effects cannot control for time-varying unobservable heterogeneity across home health markets that might be correlated with for-profit market share. However, the environment that affects each region's home health care industry is unlikely to change over time. Grabowski and Hirth (2003) argued that non-profit hospital market share (and thus for-profit hospital market share) is likely based on historical factors such as each city's age, volunteerism, and charitable provisions. Since for-profit home health agency market share depends on these same factors, they are also unlikely to change. I found that states like Texas and Louisiana that experienced rapid growth in Medicare home health care provision under the fee-for-service payment system observed similarly dramatic expansions under the PPS. By contrast, states like New Jersey and Massachusetts experienced similarly small expansions of Medicare home health care provision under both payment systems. That is, the business environment that affected Medicare home health care provision in each region remained the same over time. Therefore, I conclude that for-profit home health agency market share is not correlated with changes in unobserved characteristics in individual HRRs. The fixed effect approach could also have been limited if the within-HRR change in for-profit market share was small because the influence of for-profit market share is identified solely in terms of changes within each HRR over time. However, fortunately, for-profit market share within each HRR changed greatly under the PPS, providing sufficient variation.

I estimate separate linear probability models for each dependent variable. In fact, all

results are essentially the same if I estimate probit models instead. However, I prefer the individual OLS results due to the more straightforward inference with the interaction term estimates. The standard errors are clustered on HRR.

The coefficient of my interest, β_{12} , measures changes in the influence of for-profit home health agency market share on each agency's home health service provision patterns over time, and is expected to be positive when Y is a profitable home health service provision pattern (i.e., recertifying another episode of care and providing 10-13 therapy visits per episode). After estimating regression (1), I also compute the marginal effect of for-profit home health agency market share on each agency's home health service provision patterns for each year.

4.2 The service provision among new home health agencies

(Hypothesis 2) Agencies that entered the market under the PPS were more likely to follow profitable home health provision patterns than existing agencies.

The entry of new home health agencies to the market explains the gradual adjustments in home health service provision patterns among agencies under the PPS. New home health agencies might have started their businesses under the PPS because they recognized that the incentives built into the PPS would enable them to achieve high profit margins. Furthermore, existing agencies might have enjoyed more stable budget sources, which would have provided weaker incentives for following profitable home health service provision patterns. New agencies might be more inefficient firms with higher input costs, and therefore had to pursue profitable service provision patterns more aggressively. Consequently, new agencies would have been more likely than existing agencies to follow the specific home health provision patterns that lead to high profits.

To examine this hypothesis, I limit my sample to home health episodes that occurred in 2007 and examine how home health service provision patterns differed depending on the starting year of each home health agency, by agency ownership type. As a robustness check,

I also limit my sample to home health episodes that occurred in 2004, 2005, and 2006, and did the same analysis. The basic estimating equations take the following form:

$$Pr(Y_{ijk}) = \beta_0 + \sum_{n=2001}^{2007} \beta_{1n} EntryYear_{jn} + \beta_2 Agency_j + \beta_3 Patient_{ijk} + \beta_4 Seasonality_k + HRR_h + \varepsilon_{ijk} \quad (2)$$

where *EntryYear* is a vector of dummy variables that represent the starting year (n) of each home health agency (reference group: $n \leq 2000$, i.e., agencies that entered the market prior to the PPS). The coefficient of my interest, β_1 , measures how each new agency's home health service provision patterns varied depending on the year of establishment compared to the patterns of agencies established prior to the PPS. β_1 is expected to be positive when Y is a profitable home health service provision pattern (i.e., recertifying another episode of care and providing 10-13 therapy visits per episode).

4.3 The influence of new entrants on home health service provision among existing agencies

(Hypothesis 3) New home health agencies influenced home health provision patterns among neighboring existing agencies.

In the presence of new home health agencies, existing home health agencies in the same market might have adopted profitable home health provision patterns either through competition or through a learning process. To examine this hypothesis, I evaluate the importance of new agencies' home health service provision patterns in determining each existing for-profit and non-profit agency's service provision practice. Thus, I limit my sample to episodes served by existing agencies, and further exclude episodes in HRRs with no entrants. The basic estimating equations follow:

$$\begin{aligned}
Pr(Y_{ijkt}) = & \beta_0 + \beta_1 \overline{Y_{ht-1}^{new}} + \beta_2 Year_t + \beta_3 HHI_{ht} \\
& + \beta_4 Agency_{jt} + \beta_5 Patient_{ijkt} \\
& + \beta_6 Seasonality_k + HRR_h + \varepsilon_{ijkt}
\end{aligned} \tag{3}$$

where $Pr(Y)$ represents existing agency's home health service provision patterns. $\overline{Y_{ht-1}^{new}}$ is the proportion of specific home health service provision practice (Y) of new agencies (regardless of their ownership) in HRR h in year $t - 1$. I assume existing agencies followed the past year's home health service provision practices of new agencies because it might take time for agencies to adjust their service provision patterns. The coefficient of my interest, β_1 , measures how average home health provision behavior among new agencies in a HRR affected service provision practice among existing agencies in the same HRR and is expected to be positive.

4.4 Learning from the practices of agencies in the same chain

(Hypothesis 4) Existing chain-affiliated agencies adjusted home health service provision patterns as a result of learning from the experiences of other agencies in the chain.

If an existing agency was affiliated with a chain, it would have identified profitable home health service provision patterns based on the experiences of other agencies in the chain. To examine this hypothesis, I limit my sample to episodes served by existing, chain-affiliated agencies and evaluate the importance of home health service provision patterns among other agencies (including both existing and new ones) in the chain in determining each agency's service provision practice, by agency ownership type. The basic estimating equations follow:

$$Pr(Y_{ijkt}) = \beta_0 + \beta_1 \overline{Y_{-jct-1}} + \beta_2 Year_t + \beta_3 HHI_{ht} \tag{4}$$

$$\begin{aligned}
& +\beta_4 Agency_{jt} + \beta_5 Patient_{ijkt} + \beta_6 Seasonality_k \\
& +HRR_h + \varepsilon_{ijkt}
\end{aligned}$$

where c refers to chain. $\overline{Y_{-jct-1}}$ is the proportion of specific home health service provision practice among agencies (excluding agency j) in the chain in year $t - 1$. The coefficient of my interest, β_1 , measures how each chain-affiliated agency's home health service provision patterns were affected by the average service provision pattern among agencies in the chain, and is expected to be positive.

5 Data

5.1 Datasets

I use data from: 1) the CMS 5% Limited Data Set-Denominator File from 2001 to 2007, 2) the CMS 5% Limited Data Set-Home Health Agency File from 2001 to 2007, and 3) the CMS Provider of Service File-Home Health Agency from 2001 to 2007 (King et al., 2010). I use data from 2001 through 2007 because the concept of episode was introduced with the implementation of the PPS in 2001 and CMS partially revised its home health reimbursement system in 2008. The first dataset, which was extracted from Medicare claims, is a panel of 5 % of Medicare beneficiaries and contains their basic demographic information such as age, race, gender, and date of death, as well as Medicare HMO enrollment status. The second dataset, which was also taken from Medicare claims, is also a panel of 5% of Medicare home health patients and contains administrative information about each patient's Medicare home health care service use (CMS, 2012b). The last dataset was extracted from the Online Survey and Certification Reporting System/ Quality Improvement Evaluation System collected by the CMS Regional Offices (Choi and Davitt, 2009; CMS, 2012a). It is a panel of all Medicare/Medicaid-certified home health agencies across the nation and includes their basic agency information like location, ownership type, and date of initial

Medicare certification. I combine the first two datasets using each beneficiary's ID number, and create a complete Medicare claim dataset. The home health agency provider number enables me to merge the combined Medicare claim dataset and CMS Provider of Service File, resulting in a patient-agency linked, unbalanced panel data set. Each observation in this dataset corresponds to a patient's unique episode of care.

I limit my sample to Medicare beneficiaries who were 65 or older. I also drop beneficiaries who were enrolled in Medicare HMOs because Medicare HMOs were not directly influenced by Medicare reimbursement system changes. I further exclude those beneficiaries with zero Medicare payments, zero Medicare home health service visits, or positive non-Medicare payment amount as well as beneficiaries who resided in Puerto Rico, the U.S. Island Areas, or unidentified county areas. Medicare home health patients whose agency information was not found in the CMS Provider of Service File-Home Health Agency were also dropped. Additionally, I exclude one of the records in cases in which two episodes had the same service start and end date and referred to the same episode, but had separate records due to significant changes in the patient's health condition or the existence of an unclean claim. I drop as well episodes of care for beneficiaries who died earlier, but received home health visits after their date of death. I further exclude episodes in which home health care was interrupted because a patient was readmitted to a hospital, entered a nursing home, died, and so forth. I also exclude episodes that were treated by government home health agencies. Finally, I drop observations with missing values for the variables used in my analysis. These selection criteria created an unbalanced panel data set with 1,290,573 patient-episode observations, which translated to 498,798 unique patients.

5.2 Key independent variable

The key independent variable is for-profit market share in the HRR in which an agency was located. I compute for-profit market share as the proportion of for-profit home health admissions out of total home health admissions in each HRR. Average for-profit market share

rose significantly under the PPS, from 0.49 in 2001 to 0.60 in 2007.

6 Empirical Results

6.1 The influence of for-profit market share over time

The influence of for-profit market share on profitable home health service provision increased gradually over time, as predicted in my conceptual model. For example, the effect of for-profit market share on the likelihood of recertification and the likelihood of providing 10 to 13 therapy visits per episode became increasingly stronger over time for patients of both for-profit and non-profit agencies (See Table 1). However, for-profit market share had no effect on each patient's likelihood of receiving 7 to 9 therapy visits or of receiving fewer than five visits (regardless of service type) (See Table 2). These two findings suggest that both for-profit and non-profit agencies were increasingly likely to focus on recertification and the provision of 10 to 13 therapy visits to increase profits and thereby buffer the losses incurred from the intense competition caused by higher for-profit market share.

The cross-sectional influence of for-profit market share on the likelihood of providing 10-13 therapy visits, 7-9 therapy visits, and fewer than five visits was not significant for for-profit and non-profit agencies throughout the PPS (see Figures 3-5). However, over time I find an increase in the marginal effects of for-profit market share on profitable home health service provision (i.e., the likelihood of providing 10-13 therapy visits). On the other hand, I find a decreasing trend in the marginal effects on unprofitable service provision (i.e., the likelihood of providing 7-9 therapy visits and fewer than 5 visits). For-profit market share had a significant influence on each agency's likelihood of recertification. Higher for-profit market share increased the likelihood of recertification among patients of for-profit agencies from 2005 onward (see Figure 6). This positive relationship became much stronger over time. Higher for-profit market share predicted a reduced likelihood of recertification among patients of non-profit agencies during the early years of the PPS, which is inconsistent with

the prediction of the firm output maximization model (see Figure 6). However, this tendency weakened dramatically over time. In sum, the examination of the cross-sectional effect of for-profit market share also suggests that the influence of for-profit market share on profitable home health service provision increased gradually over time.

6.2 The service provision among new home health agencies

For-profit home health agencies that entered the market under the PPS pursued profit-seeking service provision patterns more aggressively than their for-profit counterparts established prior to the PPS. More specifically, the proportion of recertified episodes was higher among for-profit agencies established in 2001 and 2004 compared to existing ones, by 2.15% points and 6.73% points, respectively (See Figure 7). The proportion of providing 10-13 therapy visits was also higher among for-profit agencies that entered the market in 2001 and 2004 than it was for existing agencies, by 4.21% points and 7.63% points, respectively (See Figure 8). In addition, new for-profit agencies were less likely than existing ones to pursue unprofitable home health service provisions including providing 7-9 therapy visits and providing fewer than 5 visits (See Figure 9-10). However, this trend was not found among new non-profit agencies. Given that a number of home health agencies, mostly for-profits, continued to enter the market throughout the PPS (see Figure 2), the aggressive profit-seeking behavior of new home health agencies thus explains the gradual adjustments in home health service provision patterns under the PPS.

6.3 The influence of new entrants on home health service provision among existing agencies

New home health agencies affected the provision of home health service by existing agencies in the same market. For example, if the average likelihood of recertification among new agencies in year $t - 1$ was high, then existing for-profit and non-profit agencies in the same market

were also more likely to recertify an episode of care in year t (See Table 3). More specifically, 1% point increase in the average likelihood of recertification among new agencies in year $t - 1$ was associated with the 2.0% point and 1.2% point higher likelihoods of recertification among existing for-profit and non-profit agencies in the same HRR, respectively. The 1% point higher average likelihood of providing 10-13 therapy visits per episode among new agencies in year $t - 1$ was associated with the 2.3% point higher likelihood of providing 10-13 therapy visits among existing for-profit agencies in year t . Also, the 1% point increase in the average likelihood of providing fewer or equal to 4 visits per episode among new agencies in year $t - 1$ was related to the 2.0% point higher likelihood of same practice among existing non-profit agencies in year t .

6.4 Learning from the practices of agencies in the same chain

If an existing agency was affiliated with a chain, its home health provision patterns were influenced by the past year's home health service provision practices of other agencies in the chain. For instance, the 1% point higher likelihood of recertification among other agencies in the chain in year $t - 1$ was associated with the 25% point and 6.8% point higher average likelihood of recertification for existing for-profit and non-profit agencies in year t (see Table 4). I find the same phenomenon in other types of home health service provision. However, in existing non-profit agencies, the likelihood of providing 7-9 or 10-13 therapy visits had no significant relationship with that of other agencies in the chain.

7 Discussion

This study finds that the effect of for-profit home health agency market share on profitable home health service provision practices increased over time. I further suggest three mechanisms behind the gradual increase in the effect of for-profit market share over time under the PPS. Those mechanisms include the entry of new home health agencies to the market, the influence

of new agencies on existing agencies, and the fact that chain-affiliated agencies learned profitable service provision patterns from other agencies in the same chain. In particular, I find these mechanisms explain the gradual change in the influence of for-profit market share on service provision patterns over time, but do more for for-profit agencies.

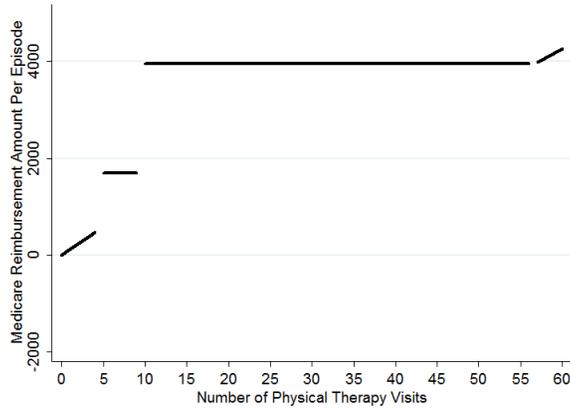
It is necessary to mention a few potential limitations of this study. First, this study cannot perfectly consider patient selection among agencies with different ownership structures. This study controls for an individual patient's main diagnoses and functional limitations, but does not have access to sufficiently detailed information about patient health status, which may potentially bias estimates. Second, this study does not consider what might happen in other health care settings during the study time period, that is, between 2001 and 2007. Because home health care can be a close substitute for nursing home and hospital care to some degree, changes in those health care settings might influence the provision of home health services. Third, this study cannot control for time-varying unobservable heterogeneity across home health markets that might be correlated with for-profit agencies' market share. As discussed above, however, unobservable heterogeneity is unlikely to change over time.

Despite these limitations, this study makes several important contributions. Notably, this is the first study that addresses changes in the effect of for-profit market share over time. In addition, it identifies three mechanisms behind the gradual change in the effect of for-profit market share. Furthermore, it examines the effect of for-profit home health agency market share on service provision across agencies with different ownership type, which has not been studied elsewhere.

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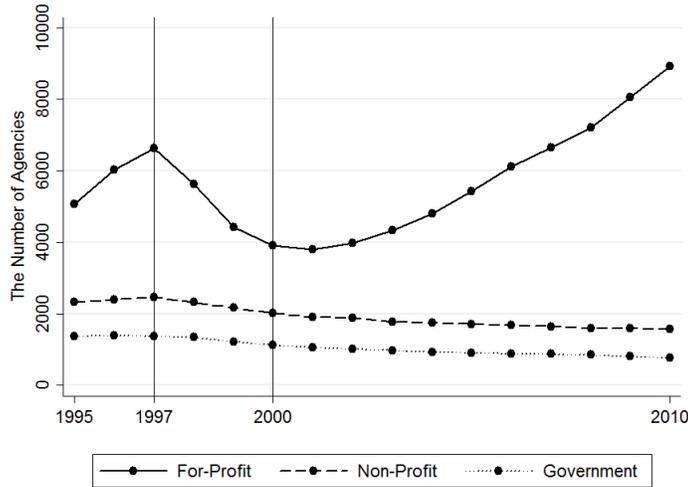
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Figure 1: Medicare Prospective Reimbursement Schedule in 2001



Note: This figure illustrates the Medicare prospective reimbursement schedule for a patient who received physical therapy visits only from a home health agency located in Ann Arbor, MI in 2001. This patient’s case-mix group was C1F3S0 when the patient received fewer than 10 therapy visits, but switched to C1F3S2 once the number of therapy visits reached 10.

Figure 2: Number of Medicare-Certified Home Health Agencies, by Ownership Type: 1995-2010



Source: The CMS Provider of Services File- Home Health Agency 1995-2010

Note: 1) Medicare Home Health was under the Fee-For-Service Payment System until 1997, Interim Payment System between 1998-2000, and PPS between 2001-2010. 2) Home health agencies in Puerto Rico and the U.S. Island Areas are excluded.

Table 1: Changes in the Influence of For-Profit Home Health Agency Market Share on Profitable Home Health Service Provision across For-Profit and Non-Profit Agencies over Time

Covariate	Pr(Recertification)		Pr($10 \leq \text{Therapy Visit} \leq 13$)	
	(1)For-Profit	(2)Non-Profit	(3)For-Profit	(4)Non-Profit
Year	-.019(.0040)***	-.0075(.0019)***	.0032(.0025)	.0017(0.0013)
FPMarketShare	-.086(.047)*	-.17(.040)***	-.021(.032)	-.022(.027)
Year \times FPMarketShare	.047(.0066)***	.024(.0049)***	.010(.0035)**	.010(.0036)**
Observations	754,884	455,762	348,471	229,093

Note: I ran all regressions, separately by agency ownership type. Other control variables include patient characteristics (age, race, gender, dual-eligible or not, major health conditions, and level of functional limitation), agency characteristics (number of patients served and whether the agency was free-standing or facility-based), Herfindahl-Hirschman Index, and seasonality. Equations are estimated using an ordinary least squares regression. Standard errors shown in parenthesis are clustered on hospital referral region.

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table 2: Changes in the Influence of For-Profit Home Health Agency Market Share on Unprofitable Home Health Service Provision across For-Profit and Non-Profit Agencies over Time

Covariate	Pr($7 \leq \text{Therapy Visit} \leq 9$)		Pr($\text{Visit} \leq 4$)	
	(1)For-Profit	(2)Non-Profit	(3)For-Profit	(4)Non-Profit
Year	-.0023(.0020)	-.00074(.0013)	.00068(.0012)	.0034(.0017)
FPMarketShare	.020(.014)	.0047(.019)	.019(.013)	-.0015(.018)
Year \times FPMarketShare	-.0035(.0025)	-.0048(.0040)	-.0019(.0015)	-.0031(.0026)
Observations	348,471	229,093	754,884	455,762

Note: I ran all regressions, separately by agency ownership type. Other control variables include patient characteristics (age, race, gender, dual-eligible or not, major health conditions, and level of functional limitation), agency characteristics (number of patients served and whether the agency was free-standing or facility-based), Herfindahl-Hirschman Index, and seasonality. Equations are estimated using an ordinary least squares regression. Standard errors shown in parenthesis are clustered on hospital referral region.

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Figure 3: Marginal Effects (with 95% Confidence Interval) of For-Profit Home Health Agency Market Share on the Likelihood of Providing 10 to 13 Therapy Visits across For-Profit and Non-Profit Agencies between 2001 and 2007

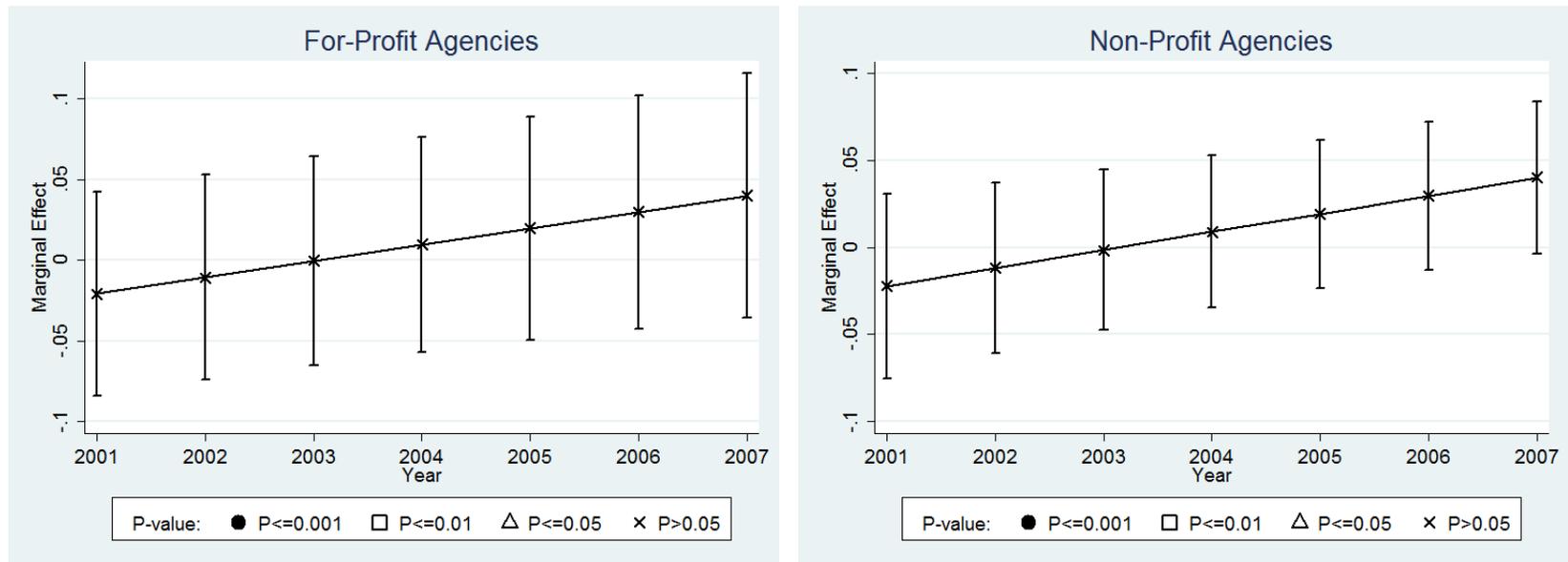


Figure 4: Marginal Effects (with 95% Confidence Interval) of For-Profit Home Health Agency Market Share on the Likelihood of Providing 7 to 9 Therapy Visits across For-Profit and Non-Profit Agencies between 2001 and 2007

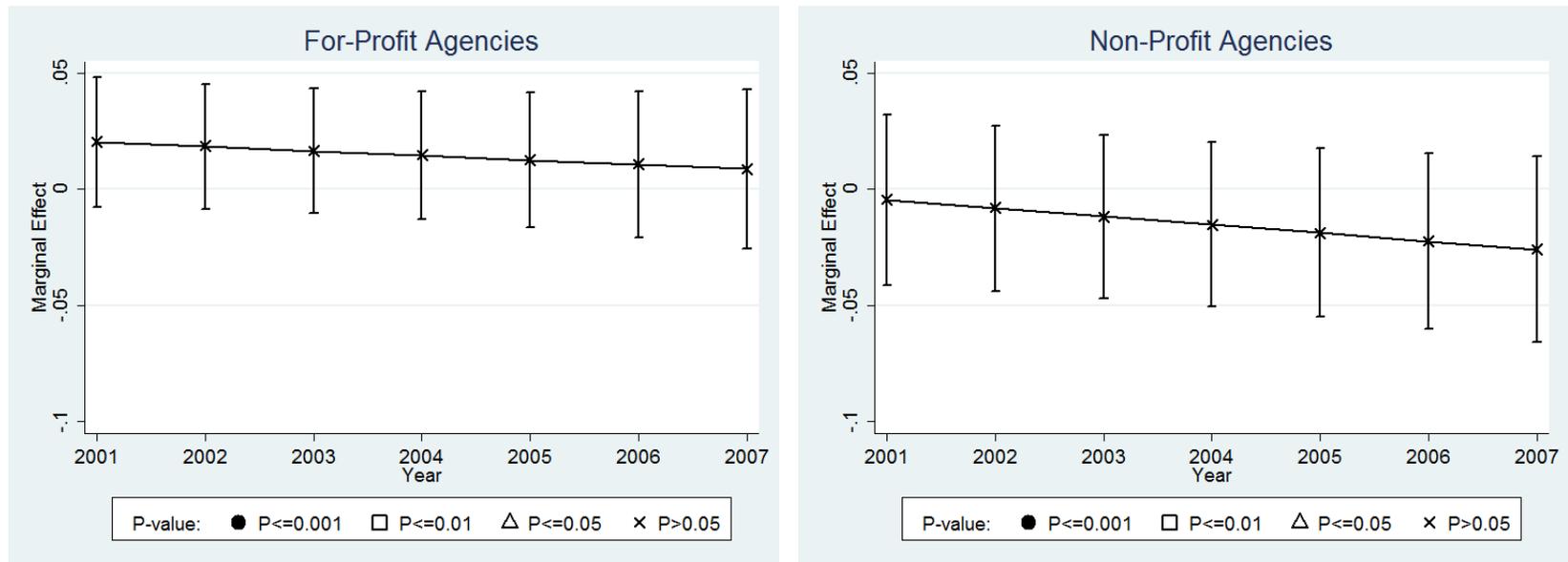


Figure 5: Marginal Effects (with 95% Confidence Interval) of For-Profit Home Health Agency Market Share on the Likelihood of Providing Fewer than Five Visits across For-Profit and Non-Profit Agencies between 2001 and 2007

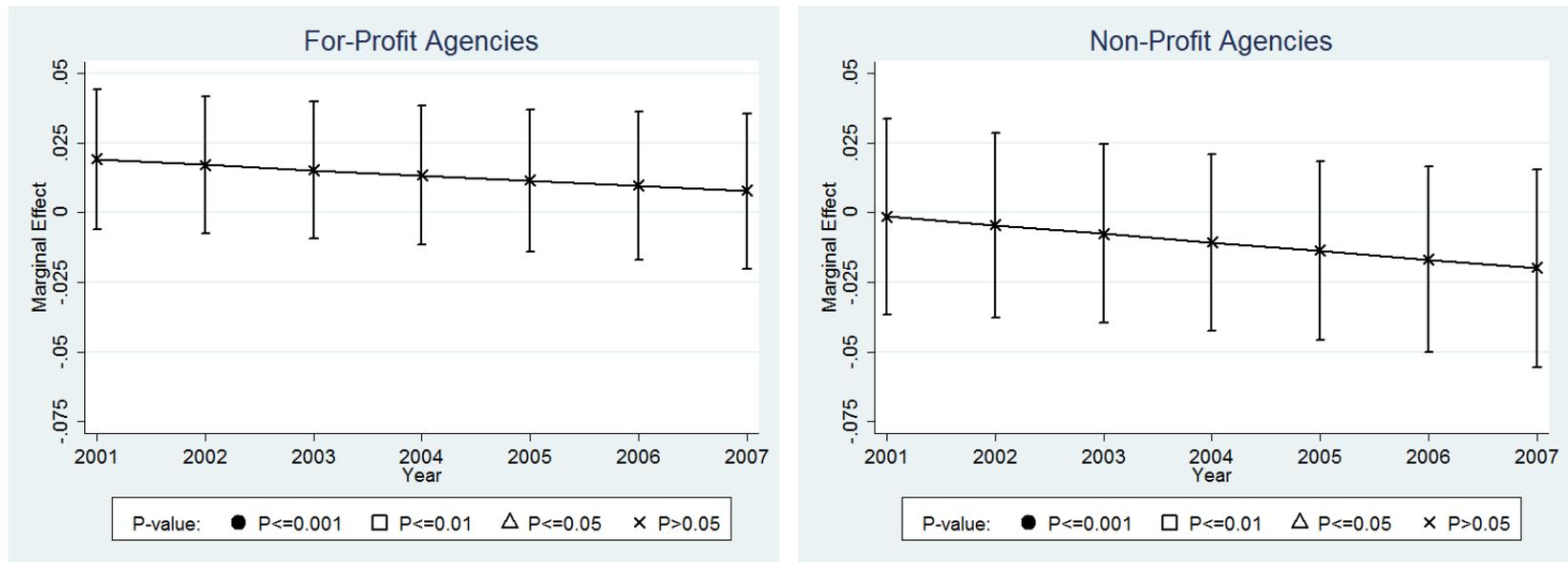


Figure 6: Marginal Effects (with 95% Confidence Interval) of For-Profit Home Health Agency Market Share on the Likelihood of Recertification across For-Profit and Non-Profit Agencies between 2001 and 2007:

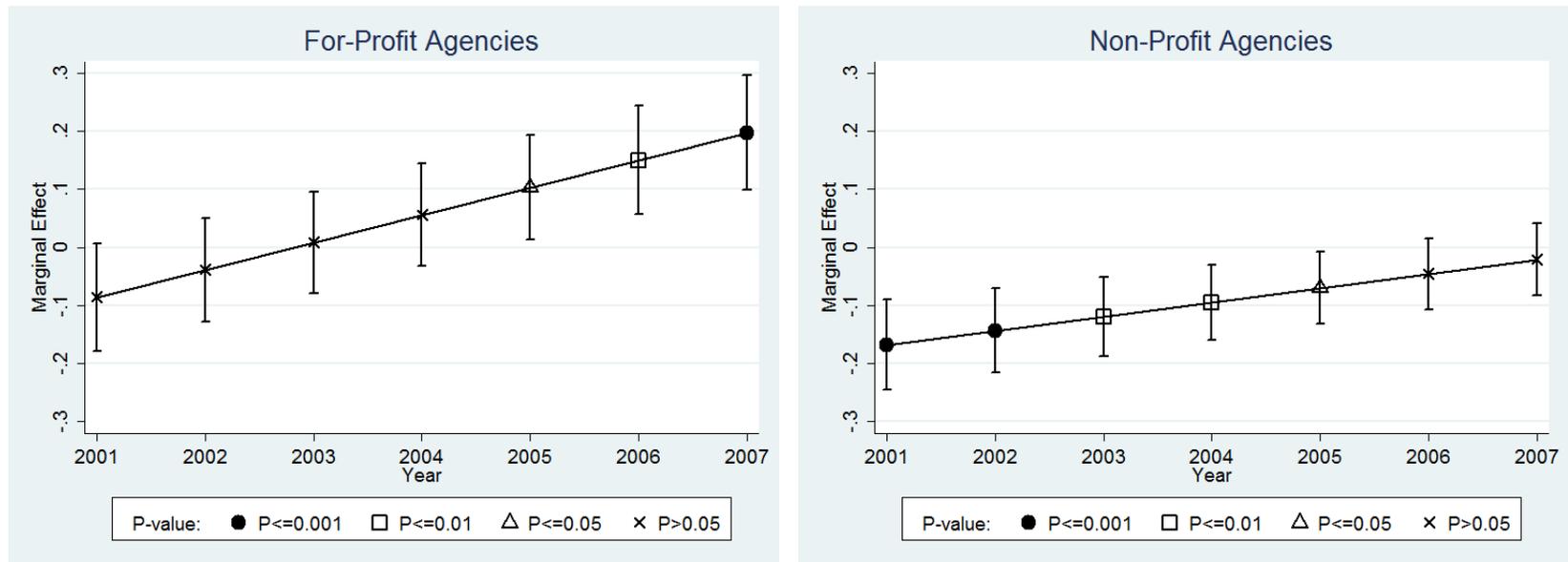
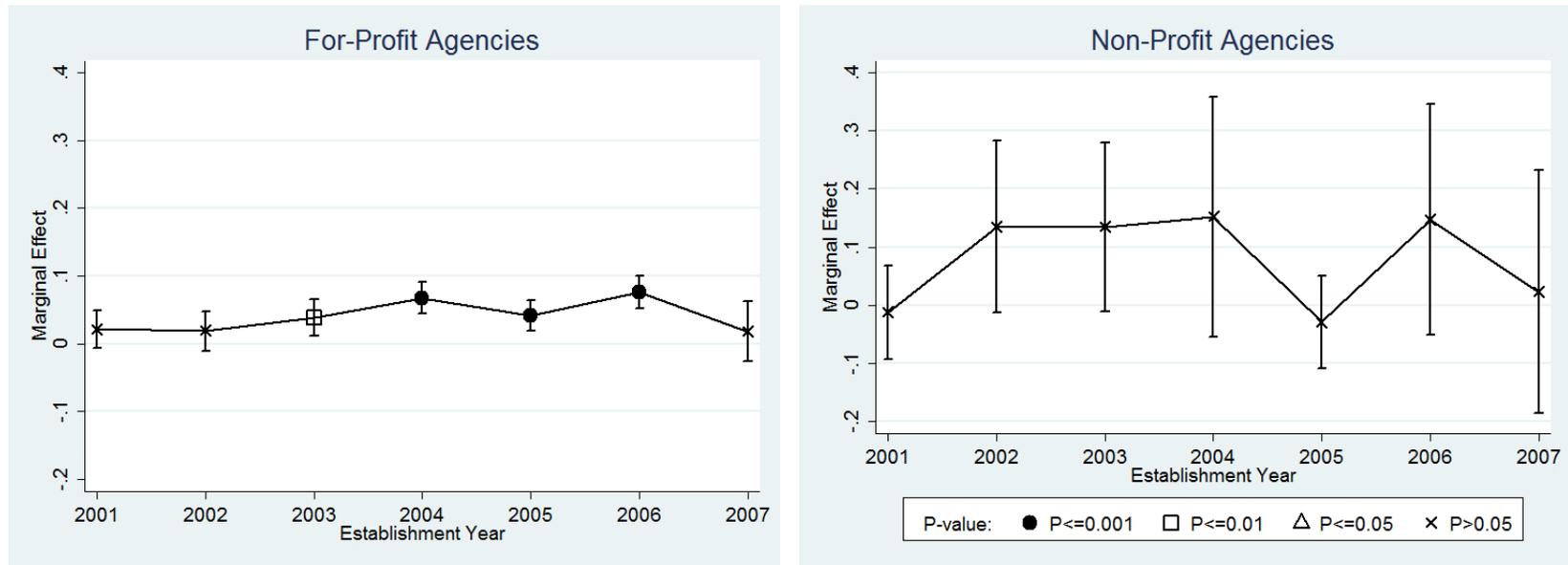
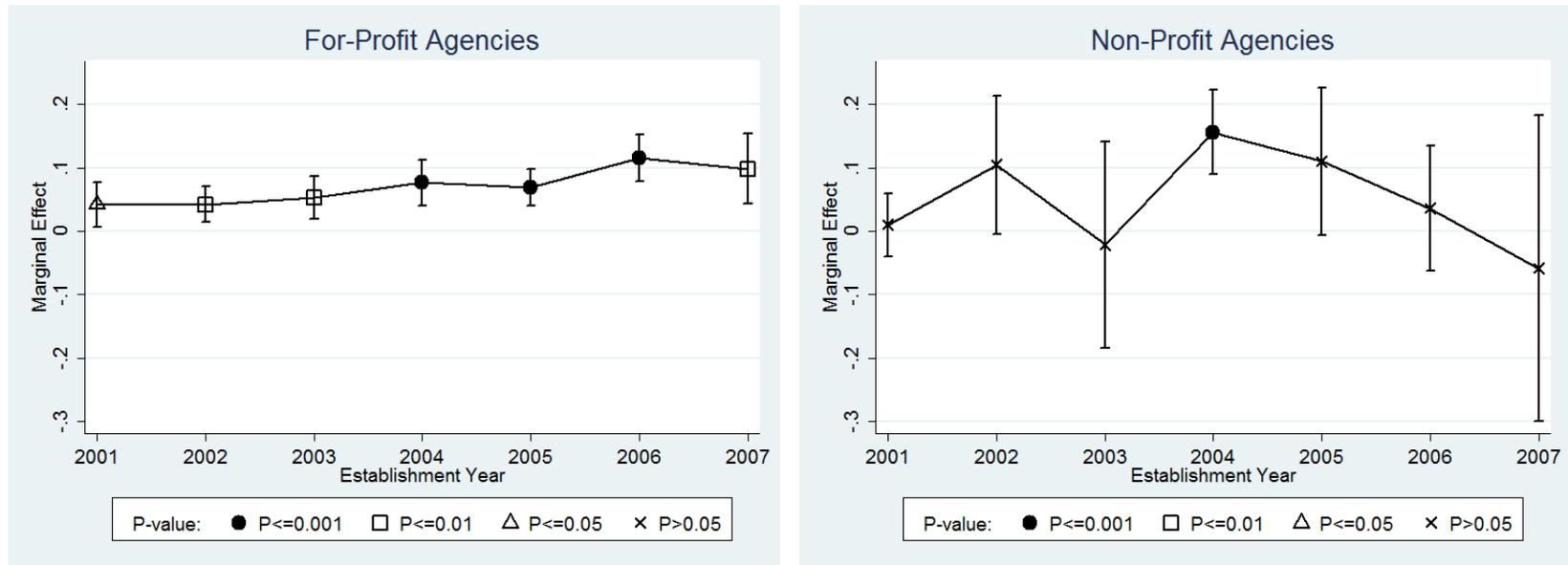


Figure 7: Marginal Effects of Starting Year of Each Home Health Agency on the Likelihood of Recertification across For-Profit and Non-Profit Agencies in 2007



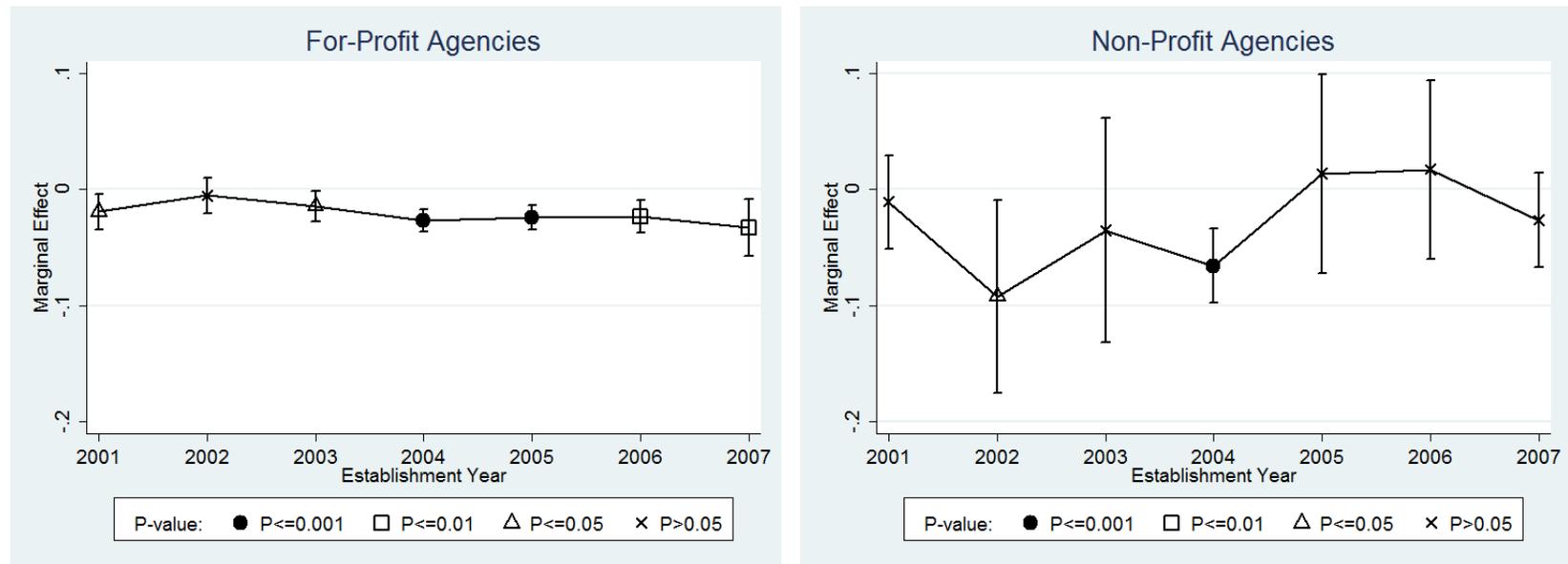
Note: The reference group of starting year of each home health agency is ≤ 2000 (i.e., agencies that entered the market prior to the PPS)

Figure 8: Marginal Effects of Starting Year of Each Home Health Agency on the Likelihood of Providing 10 to 13 Therapy Visits across For-Profit and Non-Profit Agencies in 2007



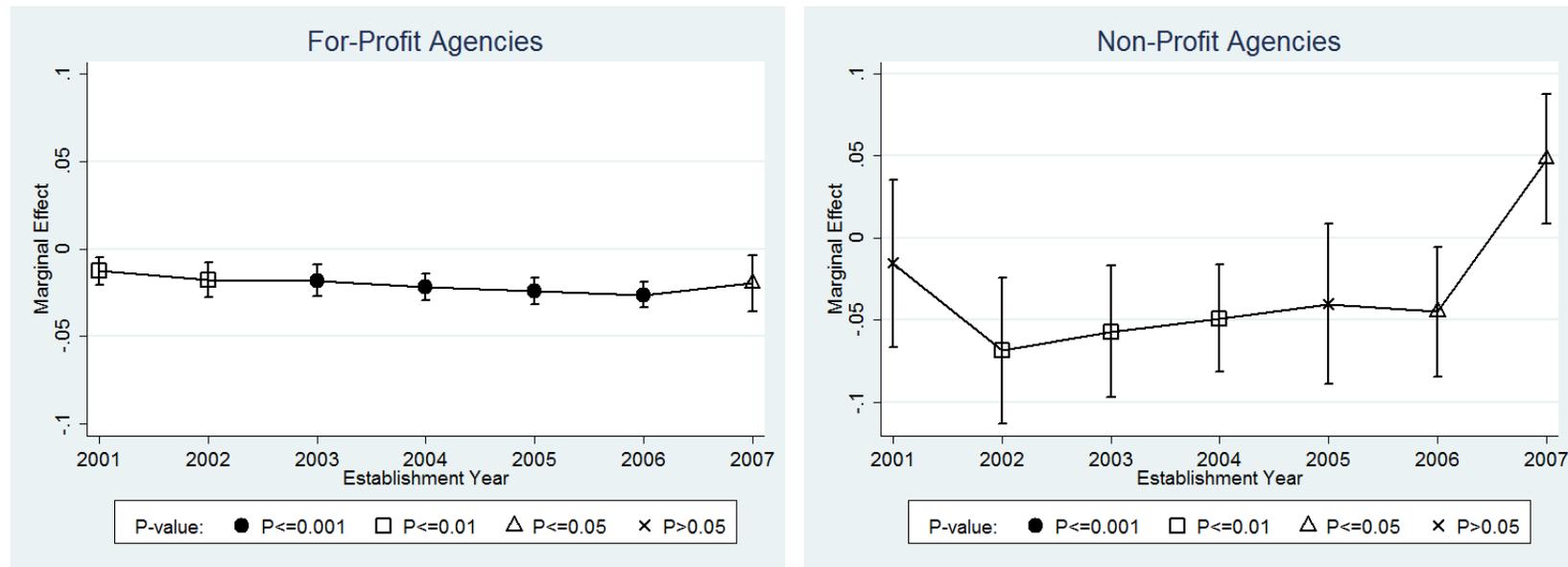
Note: The reference group of starting year of each home health agency is ≤ 2000 (i.e., agencies that entered the market prior to the PPS)

Figure 9: Marginal Effects (with 95% Confidence Interval) of Starting Year of Each Home Health Agency on the Likelihood of Providing 7 to 9 Therapy Visits across For-Profit and Non-Profit Agencies in 2007



Note: The reference group of starting year of each home health agency is ≤ 2000 (i.e., agencies that entered the market prior to the PPS)

Figure 10: Marginal Effects (with 95% Confidence Interval) of Starting Year of Each Home Health Agency on the Likelihood of Providing Fewer than Five Visits across For-Profit and Non-Profit Agencies in 2007



Note: The reference group of starting year of each home health agency is ≤ 2000 (i.e., agencies that entered the market prior to the PPS)

Table 3: The Influence of Neighboring New Agencies on Home Health Service Provision Practices among Existing Agencies

Outcome Variable	Average Home Health Provision of Neighboring New Agencies in Year $t - 1$	
	For-Profit	Non-Profit
Pr(Recertified)	.020(.0051)***	.012(.0059)*
Pr($10 \leq V^T \leq 13$)	.023(.0080)**	-.014(.0093)
Pr($7 \leq V^T \leq 9$)	-.0072(.0085)	.014(.012)
Pr($V \leq 4$)	.0014(.0055)	.020(.010)*

Note: I ran all regressions, separately by agency ownership type. Other control variables include patient characteristics (age, race, gender, dual-eligible or not, major health conditions, and level of functional limitation), agency characteristics (number of patients served and whether the agency was free-standing or facility-based), Herfindahl-Hirschman Index, and seasonality. Equations are estimated using an ordinary least squares regression. Standard errors shown in parenthesis are clustered on hospital referral region.

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table 4: The Influence of Other Agencies in the Chain on Existing Individual Agency's Home Health Service Provision Practice

Outcome Variable	Average Home Health Provision of Other Agencies in the Chain in Year $t - 1$	
	For-Profit	Non-Profit
Pr(Recertified)	.25(.0078)***	.068(.024)**
Pr($10 \leq V^T \leq 13$)	.068(.013)***	.0072(.024)
Pr($7 \leq V^T \leq 9$)	.042(.015)**	.0021(.044)
Pr($V \leq 4$)	.068(.011)***	.15(.039)***

Note: I ran all regressions, separately by agency ownership type. Other control variables include patient characteristics (age, race, gender, dual-eligible or not, major health conditions, and level of functional limitation), agency characteristics (number of patients served and whether the agency was free-standing or facility-based), Herfindahl-Hirschman Index, and seasonality. Equations are estimated using an ordinary least squares regression. Standard errors shown in parenthesis are clustered on hospital referral region.

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$