Wolves in sheep's clothing:
Is non-profit status used to signal quality?

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April 2017

Abstract

Why do many firms in the healthcare sector adopt non-profit status? One argument is that non-profit status serves as a signal of quality when consumers are not well informed. A testable implication is that an increase in consumer information may lead to a reduction in the number of non-profits in a market. We test this idea empirically by exploiting an exogenous increase in consumer information in the US nursing home industry. We find that the information shock led to a reduction in the share of non-profit homes, driven by a combination of home closure and sector switching. The lowest quality non-profits were the most likely to exit. Our results have important implications for the effects of reforms to increase consumer provision in a number of public services.

JEL Codes: L31, L38, I18, I11
Key words: non-profit, quality disclosure, nursing homes

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Acknowledgements: Funding for Propper is from an ESRC Professorial Fellowship ES/J023108/1. We thank two anonymous referees for the very helpful input, and Michael Vlassopoulos, Sera Linardi, and participants at various seminars and conferences for helpful comments. We also thank Jennifer Troyer for providing some of the data used in the paper.

1. Introduction

Not-for-profit firms play an important role in the provision of health and social care in many countries (Thompson et al 2013). In ongoing debates about public service reform, not-for-profit provision is seen by many as desirable, particularly in services characterized by asymmetry of information, such as health and long-term care. It has long been recognized that, in such markets, non-profit status may provide a signal of quality (Arrow, 1963, Hansmann, 1980, 1996; Easley & O'Hara, 1983; Weisbrod & Schlesinger, 1985; Hirth, 1999; Glaeser & Shleifer, 2001). The essence of the argument is that the quality of non-profit-provided services will be higher (compared to for-profits) because the non-distribution constraint reduces the incentive to cut unobservable quality.[1] It follows that because consumers expect higher quality, they will be prepared to pay a higher price for non-profit-provided services. Glaeser & Shleifer (2001) show that, as a result of the opportunity to charge higher prices and extract rents from the higher revenues, it may be optimal for even self-interested entrepreneurs to choose non-profit status.

One implication of this is that changes in consumer information, which are the focus of many reforms in healthcare markets, may affect incentives for firms to adopt non-profit status and thus the composition of such markets. This implication of increasing information has not been recognized before and is the focus of our paper. We examine what happens to the organizational composition of the market when consumers are exposed to an exogenous increase in information about the quality of service provision in a market previously characterized by asymmetry of information. In doing so we also provide an indirect test of the argument that one reason for the existence of non-profits is asymmetry of information.[2]

A major reform in the US nursing home industry provides the exogenous shock to information on quality. In 2002 the Nursing Home Quality initiative (NHQI) instigated a discrete, exogenous increase in the availability of consumer-focused information on the quality of care in nursing homes. This mandated the publication of accessible quality information at the home level, aimed at consumers and made available in a widely publicized web based form, and subsequently shown to elicit responses from consumers and producers (Grabowski and Town, 2011; Lu, 2012; Hirth and Huang, 2015; Lu, 2016).

[1] The requirement that prohibits nonprofits from distributing residual revenue to those who control the firm.

[2] There are many other arguments to explain the existence of non-profits, including tax-advantages, missions (Weisbrod, 2004), ideology and altruism (Rose-Ackerman, 1996).

This exogenous shock in consumer information aside, the nursing home industry is a good "test-bed" in which to study the relationship between information asymmetries and non-profit provision for a number of reasons. First, the nursing home industry serves a vulnerable population – often represented by a family member – and is therefore characterized by asymmetric information and quality concerns (e.g., Hirth, 1999). Second, the nature of the service is such that nursing home residents often engage in one-off interactions with firms. Residents enter one home and switch infrequently. Thus there is little role for repeated interactions with a firm that may provide the opportunity for acquiring reputation for quality and negate the need to adopt non-profit status as a signal (e.g., Vlassopoulos, 2009). Third, non-profits have historically played an important role in delivery of care, and remain important, with roughly 30% of homes organized as non-profits.

We present a simple model, building on Glaeser and Shleifer (2001), to show how an increase in information provision would be expected to reduce the probability that a provider chooses non-profit status. We find strong evidence in support of this prediction in relation to nursing homes affected by the NHQI. Figure 1 tells the main story. It shows a decline in the share of non-profit providers in the nursing home market following the 2002 reform. Regression analysis confirms the result. Using a difference-in-differences strategy, comparing the probability of market exit among for-profit and non-profit nursing homes before and after information was made available to consumers, we show that non-profits were six times more likely to "exit" the market after the reform compared to for-profits. We show that this exit can be explained equally by closure and by switching to for-profit status. Further, the response is relatively rapid, again suggesting that the non-profit status was a signal rather than a long term commitment to a different way of doing business.

One possible alternative explanation for the exit of non-profits is that the reforms made consumers more quality elastic, resulting in exit of poorly performing homes. While this may have happened, our results suggest that this does not account for the higher exit and switch rates of non-profits following the reforms. We show that non-profits are on average of higher quality than for profits, that exit post-reform is higher amongst non-profits at all points in the quality distribution, and that amongst the lowest quality homes, non-profits are more likely to exit post-reform whilst for-profits are not. This pattern would not be explained solely by consumers becoming more quality elastic post-reform, as an increase in quality elasticity would have led to higher exit amongst the lowest quality homes, which are for-profit. Thus there must be some other mechanism in operation: our model and

results suggest that is the differential impact of revelation of quality information on homes of different types.

In our design, we rely on two sources of variation in the availability of information to consumers to identify the effect of the reform, the first between states, the second at the within-state level. The first comes from variation in the timing of the scheme's introduction. The reform came into effect in full from November 2002, but six states piloted the program from April 2002, while 17 states had their own information provision throughout the entire period. The second is variation in the timing of data collection. Inspections of homes were on average annual but carried out at random times to prevent homes from 'gaming' the inspections. But the reforms were implemented at a fixed date. This means that in the year in which the reform came into effect there are some homes which were inspected before the implementation date and some that were inspected after. We observe treated and non-treated homes in the same state in the same calendar year – and month – and can exploit differences between such homes.

Our paper makes substantive contribution to a number of literatures. Our main finding – that an increase in information reduces the probability that an organization chooses non-profit status – contributes to a literature on explaining non-profit provision in terms of information asymmetries. This explanation has been proposed by among others, Arrow, 1963, Hansmann, 1980, 1996; Easley & O'Hara, 1983; Weisbrod & Schlesinger, 1985; Hirth, 1999; Glaeser & Shleifer, 2001, but there have been relatively few empirical tests. With regard to nursing homes, a number of studies have looked directly at the relative quality of non-profit and for-profit nursing homes using deficiency citations and staffing inputs as measures of quality.[3] There is evidence of heterogeneity: for example, Chou (2002) found that non-profits provided better quality care than FPs to residents without family, but no better care than FPs to residents with family. Lu (2012) discusses the effect of the NHQI, focusing on the impact of quality of care. Using a difference-in-differences strategy she found that the reform affected consumer choices (low-scoring homes experienced declining market shares and revenues) and provider behaviour (scores improves for reported measures and deteriorate for unreported ones, deficiency citations, although she finds no evidence of changes in patient mix which would be consistent with

[3] Examples include: Gertler, 1989; Davis, 1993; Aaronson et al, 1994; Spector et al, 1998; Harrington et al, 2001; O'Neill et al, 2003; Grabowski and Stevenson, 2008; Jones, 2015. There may be a concern that these do not capture all dimensions of quality that consumers care about.

cherry picking).[4] To date, however, no study has looked at the effect of the reform on provider mix in the nursing home industry.

Our second contribution is to the literature on the effect of information provision on the operation of markets. One important theme in this literature is the unintended consequences of the publication of measures. To date, this literature has primarily highlighted actions by producers to manipulate their ratings, for example through selection of consumers or the diversion of effort to measured tasks. Examples relevant to the nursing home industry include the selection of 'easier to treat' patients; the provision of inefficient but less risky care in healthcare to ensure better performance on measured outcomes (e.g., Dafny & Dranove, 2003; Dranove et. al, 2009); the focus of effort on measured compared to unmeasured quality in nursing home (e.g. Lu 2012). Our paper highlights a different aspect of consumer information: the impact on the organizational form of producers. Public service reforms in many countries have targeted underlying information asymmetries and provided ratings of (indicators of) service quality in the form of score cards and league tables. The goal is for consumers to make better-informed choices and to increase the level of competition with the aim of reducing monopoly rents in the market (e.g. Gaynor and Town 2012 in healthcare markets; Minter-Hoxby (2003) in education). If non-profit status is a signal of quality then these reforms to increase information in markets characterized by information asymmetries may also have an impact on the mix of provider types in the market.

The plan of the rest of the paper is as follows. The next section describes the reform, while section 3 presents a simple model to examine the effect of increased information provision on provider status. Section 4 presents and data and describes our empirical strategy. Section 5 presents the main results. Section 6 concludes.

2. The Nursing Home Quality Initiative

Our exogenous information shock is the effect of the *Nursing Home Quality Initiative* (NHQI). This was a mandatory information disclosure policy that represented a major innovation in the way that information on nursing home quality was made available and presented to consumers.

[4] In a follow-up paper, Lu (2016) shows a similar quality response among not-for-profit and for-profit firms. Both improve against reported quality measures and deteriorate among unreported quality measures. Her explanation is that the improvement among not-for-profits is driven by a need to appeal to donors.

Since 1995 all nursing homes in the US registered with the Center for Medicare and Medicaid Services (CMS) have been subject to random inspections that are carried out (roughly) annually by state inspectors.[5] The inspections cover 190 regulatory standards relating to the quality of care provided, the quality of life of the patients and home administration. Failure to meet the standards results in a deficiency citation. Information from these regulatory inspections was disclosed online from 1998, but in a manner that made it hard for consumers to compare.

The major innovation in the NHQI in 2002 was the systematic reporting of clinical quality through a "report card" for all homes, rather than simply the disclosure of deficiencies. CMS introduced a limited number of quality indicators indicators, including measures like "percent of residents with pressure ulcers" and "percent of residents who have lost too much weight".[6] The information was made available on an easy-to-search and highly publicized website, *Nursing Home Compare*. Figure 2 provides a summary snapshot of the information that was made available, showing a small sample of homes in a local area, summary information for one of the homes (which includes ownership status) and information for the home for each of the indicators for short-stay and long-stay patients.

The policy was implemented nationally in November 2002. However, as shown in Figure 3, it was piloted in six states (Colorado, Florida, Maryland, Ohio, Rhode Island, and Washington) in April 2002 ("early treatment states"). A second source of variation in the timing of treatment was that seventeen states (including four of the pilot states) had their own information disclosure websites prior to 2002 ("pre-treatment states"). We discuss in section 4 how we incorporate this variation in the definition of treatment.

Lu (2012) reports evidence that Nursing Home Compare increased consumer awareness of nursing home quality information ("phone calls concerning nursing home information more than doubled and visits to medicare.gov's nursing home quality information increased tenfold"). She also reports positive evaluations of the Nursing Home Compare website. 40% rated it 10 out of 10; 70%, 8+. The reform also had an impact on nursing home pricing, suggesting that both consumers and firms were aware of the information and responsive to it; Hirth and Huang (2015) show that homes revealed to be "high (low) quality" increased (decreased) prices in response to the introduction of information. Although not the focus of our paper, these pricing changes are predicted by the theoretical model we present in the next section.

[5] Over 95% of nursing homes are registered with CMS (Strahan, 1997).

[6] There were ten quality indicators in 2002. The number has grown since.

3. Framework

We present a simple model to illustrate the effect of information disclosure on a provider's choice of organizational form. We build closely on Glaeser and Shleifer (2001) and model an entrepreneur facing the choice between adopting non-profit or for-profit status. To allow for a better mapping into our empirical environment, we extend the model in two directions. First, we allow for heterogeneity among consumers in distaste for deviating from their preferred level of quality. This proxies for mission and allows non-profits and for-profits to coexist even where they have the same cost function. Second, we compare two informational environments: (1) where consumers cannot observe service quality directly, but can only observe an organisation's sector (for-profit or non-profit) and (2) where consumers can directly observe service quality, in addition to sector. We refer to these, respectively, as partial information and full information. Partial information, which matches the setup of G&S, roughly captures the pre-NHQI environment; full information roughly captures the post-NHQI environment.

3.1 Setup of the model

We start by describing the objective functions faced by a firm under the two regimes (full and partial information), conditional on their choice of sector.

In a partial information regime, a for-profit (FP) entrepreneur *i* chooses quality (*q*) to maximize profits:

$$\pi_i^{FP} = z - m(q^* - E(q|FP)) - c(q_i) - b_i(q^*-q_i)$$

where $z - m(q^* - E(q|FP))$ represents consumers' willingness to pay for a single unit of nursing home care. Willingness to pay depends on consumers' perception of the entrepreneur's deviation from the preferred or promised level of quality (q*). When consumers are only partially informed, this perception is formed based on the sector: $E(q|FP)$. $c(q_i)$ represents costs faced by the firm; as in G&S, we assume this is an increasing, concave function, modelled $c(q_i)=q_i^2/2$. Thus, $z - m(q^*-E(q|FP))-c(q_i)$ captures the firm's monetary profits. $b_i(q^* - q_i)$ represents the (potentially psychic) cost to the firm of deviating from the ideal level of quality.

A non-profit firm in a partial information regime chooses *q* to maximize:

$$\pi_i^{NP} = d[z - m(q^* - E(q|NP)) - c(q_i)] - b_i(q^*-q_i)$$

This differs from the for-profit objective function only in that monetary profits are discounted by some amount d reflecting the (potentially imperfectly enforced) non-distribution constraint faced by non-profits. We assume $0<d<1$.

Under a full information regime, consumers directly observe a firm's quality choice and consumer willingness to pay now depends on actual quality: $z - m(q^*-q_i)$. Thus, for-profit firms under the full information regime maximize:

$$\pi_i^{FP} = z - m(q^* - q_i) - c(q_i) - b_i(q^*-q_i)$$

while non-profit firms maximize:

$$\pi_i^{NP} = d[z - m(q^* - q_i) - c(q_i)] - b_i(q^*-q_i)$$

3.2 Quality choice

Maximizing π_i with respect to q_i yields the following optimal choices:

- Under partial information,
  - A non-profit's optimal quality choice is $q_{NP}=b_i/d$.
  - A for-profit's optimal quality choice is $q_{FP}=b_i$.
- Under full information,
  - A non-profit's optimal quality choice is $q_{NP}=b_i/d+m$.
  - A for-profit's optimal quality choice is $q_{FP}=b_i+m$.

Note that, as in G&S, non-profits always provide higher quality than for-profits under partial information. We find that this is also true under our full information environment. We also find that both types of firms provide higher quality than they would under partial information.[7]

[7] An extension of the model with firms making distinct choices over dimensions of quality "reported" and "unreported" by Nursing Home Compare would suggest an overall increase in quality that is driven by a dramatic increase in reported quality paired with a deterioration of unreported quality, consistent with empirical findings from Lu (2012).

3.3 Sector choice

We now turn to the decision to adopt non-profit or for-profit status, which is made first. Under partial information, an entrepreneur of type b_i chooses non-profit status if:

$$d[z - m(q^* - E(q|I,NP)) - c(q_{NP})] - b_i(q^*-q_{NP})$$
$$> z - m(q^* - E(q|I,FP)) - c(q_{FP}) - b_i(q^*-q_{FP})$$

Here, the expectation of quality $E(q|I,NP)$ is based on whatever information I is available. (This additional notation is simply intended to allow us to talk about general decisions made across both informational regimes.) We will show that fewer firms adopt non-profit status under full information ($E(q|I,NP)=q_i$).

We can rewrite the above to read:

$$b_i(q_{NP} - q_{FP}) > (1 - d)(z - mq^*)+m[E(q|F)-dE(q|N)]+(d\ c(q_{NP}) - c(q_{FP}))$$

Regardless of information type, $q_{NP} - q_{FP} = b_i(1 - d)/d$. With some additional algebra, one can derive cutoff types in b that dictate when an entrepreneur would adopt non-profit status. Those cutoffs are below. (The cutoffs are not completely simplified to allow for more direct comparison.)

- Under full information: $b_i > [2d(1-d)^{-1}[(1-d)(z-mq^*)+0.5m^2(1-d)]]^{1/2}$
- Under partial information: $b_i > [2d(1-d)^{-1}[(1-d)(z-mq^*)+m(E(b|FP)-E(b|NP))]]^{1/2}$

Note that, because there is a cutoff type in b above which non-profit status is adopted, consumers' perception of b given non-profit status must be higher than their perception of b after observing for-profit status. In other words, the last term of the partial information cutoff is negative: $m(E(b|FP)-E(b|NP)) < 0$. Because $m>0$ and $d<1$, the last term under full information is positive: $0.5m^2(1-d)>0$. The cutoff types are otherwise identical and so the cutoff type under full information is higher. Thus, fewer firms adopt non-profit status under full information.

3.4 Discussion

The model highlights how increasing consumer information can lead to changes in provider type. It yields two hypotheses that we take to the data:

Hypothesis 1

An increase in information will make it less likely that organisations choose non-profit status. To test this, we compare the (change in) probability of exit among non-profits and for-profits once quality information becomes available.

Hypothesis 2

Organisations that choose non-profit under partial information and for-profit under full information will tend to have a lower cost of deviating from consumers' desired quality (b_i). To test this, we look at variation in estimated treatment effects by initial quality.[8]

4. Data and empirical strategy

4.1. Data

We study the universe of nursing homes registered with the Center for Medicare and Medicaid Services (CMS). We draw from two overlapping sources. The first is the Medicare and Medicaid *Provider of Services* (POS) files, obtained through the NBER website.[9] The second is *Online Survey, Certification, and Reporting* (OSCAR) data. Both are administrative datasets and are compilations of information, at least in part, from inspections conducted by state survey agencies and submitted to the Center for Medicare and Medicaid Services (CMS).

The POS data, which cover all Medicare/Medicaid providers (i.e., not just nursing homes, but also hospitals, dialysis facilities), are available from 1984-2011. We restrict our analysis to the years 1999-2008, as a major change in Nursing Home Compare occurred at the end of 2008. Specifically, Nursing Home Compare began summarizing their information in simple "star ratings". The data contain key information on the location of a nursing home (to the level of street address), ownership type (non-profit, for-profit), and

[8] Allowing for donations would reinforce these effects. As with consumers, non-profit status provides a signal of quality to donors under partial information and not full-information, changing the incentive to adopt NP status in the two regimes. Higher-quality firms would be better able to attract donors in the full information regime and would be more likely to retain non-profit status. As argued by Lu (2016), donations would also provide an additional incentive for non-profit firms to improve quality following the introduction of the full-information regime.

[9] http://www.nber.org/data/provider-of-services.html

number of beds. For much of our analysis, this is all the information we need. Crucially for our analysis, nursing homes are identified throughout the panel by a unique Medicare/Medicaid *provider number* that is assigned to the facility itself (i.e. the physical structure of the nursing home), rather than the owners of that facility. This means that a facility maintains the same provider number even if, for instance, a non-profit nursing home is bought by new owners, who choose to operate as a for-profit. This feature of the data allows us to identify changes in ownership status.

The OSCAR data report richer information from health and safety inspections, including information about staff and residents at each nursing home. We have OSCAR data for years after 1999, excluding 2002. On the staff side, we observe number of (full-time equivalent) workers employed by the facility, as well as some information about the level of qualification of those workers (registered nurse, licensed practical nurse, etc.). On the resident side, we observe the number of residents (as opposed to simply the number of beds), frequency of Medicare usage and frequency of Medicaid usage, and frequency of a variety of indicators of resident health. These include: presence of pressure sores, significant weight gain/loss, etc.

The OSCAR data also contain a listing of the health deficiencies discovered in each inspection, and the severity of each deficiency. These deficiencies are an important component of the information provided through Nursing Home Compare and we use the same weights as Nursing Home Compare to summarize the list of deficiencies into a single measure, which are referred to as "deficiency points" for the remainder of the paper.[10] A higher number of deficiency points indicates either more deficiencies, more severe deficiencies, or both.

Our analysis focuses on non-profit and for-profit homes. We drop government homes from the data, which otherwise accounted for roughly 9% of observations. Our panel consists of 149,839 home-year observations (105,390 FP and 44,449 NP) over the years 1999-2011 in the POS data. A survey period refers to the time between inspections, which are required to take place at least every 15 months; in practice the modal gap length is 13 months.

[10] Details on this can be found in Table 1 of the *Nursing Home Compare Technical Users' Guide* (http://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/CertificationandComplianc/downloads/usersguide.pdf) but – in short – the scheme assigns each deficiency a number of points based on its severity and adds the points to obtain a single measure per facility.

Table 1 summarizes characteristics of non-profit and for-profit nursing homes across the entire sample period. There are relatively small but significant differences in a number of characteristics. Non-profits tend to be slightly smaller, are less likely to be part of a chain, have more care staff per bed, a higher share of Medicare payers and lower share of Medicaid payers, and to be rated of better quality in terms of having fewer deficiency points. These statistics suggest that non-profit homes are, on average, of higher quality than the for-profits. Further evidence on this is provided in Figure 4, which depicts the distribution of nursing homes in the nonprofit and for-profit sectors (respectively) across the four quartiles of deficiency points prior to the reform. The figure reveals that the lower average number of deficiency points in the nonprofit sector (as reported in Table 1) is driven by fewer nonprofit homes in the lowest quartile of quality and more nonprofit homes in the highest quality quartile.

In our estimation we seek to rule out that these different characteristics explain our results.

4.2 Empirical strategy

Our main estimating equation is of the following form:

$$D_{it}=a+b_{NP}\,NP_{it}*Treated_{it}+\,b_{FP}\,FP_{it}*Treated_{it}\,+\,\gamma\,NP_{it}\,+\,b_s[years\ in\ current\ form]_{it}+c_t+d_i+e_{it} \qquad (1)$$

Subscript *i* refers to a facility (denoted by provider code) regardless of owner, while *t* is time in months, corresponding to the precise timing of the inspection and the corresponding definition of the survey period.

D is a binary indicator which takes the value one if the facility "exits" its current provider type in the time before the next survey. This means one of two things. Either there is a "switch" in ownership, meaning that the facility has changed provider type before the time of the next survey (a facility that was a non-profit is next observed as a for-profit or vice versa) or there is "closure", meaning that the facility closes down altogether (and we do not see that provider code again). In other words, *D* is equal to one when a home is in its final (observed) period in its current form and 0 otherwise. Note that, because the unique identifier identifies facilities (physical structures) and not owners, we cannot observe whether "switching" is driven by an owner changing sectors, or a new owner taking over.

Treated indicates if the disclosure requirement comes into effect during the time before the next survey (discussed further below), interacted with indicators for non-profit and for-

profit status. Our test of hypothesis 1 involves these coefficients. Specifically we test H0: $\beta_{NP} = \beta_{FP}$ versus HA: $\beta_{NP} \neq \beta_{FP}$. We allow non-profits to have a differential exit rate prior to the reform (captured by γ). We include facility fixed effects (d_i), while month fixed effects (c_t) capture general trends. We also control for how long a facility has maintained its current form ("*[years in current form]*$_{it}$"). This measures the number of years a home with a given provider code has existed without closing or changing sectors. Throughout, standard errors are clustered at the state, unless specified otherwise.

Because the outcome variable becomes equal to one in the last period before a home changes sectors or closes, we code our treatment variable so that it indicates that treatment *will* occur before the next survey observation. Our simplest definition of *treated* is a binary indicator equal to one if consumers have information about the quality of nursing homes at any point during the time before the next survey. When the facility is observed in consecutive surveys, the definition of treatment is straightforward. The binary treatment indicator is equal to one for any facility whose next survey falls after the date of implementation (Nov 2002 for most states). In the case when the facility is not observed again, we use the modal 13 month survey gap to define the treatment variable. This means that the treatment variable will be equal to one for any facility whose last observed inspection survey was after the implementation date minus 13 months (i.e. after October 2001 for a state implementing in Nov 2002). As well as a binary treatment indicator, we also construct a variable to capture the intensity of treatment, defined as the proportion of the time during a survey period, between inspections, when *Nursing Home Compare* is available to consumers.

Variation in the treatment variable across homes comes from two sources - the timing of the roll out of NHC and the timing of inspections. The former varies across states and the latter varies within states. In terms of the timing of the roll-out, a pilot program was conducted in early 2002 and six states (Colorado, Florida, Maryland, Ohio, Rhode Island, and Washington) received the website in April 2002. The remaining 44 states received the website in November 2002.

In addition to this, some states had their own state-level websites that provided information similar to Nursing Home Compare from the beginning of the sample period (1999).[11] We refer to these as "pre-treated" states. While we know that such websites existed, there is

[11] These states are California, Florida, Indiana, Iowa, Illinois, Maryland, Massachusetts, New Jersey, New York, Nevada, Ohio, Pennsylvania, Rhode Island, Texas, Utah, Vermont and Wisconsin. This information is drawn from Lu (2012).

state-level variation in the content provided and the degree to which consumers where aware of these websites relative to the highly-publicized Nursing Home Compare website (Castle and Lowe, 2005). For these reasons, coding the "pre-treated" states as treated for the entire panel may be associated with measurement error. Therefore, as our primary definition of treatment, we use the more conservative definition and define treatment relative to November 2002 (April 2002 for the pilot states). In a robustness test we adopt an "alternative treatment definition", wherein we code the "pre-treated" states as treated for the entire panel.

The second source of variation is the timing of the inspections within the year. The date of inspection is mandated by the Federal government to occur within a 15-month period and must be unannounced, with the goal of maintaining unpredictability in inspection date.[12] In practice, we find that the modal gap between inspections is 13 months. The effect of random timing on our definition of treatment is illustrated in Table 2 for states that implemented the program in November 2002. It shows the variation in the extent to which homes inspected in 2001 will be counted as treated depending on the date when the inspection occurred. Consider a facility inspected in September 2001. If it is re-inspected by the end of October 2002 (or not observed again), it will be considered to be untreated, while if it is re-inspected after November 2002, it will be considered to be treated. Any facility last observed after October 2001 would also be considered to be treated.

In summary, we exploit both sources of variation, but our primary identification comes from the variation in inspection timing within states.

5. Results

5.1 Does increased availability of information affect provider mix?

Our model predicts that increasing information will make it less likely that organisations choose non-profit status. To test this, we compare the (change in) probability of exit among non-profits and for-profits once quality information becomes available.

We begin by looking at exit rates in the raw data. Figure 1 in the Introduction showed that after 2002, non-profits' share of the market fell. Figure 5 explores this further by examining

[12] Full details of inspection requirements can be found in the CMS State Operations Manual (http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/Downloads/som107c07.pdf). The manual states: "The State has the responsibility for keeping surveys unannounced and their timing unpredictable."

exit rates, then splits exit into switching status (from non-profit to profit status in the case of non-profits, and vice versa for for-profits) and closure. Figure 5, Panel a, shows that overall exit rates (capturing both closure and sector switching) were similar for both types of home in 1999 and 2001 and then rose sharply in 2001 for non-profit homes, with the rate of exit for non-profits remaining significantly higher than that of for-profits for the rest of our sample period. Panels b and c show that this is primarily accounted for by the significantly greater propensity of non-profits to switch sectors from 2001 onwards. Panel b shows that switching rates are significantly higher for non-profits compared to for-profits for every year from 2001 at around 4 and (slightly less than) 2 percent respectively. In contrast, Panel c shows that while closure rates for non-profits rose in the early 2000 and remained higher than for-profits until the end of our sample period, the gap is much smaller than the gap between non-profit and for-profit switching rates.

Table 2 presents the regression results for the probability of exit. The coefficients on "Treated X Nonprofit" and "Treated X For-profit" are of primary interest, as they reveal the difference-in-difference estimates of treatment (quality disclosure) on nonprofit and for-profit homes respectively. Column (1) presents the estimates of equation (1) including facility fixed effects but excluding state time trends. It shows that non-profits are just over 5 percent more likely to exit post-treatment. In contrast, there is no impact of treatment upon the exit rates of for-profits. The difference between non-profits and for-profits is statistically significant, as shown by the *p*-value on the difference in coefficient estimates for the two types of home. Column (2) allows for state-specific trends; results are little changed. Columns (3) and (4) examine switching and closure respectively. They show that the differences in exit rates were due both to switching and to closure. Consistent with the raw data, the regression results indicate that the treatment results in higher switching rates for non-profits but no change in the rate for for-profits.

Although the "Treated" coefficients are our primary interest in Table 2, it is worth briefly noting the interpretation of other coefficients reported in the table. First, as one might expect, the longer that a home has existed in its current form, the more likely it is to switch. This is indicated by the "Age of Home" coefficient. The "Nonprofit" coefficient suggests that nonprofit homes are significantly less likely than for-profits to exit the market prior to treatment; in particular, they are especially less likely to switch sectors. This might seem at odds with the raw data depicted in Figures 4a, b, and c, which suggest roughly similar rates of departure in the pre-treatment period for nonprofit and for-profit homes. Recall, however, that specifications reported in Table 2 include facility-level fixed effects. Thus, the "Nonprofit" coefficient does not imply that nonprofit homes *on average* are less likely

to exit the market in the pre-treatment period; instead, the coefficient is identified from homes that switch sectors and therefore should be interpreted to mean that homes that have switched to nonprofit status during the pre-period are less likely to leave the market than those that switched to for-profit status.[13]

To confirm that there are not differential pre-treatment trends which would invalidate our research design, we estimate an event study of the exit rates of homes. Based on the modal gap between inspections of 13 months, we define a single period as 13 months. We then define the baseline date to be 1-2 periods before the date of NHC at which is introduced (so the date of NHC is denoted period 0) and estimate exit rates for each home for subsequent periods using all the controls in equation (1). Figure 6 presents the estimates for each sector. It shows that 3-4 periods before NHC was introduced exit rates were the same in both sectors, providing support for common trends pre-treatment. Post-treatment exit rates of non-profits rose each period while those of for-profits remained essentially zero.

Our main sample for the paper begins in 1999 because data used in further analyses are only available beginning in 1999. As a robustness check we repeat the analysis of Table 2 and the event study of Figure 6 extending the pre-period to begin in 1994. This means the pre- and post-treatment periods have the same number of years. The results are reported in Appendix Table 1 and Appendix Figure 1. These show that our main results are robust to adding earlier years and that exit rates across early-treated and late-treated states (and nonprofits and for-profits) are statistically indistinguishable in not just 3-4 periods prior to treatment, but also multiple periods prior to that.[14]

Table 3 presents a number of alternative specifications. Column (1) reports the results of re-estimating our main equation with an alternative treatment definition. Specifically, in this specification, all of the states with a pre-existing, state-run, online nursing home report card are coded as "treated" for the entire panel. The estimates are qualitatively the same (non-profits are significantly more likely to exit than for-profits post treatment), but the estimated effect of the information release is lower, supporting the view that there is potential measurement error in this broader definition of treatment (because of variation

[13] While not reported in our results, if we instead estimate a specification which includes only state fixed effects (and not facility fixed effects), the coefficient on nonprofit is instead positive but much smaller in magnitude (0.017).

[14] We thank an anonymous referee for suggesting this robustness test.

across state in specific content and how usable the information released in the state-specific scheme was to consumers).

Column (2) collapses the data to the state level. Collapsing the data to state level means we ignore any within-state variation in timing of inspection and revelation of quality information. Instead, we simply code homes as treated if their home state is treated for the majority of the year. This means that homes in "early treatment" states are treated in 2002, while remaining states are treated in 2003. The estimated effect remains significant while the magnitude is about one third of the size of our baseline estimate.

As our main identification strategy relies on both across and within state variation in timing of inspections our higher baseline estimate indicates that we get identification from both within and across state variation. We explore this further by defining treatment as the proportion of the period that a home was subject to greater information following the introduction of NHC. This exploits the variation in the inspection date. Thus, instead of a treatment dummy, here we employ a continuous treatment variable that runs from 0 to 1, where any fraction between 0 and 1 is possible (depending on the when the inspection falls in the treatment period).[15] Using this definition, the estimated effect (presented in column (4)) is slightly higher than our baseline at just over 6 percent.

Table 1 showed significant (though small) differences in observables between non-profit and for-profit homes. To check that these differences are not driving our results, we add in time trends in observed baseline characteristics (from OSCAR data) to our regression specification. Specifically, for each home, we take the mean of all of the characteristics reported in Table 1 in periods prior to treatment as baseline characteristics. We then interact all of these characteristics with a linear time trend. The results, presented in column (4), indicate that our estimated effect of the exit rate of non-profits is relatively unaffected.

In the next column we further explore robustness to the differences between types of homes by limiting our sample to only those homes which share common support in terms of the rich set of observables available in the OSCAR data set. We use variables from the OSCAR data (summarized in Table 1) to predict the probability of being non-profit. We then remove all those homes that do not have common support plus the top and bottom percentiles of those that do and re-estimate our baseline model on this smaller sample. Column (6) presents the results. Again, results are very similar to our main result.

[15] For example, a home that faces treatment starting the 5th month of a 13-month period between inspections would take on a value of 9/13ths in the treatment measure.

5.2 Probing the mechanism: Heterogeneity in treatment effect across homes

The preceding results demonstrate that nonprofit homes are more likely to leave the market when informational asymmetry is reduced. In this subsection, we probe the mechanism generating this result and provide suggestive evidence that the main result is indeed driven by a change in the quality-signaling value of adopting nonprofit status.

5.2.1 Are established firms protected from information revelation?

Our first test considers whether homes that have been in the market longer at the time of treatment are affected differently by treatment than newer homes. Nursing homes that are well established in a market would be expected to have other ways of signaling quality, such as a brand, religious affiliation or reputation (see, for example, Malani and David 2005). Given this, more established homes should be less likely to respond to public information on quality as they rely less on NFP status as signal quality.[16]

To examine this we interact treatment status with the age (as a linear term) of the firm allowing the coefficients, as before, to vary by sector of firm.[17] Age is measured simply as the number of years that a firm has existed in its current state (meaning, without switching sectors or closing). The results are presented in Table 3, Column (6). We find that the main effect for treatment for NP firms is positive and significant, suggesting that very young firms indeed respond to treatment by departing. However, the interaction term with age is negative and significant. These results taken together suggest that our main results are largely driven by newer homes, and the impact of treatment is diminished for homes that have spent more time in the market. The size of the estimates are such that non-profits 9.2 years old and over (0.005*9.2 = 0.046) are not more likely to exit once treated. To provide some sense of how this might be interpreted, note that the average firm age is 7.76 years and the median is 8 years. As before, there is no impact of either treatment or the interaction with age for the FPs.

[16] Heutel (2012) provides a similar argument (and empirical evidence) in the context of charitable giving; for young charities, a government grant can lead to greater donations because the grant provides a signal of quality to donors. Donations to older charities are less affected by grants, as donors are already aware of their quality.

[17] The age term is also entered as a linear term, which differs from the baseline estimates which only include age as a set of dummies.

5.2.2 Are non-profit leavers of lower quality?

Our second hypothesis is that the non-profit share of a market decreases with more complete information because firms at the lower end of the quality range that would choose nonprofit status comes to prefer for-profit status. Thus, in our empirical setting, we might expect that the firms that are lower quality before Nursing Home Compare are the ones that are most likely to depart once treated. To explore this, we examine the likelihood of departure as a function of pre-treatment quality measures interacted with treatment and sector dummies.

We split the sample into quartiles of pre-treatment quality. Quality is measured using "deficiency points" (the weighted average of deficiencies observed during inspections). We then estimate a variation on our main estimating equation wherein we fully interact dummies indicating "quality" quartile with our treatment dummy and sector indicators. Figure 7 presents the estimated treatment effects for the non-profits and for-profits. As predicted, it is indeed the lowest quality homes (4th quartile) that are especially likely to leave the market. The highest quartile versus lowest quartile estimates within this sector are statistically different from each other (p-value=0.015). All within quartile cross-sector estimates are statistically different from each other. This makes it clear that it is the lower quality non-profits which exit, precisely those homes who have most to gain from non-profit status when there is little information.[18]

5.2.3 Does the treatment effect vary by market power?

Finally, we consider whether nonprofit firms that face more competition within their local markets are more likely to depart when information is revealed. Firms with very large market shares may have very little reason to adopt nonprofit status simply as a signal of quality; consumers have little choice in such markets, so firms can charge a high price without constraining their profit making ability in order to signal quality. Thus, nonprofits in those markets are more likely to be run by "mission-oriented" entrepreneurs (Besley and Ghatak, 2005) and are not "for-profits in disguise" (Hirth, 1999). Conversely, firms facing more competition have more need to signal quality to attract consumers (and/or charge higher prices) and therefore are more likely to use the non-profit signal as a quality marker. We therefore would expect to see a greater response to the release of quality information for firms that face more local competition.

[18] The results are very similar using sector-specific quality quartile. Available from authors on request.

To test this we interact treatment with the degree of competition that the home faces. Specifically, we measure each home's county bed share (number of beds / beds in county) in the year prior to Nursing Home Compare, and assign a dummy to homes that control a low degree of competition (county bed share exceeds the 75th percentile within the county), a dummy to homes that face a high degree of competition (county bed share is less than the 25th percentile), and a dummy for remaining homes that are not at extremes of market power. [19] Figure 8 present the estimated probability of exit and 95% confidence intervals for non-profits and for-profits for the three groups. The figure shows the probability of exit is highest in homes that face the most competition and lowest for firms that control a large fraction of their market. The treatment effect is close to three times as large as the treatment effect estimated in the main analysis. While exit rates are also highest for for-profits that face the most competition, the exit rate for these firms is significantly lower than that of non-profits.

6. Conclusions

Policy makers globally have sought to increase information in public service markets to overcome monopoly arising from information asymmetry and enable consumers to make better choices. Where information is poor, some firms in these markets may adopt non-profit status as a *signal* of quality. The corollary is that when information is revealed such firms will exit or switch status.

This paper tests this for an industry in which non-profits play a significant role: the nursing home industry. We exploit the introduction of a nationwide policy to increase the information available to consumers on the quality of nursing homes. We exploit variation across homes within states arising from the timing of inspections and variation in the date of introduction across states to test whether firms exit the non-profit sector once information is revealed. Using data on a panel of just under 15,000 nursing homes -- (nearly) the universe of homes – throughout the United States, we find that they do. Non-profits are roughly 5 percent more likely to exit after information is revealed. In contrast, for-profits are not more likely to exit. The response is rapid and it is those firms that are predicted to adopt non-profit status for non-mission reasons that are more likely to be affected. These are homes that are at the lower quality of the distribution and homes in

[19] A baseline year is adopted to avoid concerns surrounding endogeneity of bed share.

highly competitive markets. They respond both by exiting and changing status to for-profits.

The results are robust to potential concerns over differences across firm type pre-policy. They are given further credence by the fact that firms that have greater incentives to signal quality by adopting non-profit status when consumer information is poor – those that are younger and operate in less concentrated markets more competitive markets – are precisely those firms that are more likely to stop being non-profit after information disclosure.[20]

Our results have implications for the importance of the non-profit form in public service markets. In all these markets (schools, hospitals, long terms care) non-profits have historically played a large role. In all these markets, information disclosure is becoming more important and regulators are seeking ways to make information more accessible to consumers in order to stimulate choice and competition. Our results suggest that adoption of non-profit status as a signal of quality cannot be sustained post-revelation of a true (or better) quality signal and that the provider mix in these industries will change.

[20] The empirical pattern we detect is consistent with the "nonprofit as quality signal" argument. By contrast Malani and David (2005) drew the opposite conclusion from looking at whether organisations chose to signal their non-profit status (e.g., in local adverts). They found that organisations that have other signals of quality, such as a religious affiliation, are less likely to signal that they are non-profit and that organisations are also less likely to signal when they have to pay (e.g., for yellow page ads). Even among organisations that have no other indicators of quality, 30 percent of nursing homes never signal their status on their websites. However, as we have shown and as would be expected, the non-profit signal is more important in some contexts (for newer firms and when competition is high) than in others. Alternatively, we also note that Malani and David's data on nursing homes comes from after the introduction of Nursing Home Compare. A strict interpretation of our model would suggest that firms are no longer announcing sector because they no longer need to, and that salient announcement of sector may have been more prevalent before Nursing Home Compare.

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Table 1: Summary statistics

Variables	Nonprofit	For-profit	Difference (NP-FP)
Total beds	107	111	-4.343***
	(1.37)	(0.55)	(1.482)
Total residents	88.2	92.5	-4.270***
	(1.20)	(0.49)	(1.294)
Occupancy rate	0.84	0.83	0.00776**
	(0.0028)	(0.0014)	(0.00309)
Care staff / bed	0.69	0.57	0.113***
	(0.017)	(0.0078)	(0.0186)
Share: Medicare payers	0.18	0.13	0.0503***
	(0.0038)	(0.0011)	(0.00394)
Share: Medicaid payers	0.50	0.67	-0.166***
	(0.0043)	(0.0019)	(0.00466)
Share: Other payers	0.32	0.20	0.115***
	(0.0033)	(0.0014)	(0.00358)
Deficiency points	37.5	50.5	-13.04***
	(0.46)	(0.37)	(0.589)
Bed share of county	0.20	0.20	-0.00404
	(0.0045)	(0.0028)	(0.00529)
Age of home	8.39	8.88	-0.493***
	(0.036)	(0.019)	(0.0402)
Observations	22,636	62,314	

Robust standard errors (clustered at facility level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Notes: Table reports means of variables used later in the paper from throughout the entire sample (meaning all home-year combinations in the panel). The third column tests whether there are differences across nonprofit and for-profit homes. Sample period: 1999-2008. Data source: OSCAR Resident and Staffing Survey.

Table 2: Difference-in-difference estimates of the probability of exit

VARIABLES	(1) Exit	(2) Exit	(3) Switch	(4) Closure
Treated X Nonprofit	0.051***	0.053***	0.016***	0.034***
	(0.008)	(0.007)	(0.005)	(0.007)
Treated X For-profit	0.007	0.006	-0.004	0.010
	(0.007)	(0.007)	(0.004)	(0.006)
Nonprofit	-0.172***	-0.178***	-0.149***	-0.023***
	(0.022)	(0.021)	(0.021)	(0.005)
Age of home	0.014***	0.014***	0.012***	-0.000
	(0.002)	(0.002)	(0.002)	(0.000)
Constant	-0.014	-0.015	0.011	-0.021***
	(0.014)	(0.013)	(0.011)	(0.006)
Observations	137,374	137,374	137,374	137,374
R-squared	0.361	0.364	0.242	0.425
Facility and month FE's	X	X	X	X
State-level trends		X	X	X
Treat X NP – Treat X FP	0.0431	0.0477	0.0201	0.0244
P-Val.	0.00	0.00	0.00	0.00

Robust standard errors (clustered at the state-level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Notes: Exit = 1 if the facility exits its current provider type in the time before the next survey – either changes provider type or closes down. Switch = 1 if the facility changes its current provider type in the time before the next survey. Close = 1 if the facility closes down (is not observed again). Treated =1 if Nursing Home Compare is in effect at any point in the time before the next survey. NP and FP are indicators for non-profit and for-profit status respectively. The facility refers to the physical structure of the nursing home. Sample period: 1999-2008. Data source: Provider of Services files

Table 3: Robustness tests and additional results

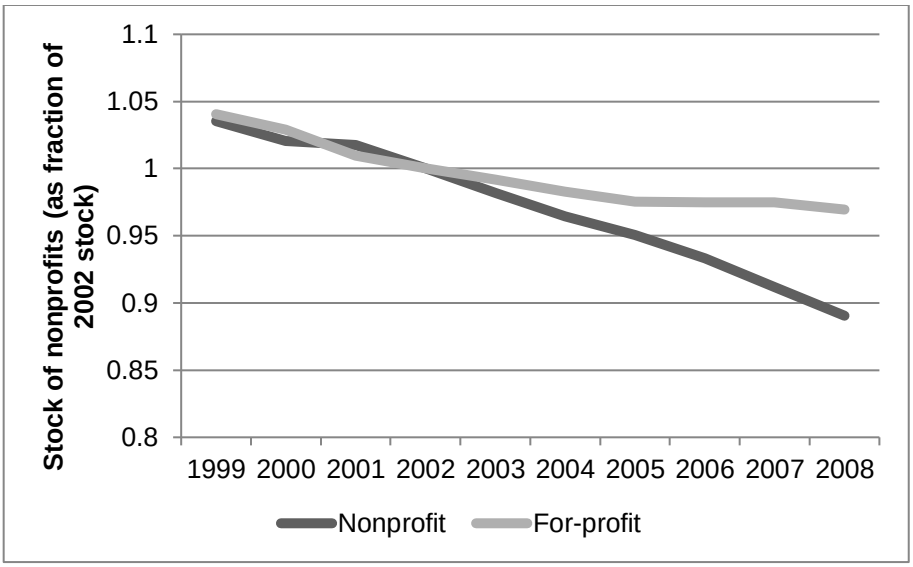
Dependent variable = Exit (0/1)

VARIABLES	(1) Alt. treatment	(2) Agg'd. to state	(3) Cont. treatment	(4) Baseline chars. Trends	(5) Common support	(6) Age of home
Treated X NP	0.029**	0.016**	0.062***	0.047***	0.048***	0.046**
	(0.012)	(0.006)	(0.016)	(0.006)	(0.008)	(0.018)
Treated X FP	-0.014	-0.000	0.016	0.007	0.002	0.018
	(0.010)	(0.005)	(0.016)	(0.006)	(0.007)	(0.012)
Nonprofit	-0.181***	0.028***	-0.174***	-0.171***	-0.141***	-0.208***
	(0.023)	(0.005)	(0.020)	(0.021)	(0.026)	(0.024)
Treat. X NP X Age						-0.005*
						(0.003)
Treat. X FP X Age						0.000
						(0.001)
NP X Age of home						0.017***
						(0.003)
Age of home	0.014***		0.014***	0.014***	0.013***	0.008***
	(0.002)		(0.002)	(0.002)	(0.002)	(0.002)
Constant	-0.012	0.040***	-0.016	-0.019	-0.014	-0.003
	(0.014)	(0.004)	(0.013)	(0.013)	(0.014)	(0.014)
Observations	137,374	996	137,374	136,842	103,682	137,374
R-squared	0.363	0.495	0.364	0.345	0.399	0.366
Facility and month FE's	X	X	X	X	X	X
State-level trends	X	X	X	X	X	X
Treat X NP – Treat X FP	0.0433	0.0164	0.0461	0.0401	0.0460	0.0272
P-Val.	0.00	0.01	0.00	0.00	0.00	0.04

Robust standard errors (clustered at the state-level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1

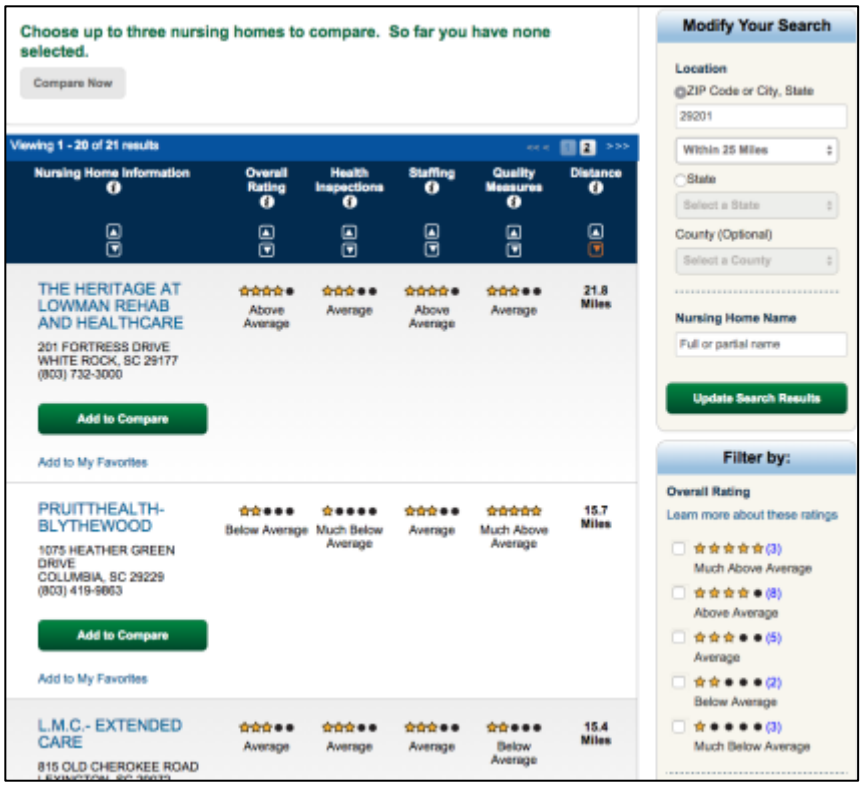
Notes : Exit = 1 if the facility exits its current provider type in the time before the next survey – either changes provider type or closes down. Treated =1 if Nursing Home Compare is in effect at any point in the time before the next survey. NP and FP are indicators for non-profit and for-profit status respectively. The facility refers to the physical structure of the nursing home. In "Alt. treatment def." (Column 1), a state is coded as treated if Nursing Home Compare is active in their survey period *or* if they are in a state that had its own nursing home report card website prior to Nursing Home Compare. "State-level specification" (Column 2), aggregates exit rates to the state-sector-year level. "Intensity of treatment" (Column 3) allows for a continuous treatment variable that runs from 0 to 1. In the year that states become treated, the treatment variable is assigned as the proportion of time between current survey and next survey that Nursing Home Compare is active. "Baseline (pre-treatment) chars." (Column 4) interacts pre-treatment home characteristics (from Table 1) with time trends, using OSCAR data. Column 5 uses the OSCAR data to identify homes with common support based on OSCAR characteristics. Column 6 only differs from the main specification in that it interacts treatment and sector with age of home. Sample period: 1999-2008 Data sources: Provider of Services Files and OSCAR data

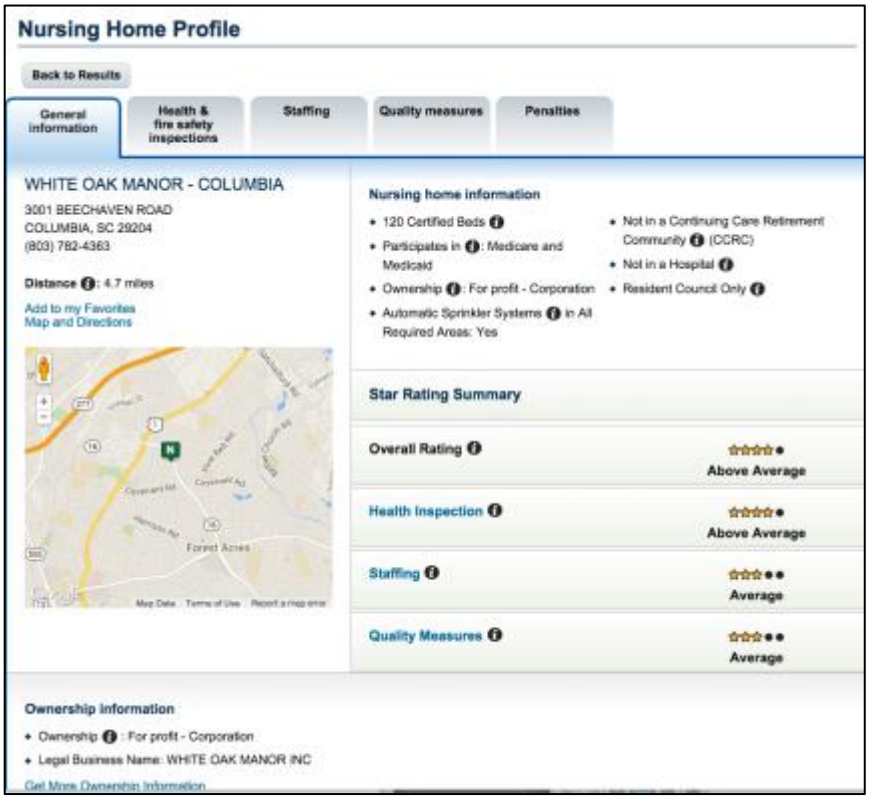
Figure 1: Non-profit and for-profit nursing home providers



Notes: Figure plots stock of homes by sector, normalized to 2002 stock. That is, each point in the Non-profit (NFP) series is [Number of Non-profit homes in year *t* / Number of Non-profit homes in 2002]. Data source: Provider of Services files

Figure 2: Comparison information, Nursing Home Compare screenshots





	WHITE OAK MANOR - COLUMBIA	SOUTH CAROLINA AVERAGE	NATIONAL AVERAGE
Percent of short-stay residents who self-report moderate to severe pain. *Lower percentages are better.*	15.2%	15.2%	18.5%
Percent of short-stay residents with Pressure ulcers that are new or worsened. *Lower percentages are better.*	0.0%	0.8%	1.0%
Percent of short-stay residents assessed and given, appropriately, the seasonal influenza vaccine. *Higher percentages are better.*	77.2%	86.8%	84.1%
Percent of short-stay residents assessed and given, appropriately, the pneumococcal vaccine. *Higher percentages are better.*	74.2%	87.3%	82.6%
Percent of short-stay residents who newly received an antipsychotic medication. *Lower percentages are better.*	0.0%	2.6%	2.4%
Long-Stay Residents			

	WHITE OAK MANOR - COLUMBIA	SOUTH CAROLINA AVERAGE	NATIONAL AVERAGE
Percent of long-stay residents experiencing one or more falls with major injury. *Lower percentages are better.*	0.9%	2.9%	3.2%
Percent of long-stay residents with a urinary tract infection. *Lower percentages are better.*	14.9%	7.5%	5.7%
Percent of long-stay residents who self-report moderate to severe pain. *Lower percentages are better.*	14.8%	6.3%	7.6%
Percent of long-stay high-risk residents with pressure ulcers. *Lower percentages are better.*	7.9%	6.2%	6.0%
Percent of long-stay low-risk residents who lose control of their bowels or bladder. *Lower percentages are better.*	52.0%	51.8%	44.6%
Percent of long-stay residents who have/had a catheter inserted and left in their bladder. *Lower percentages are better.*	1.0%	1.9%	3.1%

Notes: Each panel is a screenshot from a separate section of the Nursing Home Compare website, retrieved in March 2015. The first panel is the main listing of homes after entering a location search (e.g., zipcode). From there, consumers select a home which takes them to the home's profile (picture in the second panel). Additional details of the quality of service in the home (pictured in the third and fourth panels) can be found by navigating further from the home's main profile.

Figure 3: Roll out of nursing home comparison websites

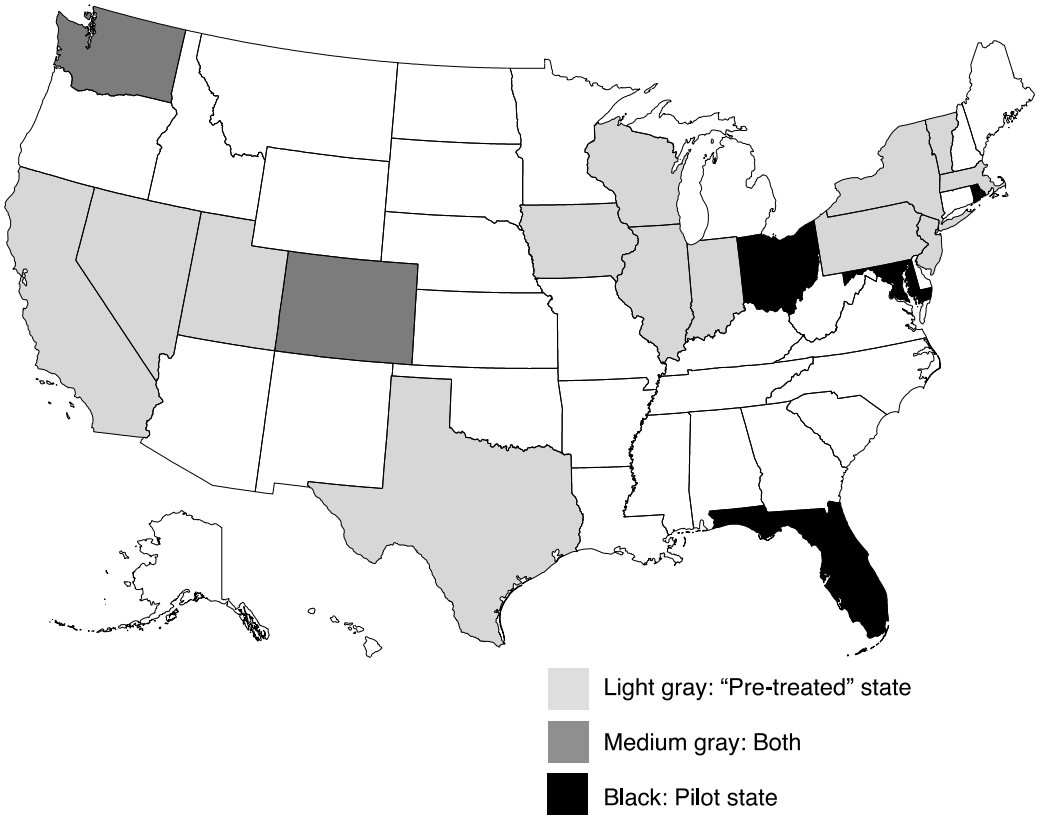
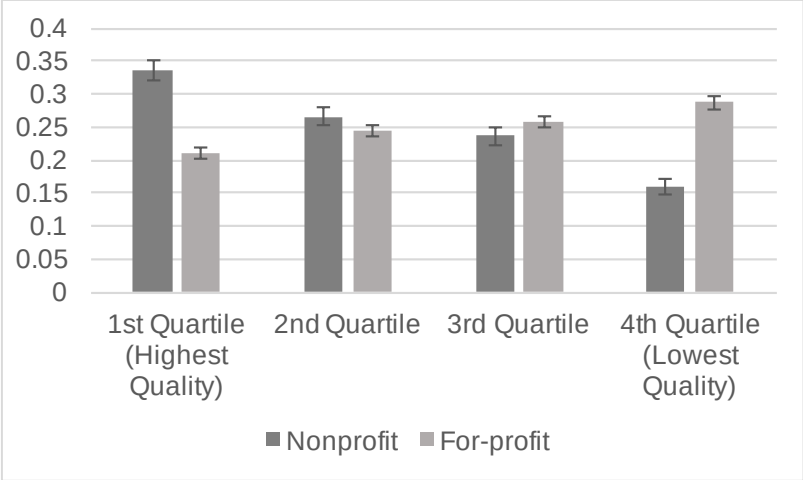


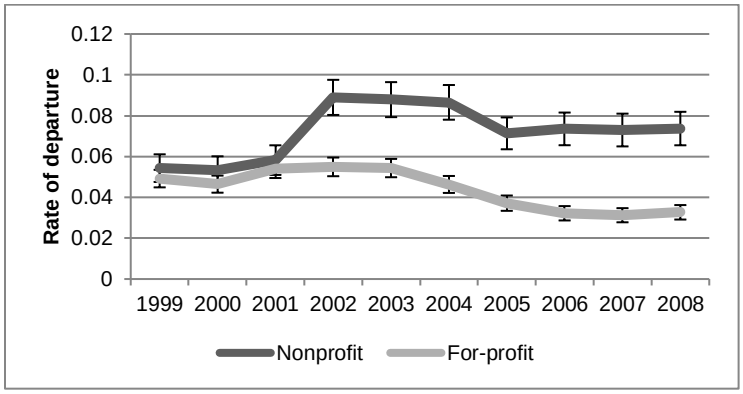
Figure 4: Distribution of deficiency points (quality measure) across sectors in year 2000



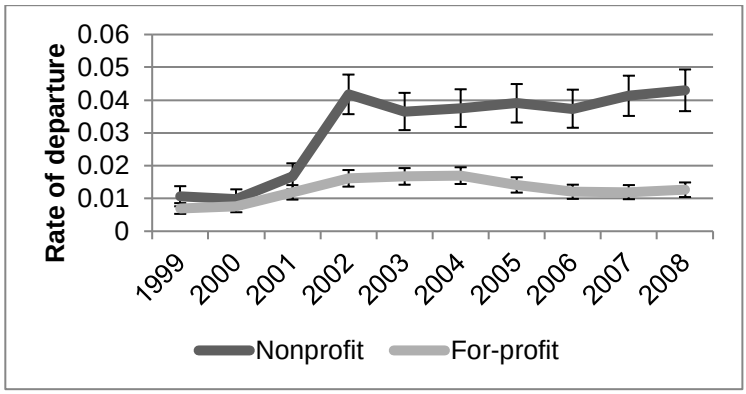
Note: The figure depicts the share of nonprofit homes and for-profit homes (respectively) in each of the four quartiles of deficiency points, which serves as a measure of quality. Fewer deficiency points implies higher quality.

Figure 5: Exit rates, non-profit and for-profit nursing homes

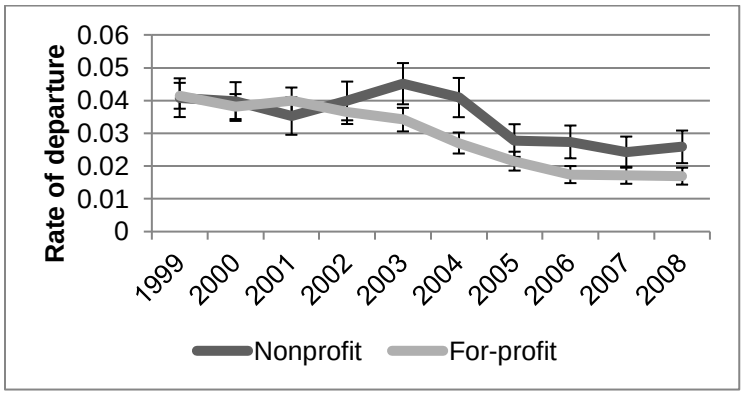
a. Exit rates



b. Switch rates



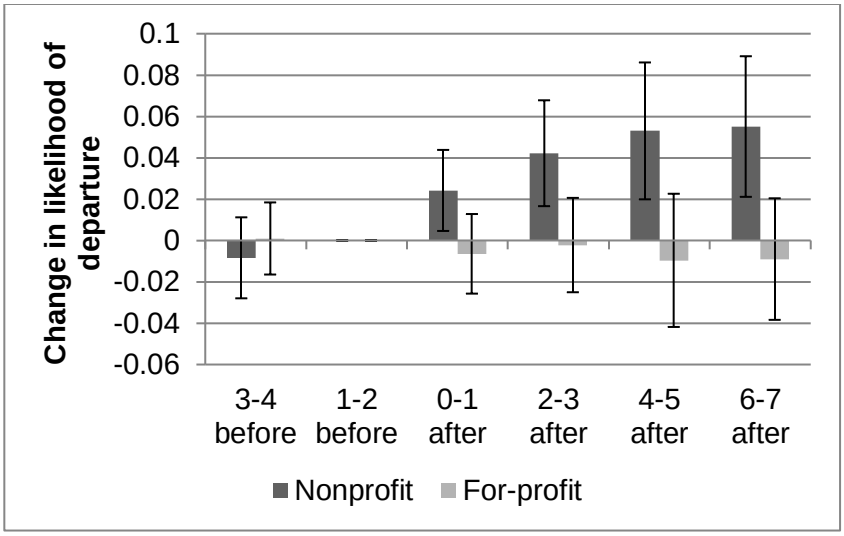
c. Closure rates



Notes: Figures show sector-year specific sample means of exit, switching, and closure rates together with 95% confidence intervals for the years 1999-2008.

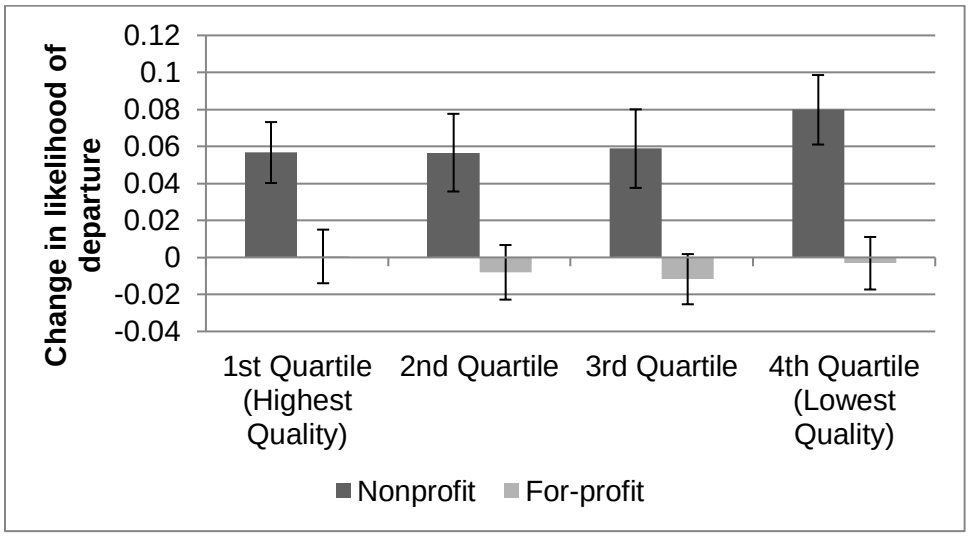
(a) Exit = 1 if the facility exits its current provider type in the time since the past survey – either changes provider type or closes down. Exit rate = Number of exits in sector / # of homes in sector. (b) Switch = 1 if the facility changes its current provider type since the past survey. Switch rate = Number of switches in sector / # of homes in sector. (c) Close = 1 if the facility closes down (is not observed again) in year following last survey. Closure rate = Number of closures in sector / # of homes in sector.

Figure 6: Event study



Notes: Figure reports coefficients and 95% confidence intervals from an event study estimation. The time period is "survey period", which we define as lasting 13 months (the modal length between surveys). Thus, "0-1 after" is 0 to 1 survey periods after (or 0-26 months after) treatment. "1-2 before" is the omitted category.

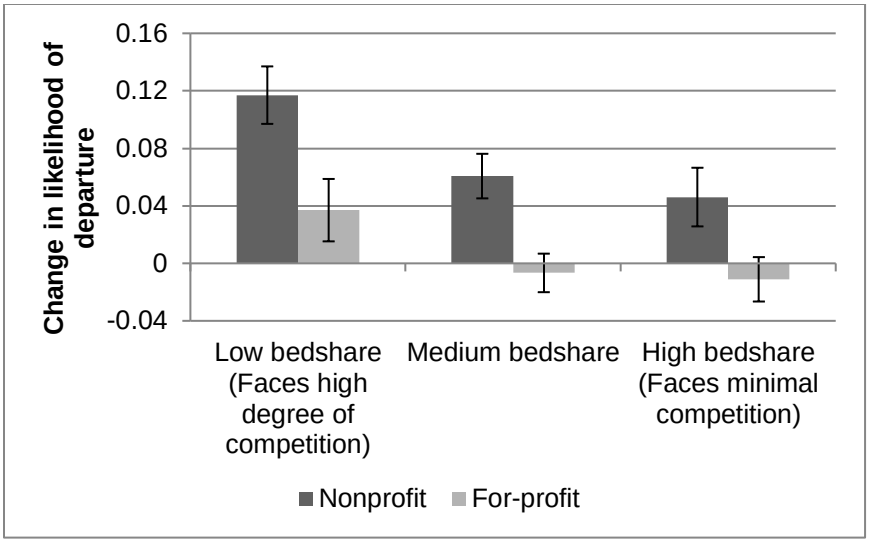
Figure 7: Variation in treatment effect by quality of home



Notes: Figure reports coefficients and 95% confidence intervals from a regression fully interacting treatment (and sector) with "quality quartile". The figure displays estimates of interaction between treatment, quality quartiles, and sector. Quality quartile is based on average deficiency points prior to treatment. A higher number of points indicates lower quality, so first quartile is the highest quality.

Pairwise comparisons: 4th quartile nonprofit coefficient is significantly larger than 1st quartile nonprofits (p-val.=0.01), 2nd quartile nonprofits (p-val.=0.06), and 3rd quartile nonprofits (p-val.=0.03). No other pairwise comparisons amongst nonprofits are significant.

Figure 8: Variation in treatment effect by competition faced



Notes: Figure reports coefficients and 95% confidence intervals from a regression fully interacting treatment (and sector) with degree of competition faced. The figure displays estimates of interaction between treatment, quality quartiles, and sector. Degree of competition is based on a home's bed share within its county in a base year (2001). Low bed share = Homes where within-county bed share is below the 25th percentile. High bed share = Homes where within-county bed share is above the 75th percentile. Medium bed share = remaining homes.

Pairwise comparisons: Low bed share nonprofit coefficient significantly higher than medium (p-val.=0.00) and high bed share (p-val.=0.00). Medium bed share nonprofit coefficient significantly higher than large (p-val.=0.06). Low bed share for-profit coefficient significantly higher than medium (p-val.=0.00) and high bed share (p-val.=0.00).

APPENDIX

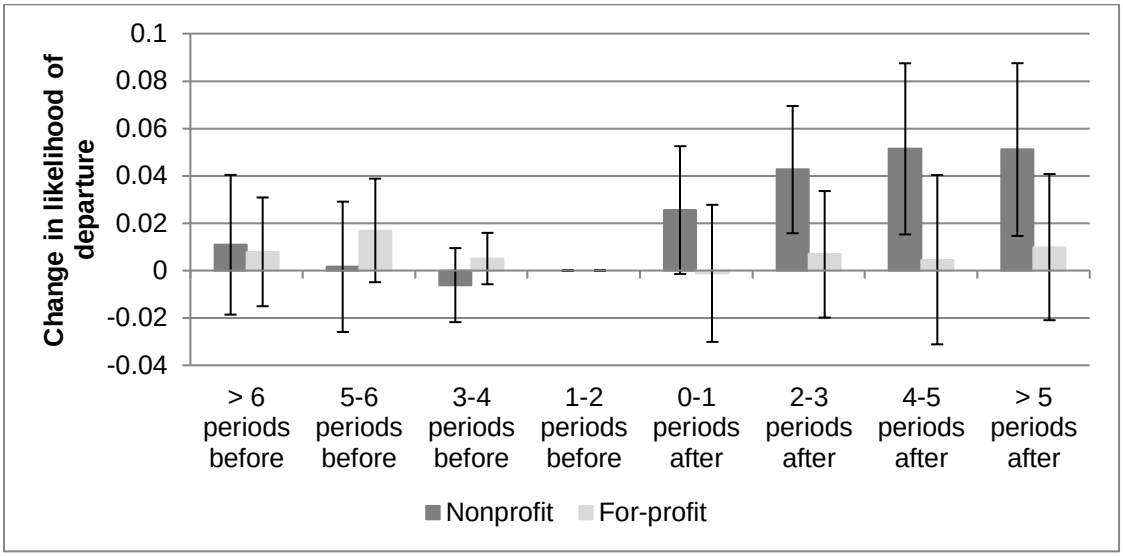
Appendix Table 1: Difference-in-difference estimates of the probability of exit (Longer panel, starting in 1994)

VARIABLES	(1) Exit	(2) Exit	(3) Switch	(4) Closure
Treated X Nonprofit	0.049***	0.054***	0.017***	0.033***
	(0.009)	(0.008)	(0.004)	(0.007)
Treated X For-profit	0.013	0.011	-0.002	0.012*
	(0.009)	(0.009)	(0.004)	(0.007)
Nonprofit	-0.103***	-0.110***	-0.093***	-0.018***
	(0.015)	(0.015)	(0.015)	(0.004)
Age of home	0.003**	0.004***	0.002*	0.000
	(0.001)	(0.001)	(0.001)	(0.000)
Constant	0.091***	0.066***	0.039***	0.023***
	(0.005)	(0.003)	(0.003)	(0.002)
Observations	210,600	210,600	210,600	210,600
R-squared	0.299	0.303	0.172	0.351
Facility and month FE's	X	X	X	X
State-level trends		X	X	X
Treat X NP – Treat X FP	0.0358	0.0427	0.0189	0.0215
P-Val.	0.00	0.00	0.00	0.00

Robust standard errors (clustered at the state-level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Notes: Exit = 1 if the facility exits its current provider type in the time before the next survey – either changes provider type or closes down. Switch = 1 if the facility changes its current provider type in the time before the next survey. Close = 1 if the facility closes down (is not observed again). Treated =1 if Nursing Home Compare is in effect at any point in the time before the next survey. NP and FP are indicators for non-profit and for-profit status respectively. The facility refers to the physical structure of the nursing home. Sample period: 1994-2008. Data source: Provider of Services files

Appendix Figure 1: Event study (Longer panel, starting in 1994)



Notes: Figure reports coefficients and 95% confidence intervals from an event study estimation. The time period is "survey period", which we define as lasting 13 months (the modal length between surveys). Thus, "0-1 after" is 0 to 1 survey periods after (or 0-26 months after) treatment. "1-2 before" is the omitted category.