Better Together: Coexistence of For-profit and Nonprofit Firms with an Application to the U.S. Hospice Industry

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Abstract

Many markets maintain a nontrivial mix of both nonprofit and for-profit firms, particularly in health care industries such as hospice, nursing homes, and home health. What are the effects of coexistence versus dominance of one ownership type? We show how the presence of both ownership types can lead to greater diversity in consumer types served, even if both firms merely profit-maximize. This is the case where firms serve consumers for multiple consumption durations, but where donations are part of a nonprofit firm objective function and happen after services have been provided. This finding is strengthened if the good or service has value beyond immediate consumption or the direct consumer. We show these predictions empirically in the hospice industry, using data containing over 90 percent of freestanding U.S. hospices, 2000-2008. Nonprofit and for-profit providers split the patient market according to length of stay, leading to a wider range of patients being served than in the absence of this coexistence.

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1 Introduction

In industries where all firms can reasonably support a claim to making social contributions, the coexistence of both nonprofit and for-profit firms is intriguing. Many health care markets, such as nursing homes, home health care, and hospice, have a meaningful mix of both for-profit and nonprofit providers.[1] In this paper, we present a general theoretical framework for nonprofit and for-profit coexistence, with an empirical application to the hospice industry in particular.

The hospice industry has grown tremendously over the past 15 years, serving an estimated 1.6 to 1.7 million patients in 2014. Approximately 40 percent of Medicare decedents used three or more days of hospice services in 2014 (NHPCO, 2015). Although there is a well-developed literature on ownership differences in hospitals (See Sloan (2000) for a summary), nursing homes and hospice care markets have significant differences; providers are smaller and more capacity constrained and care is provided over longer periods of time. In our theoretical framework, we show these characteristics affect the assortment of patients who are served, and that the type of patients served depends on ownership type. We find that hospice markets with a mix of both nonprofit and for-profit providers serve a greater range of patient types than those markets served by only for-profit or only nonprofit hospices. Having two ownership types actually expands the range of consumers being served.

The market in our theoretical framework provides a good or service which is consumed over extended time periods. The key dimensions which differentiate this market are that consumers are heterogeneous in expected number of consumption periods and that the service may have benefits which accrue to individuals other than the consumer (or accrue beyond current consumption, either to the direct consumer or to individuals other than the consumer.) This spillover of benefits beyond the direct consumer interacts with the hetero-

[1] In 2013, nonprofits made up 34 percent of hospices, while for-profits made up 61 percent. Nursing homes were 25 percent nonprofit, with remaining providers being for-profit. Inpatient rehabilitation, which also features labor-intensive services with capacity constraints, had 59 percent of providers operating as a nonprofit and 30 percent operating as for-profits (MedPAC, 2015). See Table 1 for a sample of markets with mixed nonprofit and for-profit status in health care.

geneous types to make different segments of the market more desirable to each ownership type.

The driving difference between the nonprofit and for-profit firm is that nonprofits can accept donations from (or on behalf of) the consumer. Donations occur after a consumption spell directly from the consumer, or can result from benefits of the service that accrue to others (for example, "in lieu of flowers" donations). Firms are price takers and capacity constrained. This means that referral networks and targeting are important to fill capacity with the most profitable consumers. There is a high initial fixed cost (e.g., a set-up cost) to serving each consumer and a constant per unit-of-time cost, so that firms' average cost curves exhibit increasing returns in service duration. Consumers are heterogenous in the number of periods they expect to consume the service, which cannot be changed by the services provided by the firm. If payment is only per period of service, then short-stay consumers (consuming fewer units of time) will be less profitable than long-stay consumers. However, per consumer donations cause the incentive structures to diverge between the two ownership types. With per consumer donations, taking many short-stay consumers may be more profitable to the nonprofit rather than taking fewer long-stay consumers, with fewer associated donations. If this is the case, nonprofit and for-profit firms now have different target populations within the heterogenous consumer base, even if both behave like simple profit-maximizers.

Three main behavioral predictions emerge from the theoretical framework. First, nonprofit firms should focus on consumer types with shorter expected durations of consumption and combine the per unit-of-time revenue with end-of-stay donation revenues. Second, nonprofits should focus more on components of the service which have a greater donation potential. Third, of particular innovation in this work, because nonprofit and for-profit firms each focus on a different segment of the heterogeneous consumers, markets with a mix of ownerships should see a wider range of consumers served along the dimension of heterogeneity.

We test this theoretical framework using data from the U.S. hospice industry, 2000-2008.

Our data captures over 90 percent of all U.S. freestanding hospice providers during this period. For the years 2002-2005, we also link hospice firms directly to the 100% Medicare beneficiary data, providing controls for individual patient characteristics by hospice as well as firm-level characteristics. Hospice care provides comfort, pain relief, and social services to patients with a terminal diagnosis at the end of life. Care is delivered in various settings, most often a patient's home, but also in nursing homes and occasionally institutional settings. Care is not curative, but instead palliative, so many of the services focus on nursing visits to improve comfort or social services to help the patient and family address end-of-life issues. The predominant payor in the market is Medicare, with 90.3 percent of patient days from 1.7 million patients in 2014 covered by the Medicare hospice benefit. In our empirical section, we show that the trends in hospice market patient mix during 2000-2008 match the predictions from the theoretical framework described above. For-profit hospices focus on patient diagnoses with long expected stays in hospice, such as Alzheimer's disease and dementia, as per our first prediction. Nonprofits target the short-stay portion of demand, such as cancer patients. We show that nonprofits focus more on bereavement services, a service that is practicably nonexcludable in nature.[2] Bereavement services benefit the patient's family and loved ones, even after Medicare reimbursement ends and so may serve to encourage *ex post* donations. Finally, we offer evidence that local markets with an even balance of nonprofit and for-profit firms actually serve a wider range of patient types, as measured through average length of stay.[3]

[2]Medicare will not reimburse a hospice for bereavement services. However, it is theoretically possible that a hospice (either nonprofit or for-profit) could create a separate line of services for bereavement, and offer those service lines for a fee under a separate contract to family members. To assess whether this is empirically relevant, we conducted a search of more than 100 hospice websites. Every sampled hospice offered bereavement services free of charge (commonly combined with statements that no one will be excluded). There was not a single instance of a hospice offering these services for a fee to family members. Thus, while there may technically be the potential for a bereavement services market, we find that it is empirically irrelevant. We can offer no theoretical rationale for this, other than perhaps a strong cultural taboo. Nonetheless, we will proceed with the implicit assumption that bereavement services are effectively nonexcludable.

[3]Note that length of stay refers to the patient's time spent under hospice care, not necessarily time spent at a physical hospice facility. Hospice patients are most often located in the home. Stay begins with the initiation of hospice services and ends when the patient dies or decides to end hospice services. The stay may be initiated in a facility where curative treatment was being administered but later moved into the patient's home.

Previous work on ownership types has focused on how for-profits may provide lower levels of desirable characteristics, such as quality (for example, Sloan, Picone, Jr., and Chou (2001), Glaeser and Shleifer (2001), Eggleston, Shen, Lau, Schmid, and Chan (2008), and Chou (2002)), quantity (for example, Horwitz and Nichols (2009), Jacobson and Chang (2017)), or treatment choice and control (for example, Bayindir (2012), Dalton and Warren (2016)). On the other side of the coin, there is a literature that focuses on the equivalence in behavior between for-profit and nonprofit firms – "for-profits in disguise." These papers often find little difference across the two types in terms of costs, patient mix, or quality, beginning with Weisbrod (1988). One of the important contributions of this paper is we show conditions where nonprofits and for-profits bring independent benefits to the market. In contrast to existing theoretical and empirical research, we show the existence of both types of firm in the same market actually expands the range of consumers who will be served.

One important exception is Lakdawalla and Philipson (2006), who model nonprofits with a competitive advantage due to a preference for output, which makes these firms the more stable incumbents, whereas for-profit firms are more likely to enter on the margin. However, this behavior is due to different optimization goals. In our work, we will show how mixed ownership in a market can actually arise from underlying heterogeneity in market demand, without nonprofit preference for output, altruism, quality, etc. Nearly all the nonprofit behavior literature explains nonprofit presence through differences in objectives, or in the dimension of market information. One notable exception is David (2009), who shows that changes in economic environments alter firms' incentives to remain nonprofit. Our paper offers a unique contribution by showing conditions where underlying heterogeneity in consumer types can lead to profitability that is ownership-specific.

Finally, our empirical work contributes to the growing need to document firm behavior in the hospice industry. Previous summary work has been laid out by Lindrooth and Weisbrod (2007), Connor, Tecca, LundPerson, and Teno (2004), Noe and Forgione (2014), and Gandhi (2012). This paper provides an exceptionally complete look at the freestanding

hospice market, with approximately 90 percent of freestanding hospice firms over nine years. This is also the first paper, to our knowledge, to link the firm data to individual beneficiary data.

Our paper makes three main contributions to understanding firm behavior in mixed ownership markets. First, we are able to explain why a market may have a nontrivial presence of both firms, versus an equilibrium with one dominant ownership type. Second, we show that this coexistence of ownership types can persist even without differences in firm preferences for output, quality, or as a result of information asymmetries. Instead, our innovation is that nonprofit and for-profit firms may both exist in a market because of differences in underlying market structure, in particular, from heterogeneity in consumer demand and the differential treatment of donations made by consumers (or others) to firms. Finally, our empirical evaluation of the hospice market is important; we demonstrate conditions where, instead of for-profits being inferior or nonprofits being merely for-profits in disguise, both firms' participation benefits consumers by leading to a wider range of patients being served than in the absence of this diversity.

Section 2 lays out a theoretical framework for a market with nonprofit and for-profit firms, along with behavioral predictions for each ownership type. Section 3 details the hospice industry and translates the behavioral predictions into testable empirical predictions. Our data is outlined in Section 4. The general econometric model is outlined and tested in Section 5. We test each of the three predictions and provide robustness tests. Section 6 concludes.

2 Theoretical Setting

In this section, we lay out a simple theoretical setting to predict differences in nonprofit and for-profit behavior in our market setting of interest.

2.1 Consumer Characteristics and Good

The market of interest provides a good or service, which is consumed over exogenously (to the consumer) defined periods of consumption duration. Each spell of consumption is made up of individual units; for example, a dementia patient may consume hospice services for a spell of one year, which is made up of 365 separate days. A contract is written on a per unit basis (e.g., per day). Examples of such contracts in health care would be non-Medicare hospital services, nursing home services, and hospice services (for any payor).[4] Even though a consumer may end up consuming different total numbers of periods, the firm sets only one per-unit price for all consumers. The service is directly consumed over spells of different length, but there may be some benefit that accrues beyond the direct consumption period. That is, there is some continuity of the service benefits outside of the immediate consumption period or beyond the direct consumer. This dimension of the service distinguishes it from a standard market, and will become important in differentiating how nonprofit and for-profit firms approach the consumers.

A key aspect of demand in the market is that consumers are heterogeneous in their expected length of consumption spell. Some consumers have short expected stays with the firm, while others have much longer expected stays. These expected lengths of consumption by type are observable to both the consumer and the firm. In the model below, we include this heterogeneity by indexing the space of consumer types between 0 and 1. This index normalizes the observed range of heterogeneity in the market. Those consumers near 0 have the shortest expected length of stay of their consumption spell, while those consumers near 1 have the longest expected length of consumption spell in the market.

[4]Note this is in contrast to a per spell basis (e.g., the time between admission and discharge), which is empirically not observed in markets such as hospice because the exact number of days to be consumed are not known at the beginning of the contract. Similar contracts may exist outside of health care, for example in education (private secondary schools and universities) where universities enroll a student per semester, without committing to an exact number of semesters finally consumed.

2.2 Firms

Firms in the market establish capacity to serve multiple consumers, who each have their own consumption spell length. To do this, the firm must establish the capacity to serve multiple consumer-days, which is done before actually serving the consumer. For example, in our setting of hospice care, this would involve hiring and establishing an appropriate labor force of nurses and social workers. This capacity may be flexible in the long term, but is fixed in the short term (e.g. labor contracts can only be renegotiated after a fixed period), and exhibits diminishing returns in any time frame. We denote the total capacity as ϕ, or the total number of consumer-days possible to provide. This capacity, ϕ, could end up being equivalently filled with many consumers who each consume very few days, or with few consumers who each consume very many days.

The consumer's type is observable to the firm, so, although the exact duration of a consumer's consumption spell may be uncertain, the firm is able to distinguish, and thus target, a range of consumers with certain expected lengths of stay. That is, the firm is able to target a segment of the consumer spectrum, for example, seeking out patients who are near 0 in the normalized index (short stay) versus those patients near 1 in the index (long stay).

To illustrate this relationship between capacity, ϕ, and the consumer types, consider the following framework. Let $a \,\epsilon\, [0, 1]$ be the lowest consumer type targeted by a given firm. Because choosing a consumer type determines expected consumption spell length, choosing a type a equivalently determines the total number of consumers, N, that can be served for the given capacity ϕ. This relationship is defined by:

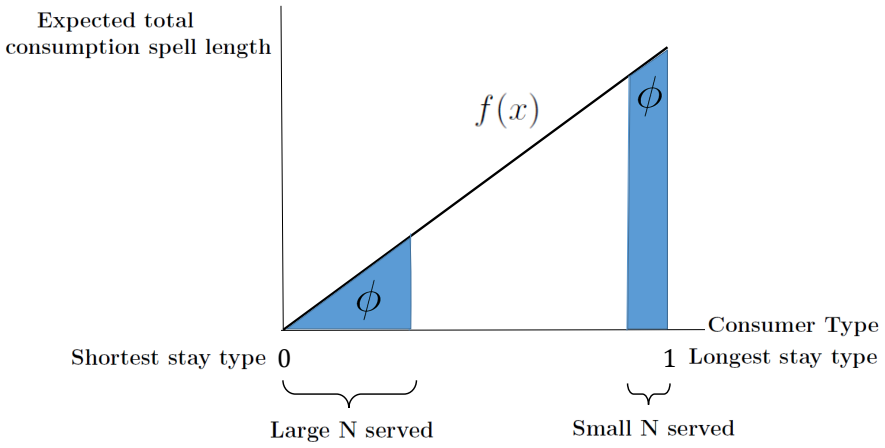
$$\int_{a}^{a+N} f(x)dx = \phi \tag{1}$$

Where the function $f(x)$ takes a consumer type from between 0 and 1, and translates it into a number of consumer-days. Given the index of 0 being short stay, and 1 being long stay, this means that $f(x)$ is increasing in x. A given capacity ϕ and a targeted consumer

type a necessarily determine the number of consumers N that can be supported in the short term. This $f(x)$ function also specifies the density of patients in the market. Even if a firm has a preferred consumer type, the firm is still constrained by the number of consumers of this type which actually exist to serve.

Figure 1 illustrates two approaches a firm could take for the same given capacity, ϕ. The horizontal axis indexes the consumer types, beginning at 0 and ending at 1. The function $f(x)$ is illustrated as simply a 45 degree line that maps a consumer type on the horizontal axis to the expected total consumption spell of that consumer type on the vertical axis. The function is increasing because consumer types on the right have higher expected consumption spells. The firm's capacity ϕ represents the total number of consumer-days, which is the area under the curve. In the figure, the same capacity ϕ could be filled under the curve either by starting at the 0 consumer type and filling in a triangle with a long base, or by pulling consumers from the 1 type, where the same total area would instead be tall with a short base. The base of the shaded area ϕ represents the number of consumers the firm would take along the consumer type index. Filling capacity with the shortest stay consumers necessarily means more consumers are served (a large N) compared to filling the same capacity with long stay consumers.

Figure 1: Relationship between firm capacity, consumer type, and number of consumers served



We next turn to the revenues and costs associated with serving consumers. Because a contract is written on a per unit basis, a firm in the market commits to serving a consumer for the entirety of that consumer's consumption spell. However, the firm is able to charge for each unit of the total consumption spell that the consumer actually consumes. The firm charges on price, P, on a per unit basis (e.g., price paid daily, over all days in the total consumption spell). Note this means that the firm receives marginal revenue P for each unit of the consumer-day ϕ.[5]

On the cost side, there is a high initial cost, α, of starting a relationship with the consumer (e.g., set-up cost). This α fixed cost must be paid for each consumer served by the firm. After the initial set-up cost, there is a constant marginal cost for each day of service, σ, which is paid for every unit of ϕ. With a high fixed cost and constant marginal cost, the average costs per consumer are downward sloping.[6]

The final component of cost accounts for the increasing cost of growing capacity. This factor captures managerial capacity, e.g. larger operations are more cumbersome to manage or monitor, or diseconomies of scale, which are likely in health services provision where labor match quality is important (e.g., staffing costs for a bed in a nursing home). Managerial costs are $\upsilon(\phi)$, where costs increase with capacity at an increasing rate, $\upsilon'(\phi) > 0$ and $\upsilon''(\phi) > 0$.

Finally, there exist two types of firm organization that are legally possible in this market: nonprofit and for-profit. The key difference between the two types is that individual consumers may make tax-exempt donations to the nonprofit. It is, of course, possible that for-profit firms receive donations if they set up an associated nonprofit 501(c)3 foundation to receive them. There are several limitations on this practice that make such an avenue much less attractive for the for-profits. First, while nonprofit firms may both solicit and receive charitable donations, foundations associated with for-profit firms may only receive

[5]Note, we are not explicitly modeling the determination of P. This is because, in the Medicare setting of several of the motivating health care examples (including hospice), Medicare reimbursement rates are fixed.

[6]Here, we assume the same cost structure across all consumer types. If this assumption was relaxed to allow the consumer types 0 to be more expensive, as may be a possibility in our empirical setting, the relative predictions are the same but with a stronger role of donations.

them, and even then face restrictions on how the funds can be used (Lorenz and et al., 2002). For example, charitable donations to for-profit foundations cannot be used for direct patient care. Generally, since the funds must be used for demonstrably public interest purposes, the capacity to divert charitable contributions to profits – and thus fulfill the for-profit objective function – are severely constrained. Second, nonprofit donations are tax-exempt, thus it is relatively "cheaper" for someone to give to the nonprofit than giving to a for-profit. Third, a foundation would add another layer of fixed bureaucratic costs into the for-profit production function. Finally, as an empirical matter, for-profit hospices do not receive many charitable donations. Indeed, in a 2008 survey of California hospices, no for-profit hospice was observed to receive any charitable donations at all (O'Neill, Ettner, and Lorenz, 2008).

However, for our theoretical purposes the key assumption is merely that the nonprofit has a nontrivial advantage in the probability and size of any donations. We assume donations are a fixed size, d. Donations come per consumer, N, not per day, which means serving a greater number of consumers increases donation revenues. For-profits and nonprofits may each choose their own optimal ϕ, which we index as ϕ_F and ϕ_N, respectively. Correspondingly, the resulting Ns, as a function of a, may vary by ownership as well. Combining the specifications of revenue and cost, we have the following:

The for-profit firm's net income equation is:

$$\Pi^F(\phi_F, a_F) = \underbrace{P\phi_F}_{\text{Service revenues}} - \Big[\underbrace{\alpha N_F(a_F) + \sigma\phi_F}_{\text{Consumer-based costs}} + \underbrace{\upsilon(\phi_F)}_{\text{Capacity-based cost}}\Big] \tag{2}$$

The nonprofit firm's net income equation is:

$$\Pi^N(\phi_N, a_N) = \underbrace{P\phi_N}_{\text{Service revenues}} + \underbrace{dN_N(a_N)}_{\text{Donation revenues}} - \Big[\underbrace{\alpha N_N(a_N) + \sigma\phi_N}_{\text{Consumer-based costs}} + \underbrace{\upsilon(\phi_N)}_{\text{Capacity-based cost}}\Big] \tag{3}$$

2.3 Firm Behavior

An important distinction of this framework is both the for-profit and nonprofit firm types maximize expected net income. The difference of donation potential alone will push the two types to behave differently. It is not necessary to assume that the nonprofit has a more altruistic, ad-hoc objective function for our main predicted behaviors. Because the firm does not influence price (i.e. P is fixed by Medicare), the important choice variables of the firm are the type of consumer to target a and the capacity ϕ.

The order of the firm's problem is as follows:

1. Choose capacity, ϕ.
2. Given capacity, choose the lowest consumer type to target, $a \, \epsilon \, [0, 1]$.
3. Based on ϕ and a, the number of consumers served, N, is realized.
4. Given revenues and costs for the corresponding choices, profits are realized.

This problem can be solved using backward induction. The firm solves for the optimal choice of a as a function of the fixed ϕ, then chooses optimal capacity based on this stage 2 solution.

To illustrate the predictions, suppose the functional form of the transformation from consumer type to expected units consumed is $f(x) = 2x$, so the integral of the function over the whole consumer space $[0, 1]$ would be $\phi = 1$. Normalized market size is thus equal to 1, and a firm can choose a share ϕ of capacity within the market. Then, we can substitute into the net income equation for the number of consumers served, N, as a function of the capacity ϕ and choose lowest consumer type to target: $N = \sqrt{\phi + a^2} - a$. Plugging this N into the net income Equations 2 and 3 yields net income in the forms $\Pi^F(a|\phi_F)$ and $\Pi^N(a|\phi_N)$. Thus the Stage 2 objective functions are:

For a for-profit firm:

$$\max_a \quad (P - \sigma)\phi_F - \alpha(\sqrt{\phi_F + a} - a) - \upsilon(\phi_F) \tag{4}$$

For a nonprofit firm:

$$\max_{a} \quad (P-\sigma)\phi_N + (d-\alpha)(\sqrt{\phi_N + a} - a) - \upsilon(\phi_N) \tag{5}$$

If targeting a consumer type is costly, for example, if creating referral networks is costly, the firm will maximize income by focusing recruiting efforts on the consumer type with the highest expected net income. Without a donation channel, the profitability implications per consumer are straightforward: consumer types with longer expected spells of consumption will be more profitable because later periods' lower costs make up for the initial high costs, given a constant revenue of P per day. However, donations to the nonprofit come per consumer, not per day. Thus, this relationship is more complicated in the nonprofit case, as the lower profitability of short stays can be counteracted by gaining more frequent donation revenue. Very short spells of consumption mean more consumers come through the firm, with correspondingly more donations.

We see this tradeoff by solving the objective functions in Equations 4 and 5. The optimal solution for each ownership type is a corner solution.[7] The nonprofit objective function is decreasing and continuous in the choice of a, with $\partial\Pi^N/\partial a < 0$ and $\partial^2\Pi^N/\partial a^2 \neq 0$ as long as $d > \alpha$ and the firm chooses nonzero capacity ϕ_N. That is, the nonprofit would choose a corner solution of targeting the shortest stay consumers, $a_N = 0$, as long as the marginal donation revenue per consumer is greater than the fixed cost of setting that consumer up with services. Note the nonprofit also has an incentive to influence donations to ensure that a marginal donation will be greater than the α fixed cost.

The for-profit objective function above is instead increasing and continuous in choice of a, with $\partial\Pi^F/\partial a > 0$ and $\partial^2\Pi^F/\partial a^2 \neq 0$ as long as $\phi_F > 0$. Thus, the for-profit would like to choose the largest a possible, conditional on the capacity relationship, $f(x)$.

Together, we see that if the following conditions hold: 1. $d > \alpha$ and 2. $\phi_N > 0$ and $\phi_F > 0$, then the optimal Stage 2 choice for the nonprofit is the lowest a possible (that

[7] See Appendix A.3 for the full first-order conditions and continuity results of the optimization problems.

is, $a_N = 0$), and the for-profit will pick the highest a possible (which, given the capacity equation and an endpoint of consumer type 1, would be $a_F = \sqrt{1 - \phi_F}$).[8]

The response to heterogeneous consumers by the two ownership types will be to split the market, with the for-profit firms focusing on the expected long-spell consumers, and the nonprofit firms focusing on consumers with short expected spells but more frequent donations. The nature of the good in this market helps bring about this result of market-splitting because donations become a viable secondary source of income for the nonprofit, beyond the per unit price for services.

The final stage of the firms' optimization is the choice of capacities, ϕ_N and ϕ_F. The firm solves this stage by substituting the value of a as a function of ϕ into the corresponding Equations 4 and 5 and solving for the optimal ϕ. Using the functional form specified above, where total market capacity is normalized to 1, we can show conditions where capacity choices of each ownership type do not overlap. The sum of the two capacity choices will be less than 1 if:

$$\sigma + \phi_N - \frac{d - \alpha}{2\sqrt{\phi_N}} < P < \sigma + (1 - \phi_N) + \frac{\alpha}{2\sqrt{\phi_N}} \tag{6}$$

The condition in 6 translates essentially into a range around the per unit price, P, which grows as the difference increases between per consumer donation revenue, d, and per consumer fixed cost, α. Donations greater than fixed costs mean the nonprofit's optimal share is chosen from a different segment of the consumer types than the for-profit's preferred share of the market. The proportional range of sufficient P would shrink, holding $d - \alpha$ constant, as the marginal daily cost, σ increases. The intuition is that, as the daily cost becomes high, the importance of a long length of stay grows in order to spread fixed costs along the consumption spell. As such, a nonprofit's preferred share would start encroaching on the for-profit preferred consumer types.

[8]The corresponding outcomes of number of patients would then be: Nonprofit $N_N = \sqrt{\phi_N}$ and For-profit $N_F = 1 - \sqrt{1 - \phi_F}$

2.4 Behavioral Predictions

The framework outlined above gives us the following predictions:

1. Nonprofit firms will focus on consumer types with shorter expected consumption spells, and make up lower per period profit with end-of-stay donation revenue. For-profits will focus on consumer types with longer expected consumption spells.
2. Nonprofit firms will focus more than for-profits on the nonexcludable components of service which are more likely to increase donation revenue.
3. Because nonprofit and for-profit firms each focus on a different segment of the heterogeneous consumers, markets with a mix of ownership will serve a wider range of consumers.

Prediction 1 states that nonprofits choose consumers of a type close to 0, which results in a larger N_N, and thus higher donation revenues dN_N. The for-profit will choose types closer to 1, where the per consumer fixed cost α is spread over more units of a consumption spell. Since nonprofit net income increases with the donation margin over fixed cost, $d - \alpha > 0$, Prediction 2 states that nonprofits should focus on services which ensure a high d. Prediction 3 results from each ownership type choosing a corner solution along the consumer spectrum. As such, markets with both types of firms should serve the fullest range of consumer types, and those markets with only one ownership type should see an upper or lower segment of the consumer type spectrum served more intensively.[9]

[9]This model does not include entry, but the same primary predictions should follow in the case of an incumbent and an entrant. A nonprofit incumbent would choose the shortest stay consumers up to its capacity constraint. The remaining segment of consumers are most attractive to a for-profit firm. If the next entrant is for-profit, it would target the opposite end of the spectrum– the consumers most dissimilar to the incumbent's. Even if the next entrant was nonprofit, its profit-maximizing choice of a would be as close to the incumbent as possible, rather than first choosing the dissimilar consumers.

In a more complex dynamic framework with entry and choice of ownership status, straightforward conditions would produce Prediction 3. As long as the fixed cost, α, of an additional consumer is sufficiently large compared to the marginal profit of increasing capacity, $(P - \sigma)$, there is a consumer type with a short enough stay that a for-profit could not enter and make positive profit. For a nonprofit entrant, since profit is decreasing in a, a differentially higher fixed cost of nonprofit entry, such as difficulty securing financing or costs of proving "community benefit," would not change the optimal consumer type, but would generate an intermediate value of $0 < a < 1$ where the nonprofit would no longer make positive profit upon entry.

3 Background: Hospice Industry

Hospice care is end-of-life care, designed to give comfort and pain relief for patients diagnosed with terminal illnesses. Care is delivered in teams, with a broad range of services from palliative pain-relief, nursing, counseling, and social work services. The hospice market is growing rapidly, with 1.3 million Medicare beneficiaries in 2014 and $15.1 billion in Medicare expenditures (MedPAC, 2016). The most complete hospice care offers both relief for physical illness as well as help for families with the legal and emotional issues at the end of life. This care may extend beyond the patient's direct consumption; that is, patients' families benefit through grief counseling or better preparation for the myriad of challenges following the death of a loved one.

The majority of services are delivered by hospice staff traveling to patients' residences in the hospice firm's area. The most common location for care is a patient's place of residence, at 66.6 percent in 2013, though patients may also be located in a hospice's own facilities (26.4 percent) or hospitals (7.0 percent). Own-residence includes the patient's home (41.7 percent), a nursing facility (17.9 percent), or a residential facility (7.0 percent) (NHPCO, 2015). Defining a market in this industry is straightforward because of the importance of physical transportation in delivering care. This ensures that markets are localized within daily driving distances of the firm.

Demand for hospice comes from patients with heterogeneity along the diagnosis dimension. The heterogeneity in diagnosis leads to a range in the length of time patients are expected to use hospice care. Cancer made up about 37 percent of hospice admissions in 2014 (NHPCO, 2015). The leading non-cancer diagnoses in hospice care are dementia, heart disease, lung disease, and stroke. There is a distinct difference in the average length of hospice services between these diagnoses and cancer diagnoses. The average length of stay for a Medicare hospice patient with a cancer diagnosis was 53 days in 2014. This contrasts greatly with the average length of stay for heart disease, at 89 days, or 148 days for patients with neurological conditions (MedPAC, 2015). This is largely due to the nature

of the disease types, as well as a culture of treatment "no matter the cost" which leads to late referral of cancer patients into hospice care.[10]

The cost structure of hospice care per-patient is generally u-shaped. Initial costs are high as the hospice sets up the team of caregivers and formulates a plan of care, and the final days of life usually involve more visits. A 2006 RAND study showed that a median patient receives 30 percent more visits in the first three days, and twice as many visits during the final three days, compared to the middle period MedPAC (2006). The major operating costs are in caregiving staff and transportation to patients.[11] In our data, the average hospice's expenses for salary, benefits, and transportation made up 58 percent of total costs.

Medicare is the dominant payer for hospice services in the U.S, accounting for 90.3 percent of patient days in 2014 (NHPCO, 2015). Patients qualify for the Medicare hospice benefit once a physician assesses life expectancy at 6 months or less, given the illness runs its normal course, and patients agree to forgo further curative medical treatment. The hospice commits to providing an uncertain number of service periods (days) over the course of serving the patient. However, there is some ability to predict the expected number of days based on the diagnoses. The hospice benefit may be renewed for as many periods as a 6-month terminal diagnosis holds, and patients may choose to dis-enroll from the benefit at any time.

The Medicare payment system is per diem with a local labor adjustment factor. There are four per diem categories of increasing intensity of care: routine home care, continuous home care, inpatient respite care, and general inpatient care. Over 97 percent of hospice days are for routine home care (MedPAC, 2006). Payment on a per-diem basis has the positive incentive effect of rewarding hospice effort to extend life. Medicare payments cease

[10]The short referral period between the end of curative cure and the start of hospice care also plays an important role in how patients and hospices connect. Recent hospice research focusing on whether patients are referred too late to care finds that 1 in 10 family members surveyed believe they were referred too late to hospice (Teno, Shu, Casarett, Spence, Rhodes, and Connnor, 2007), and Adams, Bader, and Horn (2009) find that one third of families stated it would been easier if they had started hospice earlier.

[11]The design of hospice is comfort, pain relief, and social counseling on end-of-life issues. These palliative services are not principally driven by diagnosis because curative care has been abandoned. As such, the specific diagnosis of the patient is less important than the number of days of service.

upon the death or transfer of the hospice patient. However, given the u-shaped patient cost curve, this also translates directly into a strict positive relationship between Medicare profitability and length of stay. Longer stay patients are more profitable because the longer middle sections of care are able to subsidize the more expensive beginning and end of stay.

Referral networks are important to hospice firms for two reasons. The first is that most patients come to hospice late in their illness, generally without time to "shop" for care. Hospice care begins directly after the referral, often within two days. As a result, the mix of provider types who refer to a hospice heavily influences the diagnosis mix. Hospices cannot legally refuse to serve a patient, but hospices can effectively target the type of patient who seeks their care through referrals.

Donations, in the form of bequests, memorials, or honorariums, make an important source of income for hospices. Upon a patient's death, donations can be given in the form of bequests, memorials, or honorariums. Donations are related to the nonexcludability components of hospice services. The Hospice Association of America reported that over 37 percent of funding for hospice residences in 2009 was through fundraising (Hospice Association of America, 2010). Donation data from Noe and Forgione (2014) on a subset of nonprofit hospices, 2000-2007, shows that donations accounted for approximately 12 percent of revenue, on average, and 14 percent of operating costs. Hospices in the top quartile took in nearly 15 percent of their revenues in donations.[12]

To give some reference to the magnitude of charitable giving in the tax code, in 2014, 37 percent of itemizing tax filers with Adjusted Gross Income (AGI) between $50,000 and $100,000 claimed a charitable deduction. This number was 68 percent to 87 percent for an AGI above $100,000. The average charitable amount claimed was $4,130 for an AGI between $100,000 and $200,000. This would imply an itemizer in a 25 percent tax bracket would owe over $1,000 less in federal taxes than if they did not claim the deduction, or a 25 percent "sale" on a nonprofit donation Lowry (2017). A donation of $4,130 would

[12]There is a correlation between how long a hospice has been operating and the growth in donation revenue, although market tenure is not correlated with any changes in average length of stay mix in the hospice. See Appendix A.1 for information on donations from the Noe and Forgione (2014) nonprofit hospice data.

be equal to about half the Medicare revenue received for an average stay of a nonprofit hospice (Average length of stay of 56 days, with 2014 payment rates for a routine care day at $156.06.).

3.1 Empirical Predictions

We can tailor the predictions from Section 2.4 to apply to the hospice industry.

1. Nonprofit hospices will focus on shorter-stay patients, and for-profit hospices will focus on longer-stay patients. We test:
   (a) Hospice average length of stay
   (b) Patient location – certain locations house long-stay diagnoses versus short-stay diagnoses.
   (c) For each we also control for mix of diagnosis within a hospice.
2. Nonprofit hospices should focus on services with benefits that accrue beyond the patient more than for-profits. We test:
   (a) Bereavement services – First, these are provided to loved ones after the patient's death, so explicitly do not accrue to the patient. Second, Medicare payments cease at patient death, so these services are explicitly excluded from reimbursement.
   (b) We also control for mix of diagnosis within a hospice.
3. The range of lengths of stay served by markets with mixed ownership should be greater than those in markets dominated by one ownership type. We test:
   (a) How the distribution of the industry-wide average length of stay percentiles is split among local markets.
   (b) The interquartile range of average length of stay within a local market.

4 Data and Summary Statistics

4.1 Firm-level data

Our firm-level data captures a nearly complete census of the U.S. freestanding hospice market during the period 2000-2008.[13] The data comes from the Center for Medicare and Medicaid Services (CMS) Medicare Cost Report Files. Because the dominant payer in hospice care is Medicare, any hospice which accepts Medicare payments is included in our data. Although 10 percent of payments are not through Medicare, if a hospice takes both private payments and Medicare payments, the hospice will still be included in our data. The only hospices that would not be included are those that completely eschew Medicare payments.[14]

Data is yearly and includes complete location information, including zipcode, date of first certification, and ownership status. We use the zipcode information to match a hospice with its Census Core Based Statistical Area (CBSA). A CBSA consists of the county or counties associated with at least urbanized area of at least 10,000 population, plus adjacent counties having a high degree of social and economic integration.[15] The CBSA is chosen as a market designation to capture the fact that hospice services are mainly provided by local nursing staff driving from patient to patient. A CBSA captures an area that is bound by common commuting abilities. Using a study of distances to hospice facilities in 2008, Carlson, Bradley, Du, and Morrison (2010) found that 88 percent of the population lived within 30 minutes of a hospice and 98 percent of the population lived within a 60 minute drive to a hospice, making a CBSA a more appropriate measure of market than only a county.[16]

[13] Freestanding hospices made up 59.1 percent of all hospice agencies in 2014 NHPCO (2015).

[14] The summary findings here of our national-level data are in line with previous research at a state level by Gandhi (2012).

[15] The term "core based statistical area" became effective in 2003 and refers collectively to metropolitan statistical areas and micropolitan statistical areas.

[16] For our data in particular, we are able to observe the patient zipcode along with the hospice provider CBSA for the years with individual-level observations, 2002-2005. Out of 1,870,608 patient-year observations, we see that over 80 percent of these patient zipcodes are within the CBSA of their hospice provider. For those patients that come from a different CBSA than that listed for their hospice provider, about 43 percent of these patients were in a nonprofit hospice, and 55 percent of these patients were in a for-profit, so there

The data reports annual expenses across 33 different hospice services. Detailed expenses are provided in categories of General Service Costs Centers (i.e. staff transportation, administrative services), Inpatient Care Services (both general and respite inpatient care), Visiting Services (i.e. nursing care, social services, spiritual counseling), Other Hospice Service Costs (i.e. physical inputs such as medical supplies, labs, and patient transportation), and Hospice Nonreimbursable Services (i.e. bereavement and volunteer program costs). The firm-level data reports average costs per diem and average length of stay for each hospice in each year. Reported revenues are broken down by four types of locations where a patient is served: home, skilled nursing facility, nursing facility, and other. Care days are given in total and also broken out into the four Medicare payment categories, the most common being Routine Home Care.

Table 2 lists summary statistics on patients, enrollment, and number of firms. Patients are recorded in total and by Medicare status. In the last year of our sample, over 979,000 patients were under hospice care in our data in over 2,000 hospice firms. This represents a growth of nearly 600,000 patients over 2000-2008. Medicare enrollment represents over 85 percent of these hospice days for all years in our sample, climbing as high as 90 percent of days in the final years.

Table 1: Markets with Mixed Nonprofit/For-profit Competition

Market	Pct. Nonprofit	Pct. For-profit
Health Industries, 2013		
Nursing Homes	25	70
Inpatient Rehabilitation	59	30
Hospice	34	61

Source: MedPAC (2015)

Hospice care is provided by both nonprofit and for-profit firms, with more recent for-profit entry into the market. The stacked bars in Figure 2 show the number of freestanding

does not seem to be a large differential in how patients might sort across CBSAs. We also investigated geographic mix of patients from outside the hospice CBSA, and the states with the highest number of non-CBSA patients corresponded with those states with the highest number of patients, thus not revealing any differential patterns geographically, either.

Table 2: Summary statistics for freestanding hospices, 2000-2008

Yearly Totals				
Year	Number of patients	Enrollment days	Medicare as pct of days	Hospice Count
2000	381,999	18,794,502	85	904
2001	417,229	21,104,311	86	867
2002	527,011	27,112,145	87	1,030
2003	583,149	32,990,698	88	1,150
2004	669,833	39,213,142	89	1,307
2005	785,897	46,453,675	89	1,574
2006	825,057	53,396,478	89	1,738
2007	899,119	59,809,942	90	1,953
2008	979,473	62,626,709	90	2,074
Total	6,068,767	361,501,602	89	12,597

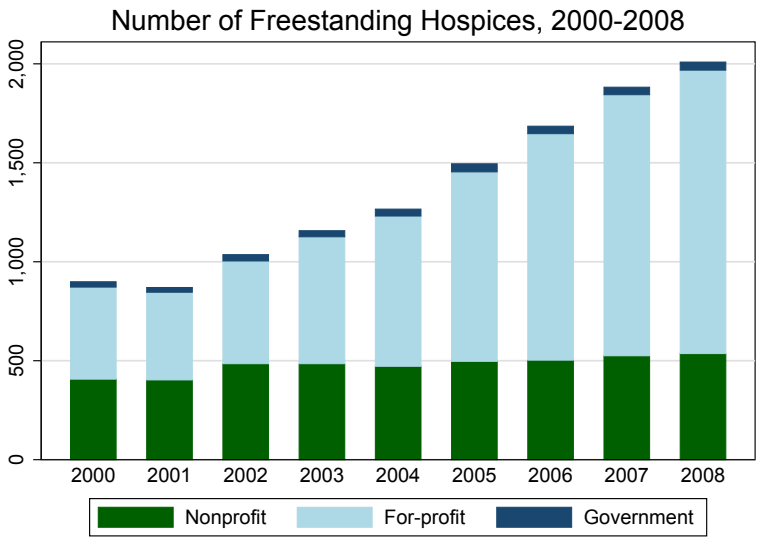
Source: CMS Hospice Cost Report Data

hospices reporting in our data from 2000-2008. The bottom bar shows the number of nonprofit hospices, the middle bar indicates for-profit hospices, and the final small top portion is government hospice firms. The number of hospice facilities more than doubled over the period, from 904 in 2000 to just over 2,000 in 2008, and our data contains over 12,000 hospice-year observations.

Table 3 reveals preliminary differences by ownership type. A large difference in the types of patients served is immediately evident by comparing the average length of stay. The average patient in a nonprofit stays only 56 days compared with the average for-profit patient who stayed nearly 77 days. Accordingly, the average cost per diem is slightly lower among for-profits, at $138.69, because of the ability to stretch out the more profitable middle period of the stay. The average cost per diem for a nonprofit is $147.74. Nonprofit hospices have slightly higher enrollment numbers over the course of the year, which may be due to the lower average length of stay per patient who is enrolled.

The middle portion of Table 3 indicates differences by ownership in the type of care over

Figure 2: Growth of U.S. Freestanding Hospices by Ownership Type



the course of a stay. The four payment categories are listed in order of intensity, with routine home care being the least intensive, but most common, type of care. Continuous home care payments are on an hourly basis for when the primary caretaker may be away. The final two categories are for inpatient care, with more intensive services delivered either as part of a planned caretaker respite (inpatient respite care) or for a crisis (general inpatient care). For-profits have a slightly higher percentage of routine home care days, at 96 percent. The more intensive category of general inpatient days makes up only 2 percent of for-profit days compared with 4 percent for nonprofits.

Finally, the lower section of Table 3 shows the distribution of hospice patients by location. An important goal of hospice care is for patients to spend the end-of-life at own home surrounded by family. At least 65 percent of the average hospice revenue is from home-based care for both ownership types. Another important location is Skilled Nursing Facilities (SNFs), and to a much lesser extent, Nursing Facilities (NF). Designation of a patient into skilled nursing facility care prescribes a greater level of care specialization than that of a nursing facility.[17]

[17]The difference between the two designations is often attributable to whether the primary payer is Medicaid or Medicare. The same facility may be able to provide both SNF and NF services. If a patient is using

Table 3: Summary statistics by ownership, 2000-2008

	Averages	
Variable	Nonprofit	For-profit
Length of stay in days	56	77
Cost per day	$ 147.74	$ 138.69
Total enrollment	674	383
Medicare enrollment	548	329
Total enrollment days	35,324	25,567
Routine home care days	33,644	24,512
General Inpatient care days	291	383
Continuous home care days	77	52
Inpatient respite care days	1,309	618
Percent Home-based revenue	69	65
Percent Skilled nursing facility revenue	13	21
Percent Nursing facility revenue	3	4
Percent Other location revenue	15	11

Source: CMS Hospice Cost Report Data

Patient location is also indicative of patient diagnosis. Table 4 lists the most common diagnoses of nursing home residents in 2004. Only 2 percent of nursing home residents had a diagnosis of cancer. In contrast, circulatory system diseases made up 25 percent, nervous system disorders made up 16 percent, of which Alzheimer's disease was over 10 percent. Mental disorders, including dementia were over 21 percent of diagnoses.

Table 4: Percent Distribution of Nursing Home Residents by Diagnosis, 2004

Diagnosis	Number	Percentage
Cancers	33,800	2.3
Endocrine, Nutritional, Metabolic Conditions (including Diabetes mellitus)	109,900	7.4
Mental disorders (including Dementia)	327,100	21.9
Nervous system disorders (including Alzheimer's disease)	246,200	16.5
Circulatory system disease (including Heart disease)	373,000	25.0
Respiratory disease (including Lung disease)	74,200	5.0
Other remaining diagnoses		21.9

Includes only those non-cancer diagnoses with at least 4.5% of total distribution.

Source: CDC 2004 National Nursing Home Survey (NNHS)

Table 5 shows how each diagnosis has a predictable relationship with average length of stay. The chart lists the top 12 conditions in hospice in 2000 compared to 2008, from the Center for Medicare and Medicaid Services' analysis of beneficiary data. The top half of Table 5 shows cancer diagnoses, whereas the bottom 7 rows are non-cancer diagnoses. Each category is ranked starting with the shortest lengths of stay in 2000 to the longest.

care under Medicare auspices, in particular for rehabilitative care that is covered for several months, the patient must be cared for by SNF services. However, if the patient is transferred out of Medicare services and instead to Medicaid services, the care type switches to NF. Because hospice patients are already under Medicare services, and usually have received a terminal diagnosis due to some worsening of their condition, it is more common for a patient to be covered under SNF services (Medicare.gov, 2017)

The shortest average stay in 2000 was for blood/lymphatic cancers, and the top five cancer categories had an average length of stay of less than 47 days. This contrasts with the remaining 7 non-cancer diagnoses, which averaged 55 days in hospice. Alzheimer's disease had the longest average stay, at 66 days.

The right hand side of Table 5 shows the change in diagnosis length of stay between 2000 and 2008. The average cancer length of stay use had increased to 51 days, while the average non-cancer length of stay increased by much more, to nearly 82 days. The average length of stay for an Alzheimer's patient increased by 59 percent during the period. Increasing average length of stay could have several causes, including earlier referral of end-of-life patients and better care within hospices. However, the large changes also may reflect the increase in for-profit care and its incentive to seek out longer-stay patients even within a diagnosis category.

4.2 Individual-level data

To capture the makeup of patient characteristics in a hospice, we have individual-level data for all Medicare hospice patients matched to their provider for a subset of the sample years, 2002-2005.[18] The patient-level data contains information on diagnosis, date of entry into hospice, and date of death or discharge. Patient demographic information is also available such as age, sex, race, state, and zipcode of residence.

Table 6 shows summary information on the individual beneficiary data. The four years of data contain over 2 million enrollees matched to their hospice. An average hospice patient is female, white, and in her 80s. Approximately 35 percent of hospice patients in 2002-2005 had a cancer diagnosis, with 15 percent of patients under hospice care for either lung, prostate, or breast cancer. Among non-cancer diagnoses, Alzheimer's disease and dementia together made up approximately 10 percent of diagnoses. Coronary disease was the next largest category, at 8 percent. Stroke patients and failure-to-thrive were 4 percent each. Finally, debility not-otherwise-specified accounted for approximately 7 percent of diagnoses.

[18] Only the years 2002-2005 were available for use in the CMS 100% Standard Analytical Files.

Table 5: Changes in Diagnosis Type and Length of Stay

	2000		2008		% Change	% Change
Diagnosis	No. patients	Avg los	No. patients	Avg los	in patients	in los
Blood/Lymph Cancer	19,185	36	25,593	41	33	14
Lung Cancer	75,602	42	95,417	45	26	7
Colo-rectal Cancer	30,100	49	33,185	55	10	12
Prostate Cancer	19,705	52	21,632	60	10	15
Breast Cancer	18,006	55	22,535	58	25	5
CVA/Stroke	30,685	37	56,986	53	86	43
Debility NOS	21,883	51	106,806	83	388	63
Congestive Heart Failure	39,414	54	89,068	75	126	39
Other heart disease	25,164	55	61,455	82	144	49
Dementia	29,309	57	113,204	89	286	56
Respiratory disease	29,984	63	72,699	86	142	37
Alzheimer's	20,633	66	60,488	105	193	59

Source: CMS Hospice Beneficiary Summary Data

Table 7 shows the age breakdown in hospice care 2002-2005. Over 80 percent of the hospice population was between age 70 and 95.

5 Econometric Specification and Results

5.1 Econometric Specification

The basic econometric specification examines the difference between for-profit and non-profit hospice firms in each empirical characteristic predicted by Section 2.4. The independent variable of interest is a for-profit dummy. The general econometric specification is:

$$Y_{jct} = \beta_0 + \beta_1 FP_{jt} + \beta_2 age_{jt} + \beta_3 X_{ct} + \tau_t + \eta_c + \epsilon_{jct} \tag{7}$$

where j indexes a hospice provider, t indexes the year, and c represents the county-level measure of CBSA indicating the local market of the hospice provider. The dependent variable is at the hospice provider-year level. The coefficient of interest is β_1, the coefficient on an indicator for hospice j being a for-profit in year t.

We also include several controls for CBSA market and hospice characteristics. To account for entry and exit during the period of study, we include the age of the hospice - the number of years since the self-reported opening date. This control will also account for learning in service provision as well as the development of referral networks, which influence the ability to target length of stay. X_{ct} is CBSA-level time-varying characteristics. These time-varying controls are from the Area Health Resource Files (AHRF) and the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute. AHRF data includes controls for labor: the number of active physicians and nurses, controls for provider availability on the extensive and intensive margins: general hospitals, hospital admissions and visits, skilled nursing facilities, nursing home beds, and Medicare prevalence in terms of payment and enrollment. AHRF controls also include per capita income. The SEER data provides information on cancer incidence broken down by age and race.

Table 6: Summary Statistics for Medicare Hospice Beneficiaries, 2002-2005

	Percent
Female	60
Race	
White	87
Black	9
Hispanic	2
Other	1
Breakdown of Diagnoses	
Any cancer	35.5
Coronary disease	8.0
Alzheimer's disease	5.3
Dementia	4.5
Lung disease	5.8
Stroke	4.0
Failure to thrive	4.0
Debility n.o.s.	7.1
Other	25.8
Cancer Diagnoses	
Lung cancer	10.6
Prostate cancer	2.5
Breast cancer	2.5
Number of Beneficiaries Each Year	
2002	416,204
2003	466,614
2004	519,217
2005	604,378
Total	2,006,413

Source: CMS SAF Beneficiary Data

Table 7: Summary Statistics for Medicare Hospice Beneficiaries, 2002-2005

Age Category	Number	Percent
< 65	119,409	5.95
65-69	157,742	7.86
70-74	236,509	11.79
75-79	337,817	16.84
80-84	414,444	20.66
85-89	381,940	19.04
90-94	251,282	12.52
95-99	90,709	4.52
≥ 100	16,651	0.83

Source: CMS SAF Beneficiary Data

Year fixed effects are τ_t and CBSA fixed effects are η_c. Remaining error is at the CBSA hospice-year level.

5.2 Prediction 1: Nonprofit firms will focus on shorter-stay patients, and for-profits will focus on longer-stay patients.

Our first prediction is that nonprofit firms should target shorter-stay patients. Although shorter-stay patients are less profitable, given increasing returns to length of stay and per diem payments, nonprofits have the additional source of reimbursements in the form of donations at the end of services. Thus, given that forming referral networks is costly, nonprofits are expected to source shorter-stay patients, compared to similarly situated for-profit firms.

We first check this prediction by directly comparing lengths of stay between nonprofit and for-profit firms while controlling for underlying characteristics of the market. Table 8 Column (1) compares the average lengths of stay between the two ownership types over the period 2000-2008. The dependent variable is a hospice's average length of stay in days for a given year, and the coefficient of interest is a for-profit dummy variable, showing the for-

profit difference from a similarly situated nonprofit. All regressions control for hospice age, time-varying market characteristics, and both time and CBSA fixed effects to account for trends in the industry over the period and the local regulatory and competitive environment. Over all the years 2000-2008, the average length of stay for a hospice patient in a for-profit hospice was 13.51 days longer than that of an observationally equivalent nonprofit hospice. The average length of stay for the overall sample is 69.3 days. This means that for-profit patients stay nearly 20 percent longer under hospice care than nonprofit hospice patients. This difference is significant at the 1 percent level.

What is striking is that this difference is persistent even after controlling for the type of diagnosis in a hospice. As discussed earlier, certain diseases have a predictable expected length of stay at the end of life. We include the percent of patients in each diagnosis category to control for the average expected length of stay attributable to a particular disease mix on average. The third column of Table 8 reveals that for-profit hospices manage to target longer stay patients even within a given diagnosis category. The dependent variable remains the hospice's average length of stay, but Column (3) additionally controls for the mix of individual diagnoses served by the hospice, as the percentage of the hospice's patients in each of the major hospice diagnosis categories. The regression clearly demonstrates the importance of diagnosis, because the coefficient on the for-profit dummy drops by a third, to 8.95. The for-profit dummy remains significant at the 1 percent level. Even besides targeting patients with a diagnosis which predicts long stays, the for-profits are still able to cherry-pick the patients within this diagnosis with the longest expected stays. Column (2) reports the for-profit coefficient without controlling for diagnosis for the years of beneficiary data availability, 2002-2005. This coefficient is comparable to the full sample results.

The coefficients on the diagnosis variables align largely with the discussion about average length of stay. The omitted category is Percentage Cancer Diagnoses, with the included controls variables of percentage in major non-cancer diagnoses including Coronary Disease, Alzheimer's Disease, Dementia, Lung Disease, Stroke, Failure to Thrive, Debility Not Otherwise Specified, and an Other category. All coefficients are positive, indicating that

increasing the percentage of any of the non-cancer diagnoses increases the predicted average length of stay in a hospice, versus an increase in malignant cancer. Coronary disease and lung disease show the greatest increase in length of stay compared with cancer diagnoses, followed by Alzheimer's disease and dementia.

In our data, we are able to identify whether the nonprofit is registered as a religious nonprofit or not. In the framework above, we show that these predictions emerge without any difference in mission-driven behavior, such as a difference between a religious versus secular hospice. When we examine the differences in average length of stay broken down between nonprofit types, we find that the religious nonprofits have predicted average length of stay 17 days shorter than a corresponding for-profit, versus 13.5 days shorter for a secular nonprofit. However, these differences are not statistically significant. We find no evidence that religious mission is a contributing factor in the nonprofit - for-profit behavior differences.[19]

We next examine the location of the patient as a proxy for the type of diagnosis the hospice is targeting. This allows us to measure the patient type prior to the patient actually benefitting from the hospice's care, which may be endogenously affected by the quality of hospice care.

As discussed above in Table 4, non-cancer diagnosis patients are much more likely to be residing in nursing facilities than cancer diagnosis patients. Because the onset of diseases such as dementia and Alzheimer's cause the patient to lose the ability to live independently, these types of patients are often already in nursing facilities when a terminal diagnosis is made. Cancer patients are much more likely to be at home or still under hospital care. Evidence on place of residence reveals information about hospice referral networks and relationships with local care providers.

Table 9 shows the differences in patient location by ownership. The dependent variable is the percent of a hospice's total revenue which comes from four location types: Skilled Nursing Facility (SNF), Nursing Facility (NF), Home, and Other.[20] Long-stay patients

[19] See Appendix A.2 for further discussion.

[20] Because revenue is from a per-diem Medicare payment irrespective of location or diagnosis, number of

Table 8: OLS: Differences in Average Length of Stay

Dependent variable: Average length of stay (days)			
	(1)	(2)	(3)
Years	2000-2008	2002-2005	2002-2005
For-profit difference	13.51 ***	14.11 ***	8.95 ***
from nonprofit	(1.36)	(1.80)	(1.79)
% Coronary disease			107.75 ***
			(12.85)
% Alzheimer's disease			61.39 ***
			(13.38)
% Dementia			60.67 ***
			(11.53)
% Lung disease			78.26 ***
			(18.80)
% Stroke			39.62 *
			(21.93)
% Failure to Thrive			59.62 ***
			(15.57)
% Debility n.o.s.			39.59 ***
			(9.23)
% Other			56.44 ***
			(7.37)
Omitted: Malignant cancer			-
Hospice age	Y	Y	Y
CBSA time-varying controls	Y	Y	Y
Year fixed effects	Y	Y	Y
CBSA fixed effects	Y	Y	Y
N	11,160	4,431	4,421

Beneficiary data is only available for 2002-2005.

Regression (1) is the full firm-level sample.

Regression (2) is the firm-level sample for the truncated years.

Regression (3) is the linked firm-beneficiary sample.

All regressions include hospice age and time-varying CBSA-specific controls for:
health care resources, per capita income, and incidence of cancers.

***, **, and * indicate significance at the 1, 5, and 10 pct level, se in parentheses.

are more likely to be located in a SNF or a NF. Short-stay patients are more likely to be found at home or a hospital setting. A positive coefficient in the first row of Table 9 indicates that the for-profit has a higher percentage of revenue from that location compared to a nonprofit hospice. The first two regressions in each Place of Residence category are unadjusted for diagnosis mix, while the third column includes the percentage of diagnosis type for major diagnosis categories. All regressions have CBSA fixed effects, year fixed effects, and time-varying local market controls.

The results show that for-profit hospices are more likely to be serving patients from nursing facilities as compared to patients' homes. For-profits receive 6.5 percentage points more of their revenues from a skilled nursing facility (SNF) than a similarly-situated non-profit (Column 1), and nearly 3 percentage points more revenue from a nursing facility (NF) (Column 4). Nonprofits are much more likely to be serving patients in the home or a non-nursing facility. For-profits receive 6.3 percentage points less revenue from home-based patients than a comparable nonprofit (Column 7). The Other category includes hospice inpatient facilities and acute care hospitals. These facilities are much more likely to be serving cancer patients, and for-profits receive 3.4 percentage points less of their revenue from these facilities than local nonprofits (Column 10). The SNF, NF and Home coefficients are all significant at the 1 percent level. Regressions using a truncated sample of 2002-2005 to match the beneficiary data have similar signs and magnitudes (Columns 2, 5, 7, and 10).

The evidence on length-of-stay targeting through location comes through even more strongly when controlling for hospice diagnosis mix. Four regressions in Table 9 show the same dependent variable of the revenue percentages from each location, but also include the percent of patients in each major diagnosis category. Given a for-profit and nonprofit hospice with the same underlying mix of patient diagnosis, the for-profit is predicted to earn 4 percentage points more revenue from skilled nursing facility patients (Column 3). Services provided under the skilled nursing facility designation are more specialized than that of a nursing facility. Note that the for-profit bias in percentage revenue from nursing

patients is a one-to-one mapping into revenue across patient locations.

facilities slightly increases when accounting for underlying diagnosis mix (Column 6). Cases with fewer complications, those more likely to be designated into a nursing facility instead of a skilled nursing facility, are likely to have longer expected prognoses. Nonprofits are still much more likely, even controlling for diagnosis, to source patients from their home (Column 9).

5.3 Prediction 2: Nonprofits should focus more than for-profits on services with benefits that accrue beyond the patient.

Because of the declining average cost curve, shorter stay patients are less profitable because the profitable middle section of the stay is shorter. However, as outlined above, these short-stay patients may actually be to a nonprofit's advantage if the nonprofit receives donations at the end of the stay. We have already shown that nonprofits are much more likely to take on these short-stay patients. Here, we focus on the donation dimension.

Table 10 shows the difference in for-profit and nonprofit provision of bereavement services. Bereavement services can be provided to the family both during and after death. These services include emotional, social, and spiritual support services, often provided by a chaplain or a social worker, and sometimes clinical staff. Patients and families that have a better experience in their care are more likely to include the hospice in their bequests or as a request for friends and family wishing to contribute at the time of death.[21] However, Medicare per diem payments end after the patient's death, so any bereavement services provided to the family after death will not be covered under the Medicare hospice benefit. Since donations at the end of the consumption period are the counterbalance to lower profitability from a short stay, nonprofits and for-profits have different incentives to focus on these services. Nonprofits should be more likely to offer bereavement services. We see in Column 1 of Table 10 that the average for-profit offers over $20 less per patient in bereave-

[21]Donations could also be increased more generally by high quality on other dimensions of care. This quality could feed both into donations as well as improve a patient's outcome. However, we isolate the bereavement component particularly because these services are provided for the family and after death, which is unlikely to influence the outcomes of the patient, and thus provide a more direct test of the donation potential.

Table 9: OLS: Differences in Place of Residence

Dependent variable: Percent of total revenue from:												
	SNF			**NF**			**Home**			**Other**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
For-profit difference	6.50***	5.72**	3.94*	2.91***	3.46***	3.87***	-6.28***	-4.75	-5.46*	-3.36	-5.01**	-3.12
from nonprofit	(1.95)	(2.34)	(2.25)	(0.9)	(1.26)	(1.29)	(2.31)	(3.02)	(3.09)	(1.82)	(2.33)	(2.44)
% Coronary disease			-6.08			-5.71			30.96*			-11.43
			(13.45)			(5.43)			(18.24)			(11.21)
% Alzheimer's disease			38.43**			-1.85			-9.20			-22.81**
			(15.49)			(4.92)			(17.57)			(10.70)
% Dementia			71.83***			-19.20***			-19.98			-33.32***
			(14.98)			(5.39)			(16.50)			(10.88)
% Lung disease			10.46			2.36			32.66			-48.36***
			(22.97)			(7.64)			(26.66)			(17.51)
% Stroke			56.42**			-9.26			-59.23**			11.34
			(21.88)			(8.89)			(25.32)			(17.87)
% Failure to Thrive			-24.55*			-3.55			60.25***			-28.03**
			(13.96)			(6.69)			(18.63)			(11.74)
% Debility n.o.s.			27.67**			11.43*			-51.79 ***			15.02
			(12.71)			(6.27)			(16.05)			(12.16)
% Other			33.05***			-2.02			-24.19**			-6.12
			(9.38)			(3.32)			(11.15)			(9.81)
Omitted: Malignant cancer			-			-			-			-
Hospice age	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
CBSA time-varying controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
CBSA fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	10,988	4,362	4,352	10,988	4,362	4,352	10,988	4,362	4,352	10,988	4,362	4,352

Beneficiary data is only available for the years 2002-2005.

Regressions 1, 4, 7, 10 : 2000-2008 firm-level sample, Regressions 2, 5, 8, 11: 2002-2005 firm-level sample, Regressions 3, 6, 9, 12: 2002-2005 linked firm-beneficiary sample.

*** ,**, and * indicate significance at the 1, 5, and 10 pct level, se in parentheses.

ment services compared to a similarly situated nonprofit. This result is significant at the 1 percent level. The average hospice in the dataset spends $75 per patient on bereavement services – the difference between the two ownership types is over a quarter of the average value.

It may be that different end-of-life diagnoses have different needs for bereavement services; perhaps the emotional component of Alzheimer's's and memory diseases are different than that of cancer. To account for this, Column 3 of Table 10 includes controls for the hospice diagnosis mix. Even controlling for the mix of end-of-life diseases, a for-profit is predicted to provide each patient with $20 less in bereavement services than that of a similarly situated nonprofit hospice.

5.4 Prediction 3: The range of lengths of stay served by markets with mixed ownership should be greater than those in markets dominated by one ownership type.

Our third prediction outlines how nonprofit and for-profit presence should affect the segment of demand served by a local market. Markets with mixed ownership should see a wider range of consumers served along the heterogeneous dimension. Here, heterogeneity is in patient length of stay. Because the most profitable patients for a nonprofit hospice differ from those of a for-profit hospice, we would expect the markets served primarily by nonprofit firms to disproportionately serve short-stay diagnoses, and the markets dominated by for-profit firms to serve mainly longer-stay patients. Thirdly, local markets which have a more equal presence of both types of ownership should actually have a larger range of stay lengths, because both the short-stay and the long-stay patients are being served.

We test this prediction on the CBSA level. As discussed in Section 4, a CBSA is a good measure of a hospice's local market because its services are mainly nursing and social work visits that must be within day-driving distances. There is significant variation across CBSAs in ownership mix. Table 11 shows the breakdown across the 3,813 CBSA-year combinations in our data. Approximately 41 percent of observations were fully nonprofit,

Table 10: OLS: Differences in bereavement services

Dependent variable: Bereavement services per patient			
	(1)	(2)	(3)
Years	2000-2008	2002-2005	2002-2005
For-profit difference	-20.52***	-20.88***	-19.97**
from nonprofit	(6.30)	(9.05)	(9.21)
% Coronary disease			-45.31
			(51.18)
% Alzheimer's disease			70.96
			(45.90)
% Dementia			-33.27
			(46.72)
% Lung disease			-71.62
			(69.99)
% Stroke			-66.32
			(63.75)
% Failure to Thrive			44.58
			(43.99)
% Debility n.o.s.			-14.20
			(40.83)
% Other			-27.48
			(29.73)
Omitted: Malignant cancer			-
Hospice age	Y	Y	Y
CBSA time-varying controls	Y	Y	Y
Year fixed effects	Y	Y	Y
CBSA fixed effects	Y	Y	Y
N	11,160	4,431	4,421

Beneficiary data is only available for 2002-2005.

Regression (1) is the full firm-level sample.

Regression (2) is the firm-level sample for the truncated years.

Regression (3) is the linked firm-beneficiary sample.

All regressions include hospice age and time-varying CBSA-specific controls for:

health care resources, per capita income, and incidence of cancers.

***, **, and * indicate significance at the 1, 5, and 10 pct level, se in parentheses.

while about a third were served entirely by for-profit firms. The remaining 27 percent had a nonzero percentage of both nonprofit and for-profit providers serving the CBSA in that year. The number of firms in a CBSA also varies. Table 11 shows that 2,166 CBSAs had only one hospice firm, with about 65 percent of these markets being served by a lone nonprofit hospice and 35 percent being served by a lone for-profit hospice.[22]

Table 11: CBSA ownership mixes, 2000-2008

Total CBSA-year markets	3,813	100%
100% Nonprofit	1,575	41%
Mixed Nonprofit and For-profit	1,061	27%
100% For-profit	1,177	30%
Lone Firm in CBSA	2,166	
Lone Nonprofit	1,416	
Lone For-profit	750	

To characterize how much of the heterogenous consumer spectrum is served in each CBSA, we rank each local market's average length of stay against the same measure for all other local markets, industry-wide, during 2000-2008. We calculate the year-specific CBSA average length of stay by averaging the mean length of stay of all hospices within a CBSA for every year. Each CBSA average length of stay is percentile ranked against all other 3,812 CBSA-year observations. A CBSA with a percentile rank of 20 means that this CBSA's average length of stay for that year was in the lowest 20 percent of all local markets during the 2000-2008 period. In our data, the 25th percentile CBSA length of stay was 46.5 days; the 75th percentile CBSA length of stay was 74.3 days.

Figure 3 shows these CBSA average length of stay percentiles divided into three groups: mainly nonprofit markets, mixed ownership markets, and mainly for-profit markets. We define a market as mainly nonprofit if more than 70 percent of its hospices operate as nonprofits. Correspondingly, define a mainly for-profit market as a CBSA with less than

[22]Market percentages exclude government hospices, which compose approximately 2 percent of freestanding hospices during 2000-2008.

30 percent of hospices operating as nonprofits. Mixed markets are those with a nonprofit percentage between 30 and 70 percent.

Figure 3 shows a histogram that includes all CBSA percentile values for CBSAs that are mainly nonprofit, mixed ownership, and mainly for-profit, as defined above. Each histogram is CBSA percentile values of average length of stay. The vertical axis is a count number of CBSA markets that fall in the horizontal axis's length of stay percentile. Figure 3a displays percentile rankings for mainly nonprofit markets. The mass of the histogram is on the left, over lower percentiles, and trails away slowly as percentile values increase. A market that is dominated by nonprofit firms is much more likely to be serving patients with average lengths of stay lower than the industry average. Conversely, the bottom figure shows the same graph for CBSAs which are dominated by for-profit firms. Here, CBSA values are clustered to the right of the histogram, with average lengths of stay in the top 20 percentiles. Markets that are dominated by for-profit firms are much more likely to be serving patients with long average lengths of stay. These figures show that individual hospice operations examined in Prediction 1 play out directly onto the local market level.

What is particularly interesting is the middle histogram in Figure 3. Figure 3b shows the percentile rankings for markets that have a presence of both types of ownership. This figure is quite different than the other two, with the mass more evenly spread around the middle percentile values. In mixed ownership markets, the average length of stay is much more likely to be a combination of both short stay and long stay patients. When both ownership types are present, there is a much wider range of heterogeneity in demand which is met.

The contrast between the three markets is interesting because it shows that ownership-specific behavior is present even without the other ownership type. One might conjecture that a nonprofit only specializes in short-stay patients when there is a competing for-profit firm carving off the long-stay portion of demand. However, the top and bottom figures show that even in markets with only one type of ownership, the nonprofit is mainly focusing on short stay patients and the for-profit focuses on the upper end of the range.

Figure 4 shows another perspective on nonprofit specialization in short-stay patients, even in absence of for-profit competition. The top figure shows a cumulative distribution function (cdf) for the CBSA length of stay percentiles: One for 100% nonprofit and one for 100% for-profit. The top curve is the cdf for 100% nonprofit CBSAs. It begins rising early, with most of the CBSAs in the nonprofit category having short average stay values in the low percentiles. The nonprofit cdf then starts to level off at longer length of stay percentiles. The lower curve is 100% for-profit markets, and this curve is the inverse of the nonprofit cdf. The strong increase in slope starts toward the upper end of the length of stay percentiles, showing that most for-profit CBSAs have long average lengths of stay.

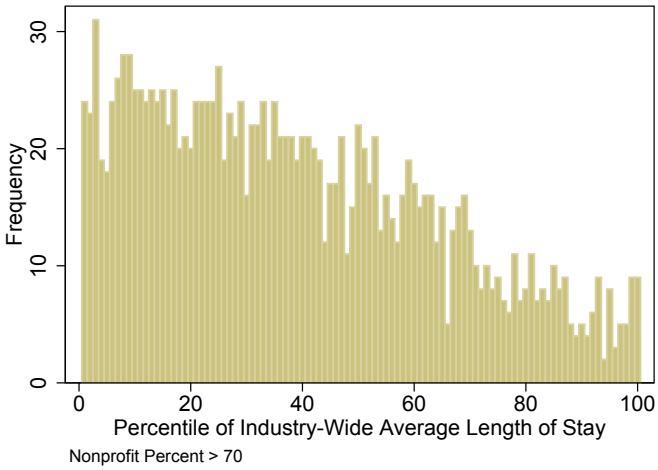
These relationships remain for the subset of single-firm CBSA markets. The lower graph of Figure 4 shows the same cdfs for the 2,166 nonprofit and for-profit CBSAs with only one firm, either a lone nonprofit hospice or a lone for-profit hospice. The lone nonprofit cdf stochastically dominates the lone for-profit cdf, showing that markets with only a nonprofit hospice typically serve patients with a much lower average length of stay served than those markets with only a for-profit firm. It is clearly not the case that a lone hospice takes on the full distribution of demand in its market, no matter the ownership. A lone for-profit still focuses on the long stay patient segment, and a lone nonprofit still focuses on the short stay segment. These differences are statistically significant at the 99 percent level. The Kolmogorov-Smirnov tests for equality of distribution are shown in Table 12.

Table 12: Kolmogorov-Smirnov Test of Equality of Distributions:
CBSA Length of Stay Percentile Distributions By Ownership Grouping

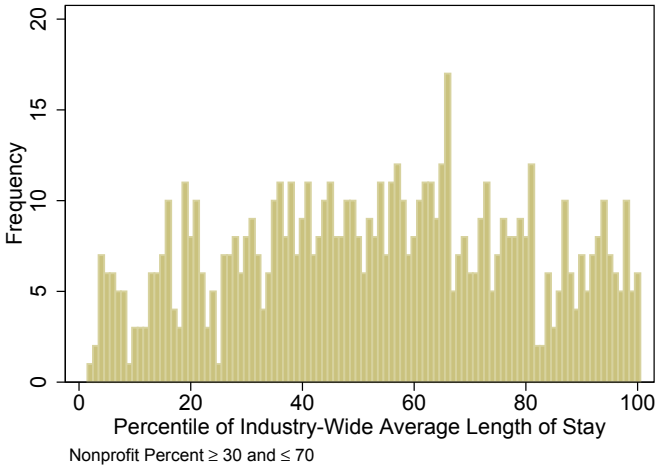
Ownership Mix - all CBSAs	D-value	P-value
Mainly Nonprofit - Mainly For-profit	0.3469	0.000
Mainly Nonprofit - Mixed	0.3063	0.000
Mainly For-profit - Mixed	0.1361	0.000
Ownership Mix - Lone Hospice	D-value	P-value
Nonprofit - For-profit	0.2627	0.000

Figure 3: CBSA Average Length of Stay: Overall Percentiles Divided by Ownership Mix

(a) CBSAs with Mainly Nonprofit Hospices



(b) CBSAs with Mixed Ownership



(c) CBSAs with Mainly For-profit Hospices

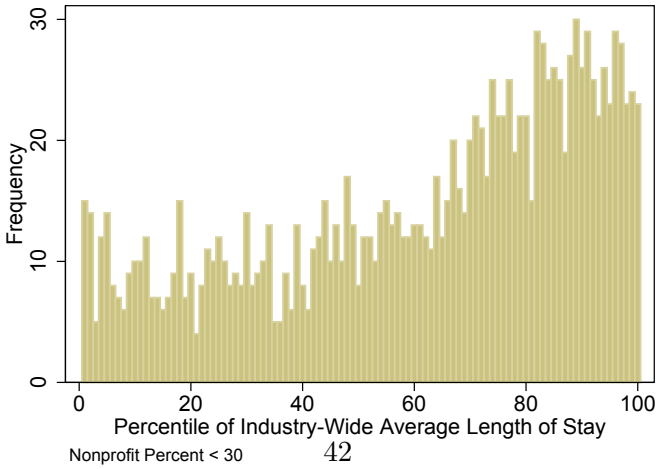
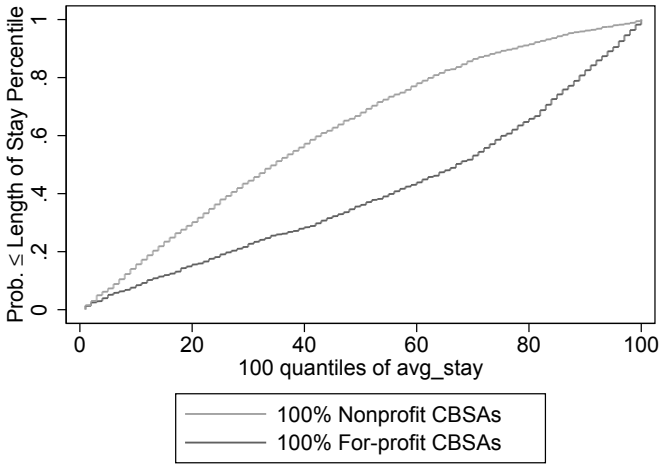
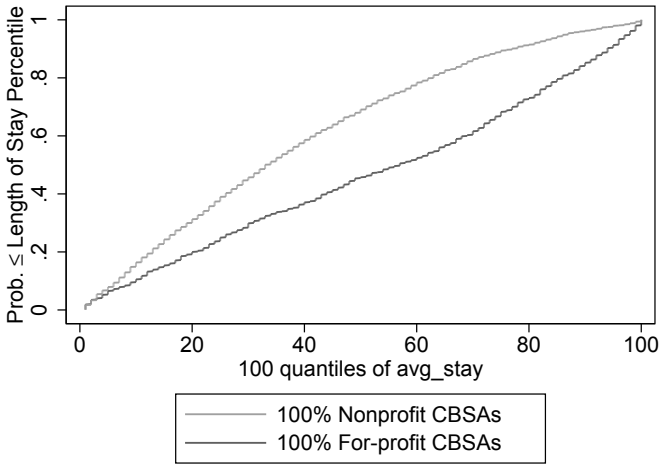


Figure 4: Cumulative Distribution Function for CBSA Length of Stay Percentiles.

(a) 100% One Ownership: ≥1 Hospice in CBSA



(b) 100% One Ownership: Lone Hospice in CBSA

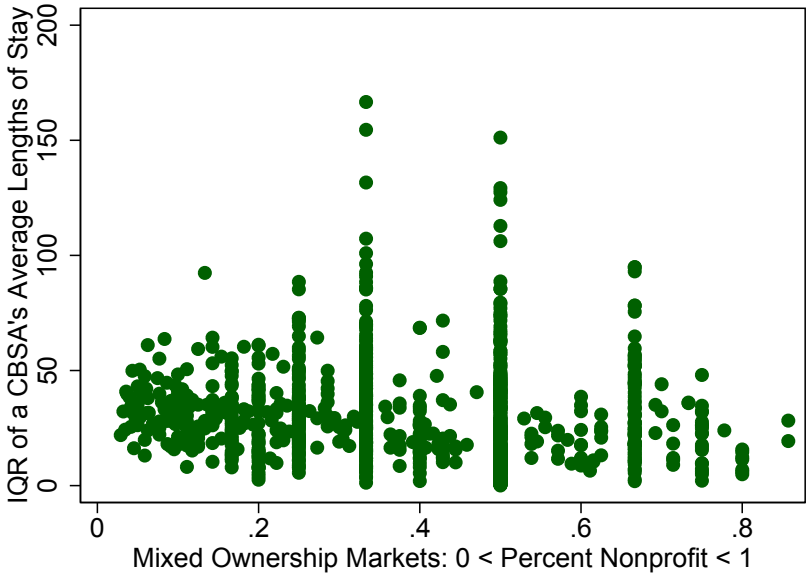


We now turn our focus to the 27 percent of local markets which have a nontrivial presence of both nonprofit and for-profit hospices. Within a CBSA, we can learn how ownership influences types of patients served by looking at the interquartile range of a CBSA's average lengths of stay. If most hospices in a CBSA served the same mix of patients, each would have similar average lengths of stay and thus the interquartile range of the local market's hospices will be small. A larger interquartile range of the average lengths of stay implies that hospices within a CBSA are serving very different types of patients.

Figure 5 illustrates this relationship for markets with mixed ownership. The vertical axis is the size of the interquartile range among the hospices in a CBSA, while the horizontal axis increases from zero percent nonprofit to 100 percent nonprofit in a CBSA. Starting at the lower left, these dots represent CBSA markets that are dominated by for-profit hospices. Interquartile range differences in average length of stay range between 0 and 50 days for hospices in these CBSAs. At the other end of the ownership mix, CBSA markets that are mainly nonprofit have similarly small interquartile ranges. However, the scatterplot has a curved shape, that as ownership mix moves toward the middle with nonprofit and for-profit mix being more equal, the within-CBSA difference between lengths of stay increases. Markets with a significant presence of both ownership types show a greater interquartile range of average length of stay, growing as high as a 100 day difference in average length of stay in the CBSA. This implies that a wider range of patients are being served by hospice care in those local markets, for individual hospice lengths of stay to vary so significantly. Moving toward the center of the scatterplot, heterogeneity in average length of stay increases along with increasing diversity in firm ownership type.

The results show that local markets with both nonprofits and for-profits will actually have higher consumer welfare outcomes in terms of the range of patients receiving care. In this case, the fact that each ownership type has a different incentive structure creates more opportunities to profitably serve patients than would occur in isolation.

Figure 5: Interquartile Range of Average Lengths of Stay Within CBSA



6 Conclusion

Both for-profit and nonprofit firms coexist in many health care markets, including nursing homes, rehabilitation, and hospices, and this coexistence is persistent over time. Much of the extant literature on for-profit and nonprofit organizations focuses on advantages that for-profits (efficiency) or nonprofits (higher quality) may have over the other in various settings. We ask two under-examined questions in this paper: what are the conditions under which these organizational structures may coexist, and are there any welfare advantages of such mixed structures? To address this, we discuss a theoretical framework that builds on existing models, most notably Lakdawalla and Philipson (2006), to accommodate the different incentives for patient volume and duration of service that is imposed by the tax treatment of donations made to nonprofit entities.

Ultimately, we conclude that, in a world characterized by consumer duration-of-consumption heterogeneity, a pricing structure based on charging for units of time within a total duration, and declining average costs, for-profit and nonprofit firms have incentives to pursue customers from different parts of the distribution. Specifically, for-profit firms will maxi-

mize profits by attracting customers with long spells of consumption and nonprofit firms will maximize profits (or net revenues) by attracting customers with shorter consumption spells. When both types of firms are present, a greater range of consumer types will be served. Since the firms supply services only when price (or reimbursement) exceeds cost for the marginal consumer, any expansion to the range of consumers served improves welfare. Conceptually, then, a mix of for-profit and nonprofit firms is preferable to dominance by either of the organizational types.

We test these predictions using data on a near-census of hospices in the U.S. from 2000-2008. Our various econometric tests are uniformly consistent with the theoretical predictions. Nonprofit hospices serve patients with shorter lengths of stay than for-profit hospices. This is true even controlling for the severity of illness of the hospices' patient mix and the setting where patients reside. We also find that nonprofit hospices devote significantly more resources to providing bereavement services to patients' survivors - which is what one would expect if donations are a significant component of the incentive structure faced by nonprofit hospices. Finally, we find that markets with both types of ownership do indeed have a wider interquartile range of observed lengths of stay than markets with only one of either type of firm ownership.

Our theoretical predictions hold true empirically: nonprofits and for-profits specialize in certain segments of demand and markets with both present appear more efficient. Future research into sectors of the economy with a significant ownership-type mix should focus less on which organizational *type* is optimal and more on questions surrounding the optimal *mix* of organizational types.

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A Appendix

A.1 Donation Patterns

This appendix uses data from Noe and Forgione (2014) on nonprofit reporting of donation revenue, which matched external data to a subset of the nonprofit hospices in the Medicare Cost Report Data.. The Medicare Cost Report Data does not report donations as part of the main reporting back to CMS. We match this subset of nonprofit-only data onto some additional information from the Medicare Cost Reports to report donation patterns and magnitudes for an abbreviated sample. The sample reported here includes only those hospices that reported nonzero patient totals and operating costs in excess of fundraising costs.

This subsample analysis shows that donations are an important component of income for nonprofit hospices. Donations account for almost 12 percent of total revenue and 18 percent of operating expenses. In fact, the average nonprofit hospice brings in $514,760 a year from these monetary contributions.

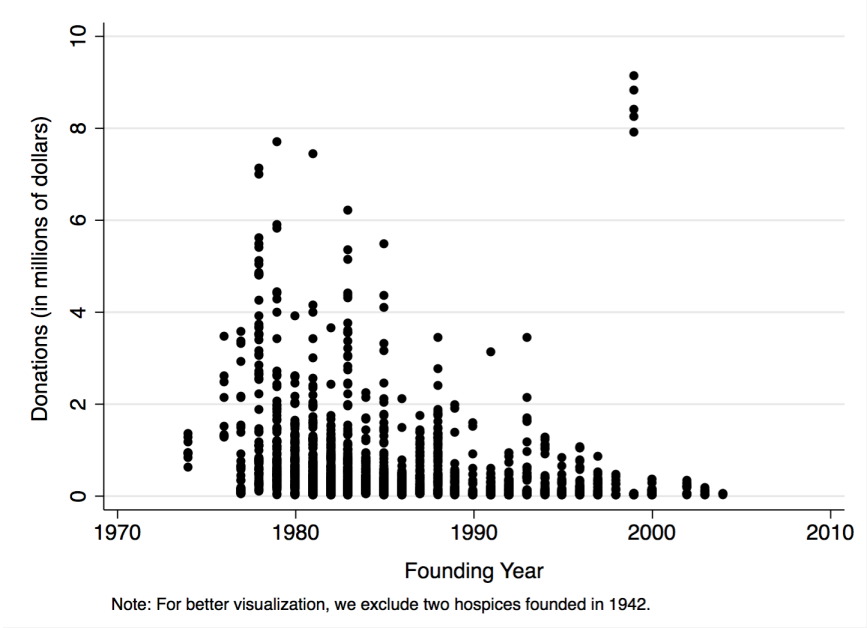
Table 13: Donation Summary Statistics for Nonprofit Subsample

	Mean	25th pctile	50th pctile	75th pctile
Donations in dollars	514,760	83,552	208,918	505,545
Donations as percent of revenue	11.86	4.36	8.23	14.85
Donations as percent of operating costs	14.28	4.78	8.84	16.39

Donations cover approximately 14 percent of costs on average. However, there is variance across hospices in this measure. Donations increase in importance as the hospice ages, suggesting that there is learning to generating donation income or increased reliance on donations. Figure 6 shows donation income matched with the year the hospice was founded. Several hospices founded before 1990 report over 6 million dollars in donation income over 10 years later, 2000-2007. Hospices founded in the late 1990s or early 2000s, with fewer years of operation, all report donation income less than 2 million.

Since our main conclusions suggest that donations and length of stay are correlated, we need to verify that experience is driving these differences in donation income, not just because all recent entry hospices take on different types of patients. Figure 7 shows hospice founding year mapped against the average length of stay. The relationship is very stable over time. Nonprofits in this sample take on similar lengths of stay, regardless of when they entered the market.

Figure 6: Nonprofits Subsample: Donation Income vs. Founding Year



A.2 Religious versus Secular Nonprofits

In the main results, the designation of nonprofit includes both those hospices established as a religious nonprofit and those that are not religious. The most populous designation of a nonprofit is secular, at 3,955 of the total 4,401 nonprofits.

We investigate whether religious mission causes different behavior than predicted generally regarding the secular nonprofit. The first column of 15 shows the baseline results that for-profit hospices are predicted to have an average length of stay that is 13.51 days longer than a similarly-situated nonprofit hospice (of any type). The second column simply shows

Figure 7: Nonprofit Subsample: Average Length of Stay vs. Founding Year

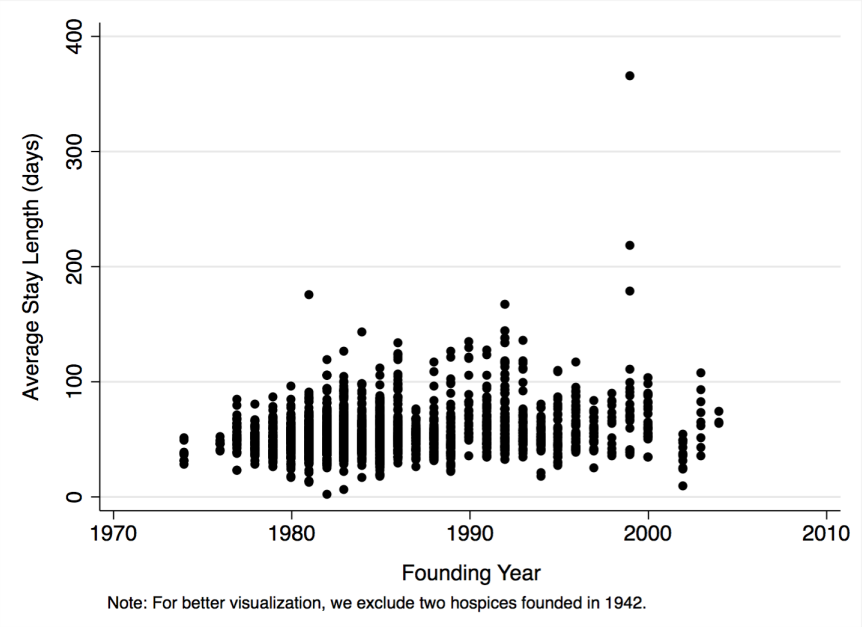


Table 14: Ownership Type Breakdown, Nonprofit subgroups

Market	Number	Percent
Nonprofit- Religious	446	3.54
Nonprofit- Secular	3,955	31.40
For-profit	7,882	62.57
Government	314	2.49

One observation is a hospice-year in 2000-2008.

the mirror image of this result, that a nonprofit of any type has shorter average lengths of stay than a for-profit. In Columns 3 and 4, we have broken the nonprofit category into two components, hospices classified as "Voluntary Nonprofit, Church" in the CMS data, and those classified as "Voluntary Nonprofit, Other."

The first trend to note is that both the religious and the secular hospices maintain the pattern of having lower average lengths of stay than a similarly-situated for-profit. The religious nonprofit, in fact, has an even larger difference than the secular nonprofit, with a predicted average length of stay that is 17 days shorter than a for-profit. The secular nonprofit still maintains substantially shorter average lengths of stay than the for-profit, at

nearly 13 days less.

To see if these differences between the secular and religious nonprofits are statistically distinguishable, the final column of Table 15 includes coefficients with the omitted category of secular nonprofit. The average religious nonprofit does have a lower predicted average length of stay, by approximately 4 days. However, this difference is not statistically significant. This suggests that the main driver of differences between nonprofit and for-profit outcomes is not related to the presence or absence of a religious mission.

Table 15: OLS: Differences in Average Length of Stay

Dependent variable: Average length of stay (days)				
	(1)	(2)	(3)	(4)
For-profit	13.51 ***			
vs. Any Nonprofit	(1.36)			
Any Nonprofit		-13.51 ***		
vs. For-profit		(1.36)		
Religious Nonprofit			-17.02 ***	
vs. For-profit			(2.60)	
Secular Nonprofit			-12.93 ***	
vs. For-profit			(1.38)	
Religious Nonprofit				-4.09
vs. Secular Nonprofit				(2.51)
For-profit				12.93 ***
vs. Secular Nonprofit				(1.38)
Hospice age	Y	Y	Y	Y
CBSA time-varying controls	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y
CBSA fixed effects	Y	Y	Y	Y
N	11,160	11,160	11,160	11,160

Regression (1) is the baseline specification, grouping all nonprofits (both religious and secular) together.
Regression (2) is the baseline, but leaving for-profit as the omitted ownership group.
Regression (3) separates religious and secular nonprofits versus for-profits.
Regression (4) compares religious and for-profit hospices versus secular nonprofits.
All regressions are for the full firm-level sample, 2000-2008.
All regressions include hospice age and time-varying CBSA-specific controls for:
health care resources, per capita income, and incidence of cancers.
***, **, and * indicate significance at the 1, 5, and 10 pct level, se in parentheses.

We also investigate whether Prediction 2, the provision of nonexcludable services, differs

by religious versus secular hospices. The first column of Table16 reports the results from the main paper regarding differences in provision of bereavement services. A for-profit hospice offers nearly 21 dollars less in bereavement services per patient than a similarly situated nonprofit. The second column reports the inverse result, with the for-profit as the omitted category. However, in Columns 3 and 4, we report the regression findings between religious and secular nonprofits versus a for-profit hospice. Both types of nonprofit hospices, religious and secular, have positive coefficients, meaning that they are predicted to offer more bereavement services per patient than a corresponding for-profit. However, the coefficient for a religious nonprofit is actually much smaller than a secular hospice, at $9.28 more versus $22.36 more. Additionally, although the secular nonprofit coefficient is statistically significant at the 99 percent level, the religious nonprofit coefficient cannot be statistically distinguished from the for-profit levels. In column 4, we compare the statistical difference between a religious nonprofit and a secular nonprofit, and find that the religious nonprofit is predicted to offer fewer bereavement services, but again this is not statistically significant. Overall, these results show there is not much concern for a separate, religiously-related mission-driven reason for a nonprofit to offer bereavement services.

Table 16: OLS: Differences in bereavement services

Dependent variable: Bereavement services per patient				
	(1)	(2)	(3)	(4)
For-profit	-20.52 ***			
vs. Any Nonprofit	(6.30)			
Any Nonprofit		20.52 ***		
vs. For-profit		(6.30)		
Religious Nonprofit			9.28	
vs. For-profit			(14.61)	
Secular Nonprofit			22.36 ***	
vs. For-profit			(6.39)	
Religious Nonprofit				-13.08
vs. Secular Nonprofit				(14.51)
For-profit				-22.36 ***
vs. Secular Nonprofit				(6.39)
Hospice age	Y	Y	Y	Y
CBSA time-varying controls	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y
CBSA fixed effects	Y	Y	Y	Y
N	11,160	11,160	11,160	11,160

Regression (1) is the baseline specification, grouping all nonprofits (both religious and secular) together.

Regression (2) is the baseline, but leaving for-profit as the omitted ownership group.

Regression (3) separates religious and secular nonprofits versus for-profits.

Regression (4) compares religious and for-profit hospices versus secular nonprofits.

All regressions are for the full firm-level sample, 2000-2008.

All regressions include hospice age and time-varying CBSA-specific controls for:
health care resources, per capita income, and incidence of cancers.

***, **, and * indicate significance at the 1, 5, and 10 pct level, se in parentheses.

A.3 Theory Appendix

In this appendix, we lay out the firms' optimization problems in greater detail using the specific functional form described in Section 2.

Consumers in the market consume services per-unit for a total consumption spell. Consumers are heterogeneous in the number of units of consumption which will compose the total consumption spell. In particular, the consumer types are indexed along a line between 0 and 1, with those closest to 0 having the shortest consumption periods and those closest to 1 having the longest.

The consumer type and number of units consumed is specified in relationship with total firm capacity, ϕ,

$$\int_{a}^{a+N} f(x)\,dx = \phi \tag{A.1}$$

where a is the lowest consumer type that the firm takes, and N is the total number of consumers the firm takes between its first consumer, a, and the last consumer type which fills ϕ. Substituting a functional form, $f(x) = 2x$, into Equation A.1, we obtain the expression for number of consumers as a function of capacity and the lowest consumer type:

$$N = \sqrt{\phi + a^2} - a \tag{A.2}$$

The for-profit firm's net income, $\Pi^F(\phi_F, a_F)$, is:

$$\Pi^F(\phi_F, a_F) = \underbrace{P\phi_F}_{\text{Service revenues}} - \Big[\underbrace{\alpha N_F(a_F) + \sigma\phi_F}_{\text{Consumer-based costs}} + \underbrace{\upsilon(\phi_F)}_{\text{Capacity-based cost}}\Big] \tag{A.3}$$

The nonprofit firm's net income, $\Pi^N(\phi_N, a_N)$, is:

$$\Pi^N(\phi_N, a_N) = \underbrace{P\phi_N}_{\text{Service revenues}} + \underbrace{dN_N(a_N)}_{\text{Donation revenues}} - \Big[\underbrace{\alpha N_N(a_N) + \sigma\phi_N}_{\text{Consumer-based costs}} + \underbrace{\upsilon(\phi_N)}_{\text{Capacity-based cost}}\Big] \tag{A.4}$$

where P is the price the firm receives per unit of service (i.e. day), ϕ_F and ϕ_N are the service capacities, α is the fixed cost of setting up a new consumer, and the number of consumers served is N_N and N_F, respectively, which are in turn a function of a. The per-unit of service marginal cost is σ, $\upsilon(\phi)$ is the managerial cost of increased capacity, and d is the donation revenue per consumer.

The firm chooses the consumer type to target and the total capacity. The order of the firm's problem is as follows:

1. Choose capacity, ϕ.
2. Given capacity, choose the lowest consumer type to target, $a \,\epsilon\, [0, 1]$.
3. Based on ϕ and a, the number of consumers served, N, is realized.
4. Given revenues and costs for the corresponding choices, profits are realized.

The firm's problem is solved through backward induction.

The optimization problem for the for-profit firm in Stage 2 is to maximize net income with respect to a, conditional on its capacity choice, $\Pi^F(a|\phi_F)$. Substitute Equation A.2 into Equation A.3 to write the for-profit firm's Stage 2 problem in terms of a and ϕ:

$$\max_a \quad (P-\sigma)\phi_F - \alpha(\sqrt{\phi_F + a} - a) - \upsilon(\phi_F) \tag{A.5}$$

The first-order condition is:

$$\frac{\partial \Pi^F(a|\phi_F)}{\partial a} = -\alpha\left(\frac{a}{(\phi + a^2)^{1/2}} - 1\right) \tag{A.6}$$

This first-order condition does not have an interior solution. However, as long as the firm chooses nonzero capacity, $\phi_F > 0$, then $\partial\Pi^F/\partial a$ is increasing in a. The second-order condition is nonzero, so $\partial\Pi^F/\partial a$ is continuous and increasing in a. Thus, the for-profit will choose a corner solution of the highest average consumer type possible, where the last consumer to fill capacity will be of type equal to 1 and the first consumer type chosen will be $a_F = 1 - N_F$.

Likewise, substituting Equation A.2 into Equation A.4 to obtain $\Pi^N(a|\phi_N)$, the optimization problem for the nonprofit firm in Stage 2 is:

$$\max_a \quad (P-\sigma)\phi_N + (d-\alpha)(\sqrt{\phi_N + a} - a) - \upsilon(\phi_N) \tag{A.7}$$

The first-order condition is:

$$\frac{\partial \Pi^N(a|\phi_N)}{\partial a} = (d-\alpha)\left(\frac{a}{(\phi_N + a^2)^{1/2}} - 1\right) \tag{A.8}$$

This first-order condition does not have an interior solution. However, if per patient donation is greater than per patient fixed cost, $d > \alpha$, and the firm chooses nonzero capacity, $\phi_N > 0$, then $\partial\Pi^N/\partial a$ is decreasing in a. The second-order condition is nonzero, so $\partial\Pi^N/\partial a$ is continuous and decreasing in a. Thus, the nonprofit will choose a corner solution of lowest consumer type, $a_N = 0$.

Inserting the respective optimal choices of a described above, we find each ownership type's N and a as a function of capacity ϕ:

Nonprofit: $a_N = 0$ into Equation A.2 implies $N_N = \sqrt{\phi_N}$

For-profit: $a_F = 1 - N_F$ into Equation A.1 implies $N_F = 1 - \sqrt{1-\phi_F}$ and $a_F = \sqrt{1-\phi_F}$

Stage 1 of the firm's problem is solving for capacity choice. Once the lowest consumer type choice is known in terms of the capacity, ϕ, this is inserted into Equations A.7 and A.5, respectively, and the firm maximizes with respect to ϕ. To illustrate the managerial cost of capacity, we use the functional form of $\upsilon(\phi) = \phi^2/2$. This form for υ is increasing at an increasing rate in additional service capacity.

The for-profit's optimization problem for Stage 1 is:

$$\max_\phi \quad P\phi_F - \left[\alpha(1 - \sqrt{1-\phi_F}) + \sigma\phi_F\right] - \frac{\phi_F^2}{2} \tag{A.9}$$

The first order condition is:

$$\frac{\partial \Pi^F(\phi_F)}{\partial \phi} = P - \sigma + \frac{-\alpha}{2\sqrt{1-\phi_F}} - \phi_F \tag{A.10}$$

The nonprofit's optimization problem for Stage 1 is:

$$\max_{\phi} \quad P\phi_N + d\sqrt{\phi_N} - \left[\alpha\sqrt{\phi_N} + \sigma\phi_N\right] - \frac{\phi_N^2}{2} \tag{A.11}$$

The first order condition is:

$$\frac{\partial \Pi^N(\phi_N)}{\partial \phi} = P - \sigma + \frac{d-\alpha}{2\sqrt{\phi_N}} - \phi_N \tag{A.12}$$

We can compare the marginal revenue and marginal costs for each firm to understand the forces at play in choosing capacity for each ownership type.

For a for-profit, the marginal revenue of increasing ϕ_F is constant, because the only revenue source for a for-profit is per-unit revenue, P. The marginal consumer-based cost of increasing capacity is increasing for the for-profit since additional consumers necessarily will have shorter stays and, thus, will rack up fixed costs over fewer days than the consumers already existing under their care.

For a nonprofit, marginal revenue is decreasing in ϕ_N, because a larger capacity means that the nonprofit needs to be taking in more long-stay consumers, who do not donate as frequently as the consumers already in their capacity. However, the consumer-based marginal cost for an additional unit of capacity is decreasing, since the additional capacity will be consumers with longer stays over which to spread out the initial fixed per-consumer costs.

Since each ownership type will choose a corner solution to ground their capacity, we can determine the conditions where the two capacity choices would end up not overlapping from each respective side of the consumer index.

Both ownership types chose capacity where marginal revenue is equal to marginal cost.

We can set these curves in inequalities where the firm would choose an optimal ϕ less than the remaining ϕ from the other ownership type. If the consumer type index was served completely, then $\phi_N + \phi_F = 1$.

The for-profit will choose optimal capacity such that:

$$P < \sigma + \frac{\alpha}{2\sqrt{1-\phi_F}} + \phi_F \tag{A.13}$$

The nonprofit will choose optimal capacity such that:

$$P + \frac{d}{2\sqrt{\phi_N}} > \sigma + \frac{\alpha}{2\sqrt{\phi_N}} + \phi_N \tag{A.14}$$

Combining these equations, and rearranging around the price, P, we can construct the range of possible per-unit prices which would result in neither ownership type choosing capacity that overlapped with the other type.

$$\sigma + \phi_N - \frac{d-\alpha}{2\sqrt{\phi_N}} < P < \sigma + (1-\phi_N) + \frac{\alpha}{2\sqrt{\phi_N}} \tag{A.15}$$