Institute for Policy Research
Northwestern University
Working Paper Series

WP-05-13

Do Nonprofit and For-profit Organizations Respond Differently to Incentives? Behavior in the Mixed Hospice Industry

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Version: December 2004

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Abstract

Strong selection incentives exist in many institutionally-mixed industries. We examine such an industry, hospices, where there are strong financial incentives due to the Medicare pricing system, to maximize patients' expected lengths of stay. We investigate the responses of for-profit and nonprofit organizations to these incentives, using a unique dataset consisting of all urban Medicare admissions at for-profit and religious nonprofit hospices in 1993. The hospice industry is ideal for testing whether the response to selection incentives differs by ownership. First, provider selection of patients would be based on expected length of stay, which can be estimated using observable patient characteristics. Second, curative care is not reimbursed, and so the length of stay is unlikely to be affected by endogenous provider behavior subsequent to admission. Third, competition is local and most markets have both for-profit and nonprofit hospices—which allows us to take advantage of within-market variation for identification. Fourth, price is exogenous and marginal costs are largely homogenous within a given disease category. We find that, as expected, for-profit hospices are more responsive to the incentive to attract longer-stay patients. For-profits have significantly longer average lengths of patient stay: they are significantly less likely to admit patients with short expected lengths of stay and they admit patients sooner after hospital discharge. We posit that the mechanism through which these results occur involves limiting the provision of services that would be attractive to patients with diagnoses associated with short life expectancies. In addition, selective marketing of the hospice will likely lead to early admissions and disproportionate admissions of patients with longer life expectancies. Finally, we show the behavior in the industry is consistent with a model of nonprofit organization behavior in which nonprofits maximize profit on profitable patients in order to subsidize care of unprofitable patients and, thus, to satisfy their mission.

We thank Nicholas Christakis, who graciously provided the data used in this paper. In addition, Dick Arnould, Susan Ettner, Haiden Huskamp,Bob Town, and Courtney Van Houtven provided very helpful comments on a previous draft. Discussions with David Bradford and Joe Terza also served to improve this paper. Weisbrod thanks the Robert Wood Johnson Foundation Investigator Awards Program, and The Atlantic Philanthropies for research support.

I. Introduction

We pose the question of whether financial incentives lead to systematically different responses for nonprofit and for-profit ownership forms (James 1983, Weisbrod 2004). Differential behavior could result if unobserved organizational objective functions differed systematically across ownership forms and manifested their effects through observable aspects of behavior. We posit that for-profit organizations, in this case hospices, take greater advantage than do nonprofits of the financial incentives.

Since nonprofit and governmental organizations have access to subsidies not available to private firms, it is natural to ask what society gains in return for those subsidies. To this end, we extend previous empirical work in order to identify whether differences in for-profit and nonprofit organizations' responses to financial incentives are due to a different objective function and efficient behavior or simply due to inefficiency on the part of nonprofits because of weak incentives resulting from the attenuated managerial property rights (the non-distributional constraint).

The subsidies for nonprofit organizations take a number of forms. They include exemption from taxation on corporate profits and, for the "charitable" nonprofits—essentially those providing goods with a significant public-good component, as identified by tax-exempt status under section 501(c)(3) of the Internal Revenue Code, which includes hospices—eligibility for tax-deductible donations and, in most states, exemption from real-property and sales taxation. In addition to tax advantages, nonprofits have access to sale of tax-exempt bonds and often receive substantial amounts of volunteer labor that may not be available to for-profit organizations (Segal and Weisbrod 2002), though Medicare-certified hospices must have at least 5 percent volunteer labor

regardless of ownership. In some respects, however, nonprofits confront constraints that are more restrictive than is the case with for-profit firms: nonprofits may not lawfully distribute organizational profit or surplus to any manager, director, or "owner" of the organization, and because of this "nondistribution constraint" (Hansmann 1980) nonprofits do not have access to private equity capital markets.

Nonprofits and for-profits may respond differently to given opportunities not only because constraints differ but also because their missions or objective functions differ. Nonprofits may pursue the goal of providing, even maximizing, provision of outputs that while socially valuable, are privately unprofitable. Examples include health care and other social services for the poor and public goods such as basic research and community education. In the case of services for which buyers are asymmetrically under-informed relative to sellers, a nonprofit might avoid taking advantage of its informational superiority—perhaps because it has less incentive to do so in light of the nondistribution constraint or because such behavior is inconsistent with its mission, or both.

Empirical research has found systematic differences across institutional forms in a variety of industries over a variety of behavioral dimensions including staff-client ratios, prices, client information, use of volunteers, participation in Medicare, and facility location decisions. Staff-client ratios have been found to be lower at for-profit nursing homes (Weisbrod 1988,1998), and prices have been found to be higher at for-profit nursing homes and facilities for the mentally handicapped (Weisbrod, 1988). Mauser (1998) found higher staff-client ratios at nonprofit daycare facilities and better informed consumers at for-profit facilities. Other industries studied include facilities for the

mentally handicapped (Kapur and Weisbrod, 2000), hospices participating in Medicare (Hamilton, 1993, 1994), and hospitals (Norton and Staiger, 1996 and Sloan, 1998).

There are strong financial incentives to attract (i.e. cream-skim) patients with longer life expectancies under the Medicare payment system for hospice care. Medicare pays hospices a fixed per diem rate, but the cost function confronting a hospice is not linear--the cost of a marginal day of care is relatively high at the onset of care and again in the days immediately prior to the death, while considerably lower in between. The conjuncture of this U-shaped hospice cost structure and the exogenously determined linear price provides financial incentives to a profit-maximizing hospice to maximize the length of stay of its patients.

Similar incentives to cream-skim are prevalent in many industries where firms include for-profit, nonprofit, and governmental organizational forms. For example, schools have an incentive to enroll bright, well-behaved students; prisons prefer docile prisoners and longer sentences; and health insurers prefer healthy enrollees. However, in contrast to other industries, testing whether the response to financial incentives differs by ownership is straightforward in the hospice industry. First, selection, if it occurs, is based on expected length of stay, which can be estimated using observable patient characteristics. Thus, we have a good measure of the information for both the hospice and patients. Second, curative care is not reimbursed, and, thus, the length of stay is unlikely to be affected subsequent to admission. In other words, there is unlikely to be a differential treatment effect; once a patient is admitted, his length of stay is unlikely to be affected by the hospice. This is in contrast to schools**,** where students learn while attending a school**,** or hospitals, where patients are treated for a disease. Third,

competition is local, and most markets have both for-profit and nonprofit hospices. This allows us to take advantage of within-market variation for identification. Fourth, price is exogenous and marginal costs are largely homogenous within a given disease category. In the next section we describe the financial incentives and the admission criteria for hospice care in the Medicare system.

II. Medicare Payments to Hospices: Incentives through the Revenue and Cost Functions

A terminally ill patient who chooses to receive care from a hospice gives up reimbursement for other Medicare services related to curative treatment (Medpac, 2002). Patients may choose to do so in order to live relatively normal lives while the disease runs its course. In return, a hospice provides the patient with palliative care, bereavement counseling, and other primarily-nonmedical services. Under Medicare rules, a hospice may provide palliative treatment, rehabilitation, or provide/arrange for curative treatment only for other ailments not related to the principal diagnosis of the cause of impending death. A patient must be certified by a physician and the hospice medical director to have a life expectancy of six months or less before entering a Medicare-authorized hospice program. After 90 days the patient must be recertified to continue receiving hospice services. After two 90 day periods, recertification is increasingly difficult to get and is required every 60 days.

Medicare is the dominant payer for hospice services, and payment is at a flat rate per day the patient is served by the hospice. The per diem rate, while varying by site of care, is (a) the same for nonprofit and for-profit hospices and is (b) constant with respect to both the patient's duration of involvement in the hospice program and the patient's illness (e.g., whether it is cancer or kidney disease). The rationale for not differentiating

among illnesses is that hospices are designed to only provide care that is palliative, not curative, and at one time palliative care was not disease specific. The technology of palliative care has changed significantly, however, since the fixed per diem rates were established. Chemotherapy and radiation therapy-based palliative care has been found to be useful for some patients, but not all. Nevertheless, the fixed per diem reimbursement remains in effect, and thus, hospices continue to face a linear revenue function with respect to the duration of patient care and the nature of the terminal illness.

The cost function confronting a hospice, by contrast with the revenue function, is not linear. The cost of a marginal day of care is relatively high at the onset of care, when there are initial costs of learning about the patient's and family members' physical and emotional needs and for developing a plan to facilitate adjustment to the impending death; this period is approximately four days. Costs are again relatively high during the approximately four days prior to the death. In the intermediate period between the high costs at the start and at the end of the period of care, costs are lower (Carey, Burns and Brobst, 1989, Huskamp *et al*, 2001). This U-shaped pattern of cost is the same for all diagnoses, although the provision of relatively expensive types of palliative care or recreational services for patients with some diagnoses shifts the marginal cost function up.

We use the fact that the cost function is U-shaped while the revenue function is linear to generate testable hypotheses about the differential behavior of nonprofit and for-profit hospices if their (unobservable) objective functions differ. Under the reasonable assumption that the Medicare-established price per diem is sufficiently high to make the intermediate days profitable, the financial incentives for all hospices is to maximize the

duration of that period. Regardless of the patient's diagnosis, a longer length of stay will yield higher profits for any hospice, for-profit or nonprofit. Length of stay, which is observable, is positively correlated with unobserved profit. Furthermore, at the time of admission, a patient's diagnosis is an excellent predictor of length of stay. Thus, the hospice's financial incentives are to attract patients with diagnoses having long expected length of stay. The null hypotheses that for-profit and nonprofit hospices behave alike in the kinds of patients they attract and in the ensuing length of stay will be tested below. Our model of organization behavior implies rejection of the null hypothesis, as private firms take greater advantage of profit opportunities than do non-profits, to the extent that nonprofits pursue the goal of serving the terminally ill even when that is unprofitable.

III. Conceptual Framework

a. Models of Nonprofit Behavior

All hospices confront the same opportunities to attract patients with a long expected length of stay. However, nonprofit and for-profit hospices may or may not take differential advantages of information regarding expected length of stay to maximize profit. Findings of no differences between for-profits and nonprofits in admission timing or in the share of patients with longer or shorter length of stay would suggest that nonprofits and profit-maximizing private firms act alike and nonprofit hospices behave as "for-profits-in-disguise" (Weisbrod 1988). A finding that nonprofits have patients with a shorter expected length of stay would suggest that nonprofits are pursuing objectives rather than profit-maximization. Such behavior by nonprofits could result from a variety of models. The nonprofits might have objective functions characterized as those of "bonoficers," seeking to maximize a function of both profit and output of "Mission-

goods," which are socially desirable but privately unprofitable (Weisbrod 1988, 2004). They might also be acting as utility maximizers but simply be inefficient, permitting unprofitable behavior because of the weak incentives resulting from managers' legal prohibition from sharing in profits (Alchian and Demsetz 1972, Hansmann 1980).

A simple two-good model of nonprofit organization behavior provides a framework for predicting both similarities and particular differences in behavior of for-profit and nonprofit organizations in a mixed industry (James 1983, Schiff and Weisbrod 1991, Weisbrod 2004; for other models see Newhouse 1970, Lakdawalla and Philipson 1998, Weisbrod 1998b, Glaeser 2003). As developed in Weisbrod (2004) and applied there to the hospital industry, the model, building on the model in James (1983), has the empirical implication that nonprofits will compete directly with for-profits for profitable patients. Thus, in such "Revenue-goods" markets there would be no difference in their behavior; both types of organization would seek to maximize profits where they can, but would do so for differing purposes. Nonprofits, but not for-profits, will use the profit on some patients to support unprofitable Mission-goods activities. As a result, behavior in Mission-good markets would differ markedly. Insofar as Mission-goods are largely unprofitable, for-profit firms would not provide them, but nonprofits would provide them, subject to the budget constraint. (For a more complete explanation of the model see James 1983 and Weisbrod 2004.) In the case of hospices, the Mission-good might be thought of as the provision of palliative and counseling services to patients and families who could benefit from the services but who would be expected to be unprofitable because of their relatively short length of stay. A profit-maximizing firm would not intentionally serve such consumers.

Thus within the framework of the two-good model, prospectively profitable patients would be served at both nonprofit and for-profit facilities, while prospectively unprofitable patients—those having short expected lengths of stay—would be served only, or more generally, disproportionately, at nonprofits. This expectation assumes that other relevant variables are randomly distributed across ownership forms: that there are no differential exogenous revenues, that input price do not differ, and that, in short, any output (or patient) that is profitable (or unprofitable) for one organizational form is also profitable (unprofitable) for the other. While nonprofits receive a variety of tax-subsidies, some, such as exemption from corporate profits taxation, do not affect marginal incentives. Other tax-subsidies, such as the exemption from property and sales taxation, are only weakly correlated with profitability of incremental profits. In addition, differential access to volunteer labor could make it more profitable to accept a marginal patient.

The testable implications of this model are: (1) there will be no difference in the number of Revenue-good patients at nonprofit and for-profit providers, and (2) nonprofit providers will serve more Mission-good patients. Thus, nonprofit providers would then be absolutely larger, in terms of patients treated at a point in time, and would have a greater share of unprofitable Mission-good patients.

b. Maximization of Length of Stay

If we assume that there is nothing that a hospice can do to delay the date of a patient's death—that is, the terminal day is exogenous-- any hospice, regardless of its ownership form, can increase its patients' average length of stay (LOS) in two ways. First, conditional on a patient's diagnosis, it may to attract patients earlier rather than

later, thereby extending the intermediate period of profitability. Second, it may select patients with characteristics (e.g. diagnoses) that are associated with longer lengths of stay by using marketing techniques, including advertising to patients or their agents (i.e. referring physicians and families), to encourage early admissions, and by altering the patient mix in favor of diagnoses involving longer expected length of stay. A hospice may avoid marketing to physicians whose patients are most likely to have unprofitable, short-stay, diagnoses.

A hospice may also offer facilities or services to patients who are most likely to have longer expected stays. Conversely, it may skimp on services that are attractive to patients who have a relatively short expected length of stay. A hospice can choose, for example, whether to offer costly palliative chemotherapy, thereby affecting its attractiveness to terminal cancer patients, who have shorter expected stays than do non-cancer patients. It can also choose whether to offer activities and amenities for patients who have ceased curative care, but are still relatively active mentally or physically, and who have a relatively long life expectancy. A hospice may thus prefer, on financial grounds alone, a dementia patient with a long expected length of stay, who could benefit from light physical activity, to a cancer patient with a shorter expected length of stay and who is confined to bed, and could differentially attract the two by offering such physical activities. The hospice could then market itself to referral sources, such as hospitals, physicians, and social workers that are particularly likely to treat dementia, and emphasize its special attention to these (more-profitable) patients. At the extreme, a

hospice could deny admission to patients with short, unprofitable, expected lengths of stay, although doing so is unlawful under Medicare rules[1].

This explanation of the selection process through which providers influence the customers/patients who seek their services is commonly associated with health insurance plans (Newhouse, 1996). For example, Frank, Glazier, and McGuire (2000) presented a model of health insurance plans that allocate their resources so as to become less attractive to unprofitable enrollees such as persons with serious chronic illnesses and more attractive to healthy, young families. This can be done by skimping or raising the barriers to treatment for diagnoses that are predictable for the patient but not for the health plan. Conversely, a plan may offer discounted or even free memberships in health clubs—of little appeal to elderly persons with chronic debilities, which then causes the profitable patients to self-select into the plan. Through such procedures, a health insurance plan can minimize the detrimental effects of informational asymmetries owing to the fact that prospective enrollees are better informed about their health status than are health insurance plans.

In the hospice market, however, informational asymmetries between patients and hospices are of little importance, since both parties can observe the diagnosis and prognosis upon admission. Furthermore, it is illegal for a hospice licensed by Medicare to discriminate explicitly among patients based on their expected profitability; a hospice is required to accept all patients who seek care, conditional on the facility's capacity constraint and on the admission being valid under Medicare guidelines. Thus, the problem of asymmetric information in the hospice industry is not between patients and

[1] However, in October 2004 the Justice Department initiated an investigation of a for-profit hospice chain, Odyssey Healthcare, with respect to patient admissions. The investigation is thought to be related to

hospices but between the hospice/patient unit and the payer Medicare. Nonetheless, the opportunity for a hospice to choose its service mix so as to attract profitable patients and repel unprofitable patients is analogous to the classic situation of the health plan and enrollee.

In summary, we propose to answer the following sets of research questions:

1) Are there systematic differences in the length of stay of patients admitted to nonprofit and for-profits hospices? Are such differences due to selection by diagnosis or earlier admission?

2) Is there a difference in the number of Revenue-good patients at nonprofit and for-profit providers? Do nonprofit providers serve more Mission-good patients? Are for-profit providers more likely to admit patients who stay beyond 180 days?

Empirical Methods

The empirical analysis is in two parts. First, we decompose difference in length of stay at hospices into patient selection and early admission components (Research Question 1). Second, we test whether nonprofit and for-profit hospices are similar with respect to Revenue patients but differ with respect to Mission patients (Research Question 2).

a. Hospice Length of Stay at For-profits and Nonprofits

Research question 1: Are there systematic differences in the length of stay of patients admitted to nonprofit and for-profits hospices? Are such differences due to selection by diagnosis or earlier admission?

To answer this question we decompose unadjusted difference in length of stay into difference in early admission and differences in patient diagnoses. Ignoring patient characteristics that are observable to patients, hospice administrators, and referral agents, length of stay can be modeled as:

Odyssey's record of serving few unprofitable cancer patients (Freudenheim, 2004)

$$los_{ijd} = f\left(hospice_j, for-profit_j\right) \quad (1)$$

where *los* is length of stay in the hospice program (in days), *hospice* controls for the type of hospice, *j* (free-standing, home-health based, or other), and *for-profit* is a dummy variable indicating ownership. Thus, for hospices of a given type, unadjusted differences in length stay between for-profit and nonprofit organizations are:

$$\Delta los_{fp}^{U} = E(los_{ijd} | for\text{-}profit = 1) - E(los_{ijd} | for\text{-}profit = 0) \quad (2)$$

The subscript *i* indicates patient and the subscript *d* indicates diagnosis. If there is differential cream-skimming across ownership form, by diagnosis or other patient characteristics, the estimate of differential *los* will be a biased estimate of the effect of institutional form, *cet. par*. Here, the superscript *U* indicates the unadjusted estimate.

The unadjusted estimate ignores information regarding the patient's expected length of stay. Hospices can observe the diagnosis of the patient as well as patient demographics and previous health care utilization. Thus, to account for patient selection by disease and observable patient characteristics, we estimate:

$$los_{ijd} = f\left(patient_i, disease\ type_d, hospice_j, for\text{-}profit_j\right) \quad (3)$$

where *patient* includes demographic information on patient *i* and on the patient's health care utilization during his last hospitalization; *disease type* is a dummy variable indicating each of the 27 Charlson diagnoses (described below) from which the hospice patient is expected to die. Using the parameter estimates from Equation 3 we calculate:

$$\begin{aligned}\Delta los_{fp}^{D} = {} & E(los_{ijd} | for\text{-}profit = 1; patient_i, disease_d) \\ & - E(los_{ijd} | for\text{-}profit = 0; patient_i, disease_d)\end{aligned} \quad (4)$$

which measures the difference in length of stay at for-profit hospices conditional on patient characteristics. The superscript *D* indicates the estimate is conditional upon

patient characteristics and diagnosis. If the differences found in Equation 2 are completely due to differential selection on observable characteristics that are associated with expected length of stay, we would expect the estimates of Equation 4 to be not significantly different from zero – i.e., variation in patient characteristics, within a given diagnosis, would be irrelevant to the selection process. The estimates of Equations 2 and 4 can be used to quantify the effect of differential patient selection on expected length of stay, as follows:

$$Selection = \Delta los_{fp}^{D} - \Delta los_{fp}^{U} \tag{5}$$

When we estimate Equations 1 and 3 we assumed that the hospice is unable to control the timing of admission. Now we relax that assumption by modeling the hospice as being able to influence whether the patient is admitted sooner or later. We control for this using a method of residual substitution based on Terza (2004). We use a two-stage approach that is less efficient than Full Information Maximum Likelihood, but it yields consistent estimates. In the first-stage, we model the elapsed time between hospital discharge and hospice admission conditional on patient characteristics and diagnosis:

$$days\ \ between\ \ admissions_{ijd} = f\left(patient_i, disease\ type_d, instruments_m\right) \tag{6}$$

where *days between admissions* is the number of days between hospital discharge and hospice admission, and *instruments* is a vector of instruments.

We use instruments that are correlated with the timing of the hospice admission but uncorrelated with the time of death of the patient. Thus, instruments that reflect the substitutes for hospice care available in the market, the reputation of hospice services at a specific hospice, and the amount of competition in the market area are strong candidates. The instruments that reflect the availability of potential substitutes are nursing home,

intermediate care facility, and skilled nursing facility beds per population over 65. The number of hospice days and beds per person over 65 and the number of years the hospice has been in operation reflect the reputation of hospice care in the community. All are likely to be correlated with the hospice's decision to admit a patient to a hospice, but uncorrelated with the length of time the patient will live. The ability of the instruments to meet these criteria is tested below. The basic premise of hospice care is that it is palliative rather than curative; this is also the premise of our instrumental variables.

Using the results from Equation 6, we calculate the residual,

$$\Delta residual_{ijd} = days\ between\ admissions_{ijd} - \hat{f}(\bullet) \tag{7}$$

In the second stage, we re-estimate Equation 3, including the residual calculated in Equation 7, to determine whether length-of-stay is greater at for-profit facilities, conditional on patient timing of admission and the other controls:

$$los_{ijd} = f\left(patient_i, disease\ type_d, hospice_j, for\text{ - }profit_j, \Delta residual_{ijd}\right). \tag{8}$$

The estimates from Equation 8 can then be used to measure:

$$\begin{aligned}\Delta los_{fp}^{C} = {} & E(los_{ijd} \,|\, for\text{ - }profit = 1; patient_i, disease_d, \Delta residual_{ijd}) \\ & - E(los_{ijd} \,|\, for\text{ - }profit = 0\, patient_i, disease_d, \Delta residual_{ijd})\end{aligned} \tag{9}$$

where the superscript *C* denotes "corrected" estimate. The estimate can be interpreted as the differential *los* effect of being treated at a for-profit hospice, conditional on (a) patient characteristics, (b) disease diagnosis, and (c) differential time of admission. Finally, the difference between estimates from Equations 4 and 9 is our estimate of the effect of earlier admission on hospice length of stay:

$$Earlier\ Admission = \Delta los_{fp}^{C} - \Delta los_{fp}^{D}. \tag{10}$$

If *Earlier Admission* is significantly different than zero, we conclude that there is a systematic difference in the time of admission at nonprofit and for-profit hospitals, a positive difference indicating that for-profits admit earlier.

To implement this model, we assume that length of stay, *los,* follows a Weibull distribution, and we control for the presence of censoring of the distribution of hospice length of stay for those who do not die while in the hospice. Our results and conclusions do not rely on the particular functional form. All standard errors in this analysis are bootstrapped, such that all equations are re-estimated for each sample of the data. For example, to calculate the standard errors of Equation 10, we re-estimate Equations 3, 4, 6, 7, 8, and 9 for each bootstrapped sample.

b. Analysis of Revenue Patients and Mission Patients

Research Question 2: Is there a difference in the number of Revenue-good patients at nonprofit and for-profit providers? Do nonprofit providers will serve more Mission-good patients? Are for-profit providers more likely to admit patients who stay beyond 180 days?

The second part of the analysis tests whether nonprofit hospices act like for-profit hospices with respect to Revenue-good patients. The results based on expected length of stay test whether there are differences across ownership forms and shed light on the reasons why such differences might occur. However, the analysis does not give insight into whether nonprofit hospices compete as a profit-maximizing hospice would for Revenue-good patients. If the number of Revenue-good patients differ across ownership types we would reject the null hypothesis that nonprofits and for-profit behave similarly with respect to profitable Revenue patients.

We test whether the number of admissions at nonprofit and for profit hospices are greater or less than expected as follows. We estimate the expected number of admissions

for each diagnosis for nonprofits in markets where there is no for-profit hospice, using the following specification:

$$n_{dj} = f(hospice_j, \mu_m) \tag{11}$$

where *f(.)* is assumed to be a negative binomial distribution, μ_m is a market fixed effect, and *hospice* includes the total number of admissions at the hospice and type of the hospice. Here we define the market as a metropolitan statistical area. However, the results do not vary if we choose a narrower definition such as county.

We limit the sample to hospices in markets without for-profit entry in order to get an unbiased expectation about the distribution of patients across diagnoses in market without mixed ownership. We use Equation 11 to generate out-of sample predictions of the expected number of admissions, $E(n_{dj})$, at all hospices in markets that have been entered by for-profit hospices. Next, we model the actual number of admissions by diagnosis as a function of $E(n_{dj})$:

$$n_{dj} = f(E(n_{dj}), for\text{-}profit_j, \mu_m) \tag{12}$$

If nonprofit hospices behave like for-profits with respect to the patients with a long expected length of stay (Revenue-good patients) but, unlike the for-profits, use the profits to serve patients with a short expected length of stay (Mission-good patients), then we would expect the following. The coefficient on *for-profit* would be insignificant for patients with a long expected length of stay (profitable for both), and negative and significant for patients with a short expected length of stay. To test for robustness, we also estimate a version of Equation 12 where we replace, $E(n_{dj})$, with *hospice* as defined in Equation 11.

Finally, we test whether for-profit hospices are likely to have a larger proportion of patients that stay beyond Medicare's initial 180-day limit. Recall that it is impossible to perfectly predict length of stay upon admission, and thus it is difficult to enforce Medicare's 180-day limit. However, patients can be re-certified if they have lived beyond the 180-day limit. We test whether for-profit hospices are more likely to admit patients that stay beyond the initial 180-day limit and, thus, are more likely to take advantage of their information asymmetry with Medicare than nonprofits.

Our test is as follows. First, we calculate the proportion of people with a length of stay greater than 180 days. Next, we estimate the following equation:

$$Proportion\ 180\ days\ or\ longer_{dj} = f(hospice_j, n_{dj}, for\text{-}profit_j) \qquad (13)$$

As suggested by Papke and Wooldridge (1996) we estimate Equation 13 using a generalized linear model using a logit link function and assuming a binomial distribution of the proportion. This approach is an improvement over OLS because it explicitly takes into account the fact that the proportion is bounded by zero and one. Nevertheless, the results reported below are qualitatively identical to an OLS approach.

Data

The dataset used in this analysis is the one used in Christakis and Iwashnya (2000), and graciously made available to us by Nicholas Christakis. The data include all admissions to hospices that were reimbursed by Medicare for patients newly admitted in 1993. The patients were followed from admission until August 20, 1996, and date of mortality was confirmed using the Hospice Standard Analytic File (SAF) and the Vital Status File (VSF). About 2.5% of the patients were still in the hospice at the end (i.e. censored) of the follow-up period. A 730-day look back window prior to the hospice

admission was included in the dataset using data from the MEDPAR file also collected by the Centers for Medicaid and Medicare Services (CMS). Information on the diagnosis, comorbidities, procedures, and hospital discharge date was drawn on the prior inpatient admissions of the patient during the look-back window.

Table 1 presents summary statistics for patients, and defines the variables included in the *patient* vector defined above. Overall there are 173,689 patients treated, of which 33,674 were treated at for-profit hospices and 125,430 at religious nonprofit hospices. The average length of stay at a religious nonprofit hospice was about 85 days, compared with over 100 days at for-profit hospices. On average, there were 200 days between the last hospital admission and the hospice admission, though more time elapsed between hospital discharge and admission at for-profit hospices. The average patient age was about 77 years old, and over 85% of the patients were white. Overall, patients admitted to for-profit hospices were more likely to be enrolled in an HMO and were healthier in the sense of having fewer co-morbidities and having had fewer surgical procedures in the "look-back window" period.

Table 2 presents summary statistics for the hospices studied. Overall, there are 1297 hospices in our data--all of the private hospices that accept Medicare patients in the country as of 1993. Roughly three-fourths, or 945, are religious nonprofits, while 218 are for-profit; the balance are secular nonprofit, but numbers are sufficiently limited—135—that we have omitted them from our analysis, so our sample is of 945 + 218 = 1163 for-profit and religious nonprofit facilities. The majority of for-profit and nonprofit hospices are free-standing. However, a larger proportion of religious nonprofit hospices are home-health based.

In the empirical analysis, unless otherwise noted, we focus on patients who were admitted to either for-profit or religious nonprofit hospices in urban areas. We omit analysis of secular nonprofits not only because of their small number but also because they are largely linked to hospitals, which causes unique admission patterns that are beyond the scope of this analysis. If we include secular nonprofit hospices in the analysis, however, there is no material effect compared with our finding based on for-profit/religious nonprofit comparisons. Thus, we exclude them for purely expositional purposes. The lower part of Table 2 displays the means and standard deviations of the market-level variables, from which we draw our instruments. We define the market as the MSA where the hospice is located. The results are robust to using county-level measures rather than the more aggregated MSA-level measures. Hospice care often occurs in the home, and the caregivers are likely to travel across county lines in urban areas. Thus, we chose to present the results using the MSA level definition

Table 3 displays the number of patients, hospice share, and expected hospice length of stay for each diagnosis ranked by mean length of stay. Lung cancer patients, who have one of the least-profitable and shortest mean length of stay, comprise close to 20 percent of the admissions at both nonprofit and for-profit hospices. For the most part, however, there is a larger share of patients with neoplasm diagnoses at nonprofit hospices, and these patients have a shorter expected length of stay. By contrast, the most dramatic difference in shares is of patients with diagnoses of Dementia, Parkinson's, Stroke, and Liver. The share of patients with these diagnoses at for-profit hospices is almost double that of nonprofit hospices—and these are generally associated with the longest expected lengths of stay and, therefore, the greatest profitability.

Results

The results of the analysis of hospice length-of-stay are in Table 4. The first column presents the unadjusted estimates based on Equations 1 and 2. The second column contains the estimates that control for disease and patient characteristics from Equations 3, 4, and 5. The last column contains the two-stage estimates from Equations 6-10.

The unadjusted estimates reveal that patients admitted to for-profit hospices have a longer (unconditional) length of stay of about 34 days—a difference that is significant at the 1% level. This result is consistent with the raw means; the only difference between the raw means and this estimate in Table 4 is the distributional assumption and that we control for censoring in the Weibull model. When we condition on disease-diagnosis and patient characteristics, patients at for-profit hospices experience a length of stay that is about 15 days longer than at nonprofits, though that is smaller than the unadjusted estimate of about 19 days, a difference that is significant at the 1% level.

The two-stage estimates are in the third column of Table 4. (The first-stage estimates are in the Appendix.) Of note is that the instruments are jointly significant in the first-stage with a test statistic of 65.17 and a p-value less than 0.01. The instruments pass the test for over-identifying restrictions where we fail to reject the null with a p-value of 0.16. This test is a likelihood ratio test which compares the likelihood function of the two-stage estimates with the likelihood estimates that replace the first-stage residual and the for-profit dummy with the six instruments. The two-stage estimates control for both selection of patients and timing of admission. With these controls, length of stay is almost identical at for-profit and nonprofit hospices--less than a day longer at

for-profits. The effect of early admission, is very large, calculated to be a difference of about 14.5 days between for-profits and religious nonprofits, and is significant at the 1% level. The significantly greater length of stay at for-profit than at nonprofit hospices is largely explainable by the process through which for-profits select or attract patients with diseases associated with longer life expectancies.

The estimates of the early-admission effect by diagnoses, are in Table 5. We only report diagnoses for which the instruments were significant in the first-stage and satisfied the over-identification test. The instruments were valid for half of the diagnoses. The first column contains the estimates of the for-profit differential, in days, without controlling for early admission. The second column contains the estimates controlling for early admission. Thus, for example, Dementia patients spent about 121 days longer in for-profit hospices than in nonprofit hospices. Controlling for early admission within diagnostic groups, the patients stayed about 3 fewer days. The last column is the difference between the estimates in columns 1 and 2, or the effect of early admission by diagnosis. The effect is substantial for patients with Dementia, Parkinson's, and Stroke. Dementia patients have an expected length of stay that is nearly four months longer at for-profit facilities, almost all of which can be explained by patients being admitted in early stages of their disease progression. The effects of early admission for other diagnoses are significant but smaller in magnitude.

The results of the analysis of the total number of patients are in Table 6. The first column is the normalized expected length of stay; the second column contains the estimates from the Negative Binomial count data model of number of hospice admissions controlling for market fixed effects, hospice type, and hospice size. The last column is

also from the Negative Binomial count data model of number of hospice admissions, but it controls for market fixed effects and the expected number of admissions from the first stage (See Equations 11-12). Recall that the first stage only uses a sample of hospices in markets without a for-profit hospice in order to avoid biasing the prediction.

The results reveal that for-profit hospices consistently have fewer patients with short expected lengths of stay (Mission patients) than would be predicted based on there characteristics. Furthermore, we fail to reject the null that for-profit and nonprofit hospices have the same number of Revenue patients (i. e., patients with long expected lengths of stay). These results are consistent with the predictions of the two-good model.

Finally, we find that the proportion of patients with greater than 180 days is greater at for-profit hospices for 25 out of 27 diagnoses and is statistically significant in 13 cases. Thus, for-profit hospices have a greater tendency, within diagnosis, to admit patients that stay beyond 180 days.

Conclusion

The Medicare pricing system for hospice care provides a strong financial incentive for all hospices to prefer patients with longer expected length of stay and to avoid patients with shorter expected lengths of stay. We have shown that for-profit hospices respond to this incentive more than do religious nonprofits, achieving substantially longer length of stay of patients admitted to the hospice. For-profit hospices achieve this by (1) admitting patients sooner and (2) selectively admitting patients with diagnoses and other characteristics that are associated with longer expected lengths of stay.

The mechanisms by which for-profit hospices can deter patients with short life expectancies—e.g., cancer diagnoses – are not observable in our data. However, they are likely to include (1) avoidance of services that are attractive to such patients and (2) foregoing efforts to market themselves to cancer patients or their referral agents. It is not likely that the Medicare rule that a hospice must accept all prospective applicants was differentially enforced at nonprofits versus for-profits.

Given that the response to the incentives in the Medicare reimbursement system differs by organizational form, we tested whether the nonprofit/for-profit differences are due to inefficiency on the part of the nonprofit hospice or due to behavior consistent with a two-good model of Revenue-goods and Mission-goods. We found that (1) the number of Revenue patients -- with diagnoses having higher expected profitability (longer lengths of stay)— is the same at nonprofit and for-profit facilities; but (2) the number of Mission-good patients, who are expected to be financially unprofitable or, at least, less unprofitable, are more likely to be admitted to nonprofit hospices. Thus, the patterns of selection by diagnosis reveal that both ownership forms compete for patients with long expected lengths of stay, but nonprofit hospices subsidize the admissions of Mission-good patients. These two findings are consistent with a model in which for-profits maximize expected profit while nonprofits (religious nonprofits in our empirical work) maximize a function of service provision to eligible patients regardless of expected profitability, subject to a budget constraint that depends on provision to longer-stay, more-profitable, patients. Our findings are not consistent with the property-rights hypothesis that nonprofits are simply inefficient because of their legally-constrained ability to reward managers who generate greater profit; such a source of inefficiency is

unlikely to be manifest only with respect to unprofitable patients, yet we find the same number of the more-profitable Revenue patients in the for-profit and nonprofit facilities.

Finally, with respect to earlier admissions at for-profit hospices, conditional on medical diagnosis, we find that for-profit hospices had a significantly higher number of patients staying beyond the 180-day Medicare rule. This finding is also consistent with the two-good model insofar as Medicare continues to pay, and particularly if nonprofits' objective function encompassed paying greater heed to medical ethics, which would constrain hospices from admitting patients "too early", as defined by the Medicare 180-day rule.

This paper sought to understand how nonprofit and for-profit organizations respond to particular financial incentives. More generally, it is a step in the process of determining whether nonprofits act systematically differently from private profit-maximizing firms. In the case of hospices, it is clear that because certain types of patients are *ex-ante* less profitable or even unprofitable, a profit-maximizing firm will not provide such services as care to patients with shorter expected lengths of stay and instead will seek patients who are expected to be profitable.

Our results are consistent with the prediction of the two-good model that nonprofit firms compete for Revenue-good patients and use those profits to subsidize the care of Mission-good patients. In this scenario, nonprofit firms are efficient--their Mission, together with the non-distribution constraint, leading them to utilize surplus to expand service to unprofitable patients. In contrast, under profit maximization, firms would avoid producing unprofitable goods. Finally, nonprofit firms that are inefficient would have fewer proportions of Revenue-good patients; however, in the hospice industry this is

not found. Thus, while the Medicare reimbursement system is inefficient, providing financial incentives for hospices of all institutional forms to maximize patient length of stay, we find that nonprofit organizations are using surplus to provide socially desirable Mission-goods, in the form of services to patients with short expected lengths of stay--arguably consistent with societal goals. Nevertheless, in light of our findings, we conclude that both hospice patients and Medicare would be better off if an efficient pricing mechanism were adopted—one that is non-linear with respect to length of patient stay and that removes incentives to manipulate patient mix, while at the same time ensuring continued participation in Medicare by hospices.

The finding of systematic differences in for-profit and nonprofit organization behavior in the mixed hospice industry adds to similar findings in other industries such as hospitals, nursing homes, and day care. Our findings are consistent with a model, developed elsewhere, that differential organization behavioral reflects responses to different objective functions—nonprofit organizations utilizing profit from profitable activity to finance unprofitable but, arguably, socially desirable activity, while for-profit firms engage only in the profitable activities.

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Table 1. Patient Characteristics

	All Patients[1]	For-profit	Religious Non-profit
Number of Patients	115,218	23,873	91,345
Dependent Variables			
Hospice Length of stay	113.294	145.561	104.861
	(226.631)	(277.547)	(210.500)
Days between hospital	206.738	234.933	199.369
discharge & hospice admission	(286.313)	(303.151)	104.861
Patient Characteristics *(Patient)*			
Age	77.152	78.818	76.717
	(9.637)	(10.072)	(9.472)
White	0.879	0.851	0.887
	(0.326)	(0.356)	(0.317)
Male	0.493	0.465	0.500
	(0.500)	(0.499)	(0.500)
Transfer from Hospital	0.191	0.223	0.182
	(0.393)	(0.417)	(0.386)
HMO Enrollment	0.048	0.089	0.038
	(0.215)	(0.285)	(0.191)
Psychiatric Index	0.080	0.091	0.077
	(0.271)	(0.287)	(0.266)
Substance Abuse Index	0.043	0.038	0.044
	(0.203)	(0.191)	(0.206)
Indicator for Charlson Diagnosis	0.811	0.769	0.822
	(0.392)	(0.421)	(0.383)
Charlson Comorbidity Score	3.870	3.222	4.039
	(3.044)	(2.963)	(3.043)
Dialysis within 90 days	0.010	0.012	0.009
	(0.098)	(0.107)	(0.095)
Dialysis within 730 days	0.013	0.015	0.012
	(0.113)	(0.120)	(0.111)
Enteral feeds within 90 days	0.005	0.006	0.005
	(0.070)	(0.074)	(0.069)
Enteral feeds within 730 days	0.008	0.008	0.007
	(0.087)	(0.090)	(0.086)
Feeding tube within 730 days	0.038	0.051	0.034
	(0.190)	(0.220)	(0.181)
Transfusion within 90 days	0.102	0.105	0.102
	(0.303)	(0.306)	(0.302)
Surgical procedure count	1.118	0.910	1.173
	(1.510)	(1.418)	(1.529)
Surgical procedure indicator	0.348	0.389	0.337
	(0.476)	(0.488)	(0.473)

Standard Deviation in Parentheses. 1: Includes Secular Non-profit hospices

Table 2. Hospice Characteristics and Instruments

	All Hospices[1]	For-profit	Religious Non-profit
Number of Hospices:	651	113	538
Hospice			
Hospital-based	0.130	0.090	0.140
	(0.336)	(0.287)	(0.347)
Home-health	0.286	0.177	0.314
	(0.452)	(0.382)	(0.464)
Free-standing	0.585	0.733	0.546
	(0.493)	(0.443)	(0.498)
Market Level Variables			
Average Size of Hospice	610.181	N/A	N/A
	(681.414)		
Number of Hospices	6.99		
	(8.027)		
Instruments:			
NH Beds per Population over 65 (100s)	4.56		
	(2.001)		
ICF Beds per Population over 65 (100s)	0.029		
	(0.129)		
SNF Beds per Population over 65 (10,000s)	0.016		
	(0.029)		
Hospice Beds per Population over 65 (100s)	0.003		
	(0.017)		
Hospice Days per Population over 65	0.002		
	(0.003)		
Mean years in operation	7.327		
	(2.179)		

Standard Deviation in Parentheses. 1: Includes secular nonprofit hospices

Table 3. Number of Patients, Hospice Share and LOS by Diagnosis

Disease	# Patients (All)	# Patients (For-profit)	Share[1] (For-profit)	Share[1] (Non-profit)	Predicted LOS (Equation 8)
Neoplasm Diagnoses					
Head and Neck	2063	373	0.020 (0.014)	0.025 (0.026)	89.764 (28.505)
Upper GI Tract	3764	699	0.041 (0.059)	0.040 (0.024)	76.753 (25.371)
Colon and Rectum	9991	1578	0.083 (0.058)	0.103 (0.066)	87.208 (26.616)
Hepatobiliary System	3115	552	0.032 (0.020)	0.038 (0.054)	52.976 (17.100)
Pancreas	4649	708	0.044 (0.029)	0.051 (0.052)	69.173 (22.201)
Lung	22,507	3525	0.206 (0.142)	0.215 (0.076)	72.221 (23.126)
Skin	917	151	0.014 (0.012)	0.016 (0.014)	70.448 (22.413)
Breast	5563	906	0.045 (0.027)	0.056 (0.032)	115.371 (32.031)
Female Genital Tract	3357	555	0.031 (0.018)	0.040 (0.037)	80.144 (24.181)
Prostrate	7444	1293	0.074 (0.053)	0.073 (0.034)	103.254 (29.251)
Urinary tract	3694	669	0.041 (0.032)	0.040 (0.027)	82.558 (27.790)
CNS	2510	432	0.027 (0.020)	0.028 (0.018)	100.523 (34.417)
Lymphoma	2105	310	0.023 (0.018)	0.026 (0.017)	73.110 (23.767)
Leukemia	2933	502	0.032 (0.037)	0.033 (0.030)	85.248 (28.245)
Other Neoplasms	6023	814	0.056 (0.046)	0.071 (0.060)	77.777 (25.768)

Standard Deviation in Parentheses.

Notes: 1: Share of disease type of total admissions at hospice

Table 3. Number of Patients, Hospice Share and LOS by Diagnosis (continued)

Disease	# Patients (All)	# Patients (For-profit)	Share[1] (For-profit)	Share[1] (Non-profit)	Predicted LOS (Equation 8)
Non-neoplasm diagnoses					
Dementia	2965	1315	0.065 (0.066)	0.026 (0.034)	276.572 (77.373)
Parkinson's	844	323	0.020 (0.020)	0.011 (0.011)	214.000 (60.860)
Other neurological	1007	198	0.014 (0.010)	0.015 (0.013)	210.196 (64.565)
CHF	6266	1755	0.077 (0.041)	0.058 (0.042)	163.903 (53.089)
Other CVD	5011	1726	0.058 (0.055)	0.044 (0.036)	172.750 (58.063)
Stroke	3946	1546	0.073 (0.077)	0.031 (0.031)	125.013 (42.403)
COPD	5069	1347	0.059 (0.037)	0.046 (0.031)	196.723 (59.483)
Liver	1144	299	0.036 (0.124)	0.016 (0.013)	96.226 (30.144)
Renal	2292	624	0.030 (0.016)	0.025 (0.025)	58.642 (26.892)
AIDs	749	180	0.021 (0.040)	0.016 (0.025)	137.077 (49.386)
Other Infections	740	128	0.028 (0.071)	0.016 (0.015)	82.533 (29.185)
Other non-neoplasms	4550	1365	0.056 (0.050)	0.047 (0.047)	144.428 (48.433)

Standard Deviation in Parentheses.

Notes: 1: Share of disease type of total admissions at hospice

Table 4. Duration Analysis of Hospice Length of Stay, All diagnoses

	Naïve Estimates	Within Disease Estimates	Two stage Estimates
For-Profit Hospice	0.840***	0.919***	0.996
(Hazard Ratio)	(0.006)	(0.007)	(0.008)
For-profit minus Religious	33.851***	15.169***	0.597***
(Days)[1]	(2.115)	(1.895)	(1.720)
Patient Selection Effect		–18.682***	
(Equation 5) [1]		(1.062)	
Early Admission Effect			–14.572***
(Equation 10) [1]			(0.771)
Disease Controls	No	Yes	Yes
Patient Characteristics	No	Yes	Yes
Hospice Type	Yes	Yes	Yes
Early Admission Control	No	No	Yes
Significance of the instruments in the first stage:			$X^2(6) = 65.17$ p-value <0.01
Test for over-identifying restrictions:			$X^2(4) = 6.55$ p-value = 0.16

Note: Religious non-profits are the excluded ownership category. Standard Errors in parentheses. *, **, and *** represent 90%, 95%, and 99% confidence levels, respectively.

1: Bootstrapped Standard Errors (500 Repetitions)

Table 5. Duration Analysis of Hospice Length of Stay, By diagnoses

	For-profit minus Religious (Days)	Two-stage For-profit minus Religious (Days)	Early Admission Effect (Days)
Pancreas	3.564	3.224	–0.340
	(5.778)	(5.945)	(1.234)
CNS	13.727	–2.138	–15.859***
	(10.391)	(8.494)	(5.738)
Lymphoma	–1.880	–3.216	–1.339
	(10.517)	(137974.500)	(137974.400)
Leukemia	2.034	–6.810	–8.840**
	(9.868)	(9.289)	(3.516)
	12.163*	4.370	–7.757***
Other neoplasms	(6.363)	(5.654)	(2.811)
Dementia	121.140***	–3.805	–118.226***
	(40.568)	(36.906)	(21.048)
Parkinson's	22.985	–36.433	–58.688**
	(51.268)	(44.144)	(23.351)
Other neurological	121.272	67.855	–52.030
	(3.54 X E+08)	(1.38 X E+08)	(1.35 X E+09)
CHF	45.632***	13.820	–30.722***
	(14.674)	(13.026)	(6.464)
Other CVD	31.173*	–3.247	–34.045***
	(17.376)	(16.395)	(6.181)
Stroke	97.641***	1.629	–83.673***
	(21.988)	(15.468)	(12.566)
COPD	26.101	–14.819	–40.491***
	(18.003)	(15.575)	(7.682)
Renal	–3.852	–5.917	–2.083
	(7.309)	(7.321)	(1.552)
Other non-neoplasm	80.471***	52.818***	–26.870***
diagnosis	(17.149)	(15.986)	(6.645)
Controls:			
Patient Characteristics	Yes	Yes	N/A
Hospice Type	Yes	Yes	N/A
Early Admission Control	No	Yes	N/A

Note: Religious non-profits are the excluded ownership category. Bootstrapped Standard Errors (500 Repetitions) in parentheses. *, **, and *** represent 90%, 95%, and 99% confidence levels, respectively.

Table 6. Analysis of Admissions by Hospice Ownership and Disease

	Normalized E(LOS)	For-profit	For-profit
Neoplasm			
Head and Neck	0.78	–0.402***	–0.248*
		(0.111)	(0.135)
Upper GI Tract	0.67	–0.395***	–0.290**
		(0.105)	(0.121)
Colon and Rectum	0.76	–0.334***	–0.198*
		(0.101)	(0.111)
Hepatobiliary System	0.46	–0.336***	–0.227*
		(0.106)	(0.121)
Pancreas	0.60	–0.297***	–0.130
		(0.110)	(0.123)
Lung	0.63	–0.409***	–0.278***
		(0.100)	(0.106)
Skin	0.61	–0.339**	0.019
		(0.148)	(0.162)
Breast	1.00	–0.401***	–0.280**
		(0.103)	(0.117)
Female Genital Tract	0.69	–0.363***	–0.244**
		(0.110)	(0.124)
Prostrate	0.89	–0.354***	–0.175
		(0.104)	(0.114)
Urinary tract	0.72	–0.437***	–0.342***
		(0.105)	(0.121)
CNS	0.87	–0.348***	–0.184
		(0.115)	(0.133)
Lymphoma	0.63	–0.432***	–0.204
		(0.121)	(0.132)
Leukemia	0.74	–0.420***	–0.303**
		(0.112)	(0.129)
Other Neoplasms	0.67	–0.399***	–0.309***
		(0.109)	(0.116)
Market Fixed Effects		Yes	Yes
Hospice Type Controls		Yes	No
Other Variables		Total Adm	$E(n_{dj})$
Estimation Method		Neg. Bin. w/ FE	Neg. Bin. w/ FE

Note: Religious nonprofits are the excluded ownership category. Standard Errors in parentheses. *, **, and *** represent 90%, 95%, and and 99% confidence levels, respectively.

Table 6. Analysis of the admissions by Hospice Ownership and Disease (continued)

	Normalized E(LOS)	For-Profit (Number)	For-profit (Number)
Non-Neoplasm Diagnoses			
Dementia	2.40	0.211 (0.131)	0.165 (0.143)
Parkinson's	1.85	0.154 (0.143)	0.160 (0.168)
Other neurological	1.82	–0.129 (0.140)	–0.083 (0.162)
CHF	1.42	–0.060 (0.106)	–0.001 (0.117)
Other CVD	1.50	–0.087 (0.109)	–0.106 (0.124)
Stroke	1.08	0.096 (0.118)	0.048 (0.132)
COPD	1.71	–0.092 (0.105)	–0.159 (0.121)
Liver	0.83	–0.018 (0.114)	0.088 (0.145)
Renal	0.51	–0.212* (0.115)	–0.155 (0.135)
AIDs	1.19	–0.147 (0.242)	0.160 (0.240)
Other Infections	0.72	–0.252 (0.181)	–0.100 (0.169)
Other non-neoplasm diagnoses	1.25	–0.109 (0.116)	–0.074 (0.124)
Market Fixed Effects		Yes	Yes
Hospice Type Controls		Yes	No
Other Variables		Total Admissions	$E(n_{dj})$
Estimation Method		Neg. Bin. w/ FE	Neg. Bin. w/ FE

Note: Religious non-profits are the excluded ownership category. Standard Errors in parentheses. *, **, and *** represent 90%, 95%, and and 99% confidence levels, respectively.

Table 7. Share of Patients with LOS>=180 days by Hospice Ownership and Disease

	For-profit		For-profit
Neoplasm		**Non-Neoplasm**	
Head and Neck	-0.054 (0.282)	Dementia	0.389** (0.182)
Upper GI Tract	0.594** (0.247)	Parkinson's	0.183 (0.280)
Colon and Rectum	0.361** (0.166)	Other neurological	0.761*** (0.246)
Hepatobiliary System	-0.524 (0.391)	CHF	0.530*** (0.146)
Pancreas	0.313 (0.279)	Other CVD	0.270 (0.179)
Lung	0.401** (0.161)	Stroke	0.472** (0.209)
Skin	0.616 (0.396)	COPD	0.012 (0.149)
Breast	0.390** (0.173)	Liver	0.034 (0.290)
Female Genital Tract	0.323 (0.236)	Renal	0.500* (0.284)
Prostrate	0.279* (0.158)	AIDs	-0.492 (0.383)
Urinary tract	0.405* (0.238)	Other Infections	0.175 (0.366)
CNS	0.110 (0.238)	Other non-neoplasm diagnoses	0.328* (0.187)
Lymphoma	0.363 (0.292)		
Leukemia	0.485** (0.231)		
Other Neoplasms	0.390* (0.202)		
Hospice Type Controls		Yes	
Other Variables		Total Hospice Admissions by diagnosis	
Estimation Method		GLM w/ Logit Link	

Note: Religious nonprofits are the excluded ownership category. Robust Standard Errors in parentheses. *, **, and *** represent 90%, 95%, and and 99% confidence levels, respectively.

Appendix I. First Stage Survival Analysis of Time Between Hospital Discharge and Hospice Admission

Patient Characteristics	
Age	0.996
	(0.003)
Age Squared	1.000
	(0.000)
White	0.933***
	(0.009)
Male	0.980***
	(0.007)
Psychiatric Index	1.214***
	(0.014)
Substance Abuse Index	1.119***
	(0.017)
Indicator for Charlson Diagnosis	3.399***
	(0.041)
Charlson Comorbidity Score	1.117***
	(0.002)
Dialysis within 90 days	1.819***
	(0.111)
Dialysis within 730 days	0.699***
	(0.038)
Enteral feeds within 90 days	1.780***
	(0.129)
Enteral feeds within 730 days	0.878**
	(0.051)
HMO Patient	0.718***
	(0.010)
Feeding tube within 730 days	1.150***
	(0.019)
Transfusion within 90 days	2.157***
	(0.024)
Surgical procedure count	0.997
	(0.003)
Surgical procedure indicator	1.225***
	(0.012)
Market distance to provider	0.998***
	(0.000)
Hospital Transfer	40.569***
	(0.549)
Diagnosis	
Head and Neck	0.830***
	(0.020)
Upper GI Tract	0.984
	(0.018)

Diagnosis (continued)	
Colon and Rectum	0.754***
	(0.009)
Hepatobiliary System	1.101***
	(0.021)
Pancreas	1.156***
	(0.019)
Skin	0.935*
	(0.032)
Breast	0.803***
	(0.013)
Female Genital Tract	0.918***
	(0.018)
Prostrate	0.823***
	(0.012)
Urinary tract	0.993
	(0.018)
CNS	1.168***
	(0.025)
Lymphoma	1.198***
	(0.028)
Leukemia	1.209***
	(0.024)
Other Neoplasms	0.994
	(0.015)
Mean Size	0.969
	(0.021)
Number of Hospices	1.322***
	(0.022)
Instruments	
NH Beds per Population over 65	0.977
	(0.036)
ICF Beds per Population over 65	1.051
	(0.035)
SNF Beds per Population over 65	1.259***
	(0.019)
Hospice Beds per Population over 65	1.168***
	(0.019)
Hospice Days per Population over 65	1.108***
	(0.021)
Mean years in operation	1.212***
	(0.039)
F-test of Significance of Instruments	65.17
	(p<0.001)

Note: Hazard ratios are reported with standard errors in parentheses. *, **, and *** represent 90%, 95%, and 99% confidence levels, respectively. N=111,165. Religious is the excluded ownership category.