Essays in Health Economics: Empirical Studies on Employment-Based Health Insurance Plans and Hospice Care

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DEDICATION

To my husband Rafal who has always believed that I could do it

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ABSTRACT

ESSAYS IN HEALTH ECONOMICS: EMPIRICAL STUDIES ON EMPLOYMENT-BASED HEALTH INSURANCE PLANS AND HOSPICE CARE

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This dissertation describes results of empirical studies addressing important issues in the field of health economics. The investigated problems include two major topic areas: employment-based health insurance plans and hospice care. In particular, we empirically examine the determinants of the employers' contributions towards health insurance premiums, the price elasticity of demand in employer-provided self-insured health plans, and the effects of hospice ownership and certification on the length of hospice use.

We extend previous empirical work on employment-based health insurance to self-insured health plans and show that union membership and self-insurance predict higher amounts of employer's contribution to health insurance premiums. The obtained empirical evidence also indicates that several socioeconomic characteristics (i.e., family income, poverty level, and employer's provision of fringe benefits) as well as other

factors (i.e., sex, the place of residence, and family coverage) have impact on the employer's contribution.

The obtained estimates of the price elasticity of demand for self-insured health plans show it to be relatively inelastic. This agrees well with previous literature findings for traditional health insurance plans. The similarity of our results not only provides a relevant re-confirmation for these earlier measures but it also demonstrates that the demand responsiveness to changes in price for self-insured health plans does not differ from estimates of other types of health insurance.

Our analysis of the effects of the ownership form and the certification status on hospice care shows a positive impact of the for-profit organizational form with respect to the length of hospice use as compared to their nonprofit counterparts. In particular, the obtained results suggest that among individuals with short expected length of hospice use, patients at nonprofit hospices have lower mortality while using hospice care. In contrast, among those with long expected length of hospice use, patients at for-profit hospices have longer survival times. There is, however, no evidence of systematic selection of long-stay patients by for-profit hospices or of short-stay patients by nonprofit hospices. Furthermore, the results of the impact of hospice certification show that the length of hospice use is shorter at certified hospices as compared to noncertified ones.

All three problems investigated in this dissertation address key elements of the healthcare system in the US and hence the results reported should be relevant not only to policy makers, but also to parties directly involved in the healthcare system such as employers, insured and uninsured individuals, and insurance companies.

1. INTRODUCTION

This dissertation describes results of empirical studies addressing important issues in the field of health economics, one of the fastest growing fields within economics. The investigated problems include two major topic areas: employment-based health insurance plans and hospice care. In particular, within the realm of the employment-based health insurance plans, we empirically examine the determinants of the employers' contributions towards health insurance premiums as well as the price elasticity of demand in employer-provided self-insured health plans. On the other hand, our research related to hospice care focuses on the effects of ownership and certification with respect to the length of hospice use. All three problems investigated in this dissertation address key elements of the healthcare system in the US and hence the reported results should be highly relevant not only to policy makers, but also to parties directly involved in the healthcare system such as employers, insured and uninsured individuals, and insurance companies.

Chapter 2 reports results of several empirical analyses examining the factors affecting employers' contributions to health insurance premiums. In these analyses, two types of insurance were considered: traditionally purchased coverage[1] and self-insured

[1] The traditionally/conventionally purchased insurance means insurance that is bought from insurance carriers.

health plans.[2] This is an important research problem, as employment-based insurance represents a dominant form of providing insurance coverage to employees in the US. In addition, other researchers have neglected self-insured health plans in examining the determination of an employer's contribution towards premiums.

Chapter 2 addresses this gap by explicitly accounting for self-insurance within health coverage and determining the important factors impacting the premium contribution provided by an employer. Our study extends previous research in several directions. First, it emphasizes two determinants of an employer's contribution that are particularly relevant: union membership[3] and the type of health insurance coverage (e.g., self-insured versus not self-insured health insurance plans). Second, it also augments the previous work by examining all firms regardless of their size and by considering other important factors not accounted earlier, including the policy holder's income, sex, race, and the place of residence.

Chapter 3 further investigates employment-based health insurance plans by focusing on the issue of the price elasticity[4] of demand in self-insured health plans. This issue is critical in analyzing the effectiveness and relevance of various health insurance policies (Blumberg et al. 2001; Chernew et al. 1997). Moreover, "the degree of responsiveness to price or insurance coverage is important because, other things equal,

[2] In the context of employer-based health insurance, self-insured health plans stand for the type of health insurance coverage where the employer assumes all or part of the risks regarding paying potential medical claims. In contrast to traditionally purchased health insurance, self-insurance is typically characterized by no intermediation of an insurance company.

[3] The effect of union membership will receive special attention, as it illuminates the problem of adverse selection in employer-sponsored health insurance coverage. Specifically, recently Robin Hanson (2005) theoretically demonstrated that the adverse selection problem is mitigated by the presence of unions.

[4] The price elasticity of demand in health insurance is defined as a degree of the price responsiveness to changes in the quantity of insurance provided, all other things held constant.

services that are more elastic should be less well insured" (Haas-Wilson et al. 1989). Even though there already is extensive literature on the price elasticity of the demand for health insurance coverage (Abraham et al. 2002; Barringer and Mitchell 1994; Cutler and Reber 1998; Feldman et al. 1989; Holmer 1984; Hosek et al. 1995; Marquis and Phelps 1987; Merrill et al. 1985; Neipp and Zeckhauser 1985; Short and Taylor 1989; Welch 1986), little is known on the price elasticity of demand in self-insured health plans. Hence, in Chapter 3 we report results of our empirical studies on the magnitude of the price responsiveness of demand for self-insured health coverage. We also compare obtained measures to previously reported results across various types of health insurance.

Chapter 4 presents results of another empirical study, this time addressing the issue of hospice care. The study explores the effects of behavioral differences of the ownership form and the certification status on the length of hospice service use. Both of these issues, for-profit versus nonprofit organizational forms and certified versus not certified status of hospice agencies, are highly relevant, as they have implications with respect to the access, cost and quality of health care provided. Moreover, the certification status of hospice organizations is highly relevant to hospice providers because they cannot be reimbursed within the Medicare Hospice Benefit if a hospice is not certified.

The issue of hospice certification has not been studied much in the literature, except for the paper by Hamilton (1993). Chapter 4 bridges this gap by studying the impact of certification on the length of hospice use. It also extends the previous work on for-profit and nonprofit types of hospices by Christakis and Escarce (1996), Lindrooth and Weisbrod (2007), and Ohri (2007) by accounting for other factors that may impact

the length of hospice use not studied earlier, including payment sources, caregiver status, and referral sources. Furthermore, it employs a more advanced statistical methodology and utilizes more recent, detailed, and nationally representative dataset.

Finally, Chapter 5 summarizes our major empirical findings and briefly describes our conclusions.

2. DETERMINANTS OF EMPLOYERS' CONTRIBUTIONS TOWARDS HEALTH INSURANCE PREMIUMS

2.1. Introduction

Employment-based health insurance has become the primary source of private health insurance coverage in the United States, provided to about 160 million people (Claxton et al. 2005; Kaiser Commission on Medicaid and the Uninsured 2007). Approximately 90 percent of the privately insured population under 65 receive health coverage through their workplace (Kaiser Commission on Medicaid and the Uninsured 2007). Continually rising health care costs and the preferential tax treatment of fringe benefits (e.g., the premiums paid by employers are excluded from an employee's taxable income) have largely contributed to their increasing popularity. In particular, as a result of this tax subsidy, the relative price of health coverage obtained through the workplace is estimated to be 27% lower (Gruber and Poterba 1996). As such, based on a high relevance of health insurance obtained through employment, there exists continued policy interest in understanding factors affecting employers' health insurance offer decisions. In particular, the determination of an employer's contribution towards health insurance premiums, which is the subject of this study, is of special interest.

Despite the importance of this issue, to our knowledge, there has only been limited work done on factors determining the employer's contribution towards the health insurance premium (referred to as the employer's contribution in the remainder of this dissertation). A few empirical papers addressed the problem in terms of the size of the company (Marquis and Long 2001) and the impact of unionization (Buchmueller et al. 2002; Marquis and Long 2001; Pauly and Herring 1999). The effect of industry composition on the employer's contribution was also investigated (Long and Marquis 1999; Marquis and Long 2001). The most comprehensive study to date in terms of the number of factors affecting the employer's contribution was conducted by M. Susan Marquis and Stephen H. Long (2001). They investigated the impact of local market conditions on small employers' offer decisions and their contributions towards health insurance premiums. Those local market characteristics included marginal tax rates, employee concentration, company size, unionization, industry composition, unemployment rate, average age of employee, average education of working population, and percent of full-time workers having full-time employed spouses.

This study builds upon the previous literature regarding employers' offer decisions and their premium contributions, as well as on the work of (Buchmueller et al. 2002; Dranove et al. 2000; Hanson 2005; Long and Marquis 1999; Marquis and Long 2001). Similar to earlier studies, the major purpose of this study is to empirically investigate the employer's contribution to health insurance premiums.

Furthermore, this study extends previous research in several directions. First, it augments the work of Marquis and Long (2001) by examining all firms regardless of their size, as measured by the number of individuals employed at a particular company (Marquis and Long's study considered only small firms). Second, it investigates other potential factors that are hypothesized to affect employers' insurance offer decisions which were not accounted for in previous research. These factors include policy holder's income, poverty status, sex, race, and place of residence. Third, this study emphasizes two determinants of employers' insurance offer decisions that are particularly relevant: union membership and the type of health insurance coverage.

The effect of union membership has already received significant attention in the literature, as it illuminates the problem of adverse selection in employer-sponsored health insurance coverage. Specifically, Robin Hanson (2005) theoretically demonstrated that the adverse selection problem is mitigated by the presence of unions which represent an instance of a democratic choice (similarly to other democratically organized groups, such as homeowners associations and churches). The intuition is that the choice is less sensitive to the risk types of individuals, all other factors being equal.

The second important factor investigated in this study is the type of insurance coverage offered by employer-provided health insurance plans. In particular, this study extends earlier work by analyzing self-insured/funded employer health plans[5]—and examining their impact on the employer's contribution. This is an important research

[5] In the case of self-insured/funded employer health plans, the employer assumes all or part of the financial risk associated with paying medical claims, and does not assign that risk to contract with an insurance company to assume the financial risk, but instead it assumes internally all or part of the financial risk associated with paying potential medical claims.

problem: self-insured health plans have become a prevalent way of providing coverage to employees (Park 2000), mostly because they are considered to be less expensive than conventional group health benefits. Unfortunately, previous research has neglected self-insurance when examining the level of the employer's contribution towards the health insurance premium, something this study attempts to address.

The chapter is organized as follows. First, the background section introduces self-insurance, theory of employers' health coverage decision, and some applied work on an employer's contribution towards the total premiums of health insurance. Next, research questions and hypotheses are discussed, followed by a brief description of the determinants regarding the amount of the employer's contribution. The data and the methodology used in the empirical analyzes are then introduced. This is followed by a detailed discussion of the obtained results. Finally, concluding remarks are presented, together with a brief discussion on possible directions for future research.

2.2. Background

2.2.1. Employer-Provided Self-Insurance

In the case of self-insured/self-funded employer health plans, the employer does not contract with an insurance company to assume the financial risk (as in the case of conventional/traditional health plans), but instead it assumes internally all or part of the financial risk associated with paying potential medical claims[6]. In practical terms, self-insuring firms act as their own health insurance firms meaning that they pay for their

[6] A large number of self-insured employers limit their financial risk through reinsurance (e.g. stop-loss insurance as a liability cap.

employees' medical claims out of their own pockets. The rationale behind accounting for self-insurance within health coverage offered by the employer is that self-insuring health plans have become a prevalent way of providing health benefits by the sponsoring employers (Employee Benefit Research Institute (EBRI) 2008; Henderson 1999; Park 2000).

Currently, over one-half of all private insurance is offered in the form of self-funded health coverage through the workplace (Henderson 1999), which, according to Employee Benefit Research Institute, is estimated to be approximately 55 percent or 50 million workers and their dependents. In fact, 89 percent of workers were covered by self-insured arrangements in 2008 in companies with 5,000 or more employees, which represents an increase from 62 percent in 1999 (Employee Benefit Research Institute (EBRI) 2008; Employee Benefit Research Institute (EBRI) 2009). In terms of the overall market share, this implies that 55 percent of workers with health insurance were covered by employer's self-insured health plans (Employee Benefit Research Institute (EBRI) 2009).

Even though self-insurance has become a standard practice mostly for larger firms (Employee Benefit Research Institute (EBRI) 2008; Henderson 1999; Park 2000), there are also smaller firms which self-insure (Henderson 1999)[7]. According to Thompson (1993), over 20,000 small companies with an employment below 100 self-insured in

[7] The list with self-insured employers in Washington Sate, compiled by the Washington State Department of Labor & Industries, may be found at: http://www.lni.wa.gov/ClaimsIns/Insurance/SelfInsure/EmpList/FindEmps/Default.asp. Other states also make similar lists available to the public.

1992[8]. However, only 13 percent of employees in companies with fewer than 200 participants obtained self-insured health plans in 2006 (Pierron and Fronstin 2008). Thus, the trend to self-insure is not that prevalent for small firms as it is for large firms.

Specifically, the dominant role of self-insurance can be explained by its cost advantage which is due to several factors:

- According to the Employee Retirement Income Security Act of 1974 (ERISA), self-insuring employers are exempt from paying state insurance premiums taxes levied by most states. They also don't have to comply with varying state mandates (Acs et al. 1996; Claxton et al. 2005; Henderson 1999; Pierron and Fronstin 2008; Self-Insurance Institute of America ; Thompson 1993)[9];
- According to the ERISA, self-insuring employers are not required to hold reserve requirements, offer mandated benefits, and meet consumer protection requirements (Acs et al. 1996; Claxton et al. 2005);
- Self-insuring employers also have greater flexibility in the plan design (Claxton et al. 2005; Pierron and Fronstin 2008; Self-Insurance Institute of America ; Thompson 1993);
- Self-ensuring employers have better opportunities to treat their employees more equally with respect to health benefits offered, especially when they are

[8] Self-Insurance Institute of America recommends practicing self-funded health plans to any business, regardless of its size. On the other hand, the National Business Coalition on Health advocates self-insurance for firms employing between 100 and 300 workers as a minimum.

[9] Thus, self-insured plans are overseen only on the federal level by the Department of Labor. However, self-insurance may lead to a greater risk if more claims than anticipated need to be paid.

located in several states (Marquis and Long 1999; Self-Insurance Institute of America).

2.3. Theoretical Framework

What factors should determine the employer's decision to offer health benefits to its employees? The standard economic theory explaining why employers offer health insurance benefits to their employees in the first place focuses on worker demand (Cutler 1997; Pauly 1997; Summers 1989). According to this theory, employers are willing to provide health insurance to their workers because the workers are willing to "buy" it through a wage offset (e.g., by receiving wages decreased by the cost of that coverage). In other words, instead of receiving higher cash compensation and buying health coverage by themselves, employees prefer obtaining it from employers in exchange for lower wages (decreased by the amount of that coverage).

What factors should determine the employer's decision about its dollar amount of premium contribution? According to the theory outlined in Goldstein and Pauly (1976), which presumes competitive labor markets[10] and profit maximizing employers, the equilibrium health insurance benefits can be determined in two ways. First, they are a result of a collective choice (e.g., a standard voting process) made among current employees that occurs either through an insider/outsider or union choice (e.g., employee-choice equilibrium/employee model). Based on this model, the health benefits package will reflect the tastes and preferences of the median voter. In addition, under a union

[10] E.g., employees decide where and whether to work based on compensating differentials.

mechanism, higher quantities of health insurance will be chosen by union workers than non-union workers.

The second approach in the model of Goldstein and Pauly (1976), which similar to the theory by Feldman et al. (1997), states that the health insurance offer is an outcome of the choices made by employers who aim to minimize their overall labor costs. Their design of health benefits will reflect the average preferences of their employees. That further empirically implies that the level of health insurance offered by an employer will rather be associated with demand characteristics of all workers in a particular labor market than the characteristics of those specific individuals it employs.

As mentioned above, the presented benchmark theory presumes competitive labor markets, profit maximizing firms, and homogenous employees. However, in the case of different features of workforces, no "more general equilibrium" theory of the provision of health insurance type benefits, or fringe benefits is known (Pauly 2001).

2.3.1. Empirical Literature Review

The problem of determining the employer's contribution to health insurance premiums has been studied in the economic literature (Buchmueller et al. 2002; Dranove et al. 2000; Hanson 2005; Long and Marquis 1999; Marquis and Long 2001). In particular, the paper by Marquis and Long (2001) considered the largest variety of factors determining small employers' decisions to provide health insurance and their contribution amounts. Their study was specifically motivated by the labor economics literature that examined fringe benefits without differentiating them into specific components, such as

health insurance, life insurance contribution, or retirement benefits[11]. The objective of their work was to empirically investigate the impact of local market conditions on the employer's contribution to health insurance premium. Those local market characteristics hypothesized to affect the insurance offer decisions in terms of the contribution amounts provided included the following: marginal tax rates, employee concentration, business size, unionization, industry composition, unemployment rate, and worker characteristics such as average age and average education of working population, and percent of full-time workers having full-time employed spouses.

Marquis and Long used the National Employer Health Insurance Survey (NEHIS), the 1997 Robert Wood Johnson Foundation (RWJF) Employer Health Insurance Survey databases, and data on special labor market features. One of the conclusions of their study was that larger firms (as measured by the number of their employees) are not only more likely to provide health insurance benefits, but they also offer higher premium contributions of health insurance. This confirms earlier findings reported by Dravove et al. (2000). Their results also suggested that greater unionization is associated with higher employer's contributions, which is also consistent with theoretical predictions by Hanson (2005) and Goldstein and Pauly (1976), as well as empirical findings by Buchmueller, Dinardo et al. (2002). Specifically, Marquis and Long (2001) estimated the employer contributions to be higher by about 2 to 5 percent as a result of higher unionization. They also reported that the industry composition (e.g.

[11] Marquis and Long (2001) also reviewed the relevant literature on fringe benefits in their paper where they also emphasized their particular aspects, which they used as providing the rationale for their hypotheses. This study, however, doesn't discuss those studies on fringe benefits, but it directly reviews those papers on health insurance as a specific type of fringe benefits. Thus, an interested reader in the literature on fringe benefits can refer to the paper by Marquis and Long (2001).

construction, manufacturing, etc.) has no influence on employers' decisions regarding the premium contributions. On the other hand, they found significant differences between public and private sectors with respect to their health benefits offerings in their previous study (Long and Marquis 1999). Specifically, they concluded that private employers' contributions towards the premium were higher than the federal government's shares. On the contrary, they were lower than state and local governments' premium contributions (Long and Marquis 1999).

In contrast to the work by Pauly and Herring (1999), which concluded that the employer's contribution is higher in areas with older and more educated employees, the study by Marquis and Long's showed that age and education were not statistically significant for insurance offer rates. Finally, Marquis and Long (2001) found the difference in the contribution amounts between single and family coverage offered by employers that was estimated to be approximately 33%.

2.4. Research Questions

As discussed earlier, the major goal of this study was to investigate determinants of the employer's contribution to the health insurance premium, with an emphasis on two major factors: the union membership and the type of health insurance. In addition, other determinants were considered in the empirical analyses, including firm size, income, poverty level, policy holder's sex, race, and place of residence. Consequently, the major research questions and the corresponding predicted responses investigated in this study are shown in Table 1.

Table 1: Major research questions and predicted responses investigated in this study.

	Research Question (RQ)	*Predicted Response (PR)*
1.	What is the impact of the presence of unions on the employer's contribution?	Unions purchase larger quantities of health insurance (Hanson 2005; Marquis and Long 2001) as a result of their democratic choice (Hanson 2005): health insurance is less expensive for union members, all other factors held constant[12].
2.	What is the impact of self-insured vs. not self-insured insurance plans on the employer's contribution?	Since self-insuring health plans are usually cheaper for employers than conventional health insurance (Park 2000), self-insuring employers choose to offer higher contributions towards employees' total premiums.
3.	What is the effect of socioeconomic status characteristics?	A higher employer's share is correlated with a higher income/compensation and education.
4.	What is the influence of demographic characteristics on the amount of the employer's contribution?	Older employees are provided with higher amount of insurance (Marquis and Long 2001; Pauly and Herring 1999). Sex and race are expected to have a significant effect.
5.	What is the effect of geographic variations on the quantity of insurance?	Regional variations are expected to have a statistically significant impact, which may partially be a consequence of regional income variations.
6.	What are the effects of the employer organization form and the size of an establishment on the employer's share?	State and local governments' premium contributions are expected to be higher than their private firms' counterparts (Long and Marquis 1999). Larger companies tend to offer larger quantities of health insurance (Marquis and Long 2001).

[12] In other words, if there would be other factors affecting price, they may also affect the quantity of health insurance. In this case, our quantity expectations would not be valid. However, we try to account for these potential other factors by including control variables.

2.5. Data

This section introduces the data used in this study in terms of their source, aspects of their coverage, and their relevance.

2.5.1. Data Source

The empirical analysis was conducted using the 1987 National Medical Expenditure Survey (NMES) data series. Specifically, two datasets of the 1987 NMES were utilized: Employment-Related Coverage (U. S. Department of Health and Human Services. Agency for Health Care Policy and Research 1992b) and Household Survey data sets (U. S. Department of Health and Human Services. Agency for Health Care Policy and Research 1992a) that were merged together by the policy holder identifier.

The 1987 NMES survey included the first release of data from the Health Insurance Plan Survey (HIPS), which to our knowledge has also been its only publicly available dataset. The NMES Employment-Related Coverage dataset represents a stratified random sample of the civilian non-institutionalized population of the United States and it's unique for the purposes of this study, as it breaks private health insurance information into self-insured and not self-insured plans.

The original NMES sample covers 165 geographic areas as primary sampling units that represent 127 distinct geographic regions, in which around 15,000 households were interviewed on their health insurance during 1987 (U.S. Department of Health and Human Services Agency for Health Care Policy and Research 2001). After interviewing households, 11,422 employers (with the response rate of 85.5%), 353 unions (with the

response rate of 76.7%), and 745 insurance companies (where 75.6% of them responded) were contacted in order to verify the information on the plan, including enrollment, premiums, and payment sources (U.S. Department of Health and Human Services Agency for Health Care Policy and Research 2001).

Employers that assumed financial liability for claims or expenses covered under their health insurance plans were considered self-insured (U.S. Department of Health and Human Services Agency for Health Care Policy and Research 2001). Further, before the data were recorded to the final dataset, the information collected on self-insured plans was subjected to rigorous automated checking routines. Those respondents whose data failed those checks were contacted again in order to verify the data provided by them. Missing out-of-pocket expenses were imputed using a weighted sequential hot-deck procedure (U.S. Department of Health and Human Services Agency for Health Care Policy and Research 2001).

2.5.2. Sample Construction

The analysis presented in this chapter is based on a person-level data set constructed by selecting the subset of employees covered by employer health insurance from the Employment-Related Coverage data set that was further linked with data on the policy holder's household and individual characteristics from the Household Survey dataset. Further, in order to make estimates across health plan-levels, the sample of policy holders consisted of people as either those who were covered only by self-insured plans or those covered only by not self-insured plans. In other words, employees whose coverage consisted of multiple plans where at least one plan was self-insured and at least

one plan was not full-insured were excluded from the samples under discussion (i.e., persons obtaining a mixture of both self-insured and not self-insured coverage were not included in order to disentangle differences among those plans)[13].

2.6. Methodology

This section examines the union and the insurance type variables, which were the focus of this study. It also introduces other explanatory variables and the model and statistical techniques used in the empirical analysis.

2.6.1. Output Variable

The dependent variable is used in the form of the natural log of the dollar amount of the employer's contribution to its employee's *i* total annual premium of health coverage ($\log(I_i)$)[14]. In order to make self-insured and not self-insured health coverage comparable (as self-insured organizations assume financial liability for claims or expenses incurred), the 1987 NMES also constructs the employer contribution towards the premium as the expected value of its funding per policy holder. As such, the created employer's premium share in self-insurance is the sum of claims paid, premiums for re-

[13] There is no information on proportions of the component parts of this mixed type of insurance coverage (e.g. proportions of self-insured and traditional plans). Thus, including this type of coverage in the analysis would generally not be meaningful and it would potentially lead to misleading results; that is why it has been excluded from the analysis.

[14] A few observations of the employer's contribution variable took on the value 0. Hence, in order to use the outcome measure in the logarithmic form, the variable was transformed as log(1+employer's contribution), which is acceptable when the data on the dependent variable have only a few zeros (Wooldridge 2002).

insurance of larger claims, and administrative costs that are associated with hospital and medical plans[15].

2.6.2. Union and Insurance Type Explanatory Variables

The main variables under examination are the union membership in an establishment of a person's employment and the type of health insurance provided by the employer (self-insurance vs. traditional insurance) (see Table 2 for their summary). In particular, the insurance type of employment-related coverage is a categorical variable standing for self-insured plans where not self-insured plans are the omitted reference group.

On the other hand, the union variable is expressed as a percentage of all employees who are members of a union at a particular establishment. However, in addition to those numeric values, it also includes categories such as inapplicable, not ascertained, don't know, refused, or never will know, which were grouped together as the "don't know" dummy variable to represent unknown and inapplicable cases[16]. Further, if "don't know"=1, then the values of the union variable were set to 0, so that in addition to the categorical union variable, the union could also be expressed as the continuous variable without dropping those unknown/inapplicable observations. That means that the union variable is represented twofold: as the "don't know" dummy variable (where applicable cases are the reference) and the continuous variable (expressed as the

[15] That means that funding relating to separate vision, drug and dental plans within self-insured coverage is excluded from the estimated value of the employer premium in self-insurance.

[16] They were combined together as one category because the "inapplicable" cases represent the vast majority of them and other categories are very similar to "inapplicable" (such as "not ascertain" which in general means that the information was not collected).

percentage) in the same model. This specification is applied to allow for a more meaningful interpretation of results.

2.6.3. Other Control Variables

In terms of other explanatory variables used in the estimated models (described in the following section), demographic, geographic, socioeconomic status, and employer specific variables are accounted for in the models specified (see Table 2 for their summary). In particular, the demographic control variables consist of sex (as a binary variable with 1 if male), age (expressed in years), including its squared term (to allow for a diminishing character of age), and race (Hispanic, Black, White whereas White is an omitted control variable). On the other hand, the vector of geographic variables takes into account four main regions according to the U.S. region specification (Northeast, Midwest, South, and West, with West as an omitted control variable).

Furthermore, available socioeconomic status characteristics include family income, poverty status, benefits provided by the employer, and education. Specifically, the respondent's total family income (at last interview) is measured in $1,000s. Next, the poverty status identifies five poverty groups that are constructed in the data set based on the family income such as poor[17], near poor, low income, middle income, and high income where poor is an omitted variable. Other components of the person's compensation are represented by various employee fringe benefits in addition to health insurance such as paid vacation, paid sick leave, life insurance, and retirement plan.

[17] In the data set, two separate categories, "poor" and "negative income," were constructed, which we combine as "poor" because they often are perceived as the same.

They are categorized as yes (e.g., provided), don't know (e.g., don't know if provided), and no (e.g., not provided which is the reference). Final variable within socioeconomic status characteristics is education, which, similarly to the union variable, is expressed twofold: as the "don't know" categorical variable (where applicable is the omitted variable) and the continuous variable (expressed in years of the policy holder's highest education)[18].

Moreover, the other group of explanatory variables is the vector of employer's specific control variables that include the employer organization form, establishment size, and industry. Specifically, the employer organization form differentiates between for profit, non-profit, state/local government and other types, where the government form is an omitted variable. Next, the size of the establishment is measured as the total number of employees at a particular location. However, it also includes unknown values under "not ascertain" category. Following the union and the education variables, the firm size is used in the model as both: the "don't know" categorical variable (that includes not ascertained cases with "applicable" as the reference) and the continuous variable (where the values of the firm size were set to 0 for unknown cases, i.e., when "don't know"=1). The industry variable is applied in the model as well, which corresponds to condensed industry codes for S16 last job held as defined by the Bureau of the Census for the 1980 Census (U.S. Department of Commerce. Economic and Statistics Administration. U.S. Census Bureau 1980). As such, the industry variable identifies the following industry groups: agriculture,

[18] In other words, the education variable also includes categories such as inapplicable, not ascertained, don't know, refused, or never will know, which we combined together as the "don't know" categorical variable that stands for unknown and inapplicable cases. Next, if "don't know"=1, then the values of the education variable are set to 0 in order to express the education as the continuous variable in addition to the categorical variable that differentiates between unknown/inapplicable and applicable cases.

forestry and fisheries, construction, manufacturing, transportation, sales, finance, business and repair, personal services, entertainment, public administration, unknown, inapplicable, and professional and related services (as the reference).

It is also controlled for the type of coverage held: single, family, two-person, or other where family coverage is an omitted variable. Finally, μ stands for a random error term.

2.6.4. Models and Estimation Issues

The applied regression technique is ordinary least squares (OLS). The lognormal model is used, as it is suggested by the variance stabilization techniques such as the Box-Cox and the coded groups' methods. These methods and the fact that the OLS method includes the robust standard errors option imply that heteroskedasticty is not an issue.

Five specifications of the model were selected in order to test the robustness of the obtained results:

- (1) OLS results with the union and insurance controlling for the type of coverage held;
- (2) OLS output with the union and insurance, the type of coverage held, and demographics (e.g., age, sex, and race);
- (3) OLS results with union, insurance, coverage type, demographics, and socioeconomic status (SES) independent variables (e.g., family income, poverty status, benefits provided by the employer, and education);

- (4) OLS results with union membership, insurance, coverage type, demographic, SES, and geographic control variables;
- (5) OLS output with union membership, insurance, coverage type, demographic, SES, and geographic, and employer specific variables (e.g., employer organization type, total employment, and industry).

Thus, the applied specifications of the model were expressed in the following ways:

(1)

$$\log(I_i)=\alpha+\beta_1 UNION+\beta_2 INSURANCE+\beta_3 TYPE+\mu,$$

(2)

$$\log(I_i)=\alpha+\beta_1 UNION+\beta_2 INSURANCE+\beta_3 TYPE+\beta_4 DEMOGRAPHIC+\mu,$$

(3)

$$\log(I_i)=\alpha+\beta_1 UNION+\beta_2 INSURANCE+\beta_3 TYPE+\beta_4 DEMOGRAPHIC+\beta_5 SES+\mu,$$

(4)

$$\log(I_i)=\alpha+\beta_1 UNION+\beta_2 INSURANCE+\beta_3 TYPE+\beta_4 DEMOGRAPHIC+\beta_5 SES+ \beta_6 GEOGRAPHIC+\mu,$$

(5)

$$\log(I_i)=\alpha+\beta_1 UNION+\beta_2 INSURANCE+\beta_3 TYPE+\beta_4 DEMOGRAPHIC+\beta_5 SES+ \beta_6 GEOGRAPHIC+\beta_7 EMPLOYER+\mu,$$

where I_i= employer contribution towards policy holder's (PH's) health coverage

Even though our data pertain mostly to large employers and hence, according to Newhouse, "insurance is exogenous or […] any self-selection is minimal" (Newhouse 1981), we should still acknowledge a possible endogeneity of the unionization. In

particular, if individuals select the work place with a higher percentage of workers being union members based on some unmeasured characteristics which are also correlated with the employer's contribution, then the union membership is endogeneous and its effect may be overstated. The instrumental variables estimation could be used to test the presence of endogenous selection and to control for possible reverse causation. However, due to lack of adequate instruments in our dataset, we were not able to use this technique.

2.7. Study Sample Characteristics

Table 2 presents summary statistics of all variables included in the analysis as well as their descriptions. Frequency tables of categorical variables are listed in Table 10 in Appendix A. The sample applied in the empirical analysis contains 6,014 observations for the first two model specifications and 2,973 observations for models (3)–(5) (the difference in the number of observations comes from the presence of missing values after the data set on employer related coverage is merged with the household characteristics data). The study sample characteristics presented in this section relate to the models with the larger number of explanatory variables (e.g., 2,973 observations). The dominant type of coverage is the family coverage that is held by close to 51%, followed by the single coverage obtained by 41% (the remaining cases are represented either by two-party or other type of coverage).

The analyzed sample considers individuals who receive employer-sponsored health benefits and reside in various geographic regions in the U.S. at the last round in 1987 when the survey was conducted. The mean employers' premium contribution was approximately $1,626 whereas its median was equal to $1,356 per employee (ranging

from about $0 as the minimum to $8,109 as the maximum contribution). In terms of the main variables under discussion, on average 17% of employees were unionized at an establishment whereas 1488 individuals[19] (about 0.5%) worked for companies with no union members, and 240 of policy holders were employed at firms with 80% or more of unionized workers. Next, with respect to the insurance type, approximately 40% of policy holders were provided with self-insured health coverage and the vast majority of employees (the corresponding 60%) obtained traditional health insurance.

Within the demographic characteristics, the average age of the policy holder was approximately 41 years with the oldest individual being 96 years of age. On average 55% of policy holders were males and the remaining 45% were females, thus, the sex distribution was relatively uniform. In terms of racial composition, Whites were the most prevalent group (76%), followed by Blacks (17%), and Hispanics (8%). Next, with respect to geographic regions of the policy holders' place of residence, 21% of individuals lived in the Northeast, 25% lived in the Midwest, 37% resided in the South, and 17% of employees lived in the West.

In terms of the socioeconomic characteristics, on average the family income was $38,000 whereas the lowest income on the family level was -$99,380 (meaning the family highest debt within the subset analyzed) and the highest income was $404,730 per family. Considering the poverty status of the policy holder, the vast majority of employees represented high and middle income individuals (over 40% and 34%,

[19] This excludes 580 unknown cases that were set to 0 in the case of the continuous union variable.

respectively). The smallest group in the sample, consisting of approximately 8% of employees, represented individuals under the poverty level.

Regarding the fringe benefits offered by employers other than health care benefits, 87% of employees were offered paid vacation, 79% of them were provided with paid sick leave, 82% of individuals obtained life insurance, and 71% of them were provided with retirement plans (the remaining percentages for each benefit group referred to employees who either did not receive a particular benefit or did not know if they received it). Furthermore, with respect to education as the other socioeconomic variable, the mean policy holder's education was 9 years. Eight employees had no education (that excludes 718 unknown cases) and 128 employees had 18 years or more of education.

In terms of employer specific control variables (e.g., employer organization type, total employment, and industry), the studied sample considered establishments with the mean of 1,004 employees where nine smallest firms employed only one person[20], and each of the 89 largest companies employed 10,000 or more people. Regarding the organizational form of an establishment, 65% of individuals were employed at for-profit firms, 12% of them worked for non-profit organizations, and 16% were at government establishments (the rest represented other or unknown employer organizational forms). Moreover, with respect to the industry composition, inapplicable category was the most dominant, followed by manufacturing (over 3%), professional services (about 3%), sales (over 2%), unknown cases (over 1%), public administration (over 1%), and construction (over 1%).

[20] This excludes 149 unknown cases for the firm size.

Table 2: Descriptive Statistics of Variables in Employer-Sponsored Health Plans

Variable	*Mean*	*Std Dev*	*Min.*	*Max.*	*Description*	*Format*
Union membership						
DON'T KNOW	0.19	0.40	0	1	It includes the following categories: inapplicable, don't know, refused, and never will know	Applicable as reference
UNION	16.79	30.21	0	100	Union membership as a percentage of all employees at an establishment	Percent
Insurance type					Full-insurance as reference	
SELF-INSURANCE	0.40	0.49	0	1	Employment-related coverage consists of a plan(s) that is (are) all self-insured	Traditional insurance as reference
Type of coverage held					Family as reference	
Single	0.41	0.49	0	1	Single coverage held	
Family	0.51	0.50	0	1	Family health coverage	omitted
Two-party	0.07	0.25	0	1	Two-party coverage held	
Other	0.01	0.12	0	1	Other type coverage held	
Age	41.45	15.25	9	96	Age in the last round in 1987	Years
Male	0.54	0.50	0	1	Policy holder's (PH) sex	1-Male, 0-Female (omitted)
Race					White as reference	
Black	0.17	0.37	0	1	Policy holder (PH) gender	
Hispanic	0.08	0.26	0	1	Policy holder (PH) gender	
White	0.76	0.43	0	1	Policy holder (PH) gender	(omitted)
Family income	37.62	30.36	-99.38	404.73	The respondent's family income expressed in $1,000s	Numeric ($1,000s)
Poverty status					Poor as reference	
Poor	0.08	0.27	0	1	Poor/below the poverty level	(omitted)
Near poor	0.04	0.19	0	1	Near poor	
Low income	0.13	0.34	0	1	Low income	
Middle income	0.34	0.48	0	1	Middle income	
High income	0.40	0.49	0	1	High income	
Benefits provided by the employer						
Paid vacation: YES	0.87	0.34	0	1	Paid vacation offered by the employer	NO (omitted)
Paid vacation: Don't know	0.10	0.31	0	1	Unknown if paid vacation offered by the employer	NO (omitted)
Paid vacation: NO	0.03	0.16	0	1	Paid vacation isn't offered by the employer	omitted
Paid sick leave: YES	0.79	0.41	0	1	Paid sick leave offered by the employer	NO (omitted)
Paid sick leave:	0.11	0.31	0	1	Unknown if paid sick	NO

Don't know					leave offered by the employer	(omitted)
Paid sick leave: NO	0.10	0.30	0	1	Paid sick leave isn't offered by the employer	omitted
Life insurance: YES	0.82	0.38	0	1	Life insurance offered by the employer	NO (omitted)
Life insurance: Don't know	0.11	0.31	0	1	Unknown if life insurance offered by the employer	NO (omitted)
Life insurance: NO	0.07	0.25	0	1	Life insurance isn't offered by the employer	omitted
Retirement plan:YES	0.71	0.45	0	1	Retirement plan offered by the employer	NO (omitted)
Retirement plan: Don't know	0.11	0.31	0	1	Unknown if retirement plan offered by the employer	NO (omitted)
Retirement plan: NO	0.18	0.38	0	1	Retirement plan isn't offered by the employer	omitted
Education					Applicable as reference	
Don't know	0.24	0.43	0	1	It includes the following categories: inapplicable, don't know, refused, and never will know.	Applicable as reference
Education (years)	9.32	5.90	0	18	PH's highest education completed expressed in years of education	Years
Geographic Region					The U.S. Census region of the PH's residence	
Northeast	0.21	0.41	0	1	Northeastern region	West (omitted)
Midwest	0.25	0.43	0	1	Midwestern region	West (omitted)
South	0.37	0.48	0	1	Southern region	West (omitted)
West	0.17	0.38	0	1	Western region	(omitted)
Employer organization type					Government as reference	
For profit	0.65	0.48	0	1	For profit organization	
Non-profit	0.12	0.32	0	1	Non-profit organization	
Government	0.16	0.37	0	1	State/local government	(omitted)
Other	0.02	0.13	0	1	Other form	
Don't know	0.06	0.23	0	1	Unknown form	
Total employment					Applicable as reference	
Don't know	0.05	0.22	0	1	The size of the establishment not ascertained (e.g., interviewer did not record the data)	Applicable as reference
Total employment	1,004.4	2,115.4	0	10,000	Total number of employees at a particular location of an establishment	Numeric

Industry					Condensed industry code for last job[21] Professional services as reference	
Inapplicable	0.85	0.36	0	1	Inapplicable	
Agriculture, forestry, and fisheries	0.003	0.05	0	1	Agriculture, forestry, and fisheries	
Construction	0.01	0.10	0	1	Construction	
Manufacturing	0.03	0.17	0	1	Manufacturing	
Transportation	0.009	0.10	0	1	Transportation	
Sales	0.02	0.15	0	1	Sales	
Finance	0.004	0.07	0	1	Finance	
Business and repair	0.008	0.09	0	1	Business and repair	
Personal services	0.006	0.08	0	1	Personal services	
Entertainment	0.002	0.05	0	1	Entertainment	
Public administration	0.01	0.10	0	1	Public administration	
Don't know	0.01	0.11	0	1	Don't know	
Professional services	0.03	0.17	0	1	Professional and related services	(omitted)
Employer contribution	1,625.89	1,098.32	0	8,108.64	Employer contribution towards the premium	Numeric ($)

Note: PH=Policy Holder; the summary statistics are based on 2,973 observations used in model specifications (4) and (5).

2.8. Discussion

The empirical analysis addresses determinants of the employer's contribution towards the premium provided in both self-insured and not self-insured plans. Table 3 reports the empirical outcomes from OLS that include the estimated parameters, p-values and robust standard errors of the employer's contribution equations.

2.8.1. Union Effect

One of the major two variables under consideration, union membership, is statistically significant in most of the model specifications reported ($p_{value}<0.01$ and

[21] Condensed industry codes for S16 last job are defined by the Bureau of the Census for the 1980 Census.

$p_{value}<0.05$). Specifically, the results imply that unknown cases (e.g., observations coded as inapplicable, not ascertained, don't know, refused, or never will know regarding union membership) have a positive effect on the employer's contribution compared to known cases. This suggests that individuals employed at establishments where we have no specific information regarding the union membership are provided with higher employer contributions for health care premiums than at corresponding firms with known percentages of union employees. This suggests that both, known vs. unknown cases of the union membership matter; however, their effects should not be overemphasized, as we lack information with respect to the unknown category of the union membership.

However, the union effect, as predicted by its continuous variable, can provide more meaningful implications in terms of an employer's contribution towards the premium. In particular, the direction of the relationship between union membership and the employer's contribution is estimated to be positive in all models specified. This suggests that a higher percentage of union members at an establishment is correlated with higher employer's contribution. Hence, these findings also provide evidence for the predicted response (PR1) stating that unions as a form of democratic organization consume more insurance (Hanson 2005), which is consistent with the earlier empirical findings (Buchmueller et al. 2002; Marquis and Long 2001). However, compared with Marquis and Long (2001), the contribution of unionization is not large: its magnitude is estimated to be of about 0.14-0.40 percent. In other words, it is implied that as a result of higher unionization, an employer's contributions are higher by about 0.14-0.40 percent, and the largest effects are observed in the first two specifications (models without

geographic and employer-specific characteristics). Moreover, this effect is statistically significant in the specifications (1)-(3), but not significant once accounting for geographic and employer specific characteristics (such as employer organization form, firm size, and industry) in the models (4) and (5). Hence, this finding is not robust across all specified models.

2.8.2. Effect of Insurance Type

Another determinant this study specifically addresses the type of health insurance (self-insurance vs. traditional insurance). The obtained results imply that due to their cost advantage, self-insured plans are characterized by higher employer's contribution compared to traditional plans. This finding also agrees well with our predictions (PR2). In other words, providing self-insured coverage is cheaper than offering conventional insurance coverage; hence, self-insuring employers choose to offer higher amounts of the premium share to their employees. They do so and still realize reduced labor costs, because they do not have to obey various laws and regulations, do not have to hold reserves, and have greater flexibility over the plan design (Acs et al. 1996; Claxton et al. 2005; Henderson 1999; Pierron and Fronstin 2008; Self-Insurance Institute of America ; Thompson 1993). This result is highly statistically significant in all models specified ($p_{value}<0.0001$). Its magnitude is estimated to be 18-25% (depending on the model specification).

2.8.3. Other Determinants

According to the obtained results, control variables within demographic characteristics also influence the amount of insurance provided. In particular, female-male differentials are very statistically significant across all model variations (p_{value}<0.0001) and its estimate is positive. Thus, it may indicate that males receive higher employer's contributions on average than females by approximately 20%. The statistical significance of this relationship was predicted (PR4); however, its direction was not. This effect may also be explained by the income effect: if income and broadly understood compensation is correlated with the employer's contribution, and if on average males earn higher incomes than females, then correspondingly, males may be provided with higher employer's contributions.

In fact, our empirical findings imply that the policy holder's family income level is statistically significant. In particular, the income level is positively correlated with the employer's contribution (PR3), and the effect of this relationship is estimated to be about 0.20%. Moreover, if taking into account the poverty level, this result for high income people still holds. This implies that higher income workers receive higher employer's premium contributions, which further implies that higher income workers accrue greater tax benefits as well. In addition, the poverty level indicator also suggests the positive effect of near-poor and low income individuals relative to those below the poverty level. This may imply that workers with low incomes or a near-poor status, though not below the poverty line, are particularly attracted to jobs with high employer premium shares.

In terms of the impact of other fringe benefits on the employer's contribution, paid vacation, life insurance, and retirement plan imply that providing them (as opposed to not providing) is associated with a higher employer's contribution by about 18-46%. Thus, offering those benefits by an employer also suggests a higher provision of health care benefits, which may be understood broadly as an income effect, as expected. However, offering paid sick leave is not statistically significant.

These findings are also characterized by some geographical variations. Specifically, the results obtained indicate that only the Northeast is statistically significant ($p_{value}<0.05$), as compared to the West. The predicted sign of the coefficient is positive, indicating that employees in the Northeast are provided with smaller premium contributions by their employers on average by approximately 15-16% (depending on the model variation) than their counterparts in the West. A possible explanation, which was also suggested as one of the research hypotheses (PR5), may refer to different economic conditions, and thus, higher earnings in those regions of the country as opposed to the western states (e.g. an income effect).

In contrast, the empirical results imply no statistically significant impact of an employer's specific characteristics on the employer's contribution. These characteristics include firm size (in contrast to Dranove et al. (2000) and Marquis and Long (2001)), employer organization form (as opposite to Long and Marquis (1999)), and industry composition (similarly to Marquis and Long (2001)). The models also predict, similarly to Marquis and Long (2001), that an employee's age and education are not statistically significant for the employer's insurance offer decisions. Furthermore, race is not found

to have any statistically significant effect either (it was not accounted for in Marquis and Long (2001)). Similar to conclusions reached by Marquis and Long (2001), the difference in the contributions between single and family coverage was found to be statistically significant: employers contribute more towards family coverage than single coverage.

Table 3: OLS Results in Employer-Sponsored Health Plans

y=ln(employer's contribution)	(1)	(2)	(3)	(4)	(5)
Union membership					
Union (applicable as the reference)					
DON'T KNOW	0.1648***	0.1616***	0.1767**	0.1618**	0.1494**
	(0.0355)	(0.0371)	(0.0721)	(0.0723)	(0.0723)
UNION(percentage)	0.0040***	0.0038***	0.0020**	0.0015	0.0014
	(0.0006)	(0.0006)	(0.0009)	(0.0009)	(0.0009)
SELF-INSURANCE	0.2483***	0.2502***	0.1813***	0.1975***	0.1987***
	(0.0270)	(0.0272)	(0.0372)	(0.0377)	(0.0426)
Type of coverage held (family coverage as the reference)					
Single	-0.8548***	-0.8046***	-0.8046***	-0.8019***	-0.7926***
	(0.0320)	(0.0340)	(0.0468)	(0.0468)	(0.0475)
Two-party	-0.1310*	-0.1223	-0.2027**	-0.1971*	-0.1904*
	(0.0771)	(0.0760)	(0.1032)	(0.1019)	(0.1025)
Other	-0.2159	-0.1656	-0.2287	-0.2239	-0.1919
	(0.1408)	(0.1401)	(0.2260)	(0.2226)	(0.2272)
Age		0.0057	-0.0014	-0.0001	0.0009
		(0.0054)	(0.0074)	(0.0074)	(0.0075)
Age^2		-0.0001	0.0000	0.0000	-0.0000
		(0.0001)	(0.0001)	(0.0001)	(0.0001)
Male		0.1703***	0.2103***	0.2082***	0.1982***
		(0.0321)	(0.0467)	(0.0467)	(0.0476)

Race (White as the reference)				
Hispanic	0.0167	0.1118	0.1297*	0.1220
	(0.0555)	(0.0764)	(0.0765)	(0.0766)
Black	0.0078	0.0551	0.0763	0.0661
	(0.0363)	(0.0480)	(0.0492)	(0.0483)
Family income (in $1,000s)		0.0017**	0.0016*	0.0015*
		(0.0008)	(0.0009)	(0.0009)
Poverty status (poor as the reference)				
Near poor		0.3660***	0.3692***	0.3608***
		(0.1197)	(0.1196)	(0.1194)
Low income		0.2016**	0.1889*	0.1949*
		(0.1027)	(0.1025)	(0.1019)
Middle income		0.1379	0.1275	0.1250
		(0.0943)	(0.0944)	(0.0943)
High income		0.1983*	0.1843*	0.1860*
		(0.1073)	(0.1073)	(0.1082)
Benefits provided by the employer (NO as the reference)				
Paid vacation: YES		0.4612**	0.4308*	0.4046*
		(0.2220)	(0.2232)	(0.2288)
Paid vacation: Don’t know		0.2626	0.2482	0.1688
		(0.3687)	(0.3653)	(0.3748)
Paid sick leave: YES		0.0913	0.0912	0.0983
		(0.0829)	(0.0832)	(0.0843)
Paid sick leave: Don’t know		0.3067	0.3214	0.2959
		(0.2524)	(0.2546)	(0.2584)

Life insurance: YES	0.3255**	0.3490**	0.3372**
	(0.1403)	(0.1410)	(0.1422)
Life insurance: Don’t know	-0.2361	-0.2144	-0.2345
	(0.5748)	(0.5694)	(0.5785)
Retirement plan: YES	0.1812***	0.1762***	0.1781***
	(0.0668)	(0.0670)	(0.0694)
Retirement plan: Don’t know	0.3812*	0.3625	0.3684*
	(0.2245)	(0.2221)	(0.2202)
Education			
Education (applicable as the reference)			
Don’t know	-0.0897	-0.0699	-0.0869
	(0.1027)	(0.1025)	(0.1041)
Education (years)	-0.0077	-0.0069	-0.0077
	(0.0081)	(0.0081)	(0.0080)
Geographic region (West as the reference)			
Northeast		0.1523**	0.1621**
		(0.0758)	(0.0761)
Midwest		0.0600	0.0683
		(0.0749)	(0.0745)
South		-0.0496	-0.0438
		(0.0692)	(0.0690)
Employer organization type (government as the reference)			
Non-profit			-0.0243
			(0.0893)

For-profit	0.0429
	(0.0618)
Other	-0.1006
	(0.2090)
Don’t know	-0.5652
	(0.4874)
Total employment	
Total employment (applicable as the reference)	
Don’t Know	0.9019*
	(0.4723)
Total employment (numeric)	0.0000
	(0.0000)
Industry (professional services as the reference)	
Inapplicable	-0.0552
	(0.1312)
Agriculture, forestry, and fisheries	0.0647
	(0.1816)
Construction	-0.0655
	(0.2479)
Manufacturing	-0.1645
	(0.1837)
Transportation	-0.1997
	(0.3053)
Sales	-0.0677
	(0.1721)

Finance					0.0529
					(0.1578)
Business and repair					-0.0459
					(0.2117)
Personal services					0.0668
					(0.1693)
Entertainment					-0.0963
					(0.2368)
Public administration					-0.1155
					(0.2722)
Don't know					0.1020
					(0.1484)
Constant	7.2018***	6.9667***	6.0338***	5.9955***	6.0406***
	(0.0324)	(0.1268)	(0.3301)	(0.3451)	(0.3638)
N	6014	6014	2973	2973	2973
F	186.2040	108.3972	26.7837	26.3185	19.0727
p_{value}	0.0000	0.0000	0.0000	0.0000	0.0000
R^2	0.1383	0.1426	0.1666	0.1700	0.1753

Notes: Robust standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01 (2 tail test);
PH=Policy Holder;

2.9. Additional Robustness Checks

Two additional variations were explored in order to check the sensitivity of the obtained results. One variation of the model (see Table 12 in Appendix A) defines the union, education, and total employment in terms of continuous variables, after dropping observations with unknown categories. Thus, the union is expressed as a percentage, the education as the number of years, and the firm's size as the number of employees. The other version (see Table 11 in Appendix A) defines union membership as percentage bins: don't know[22], 0%, 1-20%, 20-40%, 40-60%, 60-80%, and 80-100%, where the categories represent the percentage of employees at a firm who are members of a union. Further, the education variable differentiates between don't know[23], 0-8, 9-12, 13-17, and 18 or more years of education. Finally, the firm size was binned as don't know[24], 1-100, 100-300, 300-500, 500-1,000, 1,000-10,000, and 10,000 or more as the number of employees at a particular location of a firm. Thus, the second variation of the models includes the unionization, education, and total employment characteristics as categorical variables, without dropping unknown cases.

The results from the alternative versions agree with those obtained using the main models specified in Section 2.6.4. The key variable under investigation (i.e., self-insurance vs. traditional insurance) is highly statistically significant. Moreover, the union effect is statistically significant in all alternative specifications, thus, providing additional

[22] The "don't know" category, as in the main model specification, includes observations that were coded in the data set as inapplicable, not ascertained, don't know, refused, or never will know.
[23] The "don't know" category, similarly to the main model specification, takes into account observations that were originally recorded as inapplicable, not ascertained, don't know, refused, or never will know.
[24] Correspondingly, similar to the main models, the "don't know" category of the total employment variables includes the cases with "could not ascertain" category.

evidence of the robustness of our results. Specifically, for the case with the categorical union variable, the union effect is highly statistically significant and robust across all specifications for those cases in which union workers represent between 60 and 80% of the total employment at a particular establishment. The results with respect to the union are not robust across all models in the case of the union employees representing 20-40% and 80-100% of the firm size. In general, the results for other determinants of the employer's contribution correspond to those obtained for the main model specifications.

2.10. Conclusions

This chapter presented an empirical analysis of the determinants of an employer's contribution to health insurance premium in both self-insured and traditional health plans using the micro-level data from the 1987 National Medical Expenditure Survey (NMES) Household Survey. This study extended the previous research in several directions: by considering self-insured and conventional health benefits, by including all establishments regardless of size, and by accounting for income, poverty level, race, and regional variations. It also revisited the issue of the impact of unionization on the employer's contribution due to its high relevance in the context of self-insured health plans.

Our empirical results indicate that union membership and self-insured health plans predict higher amounts of an employer's contribution. Specifically, these findings provide support for the claim that unions as a form of democratic organizations consume more insurance (Buchmueller et al. 2002; Hanson 2005; Marquis and Long 2001). On the other hand, higher premium contributions offered by self-insuring employers may imply the cost advantage of self-insured health plans relative to conventional health insurance.

Furthermore, the empirical results identified the following socioeconomic characteristics as the predictors of higher employer's contribution: family income, poverty level (high income, low income, and near poverty), and employer's provided fringe benefits (such as paid vacation, life insurance, and the retirement plan). This implies that since higher income workers receive higher premium contributions from their employers, they also accrue greater tax benefits. Another implication is that workers with low incomes or those near the poverty level (but not below this level) are particularly attracted to jobs with high employer contributions. However, our results do not imply that policy holder's education has a statistically significant impact on the employer's contribution towards health insurance premiums.

Higher employer's contributions are also associated with the following demographic and geographic factors: being male, residing in the Northeast, and obtaining family coverage. Employer-specific characteristics such as organizational form, industry composition, and firm size do not have any statistically significant effect on the employer's premium contribution.

Empirical results relating to union membership can be re-examined in the context of its impact on adverse selection in insurance, as theoretically predicted by Hanson (2005).[25] Since under-provision of insurance is a major problem associated with adverse selection, and the results of this study show how the union membership affects the employer's contribution, we were able to indirectly draw inferences pertinent to adverse selection. In particular, the dataset provided evidence that increased employer's

[25] This interpretation is necessarily indirect (i.e., through the employer's contribution towards health insurance premium) as the dataset didn't include any information on individual risk types.

contribution is associated with an increased number of employees who are union members (which is the opposite of the under-provision of insurance). As such, these empirical results suggest that "democratic organizations such as unions suffer less from adverse selection in insurance" as predicted by Hanson (2005). However, this issue should be further examined more directly by including the data on risk types of individuals when they become available.

Another possible direction of future research includes incorporation of additional factors in the empirical analysis, such as other labor market characteristics. In addition, assuming appropriate data are available, the instrumental variable estimation could be applied to control for a potential endogeneity problem and subsequently compared against our benchmark OLS model.

3. PRICE ELASTICITY OF DEMAND IN EMPLOYER-PROVIDED SELF-INSURED HEALTH PLANS

3.1. Introduction

The demand for health care, its specific services, and its responsiveness to price has been long studied in the economic literature (Ringel et al. 2002). In particular, the issue of the price responsiveness of demand for health insurance is critical in analyzing the effectiveness and relevance of various health insurance policies proposed over the years (Blumberg et al. 2001; Chernew et al. 1997). These proposals have been largely designed to decrease the growing number of uninsured people in the US, which is estimated to include approximately over 46.3 million in 2008 (and increased from 45.7 million in 2007) (DeNavas-Walt et al. 2009). Moreover, "the degree of responsiveness to price or insurance coverage is important because, other things equal, services that are more elastic should be less well insured" (Haas-Wilson et al. 1989). Similarly, the most dominant form of providing health insurance coverage nowadays in the US through the employment is also critically conditional on health plans' price sensitivity (e.g., employers relate their decisions to premium costs, as shared by employees and employer) (Abraham et al. 2002).

The extensive research on the price elasticity of the demand for health insurance includes numerous empirical studies that differ from each other with respect to the data

sources used as and the empirical and experimental methods applied. As a result, there exists "no definitely established range of price elasticities [of health plan choice] in the literature" (Royalty and Solomon 1999). However, in general, the estimates are that prices are inelastic across studies, with their mid-estimate of 0.17 (Ringel et al. 2002).[26] In contrast, specific health care services are estimated to be more price sensitive relative to price estimates for health care in general.[27]

This chapter focuses on the price elasticity of demand in the context of self-insured/funded health coverage within employer-sponsored health plans. Employer provided self-insurance is defined here as health coverage in which the employer does not contract with an insurance company to assume the financial risk (as opposed to conventional/traditional health plans), and assumes internally all or part of the financial risk associated with paying potential medical claims. Hence, it acts as its own health insurance firm, paying for its employees' medical claims out of its own pockets.

Specifically, in this study we seek to establish if employees' demand for self-funded coverage is price responsive, and to determine the degree to which employees face elastic or inelastic demand for this type of health plan. Moreover, we compare the obtained measures of the price elasticity of self-insured health plans to the previous literature on the subject across various types of health insurance. The methodology used in this study draws upon that used by Phelps (2002), who defines the price of insurance as "the 'loading fee' of the insurance company above expected benefits" that

[26] There are, however, some studies that found elastic estimates with respect to the price, such as the work by Royalty and Solomon (1999), which is discussed in more detail in Table 13 in Appendix B.
[27] For the literature review of empirical studies of the price elasticity of demand for special types of health care, refer to Ringel and Hosek (2002).

predominantly refers to administrative costs of insurance. Hence, administrative costs associated with operating self-funded health coverage are recognized as its implicit price. Furthermore, following Thorpe (1992), the administrative costs of self-insured health plans are expressed as a fraction of incurred benefits claims in order to capture the administrative spending more appropriately.

The motivation for this work comes from the prevalent role of self-insurance in the employer's health benefits provision (Employee Benefit Research Institute (EBRI) 2008; Henderson 1999; Park 2000). In fact, approximately 55 percent, or 50 million, employees and their dependents are offered self-funded group health coverage through their workplace. This constitutes over one-half of all private insurance subscribers (Employee Benefit Research Institute (EBRI) 2008; Henderson 1999).

Self-insurance has become prevalent in larger firms (Employee Benefit Research Institute (EBRI) 2008; Henderson 1999; Park 2000). Specifically, in 2008, approximately 89 percent of workers received self-insured health benefits in companies with 5,000 or more employees (Employee Benefit Research Institute (EBRI) 2008; Employee Benefit Research Institute (EBRI) 2009). Some smaller firms choose to self-insure as well.

The dominant motivation for self-insurance offered through the workplace is typically explained by its costs advantages, as compared to traditional health plans. These cost advantages are realized mostly from several exemptions and flexibility features it enjoys. In particular, those exemptions are in the context of state insurance premiums taxes and compliance with varying state mandates (Acs et al. 1996; Claxton et al. 2005;

Henderson 1999; Self-Insurance Institute of America ; Thompson 1993).[28] In addition, other exemptions refer to holding reserve requirements, mandated benefits' provision, and consumer protection requirements (Acs et al. 1996; Claxton et al. 2005). Flexibility features, on the other hand, are associated with the plan design (Claxton et al. 2005; Self-Insurance Institute of America ; Thompson 1993) and with providing employers with more opportunities to treat their employees more equally with respect to health benefits offered, especially when they are located in several states (Marquis and Long 1999; Self-Insurance Institute of America). That way, self-insuring employers have more control over their cash flows. Thus, the relevance of self-insured coverage offered through the workplace provides a rationale for additional investigation with respect to its demand responsiveness. As such, the subject under examination is not just important for public policy makers; it is also highly relevant for employers and employees.

This chapter is organized as follows. First, we briefly discuss the empirical literature related to the price elasticity of the demand in health insurance, mostly focusing on employer-provided health coverage. Next, we introduce research questions guiding our work, and subsequently describe our analytical setup for investigating the price elasticity of the demand for self-insured health plans. This empirical section also introduces the dataset and the methodology used. Furthermore, we report and discuss descriptive statistics and the obtained empirical results. Finally, we summarize our

[28] Thus, self-insured plans are overseen only on the federal level by the Department of Labor. However, self-insurance may lead to a greater risk if more claims than anticipated need to be paid.

empirical findings and present a brief discussion of possible directions for future research.

3.2. Background

In order to understand the need for another study of health plan elasticities, let us first briefly discuss the variety of estimated elasticities in the literature with respect to the subjects examined and their major findings. (Table 13 in Appendix B provides a more detailed overview of representative work on the price elasticity of demand for health insurance plans with respect to the context studied, data sources, and empirical as well as experimental methods applied.)

A large number of empirical studies on the price elasticity of demand for health insurance investigate employees' enrollment decisions when faced with a choice among multiple health plans offered by an employer[29] (Abraham et al. 2002; Barringer and Mitchell 1994; Cutler and Reber 1998; Feldman et al. 1989; Holmer 1984; Hosek et al. 1995; Marquis and Phelps 1987; Merrill et al. 1985; Neipp and Zeckhauser 1985; Short and Taylor 1989; Welch 1986). In these papers, consumers are presumed to assess health plans available to them based on the expected utility they gain from them. Typical results reported in these papers suggest that the choice of the health plan is determined by the price of insurance, cost sharing arrangements, income, health status, and several demographic characteristics. Another line of research focused on the demand for health insurance coverage investigates the price elasticity in the context of a particular health

[29] In other words, they examine the demand responsiveness for various health plans to their price changes.

plan (Manning et al. 1988; Manning et al. 1987; Marquis and Phelps 1987; Newhouse and the Insurance Experiment Group 1993; Royalty and Solomon 1999).

Referring to Figure 1, in general, the estimates of the price elasticity are far from consistent. In fact, they vary largely from each other depending on the data source, methodology, and econometric techniques applied. The range of price elasticity estimates in absolute terms includes values as low as [-0.01, -0.02] (Barringer and Mitchell 1994)[30] and as high as [-3.7, -6.2] (Royalty and Solomon 1999).

Feldman, Dowd et al. (1997) obtained slightly different estimates within the absolute high range, such as -5.82 for family coverage and -3.91 for single coverage (1997).[31] It should also be emphasized their results and the work of Royalty and Solomon (1999) represent the only two studies which, to our knowledge, found that employees were price-elastic with respect to their demand for coverage. This implies that most of the empirical work concluded that the price elasticity of demand for health insurance is less than 1, suggesting that employees are insensitive to the price changes of health insurance.

[30] These values are reported in their revised estimates whereas their original publication includes estimates ranging from -0.1 to -0.2.

[31] Refer to Appendix A for more details on how these measurements were calculated, their general contexts, and the methodology used.

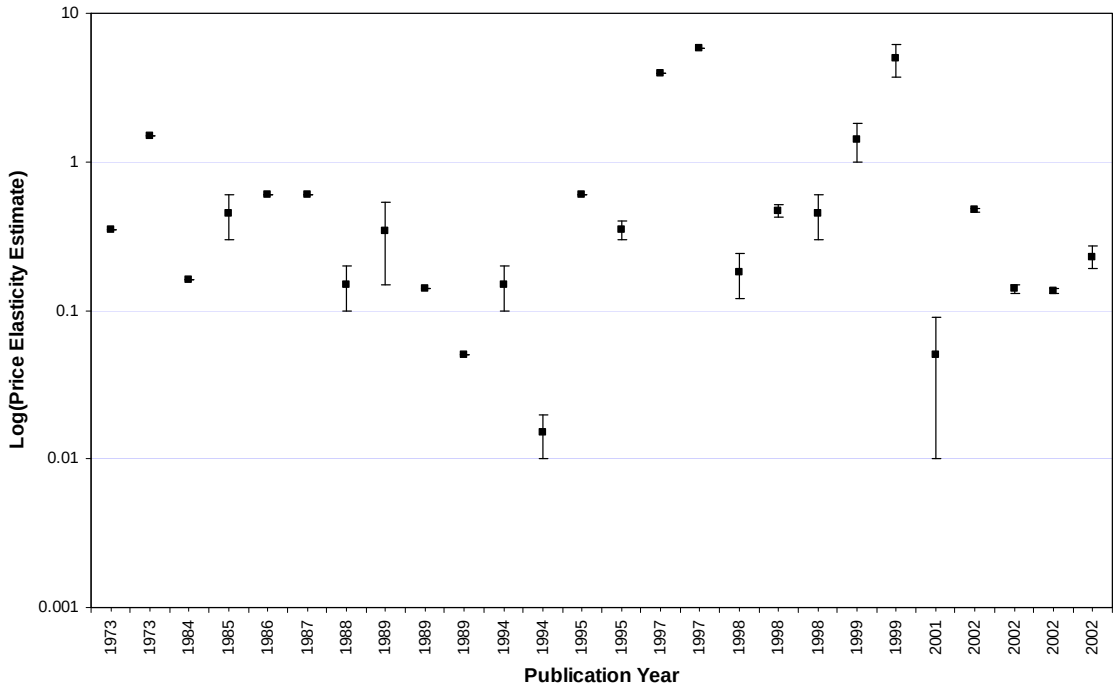

Figure 1: Representative Estimates of the Price Elasticity of Demand of Health Insurance in Existing Literature

The interactions of the price elasticity of demand with other factors were also examined in the previous literature, including interactions with income (Beck 1974; Manning et al. 1980; Manning and Phelps 1979; Newhouse 1981; Newhouse and Phelps 1976; Phelps and Newhouse 1972) and interactions with age (Royalty and Solomon 1999). The variation of the price elasticity with income implies that the rich are less sensitive to price changes than the poor. This was found to be the case in Beck's (1974) work using who used the Canadian dataset. However, empirical analyses that used US data concluded either the contrary effect (e.g., the poor less sensitive to price than the rich), or that the data are inconclusive (Manning et al. 1980; Manning and Phelps 1979; Newhouse 1981; Newhouse and Phelps 1976; Phelps and Newhouse 1972).

3.3. Research Questions

As mentioned earlier, the main objective of this study is to measure the price elasticity of self-insured health plans and to compare obtained estimates to those reported in the previous literature. Since previous studies examined relationships between the price elasticity of demand and income (Manning et al. 1980; Manning and Phelps 1979; Newhouse 1981; Newhouse and Phelps 1976; Phelps and Newhouse 1972), we included the interaction term between these variables in our empirical analyses. Hence, the research questions and the corresponding predicted responses investigated in our study can be formulated as shown Table 4.

Table 4: Major research questions and predicted responses in this study

	Research Question (RQ)	*Predicted Response (PR)*
1.	What is the price elasticity of demand in self-insured health plans, and how does it relate to other estimates across studies?	According to the majority of findings reported in the previous literature, the price elasticity is hypothesized to be in an inelastic range of the demand.
2.	Does the price elasticity of demand vary with income? If yes, then what is the direction of this variation (e.g., are the poor/ rich more sensitive to the price than the rich/ poor)?	Based on the previous empirical evidence from the US, no variation or the opposite effect (e.g., the rich are more price sensitive to the price than the poor) is expected (Manning et al. 1980; Manning and Phelps 1979; Newhouse and Phelps 1976; Phelps and Newhouse 1972).

3.4. Data

3.4.1. Data Source

Similar to the study reported in the previous chapter, here we also used the 1987 National Medical Expenditure Survey (NMES) data series. A detailed description of this datasets can be found in Section 2.5.

3.4.2. Subset Construction

The analytical part utilizes a person-level sample of two 1987 NMES datasets that is constructed by selecting only the subset of employees covered by self-insured employer-sponsored health plans. That also implies that employees whose coverage consisted of multiple plans where at least one plan was self-insured and at least one plan was not self-insured were not included in the examination. In other words, since the focus of the study is self-insured health coverage, we excluded those who received parts as both self-insured and not self-insured coverage (otherwise, it would be impossible to draw meaningful conclusions with respect to self-insurance only).

Further, in order to construct the continuous price variable, records with no specific numeric values (such as “not ascertained”, “never will know”, “inapplicable”, “suppressed for reasons of confidentiality”, and “refused”) with respect to firm’s administrative costs associated with operating self-insurance, number of its enrollees, and total claims incurred were dropped from the analysis. Specifically, the values of administrative costs per establishment reported in the 1987 NMES data as “not

ascertained", "never know", and "inapplicable" were excluded. In addition, the values of administrative costs taking on 0 (11 cases of them) were dropped from the analysis, as they did not represent legitimate cases. Next, observations denoted as "not ascertained" in the case of the number of employees at a company enrolled into self-insured health plans were excluded as well. Some values of the number of enrollees were suppressed for confidentiality reasons and assigned a category "10,000 or more" which we replaced by a numerical value of 10,000. We recognize it as a shortcoming of this analysis, but we are not able to define it better due to lack of adequate data. Finally, next to specific dollar amounts, the total claims variable had categories such as "not ascertained", "refused", and "never will know" that were also excluded from the analysis.

3.5. Methodology

This section discusses the measure of the output variable, the price explanatory variable, and other variables used. It also examines the model specification and empirical methods applied in the analytical part.

3.5.1. Output Variable

Most observational studies (Barringer and Mitchell 1994; Blumberg et al. 2001; Feldman et al. 1997; Holmer 1984; Hosek et al. 1995; Merrill et al. 1985; Newhouse 1981; Rosett and Huang 1973; Royalty and Solomon 1999; Short and Taylor 1989; Welch 1986) typically use premium data or insurance claims as a measure of the demand for health care (e.g. expenditures or physical units of utilization) in their empirical analyses. We follow this approach in our study and use premium data as the measure of

the demand for health insurance. This method has its advantages as well as drawbacks. When compared to other measures (e.g. demand comparisons before and after a policy change), the approach utilizing the premium data offers the following advantages (Newhouse 1981):

- It is not ambiguous with respect to specifying the change in price, as the data usually include the information on the variation in coinsurance and deductible rates.
- In the case of employer-based health insurance, which generally includes large employers, insurance is exogenous (e.g., any self-selection bias is minimized).

On the other hand, some argue that the premium data do not provide any explicit welfare interpretation (Newhouse 1981).

Hence, this study follows the methodology used in the literature with respect to measuring demand for health insurance coverage. In other words, in this study the premium expenditure is used to define the demand for self-insured health plans. Specifically, the total premium per policyholder of self-insured medical and hospital plans that is available in the 1987 NMES data is used to construct the output variable which is expressed in the logarithmic form ($\log(I_i)$). Since self-insured coverage does not have any premium per se that is typical for traditional insurance, its suitable equivalent was constructed in the NMES data as the expected value of total funding per policy holder (U.S. Department of Health and Human Services. Agency for Health Care Policy and Research 1992). In other words, the total premium is specified as the

expected value of total funding of self-insured medical and hospital plans per policyholder.

The expected value of total funding per policyholder, in turn, was measured by a stepwise regression model that included actual values from approximately 1,300 questionnaires (U.S. Department of Health and Human Services. Agency for Health Care Policy and Research 1992). In particular, the following factors were used in the determination of the expected total funding per enrollee: the policyholder's contribution, his/her age and sex, covered health services, coverage for retirees, other fringe benefits provided, type of ownership (e.g., sole proprietorship, partnership, or corporation), the census region, industry, and unionization.

3.5.2. Price Explanatory Variable

The major variable of interest in our study is the price of employer's self-funded health coverage. In general, the price of insurance can't be defined as a premium because the premium itself contains average expense that the insurance holder would have to incur anyway (Phelps 2002). On the other hand, the price of insurance may be defined as "any markup above those expected benefits that the insurance company adds" or "the 'loading fee' of the insurance company above expected benefits" (Phelps 2002). More specifically, the "loading fee" includes the insurer's costs related to risk bearing and administration of insurance (e.g., processing claims, making appropriate payments that also depend upon the number and complexity of claims submitted). In other words, if the price of insurance would be equal to expected benefits then it would be "actuarially

fair" insurance (e.g., that would not charge for risk bearing and/or overhead costs), which would not be realistic because the conduct of insurance companies' operations is also associated with some costs, especially administrative costs.

This study follows the methodology used by Phelps (2002) with respect to defining the price of insurance as "the loading fee" that mostly relates to the administrative costs of insurance. Hence, in our specific context of self-insured health plans, the administrative costs associated with operating this type of health plans are recognized as their implicit price. Moreover, in order to determine a more adequate level of administrative spending, we express the administrative costs of self-insured coverage as a fraction of total benefits claims per enrollee. This measure is also used in the literature, for example by Thorpe (1992). In other words, the price of self-insurance is defined as the ratio of average administrative costs to total benefits claims per policyholder. In fact, administrative costs related to self-insured coverage[32] are substantial, as they are estimated to range between 5 to 12 percent of incurred benefits claims (Thorpe 1992), depending on employers and the type of services purchased. Furthermore, since the price is usually a positive dollar amount and as such it may be expressed in a logarithmic form (a few observations with values equal to 0 were excluded because they did not represent plausible cases[33]).

[32] Administrative costs in self-insurance typically contain claims processing, claims review, accounting, computing, and consulting.

[33] An alternative version of the model was considered that did not exclude values equal to 0 for the price variable. In this variation, ln(price) was generated by transforming the price in the following way: log(0.000000001+price). Since the obtained results were similar to those that did not include 0 values for the price variable, they were not reported here.

Moreover, following previous literature findings (Manning et al. 1980; Manning and Phelps 1979; Newhouse and Phelps 1976; Phelps and Newhouse 1972; Royalty and Solomon 1999), the interaction term between the price elasticity and the income is also considered in order to test the variations of the self-insurance price responsiveness for different income groups (low vs. high income individuals). In particular, the median family income estimated as $31,812 is used as the criterion for setting the low vs. high income to be applied in the interaction term with the price elasticity. In other words, it is defined as ln(Price)*lowIncome where lowIncome=1 if Income<31,812 and lowIncome=0, otherwise.

3.5.3. Other Explanatory Variables

Among other control variables, demographic, geographic, socioeconomic status (SES), and employer characteristics were included (see Table 5 for their summary) in the predicted models (described in the following section).

Specifically, the demographic control variables consist of sex (as a binary variable with 1 if male), age (expressed in years), including its squared term (to allow for a diminishing character of age), and race (Hispanic, Black, White whereas White is an omitted control variable). On the other hand, the vector of geographic variables takes into account four main regions according to the U.S. region specification (Northeast, Midwest, South, and West, with West as an omitted control variable). Next, in terms of the socioeconomic status characteristics, the policyholder's total family income (at last

interview) expressed in $1,000s and his/her highest education level completed (defined in years) are considered.

Furthermore, the other group of explanatory variables is the vector of employer's control variables that include union, firm size, and employer's organization type. In particular, the union variable is expressed as a percentage of all employees who are members of a union at an establishment. On the other hand, the size of a company is measured as the total number of employees at its particular location and is expressed in the logarithmic form. Finally, the employer organization form accounts for profit, non-profit, government and other, where the last one is an omitted variable.

3.5.4. Applied Models and Techniques

The empirical analysis uses ordinary least squares (OLS). Specifically, the lognormal model is applied, as it is suggested by the variance stabilization techniques such as the Box-Cox and the coded groups' methods. The methods used here as well as robust standard errors also imply that heteroskedasticty is not an issue (Draper and Smith 2001; Wooldridge 2002).

Specifically, in order to test the sensitivity of the obtained results, five specifications of the model were chosen:

- (1) OLS results with the price variable only;
- (2) OLS output with the price, demographic, and geographic control variables;
- (3) OLS results with the price, demographic, geographic, and socioeconomic status independent variables;

- (4) OLS results with the price, demographic, geographic, socioeconomic status, and employer characteristics control variables;
- (5) OLS outcomes with the price, demographic, geographic, socioeconomic status, employer specific, and the interaction term between the price elasticity and the low income (vs. high income) explanatory variables.

Thus, the applied specifications of the model are expressed in the following ways:

(1) $\log (I_i)=\alpha+\beta_1 \log(PRICE)+\mu$,
(2) $\log (I_i)=\alpha+\beta_1 \log(PRICE)+\beta_2 Demographic+\beta_3 Geographic+\mu$,
(3) $\log (I_i)=\alpha+\beta_1 \log(PRICE)+\beta_2 Demographic+\beta_3 Geographic+\beta_4 SES+\mu$,
(4) $\log (I_i)=\alpha+\beta_1 \log(PRICE)+\beta_2 Demographic+\beta_3 Geographic+\beta_4 SES+\beta_5 Employer+\mu$,
(5) $\log (I_i)=\alpha+\beta_1 \log(PRICE)+\beta_2 Demographic+\beta_3 Geographic+\beta_4 SES+\beta_5 Employer+ \beta_6 \log(PRICE)*lowIncome+\mu$,

where I_i=total premium (defined as the expected total funding of self-insured health coverage). Finally, μ stands for the unobservable error associated with an individual.

Even though self-insured coverage mostly pertains to large employers and therefore "any self-selection is minimal" (Newhouse 1981), we should still be concerned about possible endogeneity of workforce in our data. This may happen when employers set up their compensation packages in response to expected preferences for health insurance benefits of individuals they want to hire. Equally likely, employees may respond to employers' compensation packages. Thus, if workforce composition is endogenous in our models, then it is not possible to determine the direction of the causality. Instrumental variables estimation could be used to control for the presence of

endogenous selection and also for possible reverse causation. However, due to lack of adequate instruments in our data, we were not able to use this technique.

3.6. Study Sample Characteristics

The sample applied in the empirical analysis consists of 815 policyholders of self-insurance group in models (1) and (2) and of 399 individuals in models (3)-(5).[34] The summary statistics and frequencies were calculated based on the second sample of 399 holders of self-insured health plans (e.g., the sample accounting for more control variables). Specifically, Table 5 presents summary statistics and descriptions for all variables used in our models, including the dependent variable, and the frequency tables of categorical variables are listed in Table 14 in Appendix B.

The total premium of self-insured medical and hospital plans (specified as the expected value of total funding per policyholder) which was used in constructing the dependent variable has the mean of about $2,191 and the median of $2,076. Its values range from about $444 as the minimum to $6,650 as the maximum expected funding. On the other hand, the main variable under examination, the price defined as the ratio of administrative costs to total claims per enrollee is equal to 0.0004 on average whereas its minimum and maximum values equal to 0.002 and 0.09, respectively.

With respect to the demographic characteristics, approximately 59% of self-insured enrollees were males. The mean of the policy holder's age was approximately 44 years with the youngest individual being 17 and the oldest person being 86 years old. The

[34] The difference in the number of observations used in the models is due to missing values after the data on the employer related coverage were linked with the data on the household characteristics.

racial composition of the analyzed subset includes approximately 7% Hispanics, 14% Blacks, and 79% Whites. The distribution of employees' place of residence spanned the following geographic regions: 15% of them resided in the Northeast, 35% lived in the Midwest, 36% lived in the South, and 15% resided in the West.

When considering socioeconomic characteristics, an average policyholder's family income was equal to about $37,000, the poorest family had above $99,000 in debt, and the richest family earned approximately $225,000. Regarding educational status, an average enrollee of self-insured coverage completed the 8th grade (e.g., close to nine years of completed education), over 100 individuals (107 enrollees) did not have any education, and 16 policyholders had six or more years of college (e.g., the total of eighteen years or more of completed education).

When considering the employer specific control variables, the study sample included establishments with the mean of about 2,294 employees, the smallest firm size of one person, and the largest company of 10,000 or more individuals. Regarding the employer organization form, 79% of all establishments under examination were for profit firms, 10% represented non-profit organizations, 10% were government organizations, and the remaining 1% represented other or unknown organizational forms. Finally, the unionized employees on average represented approximately 30% of the company's total workforce, 186 firms did not have any union members at all, and eight companies had all of their employees unionized.

Table 5: Descriptive Statistics of Variables in Self-Insured Health Plans

Variable	*Mean*	*Std Dev*	*Min.*	*Max.*	*Description*	*Format*
Price						
ADM.COSTS/ TOTAL CLAIMS	0.0004	0.005	0.002	0.09	Average administrative costs as a fraction of total claims incurred per enrollee	Proportion
Interaction Term						
ln(Price)* lowIncome	-5.426	5.579	-15.19	0	Interaction term between the price elasticity and the income level where lowIncome=1 if Income<31,812	ln(Price)* highIncome
Age	44.27	15.94	17	86	Age in the last round in 1987	Years
Male	0.59	0.49	0	1	Policy holder's (PH) sex	1-Male, 0-Female (omitted)
Race					White as reference	
Black	0.14	0.35	0	1	Policy holder's (PH) sex	
Hispanic	0.06	0.25	0	1	Policy holder's (PH) sex	
White	0.79	0.41	0	1	Policy holder's (PH) sex	
Geographic Region					The U.S. Census region of the PH's residence	
Northeast	0.15	0.36	0	1	Northeastern region	West (omitted)
Midwest	0.35	0.48	0	1	Midwestern region	West (omitted)
South	0.36	0.48	0	1	Southern region	West (omitted)
West	0.15	0.35	0	1	Western region	(omitted)
Family income	37.30	29.45	-99.38	225.33	The respondent's family income expressed in $1,000s	Numeric ($1,000s)
Education						
Education	8.87	5.96	0	18	PH's highest education completed expressed in years of education	Years
Employer organization type					Government as reference	
For profit	0.79	0.40	0	1	For profit organization	
Non-profit	0.09	0.29	0	1	Non-profit organization	
Government	0.09	0.29	0	1	State/local government	
Other	0.01	0.11	0	1	Other form	
Don't know	0.002	0.05	0	1	Unknown form	
Union	30.17	34.30	0	100	Union membership as a percentage of all employees at an establishment	Percentage

Total employment						
Total employment	2,293.85	3,020.13	1	10,000	Total number of employees at a particular location of an establishment	Numeric
Total Premium	2,190.83	1,314.06	444.52	6,650.44	Total premium of self-insured medical and hospital plans	Numeric ($)

Note: Note: The frequencies are based on 399 observations used in model specifications (3)-(5); PH=Policy Holder

3.7. Discussion

Table 6 reports the empirical outcomes from OLS that include the estimated parameters, p-values and robust standard errors of the demand for self-insured health coverage. These results are discussed below.

3.7.1. Price Elasticity Estimates

The major focus of this study is an empirical examination of the responsiveness of demand to changes in price. As such, the predominant variable under examination is the price variable. The specified log-linear demand model allows us to interpret the price variable directly in terms of the elasticity measure (which assumes the constant price elasticity across all illness events).

According to the obtained results, the estimates of the price elasticity of demand for self-insured health plans (PR1) range from -0.06 to -0.05 in models (1)-(3), and from -0.02 to -0.01 in models (4)-(5) (see Table 6 for exact measures in each of the models). These estimates can be also expressed as ranges (see Table 7) in order to make our results

directly comparable with other studies. Also, Figure 2 compares our values to previous results reported in the literature.

Thus, the price elasticity of demand is estimated to range approximately from -0.08 to 0.01 (in models (1)-(5)). In fact, the measures obtained for these models (e.g., the range between -0.08 to 0.01) correspond to the lowest range of earlier estimates, such as to those estimated by Short and Taylor (1989) (the estimate of -0.05), Barringer and Mitchell (1994) (their revised estimates ranging from -0.01 to -0.02), and Blumberg, Nichols, et al. (2001). However, the price elasticity variable is highly statistically significant in models (1)-(3) ($p_v<0.001$), but it is not once we account for employer's characteristics and the interaction term between the price elasticity and the income level in (4) and (5).

Hence, as predicted earlier, the obtained estimates of the price elasticity of demand for self-insured health plans in all the models specified accord well with most of previous findings, which also found that the price elasticity of demand for health insurance was less than 1 in absolute terms[35]. In other words, these estimates of the price elasticity of demand in self-insured health plans fall well within the range of previous results that were obtained in the case of health insurance in general, or for specific health plans other than self-insured coverage (such as HMOs).

[35] The studies by Feldman, Dowd et. al (1997) and Royalty and Solomon (1999) may be considered here as exceptions because they concluded that the price elasticities were above 1 in absolute terms.

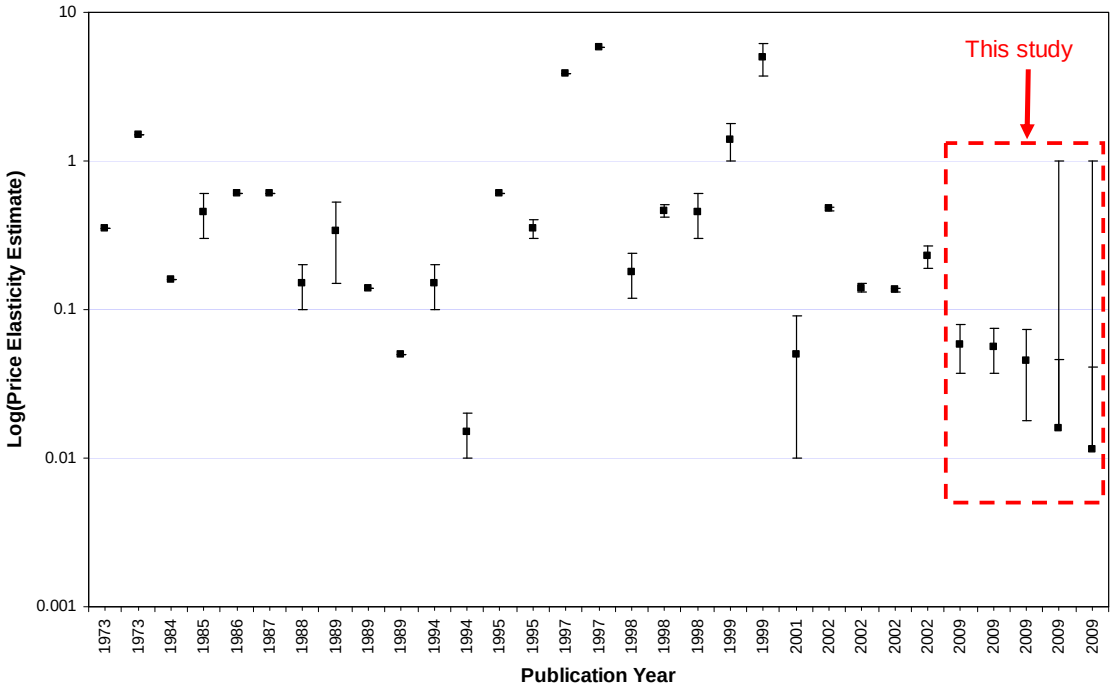

Figure 2: Estimates of the Price Elasticity of Demand of Self-Insurance vs. Other Health Plans in the Existing Literature.

The similarity of our results not only provides a relevant re-confirmation for those earlier measures but also demonstrates that the demand responsiveness to changes in price for self-insured health plans does not differ from estimates of other types of health insurance. Furthermore, the identified interaction of the price elasticity with the income level (in model (5)) has other implications. In particular, its effect is estimated to be -0.01 which may imply that low income people are less price sensitive than their high income counterparts (PR2) (e.g., the poor less sensitive to price than the rich). However, the variation between the price elasticity of demand and income level is only approaching statistical significance (p_v=0.101). Hence, this effect should be interpreted with caution especially in the light of the findings by others who also used the US data and concluded

that the data were inconclusive (Manning et al. 1980; Manning and Phelps 1979; Newhouse 1981; Newhouse and Phelps 1976; Phelps and Newhouse 1972).

3.7.2. Other Demand Factors

Some demographic characteristics also affect the employee's demand for self-insured health plans. In particular, female-male differentials are highly statistically significant across all model specifications (p_{value}=0.000) and their estimate is positive. This may suggest that demand for self-insured coverage is higher for males than for females. In addition, the age effect is also of statistical significance (p_{value}<0.05 in most of the models) implying that older individuals are expected have a higher demand for self-insured coverage as well; however, this effect diminishes over time (e.g., the squared term for age is negative and statistically significant in most model specifications). Our empirical findings do not suggest any statistically significant impact of race or geographical variations (the Midwest is statistically significant only in models: (2) and (3)). Similarly, our empirical findings do not provide evidence that socioeconomic status, such as policyholder's education or his/her family income, affect the demand for self-insured health plans.

Furthermore, among employers' characteristics, the unionization rate and the firm size have proven to be of a statistical significance, whereas an employer's organizational type has not. Specifically, the union membership is very statistically significant in each of output reported (p_{value}<0.001). Moreover, this relationship is positive, which implies that policyholders at establishments with a higher percentage of union members as

employees have a higher demand for group self-insurance by approximately 0.4%. This finding is consistent with the earlier empirical conclusions stating that insurance in general is favored by unionized employees (Buchmueller et al. 2002; Marquis and Long 2001).

3.8. Conclusions

This study investigated empirically the price elasticity of demand for self-insured health benefits provided by the employer. As such, this study extends the previous work to a new setting of self-insurance and compares obtained results to existing price elasticity measures.

Based on the results of our empirical analyses, we concluded that the estimates of the price elasticity of demand for self-insured health plans ranged from -0.01 to -0.06 (depending on the model). However, after extending the model to include the interaction effect between price elasticity and income level (high vs. low income), we found the price elasticity of demand to be approximately equal to -0.01. Even though this effect may imply that the poor are less sensitive to price than the rich, it is of a low statistical significance. Hence, we concluded that this result is inconclusive, similar to earlier literature (Manning et al. 1980; Manning and Phelps 1979; Newhouse 1981; Newhouse and Phelps 1976; Phelps and Newhouse 1972).

Table 6: OLS Results in Self-Insured Health Plans

y=ln(total premium)	(1)	(2)	(3)	(4)	(5)
ln(price)	-0.0579***	-0.0562***	-0.0453***	-0.0161	-0.0116
	(0.0107)	(0.0097)	(0.0139)	(0.0151)	(0.0151)
ln(price)*lowIncome					-0.0112*
					(0.0068)
Age		0.0126*	0.0216**	0.0219**	0.0217**
		(0.0067)	(0.0101)	(0.0096)	(0.0095)
Age^2		-0.0001	-0.0002*	-0.0002**	-0.0002**
		(0.0001)	(0.0001)	(0.0001)	(0.0001)
Male		0.5693***	0.5917***	0.5177***	0.5147***
		(0.0384)	(0.0556)	(0.0547)	(0.0546)
Race					
Hispanic		0.0946	0.0772	-0.0382	-0.0309
		(0.0820)	(0.1108)	(0.0973)	(0.0958)
Black		-0.0085	0.1046	0.0634	0.0691
		(0.0499)	(0.0788)	(0.0724)	(0.0728)
Region (West as the reference)					
Northeast		-0.0005	0.0378	-0.0115	-0.0171
		(0.0649)	(0.0975)	(0.0993)	(0.0993)
Midwest		0.1413**	0.1851**	0.0842	0.0840
		(0.0582)	(0.0859)	(0.0835)	(0.0827)
South		-0.0528	-0.0293	-0.0193	-0.0273
		(0.0572)	(0.0885)	(0.0839)	(0.0841)

Family income (in 1000s)			0.0000	0.0000	0.0000**
			(0.0000)	(0.0000)	(0.0000)
Education (in years)			0.0023	0.0030	0.0028
			(0.0047)	(0.0045)	(0.0044)
Employer organization type	**(government as the reference)**				
Non-profit				-0.1336	-0.1280
				(0.1200)	(0.1205)
For-profit				0.0377	0.0499
				(0.0873)	(0.0886)
Other				-0.0164	-0.0221
				(0.1470)	(0.1425)
Don't know				-0.0748	-0.1017
				(0.1359)	(0.1382)
Union (%)				0.0045***	0.0044***
				(0.0009)	(0.0009)
ln(total employment)				0.0264*	0.0267*
				(0.0154)	(0.0155)
Constant	6.8728***	6.1316***	5.9660***	6.1106***	6.0546***
	(0.1171)	(0.1900)	(0.2855)	(0.2802)	(0.2831)
N	815	815	399	399	399
R^2	0.0342	0.3041	0.2897	0.3574	0.3625

Notes: Robust standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01 (2 tail test);

Table 7: Ranges of Estimates for the Price Elasticity of Demand in Self-Insured Health Plans across all Model Specifications

Price Elasticity *(95% Conf. Interval)*	***Model I***	***Model II***	***Model III***	***Model IV***	***Model V***
ln(Price)	[-0.079,-0.037]	[-0.075,-0.037]	[-0.073,-0.018]	[-0.046, 0.014]	[-0.041,0.018]
ln(Price)* lowIncome	[-0.025,0.002]				

The obtained estimates of the price elasticity of demand for self-insured health plans in all the models specified accord well with most of the previous literature, which also found the price elasticity of demand for health insurance to be inelastic. The similarity of our results not only provided a relevant re-confirmation for those earlier measures, but it also demonstrated that the demand responsiveness to changes in price for self-insured health plans did not differ from estimates of other types of health insurance. Moreover, the magnitude of the price elasticity suggests that there is no place for price competition in the health insurance market.

Our empirical analyses also identified other factors having a positive impact on the employee's demand for self-insured health plans: age, sex (male), regional variation, unionization, and the size of an establishment. On the other hand, such factors as race, family income, education, and employer organization type do not have any impact.

Future research may extend these analyses by considering several additional factors, such as other labor market characteristics. Moreover, it could re-examine the subject of the employee's demand for group self-insurance in the light of the most recent

data, if those would be available. Provided appropriate data, the instrumental variable estimation could also be applied to test and control for a potential endogeneity problem that could be compared against the benchmark OLS model.

4. THE EFFECTS OF HOSPICE OWNERSHIP AND CERTIFICATION STATUS ON HOSPICE USE

4.1. Introduction

In this study, we investigate the effects of behavioral differences regarding the ownership form and the certification status on the length of hospice service use. Both of these issues, for-profit versus nonprofit organizational forms and certified versus not certified status of hospice agencies, are highly relevant especially to policymakers, care providers, and patients because they have implications with respect to the access, cost and quality of health care provided.

In recent years, much attention has been focused on the ownership form of hospices, mainly due to the fact that for-profit ownership of hospices has grown rapidly. In fact, the number of for-profit hospice (Medicare-certified) organizations has increased nearly 300% from 1992 to 1999, whereas the number of corresponding nonprofit organizations has risen 43% during the same period (General Accounting Office, 2000). This observation has become a starting point for this study, as we were interested in explaining differences between for-profit and nonprofit forms of hospices and the impact of the hospice certification status on the length of service use.

The existing empirical literature provides contradictory results regarding the differences between for-profit versus nonprofit organizational forms of hospices. Some

findings imply the differential behavior across the ownership types (Carlson et al. 2004; Christakis and Escarce 1996; Foliart et al. 2001; Lindrooth and Weisbrod 2007; Ohri 2007) whereas others do not (Hamilton 1994; Lindrooth and Weisbrod 2007; Ohri 2007). Our approach builds mostly on the work of Christakis and Escarce (1996) and Ohri (2007) and examines the behavioral differences with respect to the length of service use. Moreover, similarly to Lindrooth and Weisbrod (2007), we hypothesize that based on the U-shaped cost function, hospices may be inclined to maximize the duration of the patient's intermediate days in order to maximize their profits. Specifically, we investigate whether for-profit and nonprofit hospices behave differently with respect to "short-stay" versus "long-stay" patients and whether there is a selection bias towards patients with the longest expected service use.

This study extends the previous research in several directions. First, it accounts for other potential factors that may impact the length of hospice service use which have not been studied previously in this context, such as payment sources, caregiver status, and referral sources. Second, it uses more detailed non-neoplasm (i.e., non-cancer) type diagnoses at admission whereas other studies mostly focused on neoplasm diagnoses, by either accounting for the percentage of cancer patients (Ohri 2007), or including detailed neoplasm type diagnoses (Lindrooth and Weisbrod 2007; Ohri 2007). Both of these factors provide more complete models than found in literature. Further, this study also provides more advanced statistical methodology utilizing three model specifications: the negative binomial regression, the ordinary least squares (OLS), and the logistic estimations. All of these models provide additional robustness checks, which result in

improved reliability and accuracy of reported results. Finally, our work utilizes the 1998 and 2000 National Home and Hospice Care Survey (NHHCS) data. These are more recent, detailed, on the patient-level, and nationally representative compared to the data applied in the other studies.

The other objective of this study includes examination of the impact of hospice certification on the patients' length of service use. The certification status of hospice organizations is highly relevant for hospice care providers because based on the policy in place they cannot be reimbursed through the Medicare Hospice Benefit if they are not certified. However, to our knowledge, this issue has not been studied much, except for the paper by Hamilton (1993).

In contrast, numerous studies have been done in other fields on the effects of certification, such as in education (Goldhaber and Brewer 1997; Goldhaber and Brewer 2000; Qu and Becker 2003; Walsh 2001). These findings, however, have been inconclusive, with an exception of certification in mathematics which associated certification with higher student achievements in mathematics (Goldhaber and Brewer 2000). Thus, this study attempts to bridge this gap by studying the impact of certification on the length of hospice use. In addition, some other factors that may determine patients' service use in the hospice are documented.

The chapter is organized as follows. First, the background section introduces hospice care and the Medicare Hospice Benefit in general. Next, the theory on for-profit and nonprofit organizations is discussed and followed by a literature review of empirical findings relevant to hospice agencies, including the impact of certification in the context

of quality improvement. Further, the data source and the sample studied are introduced together with the methodology used in this study. Finally, empirical results are reported and discussed detail.

4.2. Background

4.2.1. Hospice Care and Medicare Hospice Benefit

Hospices provide palliative care to the terminally ill that focuses on pain management rather than curative treatments (Gage et al. 2000). In addition, hospice care is offered by a multidisciplinary team that cares not just for the physical needs of patients, but also for their psychological and spiritual needs (General Accounting Office 1979; National Hospice and Palliative Care Organization 2008). The offered services include skilled nursing care, social services, bereavement counseling, physician services, home health aide services, therapy, inpatient respite care, medical appliances, and supplies (Gage et al. 2000; Medicare Payment Advisory Commission (Medpac) 2004; Medicare Payment Advisory Commission (Medpac) 2008; National Hospice and Palliative Care Organization 2008).

A patient is eligible for hospice services under Medicare policies if he/she is certified by a physician and the hospice medical director of having a terminal disease with life expectancy of six months or less (Medicare Payment Advisory Commission (Medpac) 2008). The patient needs to be recertified again after 90 days (Medicare Payment Advisory Commission (Medpac) 2008). Patients are usually admitted to hospices through referrals from other long-term care facilities and physicians.

The Medicare program is the dominant payer for the provision of hospice care. However, hospices may also be reimbursed by other sources, such as patients' private health insurance policies or self-payment. However, these alternate sources usually do not cover all the costs incurred; thus, the Medicare Hospice Benefit is the domiant source of income for hospices (Zandbergen et al. 1990). The Medicare Hospice Benefit reimburses on a fixed per diem basis regardless of the patient's diagnosis, the duration of the patient's enrollment in the hospice program, or the type, volume or intensity of services provided (Gage et al. 2000; Medicare Payment Advisory Commission (Medpac) 2004; National Hospice and Palliative Care Organization 2008). The Medicare reimbursement scheme uses four payment categories that reflect different levels of care to account for expected variations in their input cost. The fixed payment rates are adjusted by the hospital wage index to account for geographic cost differentials.

Those four payment fees reflect the following general levels of care:

- *Routine home care:* Patients are provided with hospice care at their residence: at home or in a nursing facility. Typically, they receive less than eight hours of care a day, This routine home care accounts for approximately 95 percent of all days hospice services are provided (National Hospice and Palliative Care Organization 2004). In fiscal year 2004, a national fee for this category of care was $118 per day (Medicare Payment Advisory Commission (Medpac) 2004).
- *Continuous home care:* This level of care is delivered only during short periods of crisis and only if it is required for ill patients to stay home. It mainly consists of nursing care, and sometimes also of home health aides or homemaker services.

Continuous home care accounts for 1 percent of patients' days in hospice care (National Hospice and Palliative Care Organization 2004). It is reimbursed by the Medicare on an hourly basis and its national payment rate for 24 hours a day was $689 in year 2004 (Medicare Payment Advisory Commission (Medpac) 2004).

- *General inpatient care:* Patients are provided with general inpatient care in an inpatient facility (e.g., a hospital, skilled nursing home, or hospice facility), as their acute conditions cannot be managed in home setting. This payment category accounts for 4 percent of patients days in hospice programs (National Hospice and Palliative Care Organization 2004). In 2004, its national reimbursement rate was $525 per day, which also covered the inpatient facility charges. (Medicare Payment Advisory Commission (Medpac) 2004).
- *Inpatient respite care:* This level of care is delivered on a short-term basis and is aimed to provide a relief for the patient's caregiver. The reimbursement covers five consecutive days per benefit period at the maximum. Inpatient respite care accounts for less than 1 percent of patient care days in hospice (National Hospice and Palliative Care Organization 2004). Medicare's national payment rate was $122 per day in year 2004 (Medicare Payment Advisory Commission (Medpac) 2004).

Although hospices are confronted with linear revenue function, their cost function is not linear. Hospice costs vary by the marginal day of care (U-shaped cost structure): patients are most expensive in the first and last days of care and significantly less costly during intermediate days (Carney et al. 1989; Huskamp et al. 2001). The costs are high

in the first days because hospice personnel must learn about physical and emotional needs of a patient and his/her family and incorporate them into a hospice care plan.

Hence, similarly to Lindrooth and Weisbrod (2007), we hypothesize that based on the U-shaped cost function, hospices have an incentive to make the intermediate days profitable by maximizing their duration. They may do so by selecting patients based on their expected lengths of their stay (predicted by their diagnosis at admission) because patients with lower expected costs are more profitable under this reimbursement system. In other words, in order to maximize their profits, hospices may be inclined to select patients with the longest expected service use, i.e., with the highest expected number of intermediate days.

4.3. Literature Review

4.3.1. Theory of For-Profit and Nonprofit Organizations

A major difference between nonprofits and for-profits is argued to be their legal status (Clarke and Estes 1992; Estes and Alford 1990; Powell and Friedkin 1987; Steinberg 1987). In particular, in contrast to for-profits, nonprofits enjoy large public tax subsidies, such as exemptions from taxes on corporate profits, property taxes, sales, and donations at the federal, state, and local levels (Frank and Salkever 1994; Hansmann 1987). In addition, not-for-profit organizations are subject to the "nondistribution constraint", which forbids nonprofit organizations from distributing their profits to owners or other persons being in conduct of the enterprise (Hansmann 1987). This

constraint largely "affects a firm's role or behavior" and thus, creates the base of the economic theories of nonprofit institutions (Hansmann 1987).

There are several behavioral models of nonprofit organizations in the economic literature that suggest either systematic differences (Alchian and Demsetz 1972; Lindrooth and Weisbrod 2007) or no differences (DiMaggio and Powell 1983; Weisbrod 1988) between for-profit and nonprofit institutions that may have an impact on the length of service use or patient stay. Some of them are complementary; others are more competitive in nature. Below, we outline a few theoretical models that are relevant in the context of this research.

One theory of not-for-profit organization, as put forth by Weisbrod (1988), predicts no systematic differences across ownership forms by stating that nonprofits are "for-profits in disguise." In other words, the nondistribution constraint is not enforced properly, so that nonprofit institutions take advantage of it by maximizing their private profits, which then contributes to higher managerial compensation. Thus, according to the model by Weisbrod (1988), nonprofit institutions behave similarly to for-profit firms.

Another theory is the theory of organizational isomorphism (DiMaggio and Powell 1983), which implies homogeneity of organizations with respect to their ownership types. In particular, it states that under the clearly structured payment system, both for-profits and nonprofits should behave similarly. This organizational isomorphism of organizations is a result of various structural processes that may happen either through political influence (e.g., coercive isomorphism), a response to uncertainty (e.g.,

modelic/mimetic isomorphism), or establishment of norms and standards (e.g., normative isomorphism).

In addition, the second part of this theory implies differential institutional behavior between for-profits and nonprofits. One such theoretical framework is formulated by Alchian and Demsetz (1972), who suggests that the nondistribution constraint leads to inefficiencies in not-for-profit institutions, as managers lack strong incentives to maximize profits. As such, managers may be more inclined to treat unprofitable patients.

Another instance suggesting different behavioral patterns across ownership forms consists of two goods: a "mission" good, M, and a profitable Revenue good, R (Lindrooth and Weisbrod 2007). According to this two-good model, the objective of the nonprofit organization is to serve public goals by maximizing provision of the M good, that is beneficial from the social point of view, but not profitable from the private point of view (such as treating unprofitable patients), being a subject to a budgetary break-even constraint. Presuming that the M and R goods are independent, the model predicts that both for-profit and not-for-profit institutions would tend to seek profitable patients with long stays (from R goods). However, for-profits would seek only long-stay patients and deny admission to unprofitable patients, whereas nonprofits would also care for unprofitable patients with short stays. In other words, nonprofit organizations would provide more M goods than their for-profit counterparts. Hence, the model by Lindrooth et al. (2007) implies that the distributions of patients would systematically differ across

the institutional types with respect to the length of stay, as nonprofits would be inclined to admit long stay patients rather than those with short stay.

4.3.2. Empirical Literature on For-Profit vs. Nonprofit Hospices

There have been numerous empirical studies investigating differences across the ownership types in a variety of industries, including those in health care. A few of them have examined the differential behavior between for-profit and nonprofit organizations in the hospice industry as well. Most of these studies found that for-profit hospices typically treat noncancer patients (Ohri 2007), offer less services (Carlson et al. 2004; Foliart et al. 2001), and admit less patients (Hamilton 1994) relative to nonprofit hospice agencies. For-profit hospices were also found to be more likely to treat patients with longer stays or expected stays (Christakis and Escarce 1996; Lindrooth and Weisbrod 2007; Ohri 2007), and admit patients with referrals from long-term facilities (Ohri 2007). On the other hand, no significant differences between for-profit and nonprofit hospices were found with respect to the operating cost of hospices (Hamilton 1994), quality (Hamilton 1994; Ohri 2007), and the timing of admission (Lindrooth and Weisbrod 2007).

Specifically, Carlson et al. (2004) employed the data from the 1998 National Home and Hospice Care Survey in their analysis. Their major conclusion was that patients at for-profit hospices obtained significantly less services than patients at nonprofit providers. Moreover, they found that bereavement services were less likely to

be provided by for-profit hospices than their nonprofit counterparts, which is also consistent with the conclusion reached by Foliart et al. (2001).

The research by Lindrooth et al. (2007) tested the timing of admission and the length of stay in for-profit and religious not-for-profit hospice programs. The population studied included hospice patients whose admissions were reimbursed by Medicare in 1993.[36] They did not find any significant differences in the timing of admission by disease type. However, they found evidence that, in contrast to nonprofit hospices, for-profit providers tend to admit more profitable patients who have longer expected stays (they also have fewer cancer patients). Similar conclusions were obtained by Christakis et al. (1996) who found that patients at for-profit hospices had longer survivals after enrollment than those at nonprofit providers[37]. In the latter case, Medicare claims data from 1990 were used.[38]

The study by Hamilton (1994) examined the hospice ownership in terms of hospice size, cost of hospice operation, and quality using the 1987 National Hospice Organization's (NHO) annual census data. She concluded that there were no significant differences in the overall operating cost of hospices[39] (specified twofold, as costs per patient and costs per day), and in quality (measured as the number of patients served, and the number of services received) between for-profit, nonprofit, and government-owned

[36] The dataset used was constructed from a few data sources, such as the hospice Standard Analytic (SAF), the Vital Status (VSF), and the Medicare Provider Analysis and Review (MEDPAR) files collected by the Centers for Medicaid and Medicare Services (CMS).
[37] However, the differential behavior across ownership type was not the main objective of this study.
[38] In particular, they applied the Standard Analytic File (SAF) for all Medicare patients who were enrolled in the hospice programs in 1990 in California, Florida, New York, Pennsylvania, and Texas, the Medicare Provider Analysis and Review file (MEDPAR), and Provider of Services (POS) file.
[39] They included expenses related to buildings, fixtures, employee benefits, and administration.

hospices. On the other hand, significant differences in hospice size (quantified as the number of patients served) were observed. In particular, she found that nonprofit hospices treated more patients than their for-profit counterparts, suggesting that "nonprofit hospices are patient maximizers, not profit maximizers in disguise who are aiming to circumvent the nondistribution constraint."

The study by Ohri (2007) tested behavioral differences across ownership forms in hospices with respect to patient selection and quality using a merged dataset of provider-level data on all California hospices that were Medicare licensed from 2002 to 2004 and data on quality deficiencies[40]. In particular, institutional differences in patient selection were examined through utilizing information on the length of stay, diagnoses at admission, and referral sources. In the context of the length of stay, Ohri inferred that patients with very long stay (longer than 180 days) have a higher probability to be cared for in for-profit hospices. In terms of patient selection by admission diagnosis, she found that non-cancer patients were most likely to be enrolled in for-profit hospices, as they were more profitable patients than their cancer counterparts. With respect to referral sources, she concluded that for-profit hospices were more likely to admit patients with referrals from long term facilities; whereas nonprofit hospices were more likely to treat patients referred by physicians (no difference in hospital referrals). As such, Ohri's study provided evidence that for-profit hospices select patients by the disease type, the length of stay, and referrals. However, the research is inconclusive with respect to drawing

[40] Specifically, she combined data from the California Office of Statewide Health Planning and Development (OSHPD) on all California hospices that were Medicare certified between 2002 and 2004 with data on quality from the Automated Certification and Licensing Administrative Information and Management Systems (ACLAIMS) of the California Department of Health Services.

inferences on quality that was tested in terms of staffing levels, the skill mix of the staff, and the quality citations (e.g., lower quality in for-profit providers was only weakly supported by the data).

The studies reviewed above provide relevant contributions to our understanding of the differences by ownership status in hospices. However, they also have their limitations. One shortcoming is the age of the data used in Hamilton (1994), Christakis et al. (1996), and Lindrooth et al. (2007), as their results may not necessarily be applicable to the current hospice market, which has undergone significant change during recent years. Another limitation of studies by Foliart et al. (2001) and Ohri (2007) is that the results cannot be considered as nationally representative because they relate only to California. Moreover, several studies omit key factors. For example, the work by Foliart et al. (2001) is limited to bereavement services only. Carlson et al. (2004) does not take into account the patient length of stay, which constitutes an important element in service utilization studies. Ohri (2007), on the other hand, used the data that are aggregated on the provider-level where patient-level data would be more appropriate.

4.3.3. Certification in the Context of Quality

A health care provider cannot be reimbursed by Medicare or Medicaid unless it conforms to all applicable requirements on the federal level, which is verified through the certification process (Center for Medicare & Medicaid Services 2004). According to the Health Care Financing Administration (1988), a certified hospice is required to directly provide the "core services", such as nursing care, medical social services, physicians'

services, and counseling services (bereavement, dietary, and spiritual) to those entitled to receive the Medicare Hospice Benefit. Moreover, it has also management responsibility for offering several "noncore services" to its patients (e.g., continuous home care, physical therapy, or high-tech services) (Smith et al. 2008). Since Medicare and Medicaid represent the largest sources of payment for the elderly, the certification status is highly relevant for health care providers, such as hospices. However, the above mentioned requirements imposed on certified hospices may suggest that the cost of certification is high to many hospice agencies.

Even though the subject of certification in the context of hospice care is so important, to our knowledge only the study by Hamilton (1993) addressed this issue. Specifically, it investigated a hospice's certification decision with respect to geographical variation of certification rates and the hospice's size. The main findings of this study were that certification is associated with a larger hospice's size and the reimbursement rates are an important determinant of a hospice certification decision. In other words, the participation in the Medicare Hospice program through certification allows hospices to serve more patients than otherwise if they were not certified. As a consequence, patients have a better access to hospice care and certified hospices receive an additional source of income.

On the other hand, in other areas not directly related to health care, e.g., in education, there has been substantial research done on the subject of certification. In particular, teacher certification has been studied as an indicator of quality and performance (mostly in terms of student achievement). The findings were typically

inconclusive with one major exception, namely the certification in mathematics. Goldhaber and Brewer (2000) showed that certification was associated with higher students' achievements compared to no certification or private certification. In contrast, they also showed that students taking English classes gained less from English teachers who were certified (where certification was considered without referring to any special subject) (Goldhaber and Brewer 1997). There is also a strong critique by Walsh (2001) who argues that the teacher certification is often counterproductive and "a leap of faith taken without benefit of supporting evidence" because it is "incapable of providing insight into a person's ability, intellectual curiosity, creativity, affinity for children, or instructional skills."

4.4. Data

This section introduces the data used in the empirical analyses reported in this chapter.

4.4.1. Data Source

In this study, the cross-sectional National Home and Hospice Care Survey (NHHCS) Series, Discharged Patient Data were used (U.S. Dept. of Health and Human Services. National Center for Health Statistics 1998; U.S. Dept. of Health and Human Services. National Center for Health Statistics 2000). The data was pooled from two years: 1998 and 2000. The NHHCS is a nationally representative sample of U.S. home health and hospice agencies and their current and discharged patients, which was conducted by the National Center for Health Statistics (Haupt 2003; Haupt and Jones

1999; U.S. Department of Health and Human Services. Centers for Disease Control and Prevention. National Center for Health Statistics 2003). The information about the sampling base for the NHHCS was obtained from mostly national organizations and other sources. For instance, in the case of the 2000 NHHCS data, the sampling frame consisted of the total of 15,451 agencies from which 1,800 home health and hospice agencies were chosen. The data on agency characteristics were collected through interviews with administrators whereas current patient and discharge data were obtained from interviewing staff who had access to medical records.

4.4.2. Study Sample

The study sample includes patients who were discharged dead from hospice agencies. Specifically, the sample considers those patients who only used hospice services (e.g., it excludes those who used services provided by home health agencies). Discharged Patient Data files were selected to be more suitable for the purposes of this study because they represent more complete episodes of care relative to current patients' data. Specifically, they provide information on patient characteristics during the 12 months before the day of the survey data collection, whereas current patient samples provide only partial information on patient characteristics (e.g., only valid at the time the survey was completed) (Han et al. 2007).

The study is restricted to patients who were deceased while using hospice care (either in their homes or in an inpatient setting) and who represent the vast majority of the discharged patients (approximately 88%). In other words, patients who were discharged

alive from the hospice[41] were excluded from the study cohort, as they may add some endogeneity if for-profit and nonprofit hospices act differently with respect to those groups of patients (e.g., patients who were discharged dead vs. those discharged alive). Thus, the final count of observations used in the analysis includes 3,704 patients who were discharged because they died while using hospice services (499 patients who were discharged alive were excluded from the sample).

4.5. Methodology

This section introduces the methodology used to investigate the ownership form and the certification status of hospices with respect to the length of service use. It describes the dependent and explanatory variables selected for statistical models applied in the empirical analyses.

4.5.1. Measure of Hospice Use as the Output Variable

The detailed information on the number, type, and duration of visits and services provided to patients would be best indicators of their hospice service use. However, it is not possible to use these measures, as hospice agencies are not yet required to report such data (Medicare Payment Advisory Commission (Medpac) 2008).

On the other hand, the length of service is "generally more clearly defined and measured than the number of visits to patients across different payment sources" (Han et al. 2007) and its measure is available in the 1998 and 2000 NHHCS data applied in this

[41] Those patients include those who were transferred to other institutions, recovered, their conditions stabilized, family or friends resumed care over them, or who were not eligible for services, did not need services any longer, moved out of area, and were discharged for another reason.

study. Hence, it is possible to examine the impact of ownership and certification status of agency on the length of hospice use. Moreover, the choice of the length of hospice use as the outcome variable also follows the methodology used by Christakis & Escarce (1996), Lindrooth & Weisbrod (2007), and Ohri (2007). Specifically, in this study the length of service use (LOS) is defined as the period of time from the date of the most recent admission to the date of discharge.

The length of service use is also critical to estimating the quality and cost of care provided to patients at the end of life (Christakis and Escarce 1996). Specifically, the duration of their survival while at hospice (both, short and long survival) may result in adverse economic consequences especially for payers and may lead to otherwise avoidable suffering of patients (Christakis 1994; Greer et al. 1986; Office of Research and Demonstrations 1994). As such, short patient survival may suggest either inadequate planning of a patient's health care or too late enrollment into the hospice program.

4.5.2. Ownership Form and Certification Status Explanatory Variables

The major variables under investigation are the type of hospice ownership FOR-PROFIT and the certification status CERTIFICATION (see their summary statistics in Table 8 and Table 9, and the corresponding frequency Table 15 and Table 16 in Appendix C). The main variable PROFIT indicates whether the organizational form of the agency is for-profit or nonprofit (defined as an omitted variable). On the other hand, the second variable studied CERTIFICATION denotes that the hospice is either certified,

not certified (as a reference), or other (i.e., either pending certification or unknown status).

Additionally, several specifications of the model (introduced below) allow for different slopes for small and large values of LOS with respect to the behavioral response of for-profit versus nonprofit hospices. In other words, it is hypothesized that the for-profit and nonprofit hospices may behave differently with respect to short-stay versus long-stay patients, which may be due to a selection effect. As such, for-profit and nonprofit hospice agencies may choose their patients based on their expected length of stay. Specifically, for-profit hospice providers may be more likely to admit more profitable patients who have longer expected stays, as that way they would maximize their profits (e.g., patients with lower expected costs and with longer expected stay are more profitable under the current reimbursement system). Following a similar rationale, if choosing among sicker patients, for-profit agencies may admit those individuals with a shorter expected stay because their treatment is more costly.

This possible selection effect is tested twofold: via an interaction effect INTERACTION between the ownership type PROFIT and longLOS in the OLS and the negative binomial models and via the logistic model.

4.5.3. Other Control Variables

Other explanatory variables used in the models (described below) include hospice and patient characteristics (their summary statistics are shown in Table 8 and Table 9 whereas frequency tables are reported in Table 15 and Table 16 Appendix C).

Specifically, the vector of hospice variables HOSPICE controls for various affiliations, location of care provided, and geographical variation. Affiliations provide the information whether a hospice agency is a member of a chain, or whether it is operated by a health maintenance organization (HMO), hospital, or nursing home (indicated by affiliated, don't know not affiliated, or where not affiliated is as an omitted variable). Next, location of care provided includes categories such as inpatient, in home, or other with inpatient as a reference. Further, HOSPICE controls also take into account geographic differences by including Census geographic regions (Northeast, Midwest, West, and South as an omitted variable) and metropolitan statistical area (MSA) indicator (yes, or no as a reference).

On the other hand, patient characteristics PATIENT include primary diagnosis upon admission, primary payment source, referral source, caregiver status, and demographic information such as age, sex, race, and marital status. In particular, primary diagnoses at admission follow the codes from the International Classification of Diseases, 9th Revision (ICD-9) (Public Health Service and Health Care Financing Administration 1991). The information on disease categories is more detailed compared to the previous literature in order to capture one's health condition upon admission more adequately. Thus, in addition to diagnoses such as cancer, Alzheimer's, pneumonia and influenza, diabetes, and ischemic heart conditions that were typically included in earlier papers (Carlson et al. 2004; Christakis and Escarce 1996; Ohri 2007), this study takes into account more disease categories. Specifically, 19 disease categories are used which can be grouped here into two strata: cancer- and non-cancer strata. The cancer stratum

contains all possible neoplasm types used in the ICD-9 (Public Health Service and Health Care Financing Administration 1991) within one variable denoted as cancer (e.g., lung, breast, bone, or urinary neoplasms). On the other hand, the non-cancer stratum consists of the remaining eighteen categories, such as HIV, diabetes, mental diseases, digestive, or cerebrovascular diseases where Alzheimer's is an omitted variable (see Table 9).

Next, primary payment sources include Medicare (an omitted variable), Medicaid, other government medical assistance, private insurance, own source for payment, military sources, no charge made, other payment source, and unknown or invalid sources. Other patient level variables consider various sources of referrals, such as self/family, nursing home, hospital, physician, health department, hospice, or friend. Moreover, the model also controls for the presence of a caregiver by including the categories: primary caregiver, no primary caregiver (an omitted variable), or don't know. The other category within patient characteristic accounts for age with the following categories: <18, 18-44, 45-64, 65-74, 75-84, ≥ 85, where 65-74 is defined as a reference age group. It also provides information on sex (female as a reference), race (native American, Asian, Black, other, don't know, and White as an omitted variable), and marital status (married, widowed, divorced, separated, unknown, or single as a reference). Finally, the year independent variable is also included in order to control for possible variations over time where year 1998 is a reference to year 2000.

4.5.4. Models and Estimation Issues

This section elaborates on the estimation techniques used which include the negative binomial regression, the OLS, and the logistic regression.

Negative Binomial Regression

LOS as the dependent variable represents the case of an event count and its distribution is skewed to the right (see Table 18 in Appendix C). Hence, it has a shape of the Poisson distribution. Since the data under examination exhibits over-dispersion (e.g., the mean does not equal the variance)[42], the classical Poisson regression model for count data is of a limited use. However, the negative binomial (NB) regression, which is a standard generalization of the Poisson model, is appropriate here, as it typically captures over-dispersion relatively well (Cameron and Trivedi 1998). Hence, the NB model with the heteroskedasticity-robust standard errors option is applied.

In addition to the main variables studied: the ownership form and the certification status, the general form of the LOS equation also controls for patient- and other hospice-level characteristics. Thus, the model may be expressed as follows:

$$LOS_i=\alpha+\beta_1 PROFIT_j+ \beta_2 CERTIFICATION_j+ \beta_3 HOSPICE_j+\beta_4 PATIENT_i+\mu$$

where

- LOS: length of service use (days);
- PROFIT: for-profit or not-for-profit form of hospice;
- CERTIFICATION: certified, not certified, or don't know if certified;

[42] The mean is approximately 55.84 and the variance is 17,153.79.

- PATIENT:
    - medical related MEDICAL: primary admission diagnosis and referral source;
    - primary payment source PAYMENT;
    - caregiver status CAREGIVER;
    - demographic information DEMOGRAPHIC;
- HOSPICE:
    - affiliations AFFILIATION;
    - location of care provided LOCATION;
    - geographical variation GEOGRAPHIC;
- YEAR: Year of the data used.

These variables are described in a more detail in Sections 4.5.1-4.5.3, Table 9, and Table 16 in Appendix C. The subscript $_i$ refers to a patient, $_j$ refers to a hospice, and μ for a random error term.

Specifications of NB models are shown below. In particular, the model (3a) is considered as a main reference model, whereas two other specifications are included as robustness checks.

(1a)

$$LOS_i=\alpha+\beta_1 PROFIT_j+\beta_2 CERTIFICATION_j+\beta_3 DEMOGRAPHIC_i+\beta_4 GEOGRAPHIC_j+\beta_5 YEAR+\mu$$

(2a)

$$LOS_i=\alpha+\beta_1 PROFIT_j+\beta_2 CERTIFICATION_j+\beta_3 DEMOGRAPHIC_i+\beta_4 GEOGRAPHIC_j+$$

β_5YEAR +β_6MEDICAL$_i$+β_7LOCATION$_j$+β_8CAREGIVER$_i$+β_9AFFILIATION$_j$+μ

(3a)

LOS$_i$=α+β_1PROFIT$_j$+β_2CERTIFICATION$_j$+β_3DEMOGRAPHIC$_i$+β_4GEOGRAPHIC$_j$+

β_5YEAR +β_6MEDICAL$_i$+β_7LOCATION$_j$+β_8CAREGIVER$_i$+β_9AFFILIATION$_j$+

β_{10}PAYMENT$_i$+ μ

Further, the variations of the NB model provided above are extended by the interaction term longLOS$_i$*PROFIT$_i$. In particular, longLOS is defined based on the median value of the predicted LOS, which is estimated from the OLS model by including only a patient's clinical characteristics (such as age, sex, race, and admission diagnosis). That means that the model predicting the median of LOS does not take into account organizational characteristics. The latter were not included because they may also impact LOS as they are more sensitive to outliers if those are present. Hence, the median of LOS predicted in this way provides a more clinically based rationale to define longLOS.

Using these assumptions, the median value of LOS was estimated to be 55 days (see Table 18 in Appendix C). Thus, this value was used as the criterion for selecting longLOS. In other words, longLOS=1 if LOS>55 days and longLOS=0, otherwise. The value was also used in the interaction term with the ownership type as longLOS* PROFIT in the following way (with (3b) as the other main reference model):

(1b)

LOS$_i$=α+β_1PROFIT$_j$+β_2CERTIFICATION$_j$+β_3DEMOGRAPHIC$_i$+β_4GEOGRAPHIC$_j$+

β_5YEAR+β_6*longLOS$_i$*PROFIT$_i$* +μ

(2b)

$LOS_i=\alpha+\beta_1 PROFIT_j+\beta_2 CERTIFICATION_j+\beta_3 DEMOGRAPHIC_i+\beta_4 GEOGRAPHIC_j+$

$\beta_5 YEAR+\beta_6 MEDICAL_i+\beta_7 LOCATION_j+\beta_8 CAREGIVER_i+\beta_9 AFFILIATION_j+$

$\beta_{10} longLOS_i*PROFIT_i+\mu$

(3b)

$LOS_i=\alpha+\beta_1 PROFIT_j+\beta_2 CERTIFICATION_j+\beta_3 DEMOGRAPHIC_i+\beta_4 GEOGRAPHIC_j+$

$\beta_5 YEAR+\beta_6 MEDICAL_i+\beta_7 LOCATION_j+\beta_8 CAREGIVER_i+\beta_9 AFFILIATION_j+$

$\beta_{10} PAYMENT_i+\beta_{11} longLOS_i*PROFIT_i+\mu$

Hence, the NB uses models (3a) and (3b) as main reference models and the remaining four models are considered as robustness checks for obtained results.

OLS Estimation

The Poisson distribution can be approximated well by a normal distribution, as the mean of LOS is not too small (close to 56 days). The reference model here is the log-linear ordinary least squares (OLS), as it is also suggested by the residual plots and the variance stabilization techniques such as the Box-Cox. These techniques as well as application of the OLS with the robust standard errors option account for potential heteroskedasticty problem.

The length of hospice service use LOS is modeled as described in 5.4.1:

$\ln(LOS_i)=\alpha+\beta_1 PROFIT_j+\beta_2 CERTIFICATION_j+\beta_3 HOSPICE_j+\beta_4 PATIENT_i+$

$(\beta_5 longLOS_i*PROFIT_i)+\mu$

Similarly to the NB regression, also six model specifications of the OLS were chosen in order to additionally test the robustness of obtained results. The specifications

are exactly the same as in Section 5.4.1., except for the dependent variable, which is now in the log functional form instead of a linear one. The model specifications (3a) and (3b) are used as main reference models:

(3a)

$$\ln(LOS_i)=\alpha+\beta_1 PROFIT_j+\beta_2 CERTIFICATION_j+\beta_3 DEMOGRAPHIC_i+\beta_4 GEOGRAPHIC_j +\beta_5 YEAR +\beta_6 MEDICAL_i+\beta_7 LOCATION_j+\beta_8 CAREGIVER_i+\beta_9 AFFILIATION_j+ \beta_{10} PAYMENT_i+\mu$$

(3b)

$$\ln(LOS_i)=\alpha+\beta_1 PROFIT_j+\beta_2 CERTIFICATION_j+\beta_3 DEMOGRAPHIC_i+\beta_4 GEOGRAPHIC_j +\beta_5 YEAR +\beta_6 MEDICAL_i+\beta_7 LOCATION_j+\beta_8 CAREGIVER_i+\beta_9 AFFILIATION_j+ \beta_{10} PAYMENT_i+\beta_{11} longLOS_i * PROFIT_i +\mu$$

Logistic Model

In addition to the interaction term included in the OLS and the NB regressions, a logistic model is used to test whether systematic selection of long LOS patients by for-profit hospices is an issue. In other words, the logistic model is applied to test the probability of treating long-stay patients by for-profit hospice agencies. The model applies longLOS as the dependent variable, which is defined in the same way as if used in the interaction term with the for-profit variable in the OLS and the NB regressions, i.e., longLOS=1 if: LOS>55 days and longLOS=0, otherwise.

Three specifications of the model were used with the same independent variable specifications as in the OLS and the NB regressions without the interaction term (e.g., specifications: (1a), (2a), and (3a)):

(1)

$$longLOS_i=\alpha+\beta_1 PROFIT_j+\beta_2 CERTIFICATION_j+\beta_3 DEMOGRAPHIC_i+ \beta_4 GEOGRAPHIC_j+\beta_5 YEAR+\mu$$

(2)

$$longLOS_i=\alpha+\beta_1 PROFIT_j+\beta_2 CERTIFICATION_j+\beta_3 DEMOGRAPHIC_i+ \beta_4 GEOGRAPHIC_j+\beta_5 YEAR+\beta_6 MEDICAL_i+\beta_7 LOCATION_j+\beta_8 CAREGIVER_i+ \beta_9 AFFILIATION_j+\mu$$

(3)

$$longLOS_i=\alpha+\beta_1 PROFIT_j+\beta_2 CERTIFICATION_j+\beta_3 DEMOGRAPHIC_i+ \beta_4 GEOGRAPHIC_j+\beta_5 YEAR+\beta_6 MEDICAL_i+\beta_7 LOCATION_j+\beta_8 CAREGIVER_i+ \beta_9 AFFILIATION_j+ \beta_{10} PAYMENT_i+ \mu$$

4.6. Study Population Characteristics

Table 8 and Table 9 present summary statistics of all variables also including the dependent variable used in the analysis as well as their descriptions. Frequency tables of categorical variables are listed in Table 15 and Table 16 in Appendix C.

The sample studied consists of 3,704 individuals who used health care services of hospices that were located in different geographic regions in the U.S. In terms of the main factors under examination, the majority of hospice agencies in the sample were nonprofit (approximately 77%) and a vast majority of them were certified (over 94%) (about 5% of them were not certified and in the remaining cases the certification was either pending or its status was unknown).

The mean of the patients' length of service use was about 56 days, whereas its median was equal to 19 days. Patients at for-profit agencies have longer stays than their corresponding nonprofit agencies by approximately 13 days,[43] on average (see Figure 3). On the other hand, the length of stay of patients at certified services is shorter than of those at not certified hospices by about 63 days, on average[44] (see Figure 4).

[43] Mean length of service use for patients at for-profit hospices was approximately 66 days and of those at nonprofit hospices was 53 days on average.

[44] The mean of length of service use for patients at certified hospices was 53 days and 116 days for those at not certified agencies (and 22 for those at agencies with unknown certification status).

Table 8: Summary Statistics of Organizational Characteristics, National Home and Hospice Care Survey (1998 and 2000).

Variable	Mean	Std Dev	Description	Format
Agency Ownership			***Type of agency ownership***	
PROFIT	0.23	0.42	For-profit/ proprietary	Nonprofit (ref.)
Interaction Term				
longLOS*PROFIT	0.06	0.23	Where longLOS=1 if LOS>55	shortLOS*Non-profit (omitted)
CERTIFICATION			***Certification status***	
Certified	0.95	0.22	Either by Medicare, Medicaid, or both	Not certified (ref.)
Not certified	0.04	0.20	Not certified	Omitted
Don't know	0.006	0.08	Don't know if certified	Not certified (ref.)
Chain Affiliation			***Agency as a member of a group***	
Yes	0.43	0.50	Chain affiliated	No (ref.)
No	0.55	0.50	Not chain affiliated	Omitted
Don't know	0.02	0.15	Unknown status	No (ref.)
HMO-based Agency			***Agency operated by a HMO***	
Yes	0.02	0.13	HMO-based agency	No (ref.)
No	0.97	0.17	Not HMO-based agency	Omitted
Don't know	0.01	0.09	Unknown status	No (ref.)
Hospital-based Agency			***Agency operated by a hospital***	
Yes	0.23	0.42	Hospital-based ag.	No (ref.)
No	0.74	0.44	Not hospital-based ag.	Omitted
Don't know	0.02	0.14	Unknown status	No (ref.)
Nursing Home-based Agency			***Agency operated by a nursing home***	
Yes	0.01	0.10	Nursing home-based ag.	No (ref.)
No	0.98	0.12	Not nursing home-based ag.	Omitted
Don't know	0.004	0.07	Unknown status	No (ref.)
Location of hospice care				
In home	0.71	0.45	In the home/residence	Inpatient (ref.)
Inpatient	0.13	0.34	Inpatient	omitted
Other	0.15	0.36	Other location than above	Inpatient (ref.)
Census Region			***The U.S. Census region***	
Northeast	0.11	0.32	Northeastern region	South (omitted)
Midwest	0.27	0.45	Midwestern region	South (omitted)
West	0.18	0.39	Western region	South (omitted)
South	0.43	0.49	Southern region	Omitted variable
MSA	0.65	0.48	***Metropolitan statistical area***	1 if YES, 0 if NO (omitted)

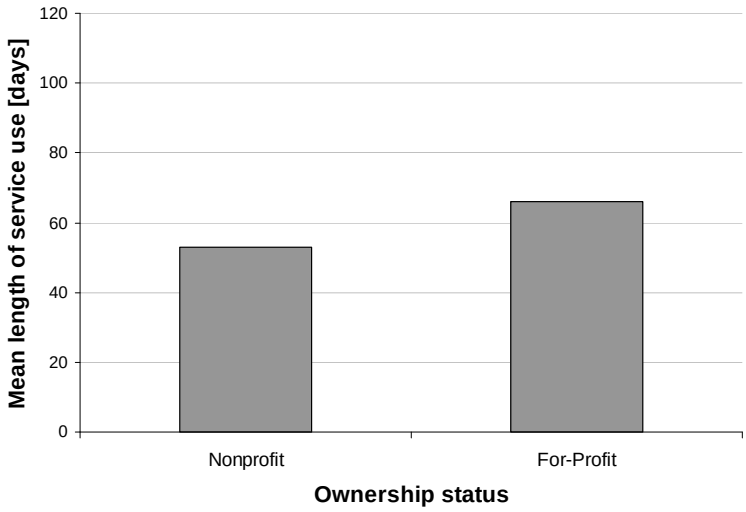

Figure 3: Mean length of service use by the ownership status

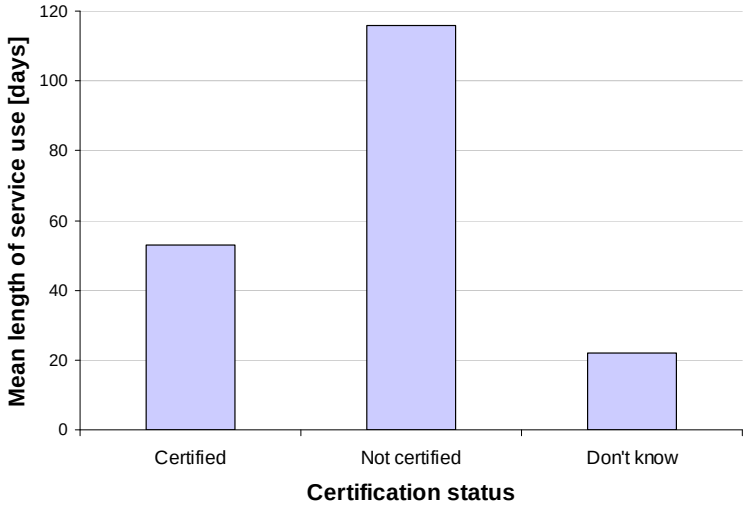

Figure 4: Mean length of service use by the certification status

Other organizational characteristics considered are affiliations and geographical characteristics. With respect to various affiliations, approximately 57% of hospices were chain affiliated, nearly 2% of them were HMO-based, about 23% of them were hospital-based, and only about 1% of them were nursing-home based. The vast majority of care

took place in patients' homes (approximately 71%) and 13% of care was provided inpatient (the remaining about 16% is other location for care than above). In terms of geographical location of hospice agencies, approximately 43% of them were located in the South, 18% in the West, 27% in the Midwest, and 11% in the Northeast, and the majority (about 65%) was located in metropolitan statistical areas.

The variables measuring individual characteristics include primary admission diagnosis, primary payment source, referral source, caregiver source, and demographic information. Most of patients admitted had a type of cancer as their primary diagnoses (about 64%). The most representative among the noncancer diagnoses were the following: congestive heart failure (CHF) (about 5%), chronic obstructive pulmonary disease (COPD) (about 4%), and cerebrovascular disease (about 4%). In terms of primary payment source, the dominant payment source was Medicare (approximately 77%), followed by private insurance (about 11%), and Medicaid (about 5%). Patients are mostly referred to hospices by physicians (about 53%), hospitals (about 19%), self or family (about 11%), and nursing homes (9%). Most patients have primary caregivers (about 94%). In terms of demographic characteristics, the average age of a hospice patient was approximately 73 years and the age group 75-84 was the most prevalent (about 29%), whereas among the youngest hospice patients, there were only 14 patients below 18 years of age. On average, 47% of patients were males; thus, the sex distribution was relatively even. With respect to the racial composition of the analyzed sample, Whites were the dominant group (86%), followed by Blacks (7%). Further, most patients were either married (49%) or widowed (34%).

Table 9: Patient-Level Characteristics, National Home and Hospice Care Survey (1998 and 2000).

Variable	Mean	Std Dev	Description	Format
DEPENDENT VARIABLE:				
Length of service (LOS) [45]	55.84	130.97	Length of hospice service use: the period of time from the date of the most recent admission to the date of discharge	Numeric (days)
EXPLANATORY VARIABLES:				
Admission Diagnosis			***Primary diagnosis at admission (Alzheimer's is a reference)***	
Cancer	0.64	0.48	Various types of neoplasms (e.g., of breast, lung, bones, etc)	
HIV	0.01	0.10	HIV disease	
Diabetes	0.005	0.07	Diabetes disease	
Mental	0.03	0.17	Mental disorders	
Parkinson's	0.009	0.09	Parkinson's disease	
Other nervous	0.008	0.09	Other diseases of the nervous system and sense organs	
Ischemic heart	0.004	0.06	Ischemic heart disease	
CHF	0.05	0.22	Congestive heart failure (CHF)	
Other heart	0.03	0.16	Other forms of heart disease	
Cerebrovascular	0.04	0.20	Cerebrovascular disease	
Pneumonia and influenza	0.002	0.04	Pneumonia and influenza	
COPD	0.04	0.20	Chronic obstructive pulmonary disease (COPD) and allied conditions	
Digestive	0.02	0.13	Diseases of the digestive system	
Genitourinary	0.02	0.15	Diseases of the genitourinary system	
Symptoms	0.03	0.18	Symptoms, signs and ill-defined conditions	
Supplementary	0.003	0.05	Supplementary classification of factors influencing health status and contact with health services	
Alzheimer's	0.02	0.15	Alzheimer's disease	omitted
Other diagnoses	0.03	0.17	Other types of diagnoses, not specified above[46]	

[45] The lowest value of LOS is 1 day, the maximum of LOS is equal to 3,297, and its median is 19 days.

[46] Those include the following, as defined in the International Classification of Diseases, 9th Revision: infectious and parasitic diseases except HIV; endocrine, nutritional, and metabolic diseases and immunity

Primary Payment Source			***Expected source of primary payment (Medicare is a reference)***	
Medicare	0.77	0.42	Medicare hospice, or Medicare HMO, or Medicare fee for service for hospice care.	Omitted
Medicaid	0.05	0.21	Medicaid hospice, or Medicaid privately insured, or Medicaid fee for service for hospice care.	
Other government	0.001	0.03	Other government medical assistance	
Private insurance	0.11	0.31	Private insurance	
Own payment	0.005	0.07	Own source for payment including: own income, family support, social security and supplementary security income, religious organizations, foundations, and agencies	
Military	0.006	0.07	Military sources such as: Veterans Administration, CHAMPVA/CHAMPUS, and other military medicine	
No charge	0.02	0.14	No charge made for obtained care	
Other payment source	0.03	0.18	Other payment source	
Blank/ invalid	0.004	0.06	Unknown or invalid	
Referral Source			***1 if YES, 0 if NO (omitted)***	
Self/ Family	0.11	0.32	Referred by self or family	
Nursing home	0.09	0.29	Referred by a nursing home	
Hospital	0.19	0.39	Referred by a hospital	
Physician	0.53	0.50	Referred by a physician	
Health department	0.003	0.05	Referred by a health department	
Social service agency	0.03	0.17	Referred by a social service ag.	
Home health agency	0.04	0.19	Referred by a home health ag.	
Hospice	0.02	0.14	Referred by a hospice	
Religious org.	0.0005	0.02	Referred by a religious org.	
HMO	0.005	0.07	Referred by a health maintenance organization	

disorders other than diabetes; diseases of blood and blood-forming organs; acute rheumatic fever; chronic rheumatic heart disease; hypertensive disease; diseases of pulmonary circulation; diseases of arteries, arterioles, and capillaries; diseases of veins and lymphatics, and other diseases of circulatory system; acute respiratory infections; other diseases of upper respiratory tract; pneumoconioses and other lung diseases due to external agents; other diseases of respiratory system; complications of pregnancy, childbirth, and the puerperium; diseases of the skin and subcutaneous tissue; diseases of the musculoskeletal system and connective tissue; congenital anomalies; certain conditions originating in the perinatal period; injury and poisoning; supplementary classification of external causes of injury and poisoning.

Friend	0.01	0.11	Referred by a friend, or neighbor	
Other	0.02	0.15	Referred by other person, or institution	
Don't know	0.01	0.12	Unknown referral source	
Caregiver status			***No primary caregiver is a reference***	
Primary caregiver	0.94	0.24	Has a primary caregiver	
No primary caregiver	0.05	0.22	Does not have a primary caregiver	Omitted
Don't know	0.01	0.08	Don't know the primary caregiver	
Age			***Age at admission (years), 65-74 is a reference***	
< 18	0.004	0.06	Less than 18 years of age	
18-44	0.03	0.18	Age group: 18-44	
45-64	0.18	0.38	Age group: 45-64	
65-74	0.25	0.43	Age group: 65-74	omitted
75-84	0.29	0.45	Age group: 75-84	
≥ 85	0.22	0.41	85 or more years of age	
Sex			***Female is a reference***	
Male	0.47	0.50	Patient's sex: male	
Race			***White is a reference***	
Native American	0.008	0.09	American Indian or Alaska Native and Native Hawaiian or other Pacific Islander	
Asian	0 .006	0.08	Asian	
White	0.86	0.34	White	omitted
Black	0.07	0.25	Black or African American	
Other	0.003	0.06	Other race	
Don't know	0.05	0.22	Don't know	
Marital Status			***Single is a reference***	
Married	0.49	0.50	Married	
Single	0.07	0.25	Single or never married	omitted
Widowed	0.34	0.47	Widowed	
Divorced	0.07	0.25	Divorced	
Separated	0.004	0.07	Separated	
Don't know	0.03	0.18	Unknown marital status	

4.7. Discussion

Appendix C reports results of empirical analyses with the negative binomial, the OLS, and logistic models that include the estimated parameters, p-values and robust

standard errors of the length of service use equations. The following subsections summarize major findings obtained in these analyses.

4.7.1. Estimates of For-Profits vs. Nonprofits

The primary variable under examination is the organizational form of the hospice agency, which is studied with respect to its impact on the length of service use. The following subsections summarize results obtained using our models.

Negative Binomial Model

According to results from the NB regressions (see Table 18 Appendix C), the estimate of the for-profit hospice is consistent across all model specifications without the interaction term (1a, 2a, and 3a) being positive and also highly statistically significant ($p_{value}<0.01$). This implies that patients at for-profit hospices tend to have longer stays/usage of services than their counterparts at nonprofit hospices. The estimates of the for-profit effect, however, are rather small, ranging from 0.25 to 0.31 days.

Furthermore, after adjusting for possible differences in slopes between small and large values of LOS (via the interaction term between FOR-PROFIT and longLOS), both the profit status as well as the interaction term are very statistically significant ($p_{value}<0.001$). The direction of the relationship for the for-profit is negative and for the interaction term is positive; however, the direction of the overall effect is still positive. These results imply that among long-stay patients, the patients at for-profit hospices have longer LOS than their counterparts at nonprofit hospices by approximately 1.5 days on average, regardless of the model specification. On the other hand, the opposite effect is

observed for short-stay patients (whose predicted median of LOS is smaller than or equal to 55 days). Namely, on average short-stay patients at nonprofit hospices stay about 1 day longer than their counterparts at for-profit hospices.

OLS Regression

In contrast to the NB regression results, all specifications of the OLS models—except those with the interaction term between the ownership type and large LOS (1a, 2a, and 3a) (see Table 19 in Appendix C)—don't imply any statistical significance for the ownership form of hospices. However, the direction of the effect of the for-profit/nonprofit form of a hospice on expected LOS is also positive, similar to the NB models.

After adjusting for differences in slopes of LOS, both the for-profit variable and the interaction term (specifications 1b, 2b, and 3b) are again very statistically significant ($p_{value}<0.001$). The direction of their impact on LOS agrees with the results obtained in the case of the NB model as well (negative for the for-profit, positive for the interaction term, and positive for the overall effect). Regarding the magnitude of the effect of the for-profit versus nonprofit status on LOS, a different response of the ownership type is predicted when analyzing patients with higher and lower values of LOS separately. Namely, in the case of long-stay patients, the for-profit hospices are associated with patients' longer service use compared to their nonprofit counterparts. On the other hand, for the subset of individuals with short LOS, the model predicts that patients at nonprofit hospices have longer service use than those at for-profit hospices.

Logistic Model

Even though the differential behavioral response of for-profit versus nonprofit hospices with respect to short- versus long-stay patients is implied by the OLS and the NB models, the logistic models (see Table 20 in Appendix C) do not provide evidence for the presence of systematic selection. In particular, the results obtained in all logistic models do not predict any statistical significance of the for-profit status with respect to patients with long versus short LOS.

4.7.2. Estimates of Certification Status

The secondary variable examined is certification status. The results obtained regarding the effect of certification status on the length of service use are robust across the NB and OLS specifications (see Table 18 and Table 19 Appendix C). Specifically, the direction of the relationship is negative, which implies that patients enrolled in the programs of certified hospices (e.g., certified by Medicare, Medicaid, or both) use their services for shorter periods than their counterparts at noncertified hospice agencies. This result is also highly statistically significant in all models specified ($p_{value}<0.001$). A similar outcome is obtained for hospices at which certification status is either pending or unknown (e.g., a negative and statistically significant result).

In the case of the NB regression, the estimates of the certification range from about -0.78 to -1 days, meaning that patients' LOS at certified hospices is shorter than their counterparts' at noncertified hospices by approximately one day. As a comparison,

in the case of patients at hospice facilities without known certification status, this difference is about 2 days (the range of the coefficients is -1.50 to -1.89).

4.7.3. Other Determinants of Length of Service Use

The results in Table 18 and Table 19 in Appendix C indicate that control variables within institutional characteristics, such as geographical variation and location of hospice care provided, also influence how long a patient uses hospice care, or survives while at hospice (various affiliations do not have any statistically significant effect on LOS[47]).

In particular, the data imply that patients' LOS is also determined regionally, as indicated by the U.S. Census region and metropolitan statistical area (MSA) variables. This effect is robust over all model specifications. Overall, for the cases in which geographical variation is very statistically significant, the results suggest that patients using care at hospice agencies located in the Southern region use their service for longer periods than in the rest of the country. Similarly, they also indicate that patients at hospices located within metropolitan statistical areas tend to have patients with shorter LOS than outside such areas. This corresponds to the common finding in studies of health economics: there are regional variations in health care availability and quality.

Furthermore, the effect of location of care provided on LOS is positive, implying that patients who receive their care in their homes/residences or other places have longer LOS than if those who are served inpatient. There may be two reasons for this: a) they

[47] Only the results from the NB models suggest the statistically significant impact of the unknown category and nursing home affiliations relative to the no category and nursing home affiliations, respectively.

may be healthier in the first place, thereby enabling hospice care in the home; and b) they may feel more comfortable in their own surroundings, which contributes to longer survival times. However, the effect of location of care provision is statistically significant in the OLS models and is not in the NB models, so this effect is not robust over all model specifications.

There are additional, case-by-case characteristics that also impact LOS in a statistically significant way, such as primary diagnosis upon admission, referral source, and primary payment source. (Caregiver status and demographic information such as age, sex, race, and marital status are not statistically significant.)

In particular, an HMO as a referral source is positively statistically significant with respect to LOS. This suggests that patients referred to hospice by an HMO tend to have longer service use than their counterparts who are referred by nursing homes and hospitals. The latter are also statistically significant and their effect on LOS is negative, which implies that patients referred by these facilities tend to have shorter service use and shorter survival rates compared to patients referred by other sources. Regarding hospital referrals, this finding may be explained by the fact that hospitals typically do not readily discharge their patients to other health care providers. In the case of terminally ill patients, this may mean by the time hospitals exhaust all the resources at their disposal, the patient's life expectancy is already low; hence, the survival time after admission to hospices is also short.

Some primary diagnoses at admission are also very statistically significant, but not robust across all of the model specifications. Cerebrovascular conditions, pneumonia,

and some diseases of the nervous system are among those most robust admission diagnoses. The effect of cerebrovascular and pneumonia diseases on LOS is predicted to be negative, which suggests that patients with those diagnoses use hospice services for shorter periods relative to those diagnosed with Alzheimer's disease. On the other hand, pneumonia is predicted to affect LOS in a positive way, implying that individuals with this primary diagnosis stay at hospice for more days relative to those with Alzheimer's disease.

Furthermore, the effect of Medicaid as the primary payment source on LOS is found to be statistically significant and robust across models specified. Specifically, patients whose hospice care expenses are covered by Medicaid are predicted to stay for longer periods compared to their counterparts whose medical expenses are not paid by Medicaid.

In summary, determinants affecting LOS other than ownership form and certification status were identified. Specifically, some referral sources, some diagnoses at admission, payment sources, and geographical variation were found to be factors affecting patients' survival and LOS, and these factors are highly statistically significant and relatively robust across all models. On the other hand factors, such as affiliations, presence of a caregiver, and a patient's demographic characteristics were not found to have any statistically significant impact on LOS.

4.7.4. Additional Robustness Checks and Issues

Several alternative approaches to characterize outliers were explored in order to check the robustness of the obtained results. The rationale for the concern about outliers comes from patients with extremely long service use being present in the study sample, such as those with LOS more than 3,000 days. While such long stays do occur in our dataset, they are very untypical when we compare them to the mean and the median of LOS in the sample equal to 56 and 19, respectively. Hence, in order to check if those cases influence the findings discussed above, the following alternative assumptions were made about potential outliers:

- LOS>365 days,
- LOS>730 days,
- LOS>1,000 days.

The OLS, the NB, and the logistic models were applied using these three definitions of possible outliers.[48] The only difference between the results obtained in both approaches (all observations vs. excluding potential outliers) is that the NB models without the interaction term did not result in the statistically significant coefficient of for-profit/nonprofit type (which was found in the NB estimation where all cases were included). However, the implications of the OLS regressions (with and without the interaction term) and the NB models with the interaction term agreed with the findings of their corresponding models that included all observations. The logistic models were applied after excluding potential outliers, and did not suggest any systematic patient's

[48] The output tables are not included here; they may be provided upon request.

selection by for-profit agencies. Hence, their results provided good evidence that the basic findings for all observations are not sensitive to the presence of potential outliers.

Additional model variation was applied to test sensitivity of the results obtained by the logistic regressions (because their results were different than those produced by the NB and the OLS models). Namely, the ordered logistic regression with four intervals of LOS ordered from the smallest to the largest values were identified as its dependent variable (e.g., intervals of 1-6, 7-19, 20-54, and 55-3,297 days with cumulative frequencies of about 926 observations each). The results of the ordered logistic regression did not show any statistical significance of the for-profit status (p_{value}=0.47)[49]. Hence, these results confirm our previous results obtained by the logistic model (with longLOS as the dependent variable).

Possible endogeneity of the for-profit versus nonprofit organizational type of hospices needs to be acknowledged in our data. Specifically, if long-stay patients choose a for-profit hospice based on some unmeasured factors (such as amenities or quality) that are also correlated with LOS, then the for-profit type is endogenous. If endogeneity is present, the OLS estimators may be biased and inconsistent. For instance, if patients with long expected LOS choose a for-profit hospice because they think that they have better quality of care or amenities, then positive effects of for-profit hospices on their mortality may be overstated, and the positive effects of their corresponding nonprofit organizations may be understated. The presence of the potential endogenous selection was not tested because valid instrumental variables were not available in our dataset.

[49] Specific results are not listed here; they may be provided upon request.

4.8. Conclusions

This study investigated the impact of the ownership form and the certification status of hospices on patients' length of service use. The National Home and Hospice Care Survey data from 1998 and 2000 were utilized in the analyses. The empirical results shown by all our simple models (without the interaction term) suggest a positive impact of the for-profit organizations with respect to LOS relative to their nonprofit counterparts. These findings are consistent with those found in the literature (Christakis and Escarce 1996; Lindrooth and Weisbrod 2007; Ohri 2007). However, in contrast to previous findings, the overall result is not found to be statistically significant. Hence, according to our simple results, we cannot see consistent differences between for-profit and nonprofit organizational forms of hospices on the LOS.

However, after accounting for differences in the patients' length of service use via the interaction term (which was not done in previous studies), the differential behavioral response of for-profit vs. nonprofit hospices with respect to short- vs. long-stay patients is evident. In particular, the results consistently suggest that patients with long expected length of hospice use have higher survival times at for-profit hospices whereas patients with short expected length of hospice use have lower survival times. However, according to the results from the logistic models, there is no evidence that this result may be attributed to systematic selection of long-stay patients by for-profit hospices. In other words, our empirical findings imply that for-profit hospices are better for patients with longer expected stays. A possible explanation could be that since patients with longer expected stays are more profitable for hospices, for-profit hospices may also put more

effort into providing better care for them. They also have more incentives to act in this way, as they are not limited by the nondistribution constraint the way nonprofit hospices are. This, however, is not the effect of a systematic selection of long-stay patients by for-profit hospices. These findings are robust across model specifications and samples studied.

In contrast, examining the impact of hospice certification showed that certification is associated with shorter LOS; this, in turn, may be translated into lower survival times at certified hospices compared to those at noncertified hospices. This finding may first sound counterintuitive, as certification is commonly associated with a wider variety of services and better quality. This result, however, is consistent with results of other studies on certification in other disciplines. See, for example, the work by Walsh (2001) in the context of education.

In addition to the main conclusions regarding the ownership form and the certification status, the analysis identified the following additional predictors of longer patients' use of hospice services: HMO referrals, other nervous diseases as the primary admission diagnosis, Medicaid as the primary payment source, and Southern regions. Conversely, analysis indicated shorter hospice use was associated with nursing home and hospital referrals, pneumonia, influenza, cerebrovascular conditions, and genitourinary diseases as admission diagnoses. Finally, affiliations, presence of a caregiver, and patients' demographic characteristics (such as age, sex, race, and marital status) were not found to influence patients' survival and the length of service use.

One of the limitations of this study is that we are not able to control for quality and quantity of services provided at hospices; such data are not available. The other limitation is potential endogeneity that was not tested because of lack of valid instrumental variables in our data. Hence, further research taking into account those shortcomings is required to further confirm and possibly extend our findings.

5. CONCLUSIONS

In this dissertation, we reported results of empirical studies addressing important research areas in the field of health economics: employment-based health insurance plans and hospice care. In particular, we examined the determinants of employer's contributions towards health insurance premiums, the price elasticity of demand in employer-provided self-insured health plans, and the effects of ownership form and certification status on hospice use.

In Chapter 2, we discussed results of empirical analyses on the determinants of an employer's contribution to premium for self-insured and traditional health insurance plans using the micro-level data from the 1987 National Medical Expenditure Survey (NMES) Household Survey. This study extended previous work by considering both self-insured and traditional health insurance plans, by including all establishments regardless of size, and by accounting for income, poverty rate, race, and regional variations. It also revisited the issue of the impact of unionization on the employer's contribution due to its high relevance in the context of self-insured health plans.

We showed that union membership and self-insured health plans predict higher amounts of employer's contribution. The obtained empirical evidence also identified the following socioeconomic predictors of the employer's contribution: family income,

poverty level (high income, low income, and near poverty), and employer's provision of fringe benefits. In addition, higher employer's contributions are associated with the following factors: being male, residing in the Northeast, and obtaining family coverage. We also reported that employer-specific characteristics such as organizational form, industry composition, and firm size do not have any statistically significant effect on the employer's premium contribution.

Chapter 3 continued our investigations of employment-based health insurance plans. It described results of an empirical study on the price elasticity of demand in self-insured health benefits provided by the employer using the same 1987 National Medical Expenditure Survey (NMES) Household Survey. This study examined the price elasticity of demand in a new setting of self-insurance and compared the obtained measures to previous results available in the literature across various types of health insurance.

The results of conducted empirical analyses showed that the estimate of the price elasticity of demand for self-insured health plans ranged from -0.01 to -0.06 (depending on the model). On the other hand, the model specifications extended by the interaction effect between the price elasticity and the income level predicted the price elasticity of demand to be approximately equal to -0.01. However, the latter result was inconclusive based on its low statistical significance.

The obtained estimates of the price elasticity of demand for self-insured health plans accord well with previous findings reported in the literature, which also found the price elasticity of demand for health insurance to be inelastic. The similarity of our results not only provides a relevant re-confirmation for these earlier measures but it also

demonstrates that the demand responsiveness to changes in price for self-insured health plans does not differ from estimates for other types of health insurance. Our empirical analyses also identified other factors having a positive impact on the employee's demand for self-insured health plans: age, sex (male), regional variation, unionization, and the size of an establishment. On the other hand, such factors as race, family income, education, and employer organization type do not have any impact.

In Chapter 4, we examined the effects of the ownership form and the certification status on hospice care. In particular, we investigated the patients' length of hospice use using the National Home and Hospice Care Survey data from 1998 and 2000. The empirical results showed a positive impact of the for-profit organizational form with respect to the length of hospice use as compared to their nonprofit counterparts but not all model specifications yielded statistically significant results. However, after accounting for differences in the patients' length of hospice use via the interaction term (which was not done in previous studies), the differential behavioral response of for-profit vs. nonprofit agencies with respect to short- vs. long-stay patients became statistically significant for all model specifications. In particular, the obtained results suggested that among individuals with short expected length of hospice use, patients at nonprofit hospices have lower mortality while using hospice care. In contrast, among those with long expected length of hospice use, patients at for-profit hospices have longer survival times. There is, however, no evidence of systematic selection of long-stay patients by for-profit hospices.

Furthermore, the results of the impact of hospice certification status showed that the length of hospice use is shorter at certified hospices as compared to noncertified ones. This in turn may be interpreted as lower survival rates at certified hospices. This finding may first sound counterintuitive, as certification is commonly associated with a wider variety of services and better quality. This result, however, is consistent with results of other studies on certification in other disciplines, e.g., in education.

Since all investigated problems address crucial elements of the US healthcare system, it is our hope that the results of this work will provide contributions to improving our understanding of the healthcare system and to increasing its efficiency. The findings should also be relevant to policy makers and parties directly involved in the healthcare system such as employers, insured and uninsured individuals, and insurance companies.

APPENDIX A: EMPLOYER CONTRIBUTION EMPIRICAL ANALYSIS

Table 10: Frequencies of Categorical Variables in Employer-Sponsored Health Plans

Variable	*Value*	*Frequency*	*Percent*
Union membership			
DON'T	0	2,393	80.49
KNOW	1	580	19.51
Insurance type			
SELF-	0	1,788	60.14
INSURANCE	1	1,185	39.86
Type of coverage held			
Single	0	1,750	58.86
	1	1,223	41.14
Family	0	1,467	49.34
	1	1,506	50.66
Two-party	0	2,775	93.34
	1	198	6.66
Other	0	2,927	98.45
	1	46	1.55
Male	0	1,352	45.48
	1	1,621	54.52
Race			
Black	0	2,475	83.25
	1	498	16.75
Hispanic	0	2,748	92.43
	1	225	7.57
White	0	723	24.32
	1	2,250	75.68
Poverty status			
Poor	0	2,735	91.99
	1	238	8.01
Near poor	0	2,859	96.17
	1	114	3.83
Low income	0	2,580	86.78
	1	393	13.22
Middle income	0	1,946	65.46
	1	1,027	34.54
High income	0	1,772	59.60
	1	1,201	40.40

Benefits provided by the employer			
Paid vacation:	0	388	13.05
YES	1	2,585	86.95
Paid vacation:	0	2,661	89.51
Don't know	1	312	10.49
Paid vacation:	0	2,897	97.44
NO	1	76	2.56
Paid sick	0	628	21.12
leave: YES	1	2,345	78.88
Paid sick	0	2,654	89.27
leave: Don't	1	319	10.73
know			
Paid sick	0	2,664	89.61
leave: NO	1	309	10.39
Life	0	519	17.46
insurance:	1	2,454	82.54
YES			
Life insurance:	0	2,657	89.37
Don't know	1	316	10.63
Life insurance:	0	2,770	93.17
NO	1	203	6.83
Retirement	0	852	28.66
plan:YES	1	2,121	71.34
Retirement	0	2,648	89.07
plan: Don't	1	325	10.93
know			
Retirement	0	2,446	82.27
plan: NO	1	527	17.73
Education			
Don't know	0	2,255	75.85
	1	718	24.15
Geographic Region			
Northeast	0	2,346	78.91
	1	627	21.09
Midwest	0	2,236	75.21
	1	737	24.79
South	0	1,881	63.27
	1	1,092	36.73
West	0	2,456	82.61
	1	517	17.39
Employer organization type			
For profit	0	1,047	35.22
	1	1,926	64.78
Non-profit	0	2,623	88.23
	1	350	11.77
Government	0	2,499	84.06
	1	474	15.94

Other	0	2,919	98.18
	1	54	1.82
Don't know	0	2,804	94.32
	1	169	5.68
Total employment			
Don't know	0	2,824	94.99
	1	149	5.01
Industry			
Inapplicable	0	456	15.34
	1	2,517	84.66
Agriculture, forestry, and fisheries	0	2,965	99.73
	1	8	0.27
Construction	0	2,942	98.96
	1	31	1.04
Manufacturing	0	2,879	96.84
	1	94	3.16
Transportation	0	2,945	99.06
	1	28	0.94
Sales	0	2,901	97.58
	1	72	2.42
Finance	0	2,960	99.56
	1	13	0.44
Business and repair	0	2,948	99.16
	1	25	0.84
Personal services	0	2,955	99.39
	1	18	0.61
Entertainment	0	2,966	99.76
	1	7	0.24
Public administration	0	2,941	98.92
	1	32	1.08
Don't know	0	2,934	98.69
	1	39	1.31
Professional services	0	2,885	97.04
	1	88	2.96

Note: PH=Policy Holder; the frequencies are based on 2,973 observations used in model specifications (4) and (5).

Table 11: OLS results with specifications including unknown cases for union, firm size, and education variables

y=log(employer contribution)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Union membership (as % of workers being union members at an establishment)					
Don't know	0.1772***	0.1736***	0.1606**	0.1442**	0.1289*
	(0.0363)	(0.0378)	(0.0707)	(0.0710)	(0.0703)
1-20	0.1018	0.0989	-0.0599	-0.0880	-0.1007
	(0.0666)	(0.0666)	(0.1068)	(0.1073)	(0.1089)
20-40	0.2054***	0.1919**	0.0368	0.0051	-0.0070
	(0.0767)	(0.0766)	(0.0909)	(0.0912)	(0.0941)
40-60	0.1569*	0.1460*	-0.0096	-0.0301	-0.0230
	(0.0835)	(0.0836)	(0.1309)	(0.1307)	(0.1297)
60-80	0.4868***	0.4681***	0.3406***	0.3051***	0.2928***
	(0.0439)	(0.0442)	(0.0688)	(0.0716)	(0.0713)
80-100	0.2344***	0.2240***	-0.0004	-0.0528	-0.0429
	(0.0652)	(0.0657)	(0.1073)	(0.1102)	(0.1110)
Self-insurance	0.2231***	0.2262***	0.1667***	0.1856***	0.1995***
	(0.0272)	(0.0274)	(0.0377)	(0.0382)	(0.0446)
Type of coverage held (family coverage as an omitted variable)					
Single	-0.8495***	-0.8008***	-0.8051***	-0.8018***	-0.7967***
	(0.0317)	(0.0337)	(0.0467)	(0.0468)	(0.0476)

Two-party	-0.1379*	-0.1287*	-0.1987*	-0.1922*	-0.1815*
	(0.0771)	(0.0761)	(0.1021)	(0.1006)	(0.1010)
Other	-0.2246	-0.1753	-0.2133	-0.2062	-0.1806
	(0.1399)	(0.1393)	(0.2259)	(0.2225)	(0.2280)
Age		0.0057	-0.0015	-0.0001	0.0007
		(0.0054)	(0.0074)	(0.0074)	(0.0075)
Age^2		-0.0001	0.0000	0.0000	-0.0000
		(0.0001)	(0.0001)	(0.0001)	(0.0001)
Sex		0.1652***	0.2080***	0.2057***	0.1958***
		(0.0320)	(0.0463)	(0.0464)	(0.0465)
Race					
Hispanic		0.0194	0.1155	0.1326*	0.1250
		(0.0555)	(0.0759)	(0.0763)	(0.0769)
Black		0.0079	0.0553	0.0756	0.0675
		(0.0363)	(0.0480)	(0.0491)	(0.0485)
Family income			0.0000**	0.0000*	0.0000*
			(0.0000)	(0.0000)	(0.0000)
Poverty indicator	(poor as the reference)				
Near poor			0.3745***	0.3780***	0.3688***
			(0.1203)	(0.1199)	(0.1193)
Low income			0.1981*	0.1860*	0.1891*

	(0.1045)	(0.1042)	(0.1030)
Middle income	0.1314	0.1228	0.1206
	(0.0962)	(0.0962)	(0.0955)
High income	0.1889*	0.1747	0.1742
	(0.1094)	(0.1093)	(0.1096)
Negative income[50]	0.2375	0.2634	0.2290
	(0.2164)	(0.2565)	(0.2597)
Employer benefits (NO as an omitted variable)			
Paid vacation: YES	0.4628**	0.4340*	0.4160*
	(0.2245)	(0.2253)	(0.2299)
Paid vacation: Don't know	0.3207	0.3067	0.2457
	(0.3680)	(0.3641)	(0.3724)
Paid sick leave: YES	0.0891	0.0886	0.0961
	(0.0840)	(0.0842)	(0.0852)
Paid sick leave: Don't know	0.2863	0.3008	0.2803
	(0.2595)	(0.2630)	(0.2650)
Life insurance: YES	0.3009**	0.3288**	0.3238**
	(0.1396)	(0.1402)	(0.1407)
Life insurance: Don't know	-0.3085	-0.2813	-0.2941
	(0.5606)	(0.5535)	(0.5629)

[50] The main OLS results combine both "poor" and "negative income" categories as "poor" because they often are perceived as the same. Here, they are used separately.

Retirement benefits: YES	0.1931***	0.1873***	0.1989***
	(0.0667)	(0.0669)	(0.0723)
Retirement benefits: Don't know	0.4083*	0.3886*	0.3869*
	(0.2216)	(0.2188)	(0.2172)
Education (9-12 years of education as an omitted variable)			
Don't know	0.0228	0.0402	0.0372
	(0.0548)	(0.0549)	(0.0568)
0-8 years	0.1115	0.1194*	0.1305*
	(0.0694)	(0.0696)	(0.0699)
13-17 years	0.0372	0.0507	0.0549
	(0.0559)	(0.0555)	(0.0564)
18 years+	-0.1078	-0.0842	-0.0833
	(0.1330)	(0.1338)	(0.1345)
Region (West as the reference)			
Northeast		0.1682**	0.1842**
		(0.0764)	(0.0770)
Midwest		0.0514	0.0587
		(0.0750)	(0.0746)
South		-0.0517	-0.0483
		(0.693)	(0.0695)
Employer organization type (government as the reference)			

Non-profit	-0.0371
	(0.0902)
For-profit	0.0189
	(0.0628)
Other	-0.1004
	(0.2036)
Don’t know	-0.6139
	(0.4857)
Total employment (size1_100 as an omitted variable)	
Don’t Know	0.9156*
	(0.4676)
100-300	0.0080
	(0.0641)
300-500	-0.0728
	(0.0920)
500-1000	-0.0078
	(0.0663)
1000-10000	-0.0057
	(0.0639)
10000+	0.0840
	(0.1016)
Industry (professional and related services as the reference)	

Inapplicable	-0.0613 (0.1268)
Agriculture, forestry, and fisheries	0.0493 (0.1726)
Construction	-0.0624 (0.2455)
Manufacturing	-0.1762 (0.1841)
Transportation	-0.1671 (0.2973)
Sales	-0.0635 (0.1696)
Finance	0.0444 (0.1643)
Business and repair	-0.0744 (0.2117)
Personal services	0.0210 (0.1641)
Entertainment	-0.1065 (0.2254)
Public administration	-0.1219 (0.2641)

Don’t know					0.0856
					(0.1449)
Constant	7.1963***	6.9641***	5.9530***	5.9153***	5.9682***
	(0.0326)	(0.1268)	(0.3184)	(0.3316)	(0.3555)
N	6014	6014	2973	2973	2973
F	113.6185	80.0553	22.0228	22.4701	16.1897
p_{value}	0.0000	0.0000	0.0000	0.0000	0.0000
R^2	0.1417	0.1458	0.1709	0.1747	0.1798

Robust standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01(2 tail test)

Table 12: OLS results with specifications excluding unknown cases for union, firm size, and education variables

y=log(employer contribution)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Union membership (as % of workers being union members at an establishment)					
	0.0041***	0.0041***	0.0022**	0.0017*	0.0017*
	(0.0006)	(0.0006)	(0.0009)	(0.0009)	(0.0010)
Self-insurance	0.2520***	0.2580***	0.1821***	0.1965***	0.1754***
	(0.0312)	(0.0319)	(0.0431)	(0.0436)	(0.0460)
Type of coverage held (family coverage as an omitted variable)					
Single	-0.8390***	-0.7907***	-0.7832***	-0.7789***	-0.7734***
	(0.0368)	(0.0391)	(0.0547)	(0.0549)	(0.0560)
Two-party	-0.1605*	-0.1363	-0.2091*	-0.2033*	-0.1984*
	(0.0892)	(0.0877)	(0.1156)	(0.1142)	(0.1147)
Other	-0.2388	-0.1892	-0.2884	-0.2816	-0.2581
	(0.1559)	(0.1556)	(0.2664)	(0.2626)	(0.2725)
Age		0.0073	0.0008	0.0021	0.0027
		(0.0065)	(0.0089)	(0.0089)	(0.0090)
Age^2		-0.0001	-0.0000	-0.0000	-0.0000
		(0.0001)	(0.0001)	(0.0001)	(0.0001)
Sex		0.1511***	0.2026***	0.2002***	0.1912***
		(0.0367)	(0.0536)	(0.0537)	(0.0547)

Race (White as the reference)				
Hispanic	0.0168	0.1331	0.1551*	0.1517*
	(0.0642)	(0.0867)	(0.0871)	(0.0879)
Black	-0.0096	0.0499	0.0712	0.0687
	(0.0427)	(0.0577)	(0.0594)	(0.0589)
Family income		0.0000	0.0000	0.0000
		(0.0000)	(0.0000)	(0.0000)
Poverty indicator (poor as the reference)				
Near poor		0.4591***	0.4568***	0.4557***
		(0.1461)	(0.1456)	(0.1453)
Low income		0.2525**	0.2363*	0.2407**
		(0.1235)	(0.1229)	(0.1217)
Middle income		0.1884	0.1802	0.1834
		(0.1160)	(0.1159)	(0.1154)
High income		0.2895**	0.2805**	0.2845**
		(0.1276)	(0.1273)	(0.1271)
Negative income[51]		0.1315	0.1479	0.1357
		(0.1822)	(0.2160)	(0.2235)
Employer benefits (NO as the reference)				
Paid vacation: YES		0.4292*	0.4022*	0.3754
		(0.2362)	(0.2385)	(0.2423)

[51] The "poor" and "negative income" categories are used separately here, but they were used within one category "poor" in the main OLS results.

Paid vacation: Don’t know	0.0364	0.0061	0.0057
	(0.5219)	(0.5169)	(0.5180)
Paid sick leave: YES	0.0892	0.0897	0.1013
	(0.0890)	(0.0895)	(0.0918)
Paid sick leave: Don’t know	0.2491	0.2533	0.2361
	(0.3497)	(0.3499)	(0.3570)
Life insurance: YES	0.3218**	0.3437**	0.3311**
	(0.1434)	(0.1442)	(0.1450)
Life insurance: Don’t know	-0.5310	-0.4934	-0.5026
	(0.7519)	(0.7466)	(0.7524)
Retirement benefits: YES	0.2104***	0.2066***	0.2141***
	(0.0710)	(0.0712)	(0.0781)
Retirement benefits: Don’t know	0.3254	0.3084	0.3278
	(0.2111)	(0.2103)	(0.2112)
Education (9-12 years of education as an omitted variable)			
Don’t know	0.0445	0.0616	0.0650
	(0.0612)	(0.0615)	(0.0647)
0-8 years	0.1032	0.1114	0.1161
	(0.0833)	(0.0834)	(0.0829)
13-17 years	0.0168	0.0288	0.0342
	(0.0640)	(0.0631)	(0.0649)
18 years+	-0.1531	-0.1374	-0.1270

	(0.1578)	(0.1578)	(0.1568)
Region (West as the reference)			
Northeast		0.1558*	0.1572*
		(0.0885)	(0.0888)
Midwest		0.0671	0.0723
		(0.0848)	(0.0860)
South		-0.0338	-0.0312
		(0.0803)	(0.790)
Employer organization type (government as the reference)			
Non-profit			0.0034
			(0.0944)
For-profit			0.0688
			(0.0688)
Other			-0.0597
			(0.2402)
Don’t know			-0.2572
			(0.2438)
ln(Total employment)			0.0069
			(0.0132)
Industry (professional and related services as the reference)			

Inapplicable	-0.0471 (0.1572)
Agriculture, forestry, and fisheries	0.1709 (0.1706)
Construction	-0.1390 (0.3307)
Manufacturing	-0.1164 (0.1984)
Transportation	-0.2260 (0.3817)
Sales	-0.0043 (0.1824)
Finance	0.1806 (0.1893)
Business and repair	-0.0712 (0.2424)
Personal services	0.1093 (0.1938)
Entertainment	-0.2228 (0.3235)
Public administration	-0.1214 (0.3549)

Don’t know					0.1401
					(0.1788)
Constant	7.1944***	6.9653***	5.8678***	5.8201***	5.7919***
	(0.0349)	(0.1481)	(0.3504)	(0.3652)	(0.4021)
N	4878	4878	2393	2393	2393
F	175.6346	93.3870	21.4130	22.3910	15.9329
p_{value}	0.0000	0.0000	0.0000	0.0000	0.0000
R^2	0.1282	0.1318	0.1667	0.1695	0.1712

Robust standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01(2 tail test)

APPENDIX B: PRICE ELASTICITY OF DEMAND EMPIRICAL ANALYSIS

Table 13: Major Studies on the Price Elasticity of Demand for Health Insurance

No.	Study	Data Source	Context	Price Elasticity
1.	Neipp and Zeckhauser (1985)	2 Boston-area firms, 1984/85	Employees were offered a choice between health plans	-0.30 to -0.60
2.	Feldman, Finch, et al. (1989)	17 Minneapolis firms, 1984	Change in a plan enrollment resulting from a change in premium by distinguishing between two different types of HMOs : independent practice associations (IPA's) and prepaid group practices (PGP's)[52]	-0.15 to -0.53 (nested logit)
3.	Buchmueller and Feldstein (1997)	10,952 University of California (UC) employees who were provided with a health plan choice, 1993	Employees' response to a change in employer's premium share (FFS versus PPO)	$7 increase in premium leads 25% of UC employees to switch to a less expensive plan
4.	Cutler and Reber (1998)	Harvard University employees	The percentage change in PPO enrollment (versus HMO) as a result of a change in out-of-pocket premium paid by the employee	-0.3 to -0.6 (logistic regression)
5.	Marquis and Phelps (1987)	The RAND Health Insurance Experiment	Change in enrollment of supplemental insurance as a demand response to a 1 percent increase in premium	-0.6

[52] IPA's usually have contracts with independent providers, whereas PGP's use the physician services delivered by a specific group practices. Hence, IPA's offer a greater choice of physicians than PGP's do (Royalty and Solomon, 1999).

6.	Manning, Newhouse et al., (1987) & (1988) & Newhouse, and the Insurance Experiment Group (1993)	The RAND Health Insurance Experiment	A constant coinsurance policy case by applying three different methods: 1) episodes of health/treatment approach (instead of annual expenditures approach); 2) an indirect utility function to total annual expenditures; 3) average coinsurance rates	-0.1 to -0.2 for constant coinsurance across all methods[53]
7.	Rosett and Huang (1973)	Cross-sectional dataset of Consumer Expenditures conducted by the Bureau of Labor Statistics, 1960	Change in enrollment as a result of a 1 percent increase in premium when: 1) an out-of-pocket price is equal to 20 percent of market price; 2) an out-of-pocket price is equal to 80 percent of market price	1) -0.35 2) -1.5
8.	Holmer (1984)	Survey data of a sample of federal government	Employees offered a choice between health plans	-0.16
9.	Welch (1986)	The Bureau of Labor Statistics annual survey data on the employee benefits plans	When faced with a choice between HMO and a conventional insurer such as Blue Cross (e.g. the long-run price elasticity of demand for HMOs is estimated based on mean out-of-pocket premium)	-0.6 (logit)
10.	Short and Taylor (1989)	Cross-section data from National Medical Care Expenditure Survey (NMCES), 1977	Change in probability of enrollment in: 1) "high option"[54] FFS[55] versus "low option" FFS resulting from a 1 percent increase in net premium; 2) HMO relative to FFS resulting from a 1 percent increase in net premium	1) -0.14 (logit) 2) -0.05 (logit)

[53] Exact estimates for all three techniques used are as follows:
1) 0.14 to 0.20 for 0-25% coinsurance rate; and 0.14 to 0.43 for 25-95% coinsurance rate;
2) -0.18 for 25-95% coinsurance rate;
3) in the case of 0-16% average coinsurance rate: 0.10 for all care and 0.13 for outpatient care;
in the case of 16-31% average coinsurance rate: 0.14 for all care and 0.21 for outpatient care;

[54] The high option is understood as the health plan associated with the higher premium.

[55] FFS stands for fee-for-service plans, which are also known as indemnity plans. FFS are typically the most expensive among health plans; however, they also provide the most freedom and flexibility to their policy holders.

11.	Royalty and Solomon (1999)	Panel dataset on Stanford University employees, 1993-95	Change in percentage enrollment as a response to a 1 percent increase in premium	1) -1.0 to -1.8 (logit) 2) -3.7 to -6.2 (fixed effects)
12.	Barringer and Mitchell (1994)	Cross-section data on payroll benefits from single company in the US, 1989	Change in enrollment (its fraction) in traditional FFS versus prepaid plans as a result of a 1 percent increase in premium among employees offered a choice between plans	1) -0.1 to -0.2 (logit) 2) -0.01 to -0.02 (revised estimates[56])
13.	Hosek, Bennett et al. (1995)	Military beneficiaries	Change in enrollment probability to select the civilian plan (such as FFS, PPO or HMO) resulting from a 1 percent increase in premium	-0.6 (OLS)
14.	Marquis and Long (1995)	The Current Population Survey (CPS), the Survey of Income and Program Participation (SIPP), and prices for a standard insurance in various geographic regions	Decisions to purchase private insurance by working families that weren't offered employment-based health plans (the case of the non-group insurance market)	-0.3 to -0.4
15.	Feldman, Dowd et al. (1997)	The Robert Wood Johnson Foundation (RWJF) Health Insurance Survey of 2,000 small firms in Minnesota, 1993	The small firms' decision to offer health insurance studies with the major focus on the role of premiums in their decision making process	1) -3.91 for single coverage; 2) -5.82 for family coverage (probit)
16.	Liu and Christianson (1998)	Two telephone surveys, Healthcare Group of Arizona HCGA health plans administrative files, and enrollment application forms, 1993	653 potential employees in small firms were offered the option of two health and 447 of them selected one of the two plans (small employees' case)	1) -0.12 to -0.24 for employees with prior insurance; 2) -0.42 to -0.51 for employees without prior insurance (logit)

[56] These revised estimates were obtained by Royalty and Solomon in the direct communication with the study's authors: Barringer and Mitchell (Royalty and Solomon, 1999).

17.	Blumberg, Nichols, et al. (2001)	Cross-sectional dataset from the Medical Expenditure Panel Survey (MEPS), 1996	Two potential sources of coverage in one household: take up decision if the spouse is also offered insurance at his/her workplace	-0.09 to -0.01
18.	Finkelstein (2002)	Cross-section data from the Canadian General Social Surveys (GSS), 1991 and 1994	The effect of a change in tax subsidy to employer-provided supplementary health insurance in Quebec, Canada as compared to other provinces not affected by the tax change	-0.46 to -0.49 (difference-in-difference method)
19.	Abraham, Vogt, et al. (2002)	Cross-section data from the Medical Expenditure Panel Survey (MEPS), 1996	Household demand for three types on health plans provided by employers, including HMOs, PPOs, and FFSs. The analysis is based on a classification of health plans with respect to their provider organizational structure such as exclusive provider organization (EPOs), any provider organizations (ANY), and a mixture of the above (MIX).	1) -0.13 to -0.15 for ANY; 2) -0.13 to -0.14 for EPOs; 3) -0.19 to -0.27 for MIX; (logit)

Table 14: Frequency Tables of Categorical Variables

Variable	*Value*	*Frequency*	*Percent*
	0	164	41.10
Male	1	235	58.90
Race			
Black	0	342	85.71
	1	57	14.29
Hispanic	0	373	93.48
	1	26	6.52
White	0	83	20.80
	1	316	79.20
Geographic Region			
Northeast	0	339	84.96
	1	60	15.04
Midwest	0	261	65.41
	1	138	34.59
South	0	257	64.41
	1	142	35.59
West	0	340	85.21
	1	59	14.79
Employer organization type			
For profit	0	82	20.55
	1	317	79.45
Non-profit	0	361	90.48
	1	38	9.52
Government	0	361	90.48
	1	38	9.52
Other	0	394	98.75
	1	5	1.25
Don’t know	0	398	99.75
	1	1	0.25

Note: The frequencies are based on 399 observations used in model specifications (3)-(5)

APPENDIX C: HOSPICE EMPIRICAL ANALYSIS

Frequency Distributions

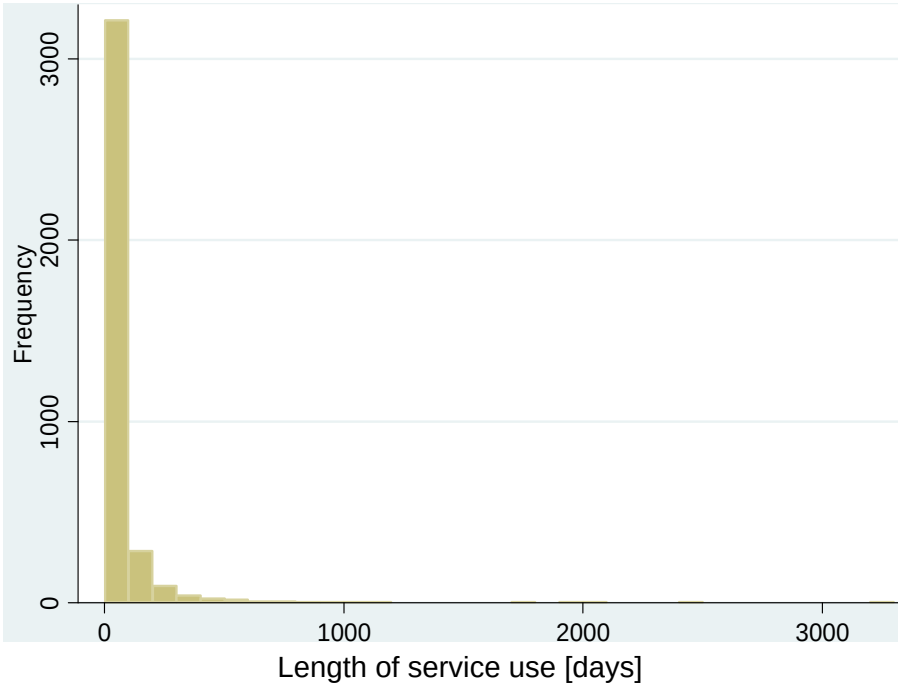

Figure 5: Frequency distribution for length of service (LOS) in days

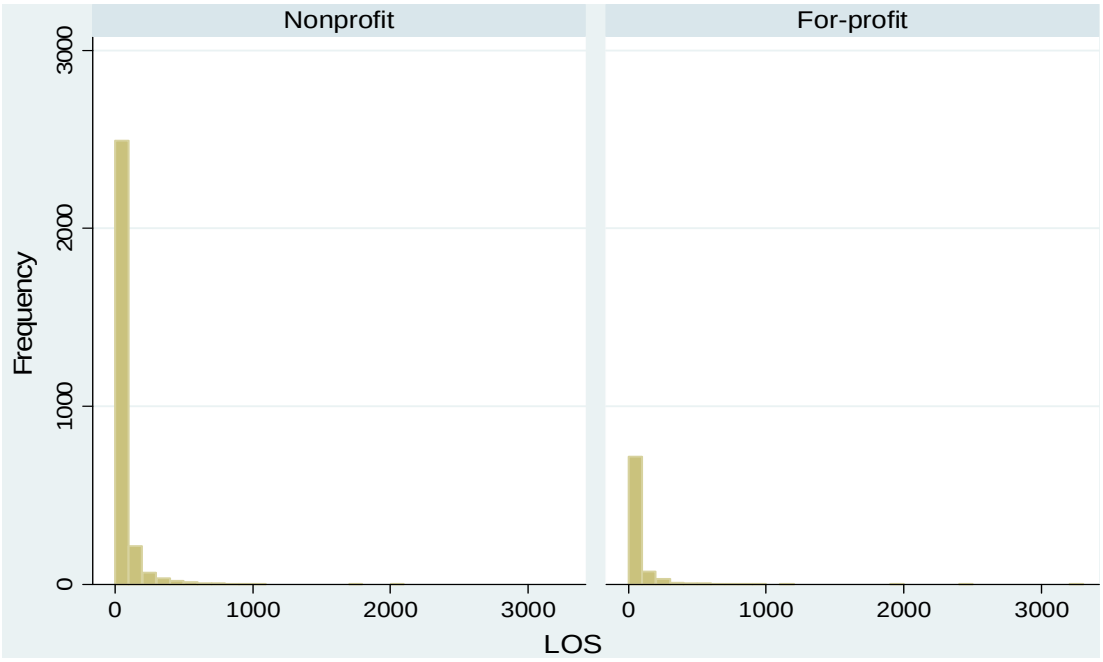

Figure 6: Frequency distribution for length of service in days by ownership form

Figure 7: Frequency distribution for length of service in days by certification status

Frequency Tables

Table 15: Frequencies of categorical variables for organizational characteristics

Variable	Value	Frequency	Percent	Variable	Value	Frequency	Percent
Agency Ownership				***Hospital-based Agency***			
FOR-PROFIT	0	2,856	77.11	Yes	0	2,838	76.62
	1	848	22.89		1	866	23.38
Interaction Term: **longLOS*FOR-PROFIT**				No	0	944	25.49
					1	2,760	74.51
	0	3,490	94.22	Don't know	0	3,626	97.89
	1	214	5.78		1	78	2.11
CERTIFICATION				***Nursing Home-based Agency***			
Certified	0	181	4.89	Yes	0	3,667	99.00
	1	3,523	95.11		1	37	1.00
Not certified	0	3,547	95.76	No	0	54	1.46
	1	157	4.24		1	3,650	98.54
Don't know	0	3,680	99.35	Don't know	0	3,687	99.54
	1	24	0.65		1	17	0.46
Chain Affiliation				***Location of hospice care***			
Yes	0	2,113	57.05	In home	0	1,068	28.83
	1	1,591	42.95		1	2,636	71.17
No	0	1,679	45.33	Inpatient	0	3,209	86.64
	1	2,025	54.67		1	495	13.36
Don't know	0	3,616	97.62	Other	0	3,131	84.53
	1	88	2.38		1	573	15.47
HMO-based Agency				***Census Region***			
Yes	0	3,637	98.19	Northeast	0	3,281	88.58
	1	67	1.81		1	423	11.42
No	0	101	2.73	Midwest	0	2,691	72.65
	1	3,603	97.27		1	1,013	27.35
Don't know	0	3,670	99.08	West	0	3,030	81.80
	1	34	0.92		1	674	18.20
				South	0	2,110	56.97
					1	1,594	43.03
				MSA	0	1,294	34.94
					1	2,410	65.06

Table 16: Frequencies of categorical variables for patient-level characteristics

Variable	Value	Frequency	Percent
Admission Diagnosis			
Cancer	0	1,344	36.29
	1	2,360	63.71
HIV	0	3,667	99.00
	1	37	1.00
Diabetes	0	3,687	99.54
	1	17	0.46
Mental	0	3,596	97.08
	1	108	2.92
Parkinson's	0	3,670	99.08
	1	34	0.92
Other nervous	0	3,674	99.19
	1	30	0.81
Ischemic heart	0	3,690	99.62
	1	14	0.38
CHF	0	3,518	94.98
	1	186	5.02
Other heart	0	3,607	97.38
	1	97	2.62
Cerebro-	0	3,547	95.76
vascular	1	157	4.24
Pneumonia	0	3,698	99.84
and influenza	1	6	0.16
COPD	0	3,546	95.73
	1	158	4.27
Digestive	0	3,640	98.27
	1	64	1.73
Genitourinary	0	3,619	97.71
	1	85	2.29
Symptoms	0	3,577	96.57
	1	127	3.43
Supplementary	0	3,693	99.70
	1	11	0.30
Age			
< 18	0	3,690	99.62
	1	14	0.38
18-44	0	3,579	96.63
	1	125	3.37
45-64	0	3,050	82.34
	1	654	17.66
65-74	0	2,774	74.89
	1	930	25.11
75-84	0	2,622	70.79
	1	1,082	29.21
≥ 85	0	2,907	78.48
	1	797	21.52

Variable	Value	Frequency	Percent
Primary Payment Source			
Medicare	0	849	22.92
	1	2,855	77.08
Medicaid	0	3,526	95.19
	1	178	4.81
Other gov't	0	3,701	99.92
	1	3	0.08
Private	0	3,291	88.85
insurance	1	413	11.15
Own	0	3,686	99.51
payment	1	18	0.49
Military	0	3,683	99.43
	1	21	0.57
No charge	0	3,627	97.92
	1	77	2.08
Other	0	3,579	96.63
payment src	1	125	3.37
Blank/	0	3,690	99.62
invalid	1	14	0.38
Referral Source			
Self/ Family	0	3,285	88.69
	1	419	11.31
Nursing	0	3,368	90.93
home	1	336	9.07
Hospital	0	3,005	81.13
	1	699	18.87
Physician	0	1,753	47.33
	1	1,951	52.67
Health	0	3,693	99.70
department	1	11	0.30
Social serv.	0	3,594	97.03
agency	1	110	2.97
Home health	0	3,560	96.11
agency	1	144	3.89
Hospice	0	3,629	97.98
	1	75	2.02
Religious	0	3,702	99.95
organization	1	2	0.05
HMO	0	3,687	99.54
	1	17	0.46
Friend	0	3,655	98.68
	1	49	1.32
Other	0	3,622	97.79
	1	82	2.21
Don't know	0	3,652	98.60
	1	52	1.40

Marital Status				***Race***			
Married	0	1,904	51.40	Native	0	3,674	99.19
	1	1,800	48.60	American	1	30	0.81
Single	0	3,448	93.09	Asian	0	3,681	99.38
	1	256	6.91		1	23	0.62
Widowed	0	2,438	65.82	White	0	508	13.71
	1	1,266	34.18		1	3,196	86.29
Divorced	0	3,460	93.41	Black	0	3,453	93.22
	1	244	6.59		1	251	6.78
Separated	0	3,688	99.57	Other	0	3,691	99.65
	1	16	0.43		1	13	0.35
Don't know	0	3,582	96.71	Don't know	0	3,522	95.09
	1	122	3.29		1	182	4.91
Gender				***Caregiver status***			
Male	0	1,959	52.89	Primary	0	220	5.94
	1	1,745	47.11	caregiver	1	3,484	94.06
				No primary	0	3,507	94.68
				caregiver	1	197	5.32
				Unknown	0	3,681	99.38
					1	23	0.62

Regression Results

Table 17: OLS Results on patient's clinical characteristics

y=LOS	Coefficient
Age	
< 18	-17.3327
	(21.4354)
18-44	-18.8477**
	(9.1870)
45-64	1.9934
	(6.1089)
75-84	-4.7218
	(6.6850)
≥ 85	-3.0252
	(8.2778)
Sex	
Male	-11.4192***
	(3.9939)
Race	
Nat. American	3.3902
	(9.8660)
Asian	-9.8544
	(9.7674)
Black	3.7504
	(8.3088)
Other	-17.8039
	(18.1833)
Don't know	8.9374
	(13.2083)
Admission Diagnosis (Alzheimer's as the reference)	
Cancer	-21.0998
	(15.4436)
HIV	30.1136
	(31.1665)
Diabetes	-40.2649**
	(18.3138)
Mental	-3.0346

	(25.3437)
Parkinson's	3.2258
	(27.6839)
Other nervous	66.1446
	(46.7214)
Ischemic heart	39.9454
	(53.8917)
CHF	-18.5304
	(16.6626)
Other heart	-7.4952
	(20.4453)
Cerebrovascular	-43.7017***
	(16.0239)
Pneumonia/influenza	-59.6179***
	(17.0936)
COPD	34.6823
	(23.7509)
Digestive	-48.3915***
	(15.5550)
Genitourinary	-54.1998***
	(15.4819)
Symptoms	-13.0611
	(30.1813)
Supplementary	14.0547
	(41.1147)
Other diagnoses	-35.4504***
	(15.8935)
Constant	80.8705
	(16.6024)
N	3704
F	5.45
P_{value}	0.0000
R^2	0.0216

Robust standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table 18: Negative Binomial Regression Results

y=LOS	NB Model Specifications					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
Agency Ownership (Nonprofit as the reference)						
PROFIT	0.3109**	-1.1146***	0.2516**	-0.9969***	0.2458**	-0.9871***
	(0.1004)	(0.0540)	(0.0886)	(0.0610)	(0.0878)	(0.0606)
Interaction Term						
longLOS*PROFIT		2.6241***		2.5051***		2.4914***
		(0.1122)		(0.1062)		(0.1069)
CERTIFICATION (Not certified as the reference)						
Certified	-0.8996***	-0.8294***	-0.7802***	-0.7795***	-1.0059***	-0.8621***
	(0.1968)	(0.1768)	(0.1595)	(0.1450)	(0.1894)	(0.1573)
Don't know	-1.7367***	-1.8853***	-1.5340***	-1.7009***	-1.7678***	-1.7736***
	(0.3693)	(0.3332)	(0.4145)	(0.4151)	(0.4247)	(0.4160)
Age (65-74 as the reference)						
< 18	-0.4383	-0.0757	-0.0657	0.1664	-0.1987	0.0183
	(0.3434)	(0.3100)	(0.4202)	(0.3657)	(0.3997)	(0.3638)
18-44	-0.1314	-0.0249	-0.4099**	-0.2877*	-0.3944*	-0.3043*
	(0.1689)	(0.1442)	(0.1586)	(0.1412)	(0.1718)	(0.1518)
45-64	0.0242	0.0773	-0.0457	-0.0163	-0.0873	-0.0953
	(0.1020)	(0.0887)	(0.0871)	(0.0793)	(0.1055)	(0.0949)
75-84	-0.1180	-0.0782	-0.0651	-0.0565	-0.0817	-0.0604
	(0.1004)	(0.0743)	(0.0859)	(0.0719)	(0.0856)	(0.0716)
≥ 85	-0.1040	-0.0417	0.0027	0.0350	0.0051	0.0403
	(0.1075)	(0.0826)	(0.0956)	(0.0825)	(0.0953)	(0.0820)
Sex (Female as the reference)						
Male	-0.1636*	-0.1093	-0.1786**	-0.1277*	-0.1637**	-0.1142*
	(0.0706)	(0.0593)	(0.0643)	(0.0544)	(0.0628)	(0.0531)

Race (White as the reference)						
Native American	-0.2359	-0.3235	-0.0485	-0.1266	0.0563	-0.0488
	(0.2208)	(0.2056)	(0.2322)	(0.2268)	(0.2440)	(0.2312)
Asian	-0.1456	0.0420	0.1473	0.1960	0.1002	0.1729
	(0.2566)	(0.2111)	(0.2876)	(0.2401)	(0.2724)	(0.2335)
Black	0.0420	0.1350	0.0381	0.1253	0.0051	0.0868
	(0.1400)	(0.1253)	(0.1227)	(0.1126)	(0.1147)	(0.1036)
Other	-0.3274	-0.0491	-0.2574	0.0053	-0.2099	0.0170
	(0.3616)	(0.2049)	(0.3552)	(0.2736)	(0.3522)	(0.2815)
Don’t know	0.0627	0.1402	0.0694	0.1757	0.0841	0.1914
	(0.1549)	(0.1442)	(0.1309)	(0.1225)	(0.1308)	(0.1222)
Marital Status (Single as the reference)						
Married	-0.1229	-0.1339	-0.1687	-0.1035	-0.1063	-0.0491
	(0.1271)	(0.1175)	(0.1247)	(0.1155)	(0.1232)	(0.1148)
Widowed	-0.0370	-0.0532	-0.0873	-0.0309	-0.0350	0.0175
	(0.1412)	(0.1276)	(0.1308)	(0.1217)	(0.1280)	(0.1195)
Divorced	-0.0606	-0.0362	-0.0082	0.0206	0.0337	0.0604
	(0.1552)	(0.1453)	(0.1542)	(0.1453)	(0.1520)	(0.1437)
Separated	-0.1072	-0.1423	-0.3111	-0.2305	-0.3061	-0.2245
	(0.3793)	(0.3788)	(0.3240)	(0.3078)	(0.3162)	(0.3054)
Don’t know	-0.0939	-0.1443	-0.1253	-0.1703	-0.0891	-0.1334
	(0.2424)	(0.2407)	(0.2128)	(0.1974)	(0.2038)	(0.1860)
Census Region (South as the reference)						
Northeast	-0.3429***	-0.2596**	-0.3485***	-0.2592**	-0.3333***	-0.2472**
	(0.1031)	(0.0932)	(0.0966)	(0.0901)	(0.0965)	(0.0902)
Midwest	-0.1717*	-0.1310	-0.1825*	-0.1454*	-0.1863**	-0.1501*
	(0.0870)	(0.0700)	(0.0732)	(0.0660)	(0.0716)	(0.0645)

West	-0.3170**	-0.2620***	-0.3176***	-0.2776***	-0.3145***	-0.2671***
	(0.0968)	(0.0750)	(0.0886)	(0.0732)	(0.0882)	(0.0733)
MSA (No as the reference)						
Yes	-0.2197***	-0.2228***	-0.1576**	-0.1665**	-0.1533*	-0.1604**
	(0.0644)	(0.0591)	(0.0607)	(0.0557)	(0.0600)	(0.0552)
Year (1998 as the reference)						
2000	-0.0214	-0.1065	-0.0527	-0.1037	-0.0451	-0.0940
	(0.0664)	(0.0562)	(0.0608)	(0.0536)	(0.0609)	(0.0531)
Admission Diagnosis (Alzheimer's as the reference)						
Cancer			-0.2542	-0.0498	-0.2516	-0.0472
			(0.1970)	(0.1852)	(0.1966)	(0.1851)
HIV			0.2899	0.5286	-0.0025	0.2265
			(0.3128)	(0.2992)	(0.3165)	(0.2965)
Diabetes			-0.4752	-0.3200	-0.4638	-0.3090
			(0.3958)	(0.3816)	(0.3923)	(0.3774)
Mental			-0.1662	-0.2334	-0.1726	-0.2271
			(0.2682)	(0.2206)	(0.2626)	(0.2194)
Parkinson's			0.0008	-0.0586	-0.1197	-0.1661
			(0.3138)	(0.2989)	(0.2816)	(0.2661)
Other nervous			0.7409*	0.9093*	0.8045*	0.9847**
			(0.3678)	(0.3531)	(0.3751)	(0.3576)
Ischemic heart			0.4304	0.6903	0.4596	0.7412
			(0.4384)	(0.4647)	(0.4462)	(0.4817)
CHF			-0.1973	-0.0585	-0.1879	-0.0513
			(0.2229)	(0.2126)	(0.2234)	(0.2134)
Other heart			-0.1674	0.1496	-0.1651	0.1556
			(0.2542)	(0.2442)	(0.2545)	(0.2453)
Cerebrovascular			-0.8708***	-0.5679**	-0.8850***	-0.5903**

	(0.2435)	(0.2167)	(0.2418)	(0.2144)
Pneumonia/influenza	-1.9186***	-0.8633	-2.1138***	-1.1919*
	(0.4790)	(0.6877)	(0.3929)	(0.5653)
COPD	0.3481	0.3128	0.3287	0.2997
	(0.2468)	(0.2238)	(0.2435)	(0.2204)
Digestive	-0.8786***	-0.4546*	-0.8659***	-0.4451
	(0.2539)	(0.2275)	(0.2542)	(0.2305)
Genitourinary	-1.3458***	-0.9064***	-1.3339***	-0.9003***
	(0.2564)	(0.2412)	(0.2565)	(0.2421)
Symptoms	-0.2830	-0.1474	-0.2705	-0.1425
	(0.2880)	(0.2376)	(0.2891)	(0.2391)
Supplementary	0.4066	0.5085	0.3956	0.5562
	(0.4950)	(0.5228)	(0.5122)	(0.5411)
Other diagnoses	-0.5635*	-0.3464	-0.6006*	-0.3806
	(0.2398)	(0.2229)	(0.2355)	(0.2206)

Location of hospice care (Inpatient as the reference)				
In home	0.1394	0.0790	0.1355	0.0769
	(0.0947)	(0.0810)	(0.0950)	(0.0815)
Other	0.2250	0.1525	0.1871	0.1317
	(0.1170)	(0.1042)	(0.1144)	(0.1026)
Referral Source				
Self/ Family	0.0806	0.1226	0.0726	0.1190
	(0.1434)	(0.1394)	(0.1369)	(0.1341)
Nursing home	-0.3684*	-0.1434	-0.4042**	-0.1709
	(0.1672)	(0.1490)	(0.1451)	(0.1316)
Hospital	-0.3294**	-0.1924	-0.3329**	-0.1957
	(0.1262)	(0.1197)	(0.1197)	(0.1146)
Physician	-0.0172	0.0539	-0.0286	0.0474
	(0.1279)	(0.1219)	(0.1181)	(0.1143)
Health department	0.1812	-0.1076	-0.0145	-0.2038
	(0.4033)	(0.3028)	(0.3518)	(0.3095)
Social service agency	0.2885	0.0114	0.2464	-0.0225
	(0.2763)	(0.2083)	(0.2777)	(0.2087)
Home health agency	-0.2691	-0.1767	-0.2646	-0.1717
	(0.1739)	(0.1559)	(0.1678)	(0.1517)
Hospice	-0.4076*	-0.4680**	-0.3502	-0.4217*
	(0.1976)	(0.1695)	(0.1908)	(0.1672)
Religious organization	0.8846	0.8862	0.9100	0.8992
	(0.6687)	(0.6640)	(0.6672)	(0.6604)
HMO	0.2690	0.5377*	0.2653	0.5638*
	(0.3104)	(0.2510)	(0.2993)	(0.2439)
Friend	0.3872	0.4515	0.4611	0.4999

	(0.2936)	(0.2724)	(0.2984)	(0.2762)
Other	0.2193	0.1688	0.2059	0.1620
	(0.2343)	(0.2336)	(0.2277)	(0.2261)
Don't know	0.2359	0.2673	0.2629	0.2752
	(0.2909)	(0.2565)	(0.2888)	(0.2534)
Caregiver status (No primary caregiver as the reference)				
Primary caregiver	0.1317	-0.0029	0.2020	0.0627
	(0.1123)	(0.1030)	(0.1118)	(0.1026)
Don't know	-0.7200*	-0.5503*	-0.6868*	-0.5100
	(0.3180)	(0.2664)	(0.3243)	(0.2749)
Chain Affiliation (No as the reference)				
Yes	0.0619	0.0172	0.0734	0.0217
	(0.0632)	(0.0549)	(0.0618)	(0.0543)
Don't know	-0.0536	-0.2954	-0.0901	-0.3048
	(0.1964)	(0.1919)	(0.1945)	(0.1917)
HMO-based Agency (No as the reference)				
Yes	0.1788	0.1541	0.1953	0.1649
	(0.2098)	(0.1965)	(0.2115)	(0.1982)
Don't know	-0.3844	-0.2538	-0.3562	-0.2342
	(0.2636)	(0.2339)	(0.2659)	(0.2380)
Hospital-based Agency (No as the reference)				
Yes	-0.1154	-0.0635	-0.1117	-0.0557
	(0.0677)	(0.0655)	(0.0670)	(0.0650)
Don't know	-0.4978*	-0.4100*	-0.5321**	-0.4496**
	(0.1934)	(0.1901)	(0.1771)	(0.1689)
Nursing Home-based Agency (No as the reference)				
Yes	0.3730	0.2750	0.2397	0.1857
	(0.3311)	(0.3317)	(0.3110)	(0.3154)

Don’t know			0.8170*	0.8826*	0.8640*	0.9238*
			(0.3952)	(0.3777)	(0.3952)	(0.3767)
Primary Payment Source (Medicare as the reference)						
Medicaid					0.4806***	0.4875***
					(0.1447)	(0.1391)
Other government					0.9071	1.0150
					(0.6009)	(0.8019)
Private insurance					-0.0736	-0.0055
					(0.1130)	(0.1002)
Own payment					0.3931	0.2635
					(0.6057)	(0.5631)
Military					-0.3540	-0.1982
					(0.2363)	(0.2523)
No charge					-0.2487	-0.0455
					(0.2199)	(0.2109)
Other payment source					-0.3465*	-0.1519
					(0.1704)	(0.1453)
Blank/invalid					-0.5103*	-0.4432
					(0.2405)	(0.2527)
Constant	5.2825***	5.1687***	5.2303***	5.0374***	5.3399***	4.9948***
	(0.2417)	(0.2219)	(0.3359)	(0.3127)	(0.3503)	(0.3186)

lnalpha						
Constant	0.5242***	0.3560***	0.4649***	0.3107***	0.4572***	0.3039***
	(0.0231)	(0.0217)	(0.0216)	(0.0211)	(0.0215)	(0.0209)
N	3704	3704	3704	3704	3704	3704

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table 19: OLS Regression Results

y=ln(LOS)	OLS Model Specifications					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
Agency Ownership (Nonprofit as the reference)						
PROFIT	0.0253	-0.6705***	0.0745	-0.5901***	0.0737	-0.5866***
	(0.0639)	(0.0555)	(0.0689)	(0.0620)	(0.0689)	(0.0621)
Interaction Term						
longLOS*PROFIT		2.7496***		2.6356***		2.6254***
		(0.0702)		(0.0747)		(0.0749)
Certification (Not certified as the reference)						
Certified	-0.5604***	-0.5953***	-0.6073***	-0.6470***	-0.7012***	-0.7316***
	(0.1378)	(0.1315)	(0.1389)	(0.1330)	(0.1790)	(0.1698)
Don't know	-1.4123***	-1.5429***	-1.5406***	-1.7309***	-1.5689***	-1.7621***
	(0.3364)	(0.3089)	(0.3880)	(0.3648)	(0.4150)	(0.3826)
Age (65-74 as the reference)						
< 18	-0.2543	-0.0702	-0.1926	-0.0139	-0.2758	-0.1021
	(0.4421)	(0.4313)	(0.4924)	(0.4700)	(0.5080)	(0.4816)
18-44	-0.0317	-0.0405	-0.2306	-0.2245	-0.2233	-0.2375
	(0.1538)	(0.1468)	(0.1551)	(0.1474)	(0.1678)	(0.1589)
45-64	0.1339	0.0946	0.0658	0.0336	0.0842	0.0363
	(0.0753)	(0.0712)	(0.0743)	(0.0706)	(0.0982)	(0.0918)
75-84	-0.0720	-0.0794	0.0162	0.0034	0.0168	0.0055
	(0.0669)	(0.0617)	(0.0666)	(0.0619)	(0.0669)	(0.0621)
≥ 85	-0.0685	-0.0824	0.1000	0.0694	0.1018	0.0722
	(0.0774)	(0.0706)	(0.0799)	(0.0738)	(0.0801)	(0.0741)

Sex (Female as the reference)						
Male	-0.0672	-0.0439	-0.0944	-0.0658	-0.0965	-0.0663
	(0.0542)	(0.0504)	(0.0537)	(0.0501)	(0.0538)	(0.0502)
Race (White as the reference)						
Native American	-0.0291	-0.1138	0.0270	-0.0808	0.0332	-0.0742
	(0.2759)	(0.2503)	(0.2836)	(0.2660)	(0.2906)	(0.2747)
Asian	0.1880	0.2515	0.2323	0.2719	0.2552	0.2883
	(0.2771)	(0.2507)	(0.2985)	(0.2699)	(0.2816)	(0.2611)
Black	0.0207	0.0783	0.0122	0.0666	-0.0096	0.0485
	(0.0986)	(0.0924)	(0.1002)	(0.0944)	(0.1004)	(0.0946)
Other	0.0986	0.2755	0.0372	0.1993	0.0138	0.1809
	(0.3604)	(0.2892)	(0.3739)	(0.3180)	(0.3829)	(0.3263)
Don’t know	0.0439	0.0738	0.0963	0.1056	0.0939	0.1026
	(0.1199)	(0.1119)	(0.1162)	(0.1111)	(0.1162)	(0.1111)
Marital Status (Single as the reference)						
Married	-0.0596	-0.0454	-0.1106	-0.0783	-0.0787	-0.0549
	(0.1114)	(0.1028)	(0.1083)	(0.0992)	(0.1091)	(0.0999)
Widowed	0.0516	0.0498	0.0216	0.0306	0.0384	0.0428
	(0.1189)	(0.1090)	(0.1149)	(0.1046)	(0.1146)	(0.1044)
Divorced	0.0610	0.0325	0.0269	0.0105	0.0339	0.0188
	(0.1433)	(0.1334)	(0.1401)	(0.1304)	(0.1400)	(0.1304)
Separated	-0.0504	-0.0779	-0.1493	-0.1252	-0.1645	-0.1433
	(0.4105)	(0.3843)	(0.3763)	(0.3529)	(0.3780)	(0.3529)
Don’t know	-0.3014	-0.3375*	-0.2535	-0.2929	-0.2352	-0.2772
	(0.1852)	(0.1698)	(0.1797)	(0.1656)	(0.1790)	(0.1655)
Census Region (South as the reference)						
Northeast	-0.3436***	-0.2582**	-0.3615***	-0.2769***	-0.3588***	-0.2774***
	(0.0826)	(0.0787)	(0.0827)	(0.0790)	(0.0827)	(0.0790)

Midwest	-0.1694**	-0.1294*	-0.1751**	-0.1331*	-0.1754**	-0.1346*
	(0.0616)	(0.0581)	(0.0621)	(0.0590)	(0.0622)	(0.0591)
West	-0.3181***	-0.2353***	-0.3175***	-0.2386***	-0.3230***	-0.2452***
	(0.0725)	(0.0651)	(0.0713)	(0.0646)	(0.0715)	(0.0648)
MSA (No as the reference)						
YES	-0.1844***	-0.1795***	-0.1380*	-0.1393**	-0.1368*	-0.1374**
	(0.0540)	(0.0512)	(0.0537)	(0.0508)	(0.0540)	(0.0511)
Year (1998 as the reference)						
2000	-0.0769	-0.0980*	-0.0646	-0.0833	-0.0575	-0.0741
	(0.0506)	(0.0467)	(0.0509)	(0.0473)	(0.0514)	(0.0476)
Admission Diagnosis (Alzheimer's as the reference)						
Cancer			0.1660	0.2761	0.1665	0.2767
			(0.1749)	(0.1530)	(0.1746)	(0.1528)
HIV			0.6721*	0.7390*	0.5083	0.6372*
			(0.3361)	(0.3225)	(0.3327)	(0.3185)
Diabetes			-0.1000	0.0826	-0.1103	0.0731
			(0.3697)	(0.3447)	(0.3704)	(0.3455)
Mental			-0.1459	-0.0706	-0.1428	-0.0697
			(0.2375)	(0.1980)	(0.2372)	(0.1981)
Parkinson's			0.4944	0.2881	0.4849	0.2809
			(0.2946)	(0.2485)	(0.2914)	(0.2454)
Other nervous			0.7844*	0.8186*	0.7820*	0.8184*
			(0.3753)	(0.3702)	(0.3806)	(0.3739)
Ischemic heart			0.5934	0.7049	0.6012	0.7153
			(0.5057)	(0.4805)	(0.5054)	(0.4806)
CHF			-0.1492	-0.0072	-0.1485	-0.0060
			(0.2130)	(0.1876)	(0.2130)	(0.1877)

Other heart	-0.0873	0.1505	-0.0914	0.1476
	(0.2451)	(0.2242)	(0.2449)	(0.2240)
Cerebrovascular	-0.6613**	-0.4183*	-0.6569**	-0.4168*
	(0.2055)	(0.1815)	(0.2050)	(0.1811)
Pneumonia/influenza	-1.1679*	-0.8086	-1.2154**	-0.8466
	(0.4577)	(0.4929)	(0.4250)	(0.4586)
COPD	0.2486	0.2590	0.2483	0.2588
	(0.2242)	(0.1969)	(0.2238)	(0.1967)
Digestive	-0.3147	-0.0546	-0.3233	-0.0612
	(0.2367)	(0.2184)	(0.2364)	(0.2185)
Genitourinary	-0.8549***	-0.6197**	-0.8540***	-0.6205**
	(0.2244)	(0.2048)	(0.2245)	(0.2048)
Symptoms	-0.1241	0.0119	-0.1276	0.0090
	(0.2135)	(0.1867)	(0.2135)	(0.1867)
Supplementary	0.7403	0.7850	0.8499	0.8853
	(0.5235)	(0.4573)	(0.5405)	(0.4642)
Other diagnosis	-0.3356	-0.1743	-0.3308	-0.1703
	(0.2296)	(0.2070)	(0.2285)	(0.2061)
Location of hospice care (Inpatient as the reference)				
In home	0.2892***	0.2180**	0.3034***	0.2275**
	(0.0793)	(0.0722)	(0.0797)	(0.0725)
Other	0.2609**	0.1796*	0.2732**	0.1886*
	(0.0978)	(0.0898)	(0.0981)	(0.0901)
Referral Source				
Self/ Family	0.0694	0.0319	0.0731	0.0355
	(0.1189)	(0.1120)	(0.1188)	(0.1120)
Nursing home	-0.3563**	-0.2794*	-0.3538**	-0.2769*
	(0.1313)	(0.1189)	(0.1321)	(0.1195)

Hospital	-0.3392**	-0.2978**	-0.3367**	-0.2961**
	(0.1038)	(0.0979)	(0.1035)	(0.0976)
Physician	-0.0836	-0.0715	-0.0788	-0.0681
	(0.1026)	(0.0961)	(0.1026)	(0.0960)
Health department	-0.0720	-0.2116	-0.1145	-0.2534
	(0.5585)	(0.4906)	(0.5440)	(0.4860)
Social service agency	-0.2182	-0.2490	-0.2318	-0.2583
	(0.1710)	(0.1499)	(0.1701)	(0.1492)
Home health agency	-0.1598	-0.1382	-0.1502	-0.1342
	(0.1539)	(0.1463)	(0.1536)	(0.1461)
Hospice	-0.3967	-0.4110*	-0.3436	-0.3711
	(0.2073)	(0.1901)	(0.2057)	(0.1896)
Religious organization	1.0143	1.0103	1.1012	1.0747
	(0.8738)	(0.8988)	(0.8709)	(0.8972)
HMO	0.6858*	0.7717**	0.7295*	0.8060**
	(0.3186)	(0.2909)	(0.3127)	(0.2873)
Friend	0.1361	0.2217	0.1436	0.2235
	(0.2435)	(0.2300)	(0.2463)	(0.2322)
Other	-0.0270	-0.1087	-0.0193	-0.1022
	(0.2040)	(0.1913)	(0.2058)	(0.1926)
Don’t know	0.1468	0.1348	0.1471	0.1357
	(0.2438)	(0.2325)	(0.2461)	(0.2343)
Caregiver status (No primary caregiver as the reference)				
Primary caregiver	-0.0087	-0.0372	0.0132	-0.0184
	(0.1138)	(0.1064)	(0.1136)	(0.1061)
Don’t know	-0.6636*	-0.4341	-0.6451	-0.4205
	(0.3353)	(0.3117)	(0.3331)	(0.3120)

Chain Affiliation (No as the reference)				
Yes	0.0510	0.0144	0.0534	0.0151
	(0.0533)	(0.0506)	(0.0533)	(0.0506)
Don’t know	0.0066	-0.1467	-0.0192	-0.1662
	(0.1655)	(0.1323)	(0.1648)	(0.1332)
HMO-based Agency (No as the reference)				
Yes	0.0790	0.0339	0.0904	0.0405
	(0.1897)	(0.1850)	(0.1908)	(0.1856)
Don’t know	-0.1361	-0.0402	-0.1420	-0.0446
	(0.2264)	(0.2064)	(0.2282)	(0.2086)
Hospital-based Agency (No as the reference)				
Yes	-0.0959	-0.0944	-0.0935	-0.0908
	(0.0615)	(0.0602)	(0.0618)	(0.0606)
Don’t know	-0.2739	-0.2073	-0.2763	-0.2135
	(0.1574)	(0.1565)	(0.1563)	(0.1555)
Nursing Home-based Agency (No as the reference)				
Yes	0.1106	0.0514	0.0526	0.0070
	(0.2931)	(0.2904)	(0.2958)	(0.2919)
Don’t know	0.6589	0.7882	0.6254	0.7596
	(0.4701)	(0.4455)	(0.4792)	(0.4522)
Primary Payment Source (Medicare as the reference)				
Medicaid			0.2884*	0.2503
			(0.1424)	(0.1354)
Other government			1.1488	0.4998
			(1.0060)	(1.0184)
Private insurance			-0.1051	-0.0585
			(0.1061)	(0.1002)
Own payment			-0.6600	-0.5948

					(0.4849)	(0.4280)
Military					0.0669	-0.0138
					(0.3690)	(0.3648)
No charge					-0.2317	-0.2163
					(0.2129)	(0.2059)
Other payment					-0.0908	-0.0330
					(0.1583)	(0.1537)
Blank/invalid					0.0557	-0.0451
					(0.3240)	(0.3297)
Constant	3.8239***	3.8230***	3.6875***	3.6566***	3.7203***	3.6902***
	(0.1851)	(0.1741)	(0.3011)	(0.2797)	(0.3251)	(0.3034)
N	3704	3704	3704	3704	3704	3704
F	3.9397	71.5995	4.8658	27.3891	4.5898	24.5405
p_{value}	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
R^2	0.0248	0.1642	0.0763	0.2013	0.0799	0.2037

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table 20: Logistic Regression Results

y=longLOS	(1)	(2)	(3)
Agency Ownership (Nonprofit as the reference)			
PROFIT	1.09	1.07	1.05
	(0.10)	(0.12)	(0.11)
Certification (Not certified as the reference)			
Certified	0.51***	0.47***	0.41***
	(0.09)	(0.10)	(0.11)
Don't know	0.23*	0.19*	0.17*
	(0.15)	(0.16)	(0.15)
Age (65-74 as the reference)			
Age < 18	0.73	0.64	0.59
	(0.49)	(0.51)	(0.48)
Age 18-44	1.11	0.92	0.97
	(0.26)	(0.24)	(0.27)
Age 45-64	1.21	1.16	1.22
	(0.14)	(0.14)	(0.19)
Age 75-84	0.94	0.98	0.98
	(0.10)	(0.11)	(0.11)
Age >84	1.11	1.21	1.22
	(0.13)	(0.15)	(0.16)
Sex (Female as the reference)			
Male	0.98	0.95	0.95
	(0.08)	(0.08)	(0.08)
Race (White as the reference)			
Native American	1.24	1.48	1.53
	(0.49)	(0.59)	(0.61)
Asian	1.07	1.21	1.24
	(0.57)	(0.68)	(0.70)
Black	0.97	1.01	0.98
	(0.15)	(0.16)	(0.16)
Other race	1.21	1.08	1.12
	(0.80)	(0.83)	(0.86)
Don't know	0.91	0.95	0.95
	(0.17)	(0.18)	(0.18)
Marital Status (Single as the reference)			

Married	0.77	0.75	0.79
	(0.13)	(0.13)	(0.14)
Widowed	0.97	0.96	0.99
	(0.17)	(0.17)	(0.18)
Divorced	1.05	1.07	1.09
	(0.22)	(0.23)	(0.24)
Separated	0.87	0.82	0.82
	(0.54)	(0.50)	(0.50)
Don’t know	0.65	0.66	0.68
	(0.18)	(0.20)	(0.21)
Census Region (South as the reference)			
Northeast	0.63***	0.63**	0.64**
	(0.09)	(0.09)	(0.09)
Midwest	0.81*	0.81*	0.81*
	(0.08)	(0.08)	(0.08)
West	0.62***	0.60***	0.60***
	(0.07)	(0.07)	(0.07)
MSA (No as the reference)			
Yes	0.81**	0.83*	0.84*
	(0.07)	(0.07)	(0.07)
Year (1998 as the reference)			
2000	0.90	0.88	0.86
	(0.07)	(0.07)	(0.07)
Admission Diagnosis (Alzheimer’s as the reference)			
Cancer		0.88	0.89
		(0.21)	(0.21)
HIV		1.51	1.16
		(0.69)	(0.54)
Diabetes		0.51	0.52
		(0.36)	(0.36)
Mental		0.98	0.99
		(0.31)	(0.32)
Parkinson’s		2.20	2.18
		(0.91)	(0.90)
Other nervous		3.11**	3.14*
		(1.36)	(1.40)
Ischemic heart		2.55	2.52
		(1.55)	(1.54)

CHF	0.95	0.96
	(0.27)	(0.28)
Other heart	1.15	1.14
	(0.37)	(0.37)
Cerebrovascular	0.39**	0.40**
	(0.13)	(0.13)
COPD	1.49	1.49
	(0.43)	(0.43)
Digestive	0.32*	0.33*
	(0.15)	(0.16)
Genitourinary	0.16***	0.16***
	(0.08)	(0.08)
Symptoms	0.55	0.55
	(0.18)	(0.18)
Supplementary	2.03	2.14
	(1.50)	(1.60)
Other diagnosis	0.81	0.82
	(0.27)	(0.27)
Location of hospice care (Inpatient as the reference)		
In home	1.18	1.21
	(0.16)	(0.17)
Other	1.19	1.20
	(0.19)	(0.20)
Referral Source		
Self/ Family	1.17	1.18
	(0.21)	(0.21)
Nursing home	0.74	0.74
	(0.16)	(0.16)
Hospital	0.73	0.73
	(0.13)	(0.13)
Physician	1.10	1.11
	(0.18)	(0.18)
Health department	1.71	1.62
	(1.11)	(1.04)
Social service agency	1.06	1.05
	(0.28)	(0.28)

Home health agency	0.82	0.85
	(0.20)	(0.21)
Hospice	0.88	0.93
	(0.27)	(0.29)
Religious organization	3.33	3.94
	(5.16)	(6.11)
HMO	1.89	2.05
	(1.18)	(1.24)
Friend	1.07	1.10
	(0.37)	(0.39)
Other reference	1.39	1.48
	(0.40)	(0.42)
Don't know	2.10*	2.21*
	(0.77)	(0.81)
Caregiver status (No primary caregiver as the reference)		
Primary Caregiver	1.06	1.10
	(0.20)	(0.21)
Don't know	0.54	0.53
	(0.40)	(0.40)
Chain Affiliation (No as the reference)		
Yes	1.15	1.16
	(0.10)	(0.10)
Don't know	1.07	1.05
	(0.31)	(0.31)
HMO-based Agency (No as the reference)		
Yes	1.17	1.20
	(0.36)	(0.37)
Don't know	0.78	0.77
	(0.36)	(0.36)
Hospital-based Agency (No as the reference)		
Yes	0.91	0.90
	(0.09)	(0.09)
Don't know	0.42*	0.42*
	(0.14)	(0.15)
Nursing Home-based Agency (No as the reference)		
Yes	1.23	1.09
	(0.50)	(0.48)
Don't know	3.66	3.62
	(2.70)	(2.66)

Primary Payment Source (Medicare as the reference)			
Medicaid			1.46 (0.30)
Other government			4.99 (5.72)
Private insurance			0.79 (0.14)
Own payment			0.88 (0.51)
Military			1.38 (0.65)
No charge			0.94 (0.29)
Other payment			0.69 (0.19)
Blank/Invalid			0.61 (0.40)
Constant	1.00 (0.26)	0.97 (0.43)	1.01 (0.48)
N	3704	3698	3698

* p<.05, ** p<.01, *** p<.001

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