Spatial Competition and Market Definition in the Nursing Home Industry *

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November 15, 2006

Abstract

The degree of competition in the nursing home industry has profound implications for regulations, quality and pricing decisions. This paper presents a model of spatial competition in the nursing home industry to investigate how consumer preferences over location can affect the substitutability and the degree of competition between geographically differentiated nursing homes. A random coefficients logit demand model for nursing home care is estimated using census tract demographic information. The estimates on distance and price show plausible substitution effects and time costs. Simulation results reveal a higher own price elasticity of demand than found in the previous literature. The model is used to examine the impact of changes in the market structure of nursing homes in one hypothetical county.

*I have greatly benefitted from conversations with Randall Ellis, Marc Rysman and Jacob Glazer.

1 Introduction

The degree of competition in the nursing home industry has profound importance for regulations, quality and pricing decisions. This paper presents a model of spatial competition in the nursing home industry to investigate how consumer preferences over location can affect the substitutability and the degree of competition between different nursing homes. Specifically, I explore the appropriate definition of the market implied by consumer preferences. I first estimate consumer demand for nursing home care using data on Wisconsin nursing homes. I find that location is an important consideration for potential consumers. Using the results from the demand analysis, I estimate substitution effects between firms based on geography. The framework can be used to directly simulate market interactions and study merger effects in the nursing home industry.

There are several reasons why the extent of competition between firms is relevant in the nursing home industry. First, there are concerns over the quality and efficiency of nursing home care. Studies investigating the relationship between market structure and these outcome measures must assume a relevant market for their analysis. If not all firms within the market area chosen are considered to be close substitutes by consumers because of their location, then existing studies on the competitive effects in the nursing home industry might have biased results. Second, there has been a strong merger trend in recent years. Despite this, the industry is not considered to be highly concentrated. Market shares can be calculated only after the market has been accurately defined. Without knowing which firms compete over the same set of consumers the Herfindahl-Hirchman Index and market concentration ratios in the industry will be meaningless and might not induce the proper anti-trust pressures. Also, understanding spatial competition in the industry will enable better judgement of market power and more realistic simulations of the consequences of potential mergers. Lastly, thirty-two states still have Certificate of Need laws in place. Under these laws a new nursing facility can enter a market only with approval from the state planning agency. When considering the potential for new entry, it is necessary to identify the size of the market that might be entered.

This paper uses consumer preferences to explore substitutability between firms and to consider endogenous definitions of market areas using facility-level and aggregate population data. Demand for private payers of nursing home care is estimated following the methodology of Berry (1994) and Berry, Levinsohn and Pakes (1995). This model allows consumer heterogeneity in the valuation of characteristics. To incorporate the importance of location, I include distance in the spirit of Davis (2005). I use data on the distribution of the population and facility level

characteristics to explain the observed variation in market shares. By modeling the decision of a representative individual at each census tract in the state and taking a weighted sum of these decisions, I can infer the local demand. It is this variation in local demand around nursing homes that helps identify the effect of distance on the demand of consumers. Using this methodology I improve upon previous studies by explicitly studying how consumers value the location of a nursing home and the implied substitutability between firms using easily available aggregate data.

In general the literature assumes that the county is the appropriate definition of the market, despite the lack of research investigating the issue. There has been one recent study that explores the appropriate definition of the market area in the nursing home industry. Zwanziger, Mukamel and Indridason (2002) use the resident origin approach in New York State and find that in urban areas the market area is smaller than the county. The resident origin approach uses the zip code areas from which a nursing home drew residents as the basis of defining its market. There are several reasons that this current study improves upon the Zwanziger, Mukamel and Indridason study. The resident-origin methodology requires patient level data, which is not as accessible as facility level information. The results of the Zwanziger et al study only provide market definitions for New York State, a state dominated by one massive urban area, making it difficult to extend these results to other states. Since New York State does not allow corporate ownership of nursing homes, little can be said about anti-trust concerns possible in other states. There has also been criticism of the resident origin approach, also known as patient flow analysis, in the hospital literature as will be discussed in Section 2.

The paper is structured as follows: Section 2 and Section 3 consider the motivation to investigate market structure and define the market area and describe important industry characteristics. Section 4 describes the model that is estimated. Section 5 and Section 6 consider the data and methodology respectively. Section 7 and Section 8 describe the results from the study.

2 Motivation/ Related Literature

Historically, consumer choice of a nursing facility has been based on the proximity of the facility to an individual's home or the home of relative and friends. [1] This is especially true for residents with close family. In these cases, anecdotal evidence suggests that location will become the overriding criteria, leading families to put less emphasis on quality and price when choosing a

[1] Harrington et al, p. 50

nursing home. There is reason to believe that for a subset of potential consumers the choice of nursing homes is constrained to facilities that are within a certain distance of their previous residence. The preferences of consumers will limit the substitutability between firms and affect the market structure in the industry.

Defining the market structure is important in the nursing home industry. First, papers studying the effect of competition on outcome variables, such as quality and efficiency, can have biased results if they are based on incorrect market definitions. For example, Grabowski and Hirth (2003) study how the proportion of non-profit competitors within the market affects the level of quality a firm provides. They find that as the share of non-profits increases, the average quality in the market increases. This study assumes that the result is due to competitive spillovers between firms. The market structure is a key consideration in their paper. Depending on the geographical distribution of non-profits and for-profits and the degree of substitutability across location, the competitive spillovers may not account for the results found in this study.

Another reason that understanding the extent of competitive effects may be important in this industry is that there has been a strong merger trend starting in the 1990s. Despite the wave of mergers, the industry is not considered to be highly concentrated. However, the calculation of concentration ratios is dependent on which definition of the market is used. There has been an increased presence of corporate chains in the US nursing home industry as well as in the health sector more generally. The number of corporate organizations operating nursing homes increased from 725 in 1992 to 928 in 1996. Defining the relevant market requires identifying the set of products that compete with each other and only then can meaningful competition measures be calculated. In addition to measuring substitutability between firms, the results here can be used to simulate post-merger prices.

Finally, better understanding market structure in this industry is desirable since thirty-two states have Certificate of Need (CON) laws in place. CON policies were put into place to limit the supply of long term care by requiring approval for new beds and services. When it was first implemented, CON was a federal requirement but after 1986 the federal requirement was removed and states were left to decide whether to keep the policy in place. In addition to retaining CON laws, some states also placed moratoria on nursing home bed growth. There has been a diminished effect of these laws in recent years but states continue to deny applications. [2] In Florida, there were 133 applications submitted for nursing homes in 1997 and of these, 71

[2] Phone call to the Wisconsin State Planning Agency confirmed that applications for new nursing continue to be denied.

were denied. In Wisconsin, the State Planning Agency is no longer accepting applications for new nursing homes. Without a clear understanding of how far competitive effects reach, state planning agencies may not be able to properly assess which, if any, homes should be allowed to enter the market. For example, studies find that market concentration has an effect on the prices charged to private pay patients. [3] State planning agencies may believe that the market is more competitive than it actually is and may use CON laws to limit the number of competitors. However, if some firms do not compete as vigorously with each other due to their location, limiting the entry of facilities may lead to higher prices for private pay patients and lead to consumers becoming Medicaid-eligible more quickly. This can lead to results counter to CONs intent of reducing government costs for long term care.

Most of the literature on the industry typically starts off by assuming the county as a proxy for the market definition. The primary evidence used for this assumption is that the majority of nursing home residents choose nursing homes within the same county that they resided in prior to entering the home. In 1989, Gertler found that 75% of residents in nursing homes in New York State lived in the same county as the nursing home prior to entering. Similarly, Nyman (1994) found that 80% of residents in Wisconsin facilities chose a nursing home located in the county where they resided before entering the home. In addition to migration patterns, Federal Block Grants distributed for long term care are given out at the county level. However, these studies only seem to indicate that the upper bound on market size for nursing home markets is the county but do not consider the possibility that markets may in fact, be smaller than the county. They also do not allow for competition between firms across county boundaries, which are geopolitical.

There is evidence that the market is smaller than the county in New York State. Zwanziger, Mukamel and Indridason (2002) use zip code of prior residence for Medicare beneficiaries admitted into a nursing home in New York in 1992-1993 and 1996-1997 to study market definition. Markets are made up of the zip coded areas that account for 70% of admissions into the nursing home. According to this definition nursing homes in urban areas have markets that are a fraction of the size of the county in which they are located. Markets defined by county boundaries are 20% more competitive than if defined by the resident-origin data. The approach has several drawbacks, the main one being that it requires detailed data on the residence of individuals prior to entering the nursing homes. Studies looking at competitive effects in the nursing home industry tend to use facility level data, not detailed resident data. There also has been criticism of the resident origin approach in defining hospital markets, where consumers and hospitals are

[3] Nyman, 1994

highly differentiated. These studies often do not control for hospital or patient characteristics, leading to estimated market areas that are different than the true market area since some patients will always be willing to travel far for idiosyncratic reasons; however, non-traveling consumers can still be affected by firms having market power. [4] These criticisms may also apply to the nursing home industry where facilities and residents are heterogeneous. The demand approach used in this paper uses facility level data and accounts for some of the heterogeneity in facilities.

3 Industry

The nursing home industry is the largest and most expensive component of long term care in the United States. Twenty-seven percent of people over the age of twenty-five will use a nursing home at some point in their life. Amongst the people who do enter a nursing home, an average of 2.4 years will be spent in a home. Despite the high cost of care and prevalence of use, very few patients are covered by long term care insurance. About a half of all residents expenses are covered by Medicaid. To be eligible for Medicaid coverage, residents must spend down their assets and contribute most of their income to Medicaid. The Medicaid rate paid to nursing homes is usually 10-30% less than the private pay price. In addition to Medicaid, Medicare covers a small portion of patients; however Medicare only covers nursing home care immediately following an inpatient stay and only up to 100 days. [5] I will only consider consumers who pay for their own care in my demand analysis, although the implication on market power can affect all types of consumers through effects on quality and efficiency.

There are several types of facilities within the nursing care industry. The most common are SNFs (Skilled Nursing Care Facilities). In these facilities patients are under the care of physicians, there is 24-hour nursing care and the facility has a transfer agreement with a nearby hospital. ICFs (Intermediate Care Facilities) provide health-related institutional care above the level of room and board but not at the same level of complexity or intensity as that found in SNFs. The third type of homes, IMDs (Institutions for Mentally Disabled), serve residents with psychotic and non-psychotic illnesses. Typically residential care facilities provide primarily non-medical services, such as room, board, laundry, some personal care, recreation and some social services. There are also many other substitutes for nursing home care within the long

[4] Joint Statement of Cory Capps, David Dranove, Shane Greenstein and Mark Satterthwaite at Federal Trade Commission and Department of Justice Hearings on Health Care and Competition Law And Policy, 2003.

[5] Statistics come from the Handbook of Health Economics.

term care continuum: informal care, home care, board and care homes and continuing care retirement communities. In this study I focus on SNFs since these are the most predominant type of facilities in the industry.

Recently there have been many changes within the nursing home industry. The Balanced Budget Act of 1997 (BBA) aimed at placing significant limits on federal outlays for Medicare throughout the health care system. It included several cost containing provisions for long term care such as a switch to Prospective Payment for Services for reimbursement to facilities, consolidated billing requirements and ceilings on reimbursement for rehabilitation. [6] Prior to the BBA there was a trend of mergers and acquisitions in the industry. However in 1999 and 2000 several of the largest chains had to declare bankruptcy. Also, due to financial pressures on nursing homes, there have been closures in existing facilities and little entry of new facilities.

This paper focuses on the Wisconsin nursing home industry in 2002. By 2002 Wisconsin still had Certificate of Need laws in place. Four nursing homes closed in Wisconsin: two non-profits, one for-profit and one government home, and one non-profit facility opened that year. The nursing home utilization rate was 47.7 per 1,000 residents aged 65 and over. The payment policy for Medicaid reimbursement in 2002 was facility specific prospective payment so that the rate formula for Medicaid translated historical reported costs per patient day for a facility into a proposed rate schedule. This schedule was then revised until estimated aggregate payments satisfied budget constraints, while providing adequate and equitable reimbursement to providers across ownership type, geography and other dimensions. Each facility receives a unique per diem Medicaid rate. As in other states, about 25% of nursing home beds are occupied by patients who are not covered by Medicaid or Medicare, and are considered private pay residents, indicating that they pay for their own long term care. Very few of these residents are covered by long term care insurance.

4 Model

Demand is estimated using a discrete choice model. I follow Berry (1994) and Berry, Levinsohn and Pakes (1995). The methodology allows for the parameters to be estimated using aggregate data, the instrumenting of potentially endogenous variables and the inclusion of consumer heterogeneity. Consumers choose a nursing home that provides them with the highest utility.

[6] Prospective Payment for Services is a payment mechanism where reimbursement rates for pre-defined groups of services are set prior to the time when services are provided.

Incorporated in the consumers decision is the distance between their home and the nursing facility as in Davis (2005), which estimated the demand for movie theaters. The inclusion of distance in the utility function will allow for the counterfactuals to define the geographic market in this industry. Substitution patterns will reflect geography; if consumers receive disutility from distance then when a nursing home raises its prices, with all else equal, consumers will be more likely to switch to a nearby nursing home rather than one that is further away. I assume that residence prior to entry is near spouses, children and friends and therefore may be an important factor when choosing a nursing facility. If the nursing home is nearer to residence prior to entry, residents will be more likely to receive visitors and will hold closer ties to the community. While people over age 65 are the majority of nursing home users the choice of a nursing home may be made by family and friends and therefore demand may reflect preferences of people other than the person entering the nursing home.

Suppose that there are $i = 1, \ldots, I$ consumers choosing between $j = 1, \ldots, J$ nursing homes within a market area. I only consider the decision of consumers whose expenses are not covered by Medicaid or Medicare, since the choice for patients eligible for Medicaid and Medicare might not respond typically to characteristics of nursing homes, such as price. Since they do not have to pay for care, one would not necessarily expect the price to affect the demand for the good. Also, there has been evidence that because Medicaid rates are typically lower than the private pay rate, Medicaid patients are often given a lower priority for admissions into nursing homes and therefore do not have the same choices as private pay patients. [7] The reimbursement rate for Medicare patients is higher than for private pay patients; however, patients can only be covered by Medicare if they are directly admitted from a hospital in which case there might be an agreement between hospitals and nursing homes that gives these patients little choice in the nursing home they enter. Even without such an agreement, patients coming directly from a hospital may not have the time to investigate the different homes available to them and medical professionals may make their choice rather than the patients themselves.

The conditional indirect utility of consumer i from entering nursing home j is:

$$u_{ij} = x_j\beta + \alpha_i p_j + \gamma dist(loc_i, loc_j) + \eta_j + \epsilon_{ij} \tag{1}$$

where X is a K x 1 vector of the observed characteristics of nursing home j, such as the publicly reported quality of a home, the staffing of the home and the ownership status of the home. The distance between consumer i at loc_i, and nursing home j at loc_j is denoted by $dist$. The daily

[7] Harrington and Swan, p. 369.

rate nursing home j charges to private pay residents is denoted by p. Unobserved characteristics of the nursing facility are represented by a vector η; these are variables that may be observed by consumers and producers but not by the econometrician. Characteristics in η may include prestige, reputation, promotional activity and characteristics viewed in a consumer visit. Since these characteristics are observed by consumers and producers they may be correlated with price, which can lead to a biased coefficient on price. This will be dealt with an instrumental variables approach discussed below. The last component is ϵ, a mean-zero stochastic term. The parameters to be estimated are β, α and γ.

In addition to allowing consumers to vary based on their location, some versions of the model allow consumers to vary based on income level. This allows for potentially more reasonable price elasticities, taking into account that consumers with lower income might be more sensitive to prices. Income enters the model through an interaction with the price variable: $inc * p$. The α parameter becomes:

$$\alpha_i = \alpha + \pi * inc_i, \tag{2}$$

where inc_i is the income of individual i.

Combining Equation 1 and Equation 2 the resulting indirect utility of consumer i for choosing good j is:

$$u_{ij} = \delta_j(x_j, p_j, \eta_j; \beta, \alpha) + \zeta_{ij}(p_j, loc_i, loc_j, inc_i; \gamma, \pi) + \epsilon_{ij} \tag{3}$$

where

$$\delta_j = x_j\beta + \alpha p_j + \eta_j$$

and

$$\zeta_{ij} = \pi inc_i p_j + \gamma dist(loc_i, loc_j)$$

The first component of the indirect utility, δ_j, is the mean utility of consuming good j and is constant across all consumers. The second component, ζ_{ij}, is the part of the indirect utility which varies across consumers. To estimate the model, it is convenient to split the utility into these two components.

This specification allows for individual tastes to stem from demographic variables. Without this, consumer heterogeneity would only enter the model through the additive random shocks, ϵ's. If these shocks were assumed to be identically and independently distributed with a Type I extreme value distribution the model would reduce to a multinomial logit problem, which can lead to unrealistic substitution patterns and cross-price elasticities. The heterogeneity in consumer location allows for the possibility of higher cross-price elasticities between nursing

facilities that are geographically closer to each other. If a firm raises its price, consumers who value this home because of its location are more likely to switch to another nursing facility located at a similar distance to them. I also allow consumers to vary in their price sensitivity by their income level, leading to more realistic substitution patterns based on price.

If a consumer chooses not to enter a nursing home, then the outside good is consumed. The indirect utility of consuming the outside good is:

$$u_{i0c} = \eta_0 + \pi_0 inc_i + \epsilon_{i0} \tag{4}$$

The mean of this utility is normalized to zero. Coefficients on market level factors that enter the utility for "inside" goods can then be interpreted as being relative to the outside good.

Given the indirect utility that a consumer gets from each option, a consumer will choose to either purchase one unit of nursing home care, from the facility that provides the highest utility, or the outside option if that affords her the highest utility. This assumption of purchasing one unit is realistic within the industry. The transfer rate amongst residents in a nursing facility is extremely low, in part due to the transfer trauma that is associated with patients changing facilities.

In this study, the primary data set provides facility level information, including the number of private-pay residents at each facility and facility characteristics. In addition, auxiliary datasets provide information on the distribution of consumer locations and income levels. Micro-data is not observed in this study. With data on residents, demand could be estimated with a logit model. Each consumer's choice would be regressed on characteristics of the individual and characteristics of the facility. To use the aggregate data available to estimate the demand model above it is necessary to find an expression for a facility's market share.

The set of consumers who will choose nursing home j are those that have $dist$, inc and ϵ such that the indirect utility from consuming good j is higher than the indirect utility from choosing any other good. More formally this can be written as:

$$A_j(x_., p_., \delta_.; \theta_2) = ((inc_i, loc_i, \epsilon_{i0}, \ldots, \epsilon_{iJ}) | u_{ij} > u_{il} \forall l = 0, 1, \ldots, J) \tag{5}$$

The market share for the jth nursing home as a function of the mean utility levels of all the

$J+1$ goods, given the parameters, is:

$$s_j(x,p,\delta;\theta_2) = \int_{A_j} \partial P(inc, loc, \epsilon) = \int_{A_j} \partial P(\epsilon|inc, loc)\partial P(inc|loc)\partial P(loc) \tag{6}$$

where $P(.)$ denotes population distribution functions. The second equality is a consequence of an assumption of the independence of *dist* and *inc*, and ϵ, although *inc* and *dist* need not be independent (ı.e the distribution of income depends on the location of the resident.)

5 Data and Descriptive Statistics

The main dataset used for the analysis is the Online Survey, Certification (OSCAR) from 2002. The data are collected by the Center for Medicaid/Medicare Services (CMS). State health agencies must inspect all federally certified Medicaid/Medicare nursing homes at least once every 15 months or in response to a complaint and then submit information to CMS. In 2002 16,476 nursing homes nationally were certified to accept Medicaid/Medicare patients; certified homes make up about 96 percent of nursing homes in the US. I focus on the 408 nursing homes located in Wisconsin. Information on characteristics are prepared by the nursing home staff at the beginning of the inspection and then audited by the inspector. The data include facility characteristics: staffing variables, cited deficiencies, and location information. The OSCAR data are frequently used by both researchers and the General Accounting Office (GAO). It has also been recommended for extensive use by an Institute of Medicine (IOM) expert panel on nursing home quality. [8] In 2002 there were 408 Medicaid/Medicare certified facilities in Wisconsin with a total of 39,926 patients: 25% of whom were private pay residents and 66% were covered by Medicaid while 10% were covered by Medicare. A total of 43,572 beds were available; in 2002 there was an occupancy rate of about 85% in Wisconsin. After excluding homes missing data needed for analysis, 393 homes were included for estimation.

The product characteristics in the X matrix in Equation 1 include the total number of deficiency citations a nursing home received during the inspection, the ownership status of the nursing home, the on-site services available and the size of the facility. Summary Statistics are included in Table 1. The deficiencies cited is viewed as a proxy for quality of the nursing home. [9] The

[8] Grabowski (2004), p.94

[9] Other quality variables are available (cited health deficiencies and resident-specific outcomes that are associated with inadequate care, such as the percentage of residents with pressure ulcers or residents that are physically restrained) but through factor regressions it can be shown that the number of cited deficiencies is a

median number of citations is three. [10] Deficiencies can be split into main categories such as the quality of care, abuse, resident assessment, resident rights, environment, nutrition, pharmacy and administration. Deficiencies indicate that some aspect of the quality of care was deemed inadequate during the inspection.

Variable	Median	Mean	Std. Dev	Min	Max
Deficiency Citations	3	4.82	4.83	0	44
Non-Profit Dummy	0	0.37	0.48	0	1
Government Dummy	0	0.13	0.34	0	1
Chain Dummy	0	0.44	0.50	0	1
Distance to Nearest Hospital	2.59	4.93	6.38	0	50.02
Urban Area Dummy	1	0.70	0.46	0	1
Number of Beds	97	110.16	68.25	15	721
% Private Pay Patients	0.20	0.23	0.14	0.00	0.82
Private Payer Price Per Day	$111.00	$151.36	$25.53	$102.00	$272.00
Medicaid Rate Per Day	$147.00	$112.63	$14.18	$87.00	$272.00

N=393

% Private Pay Patients is calculated as the number of Private Pay Residents divided by total number of beds.

Table 1: Descriptive facility level information for the 393 Wisconsin nursing homes included in the data.

Ownership variables are also included. There is some evidence that potential residents have preferences on the ownership status of the facility, mainly whether the home is owned by a non-profit or for-profit organizations. [11] Prior to entry people may associate non-profit homes with higher quality and better treatment of residents. The same may be true for independent homes. Consumers may be averse to facilities that are part of a chain since decisions are often made from outside the facility and therefore may not cater to the specific needs of residents. I include dummies for both non-profit status and chain affiliation. Over 35% of nursing homes

summary statistic of all of the quality indicators.

[10] There is a positive correlation (0.241) between the number of cited deficiencies and number of beds in the nursing home. Specifications of the model with number of cited deficiencies per bed resulted in similar estimates.

[11] Ballou, 2002.

in Wisconsin were owned by a non-profit institution. Nationally only about 25% of homes are non-profit organizations. Less than half of the nursing facilities in Wisconsin are affiliated with a chain. Thirteen percent of Wisconsin nursing homes are government run and there is a mix of local, state and federal ownership. There is reason to believe that demand for these homes is different than those that are privately owned since they tend to be affiliated with hospitals. Also, the price setting mechanism in government homes may be different. For this reason, in some specifications I exclude the 53 government-owned homes.

Another characteristic that is included is the total number of beds in the facility. There are two reasons that this variable may be important to potential consumers. The first is that it is an indicator of bed availability in the nursing home. Consumers may be constrained by the availability of beds and since many of these consumers are sick, there may not be time to wait for an opening. The second reason is that consumers may have a preference over the size of the facility that they choose. Small facilities may offer more personal attention but large facilities may have better-trained staff and offer more amenities. Detailed information on these other characteristics is not available and therefore consumers may use facility size as a proxy for these other variables. [12]

In some models the distance between the nursing home and the nearest hospital was added to the X matrix. People in nursing homes tend to be too sick to live on their own and therefore it is likely that entering a nursing facility that is near a hospital will be a desirable characteristic. Data on hospital location in Wisconsin is gathered from the Wisconsin Department of Health and Family Services and the addresses were then geo-coded to get latitude and longitude information. The average distance between a nursing home and the nearest hospital is about five miles, although this varies depending on whether an urban area or rural area is considered. In rural areas the average distance from a nursing home to a hospital is about nine miles, while in urban areas it is approximately three miles.

The census tract of each nursing home was geo-coded from the street address. In the analysis the latitude and longitude of the population centroid of the census tract is used. [13] Using Census classifications on whether the census tract is in an urban cluster I am able to classify the location of the nursing home as either urban or rural. Using this classification, seventy percent of nursing homes in Wisconsin are in urban areas.

[12] Harrington et al, p.50.

[13] The Census Bureau calculates the mean center of population. The center is determined as the place where an imaginary, flat, weightless and rigid map of the census tract would balance perfectly if all residents were of identical weight.

In addition to the OSCAR dataset, the private pay price and the Medicaid rate for each facility in Wisconsin in 2002 came from the Wisconsin Annual Survey of Nursing Homes 2002 collected by the Wisconsin Department of Health and Family Services. Price information for various levels of care and payment type was provided in addition to the occupancy rate on the last day of 2002. Homes were instructed to report an average rate if the per diem rate varied in any category (i.e. private room vs. semi-private room). The price data used in this paper is for Skilled Care. The average private payer price per day is $151.35 and the average Medicaid rate across facilities is $112.37. [14]

In addition to the primary dataset, two auxiliary datasets were used to allow consumer demographic variables to enter the analysis. The US Census of Population partitions each county in the U.S. into sub- regions called census tracts. There are 1316 census tracts in the 72 Wisconsin counties. The average population in a census tract is 4,075 people. The potential number of consumers for each market area was gathered from the Census 2000 Summary File 1 (SF 1) 100-Percent Data; more specifically, census tract population data by age was used. This survey takes place once every ten years and asks questions to all people and housing units in the United States. The number of people over age 65 could be isolated within each census tract. The number of people over 65 was 533 on average and the number of people over 75 was 263 on average. The Census 2000 Summary File 3 (SF 3) - Sample Data was used to include information on the income distribution within a census tract. Summary File 3 presents detailed population and housing data, including income, collected from a 1-in-6 sample and weighted to represent the total population. This data does not immediately meet my requirements; ideally I would like the income and asset distribution of people over age 65 in each census tract. I approximate the income distribution that I am interested in by assuming that the relative income and asset distribution for those over age 65 is close to the distribution of households within the census tract, $P(inc|loc)$. The average per capita income across census tracts was approximately $20,000. Summary Statistics are included in Table 2.

The number of private pay residents at the time of survey is also included in the OSCAR data set. Market shares were calculated by dividing the number of private pay residents by the potential consumers in the market. In my analysis I try several measures for the potential

[14] If the private pay price or Medicaid rate was missing for 2002, I took the average private pay price or Medicaid rate for that facility in 2001 and 2003, if both were available. If only one of those two were available I used the that rate. Some facilities did not have any usable private payer information and were therefore dropped from the analysis. Usually these homes were comprised only of patients covered by Medicare. If private payer price was available but the Medicaid rate was not available for 2001-2003, the average Medicaid rate in that county was used instead.

Variable	Median	Mean	Std. Dev	Min	Max
Population	3836	4075.37	1786.36	224	13161
Population Over 65	507	533.97	286.41	11	2002
Population Over 75	232	263.98	168.36	1	1420
Per Capita Income	$19,840	$20,594	$7,023	$5,498	$94,479

N: 1316

Table 2: Descriptive statistics of census tracts in Wisconsin.

number of consumers. [15]

Before estimating the full model I present a descriptive regression that provides evidence that geography in an area smaller than the county may matter. In Wisconsin the average county has land area of about 760 square miles. The smallest county is Pepin county which has a land mass of 232 square miles and the largest county is Bayfield county which has a land mass of 2042 square miles. The regression in Table 3 shows that after controlling for observed product characteristics, the price a nursing home charges seem to be affected more by homes within five miles of the home rather than by nursing homes further away. More specifically, the price charged by a nursing home is significantly lower as the number of homes within five miles increases. This is an intuitive result. As the number of competitors increases, buyers have more substitutes available and therefore a firm will be constrained in the price that it can charge. However the coefficient on homes that are five to ten miles away, an area that could be well within the county boundaries, is significantly positive. This result provides some evidence that firms at this distance are not actually constraining the price of homes and may therefore not be competing for the same set of consumers.

[15] Using a potential market of people over 75 leads to very similar parameter estimates.

Dependent Variable: Log (Price)		
Variable	**Parameter**	**Std. Error**
Deficiency Citations	-0.0043**	0.0014
Non-Profit Dummy	0.03502**	0.0149
Government Dummy	0.0047	0.0228
Chain Dummy	0.0308**	0.0146
Distance to Nearest Hospital	0.0013	0.0012
Urban Dummy	0.1157**	0.0168
Total Beds	0.0050**	0.0001
Number of Competitors in 0-5 Miles	-0.0042**	0.0021
Number of Competitors in 5-10 Miles	0.0088**	0.0013
Constant	4.8262**	0.0228

** Indicate 95% significance.
F-statistic: 27.91
N: 393

Table 3: A descriptive regression to present the potential importance of location.

6 Estimation

6.1 Identification

The estimation procedure follows Berry (1994) and Berry, Levinsohn and Pakes (1995). The parameters are identified by requiring that the structural error of the demand model, η, is mean independent of some vector of observed instruments. The idea of the estimation procedure is to compute the structural error term (an estimate of η), $\omega(\theta^*)$, given a set of unknown parameters. This error term is then interacted with a set of instruments, Z, to create population moment conditions for a GMM objective function:

$$E[Z\omega(\theta^*)] = 0. \tag{7}$$

Essentially these moment conditions restrict η, the product characteristics unobserved to the econometrician, to be uncorrelated to the set of instruments denoted by Z at the true parameter values, θ^*. A search is then performed over all the possible parameter values to find the parameters that minimize the objective function. The GMM estimate is:

$$(\hat{\theta}) = argmin[\omega(\theta)' Z \Phi^{-1} Z' \omega(\theta)] \tag{8}$$

where Φ is a consistent estimate of $E[Z'\omega\omega' Z]$.

There are potential sources of endogeneity bias that the methodology and instruments attempt to address. Endogeneity bias occurs when the economic agents studied, i.e. the nursing homes and potential consumers, know information about the product that is correlated with included observed variables but is not known by the econometrician. For example, suppose that nursing homes have more information than the econometrician about whether they are considered to be a high quality nursing home by potential residents (e.g. there is information that can be gathered during a visit) and therefore homes with a high η also have a higher price. This will bias the coefficient on the price variable toward zero since higher prices will seem to have less of a negative effect on market share than the true effect. I will therefore instrument for price. This endogeneity problem is most severe for product characteristics that are easily adjustable control variables.

I follow the literature and exclude price from the instrument vector, Z, while using other observed nursing home characteristics as instruments for themselves. The first instrument is the rate the facility receives for Medicaid patients. Facility specific Medicaid rates in Wisconsin are set by the government at the beginning of the year, based on historical costs. Through costs the Medicaid rate will be correlated with the private pay price but since they are set by the government and based on lagged costs they are not subject to the same correlation with unobserved product characteristics.

The next set of instruments are rivals' product characteristics, which are commonly used in these types of models. The idea is that the mark-up for a good in an oligopolistic differentiated product market will be lower for products that have close substitutes. Since the demand of one good will depend on the characteristics of other goods, price will be correlated to rivals' characteristics. However, in the model, consumers utility from consuming good j will not depend on the characteristics of other products. I use the observed product characteristics for all firms within five mile of the nursing home. As noted by many authors, the justification for the use of these instruments requires strong assumptions. If firms choose their own product

characteristics while knowing more about η than the econometrician, it will induce correlation between the observed and unobserved product characteristics and bias the parameter estimates.

The distance coefficient is determined through correlation between nearby population and market share. Consider one market area that has only two nursing homes that are identical except for their location. One home is in a census tract that is highly populated as are the census tracts around it. The other nursing home is in a census tract that is less populated and also has a lower population in the surrounding areas. If consumers did not care about the distance that they had to travel, then we could expect that the nursing homes split the market share evenly. However if consumers do care about the distance that they have to travel, this should be reflected in the market shares. The home surrounded by more people will have a higher market share. The distance coefficient is identified by the restriction that the unobserved product characteristics are uncorrelated with the population within five miles of the nursing home. However, it is possible that a nursing home chooses its location. Nursing homes with higher levels of unobserved product characteristics, η, may locate in more populous areas (lower average distance for potential consumers to travel) or vice versa. However, in this industry there has been little entry in recent years and therefore it seems that location decisions were made many years before unobserved product characteristics were chosen; in which case, the endogenous location decision is not a problem for estimation.

Table 4 shows a reduced form regression of the log of prices on the various instruments. All of the coefficient values on the firms' observable product characteristics have has the expected sign. The Medicaid rate of the facility is significant and the expected sign. As surrounding firms have more cited deficiencies the price charged by the existing firm increases. As nearby nursing homes are located further away from hospitals, the price a firm charges increases. An increase in the number of surrounding non-profits and chain affiliated facilities conditional on the number of firms in the area, increases the price charged by the firms. There is mixed evidence within the literature of the effect of these different types of competitors. Studies show that both types are less efficient; these results might indicate that a firm competing with them will be under less pressure to be efficient. In addition, there is some evidence that chain affiliation is seen as a negative attribute by potential residents. This may explain why a firm can charge more when competing with a higher portion of chain affiliated firms. However, non-profit status is seen as a positive attribute making the expected sign on the number of non-profit competitors ambiguous. [16] As the number of competitors increases, the price decreases

[16] Running the correlation between prices and instruments for only non-profit firms does not change the results significantly, however the number of chain affiliated competitors becomes insignificant.

significantly as would be expected. The statistical significance of some of the instruments and the F-statistic of 22.04 provides encouragement that these variables meet the requirement that the instruments are relevant. [17]

Dependent Variable: Log (Price)

Instrument	Parameter	Std. Error
Deficiency Citations	-0.0031**	0.0014
Non-Profit Dummy	0.0318**	0.0140
Chain Dummy	0.0355**	0.0137
Distance to Nearest Hospital	0.0016	0.0012
Urban	0.1102**	0.0169
Total Beds	0.0005**	0.0001
Medicaid Rate	0.0025**	0.0005
Deficiency Citations of Firms within 5 Miles	0.0014**	0.0005
Number of Non-profit Firms within 5 Miles	0.0181**	0.0082
Number of Chain Affiliated Firms within 5 Miles	0.0176**	0.0084
Number of Competitors within 5 Miles	-0.0182**	0.0071
Constant	4.558**	0.05692

** Indicates 95% significance.
F-statistic: 22.04
N: 393

Table 4: "First stage" regression.

Demand parameters are identified through the relationship between the product bundles and market shares. If a product has a high value of product characteristics it will be associated with a higher market share.

[17] I present the results using competitor characteristics within five miles, however results are similar for other distances as well.

6.2 Procedure

The error term in the GMM function is defined as the structural error of the model, η. To estimate the model, the error term needs to be expressed as an explicit function of the parameters of the model and the data. Note that in Equation 3, the η term enters the mean utility level linearly. To compute the error term as a linear function of the variables, the mean utility level must first be expressed as a linear function of the variables and parameters of the model. This can be achieved by numerically solving the following system of equations:

$$s(\delta; \gamma, \pi) = S, \tag{9}$$

where S is a vector of the true market shares and $s(\delta; \gamma, \pi)$ are estimated market shares given values of γ and π.

To do this I assume that the ϵ's are distributed extreme value distribution, and they can therefore be integrated out analytically. The integral in Equation 6 and therefore the left-hand side of Equation 9 can then be approximated as [18]:

$$\begin{aligned} s_j(p, x, \delta; \gamma) &= \frac{1}{ns} \sum_i f(loc_i) s_{ij} \\ &= \frac{1}{ns} \sum_i f(loc_i) \frac{exp(\delta_j + \gamma dist_{ij} + \pi inc_i p_j)}{1 + \sum_m exp(\delta_m + \gamma dist_{im} + \pi inc_i p_m)} \end{aligned} \tag{10}$$

Distance is calculated using a method similar to calculating the Euclidean distance between two points on a sphere. More specifically the distance in miles between two points is:

$$dist_{ij} = \sqrt{(69.1(lat_i - lat_j))^2 + (69.1(long_i - long_j) cos(lat_i/57.3))^2}. \tag{11}$$

To estimate my model using aggregate data I assume that all individuals over the age of 65 within a census tract are identical. In Equation 10, $f(loc_i)$ is the number of people who live in census tract i and inc_i is the per capita income within the census tract. To estimate the left-hand side of Equation 9, I calculate the probability that a representative person from each census tract i in Wisconsin will choose each nursing home j, s_{ij}. I then weight this probability by the number of people over age 65 in census tract i, $f(loc_i)$. I then sum over the decisions at each census tract and divide by the total number of people in the state to get the expected

[18] In versions of the model excluding income effects, π is set to zero.

market share given values of δ, γ and π. The weights allow the model to take full advantage of the distribution of population and income levels around each nursing home. Including location and income allow for more reasonable price elasticities.

Equation 9 is nonlinear and given values of γ and π, the mean utilities can be solved numerically by iterating the following contraction mapping suggested by Berry, Levinsohn and Pakes (1995): [19]

$$\delta^{h+1} = \delta^h + lnS - lnS(p_., x_., \delta^h, P; \gamma, \pi), \;\; h = 0, \ldots, H \tag{12}$$

Berry, Levinsohn and Pakes (1995) show that the above contraction mapping leads to a unique δ that equates the simulated market shares to the true market shares. The δ is taken as the approximation of the true mean utilities, for particular values of γ and π. Given the value of δ, the error term can now be expressed as:

$$\omega = \delta_c(S; \gamma, \pi) - (x_j\beta + \alpha p_j) \equiv \eta_j. \tag{13}$$

Plugging this into Equation 8 the GMM objective function can be minimized over the parameter values using a Newton Raphson iterative procedure. [20]

7 Results of Demand Analysis

7.1 Results

The estimates of the model are reported in Table 5. Column 1 displays the results that are used in the counterfactual experiments. The product characteristics included are the quality of the nursing home, dummy variables describing the ownership status of the facility, the size of the nursing home, and the daily rate charged to private pay residents. In each of the specifications

[19] Given a guess of γ and π and an initial value of δ, $lnS(p_., x_., \delta^h, P; \theta_{ns})$ can be calculated. δ^{h+1} is calculated as in Equation 12. Given this new value of δ, $lnS(p_., x_., \delta^h, P; \theta_{ns})$ is recalculated. This procedure continues until $\delta^{h+1} - \delta^h$ is less than a tolerance level, 10^{-8}.

[20] The procedure starts with an initial guess of the non-linear parameters, γ and π. The δ vector is calculated using Equation 12. The Jacobian of the GMM objective function is then calculated. If it is greater than the tolerance threshold then the Jacobian and Hessian (estimated using Broyden-Fletcher-Goldfarb-Shano updating method) are used to update the guess of γ and π and the procedure is repeated until the resulting Jacobian is small enough to imply that the minimum of the GMM objective function has been found. The resulting parameter values are then used to get a consistent estimate of the weighting matrix in Equation 8 and then the procedure is repeated once more.

the potential market is the number of people over age 65 in each census tract. [21] The second column presents results when the model is estimated excluding government homes. The demand for government homes is more likely to be driven by patients entering directly from a hospital and therefore may differ from demand for privately owned homes. The third column uses driving times between the nursing homes and residents instead of Euclidean distance between the two points, which might be a more realistic approximation to what consumers consider. The last column includes a random coefficient on the price. The price of the nursing home is interacted with the income of the potential resident, or in this case the median income in the census tract. This allows for income effects to be considered in the demand for a nursing home.

I first focus on the estimates in Column 1. The product characteristics of the firm have the expected signs and are statistically significant. Cited deficiencies, a proxy for inadequate quality negatively effects consumer utility. Increasingly states are making inspection results public to potential consumers to allow for more informed choices. The statistically significant negative sign on cited deficiencies seems to indicate that this policy is an important step in improving quality of care since consumers respond to the cited deficiencies during an inspection. Chain affiliation is statistically insignificant. There is mixed evidence on how chain affiliation affects consumer utility. On one hand, consumers may prefer name recognition. On the other hand, consumers may associate chain affiliation with less personal care. Non-profit ownership status is preferred by consumers, as in previous studies. The total number of beds enters positively. This coefficient is difficult to interpret. It can indicate preference for a larger facility or it may indicate a preference for bed availability. [22]

Given the coefficient on price, the marginal change in utility given a $1 price increase per day at the median price is -.036. I calculate the price elasticity of demand for each firm using the demand parameters that I estimated. By running 393 experiments, individually increasing the price for each nursing home I find that when a firm increases its price by one percent the median decrease in market share is 3.95%. This 3.95 price elasticity is higher than what has been found in the previous literature: Nyman (1989) finds the price elasticity of demand of 1.7 and Ballou (2002) finds a price elasticity of demand of 1.25 in Wisconsin. The result is most surprising when compared with Ballou's study since it was conducted with similar data.

[21] Using other definitions of the potential market leads to similar results on all parameter values except for the coefficient on the constant term.

[22] Since the private payer rate is higher than the Medicaid rate, nursing homes prefer to admit private payers rather than Medicaid patients. Larger bed size does not translate directly into larger market share of private pay patients, but it does indicate the availability of beds. For example, there might be a shorter wait for a bed in a larger facility. However if all facilities are fully occupied for a long period of time than the model will run into problems since consumers are not free to choose nursing homes based on the observed characteristics.

However, the Ballou study does not include heterogeneity of consumers and uses a different set of product characteristics and instruments.

Variable	1	2	3	4
Constant	11.4966	16.6032	13.3279	2.3745
	(8.4960)	(11.4143)	(8.6144)	(5.3826)
Deficiency Citations	-0.0407**	-0.0525**	-0.0419**	-0.0364**
	(0.0124)	(.0144)	(0.0124)	(0.0151)
Non-Profit Dummy	0.4617**	0.4523**	0.4686**	0.415**
	(0.1193)	(.1320)	(0.1133)	(0.1393)
Chain Dummy	0.0839	0.0698	0.0814	0.0135
	(0.1154)	(.1285)	(0.1186)	(0.1299)
Total Beds	0.0081**	0.0099**	0.0082**	0.0072**
	(0.0012)	(.0015)	(0.0012)	(0.0018)
Price (Log)	-4.0477**	-5.0892**	-4.313**	-2.4965**
	(1.5500)	(2.1048)	(1.5518)	(1.1590)
Distance (Log)	-0.6238**	-0.6233**	-0.6916**	-0.3244*
	(0.2302)	(.2764)	(0.2502)	(0.1965)
Price(Log)*Income(Log)				0.0054*
				(0.0031)
Objective Function Value	6.1160	3.008	5.715	5.2375
N	393	340	393	393

** indicates 95% significance. * indicates signficance at the 90% level.
Income is measured in thousands of dollars.

Table 5: Results of the full model.

The coefficient on the log of distance is -0.624. At a distance of ten miles the marginal utility of one mile is -0.0633 and at a distance of 50 miles it is 0.012. The implied cost of being one mile further from friends and family is the marginal utility with respect to distance from the nursing home divided by the marginal utility with respect to price. Using the estimates in Column 1, the implied cost of being one mile further away at the median price and at ten miles is $1.71 per day. So, for a full year of residing in a nursing home, a resident will be willing to

pay approximately $3,500 a year to be 1 mile closer to their previous residence.

7.2 Robustness of Results: Alternate Specifications

Column 2 of Table 5 presents the results with the same specification as in Column 1 except that I exclude government owned homes. The coefficient estimates retain the same sign and seem to be fairly robust except for the price coefficient. There is evidence that government homes accept a significantly more dysfunctional and cognitively impaired population than privately owned homes. [23] These patients may be less price sensitive because they are more concerned with other characteristics of the nursing home. Therefore, it is not surprising that I find a higher price coefficient in this specification. The price elasticity for non-government homes is 4.94.

The third specification considers driving times between nursing homes and residents instead of the Euclidean distance. This is a more accurate measure of what consumers consider when assessing the distance between their friends and family and the nursing home. The data is calculated from GIS software that takes into account the speed limit on major roads in Wisconsin to calculate the driving time between points. The driving time will determine how easy it is to receive visits. The distance measure is in minutes of driving time. The results are about the same as in the first specification. The distance coefficient is -0.6916. It indicates that when a consumer lives 10 minutes away from the residence prior to entry, an additional minute of travel is worth $1.78 per day.

The last specification, which is presented in Column 4, allows for income effects. In this specification there is some change in the parameter coefficients, however the signs stay the same for all estimates. The coefficient on the interaction between inc_i and p_j indicates that as a consumer's income increases she is less sensitive to price increases. While the interaction term is significant, its magnitude is fairly small. At an income of $100,000 and at the median price the marginal utility of price is 0.02.

In future work I would like to take greater advantage of the framework used and include more consumer heterogeneity. Specifically, I think it is important to consider how different consumers may value the outside option and distance differently. The census data provides information on many characteristics at the census tract level that may prove useful. For example, it is

[23] Cohen and Dubay

reasonable to assume that the population of women over age 85 value nursing home use differently than people over the age of 65. As people age, they are more likely to require nursing home care and women at this age are less likely to have a spouse to take care of them. Also, the importance of distance to consumers may vary depending on demographic characteristics, such as ethnicity. It might be more important in some cultures to have parents and family members living nearby than in others. There might also be a difference in how rural households value proximity as compared to urban households. Given the availability of census data and the framework used, these are all potential specifications and may provide more precise information on the determinants of demand. They also may also further pin down the effect that distance plays in the demand for nursing home care. [24]

8 Market Delineation

The results in the previous section can be used to estimate the extent of competitive effects in the nursing home industry. Using the parameters it is possible to estimate demand elasticities, which can then be used to delineate markets. The process of defining a market begins by establishing the closest substitutes to a product or the set of products that are the most immediate competitive constraints on the behavior of the firm in question. Price elasticities provide information on the degree of substitutability between two goods for consumers, specifically, the cross-price elasticity will indicate what portion of consumers will switch to the other good if one firm raises its price. If the loss in market share is large enough, the firm in question is constrained in the price increase that is profitable and this suggests that the firms are in the same market.

I conduct an experiment to investigate how elasticities change under different market configurations. Since the average size of a county in Wisconsin is 760 square miles, I simulate a county with a square area whose side has a length of 28 miles. A population of 100 people over the age of 65 is then evenly distributed around this "county". To evaluate the elasticities I create two hypothetical firms, Firm A and Firm B and move them further apart along the diagonal of the fictional county. I assign the median facility characteristics that I find in the data to both firms. To simplify the analysis I restrict the consumers in the simulated market to

[24] Other specifications were tried but not presented in the paper. Most led to similar results, however the inclusion of whether the nursing home was in an urban area and the distance to the closest hospital led to an insignificant coefficient on distance. This may be due to the colinearity between these variables and the average distance that a consumer must travel.

choose an "inside good", or in other words they must enter a nursing home. Therefore the set of consumers considered in the analysis are those that require nursing home care and do not have the option of switching to the outside good. The results than become easier to interpret since otherwise many consumers would switch to the outside good. This would mean that the main constraint on the price would be the possibility that consumers choose not to buy nursing home care at all, rather than switching to the competing nursing home.

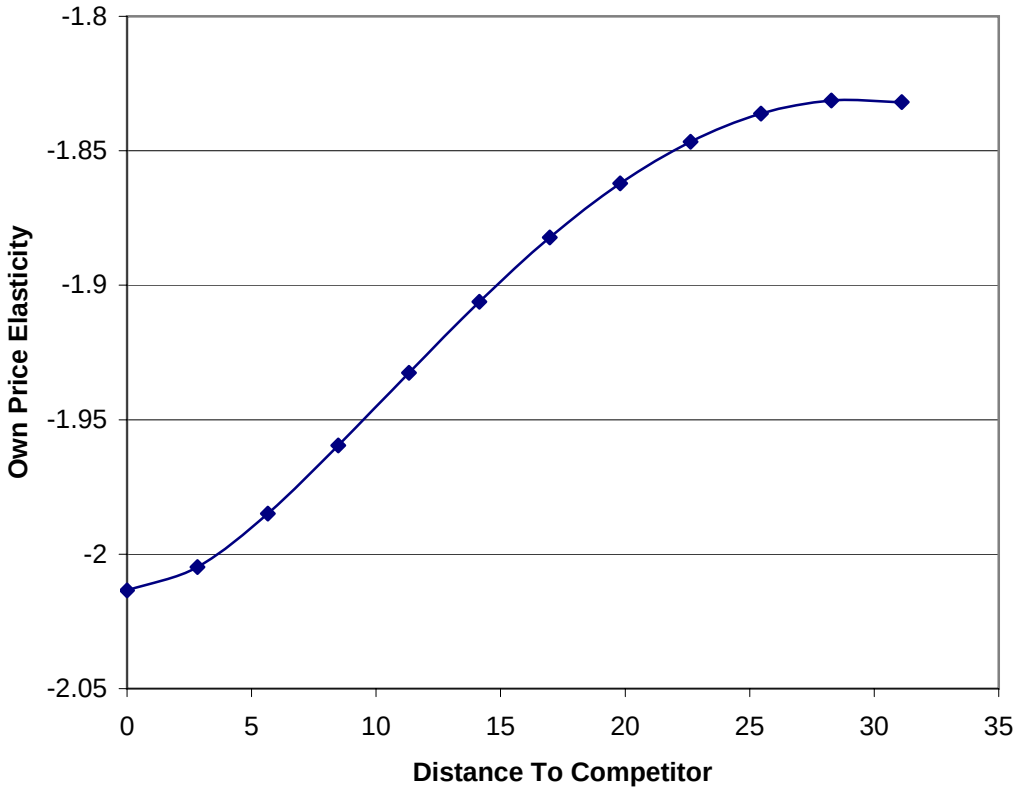

Table 6: Firm A's own-price elasticity as the distance between Firm A and Firm B increases.

Suppose that Firm A raises its price. Figure 6 demonstrates how the own-price elasticity for Firm A changes as the distance between it and its competitor, Firm B, increases. Since consumers are restricted to choosing one of the two nursing homes, the increase in market share for Firm B is the decrease in market share for Firm A, when Firm A raises its price. As potential rivals are further away, the percent change in market share due to the price increase decreases. However, this effect is not very large within the county area. When the firms are at the same location, a 1% increase in price leads to a 2.02% decrease in market share for Firm A.

In contrast, when the firms are 30 miles apart, a 1% increase in price leads to a 1.83% decrease in market share.

There is a visible drop in elasticities, but even when comparing the extreme cases within a county area, there is not a significant overall change in the rate at which consumers will switch to the other good. This indicates that the constraint Firm B imposes on the price that Firm A charges does not vary much by location within the county area. Therefore, the analysis suggests that the county is an appropriate proxy for the market and all firms within that area can be assumed to compete equally.

The result I find seems to be partly a result of the specification of distance that is used. Because of the shape of the log function, there is little difference between $log(distance)$ at larger distances. The probability of consumer i of choosing nursing home j will change very little depending on whether the resident is 20 miles away versus 30 miles away. Further work will consider other functional forms for distance. [25]

9 Conclusion

In this paper I estimate a random coefficient logit model of demand in the nursing home industry. In addition to establishing how consumers value observed characteristics such as quality, ownership status and size, I investigate how consumers value the location of the nursing home. In particular, I confirm anecdotal evidence that the distance between the consumer's previous residence and the nursing home is an important characteristic when choosing which nursing home to enter. The implied cost of traveling one mile when the consumer is already ten miles away is $1.71 a day or over 1% of the daily rate.

The estimates are then applied to study the substitutability between firms based on geography. I test whether the county is an appropriate definition of the market or whether the extent of competitive effects between firms varies greatly at distances smaller than the county. The current analysis implies that the county may in fact be a reasonable proxy for the market in the nursing home industry. The substitution between firms at distant corners of a county are similar to the substitution between firms located at the same point. This indicates that when considering competitive effects on price, efficiency and quality, all nursing homes within

[25] The linear specification leads to an unreasonable implied cost of travel and does not seem to fit as well as the log specification.

a county can be treated as equally competitive with each other, regardless of location within the county.

However, when considering anti-trust issues and implementation of CON policies, market definition is only a first step. The delineation of the market does not directly address the question of whether firms have the ability to raise the price of the good or the market power they possess. Traditionally, market shares have been used as an observable measure of market power. A more direct approach would consider the prices after entry of a new firm or post-merger. Using the demand model presented above and by modeling the supply decision of firms, I can estimate the effect that entry of a new firm would have on prices of an existing firm. I will also be able to examine the effect of potential mergers between firms at different locations within the county. It is possible that these may vary depending on the location of the firms in question.

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