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Vertical Relationships in Cremation Services**

By
Lori Parcel
Stanford University

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Stanford Institute for Economic Policy Research
Stanford University
Stanford, CA 94305
(650) 725-1874

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Stiff Competition: Vertical Relationships in Cremation Services*

Lori Parcel[†]

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Abstract

I examine the relationship between retail market competition and wholesale contracting patterns. To do so, I analyze the subcontracting behavior of funeral homes (retailers) and crematories (wholesalers) in the Minnesota funeral industry. Exploiting detailed data on wholesale and retail quantities, subcontracting patterns, consumer and establishment locations, and retail pricing, I estimate a model that predicts pricing, consumer funeral home choice, and vertical relationships between funeral homes and crematories. I find that funeral homes seeking wholesale cremation services are significantly less likely to subcontract with crematories belonging to firms that are direct retail market competitors. The estimated aversion to subcontracting with competitors is greater for funeral homes with fewer proximate crematories. This is consistent with foreclosure by integrated crematories. Estimates suggest that independent crematories enjoy seven percent larger markups on average than they would in the absence of strategic considerations in wholesale contracting. Prices and allocations in the retail market are also affected since funeral homes located near crematories owned by competitors incur additional transportation costs in using more distant crematories. Counterfactual analysis indicates that funeral homes with few crematories nearby (that are owned by retail competitors) bear additional costs ranging from \$161 to \$203 per body on average, or seven to nine percent of the retail price. Half of this cost impact is transmitted to consumers, resulting in a four percent retail price increase in these markets on average.

1 Introduction

Firms commonly outsource business functions to take advantage of economies of scale, scope, or specialized expertise. However, little empirical evidence exists evaluating the importance of strategic considerations in firm subcontracting choices. In this paper, I analyze the relationship between retail market competition and wholesale contracting in the cremation segment of the Minnesota funeral industry. The market for cremation services is an ideal setting for the identification of strategic considerations in vertical contracting. All funeral homes offer retail cremation services to consumers, but only a fraction own the equipment required to perform cremation. Funeral homes belonging to firms that do not own cremation equipment must select an independent crematory or a vertically integrated firm to provide wholesale cremation services. Comprised of both funeral homes and crematories, vertically integrated firms are potential retail market competitors to funeral homes seeking wholesale services. Because funeral homes generally incur transportation costs to the crematory, denial of service by integrated firms to unintegrated competitors could

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[†]Department of Economics, Stanford University. Email: lparcel@stanford.edu

substantially raise rivals' costs in regions with few crematories. The market for cremation services is geographically segmented at both the retail and wholesale levels, so increased costs may be transmitted to consumers.¹

The market for cremation services is also an appropriate environment for this analysis because wholesale cremation services are a commodity from the perspective of retail consumers. Although crematories may differ in terms of the ease of transfer and general convenience at which they offer their services to funeral directors, the final product received by consumers does not vary with the crematory used. Aside from the potential price effect, retail consumer demand is exogenous to the funeral home's choice of wholesale cremation supplier. This differs from some manufacturing industries in which consumers or retailers have specific demands as to supply chain origins, as well as the healthcare industry, where the patient's insurance may dictate provider or physician subcontracting choices (Ho, 2007).

Using detailed data on subcontracting patterns, wholesale and retail quantities, consumer and establishment locations, and retail pricing, I predict consumer funeral home choice and vertical relationships between funeral homes and crematories.² At the retail level, I allow consumer funeral home valuations to depend upon proximity, demographics, observed funeral home attributes (including retail price), and unobserved quality. I find that proximity is the key driver of consumer funeral home choice and use it to gauge the degree of competition between funeral homes. In estimating wholesale demand for cremation services, I allow retail market competition, transportation costs to the crematory, and unobserved quality to influence crematory choice by unintegrated funeral homes. I combine estimates from both discrete choice demand models with funeral home and crematory pricing optimality conditions to infer markups as well as marginal cost components. Using parameter estimates, I run a counterfactual to determine the impact of strategic considerations in wholesale contracting on equilibrium prices and allocations.

Retail market competition appears to have a significant influence on wholesale contracting. Unintegrated funeral homes are less than half (0.42) as likely to contract with a crematory owned by a retail market competitor than a similarly located crematory not owned by a competitor. Across all markets, the monetary equivalent of the estimated "distaste" for forming vertical relationships with retail market competitors is \$124 on average. When I permit the impact of retail market competition to vary with wholesale market thickness, funeral homes with fewer proximate crematories are less likely to subcontract with competitor firms. This is consistent with foreclosure by integrated crematories.³ On average, the estimated cost of contracting with a competitor is \$609 for funeral homes with one local crematory and \$373 for those with two crematories located nearby. Integrated crematories are less able to raise rivals' costs in markets where funeral homes have more options for wholesale service provision.

Unintegrated funeral homes' decreased propensity to form wholesale supply relationships with competitors has a number of implications. For funeral homes located near a crematory owned by a retail market competitor, marginal

¹In focusing on a geographically segmented industry, I follow Syverson (2004) and Hortacsu and Syverson (2007).

²From death certificates, I obtain the source funeral home and destination crematory for each body. Therefore, vertical links between funeral homes and crematories are directly observed.

³Throughout this paper, (upstream) foreclosure refers to actions that reduce access to a supplier, as described by Tirole (1988).

costs are increased by the additional transportation costs to a more distant supplier. While this increase is presumably smaller than the fixed cost of vertically integrating through equipment purchase or the cost of working with a competitor, it nonetheless affects equilibrium allocations. Since the retail market is imperfectly competitive and highly localized, retail prices at unintegrated funeral homes reflect these additional costs. These costs are above and beyond those incurred by unintegrated funeral homes due to double marginalization. This process is facilitated by extensive wholesale and retail market power. On average, estimated wholesale markups are approximately 80 percent of the estimated wholesale price. Median retail markups are 67 percent of the retail price for unintegrated funeral homes and 79 percent of the retail price for integrated firms.

Counterfactual estimates indicate that the aggregate retail price impact of this decreased contracting propensity is modest at \$5 per body on average. However, this figure masks substantial heterogeneity across funeral homes. Funeral homes with few proximate crematories (that are owned by retail competitors) incur additional costs ranging from seven to nine percent of the retail price, or \$161 to \$203, on average. Half of the increase in marginal cost arising from “distaste” for working with competitors is transmitted to consumers in these markets. By reducing wholesale competition, impediments to forming vertical supply relationships with horizontal competitors also inflate wholesale margins. According to counterfactual estimates, independent wholesalers enjoy seven percent larger markups on average than they would in the absence of strategic considerations in vertical contracting.

In evaluating the impact of retail market competition on wholesale contracting, I contribute to the empirical literature examining vertical foreclosure.⁴ I directly estimate the propensity to form vertical relationships with retail rivals using detailed data on subcontracting patterns. By examining subcontracting patterns among establishments, I am able to account for denial of service, quality degradation, wholesale price discrimination by crematories, unintegrated funeral homes’ desire not to raise rivals’ profits, or any other impediment to vertical contracting. In looking explicitly at vertical relationships among firms, my work is similar to Chipty (2001), who finds that vertically integrated cable operators exclude competitor program services from their distribution networks. My work differs from other papers that indirectly test for foreclosure by examining price effects. Hastings and Gilbert (2005) link retail competition in the gasoline market with wholesale market foreclosure using variation in the extent of vertical integration within a market resulting from a merger. They find that the (merged) integrated firm charges higher wholesale gasoline prices in more competitive retail markets and that, more generally, wholesale gasoline prices are higher in markets that are more integrated. In contrast, Hortacsu and Syverson (2007) find no evidence of foreclosure in the cement and ready-mixed concrete industries. Retail prices for ready-mixed concrete fall when markets become more integrated, reflecting, they argue, a tendency for integrated firms to be more productive.

I also contribute to the literature examining the funeral industry. Limited to date, this literature has investigated retail market responses to regulatory intervention. Harrington and Krynski (2002) test for demand induction in

⁴The theoretical literature is quite extensive and is reviewed by Riordan (forthcoming), among others.

response to regulation. They find that cremation rates are lower in states that require funeral directors to invest in additional training or equipment. The authors argue that this is the result of funeral directors urging consumers to purchase more costly funeral options to recoup additional investment. Chevalier and Scott Morton (2007) examine the effect of state regulations governing participation in the retail casket market on funeral directors' pricing of goods and services. They find evidence that funeral directors raise service prices and lower goods prices when open participation in the funeral goods market is permitted. My focus on inter-firm relationships within the industry is a departure from this literature.

In the next section, I briefly describe the relevant institutional features of the market for cremation services as well as the data sources. After performing a descriptive analysis of the data, I develop a theoretical model that predicts consumer funeral home choice, crematory choice by unintegrated funeral homes, and pricing. I then estimate the model, exploiting variation in transportation costs and contracting patterns to determine retail and wholesale markups in the absence of wholesale pricing information. Using model estimates, a counterfactual analysis is performed to determine the effect of strategic considerations in wholesale contracting on allocations and prices in both the wholesale and retail markets.

2 Industry Environment and Data Sources

2.1 The Market for Cremation Services

The cremation segment of the funeral industry has a structure that is particularly well-suited for the identification of strategic considerations in vertical contracting.⁵ A diagram of the market structure is shown in Figure 1. The market for cremation services consists of two components: a retail segment comprised of funeral homes that serve consumers directly and a wholesale market in which funeral homes and crematories interact. Although funeral establishments offer both cremation and burial options to consumers, only a fraction of funeral homes own cremation equipment on-site or at other establishments within the firm.⁶ Throughout this paper, I will refer to firms that own cremation equipment and their constituent establishments as “integrated.” Unintegrated funeral homes, those which do not have access to equipment internally, subcontract the work to an external provider of wholesale cremation services. In most states, providers include both independent crematories and firms that own funeral homes.⁷

In selecting a provider, an unintegrated funeral home has three potential considerations: transportation costs, the wholesale price (known as the crematory fee), and relationship-specific concerns. Since the funeral home is generally responsible for transporting the body to the crematory, wholesale providers may derive market power from horizontal

⁵The industry is described in Laderman (2003). Prothero (2001) discusses cremation in particular. A historical account of industry pricing is provided by Gebhart (1928).

⁶Theoretically, it is possible for a funeral home not to offer cremation services, but all funeral homes in my sample did so (even traditionally Jewish funeral homes).

⁷Funeral directors are legally prohibited from operating crematories in some states. As of 2006, these states included Maine, Massachusetts, New York, New Jersey, and Michigan. Source: Cremation Association of America

differentiation by location. All else equal, unintegrated funeral homes would prefer to minimize transportation costs by selecting the nearest provider. Variation in wholesale price as well as crematory-specific considerations drive unintegrated funeral homes to choose more distant suppliers. Crematory-specific considerations may relate to the competitive environment in the retail market. Since integrated firms own both funeral homes and crematories, unintegrated funeral homes potentially subcontract with retail market competitors. Anecdotal evidence indicates that funeral directors rarely engage in wholesale contracting relationships with retail market competitors. I find empirical support for this assertion which is discussed in the next section.

Because retail market power is extensive, strategic considerations in wholesale contracting may affect retail pricing since higher costs may be passed on to consumers. Funeral directors pay a per-body fee for wholesale cremation services, with no discounts based on volume, and do not generally sign contracts with crematories.⁸ Although I do not observe the wholesale prices charged by crematories in my data, they average less than \$300 industry-wide. Charges associated with transportation to the crematory, professional services, removal, death certificates, and containers constitute the balance of the final retail cost of cremation to consumers.⁹

2.2 Data Sources

In order to examine vertical relationships in this industry, I compiled data from a number of sources. The richness of the data allows for the examination of many aspects of consumer and firm behavior. The data include all individuals dying in the state of Minnesota, residing in Minnesota at the time of death, and using a funeral home in Minnesota from January 2002 through September 2006. Drawn from death certificates provided by the Minnesota Department of Health, the data contain detailed demographic information, residence location, decedent location at the time of death, funeral home selected, method of disposition, and crematory used (when applicable). Of 169,026 decedents fulfilling the above criteria, 61,747 were cremated. The cremation rate of 36.5 percent is slightly above the national average of 30.88 percent in 2004, the middle of the period studied. Quarterly demand for funeral services by method of disposition is shown in Figure 2.¹⁰

Location and ownership information for both funeral homes and crematories was obtained from the Mortuary Science Section of the Minnesota Department of Health in August 2006. License numbers and establishment names were linked to information reported on death certificates. Multiple license numbers associated with the same address were treated as one establishment. Dates of operation were inferred using reported death dates for decedents processed

⁸In focusing on an industry without long term contracting or firm specific investment, my work is similar to Gil and Hartmann (2007) who examine laundry services. However, they examine the decision to vertically integrate, whereas I examine supplier choice by unintegrated firms.

⁹Source: Personal correspondence with the Cremation Association of North America. In my data, the cost of direct cremation services to consumers, exclusive of container costs, was \$2173 on average (median \$2109).

¹⁰Although the disposition decision is not examined in this paper, results from a probit of the disposition decision on consumer demographics are reported in Table A1, located in the Ancillary Table Appendix. Jointly estimating funeral home and disposition choice is theoretically plausible, but implementation would be challenging. Ultimately, estimating such a model would require an instrument for burial price (as well as cremation price). I lack a clean instrument for burial price. Additionally, burial prices only constitute a portion of the total cost of choosing burial. A casket and a plot (or mausoleum space) must also be acquired. Since I lack information regarding individual consumer choices from the menu of funeral services, burial price is a poor proxy for the actual cost of that selection.

by that establishment. Additional information, such as corporate ownership, trade association membership, and ethnic or minority focus, was acquired from funeral home licensing information or websites. These data are augmented by price data that I collected through a survey of all Minnesota funeral homes in Spring 2007.¹¹ Funeral home and crematory locations were geocoded to the exact address. Decedent residence addresses were linked to the zip code centroid due to the large number of individuals. Refer to the Data Appendix for details.

The funeral home and the crematory named on the death certificate constitute a clear vertical link in the market for cremation services. Using this information, the crematory to which the most bodies were sent was determined on a quarterly basis for each funeral home. Most funeral homes utilize one crematory at a given point in time; the median percentage of funeral home bodies supplied to the principal cremation provider was 100 percent (mean 95.4 percent) across all quarters.¹² The principal cremation supplier was not identified for 5.9 percent (412 of 6986) of funeral home*quarters. It is possible that these funeral homes used out-of-state crematories. Using this metric, 46 percent of funeral homes changed crematories at least once.¹³ The ephemeral nature of supply relationships is not surprising given the absence of monitoring concerns, switching costs, demand uncertainty, and relationship-specific investment in this market.¹⁴

3 Descriptive Analysis

In this section, I motivate the empirical model by describing the key elements of the data. These include relative establishment location, the distance travelled by consumers to funeral homes, retail pricing dispersion, and the relationship between crematory integration status and subcontracting.

3.1 Descriptive Statistics: Firm Organization

Despite recent national trends toward consolidation, the Minnesota funeral industry remains relatively disaggregated. Firm size statistics are reported in Table 1. The majority of firms are single-establishment. Of the 220 firms operating funeral homes, 115 operated only one funeral home (and 49 operated two funeral homes). Firm size by integration status is shown in Table 2. The 36 vertically integrated firms have more funeral homes on average than their unintegrated counterparts, but just under a third of them are single-establishment. Although most firms are comprised solely of unintegrated funeral homes, there are also integrated firms that provide wholesale cremation services to other firms, integrated firms that do not provide cremation services to other firms (exclusive dealing), and

¹¹Price lists were obtained via email and telephone requests. Although federal law does not mandate that funeral establishments mail price lists in response to inquiries, the vast majority did so. Funeral homes, however, are required by federal mandate to answer pricing questions over the phone. Refer to the Data Appendix for details regarding the price survey.

¹²A portion of the balance might be explained by switching suppliers within the quarter, which occurred in six percent of funeral home*quarters.

¹³There were 391 switches in the 6574 funeral home*quarters for which the principal supplier was identified.

¹⁴Monteverde and Teece (1982) find that firms are more likely to vertically integrate into a key input when technical knowledge is firm specific. Joskow (1987) finds that relationship-specific investment is associated longer contract durations.

independently-owned crematories. Of the 49 crematories in the sample as of 2006, 40 belong to firms that operate funeral homes.¹⁵ Of those 40 integrated crematories, 36 are co-located with a funeral home.

During the period under examination, there was considerable entry in the wholesale market, but the number of funeral homes remained relatively stable. Continuing an earlier expansion trend, the number of crematories increased from 36 to 49.¹⁶ All but one of the 13 entrants were integrated. In the retail market, 29 funeral homes entered, 30 funeral homes exited, and 18 funeral homes both entered and exited.¹⁷ Histograms displaying the number of crematories and funeral homes in operation by quarter are located in the Ancillary Plot Appendix (Figures A1 and A2). Throughout my analysis, I control for funeral home and crematory entry and exit.

Establishment locations are shown in Figure 3, and summary measures of relative establishment locations are reported in Table 3.¹⁸ The geographic distribution of establishments reflects population density. All independent crematories are located within 25 miles of another crematory, whereas some integrated crematories are more isolated. Predictably, funeral homes belonging to multi-establishment firms tend to be concentrated geographically. The median distance to the nearest same-firm funeral home is 10.7 miles and the median distance to the most distant same-firm funeral home is 22.3 miles.¹⁹

3.2 Descriptive Statistics: Retail Market

3.2.1 Consumers

Since I observe prices as of Spring 2007, I restrict the decedent dataset to individuals choosing cremation who died in the most recent quarter for which I observe decedent information, the third quarter of 2006.²⁰ The distribution of distances between decedent residences and selected funeral homes, partitioned by whether the residence is located within city limits, is shown in Figure 4. The retail market for cremation services is highly localized. Given time constraints and the emotional state of the consumer, implied travel and search costs may be considerable. Among cremation consumers, 30.4 percent used the closest funeral home to the decedent's residence while 14.1 percent used

¹⁵Of the nine independently-owned crematories, most appear to be located on the grounds of or adjacent to a cemetery. Three firms own multiple crematories - two firms own two crematories each, and one firm owns three. There was some ambiguity in reporting for multi-crematory firms. See the Data Appendix for details.

¹⁶Except in estimating retail demand, establishment operation status is defined quarterly throughout this paper. Minnesota began licensing crematories in 1997. There were 23 crematories licensed at that time; thus, 13 crematories entered in the five years preceding the period of study (just as there were 13 entrants in the almost-five-year study period).

¹⁷These figures were obtained by inferring entry and exit directly from the death certificates. During my price survey, I discovered that some funeral homes that exited using my definition actually had not. It appears that some firms that own multiple funeral homes do not have business offices on all sites. In some cases, the establishment number on the death certificate might not reflect the establishment at which the service was performed. This appears to be the case for 18 funeral homes (11 of which exhibited both entry and exit by my definition). By necessity, I use the dates of operation implied by the death certificates in constructing consumer choice sets and in any calculations involving establishment output measures. When constructing the $competitor_{u,r,t}$ regressor described later, I use the additional information regarding operation obtained during the survey.

¹⁸These statistics control for entry and exit, defined quarterly. An establishment is considered to be in operation if it processed a positive number of bodies in that quarter.

¹⁹The mean value for most distant funeral home, 52.9 miles, is influenced by a regional (privately held) consolidator that owns 32 funeral homes.

²⁰The price survey was performed from March 2007 - May 2007. The most recent price revision for the vast majority of firms predated March 2007.

the second closest funeral home. Although both rural and urban consumers tend to patronize funeral homes located nearby, the distribution is more diffuse for rural consumers. When the distance travelled is exceptionally large, it is likely that the decedent residence is not a good measure of the consumer's location. In order to mitigate this potential source of measurement error, I omit consumers in the upper tail of each distribution in estimation. I restrict the choice set for decedents residing within city limits to funeral homes located within 25 miles of the residence. Since the distribution for rural consumers is more diffuse, I extend their choice set to 35 miles. These search radii are slightly greater than the 90th percentile of actual distance travelled for each group.²¹ Decedents who patronized funeral homes beyond the bounds of their choice set were dropped from the sample.

In estimating consumer funeral home choice, I allow the effect of distance to vary with demographics. Demographic descriptors are listed in Table 4, and summary measures for decedents included in the estimation sample are shown in Table 5. The sample is racially homogenous; approximately 96 percent of cremated decedents are white (non-Hispanic). Consequently, unobserved demographic characteristics affecting funeral home choice that are correlated with race, such as religion, are unlikely to vary across consumers.²² Approximately 65 percent of decedents were born in Minnesota.²³ This lack of mobility suggests that concerns with subsequent out-of-state shipping are less likely to drive consumer or firm behavior.

3.2.2 Funeral Homes: Non-Price Descriptors

In estimation, I permit consumer funeral home choice to be affected by observed funeral home characteristics, attributes of the Census tract on which the funeral home is located, and measures of pricing transparency and general consumer outreach (see Table 4). Summary statistics for the 443 funeral homes in operation during the third quarter of 2006 are shown in Table 6. In contrast to other states, publicly-traded funeral conglomerates own very few establishments in Minnesota (2.3 percent), suggesting that owners are directly involved in day-to-day business operations. Despite federal pricing disclosure requirements, funeral homes exhibited great variation in pricing transparency in response to my survey.²⁴ Extensive transparency statistics are shown in Table A2, located in the Ancillary Table Appendix. Although 62.8 percent of funeral homes had an internet presence, only 2.7 percent posted prices on the web.

²¹The 90th percentiles for urban and rural consumers are 23 and 33 miles respectively. With these restrictions, urban residents have an average of 65 funeral homes in their choice set (median 89), while those living outside of city limits have an average of 23 funeral homes (median 12). I use the exact death date on the consumer's death certificate to define the choice set. For this estimation, funeral home operation status is evaluated daily. If the death date of the individual falls between the first and final death dates of bodies processed by the funeral home, the funeral home is included in the consumer choice set. This differs from establishment and firm integration status, which are defined quarterly, and subsequent supplier choice regressions, where supplier operation status is defined quarterly.

²²My focus on cremation consumers further mitigates concerns arising from unobserved religious preference since adherents to the Catholic and Jewish faiths are less likely to be cremated.

²³Minnesota ranked 12th in terms of percent of population born in state in the 2000 Census.

²⁴Funeral homes are mandated by the federal Funeral Rule to provide a price list to consumers who request pricing information in person. The price list includes itemized information (plus effective date) and other disclosures. The Funeral Rule (16 CFR Part 453) is available on the Federal Trade Commission's website at <http://www.ftc.gov/bcp/rulemaking/funeral/16cfr453.pdf>. Although funeral homes are not required to mail price lists in response to telephone inquiries, federal law dictates that funeral homes must share pricing information over the phone when asked for pricing information.

3.2.3 Retail Pricing

For my analysis, I restrict attention to the prices of basic funeral services: direct cremation and immediate burial.²⁵ By focusing on basic services, I hope to mitigate the role of unobserved product heterogeneity.²⁶ Although actual consumer choices from the menu of services (aside from the method of disposition) are not observed, I take these prices to be reflective of the funeral home's overall price level. Price summary statistics are shown in Table 7. Prices exhibited great variation, suggesting considerable vertical or horizontal differentiation across funeral homes. Immediate burial prices ranged from \$475 to \$4000, while direct cremation prices ranged from \$850 to \$3910. Among multi-establishment firms, prices are generally set at the firm level. Of 105 multi-establishment firms in my dataset, 93 (89 percent) priced uniformly across all establishments within the firm.

Vertically integrated funeral homes charge more for burial than unintegrated funeral homes on average, but median cremation prices for integrated and unintegrated funeral homes are approximately equal (see Figure 5). Higher burial prices for integrated funeral homes may reflect both less competition in the retail market and perceived quality differentials. As shown in Table 8, unintegrated funeral homes have slightly more retail market competitors on average than integrated funeral homes, which might lead to lower retail prices. It is also possible that unobserved traits affecting consumer choice, such as the quality of the building, are correlated with integration status. The absence of a pricing differential in cremation prices may reflect lower costs to integrated firms. Examining relative pricing patterns controls for the effect of unobserved funeral home characteristics on absolute price levels. Figure 6 displays the relationship between burial and cremation prices by firm integration status. The plot, which permits within-establishment price comparisons, is consistent with the aggregate pricing statistics; vertically integrated firms charge relatively less for cremation than burial.

As discussed earlier, transportation costs to the crematory are incurred by the funeral home, so the distance to the principal cremation supplier is an observable source of variation in marginal costs. Table 9 presents the results of regressing service prices on the distance to the principal cremation supplier, controlling for observed funeral home characteristics. As expected, the distance to the principal cremation supplier is significant and positive in the cremation price regression; each additional mile to the principal cremation supplier is associated with a \$6.67 increase in retail cremation prices. Estimated transportation costs are not significant in explaining burial prices, suggesting that this relationship reflects costs to the funeral home of providing cremation services and is not an artifact of spurious correlation.

On average, funeral homes located in more densely populated areas charge less for both burial and cremation services. Marketing outreach appears relevant for burial prices but not for cremation prices, with greater outreach

²⁵Most of the time, direct cremation prices did not include the container or the crematory fee, and immediate burial prices were exclusive of the container. Prices used in estimation account for reporting differences. See the Data Appendix for details.

²⁶Both direct cremation and immediate burial include only basic services. There is no funeral ceremony. According to my discussions with funeral directors, the number of consumers choosing direct cremation is non-negligible, but immediate burial is not commonly chosen.

associated with lower prices. Compared to funeral homes which provided information after multiple phone contacts, those posting burial prices online charge \$718 less on average while establishments that responded to internet price inquiries charge \$392 less. Further reflecting the negative transparency-price relation, funeral homes responding to the first phone call posted burial prices of \$173 less on average, though the result was not statistically significant.

The third column of Table 9 shows results from regressing the ratio of cremation to burial prices on a number of funeral home descriptors.²⁷ The impact of firm integration status on relative cremation price reflects the pattern shown in Figure 6. Cremation is relatively less expensive at funeral homes belonging to vertically integrated firms (by 17 percent of the burial price). The relative price of cremation also increases with the distance from the funeral home to the principal cremation supplier.

3.3 Descriptive Statistics: Wholesale Market

The subcontracting behavior of unintegrated funeral homes suggests that retail market competition influences wholesale contracting. Across all quarters, the nearest crematory is selected 57.6 percent of the time if it is independent, but only eight percent of the time if it is owned by a retail market competitor (and 33.1 percent of the time if the crematory is integrated and not owned by a competitor).²⁸ This pattern exists despite the fact that independent crematories are more likely to be located near other crematories than integrated crematories. Although 61.2 percent of unintegrated funeral homes use a vertically integrated crematory, this is relatively small given the composition of crematory organizational form (40 integrated versus nine independent).

Table 10 presents summary statistics by crematory organizational form. Independent crematories have higher output than integrated crematories on average. Median values indicate that crematory capacity constraints are non-binding, with daily output of less than one body per work day.²⁹ On average, independent crematories have about twice as many subcontractors as integrated crematories, potentially reflecting their tendency to be located in areas more densely populated by unintegrated funeral homes.

Among integrated crematories, the percent of bodies originating within the firm varies substantially. Six crematories provide services only to funeral homes within their firm.³⁰ The remaining 34 integrated crematories provide wholesale cremation services to other firms. Figure 7 shows integrated crematory body sourcing. On average, approximately two-thirds of bodies processed by integrated crematories originate at same-firm funeral homes. Heterogeneity in sourcing composition is not merely a scale phenomenon. Within the subset of high-output crematory*quarters, there exist both crematories that generally source bodies externally and crematories that are primarily self-servicing.

²⁷Hence a negative sign reflects a lower relative cremation price.

²⁸A firm is considered to be a competitor if it owns a funeral home located within five miles of the unintegrated funeral home.

²⁹Quarterly capacity is 260 bodies per retort, not accounting for equipment failure or weekend work. I obtained this figure by assuming that a quarter consists of 13 work weeks. According to industry sources, it takes approximately 2.5 hours to process one body, with a maximum capacity of four bodies per day per retort. Although I do not observe the number of retorts per crematory, output figures imply that some crematories own multiple retorts. It is illegal to process multiple bodies in a retort simultaneously.

³⁰Of the six crematories that engage in exclusive dealing, five are also recent entrants.

In estimating wholesale demand, I use unintegrated funeral home crematory choices from all quarters in the dataset.³¹ I model the supplier decision at the funeral home level since there appears to be variation in supplier choice within unintegrated firms. The choice set consists of all Minnesota crematories, both independent and those belonging to integrated firms, in operation during that quarter. I further restrict the set of potential suppliers to those crematories that do not engage in exclusive dealing, as defined above. Funeral homes selecting a supplier that cannot be identified are dropped from the sample.

The set of regressors includes the distance to the cremation provider, an indicator for whether the crematory is a retail market competitor, and crematory fixed effects. I define $competitor_{u,r,t} = 1$ if the firm that owns cremation provider r owns a funeral home which is located within five miles of unintegrated funeral home u in quarter t . The median distance between a cremated decedent's residence and the selected funeral home is four miles (see Table 3), so using a five mile cutoff permits sufficient competitive intensity.³² Summary statistics for the estimation samples are given in Table 11.

As discussed earlier, integrated funeral homes generally use crematories belonging to the firm. Using supplier choices of integrated funeral homes for 2006, principal suppliers were outside of the firm in 32 of 1036 funeral home*quarters (3 percent). In 29 of these instances, the funeral homes in question belonged to the same large, geographically-dispersed firm. Consequently, only crematory choice by unintegrated funeral homes will be modeled and estimated in the sections that follow.

In summary, the following key facts may be ascertained from the data. The Minnesota funeral industry is disaggregated, with little ownership by publicly-traded firms. Thus, owners are likely involved in daily funeral home operations and can react to changes in the competitive climate. Consumers overwhelmingly select funeral homes located near their residences, suggesting that the retail market is geographically segmented. Retail cremation prices, which are quite variable, reflect costs. In the wholesale market, funeral homes seeking cremation services appear to favor independent crematories over those belonging to integrated firms. Within the set of integrated crematories, unintegrated funeral homes are more likely to contract with those that are not direct retail market competitors.

4 Theoretical Model of Pricing and Demand

To understand how competition affects wholesale contracting patterns and ultimately retail prices and allocations, I require a model of both pricing and demand. In this section, I describe a model that predicts wholesale and retail markups when wholesale prices are unobserved.³³ Both funeral homes and crematories derive market power from

³¹I will ultimately estimate a conditional logit model. With this model, demand elasticities are a function of the market shares. Substantial entry in the wholesale market for cremation services implies that market shares are changing through time, so assuming that the price elasticity is constant across all periods is not innocuous.

³²This cutoff is somewhat arbitrary but does not appear to be qualitatively important. See Table A3 in the Appendix for an examination of robustness.

³³Villas Boas (2007) similarly infers markups in a vertical structure absent wholesale price data. She uses variation in input prices and retail prices to identify markups. Instead, I rely upon cross-sectional variation in transportation costs across retail and wholesale

horizontal differentiation by location. My specification allows the cost of subcontracting with a particular crematory to vary according to whether the firms are retail market competitors. Ownership, relative establishment location, and integration status are taken as given throughout this analysis.

4.1 Retail Market

In the retail market, I assume that a Nash-Bertrand equilibrium exists in retail prices, with prices selected at the firm level. For ease of exposition, I further assume that all unintegrated firms consist of one funeral home and that all integrated firms consist of one funeral home and one crematory. The multi-establishment case follows directly from aggregating profits across funeral homes and crematories.³⁴

4.1.1 Consumer Funeral Home Choice

Since consumers may not contract directly with crematories, each cremation consumer selects a funeral home.³⁵ I assume that the disposition decision (cremation versus burial) is made prior to the funeral home choice. In selecting a funeral home, consumers face a tradeoff between the cost of using a particular funeral home and perceived funeral home quality. Costs incurred by consumers include the retail price paid, the cost of transporting mourners to services, and search costs. Since these costs are determined by proximity, funeral homes may derive much market power from horizontal differentiation by geographic location.

Consumer i 's valuation of funeral home h is given by

$$V_{i,h} = \delta_h - \beta_i \text{dist}(i, h) + \epsilon_{i,h} \quad (1)$$

where

$$\delta_h = x'_h \Theta - \alpha p_h + \xi_h \quad (2)$$

In these equations, x_h is the vector of funeral home attributes described in the previous section, p_h is the retail price of cremation services, and $\text{dist}(i, h)$ is the distance from the decedent's residence to funeral home h . Extensive pricing dispersion (see Figure 6) suggests that unobserved quality is potentially important in guiding consumer choice. To address this concern, I include two additional terms which proxy for unobserved quality. Funeral home attributes observed by the consumer but unobserved in the data are captured by ξ_h . I also allow quality measures unobserved

consumers.

³⁴Subsequent estimation accounts for the multi-establishment case.

³⁵I will use the term "consumer" to denote the individual making the funeral home choice. For the purpose of this model, it does not matter whether the consumer is the deceased individual or his agent. There is no outside good in this model. Although some consumers belong to cremation societies sponsored by integrated funeral homes, these are essentially a marketing device. Since an establishment is considered to be an address, funeral home demand includes cremation-society related demand.

in the data, but known to consumers, to influence funeral home choice idiosyncratically through $\epsilon_{i,h}$.³⁶

Each consumer selects the funeral home for which he has the highest valuation. If consumer i selects funeral home h^* , utility maximization implies

$$V_{i,h^*} \geq V_{i,h}, \forall h$$

4.1.2 Unintegrated Firm Retail Pricing Choice

Unintegrated funeral homes account for the cost of providing cremation services when selecting retail prices. In setting prices, I assume that funeral homes do not consider any impact their pricing decision may have on wholesale pricing by crematories. Let p be the vector of retail prices, and let r index crematories. Unintegrated funeral home u chooses retail price p_u to maximize profits

$$\pi_u = [p_u - cost_{u,r}] q_u(p) - \Gamma_u \quad (3)$$

where $cost_{u,r}$ is given by

$$cost_{u,r} = fee_r + \gamma dist(u,r) + retcost_u + \delta integ_r + \kappa competitor_{u,r} + \xi_r - \epsilon_{u,r} \quad (4)$$

In the above equations, cremation demand for funeral home u (in bodies) is given by q_u , and fixed costs of operation for the funeral home are denoted by Γ_u . The marginal cost of providing cremation services, $cost_{u,r}$, consists of several elements. In addition to the wholesale price paid to the crematory, fee_r , the funeral home must incur transportation costs, $\gamma dist(u,r)$. Costs associated with providing retail cremation services that are borne by the funeral home, such as removal and professional services, are captured by $retcost_u$.

The cost structure accounts for potential foreclosure in the wholesale market relating to retail market competition. The indicator terms $integ_r$ and $competitor_{u,r}$ allow the marginal cost of using a particular crematory to vary depending on whether the crematory belongs to an integrated firm and if the crematory's firm is a direct retail market competitor to funeral home u respectively. I cannot separately identify whether the absence of a relationship is the choice of the crematory or the unintegrated funeral home. The coefficient on $competitor_{u,r}$ could represent quality degradation for rival subcontractors, denial of service, or price discrimination by integrated crematories.³⁷ It is also possible that it represents psychic costs incurred by unintegrated funeral homes when subcontracting with a retail rival. Regardless of the exact interpretation of the term, its economic function is to raise rivals' costs.

I include two terms that influence crematory choice which are unobserved in the data. Time-invariant provider quality, such as a reputation for reliable or timely service, is captured by the inclusion of a crematory fixed-effect, ξ_r ,

³⁶One example of idiosyncratic preference is familiarity with a particular funeral director through participation in a civic organization.

³⁷Although I am told that the crematory fee charged is the same for all potential subcontractors, I cannot exclude this possibility.

and is assumed to impact marginal costs. I also allow the cost of using a particular crematory to vary idiosyncratically across funeral homes through $\epsilon_{u,r}$. This cost shock is known by funeral home u and crematory r but is not observed by other crematories or in the data.³⁸

For a single-establishment firm, optimal pricing is given by the Lerner equation.

4.1.3 Integrated Firm Retail Pricing Choice

Integrated firms earn revenues both by providing services directly to consumers in the retail market and by cremating bodies for other funeral homes in the wholesale market. The set of potential wholesale subcontractors consists of all unintegrated funeral homes. Since the integrated firm does not observe $\epsilon_{u,r}$ for other crematories with which funeral home u could contract, demand for wholesale cremation services is uncertain. Therefore, integrated firms' profits are a function of expected, as opposed to actual, wholesale demand.

Let e and e_c index integrated firm funeral homes and crematories respectively. Expected profits for an integrated firm f^{int} are given by the sum of profits from retail and wholesale cremation operations

$$\begin{aligned} E[\pi_f^{int}] &= [p_e - crcost_{e_c} - \gamma dist(e, e_c) - retcost_e] q_e(p) - \Gamma_e \\ &\quad + [fee_{e_c} - crcost_{e_c}] \sum_{u \in U} Pr(choice_{u,e_c}) q_u(p) - \Gamma_{e_c} \end{aligned} \quad (5)$$

where $crconst_{e_c}$ is the internal cost to the crematory of cremating one body and Γ_{e_c} are fixed costs associated with wholesale cremation operations. The remaining variables are defined as in the unintegrated case. Note that $dist(e, e_c)$, the distance from the integrated funeral home to the crematory, is zero when the crematory is co-located with the funeral home.

Optimal pricing implies the following

$$\begin{aligned} \frac{\partial E[\pi_f^{int}]}{\partial p_e} &= q_e + [p_e - crcost_{e_c} - \gamma dist(e, e_c) - retcost_e] \frac{\partial q_e}{\partial p_e} \\ &\quad + [fee_{e_c} - crcost_{e_c}] \sum_{u \in U} Pr(choice_{u,e_c}) \frac{\partial q_u}{\partial p_e} = 0 \end{aligned} \quad (6)$$

The first two terms are identical to the unintegrated firm pricing optimality condition. The third term reflects the

³⁸In my model, $\epsilon_{u,r}$ enters in negatively for computational simplicity. In subsequent estimation, I will assume that it follows the Type 1 extreme-value distribution. Since this distribution is asymmetric, the sign matters in determining choice probabilities. See Anderson and de Palma (1999) for a discussion of reverse discrete choice models.

fact that retail pricing by an integrated firm affects retail demand for competitor funeral homes, and thus, potential profits from subcontracting.

Retail markups for integrated firms are given by

$$p_e - crcost_{e_c} - \gamma dist(e, e_c) - retcost_e = - \frac{q_e + [fee_{e_c} - crcost_{e_c}] \sum_{u \in U} Pr(choice_{u, e_c}) \frac{\partial q_u}{\partial p_e}}{\frac{\partial q_e}{\partial p_e}} \quad (7)$$

Due to the impact of retail pricing on wholesale profits, the retail markup expression for integrated firms differs from the standard Lerner equation.

4.2 Wholesale Market

As participants in the retail cremation market, unintegrated funeral homes must select a facility to perform cremation since they do not have access to equipment within the firm. Observing the prices at which crematories offer wholesale services, each unintegrated funeral home selects the cost-minimizing provider. On the supply side, I assume that each crematory selects one price that is charged to all subcontracting funeral homes.

4.2.1 Unintegrated Funeral Home Wholesale Provider Choice

Each unintegrated funeral home selects either an independent crematory or an integrated firm to provide wholesale cremation services. Let R be the set of cremation providers. Since integrated firms located nearby are retail market competitors, there is tension between minimizing travel costs and strategic considerations. Given retail demand, q_u , retail pricing, p_u , and crematory fees, $fee_r \forall r \in R$, funeral home u selects provider r^* if

$$cost_{u, r^*} < cost_{u, r}, \forall r \quad (8)$$

where $cost_{u, r}$ is given by (4). Conceptually, the funeral director is free to change suppliers with each new body. Once in possession of a body, he examines a list of posted crematory fees and chooses the supplier that minimizes costs.

4.2.2 Cremation Provider Fee Choice

Each crematory chooses a wholesale price, fee_r , to maximize expected profits from providing cremation services. For independent crematory c , expected profits from providing wholesale cremation services are given by

$$E[\pi_c] = [fee_c - crcost_c] \sum_{u \in U} Pr(choice_{u, c}) q_u(p) - \Gamma_c \quad (9)$$

where q_u is the number of bodies provided by unintegrated funeral home u , $Pr(choice_{u, c})$ is the probability that

funeral home u selects crematory c , Γ_c represents fixed costs of operating a crematory, and $crcost_c$ reflects the internal cost to the crematory of providing cremation services. Elements of $crcost_c$ include labor costs, equipment maintenance, and fuel costs.

Assuming price competition in the wholesale cremation services market, the implied markups are

$$fee_c - crcost_c = \frac{-\sum_{u \in U} Pr(choice_{u,c})q_u}{\sum_{u \in U} \left[\frac{\partial Pr(choice_{u,c})}{\partial fee_c} q_u + Pr(choice_{u,c}) \frac{\partial q_u}{\partial p_u} \frac{\partial p_u}{\partial fee_c} \right]} \quad (10)$$

The second term in the denominator is the wholesale demand impact resulting from retail pricing responses by unintegrated funeral homes to crematory fee changes.

Unlike their independent counterparts, integrated firms' willingness to provide cremation services may be influenced by retail market competition. I assume that integrated firms consider retail pricing responses by unintegrated funeral homes to wholesale fee choices but not potential retail pricing responses by other integrated firms. From integrated firm profits (5), pricing optimality in the wholesale market yields the following expression for integrated crematory markups

$$fee_{e_c} - crcost_{e_c} = \frac{-[p_e - crcost_{e_c} - \gamma dist(e, e_c) - retcost_e] \sum_{u \in U} \frac{\partial q_e}{\partial p_u} \frac{\partial p_u}{\partial fee_{e_c}} - \sum_{u \in U} Pr(choice_{u,e_c})q_u}{\sum_{u \in U} \left[\frac{\partial Pr(choice_{u,e_c})}{\partial fee_{e_c}} q_u + Pr(choice_{u,e_c}) \frac{\partial q_u}{\partial p_u} \frac{\partial p_u}{\partial fee_{e_c}} \right]} \quad (11)$$

Let the denominator of (11) be $\Phi(\cdot)$. Combining (11) with the retail market optimality condition (7) yields the following expression for integrated firm wholesale markups

$$fee_{e_c} - crcost_{e_c} = \frac{q_e \sum_{u \in U} \frac{\partial q_e}{\partial p_u} \frac{\partial p_u}{\partial fee_{e_c}} - \frac{\partial q_e}{\partial p_e} \sum_{u \in U} Pr(choice_{u,e_c})q_u}{\frac{\partial q_e}{\partial p_e} \Phi(\cdot) - \sum_{u \in U} Pr(choice_{u,e_c}) \frac{\partial q_u}{\partial p_e} \sum_{u \in U} \frac{\partial q_e}{\partial p_u} \frac{\partial p_u}{\partial fee_{e_c}}} \quad (12)$$

For integrated firms, optimal wholesale price setting takes into account two competing responses. Assuming $\frac{\partial p_u}{\partial fee_{e_c}} > 0$, higher wholesale cremation prices lead to higher retail prices for unintegrated funeral homes. In turn, this increases retail demand for the integrated firm, and decreases wholesale demand for its services.

For simplicity in estimation, I assume that crematories only consider the impact on the probability that they are selected by unintegrated funeral homes when choosing wholesale prices. That is, I assume that crematories do not consider retail pricing responses by unintegrated firms.³⁹ Since I only observe retail prices in cross-section, identifying this derivative with the data is challenging. However, both own and cross-price elasticities are presumed small, so

³⁹I assume that $\frac{\partial p_u}{\partial fee_c} = \frac{\partial p_u}{\partial fee_{e_c}} = 0$. The restrictiveness of this assumption will be evaluated in a later version.

this should not have a first-order impact for reasonable values of $\frac{\partial p_u}{\partial fee_r}$. With this assumption, both independent and integrated crematory markups may be expressed

$$fee_r - crcost_r = \frac{-\sum_{u \in U} Pr(choice_{u,r})q_u}{\sum_{u \in U} \frac{\partial Pr(choice_{u,r})}{\partial fee_r} q_u} \quad (13)$$

If an integrated crematory is geographically isolated, denial of service to nearby funeral homes could substantially raise rivals' costs of doing business. Although the presence of an independent crematory in the market potentially prevents this from occurring, independent crematories are able to charge a higher price than they could in the absence of foreclosure by integrated firms. The extent to which independent crematories capitalize on this potential source of market power is an empirical question that will be explored in the sections that follow.

5 Estimation

In this section, I estimate two discrete choice demand models motivated by the theoretical model. In the retail market, I estimate demand for funeral homes by cremation consumers. Estimates indicate that proximity is the primary driver of consumer funeral home choice. It follows that distance is a valid metric for measuring the degree of competition among funeral homes in the retail market. In the wholesale market, I estimate a model of crematory choice by unintegrated funeral homes. I find that unintegrated funeral homes are significantly less likely to contract with retail market competitors. Wholesale markups implied by the estimates are roughly 80 percent of the wholesale price and are higher for independent crematories. In the retail market, both unintegrated and integrated funeral homes wield substantial market power with median markups of 67 and 79 percent of the retail price respectively.

5.1 Retail Market Demand: Consumer Funeral Home Choice

I use detailed micro-data from death certificates to estimate the model of consumer funeral home choice described above. Variation in the choice sets available to each consumer allows the coefficients to be identified. For the purpose of estimation, I assume that $\epsilon_{i,h}$ is distributed Type I extreme-value and that $E[\xi_h] = 0$. I let $\beta_i = z'_i \zeta$, permitting the distance between the decedent's residence and the funeral home to influence consumer funeral home valuations in a manner that is correlated with observed decedent demographics, z_i .⁴⁰ Consequently, the restrictions imposed by the independence of irrelevant alternatives implied by the logit model only apply in cases where decedents live within the same zip code and share all elements of the consumer demographic vector.

Since pricing is potentially correlated with unobserved funeral home quality, I instrument for retail price by

⁴⁰Tay (2003) also incorporates detailed consumer demographic and location data in a spatial demand model. Thomadsen (2005) and Davis (2006) use consumer demographic information, albeit at a more aggregate level.

exploiting variation in the cost to the funeral home of providing cremation services. Because the funeral home is responsible for transporting bodies to the crematory, the distance to the principal cremation supplier is a cost-shifter. As shown in Table 9, the distance from the funeral home to the cremation supplier is significant in explaining retail cremation prices, but not burial prices. Therefore, this cost-based instrument appears to be a valid source of variation for purging the regression of unobserved price and funeral home quality correlates.

Coefficient estimates were obtained in two stages. In the first stage, distance and demographic interactions as well as funeral home fixed effects were included as regressors, and choice probabilities were estimated using maximum likelihood.⁴¹ In the second stage, estimated fixed effects, $\hat{\delta}_h$, from the first stage were projected onto the vector of funeral home descriptors, including price. Prices were instrumented for using two-stage least squares. Although there is some loss of efficiency in employing this two-stage procedure, it is small relative to the gain in computational ease given the large number of observations. From estimated choice probabilities, I construct $\frac{\partial E[q_h]}{\partial p_h}$ and $\frac{\partial E[q_h]}{\partial p_f}$ where p_f is the retail price for firm f and $h \notin f$. The derivations are given in the Appendix.

Estimated coefficients from the first stage regression are presented in Table 12. With respect to search propensity, the trends that are significant among the distance and consumer demographic interactions are consistent with intuition. Decedents residing within city limits are more averse to search (on a per mile basis) than those living outside of city limits. In general, more highly educated individuals are less averse to search, although the relationship is not monotonic. When spouses are non-existent or dead, the consumer is more apt to travel than if the spouse is living. This is not surprising since, in these cases, the decedent residence is not a good proxy for the location of the decision-maker. Those dying in hospices or nursing homes are less averse to search; presumably in these cases there has been more time for pre-planning.

Coefficients from the second stage regression are reported in Table 13. The signs of estimated funeral home attribute coefficients are generally consistent with expectations regarding cremation consumer behavior. Funeral homes that market to adherents of faiths which are not inclined to choose cremation are less likely to be selected by cremation consumers (negative coefficients on both Hispanic and Jewish marketing). Individuals seeking cremation are also less likely to select minority-preferred funeral homes, which is consistent with the finding that minorities are less disposed to choose cremation (see Table A1). Relative to funeral homes that required two or more phone calls to elicit pricing information, funeral homes that exhibited greater pricing transparency were more likely to be selected. Surprisingly, cremation in the funeral home name has a negative sign, controlling for other observed funeral home attributes.

The estimated coefficient on distance is quite large relative to the price coefficient. The implied search cost is

⁴¹See McFadden (1974). It follows that the probability of consumer i choosing funeral home h^* is given by

$$Pr(choice_{i,h^*}) = \frac{\exp(\delta_{h^*} - z_i' \zeta dist(i, h^*))}{\sum_{h \in H} \exp(\delta_h - z_i' \zeta dist(i, h))}$$

\$188 per mile for a consumer who is a member of the omitted group. This is roughly equivalent to saving \$260 from search for the median cremation consumer.⁴² It is possible that substantial search costs or transportation costs for all attending the funeral drive the large coefficient on distance. The implied demand elasticities have mean -2.360 and median -1.508 across funeral homes.⁴³

5.2 Wholesale Market Demand: Cremation Provider Choice

I next estimate a model of crematory choice by unintegrated funeral homes. As discussed above, each unintegrated funeral home selects the lowest marginal cost supplier. I permit choices to change on a quarterly basis. For the purpose of estimation, I assume that $\epsilon_{u,r,t}$ is distributed Type 1 extreme-value. Since wholesale prices are unobserved, I include a scaling parameter, σ , to flexibly estimate the price level. With these additions, unintegrated funeral home marginal costs (4) may be rewritten

$$cost_{u,r,t} = fee_{r,t} + \gamma dist(u,r) + retcost_{u,t} + \delta integ_r + \kappa competitor_{u,r,t} + \xi_r - \frac{\epsilon_{u,r,t}}{\sigma} \quad (14)$$

The unobserved component of marginal cost includes not only econometric error but also the wholesale price and other unobserved provider-specific attributes, ξ_r .⁴⁴ I estimate two specifications, including fixed-effects to proxy for provider-specific marginal cost components, $-\sigma(\xi_r + \delta integ_r + fee_{r,t})$. In one specification, I assume the wholesale price is constant over time and include provider fixed effects, while in the other I allow the price to change and include crematory*quarter fixed effects.⁴⁵ Funeral home-specific descriptors do not impact the estimates since cost differences across crematories identify the model.⁴⁶

I estimate a conditional logit model of crematory choice by unintegrated funeral homes. The choice set consists of all independent crematories and non-exclusive, integrated crematories located in Minnesota and operating during that quarter. Estimates can be found in Table 14. Controlling for distance to the crematory and unobserved crematory-specific attributes, unintegrated funeral homes are 0.42 times as likely, on average, to select a crematory that is owned by a retail market competitor as they are to select non-competitor crematories. The coefficient on $competitor_{u,r,t}$ is marginally significant but robust across specifications. This decreased propensity to contract with

⁴²From Table 3, the median distance to the nearest funeral home for a cremation consumer is one mile and the median distance to the second nearest funeral home is 2.39 miles, so $1.4 * 188 = 260$. This value is between the average cremation discount that funeral homes posting prices or responding to internet inquiries offer (\$314 and \$168 respectively from Table 9).

⁴³These were computed using the expression for $\frac{\partial E[q_h]}{\partial p_h}$ derived in the Appendix and actual q_h and p_h values.

⁴⁴Unobserved cost to the funeral home of providing retail cremation services, $retcost_{u,t}$, will not be estimated directly.

⁴⁵Although $integ_r$ is observed, it is not separately identified from unobserved correlates. I do not have an instrument for integration status. Additionally, I cannot include both provider and provider*quarter fixed effects in the same estimation since there is no variation to identify the provider fixed effects.

⁴⁶The probability of unintegrated funeral home u choosing provider r^* is

$$Pr(choice_{u,r^*,t}) = \frac{exp(-\sigma(\xi_{r^*} + fee_{r^*,t} + \delta integ_{r^*}) - \sigma\gamma dist(u,r^*) - \sigma\kappa competitor_{u,r^*,t})}{\sum_{r \in R} exp(-\sigma(\xi_r + fee_{r,t} + \delta integ_r) - \sigma\gamma dist(u,r) - \sigma\kappa competitor_{u,r,t})}$$

retail market competitors is equivalent to approximately eleven miles in transportation costs on average.

In the above specifications, I restricted the impact of retail market competition on crematory choice to be the same regardless of local wholesale market structure. If the coefficient on $competitor_{u,r,t}$ represents foreclosure by integrated crematories, the ability of integrated firms to inflict higher costs upon retail rivals should vary with the number of wholesale contracting options available to unintegrated funeral homes. That is, the estimated coefficient on $competitor_{u,r,t}$ should have the greatest magnitude in markets with few crematories. Table 15 reports the results of an alternative specification in which the coefficient on $competitor_{u,r,t}$ is allowed to vary based on the number of crematories located within 25 miles of funeral home u . The absolute magnitude of the coefficient is decreasing in the number of crematories located near the funeral home, suggesting that costs associated with using a retail market competitor are decreasing in the intensity of wholesale competition. This general pattern is consistent with foreclosure by integrated crematories.⁴⁷

Since I cannot separately identify the impact of integration status from other provider-specific marginal cost determinants, I examine the impact of organizational form on relationship propensity in Figure 8.⁴⁸ In the figure, estimated choice probabilities from the baseline specification are plotted against actual distance between the funeral home and potential cremation provider. Surfaces are obtained using local mean smoothing. Three surfaces are displayed, corresponding to the three crematory classifications from the above model: integrated firm owning competitor funeral home ($integ_r = 1$ and $competitor_{u,r,t} = 1$), integrated firm not owning competitor funeral home ($integ_r = 1$ and $competitor_{u,r,t} = 0$), and independent crematory ($integ_r = 0$ and $competitor_{u,r,t} = 0$).

At close distances, integrated competitors are about 35 percent less likely (in absolute terms) to be selected on average than independent crematories, with the difference converging and eventually disappearing at 29 miles. Recall that $competitor_{u,r,t}$ relates to the relative location of retail market participants; that is, it does not relate to the relative location of funeral home u and provider r per se, but rather the unintegrated funeral home and all funeral homes belonging to the same firm as the crematory. Although most integrated crematories are co-located with funeral homes, four crematories are not located on-site of a funeral home. Therefore, it is possible, but not common, for an unintegrated funeral home to be located within five miles of the crematory but not consider the crematory firm to be a competitor ($competitor_{u,r,t} = 0$). Although these funeral homes are likely to select the proximate crematory, interpretation should be informed by the caveat that this represents relatively few potential contracting relationships and is not generally representative.

⁴⁷I also estimated a specification enabling transportation costs to vary with the number of crematories located nearby. Results were similar to the specification reported.

⁴⁸Although the model was estimated allowing the funeral home to choose any (non-exclusive dealing) crematory in the state, the plot shows predicted probabilities up to a distance of 50 miles. This cutoff lies between the 75th percentile (41 miles) and the 90th percentile (65.6 miles) of actual selected provider distances.

5.3 Wholesale Markup Determination

From the above model, estimated crematory markups may be expressed⁴⁹

$$fee_{r^*,t} - \widehat{crcost}_{r^*,t} = \frac{\sum_{u \in U} Pr(\widehat{choice}_{u,r^*,t}) q_{u,t}}{\hat{\sigma} \sum_{u \in U} Pr(\widehat{choice}_{u,r^*,t}) [1 - Pr(\widehat{choice}_{u,r^*,t})] q_{u,t}} \quad (15)$$

Since both wholesale prices and the scaling parameter, σ , are unknown, a dollar normalization may not be obtained directly from the estimates. Therefore, I obtain the normalization basis indirectly. According to industry sources, the marginal cost to a crematory of processing a body is approximately \$50.⁵⁰ The wholesale price of an independent crematory as of March 2007 was identified on a funeral home price list. Assuming this wholesale price applied to the third quarter of 2006, I calculate the wholesale markup for this crematory assuming that the marginal cost to this crematory of processing a body, $crcost_r$, is \$50. From the markup, estimated choice probabilities, and actual quantities, I obtain $\hat{\sigma}$ for different specifications. Imputed $\hat{\sigma}$ is 0.0078 in the provider fixed effect specification and 0.0083 in the provider*quarter specification. Implied transportation costs are around \$10 per mile. Although the magnitude of the estimated (per mile) transportation cost is quite high, it is relatively robust across specifications.

Using the values of the scaling parameter obtained above, I compute wholesale markups from (15). Summary statistics for estimated markups are given in Table 16. Although some markups are extremely large, this is to be expected since, within the context of the model, the absence of a vertical relationship is not separately identified from a high implied value for $fee_{r,t}$. To address this consideration, I also calculate wholesale markup means and medians, conditional on excluding the largest 10 percent.⁵¹ Median markups for all crematories range from \$148 to \$170, with means varying from \$181 to \$200. Adding \$50 to these markups yields values for wholesale prices within the reasonable range.

The magnitude of estimated wholesale markups follows organizational form, with independent crematories enjoying larger markups. Within the set of integrated crematories, those that predominantly cremate bodies originating at funeral homes outside of the firm have larger markups than those that predominately source bodies within the firm. Note that these relative comparisons are independent of the value of the scaling parameter. Interpretation should be informed by the caveat that the assumption that $\frac{\partial p_u}{\partial fee_r} = 0$ may differentially depress integrated crematory markups.

⁴⁹Refer to the Appendix for the derivation. In calculating markups, I assume that all cremated bodies are sent to the principal supplier for that quarter.

⁵⁰Components of this cost are labor, fuel (cremation retorts are generally gas-fired), and maintenance costs for the retort. Labor for operating the equipment is unskilled, and no special certification is required. It seems unlikely that these costs would vary substantially across crematories. According to an interview with one crematory owner, maintenance costs average under \$1000 annually. These costs include rebricking the retort after every 1500 cremations (at a cost of \$8000), replacing opacity tubes annually, and transporting the technician to the crematory.

⁵¹I do this because very large estimated markups imply high wholesale prices. It is unlikely that unusually high wholesale prices are actually paid by any funeral homes. Revising the choice set to exclude crematories that had no subcontractors in a prior period and those which had no output in the period caused a reduction in the range of markups observed.

One possible interpretation of this finding is that “distaste” for forming relationships with retail market competitors allows independent crematories to extract higher markups. In order to investigate this possibility, I constrain the coefficient on $competitor_{u,r,t}$ in the baseline specification and the coefficients on the $competitor_{u,r,t}$ interaction terms in the flexible specification to be zero and recalculate implied markups. Wholesale markups with this constraint are given in Table 17. In the flexible specification, about 60 percent of the difference in markups across organizational form is attributed to strategic considerations in contracting arising from retail market competition. According to counterfactual estimates, decreased competition in the wholesale market resulting from these considerations translates to \$37 higher markups on average for independent crematories (using the flexible specification) and \$2 lower markups for integrated crematories. Recall that this estimate does not account for general aversion to contracting with retail market competitors located more than five miles away.

5.4 Retail Markup Determination

Given $\hat{\sigma}$ inferred above, retail marginal cost elements may be obtained from model estimates. For firms not pricing at the firm level, I take the cremation price to be the average across funeral homes belonging to the firm.⁵² Two marginal cost elements from (14) remain uncalculated for unintegrated funeral homes. The sum of wholesale price and unobserved quality, $fee_{r,t} + \xi_r$, can be derived from estimated fixed effects, and the marginal cost of retail operations may be found using model optimality conditions (see Appendix). In this calculation, I assume that the retail price elasticities implied by the estimated funeral home choice probabilities do not change during the entire period under examination. Furthermore, I assume that the marginal cost of providing retail services, $retcost$, is identical for all funeral homes belonging to the same firm.

There is no reason to believe that average per mile transportation costs or the marginal cost of providing retail services would differ drastically across funeral home integration status.⁵³ In calculating retail markups for integrated funeral homes, transportation costs are calculated using the estimated per mile basis obtained from the crematory choice model, $retcost$ is assumed to be equal to the median estimated value for unintegrated firms, \$180.25, and the marginal cost of cremating a body, $rcost$, is assumed to be \$50.

Estimated retail markups for the third quarter of 2006 are shown in Table 18.⁵⁴ Retail markups are considerable at 67 percent for unintegrated funeral homes and 79 percent for integrated funeral homes. Although markups appear high, I did not estimate fixed costs, so I cannot evaluate overall funeral home profitability.⁵⁵ Integrated funeral homes are able to earn larger markups by both avoiding double-marginalization in the wholesale market and decreasing

⁵²Of the 11 multi-brand firms, seven are unintegrated and four are integrated.

⁵³Components of the cost of providing retail cremation services include removal of the body from the place of death, preparation for the cremation process, and filing death certificates. If anything, lower-cost firms have a greater incentive to integrate. See Hart and Tirole (1990).

⁵⁴I report markups for the third quarter of 2006 since potential pricing and ownership mismeasurement would not bias those estimates. Recall that I only observe prices as of Spring 2007 and firm ownership as of the third quarter of 2006.

⁵⁵Fixed costs could be estimated by explicitly modeling entry. However, that is beyond the scope of this paper.

transportation costs. The median estimated marginal cost value for unintegrated funeral homes (\$670) is below the lowest observed retail price of cremation (\$850). Since few unintegrated funeral homes use competitors for wholesale cremation services, the median value of the competitor aversion coefficient is zero.

Retail market competition influences the costs incurred by unintegrated funeral homes through two pathways. Unintegrated funeral homes presumably incur higher transportation costs when they are unable or unwilling to contract with horizontal competitors. As discussed above, wholesale prices charged by crematories are also affected by demand distortions owing to strategic considerations in vertical contracting. Table 19 reports the differences in costs incurred by unintegrated funeral homes and retail prices paid by consumers due to strategic considerations. In the aggregate, the impact of retail market competition on costs and pricing is quite modest; marginal costs are raised by \$10 on average, with the transportation cost impact accounting for \$5 of the difference.

Although these magnitudes are small, the aggregate cost and price effects mask substantial heterogeneity across funeral homes. The results reported in Table 15 suggest that the impact of retail market competition on wholesale contracting varies with local market structure. The potential for integrated firms to raise rivals' costs is greatest when unintegrated funeral homes have relatively few crematories located nearby. If an unintegrated funeral home has one proximate crematory that is owned by a competitor, the additional cost faced by the funeral home due to foreclosure is higher than it would be if the funeral home had a second local crematory.

In Table 19, I separately report results for those funeral homes located near crematories owned by retail market competitors. A funeral home is considered to face a wholesale monopoly market if there is one crematory located within 25 miles of the funeral home, and the crematory is owned by a retail market competitor. A funeral home faces a local duopoly market if there are two crematories located within 25 miles of the funeral home, at least one of which is owned by a competitor. Consistent with intuition, the transportation cost effect is greater for funeral homes facing a wholesale monopoly market than those funeral homes facing a wholesale duopoly. Roughly half of the increase in costs incurred by funeral homes as a result of strategic considerations in vertical contracting are transmitted to retail consumers, accounting for a four percent (\$94 monopoly or \$79 duopoly) increase in retail prices. The magnitude appears small, but it only accounts for impediments to vertical contracting with direct retail market competitors. It does not account for general inability or unwillingness to contract with integrated crematories.

5.5 Analysis With Limited Wholesale Price Data

The above analysis assumed that wholesale prices were unknown. Although I do not observe wholesale prices charged by crematories to funeral homes, some funeral homes note a crematory fee on the price lists that they provide to consumers. In this section, I re-estimate the crematory choice model using this limited wholesale price data. Results indicate that the impact of retail market competition on wholesale contracting patterns may be understated in the foregoing investigation.

I indirectly obtain wholesale prices by linking reported crematory fees from funeral home price lists with the crematories used. Only a subset of funeral homes report the wholesale price, but the fact that crematories are fewer in number than funeral homes allows most prices to be ascertained. Since funeral homes only explicitly identify the crematory used in a few cases, I assume that the wholesale price reported on the price list corresponds to the principal cremation supplier as of September 2006. When multiple wholesale prices are associated with the same crematory, I take the lowest reported fee across all funeral homes using the crematory.⁵⁶ Using this procedure, I obtain a wholesale price for 38 (of 43 non-exclusive) crematories, 31 integrated and seven independent.

Assuming that these are the actual wholesale prices charged by the crematories, I re-estimate the crematory choice model. I restrict estimation to those funeral homes selecting crematories for which a wholesale price may be imputed. The choice set consists of all non-exclusive Minnesota crematories with known wholesale prices. Absent an instrument for wholesale price, I cannot separately identify unobserved crematory quality, so no fixed effects are included in this specification. I include a dummy for crematory integration status, which is observed ($integ_r = 1$ if integrated). Since wholesale prices were inferred from Spring 2007 price lists, I separately estimate the crematory choice model using data from the most recent quarter in which choices are observed, the third quarter of 2006. Results are reported in Table 20. All regressors except for wholesale price are significant. Coefficients on both crematory integration status and the retail market competitor indicators are significant and negative, with the coefficient on $competitor_{u,r,t}$ having about twice the magnitude of the $integ_r$ coefficient. Thus, using fixed effects to proxy for unobserved wholesale prices might underestimate the true impact of retail market competition on wholesale subcontracting.

6 Conclusion

In this paper, I examined the relationship between retail market competition and wholesale contracting. Using detailed data from the Minnesota funeral industry, I found that funeral homes seeking wholesale cremation services were significantly less likely to subcontract with crematories belonging to competing firms. Denial of service, quality degradation, or unobserved price discrimination by integrated crematories are all potential explanations for the lower frequency of vertical contracting with retail market competitors. It is also possible that unintegrated funeral homes, cognizant of large wholesale margins, choose not to raise rivals' profits by using crematories owned by competitors. Although it is difficult to determine the precise cause for this lack of contracting, estimates indicate that retail market competition is a larger impediment to vertical contracting in markets with few crematories.

The presence of strategic considerations in vertical contracting affects prices and allocations in both the wholesale and retail markets. In the wholesale market, independent crematories enjoy larger markups than they would other-

⁵⁶Reasons for this discrepancy are manifold. First, funeral homes revise their price lists at different times, so variation in prices could reflect different historical fees. Second, my assumption that the principal cremation supplier used in September 2006 is the supplier as of Spring 2007 could be invalid. Third, it appears that some funeral homes include items other than the actual wholesale price paid to the crematory in the stated "crematory fee." Fourth, observed fee differences could be wholesale price discrimination, although I am told that this generally does not occur.

wise. In the retail market, funeral homes located near crematories owned by competitors incur higher transportation costs, a portion of which are passed on to consumers. Although the average impact on retail prices is modest, there is substantial variation in the price response across funeral homes.

These findings illustrate one means by which strategic considerations arising from retail market competition may distort prices and allocations. Throughout this paper, firm integration status was taken as given. However, it is also likely that integration into the wholesale market is affected by retail market competition. The fact that crematories are often located in pairs is suggestive of bandwagoning in equipment acquisition. That is, integration by a competitor might motivate a funeral home to purchase equipment as well. In future work, I plan to explicitly model the integration decision, accounting for the role of retail market competition.

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7 Appendices

7.1 Derivations

7.1.1 Obtaining $\frac{\partial E[q_h]}{\partial p_h}$ from estimated consumer choice probabilities

The expected number of bodies processed by funeral home $h^* \in U \cup E$

$$E[q_{h^*}] = \sum_i Pr(choice_{h^*,i})$$

where i indexes consumers as above. It follows that

$$\frac{\partial E[q_{h^*}]}{\partial p_{h^*}} = \sum_i \frac{\partial Pr(choice_{h^*,i})}{\partial p_{h^*}}$$

$$\frac{\partial Pr(choice_{h^*,i})}{\partial p_{h^*}} = -\alpha Pr(choice_{h^*,i}) [1 - Pr(choice_{h^*,i})]$$

where $-\alpha$ is the coefficient on p_h in (2).

7.1.2 Obtaining $\frac{\partial E[q_h]}{\partial p_f}$ from estimated consumer choice probabilities

As above, the expected number of bodies processed by funeral home $h^* \in U \cup E$ is given by

$$E[q_{h^*}] = \sum_i Pr(choice_{h^*,i})$$

Let p_f be the retail price for firm f and $h \notin f$. Let j index the funeral homes belonging to firm f . It follows that

$$\frac{\partial E[q_{h^*}]}{\partial p_f} = \sum_i \frac{\partial Pr(choice_{h^*,i})}{\partial p_f}$$

$$\frac{\partial Pr(choice_{h^*,i})}{\partial p_f} = \alpha Pr(choice_{h^*,i}) \sum_{j \in f} Pr(choice_{j,i})$$

7.1.3 Wholesale Markup Derivation

It follows from (13) that

$$fee_{r,t} - crcost_{r,t} = \frac{-\sum_{u \in U} Pr(choice_{u,r,t}) q_{u,t}}{\sum_{u \in U} \frac{\partial Pr(choice_{u,r,t})}{\partial fee_{r,t}} q_{u,t}}$$

For ease of notation, let $\nu_{u,r,t} = \exp(-\sigma(\xi_r + fee_{r,t} + \delta integr) - \sigma\gamma dist(u,r) - \sigma\kappa competitor_{u,r,t})$. Then

$$\begin{aligned} \frac{\partial Pr(choice_{u,r^*,t})}{\partial fee_{r^*,t}} &= -\frac{\sigma \nu_{u,r^*,t} \sum_{r \neq r^*} \nu_{u,r,t}}{\left[\sum_{r \in R} \nu_{u,r,t} \right]^2} \\ &= -\sigma Pr(choice_{u,r^*,t}) [1 - Pr(choice_{u,r^*,t})] \end{aligned}$$

7.1.4 Derivation of Retail Marginal Cost Elements

Wholesale Prices: Absent a normalization basis, estimates from the logit model identify relative cost differences and but not absolute cost levels. That is, it is possible to identify $\widehat{\Delta\eta}_{r,t}$ where $\Delta\eta_{r,t} = -\sigma(\xi_r + fee_{r,t} - \xi_0 - fee_0)$. With a normalization basis, however, the absolute level of $-\xi_r - fee_{r,t}$ may be determined if the wholesale price is the only crematory attribute that varies with time. If the wholesale price charged by provider a in quarter t^* , fee_{a,t^*} , is observed and unobserved attributes for this crematory are normalized to zero ($\xi_a = 0$), the entire series of wholesale prices plus unobserved quality may be constructed. This follows from

$$\begin{aligned}\widehat{\Delta\eta}_{r,t} - \widehat{\Delta\eta}_{a,t^*} &= -\sigma[\xi_r + fee_{r,t} - \xi_0 - fee_0] + \sigma[fee_{a,t^*} - \xi_0 - fee_0] \\ &= -\sigma[\xi_r + fee_{r,t} - fee_{a,t^*}]\end{aligned}$$

Therefore

$$-\xi_r - fee_{r,t} = \frac{\widehat{\Delta\eta}_{r,t} - \widehat{\Delta\eta}_{a,t^*}}{\widehat{\sigma}} - fee_{a,t^*}$$

Retail Funeral Home Operations: Let f^{unint} index unintegrated firms. Assume that the marginal cost of offering retail cremation services is identical for all funeral homes within a firm ($retcost_{u,t} = retcost_{f^{unint},t}$, $\forall u \in f^{unint}$). From unintegrated firm retail pricing optimality, it follows that

$$retcost_{f^{unint},t} = p_{f^{unint}} - \frac{\sum_{u \in f^{unint}} [cost_{u,r^*,t} - \widehat{retcost}_{u,t}] \frac{\partial E[q_u]}{\partial p_f^{unint}} - q_{u,t}}{\sum_{u \in f^{unint}} \frac{\partial E[q_u]}{\partial p_f^{unint}}} \quad (16)$$

I use values of $[cost_{u,r^*,t} - \widehat{retcost}_{u,t}]$ from the provider*quarter fixed effect, entire choice set specification in calculating markups.

7.2 Data Appendix

This Appendix details the procedures that I employed in processing the data used in this paper.

7.2.1 Death Certificate Processing

Analysis was restricted to decedents residing in Minnesota at the time of death and selecting a funeral home located in Minnesota.⁵⁷ Bequests were dropped from analysis (N=862). Although the original file contained some decedent information from October 2006 (the file was created mid-October), these observations were dropped (and a quarterly as opposed to monthly convention adopted) since information for October 2006 was incomplete.

The Geolytics Census 2000 Version 2 (Long Form) CD was used to obtain coordinates for the zip centroid corresponding to the residence zip code reported on the death certificate. For non-matching observations, zip codes were identified (and corrected when clearly errant) using the United States' Postal Service website.⁵⁸ Zip centroid matches were obtained for 98.2 percent of all death records and for 99.41 percent of cremated decedents.

7.2.2 Crematory Identification

In the death certificate file, funeral home establishments were recorded by license number while crematories were identified as strings. Strings listed on the death certificate were compared to names on a list of licensed crematories located in Minnesota that was obtained from the Mortuary Science Section of the Minnesota Department of Health on July 24, 2006. (A crematory list subsequently obtained on January 11, 2007 was identical.) Occasionally, the crematory string could not be matched to a crematory on the establishment list (N=2356 or 3.7 percent of cremated decedents). In a subset of these cases, it is clear from the string itself or from internet searching that the crematory is located out-of-state.

Occasionally, the exact match was ambiguous in cases where multiple crematories were owned by a firm. Fifty crematories are licensed by the State of Minnesota, but 49 are used for analysis.

- Three crematories are owned by the Cremation Society of Minnesota, but it appears that reporting for one of their crematories generally occurs under another crematory's license number (or it is not in operation). According to the death certificate file, Metropolitan Crematory processed 10,995 bodies, whereas Twin City Crematory processed three bodies (despite the fact that Twin City Crematory is co-located with a funeral home). Their remaining crematory, Twin Ports Crematory, processes 1808 bodies. I ignore the existence of Twin City Crematory throughout the paper, arriving at a total of 49 crematories.⁵⁹ Metropolitan Crematory and Twin City Crematory are separated by 12.8 miles.
- Bodies identified with the string "Washburn McReavey Crematory" or misspelled variants were all assigned to the crematory licensed under that name (N =4042). It is unclear, however, if this is necessarily correct since the Washburn McReavey firm owns two other crematories - Washburn McReavey Crystal Lake (N=1576) and Hillside Crematory (N=3375). The distances between Washburn McReavey Crematory and the Crystal Lake and Hillside locations are 8.75 miles and 11.02 miles respectively.

7.2.3 Funeral Home Descriptors

- **Census Tract Attributes:** Census tract attributes were obtained from Geolytics Census 2000 Version 2 (Long Form) CD.
- **Trade Association Membership:** There are two principal trade associations in the funeral industry - the National Funeral Directors' Association (NFDA) and Selected Independent Funeral Homes (formerly National Selected Morticians).⁶⁰ The NFDA is comprised of several state organizations, the relevant one in this case being the Minnesota Funeral Directors' Association (MFDA). Funeral home membership in these organizations was determined by examining the Associations' websites in October 2006.⁶¹ If one funeral home in the firm was listed as a member, it was assumed that all in that firm were members.

⁵⁷This resulted in dropping 8009 individuals from the entire decedent universe (burial plus cremation).

⁵⁸The website is located at <http://www.usps.gov>.

⁵⁹I reassign those three bodies to Metropolitan Crematory, but this does not change anything since Twin City Crematory is clearly not going to be a principal supplier for any funeral home.

⁶⁰Other notable trade associations include the National Funeral Directors and Morticians Association (NFDMA), comprised of African-American funeral directors, and the Jewish Funeral Directors of America (JFDA).

⁶¹These websites are <http://www.mnfuneral.org/> and <http://www.selectedfuneralhomes.org/> respectively.

- **Ethnic Marketing:** A funeral home was considered to be Jewish if it was a JFDA member, indicated that it catered specifically to Jewish clientele in marketing materials, or held a license under a name that indicated that this was the case (e.g. “Jewish Funeral Services of Minnesota”).

A funeral home was considered to market to Hispanic clientele if it held a license under a name that indicated that this was the case (e.g. “Funeraria La Paz,” “Funeraria Hispana,” and “Funerarias del Angel”).

- **Minority-preferred:** A funeral home was considered minority-preferred if at least 50 percent of all decedents (cremation and burial) utilizing the establishment were minority. There were 12 minority preferred funeral homes in the dataset.⁶²
- **Publicly-traded:** A funeral home was considered to be publicly-traded if it was listed on the website of a publicly-traded funeral firm on July 19, 2006. Websites consulted included those of Service Corporation International (SCI), Alderwoods Group (since merged with SCI), Stewart Enterprises, and Carriage Services.

7.2.4 Price Survey Procedure

The price survey was performed in Spring 2007. Initial internet contacts were made in March and final phone calls to non-respondents were made in May. Those not providing information by June were considered non-respondents. For each funeral home in Minnesota, I searched the internet for a web presence. If information was posted online, I followed up with an email and/or phone call to confirm that posted price information was current. For those funeral homes with a web presence but not posting pricing information (the majority of those with websites), I used the email address provided or online form to request a price list. Although some firms responded by sending these via email, most followed up with mailings. Using phone numbers provided by the state, I called those establishments not responding to my internet inquiry as well as those that did not have websites. I requested that the funeral home provide a price list via U.S. mail, fax, or email. If information was obtained as a consequence of my initial contact (including if I left my number with an answering service, but the funeral home returned the call), I coded the funeral home with the transparency indicator “first call.” All funeral homes were contacted a minimum of two times by telephone. Funeral homes that provided information but required multiple follow-up calls were coded suitably. Some firms refused to mail the information but were willing to provide the information over the telephone. In those instances, the transparency indicator represents the phone call at which that information was made available. Many multi-establishment firms utilized the same answering service for all locations. If I was given confirmation that prices were the same at other firm locations, I did not contact those other locations directly.

7.2.5 Price Standardization Procedure

Immediate burial prices used in this paper exclude any container. When the quoted price included a container, the cost of a minimum container (as quoted on the price list) was subtracted. When the cost of the minimum container was not explicitly noted and the immediate burial price included a container, I subtracted the mean value of the minimum container implied by all price lists that included the information, \$116. This occurred in three instances (0.97 percent).

Cremation prices used in this paper are the cost of direct cremation, including the crematory fee and excluding any container. Most of the time, the quoted direct cremation price followed this configuration. When prices reflected a different configuration, adjustments were made. With respect to container inclusion, the same adjustment as performed as with immediate burial. This occurred in 40 instances (9.7 percent). With respect to fees, if the fee was noted elsewhere on the price list, this was simply added into the cost for direct cremation.⁶³ If the fee was excluded, I examined whether a “crematory fee” or “cremation fee” was itemized on any other price list of a funeral home identified to be using the same principal subcontracting crematory in September 2006. I used the fee listed on those funeral homes’ price lists in instances in which a match could be obtained. When multiple fees were listed, I used the lowest fee.⁶⁴ This occurred in 45 instances (10.9 percent). When no itemized fee was listed on any subcontracting funeral home’s price list, I took the average of reported fees on the list, \$316, and added that to the quoted direct cremation price. This occurred in eight instances (1.9 percent). Although this treatment is imperfect, I felt that it was superior to ignoring reporting differences.

⁶²For reference, the sample is 94.87 percent white.

⁶³I do not use these fees in estimation. In some cases they appear to actually reflect the crematory fee, but in other instances they appear to reflect additional costs.

⁶⁴The lack of matching could have many causes. Funeral homes vary with respect to the interval of time that passes between price list revisions. It is possible that the fee listed matches that of the old subcontractor or does not represent the current wholesale price.

7.2.6 Firm Definition

I considered an establishment to be an address, so all bodies corresponding to all license numbers located at that address were included in the establishment statistics and in the definition of establishment entry and exit dates. According to the Mortuary Science Section, a change of ownership, change in name, or change in address does not generate a new license number. In some cases, the same address was given for multiple license numbers. A cremation society may have a separate license number even if it is located at the same location.

The establishment ownership file obtained from the Mortuary Science Section identifies up to three owners (names as strings). If there was at least one common owner among the (up to) three named owners, establishments were considered to be part of the same firm. For publicly traded firms, websites were consulted on July 19, 2006. For those establishments for which owners were not identified in the state data, it was assumed that they were sole proprietorships unless the price lists indicated that multiple locations belonged to the same firm (21 funeral homes representing 17 firms). This was mostly an issue for establishments which had closed down since ownership information was current as of 2006. Note that in all cases, the method used to deal with ambiguity implies that firm definitions provide a lower bound on concentration.

Crematory and funeral home establishment addresses were geocoded using Maptitude. For those addresses not matching, internet searches were conducted to find the exact address. Addresses noted on price lists were consulted to double-check the address information provided by the state. In a few cases, more accurate information was obtained during the price survey. In these cases, the address noted on the price list was used. Google Maps was used to find latitude and longitude coordinates when Maptitude did not yield an exact match.

8 Tables

TABLE 1
FIRM SIZE DISTRIBUTION

Number of Funeral Homes in Firm	Number of Firms	
	of This Size	Percent of Firms
1	115	52.27
2	49	22.27
3	24	10.91
4	9	4.09
5	12	5.45
6	6	2.73
7	1	0.45
10	2	0.91
15	1	0.45
32	1	0.45
Total Number of Firms	220	
Total Number of Funeral Homes	491	
Average Firm Size	2.2	
Median Firm Size	1	

Over half of firms operating in the retail market are single-establishment. These figures were computed using all establishments that operate at some point during the period under examination. As such, they are an upper bound on firm size.

TABLE 2
FIRM SIZE DISTRIBUTION BY INTEGRATION STATUS

Number of Funeral Homes in Firm	Number of Integrated Firms of This Size	Number of Unintegrated Firms of This Size
1	11	104
2	4	45
3	5	19
4	3	6
5	6	6
6	4	2
7	0	1
10	1	1
15	1	0
32	1	0
Total Number of Firms	36	184
Total Number of Funeral Homes	157	334
Average Firm Size	4.4	1.8
Median Firm Size	3	1

On average, integrated firms are larger than unintegrated firms. However, almost one-third of integrated firms are single-establishment.

TABLE 3
DISTANCE STATISTICS

	Mean	10th	25th	Median	75th	90th
Distance From a Funeral Home						
ALL FUNERAL HOMES						
to nearest funeral home	5.878	0.250	0.684	3.924	9.386	13.037
to second nearest funeral home	9.444	1.223	3.371	9.129	12.399	17.586
to nearest crematory	20.026	0.951	4.342	16.519	28.646	40.915
to second nearest crematory	26.087	3.424	9.993	23.110	35.909	49.741
UNINTEGRATED FUNERAL HOMES						
to nearest crematory	21.409	1.901	5.804	16.884	29.852	41.112
to second nearest crematory	27.260	4.521	11.739	24.450	36.129	49.741
to principal subcontracting crematory	29.276	2.916	7.683	20.331	40.822	65.572
CONDITIONAL ON BELONGING TO A MULTI-ESTABLISHMENT FIRM						
to nearest funeral home within the firm	12.632	3.420	6.651	10.701	15.703	20.650
to most distant funeral home within the firm	52.856	8.818	13.533	22.321	46.623	171.973
to nearest funeral home within the same pricing group	12.838	4.232	6.651	10.703	15.096	19.904
to most distant funeral home within the same pricing group	27.533	7.514	11.273	17.190	30.514	52.905
Distance From a Crematory						
ALL CREMATORIES						
to nearest crematory	10.870	0.605	1.374	4.196	15.842	31.834
to second nearest crematory	29.888	4.581	6.860	24.826	47.495	58.356
to third nearest crematory	40.963	7.074	13.217	41.485	54.469	69.867
to nearest funeral home	0.313	0	0	0	0.555	1.154
to second nearest funeral home	2.889	0.314	0.756	1.284	2.868	8.698
CONDITIONAL ON CREMATORY BEING INTEGRATED						
to nearest crematory	11.557	0.605	1.184	3.386	15.842	35.596
to second nearest crematory	31.792	4.581	6.860	34.449	51.146	68.782
CONDITIONAL ON CREMATORY BEING UNINTEGRATED						
to nearest crematory	8.184	0.792	1.888	5.609	11.675	22.439
to second nearest crematory	22.433	5.921	7.348	14.224	39.626	45.412
Distance From a Decedent's Residence						
ALL DEATHS						
to selected funeral home	10.259	0.530	1.115	3.148	9.504	19.960
to nearest funeral home	2.064	0.289	0.525	1.000	2.011	5.016
to second nearest funeral home	5.235	0.654	1.233	2.461	7.857	12.442
CONDITIONAL ON BEING CREMATED						
to selected funeral home	11.131	0.666	1.360	3.983	10.551	22.317
to nearest funeral home	2.102	0.289	0.541	1.045	2.026	4.923
to second nearest funeral home	4.913	0.654	1.233	2.385	5.982	11.609

An observation is an establishment*quarter for funeral home and crematory statistics and is a death for decedent statistics. All distance statistics are in miles and control for establishment entry and exit. Crematory distance statistics include all crematories in operation (including exclusive-dealing crematories). A pricing group refers to funeral homes within the same firm offering services at the same prices.

TABLE 4
CONSUMER VALUATION SHIFTERS

Decedent Demographics (z_i)	Funeral Home Descriptors (x_h)
	FUNERAL HOME ATTRIBUTES
Gender	Distance from decedent residence
Age	Publicly-traded firm
Education	Minority-preferred funeral home
Race	Jewish, Hispanic marketing
Birthplace	Trade association membership
Residence in city limits	Cremation in establishment name
Marital status	CENSUS TRACT ATTRIBUTES
Military service	Population density
Place of death	Median household income
Autopsy	Median value of owner-occupied housing
Manner of death	MSA indicators
Informant relationship	PRICING TRANSPARENCY
	Prices online
	Internet reply
	Responded first phone call

TABLE 5
DECEDENT DEMOGRAPHIC STATISTICS

Demographic Descriptor	Percent of Decedents	Demographic Descriptor	Percent of Decedents
Female	50.1	Place of death	
Age		<i>Residence</i>	29.8
<i>Under 18</i>	1.2	<i>Board and care home</i>	0.2
<i>18-24</i>	0.8	<i>Hospice</i>	2.4
<i>25-40</i>	2.5	<i>Hospital</i>	31.9
<i>41-60</i>	19.0	<i>Nursing home</i>	28.8
<i>61-65</i>	6.6	<i>Supervised living facility</i>	0.1
<i>66-70</i>	7.5	<i>Other</i>	6.8
<i>71-75</i>	10.1	Birthplace	
<i>76-80</i>	12.3	<i>Minnesota</i>	64.5
<i>Over 80</i>	40.0	<i>US, non-MN</i>	31.7
Education		<i>Outside US</i>	3.4
<i>Less than high school</i>	9.3	<i>Unknown</i>	0.4
<i>Some high school</i>	7.9	Residence in city limits	90.0
<i>High school graduate</i>	41.9	Autopsy	
<i>Some college</i>	21.3	<i>Yes</i>	10.6
<i>College graduate</i>	18.1	<i>Unknown</i>	0.2
<i>Unknown</i>	2.1	Manner of death	
Race		<i>Natural causes</i>	92.7
<i>White, non-Hispanic</i>	95.7	<i>Accident</i>	4.7
<i>Black</i>	1.7	<i>Homicide</i>	0.1
<i>Hispanic</i>	0.8	<i>Suicide</i>	2.3
<i>Asian</i>	1.0	<i>Other, unknown</i>	0.2
<i>Native American</i>	0.7	Informant relationship	
<i>Unknown</i>	0.1	<i>Family</i>	96.9
Marital Status		<i>Self</i>	0.03
<i>Married</i>	41.6	Military service	
<i>Divorced</i>	15.5	<i>Yes</i>	27.9
<i>Never married</i>	12.1	<i>Unknown</i>	0.2
<i>Widowed</i>	30.7		
<i>Unknown</i>	0.2		

An observation is a cremated decedent from the third quarter of 2006, conditional on being in the estimation sample (N=2969). A decedent is included in the estimation sample if he used a funeral home within 25 miles (urban) or 35 miles (rural) of his residence.

TABLE 6
FUNERAL HOME SUMMARY STATISTICS

FUNERAL HOME ATTRIBUTES	Percent of Funeral Homes				
Publicly-traded firm	2.3				
Minority-preferred funeral home	2.0				
Marketing					
<i>Jewish</i>	0.7				
<i>Hispanic</i>	0.7				
Cremation in establishment name	21.1				
Trade association membership					
<i>Selected Independent</i>	8.8				
<i>MFDA</i>	72.2				
CENSUS TRACT ATTRIBUTES	Median	Mean	Std. Dev	Min	Max
Median household income	37,672	40,262	12,189	15,965	142,796
Median home value	85,000	93,231	41,415	32,300	397,200
Population density	278	1,551	2751	3	26,154
PRICING TRANSPARENCY	Percent of Funeral Homes				
Prices online	2.7				
Internet reply	21.4				
Responded first call	53.7				

An observation is a funeral home operating at some point during the third quarter of 2006 (N=443). Census tract attributes are statistics from the 2000 Census for the tract on which the funeral home is located. Population density is defined as the number living people per square mile.

TABLE 7
RETAIL PRICE STATISTICS

	Median	Mean	Std. Dev	Min	Max
All Funeral Homes					
<i>Burial Price</i>	2220	2253.18	652.60	475	4000
<i>Cremation Price</i>	2109	2173.31	666.69	850	3910
Vertically Integrated Funeral Homes					
<i>Burial Price</i>	2550	2474.59	628.82	1125	3635
<i>Cremation Price</i>	2095	2220.50	754.84	965	3665
Unintegrated Funeral Homes					
<i>Burial Price</i>	2160	2143.27	637.15	475	4000
<i>Cremation Price</i>	2114.50	2149.88	618.43	850	3910

An observation is a funeral home in operation during the third quarter of 2006. Price information was obtained for 137 vertically integrated funeral homes and 276 unintegrated funeral homes. Integration status is defined at the firm level. Prices reported are those for immediate burial and direct cremation, including the crematory fee and excluding the container. Although burial prices are higher for vertically integrated funeral homes, cremation prices are roughly the same.

TABLE 8
FUNERAL HOME SUMMARY MEASURES BY INTEGRATION STATUS

	All Funeral Homes		Integrated Funeral Homes		Unintegrated Funeral Homes	
	Mean	Median	Mean	Median	Mean	Median
Quarterly Body Count <i>buried decedents</i> <i>cremated decedents</i> <i>total decedents</i>	13	10	13	9	13	10
	9	5	14	5	7	4
	20	14	25	13	18	14
Retail Prices <i>burial price</i> <i>cremation price</i>	2253	2220	2475	2550	2143	2160
	2173	2109	2221	2095	2150	2115
Average Implied Quarterly Revenues (all quarters) <i>burial revenues</i> <i>cremation revenues</i>	28,866	21,330	30,714	20,965	28,007	21,503
	16,433	10,490	22,886	11,070	13,341	10,160
Implied Quarterly Revenues (3q 2006) <i>burial revenues</i> <i>cremation revenues</i>	23,931	17,850	27,001	17,850	22,457	17,820
	16,420	10,700	23,115	11,500	12,910	9,700
Number of Proximate Funeral Homes <i>within 5 miles</i> <i>within 10 miles</i>	6.3	2	5.7	2	6.5	2
	12.4	3	11.7	2	12.8	3

An observation is a funeral home*quarter for body counts, average implied quarterly revenues, and the number of proximate funeral homes. An observation is a funeral home for retail prices and implied quarterly revenues (3q 2006). Implied quarterly revenues are derived using basic services prices (and hence constitute a lower bound). By necessity, revenue estimates do not include funeral homes for which prices are unknown. Totals are rounded to the nearest dollar or body. Aside from burial prices and implied revenues, integrated and unintegrated funeral homes appear to be similar, when examining median values. High mean output values for cremation for integrated funeral homes are associated with a funeral home (a cremation society) that specializes in offering low-cost, minimal cremation services. From these measures, most funeral homes process 1-2 bodies per week, suggesting that capacity constraints are not binding at the retail level.

TABLE 9
PRICE REGRESSIONS

	Burial Price	Cremation Price	Cremation/Burial Price Ratio
Distance from Funeral Home to Cremation Supplier	2.0945 (1.6750)	6.6673 $\ddagger\ddagger$ (1.6921)	0.0020 \dagger (0.0008)
Selected Independent Funeral Homes Member	-517.27 $\ddagger\ddagger$ (117.99)	-386.58 $\ddagger\ddagger$ (119.20)	0.1549 \ddagger (0.0553)
MFDA Member	166.11 \dagger (78.491)	131.69 (79.295)	0.0019 (0.0363)
Publicly-traded	-181.34 (220.56)	-218.50 (222.82)	-0.0816 (0.1018)
Minority-preferred	-67.604 (337.38)	-29.245 (340.84)	0.0059 (0.1555)
Cremation in Name	295.88 $\ddagger\ddagger$ (82.947)	79.596 (83.797)	-0.1079 \ddagger (0.0385)
Jewish Marketing	-153.87 (440.37)	270.85 (444.88)	0.2138 (0.2031)
Hispanic Marketing	689.96 (421.57)	25.382 (425.89)	-0.2869 (0.1946)
Price Online	-718.58 $\ddagger\ddagger$ (217.64)	-314.25 (219.87)	0.2805 \ddagger (0.1006)
Respond to Internet Inquiry	-392.05 $\ddagger\ddagger$ (107.72)	-167.50 (108.82)	0.1574 \ddagger (0.0500)
Respond First Call	-173.32 (95.661)	40.680 (96.642)	0.1057 \dagger (0.0441)
Median HH Income (\$1000s)	-9.6896 (4.9933)	-9.2449 (5.0445)	0.0012 (0.0023)
Median Home Value (\$1000s)	2.9113 (1.5740)	2.0203 (1.5901)	-0.0006 (0.0007)
Population Density (living people/square mile)	-0.0375 \dagger (0.0162)	-0.0514 \ddagger (0.0164)	-0.0000 (7.47e-06)
Firm Vertically Integrated			-0.1686 $\ddagger\ddagger$ (0.0336)
Model Fit			
N	320	320	320
F	5.59	7.33	4.51
Prob > F	0.000	0.000	0.000
Adjusted- R^2	0.2234	0.2842	0.1877

An observation is a funeral home. The dependent variable in each regression is given by the column header. The distance to the the cremation supplier is significant in explaining variation in the cremation price but not the burial price. Integrated firms charge less for cremation relative to burial than unintegrated firms. All regressions include a constant and also include MSA fixed effects. $\ddagger\ddagger$ = significant at 0.001, \ddagger = significant at 0.01, \dagger significant at 0.05

TABLE 10
CREMATORY SUMMARY MEASURES BY INTEGRATION STATUS

	All Crematories		Integrated Crematories		Independent Crematories	
	Mean	Median	Mean	Median	Mean	Median
Quarterly Output	74	40	66	38	103	54
Number of Subcontracting Funeral Homes	6.5	4	5.2	3	10.7	7
Total Number of Unintegrated Funeral Homes						
<i>within 5 miles</i>	2.8	1	1.9	1	6.2	3
<i>within 10 miles</i>	7.3	1	5.6	1	13.2	4
<i>within 20 miles</i>	16.0	4	13.3	4	26.0	5

An observation is a crematory*quarter. Quarterly output statistics are actual body counts (by crematory on a quarterly basis). The mean and median of number of subcontracting funeral homes and proximate unintegrated funeral homes for integrated crematories is conditional on the crematory not being exclusive dealing. Independent crematories serve as the principal cremation supplier for twice as many unintegrated funeral homes, on average, as their integrated (non-exclusive dealing) counterparts.

TABLE 11
WHOLESALE SUPPLIER CHOICE SUMMARY STATISTICS

	Median	Mean	Std. Dev.	Min	Max
Distance to Cremation Provider, $dist(u, r)$	110.40	116.48	67.888	0.127	411.54
Cremation Provider Owns Competitor Funeral Home, $competitor_{u,r,t}$	0	0.0216	0.145	0	1

An observation is a crematory*funeral home*quarter (N= 177,850). All quarters are used.

TABLE 12: CONSUMER FUNERAL HOME DEMAND: FIRST STAGE RESULTS

	Coefficient	Std. Error	P-value	Odds Ratio
Distance from residence	-0.32017	0.04380	0.000	0.726
Residence within city limits	-0.04240	0.01685	0.006	0.958
Female	-0.01912	0.01366	0.081	0.981
Age (omitted: 71-75)				
<i>Under 18</i>	0.06919	0.05600	0.108	1.072
<i>18-24</i>	-0.07169	0.06664	0.141	0.931
<i>25-40</i>	0.04904	0.03610	0.087	1.050
<i>41-60</i>	0.00592	0.02167	0.392	1.006
<i>61-65</i>	-0.02048	0.02741	0.227	0.980
<i>66-70</i>	0.00040	0.02483	0.494	1.000
<i>76-80</i>	0.02787	0.02227	0.105	1.028
<i>Over 80</i>	0.03725	0.01924	0.026	1.038
Race (omitted: White, non-Hispanic)				
<i>Black</i>	0.03080	0.04483	0.246	1.031
<i>Hispanic</i>	0.05815	0.05620	0.150	1.060
<i>Asian</i>	-0.13470	0.07916	0.044	0.874
<i>Native American</i>	-0.16886	0.09135	0.032	0.845
Education (omitted: Less than high school)				
<i>Some high school</i>	0.00544	0.02473	0.413	1.005
<i>High school grad</i>	0.03730	0.01887	0.024	1.038
<i>Some college</i>	0.02814	0.02071	0.087	1.029
<i>College grad</i>	0.04757	0.02157	0.014	1.049
Marital Status (omitted: Married)				
<i>Divorced</i>	0.03118	0.01605	0.026	1.032
<i>Never married</i>	0.07003	0.01921	0.000	1.073
<i>Widowed</i>	0.05083	0.01390	0.000	1.052
<i>Unknown</i>	-0.04365	0.15834	0.391	0.957
Military service				
<i>Yes</i>	-0.02770	0.01527	0.035	0.973
<i>Unknown</i>	-0.06632	0.14130	0.319	0.936
Place of death (omitted: Residence)				
<i>Board and care home</i>	-0.08301	0.12812	0.259	0.920
<i>Hospital</i>	-0.04196	0.01390	0.001	0.959
<i>Hospice</i>	0.04664	0.03556	0.095	1.048
<i>Nursing home</i>	0.01919	0.01393	0.084	1.019
<i>Supervised living facility</i>	-0.78606	0.42240	0.031	0.456
<i>Other</i>	0.01787	0.01987	0.184	1.018
Autopsy				
<i>Yes</i>	-0.02029	0.02026	0.158	0.980
<i>Unknown</i>	0.07701	0.06486	0.118	1.080
Manner of death (omitted: Natural causes)				
<i>Accident</i>	0.03790	0.02555	0.069	1.039
<i>Homicide</i>	-0.08735	0.20176	0.333	0.916
<i>Suicide</i>	0.01745	0.03574	0.313	1.018
<i>Other, unknown</i>	-0.07606	0.15671	0.314	0.927
Birthplace (omitted: MN)				
<i>US, non-MN</i>	-0.00814	0.01120	0.234	0.992
<i>Outside US</i>	-0.00568	0.03245	0.431	0.994
<i>Unknown</i>	-0.06711	0.11962	0.287	0.935
Informant Relationship				
<i>family member</i>	-0.01286	0.03146	0.341	0.987
<i>self</i>	-12.2635	952.616	0.495	0.000

An observation is a decedent*funeral home. The dependent variable is an indicator for whether the funeral home was selected. Reported coefficients are distance*demographic interactions. Funeral home fixed effects were also included (not reported). All funeral homes in operation, including those missing price information, were included in this first stage. Model Fit Summary: N =179,357 , LR $\chi^2 = 9752.88$, Prob> $\chi^2_{479} = 0.000$, Pseudo- R^2 (McFadden's) =0.459

TABLE 13
CONSUMER FUNERAL HOME DEMAND: SECOND STAGE RESULTS

	Coefficient	Std. Error	P-value	Odds Ratio
Cremation price	-0.00170	0.00002	0.000	0.998
Funeral home attributes				
<i>Cremation in name</i>	-0.18320	0.01130	0.000	0.833
<i>Selected Independent</i>	-0.65849	0.01612	0.000	0.518
<i>MFDA</i>	0.70833	0.01307	0.000	2.031
<i>Hispanic marketing</i>	-0.69004	0.03056	0.000	0.502
<i>Jewish marketing</i>	-0.51698	0.03238	0.000	0.596
<i>Minority-preferred</i>	-0.81393	0.03014	0.000	0.443
<i>Publicly-traded</i>	-0.17786	0.01711	0.000	0.837
Census tract attributes				
<i>Median household income (\$1000s)</i>	-0.00200	0.00043	0.000	0.998
<i>Median home value (\$1000s)</i>	0.00632	0.00014	0.000	1.006
<i>Population density</i>	0.00003	0.00000	0.000	1.000
Pricing transparency				
<i>Prices online</i>	0.72385	0.02282	0.000	2.062
<i>Respond to Internet inquiry</i>	0.72989	0.01572	0.000	2.075
<i>Respond to first phone call</i>	1.00893	0.01351	0.000	2.743

An observation is a decedent*funeral home (N=160,703). The dependent variable is the estimated funeral home fixed effect from the first stage regression. Funeral homes not reporting price information were excluded. Cremation price is instrumented for using the distance to the principal subcontracting crematory. MSA fixed effects were also included as regressors (not reported).

TABLE 14
CREMATION PROVIDER CHOICE: BASELINE SPECIFICATION

PROVIDER FIXED EFFECTS	Coefficient	Robust Std. Error	P-value	Odds Ratio
Distance to Cremation Provider	-0.0779	0.0046	0.000	0.925
Cremation Provider Owns Competitor Funeral Home	-0.8853	0.4641	0.056	0.413
N	177,850			
Prob > χ^2	0.0000			
Pseudo- R^2	0.5682			
PROVIDER*QUARTER FIXED EFFECTS				
Distance to Cremation Provider	-0.0838	0.0048	0.000	0.920
Cremation Provider Owns Competitor Funeral Home	-0.8706	0.4773	0.066	0.419
N	177,850			
Prob > χ^2	0.0000			
Pseudo- R^2	0.5920			

An observation is a funeral home*crematory*quarter, and the dependent variable is an indicator for whether the crematory was the principal supplier to the funeral home in the quarter. Fixed effects were included as indicated. Robust standard errors, clustered by funeral home, are reported. A crematory was considered to belong to a competitor firm if the firm owns a funeral home located within five miles of the unintegrated funeral home in the given quarter. Reported Pseudo- R^2 are McFadden's R^2

TABLE 15
CREMATION PROVIDER CHOICE: FLEXIBLE SPECIFICATION

	Coefficient	Robust Std. Error	P-value	Odds Ratio	Mileage Equivalent
Distance to Cremation Provider	-0.0786	0.0047	0.000	0.924	-
Retail Competitor*Number of Local Wholesale Options					
No Crematories	-15.903	0.7298	0.000	0	202.4
One Crematory	-4.200	0.9258	0.000	0.015	53.5
Two Crematories	-2.575	1.0597	0.015	0.076	32.8
Three Crematories	-0.435	0.8921	0.626	0.647	5.5
More than Three	-0.0282	0.4714	0.952	0.972	0.4

An observation is a funeral home*crematory*quarter, and the dependent variable is an indicator for whether the crematory was the principal supplier to the funeral home in the quarter (N=177,850). Provider fixed effects are included and all non-exclusive Minnesota crematories are in the choice set. Reported P-values are calculated using robust standard errors, clustered by funeral home. Retail Competitor*Number of Local Wholesale Options is a vector of regressors obtained by interacting $competitor_{u,r,t}$ from the baseline specification with a vector of indicators for the number of local non-exclusive crematories. A crematory is considered to be local if it is located within 25 miles of the funeral home. Pseudo- R^2 is 0.5727. Implied transportation cost is \$11.40 per mile. The absolute magnitude of the interaction term is decreasing in the number of wholesale contracting options available to the funeral home, suggesting that costs associated with using a retail market competitor are greater in areas with less intense wholesale competition. This general pattern is consistent with foreclosure by integrated crematories. The specification was repeated allowing travel cost to differ across wholesale classifications and a similar trend was observed (results not reported).

TABLE 16
ESTIMATED WHOLESALE MARKUPS

PROVIDER FIXED EFFECTS	All Markups		Bottom 90%	
	Mean	Median	Mean	Median
All Crematories	199.64	169.77	179.94	166.91
Independent	239.71	207.63	213.56	193.31
Integrated	188.59	165.52	171.87	161.04
<i>external sourcers</i>	231.30	220.12	219.18	216.21
<i>internal sourcers</i>	156.55	150.30	151.67	148.69
PROVIDER*QUARTER FIXED EFFECTS				
All Crematories	180.91	148.02	157.32	143.98
Independent	233.95	178.35	187.18	172.28
Integrated	166.28	140.72	149.69	138.63
<i>external sourcers</i>	207.51	201.33	196.40	191.74
<i>internal sourcers</i>	133.92	125.56	128.61	124.68

An observation is a crematory*quarter (N=763). All markups are derived from the baseline specification. The magnitude of markups follows organizational form. Independent crematories have the highest markups followed by primarily external sourcers. Predominantly internal sourcers have the lowest markups. A crematory is considered to be an external sourcer (defined quarterly) if at least 70 percent of cremated bodies originate from funeral homes outside of the firm. An internal sourcer is a crematory for which at least 70 percent of cremated bodies come from within the firm. Exclusive dealing crematories are not included (43 crematories are represented here).

TABLE 17
COUNTERFACTUAL: WHOLESAL MARKET

	Estimated Wholesale Markups		No Competitor Term(s) $\kappa = 0$	
	Mean	Median	Mean	Median
BASELINE SPECIFICATION				
All Crematories	199.64	169.77	197.50	174.52
Independent	239.71	207.63	222.53	197.23
Integrated	188.59	165.52	190.60	169.08
FLEXIBLE SPECIFICATION				
All Crematories	212.33	180.00	205.80	182.37
Independent	262.59	211.49	225.27	211.22
Integrated	198.46	175.27	200.42	176.84

An observation is a crematory*quarter (N=763). Markups were calculated using estimated parameters (including fixed effects) from the provider fixed effects specification using the entire choice set. Probabilities were recalculated imposing the constraint that $\kappa = 0$ for the baseline specification or $\bar{\kappa} = 0$ for the flexible specification.

TABLE 18
ESTIMATED RETAIL MARKUPS

	Median	Percent of Retail Price
Unintegrated Funeral Homes		
Retail Price	2075	
Retail Markup	1416.03	67
Marginal Cost	669.22	33
Wholesale Price Paid + ξ_r	187.63	11
Transportation Cost, $\gamma dist(u, r)$	171.73	9.0
Competitor Aversion, $\kappa competitor_{u,r,t}$	0	0.0
Cost of Providing Retail Services, $retcost_{funint,t}$	180.25	11
Integrated Funeral Homes		
Retail Price	2095	
Retail Markup	1726.26	79
Marginal Cost	389.91	21
Transportation Cost, $\gamma dist(e, e_c)$	159.66	7.6

An observation is a funeral home which provided retail cremation services for at least one body during Quarter 3 of 2006. Only funeral homes with available retail price data and an identified cremation supplier are included (unintegrated N=204, integrated N=116). Costs are calculated using actual (versus predicted) supplier choices. Markups are obtained using the baseline provider*quarter fixed effect specification. Median values are reported. The average price across all funeral homes in the firm was used in the case of multi-brand firms, so the prices do not coincide directly with those reported earlier. The median value of each cost component was determined in isolation of the median value of marginal costs, so cost components may not sum to the reported marginal cost exactly. Unintegrated firms are indexed by f^{unint} and integrated firms are indexed by f^{int} . In calculating retail markups for integrated funeral homes, $crccost_{fint,t}$ was assumed to be \$50 and $retcost_{fint,t}$ was assumed to be the median value for unintegrated funeral homes, \$180.25.

TABLE 19
COUNTERFACTUAL: RETAIL MARKET

	Actual		Δ [Model - Counterfactual]	
	Mean	Median	Mean	Median
Funeral Homes Facing Wholesale Monopoly				
Retail Price	2387	2525	93.61	128.54
Quantity	5	4	0	0
Marginal Cost			202.53	259.46
Transportation Cost			253.75	158.39
Wholesale Price Paid + ξ_r			-87.26	-34.82
Funeral Homes Facing Wholesale Duopoly				
Retail Price	2228	2500	79.33	81.80
Quantity	10	9	-1	-1
Marginal Cost			161.00	166.36
Transportation Cost			64.79	16.86
Wholesale Price Paid + ξ_r			68.20	115.05
All Unintegrated Funeral Homes				
Retail Price	2132	2086	5.43	0.15
Quantity	7	5	0	0
Marginal Cost			10.96	0.31
Transportation Cost			5.33	0.00
Wholesale Price Paid + ξ_r			3.97	0.13

An observation is an unintegrated funeral home*quarter. A funeral home is considered to face a Local Monopoly wholesale market if there is one crematory located within a 25 mile radius of the funeral home and it is owned by a competitor (N=43). A funeral home is considered to face a Local Duopoly wholesale market if there are two crematories located within a 25 mile radius and at least one is owned by a competitor (N=135). The counterfactual is determined using the the provider fixed effect, flexible kappa specification. Differences in expected values for the model and counterfactual are reported. Although all retail prices are as of Spring 2007, retail price statistics are different for all quarters versus quarter 3 2006 since funeral home entry and exit is considered.

TABLE 20
CREMATION PROVIDER CHOICE: LIMITED WHOLESALE PRICE DATA

	All Quarters		Quarter 3, 2006	
	Coefficient	Odds Ratio	Coefficient	Odds Ratio
Wholesale Price	0.0003 (0.0011)	1.000	-0.0019 (0.0013)	0.998
Distance to Cremation Provider	-0.0605‡‡ (0.0036)	0.941	-0.0787‡‡ (0.0059)	0.924
Integrated Crematory	-0.6464‡‡ (0.1309)	0.524	-0.7280‡‡ (0.1876)	0.483
Cremation Provider Owns Competitor Funeral Home	-1.2877‡ (0.4064)	0.276	-1.6838‡ (0.5339)	0.186
N	146,919		7,380	
Prob > χ^2	0.0000		0.0000	
Pseudo- R^2	0.4533		0.5186	

An observation is a crematory*funeral home*quarter, and the dependent variable is an indicator for whether the crematory was the principal supplier to the funeral home in the quarter. Standard errors are in parentheses. Provider fixed effects are included. For the All Quarters specification, reported standard errors are robust, clustered by funeral home. All non-exclusive Minnesota crematories are included in the choice set. Since wholesale price proxies are not observed for all crematories, the number of observations does not correspond with previous regressions. A crematory was considered to belong to a competitor firm if the firm owns a funeral home located within five miles of the unintegrated funeral home in the given quarter. Reported Pseudo- R^2 are McFadden's R^2 . ‡‡ significant at $\alpha = 0.001$, ‡ significant at $\alpha = 0.01$

9 Figures

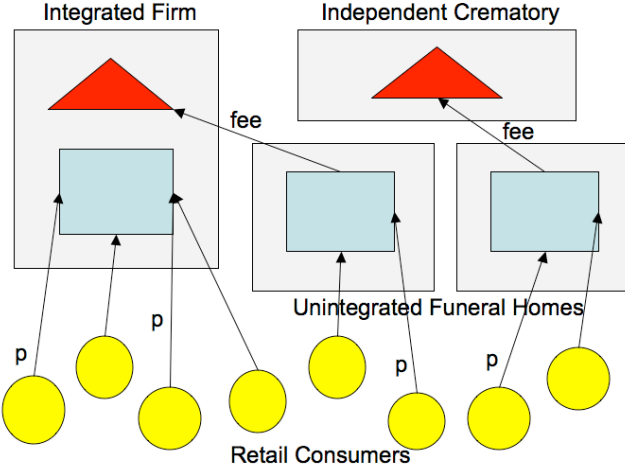


FIGURE 1: CREMATION SERVICES INDUSTRY STRUCTURE

Three types of firms participate in the market for cremation services: integrated firms (funeral homes and crematories), unintegrated firms (funeral homes), and independent crematories. Firm boundaries are shaded, and crematories are denoted by triangles. Consumers (circles) pay retail price, p , to funeral homes (rectangles) that either belong to integrated firms or are unintegrated. Unintegrated funeral homes purchase wholesale cremation services from either integrated firms or independent crematories. The wholesale price, known as the crematory fee, is paid by unintegrated funeral homes to crematories.

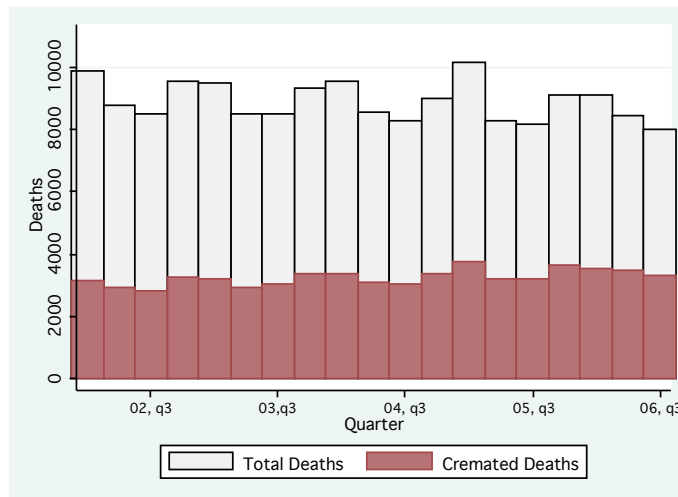


FIGURE 2: DEATHS BY METHOD OF DISPOSITION

Although aggregate demand for cremation services exhibits seasonality, it has been growing in popularity at a rate of two percent annually.

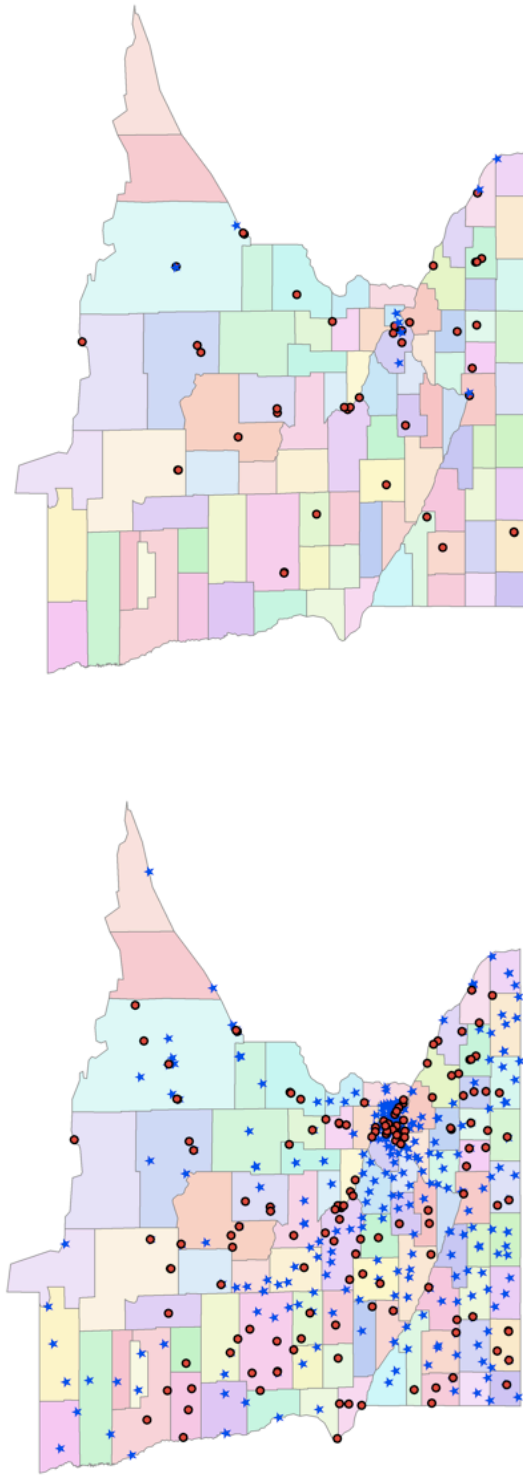


FIGURE 3: ESTABLISHMENT LOCATIONS

Funeral home locations (left) crematory locations for establishments operating in 2006. Unintegrated funeral home and independent crematory locations are denoted by a star. Integrated funeral homes and crematories are located within 25 miles of another crematory, but some integrated crematories are isolated.

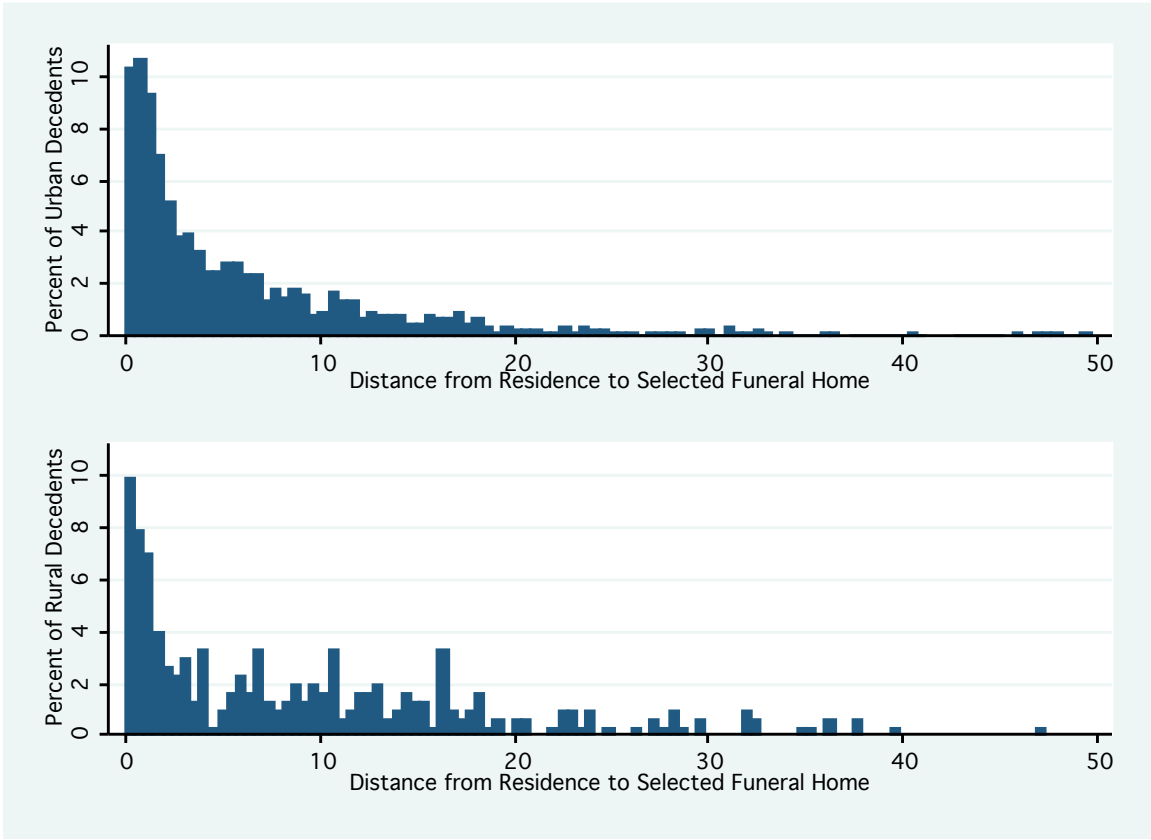


FIGURE 4: CREMATION CONSUMER TRAVEL

An observation is a cremated decedent dying in the third quarter of 2006. Distance is measured in miles. Predictably, the distribution of distance travelled is more diffuse for rural consumers.

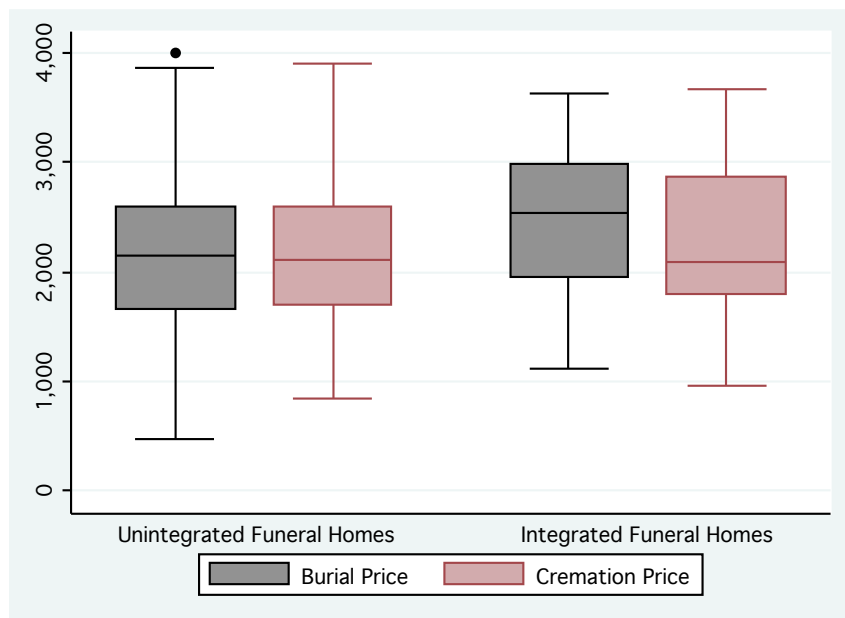


FIGURE 5: BASIC SERVICES PRICES

On average, unintegrated funeral homes charge approximately the same for immediate burial and direct cremation. The median price charged for direct cremation by integrated funeral homes is about the same as that charged by unintegrated funeral homes, but integrated funeral home burial prices are higher.

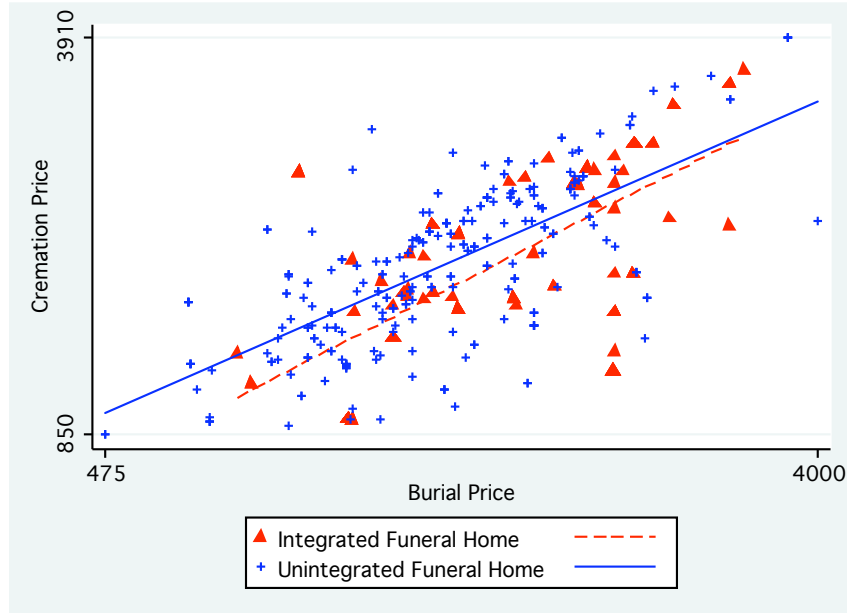


FIGURE 6: BASIC SERVICES PRICES

Since pricing decisions are generally made at the firm level, one marker may represent multiple establishments for multi-establishment firms. Wide pricing dispersion is suggestive of product differentiation, either in terms of horizontal differentiation by location or differentiation in perceived quality. In general, funeral homes belonging to vertically-integrated firms charge less for cremation relative to burial, reflecting the lower cost of providing the service.

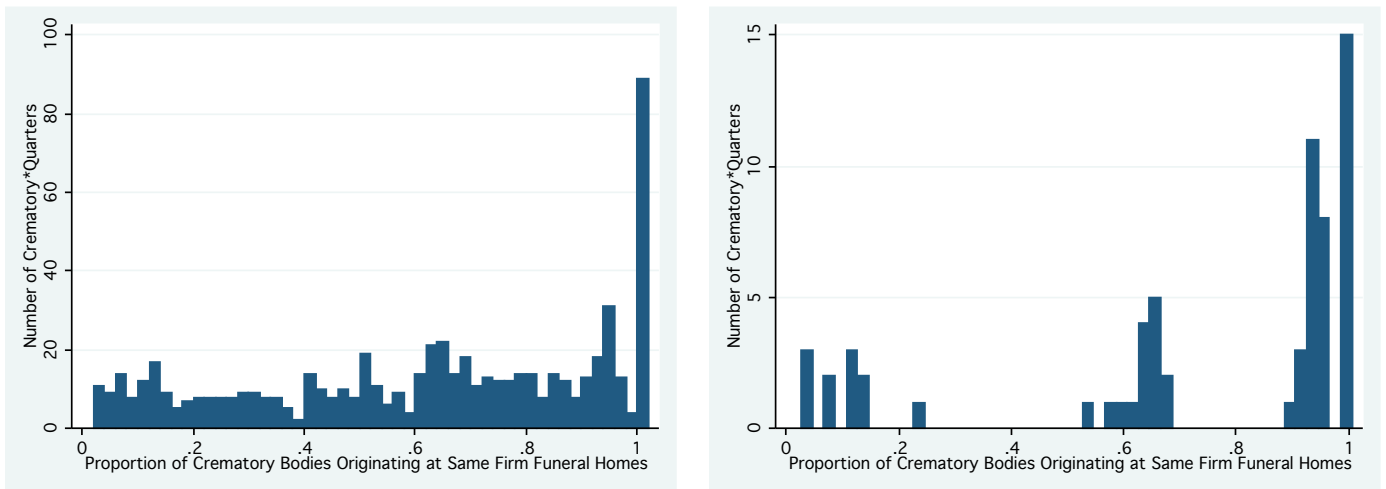


FIGURE 7: CREMATORY BODY SOURCING

An observation is an integrated crematory*quarter. Conditional on being integrated, an average of 61.8 percent (median 65.9 percent) of bodies processed by a crematory are sent by same-firm funeral homes. The histogram on the right displays composition for integrated crematory*quarters with high output (90th percentile, or 138 bodies). Among high output crematories, some primarily process bodies obtained from outside of the firm whereas others are self-sourcing.

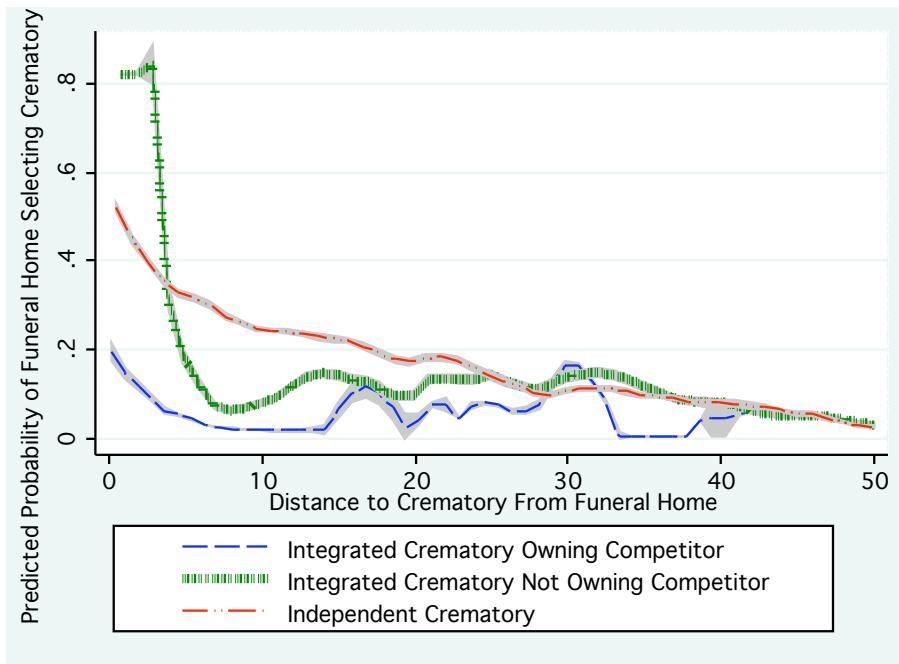


FIGURE 8: UNINTEGRATED FUNERAL HOME SUPPLIER CHOICE

Estimated crematory choice probabilities are plotted against distance to the crematory by integration status. Surfaces are obtained using local mean smoothing (with value $n=50$). Predicted crematory choice probabilities are from the provider fixed effect specification using the unrestricted choice set. Confidence intervals (95 percent) are shaded. At close distances, independent crematories are 35 percent more likely to be selected than integrated competitors, with the difference decreasing with distance.

10 Ancillary Figures and Tables

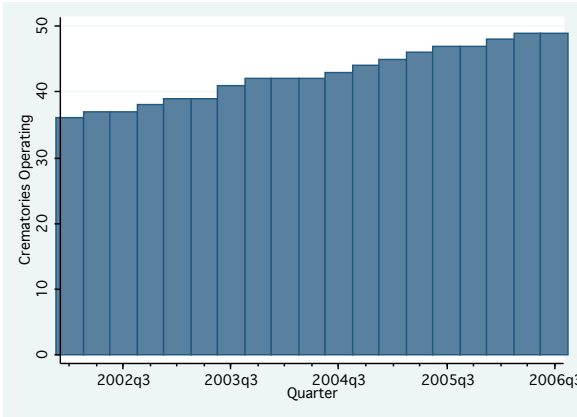


FIGURE A1: QUARTERLY CREMATORY OPERATION

The number of crematories increased by 36 percent from the first quarter of 2002 through the third quarter of 2006.

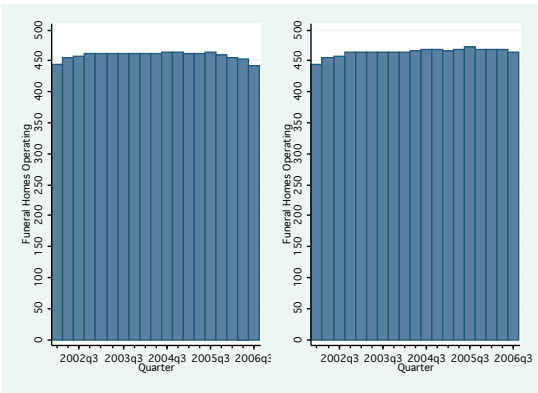


FIGURE A2: QUARTERLY FUNERAL HOME ESTABLISHMENT OPERATION

The plot on the left displays the number of funeral home establishments operating by quarter using the death certificates to define dates of operation. The plot on the right accounts for exits that were discovered to be false during the price survey. Although there was some entry and exit, the total number of funeral homes was relatively stable.

TABLE A1
PROBIT: METHOD OF DISPOSITION CHOICE

	Marginal Effect	Std. Error	Z	P-value
Female	-0.00873	0.00323	-2.71	0.007
Age (omitted: 71-75)				
<i>Under 18</i>	-0.01048	0.01626	-0.64	0.519
<i>18-24</i>	-0.07452	0.01329	-5.61	0.000
<i>25-40</i>	-0.00756	0.00915	-0.83	0.409
<i>41-60</i>	0.05928	0.00556	10.66	0.000
<i>61-65</i>	0.04435	0.00675	6.57	0.000
<i>66-70</i>	0.01315	0.00613	2.15	0.032
<i>76-80</i>	-0.02390	0.00500	-4.78	0.000
<i>Over 80</i>	-0.08195	0.00444	-18.45	0.000
Education (omitted: Less than high school)				
<i>Some high school</i>	0.13806	0.00517	26.72	0.000
<i>High school grad</i>	0.16504	0.00361	45.69	0.000
<i>Some college</i>	0.18857	0.00437	43.19	0.000
<i>College grad</i>	0.24944	0.00457	54.62	0.000
<i>Unknown</i>	-0.06582	0.00904	-7.28	0.000
Race (omitted: White, non-Hispanic)				
<i>Black</i>	-0.15899	0.00702	-22.65	0.000
<i>Hispanic</i>	-0.08720	0.01345	-6.48	0.000
<i>Asian</i>	-0.02943	0.01392	-2.11	0.035
<i>Native American</i>	-0.15962	0.00980	-16.29	0.000
Marital Status (omitted: Married)				
<i>Divorced</i>	0.16427	0.00444	37	0.000
<i>Never married</i>	0.02033	0.00463	4.39	0.000
<i>Widowed</i>	-0.01850	0.00324	-5.71	0.000
<i>Unknown</i>	0.07502	0.04364	1.72	0.086
Military service				
<i>Yes</i>	0.02491	0.00357	6.99	0.000
<i>Unknown</i>	0.04667	0.03894	1.2	0.231
Place of death (omitted: Residence)				
<i>Board and care home</i>	-0.01651	0.02985	-0.55	0.580
<i>Hospital</i>	-0.03447	0.00323	-10.68	0.000
<i>Hospice</i>	0.01219	0.00918	1.33	0.184
<i>Nursing home</i>	-0.03641	0.00344	-10.58	0.000
<i>Supervised living facility</i>	0.03296	0.01817	1.81	0.070
<i>Other</i>	-0.03272	0.00604	-5.42	0.000
Autopsy				
<i>Yes</i>	0.01364	0.00530	2.57	0.010
<i>Unknown</i>	-0.00870	0.02092	-0.42	0.678
Manner of death (omitted: Natural causes)				
<i>Accident</i>	0.02221	0.00679	3.27	0.001
<i>Homicide</i>	-0.09945	0.01959	-5.08	0.000
<i>Suicide</i>	0.11599	0.01151	10.08	0.000
<i>Other, unknown</i>	0.01831	0.02240	0.82	0.414
Birthplace (omitted: Minnesota)				
<i>US, non-MN</i>	0.08828	0.00286	30.9	0.000
<i>Outside US</i>	0.05100	0.00724	7.05	0.000
<i>Unknown</i>	0.07484	0.02573	2.91	0.004

This table reports the results of a probit of the disposition decision using decedents from all quarters. The dependent variable is one if the decedent was cremated. Pseudo- $R^2 = 0.0638$. The probability of choosing cremation is increasing in education. Minorities are less likely to choose cremation.

TABLE A2
RETAIL PRICING TRANSPARENCY

	Frequency	Overall Percentage	Conditional Percentage
Internet Presence			
<i>current prices on website</i>	12	2.7	4.3
<i>responded to online inquiry</i>	95	21.4	34.2
<i>no response to online inquiry</i>	171	38.6	61.5
TOTAL ONLINE	278	62.8	
Telephone Contacts			
<i>responded to first call</i>	238	53.7	71.7
<i>responded to subsequent calls</i>	68	15.3	20.5
<i>no information provided</i>	26	5.9	7.8
TOTAL CALLED	332	74.9	
UNREACHABLE	4	0.9	
TOTAL IN OPERATION	443		

Pricing information was obtained for 93.2 percent of funeral homes that were in operation as of the third quarter of 2006. Funeral homes that had an internet presence but did not respond to online inquiry were subsequently contacted by phone.

TABLE A3
ROBUSTNESS: RETAIL MARKET SIZE

BASELINE SPECIFICATION	Competitor Radius		
	2 miles	5 miles	7 miles
Distance to Cremation Provider	-0.0773 $\ddagger\ddagger$ (0.0046)	-0.0779 $\ddagger\ddagger$ (0.0046)	-0.0789 $\ddagger\ddagger$ (0.0047)
Cremation Provider Owns Competitor Funeral Home	-0.7961 (0.6177)	-0.8853* (0.4641)	-1.0808 \ddagger (0.4014)
N	177,850		
Prob $> \chi^2$	0.0000	0.0000	0.0000
Pseudo- R^2	0.5673	0.5682	0.5699
FLEXIBLE SPECIFICATION			
Distance to Cremation Provider	-0.0781 $\ddagger\ddagger$ (0.0046)	-0.0786 $\ddagger\ddagger$ (0.0047)	-0.0798 $\ddagger\ddagger$ (0.0048)
Retail Competitor*Number of Local Wholesale Options			
No Crematories	-15.5312 $\ddagger\ddagger$ (0.8057)	-15.9030 $\ddagger\ddagger$ (0.7298)	-16.2283 $\ddagger\ddagger$ (0.5557)
One Crematory	-4.1878 $\ddagger\ddagger$ (0.9277)	-4.2002 $\ddagger\ddagger$ (0.9258)	-2.1195 \ddagger (0.6855)
Two Crematories	-3.0918 \ddagger (1.4354)	-2.5749 \ddagger (1.0597)	-3.1365 \ddagger (1.0298)
Three Crematories	-0.3156 (1.1015)	-0.4353 (0.8921)	-0.4890 (1.3834)
More than Three	0.5669 (0.5426)	-0.0282 (0.4714)	-0.4336 (0.4481)
N	177,850		
Prob $> \chi^2$	0.0000	0.0000	0.0000
Pseudo- R^2	0.5730	0.5727	0.5731

This table reports crematory choice model estimates using various radii to define a competitor in the retail market. Provider fixed effects were included in all regressions, and all non-exclusive Minnesota crematories in operation were included in the choice set. Robust standard errors, clustered by funeral home, are reported in parentheses. The results are qualitatively similar across retail market size radii. $\ddagger\ddagger$ = significant at 0.001, \ddagger = significant at 0.01, \ddagger significant at 0.05; *significant at 0.056