Effects of Market Position and Competition on Rural Hospital Closures

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Objective. To examine the dynamic effects of competition and hospital market position on rural hospital closures.

Data Source/Study Setting. Analysis of all rural community hospitals operating between 1984 and 1991, with the exception of sole-provider hospitals. Data for the study are obtained from four sources: the AHA Annual Surveys of Hospitals, the HCFA Cost Reports, the Area Resource File, and a hospital address file constructed by Geographic Inc.

Data Collection and Analysis. Variables are merged to construct pooled, time-series observations for study hospitals. Hospital closure is specified as a function of hospital market position, market level competition, and control variables. Discrete-time logistic regressions are used to test hypotheses.

Principal Findings. Rural hospitals operating in markets with higher density had higher risk of closure. Rural hospitals that differentiated from others in the market on the basis of geographic distance, basic services, and high-tech services had lower risks of closure. Effects of market density on closure disappeared when market position was included in the model, indicating that differentiation in markets should be taken into account when evaluating the effects of competition on rural hospital closure.

Conclusions. Our findings suggest that rural hospitals can reduce competitive pressures through differentiation and that accurate measures of competition in geographically defined market areas are critical for understanding competitive dynamics among rural hospitals.

Key Words. Rural hospitals, competition, market position, closures, differentiation

Policy changes such as Medicare's prospective payment system have been designed to contain health care costs and promote efficiency by increasing competition among hospitals. Although increased competition in the period since the introduction of prospective payment has resulted in cost reduction practices among some health care providers (Sloan, Morrisey, and Valvona

1988), it has also threatened the viability of others (Mullner et al. 1989; Lillie-Blanton, Felt, Redmon, et al. 1992). Rural hospitals are especially vulnerable to these competitive pressures because of their small size, aging facilities, and limited strategic opportunities (Williams, Hadley, and Pettengill 1992; Ermann 1990; Mullner et al. 1989). The increasing number of closures among rural hospitals is convincing evidence of the tenuous position of these organizations (Mullner et al. 1989; Mullner, Rydman, and Whiteis 1990).

Given increasing levels of competition in the health care sector in general, we understand surprisingly little about the nature of market competition and its effect on hospital closures in rural areas. Existing studies of rural hospital closure adopt the traditional definition of market level competition and assume that all hospitals in a given geographic market engage in direct competition with each other (Mullner and Whiteis 1988; Williams, Hadley, and Pettengill 1992; Lillie-Blanton, Felt, Redmon, et al. 1992). In doing so, they fail to consider that competition among rural hospitals may vary by specific hospital characteristics.

In this study, we extend the current literature on competition and rural hospital closure by taking into account the market position of the focal rural hospital. We argue that studies of competitive effects in rural markets should consider differentiation among hospitals, or the extent to which each rural hospital engages in direct competition with other hospitals in the market. Such differentiation is examined in this study on three attributes: geographic distance, size, and service configuration. These attributes are selected based on their potential effects on choice of hospitals made by patients and physicians (Javalgi, Rao, and Thomas 1991; Lane and Lindquist 1988).

We use longitudinal data collected from the population of U.S. rural community hospitals ($N = 2{,}780$) from 1984 through 1991 to examine the effects of competition and market position on rural hospital closures. The study covers a period when the competitive pressures on rural hospitals are intensified by dramatic regulatory changes in the health care system.

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THEORETICAL BACKGROUND AND HYPOTHESES

COMPETITION IN RURAL MARKETS

Increasing rural hospital closures have raised concerns among policy analysts and other health care decision makers. Hospital closures in rural communities can increase barriers to health services for a large portion of the population and can undermine the economy of entire communities (McDermott, Cornia, and Parsons 1991; Mullner, Rudman, and Whiteis 1990). Given that rural hospitals tend to operate in markets with declining economies and limited resources, issues regarding the effect of competition on rural hospital closures appear particularly important (Ermann 1990).

In most current literature, competition is typically approximated by two structural characteristics of the market: market density and market concentration. Market density indicates the number of hospitals in a market. Assuming a finite set of resources, an increase in the number of rural hospitals vying for similar resources can decrease access to resources and reduce survival prospects for all hospitals in the market (Mayer et al. 1987; Mullner et al. 1989; Lillie-Blanton, Felt, Redmon, et al. 1992). Market concentration focuses on the distribution of market share. In markets with lower concentration, competition among equally powerful hospitals is likely to drive down service prices and deprive hospitals of the advantages of scale economies (Melnick et al. 1992). Consequently, such competitive pressures adversely affect the risk of closure for all hospitals in the market.

Although studies using these structural measures of competition have found empirical support in predicting the risk of rural hospital closures, their conceptualizations of competition are inherently problematic (White and Chirikos 1988). Based on these market structural approaches, information about each rural hospital is combined to construct an aggregate assessment of competition at the market level (Noether 1988; Dranove, Shanley, and Simon 1992). All rural hospitals in a designated market area are assumed to act as potential competitors and to operate under uniform competitive pressures. These assumptions, however, are unlikely to apply to rural hospitals given the particular characteristics of rural markets.

Rural hospital markets are typically characterized by few providers and disproportionately scarcer resources. In markets with a small number of hospitals, competitive moves are easily monitored and responded to by other, interdependent providers (Luke 1991; Starkweather and Carman

1988). Resource scarcity in rural markets also precludes the use of price or quality competition, which usually requires substantial capital outlay for a hospital (e.g., the purchase of innovative, high-tech equipment) (Amundson and Rosenblatt 1988). Further, as the patient population is small in rural markets, it is often unclear whether these strategic changes will attract sufficient patient revenue to increase marginal returns and compensate for capital investment. Thus, rather than engaging in direct price competition with all hospitals in the same market, scarce resources and high uncertainty may be more effectively responded to through differentiation among rural hospitals.

Through differentiation, rural hospitals may gain competitive advantages by establishing a viable market niche and reducing the actual number of competitors (Luke 1991; Dranove, Shanley, and Simon 1992; Starkweather and Carman 1988). For example, if a rural hospital is differentiated from potential competitors on the basis of size or services, direct competition may be reduced because the focal hospital and other hospitals in the market are pursuing different sets of resources. Therefore, when assessing the effects of competition on rural hospitals, the market position of a hospital, defined as the extent to which the attributes of the focal rural hospital resemble those of other hospitals in the same market, must be taken into account.

MARKET POSITION AND COMPETITION

The possibility that hospitals can avoid direct competition by establishing a distinct market position has significant implications for the competitive dynamics among rural hospitals. Failure to consider a hospital's market position may overestimate the competitive pressures the hospital experiences in a given market. For example, a small rural hospital positioned above the market average may draw a more distinct set of patients and physicians than those hospitals located at the market average. Thus, a hospital positioned above the market average will experience weaker competitive pressures than an equal-size hospital located at the market average. While both hospitals may experience similar constraints due to small size, the former is better positioned in the market and may have lower risk of closure.

We select three attributes to evaluate the market position of a focal hospital in a given market area: geographic distance, size, and service configuration. These attributes are important properties that potentially affect the choice of hospital made by patients and admitting physicians and the potential overlap of hospital markets. Hospitals with comparable attributes

tend to draw on the same groups of patients and physicians and to compete for similar sets of resources. Each of these three hospital attributes is discussed in the next sections.

Geographic Distance. Geographic distance affects the choice both patients and physicians make in selecting a hospital (Shannon, Bashshur, and Metzner 1969; Morrill and Earickson 1968; Folland 1983). Choice of providers is based on convenience and preference to reduce travel costs rather than on other aspects of medical care (Adams and Wright 1991; Morrisey, Sloan, and Valvona 1988). For example, studies demonstrate that patients typically seek care from the nearest hospital (McGuirk and Porell 1984). This tendency is particularly prevalent in rural areas where alternative sources of health care are limited and the costs of transportation are high (Adams and Wright 1991; McGuirk and Porell 1984).

Geographic distance is likely, therefore, to affect the competitive dynamics among rural hospitals. Hospitals in close proximity may have to compete with each other for patients from the same area or for physicians who can admit patients to one of several nearby hospitals. In contrast, hospitals at a distance from other hospitals may avoid direct competition for patients and physicians and have better prospects for survival. Therefore, we expect to find a negative relationship between geographic distance and risk of closure among rural hospitals.

Hypothesis 1. Compared to rural hospitals more proximate to their nearest neighboring hospital, rural hospitals more distant from their nearest neighboring hospital have lower risk of closure.

Relative Size. The relative size of a hospital also affects the choice of hospital made by patients and physicians due to particular amenities associated with hospitals of different size. For example, larger rural hospitals may attract physicians and patients on the basis of higher volume of care and technological innovations, while smaller rural hospitals may draw physicians and patients who prefer a strong community outreach philosophy or more personalized care-giving relationships. These two types of hospitals may therefore pursue distinct sets of resources and experience lower levels of competition in the market. By contrast, hospitals whose size is comparable to the market average compete with equal-size hospitals as well as with other larger and smaller hospitals in the market, and may thus have poorer prospects for survival (Carroll 1985; Baum and Mezias 1992).

Apart from the argument that both large and small hospitals have low risk of closure, we argue that liabilities associated with small size (e.g., limited power to secure critical resources) may increase risk of closure. Advantages associated with differentiation may not outweigh liabilities associated with small size. Therefore, we suggest that rural hospitals larger than the average size in the market will have better prospects for survival.

Hypothesis 2. Compared to other rural hospitals in a given market, rural hospitals larger than the market average have lower risk of closure.

Service Configuration. Service configuration indicates how specific services are strategically selected and arranged in the hospital. Rather than offering comprehensive services, hospitals generally offer particular services in specific service domains (Berry 1973; Hughes and Luft 1991). Such configuration of services is likely to affect the choice of hospitals made by patients and physicians.

In this study, the relationship between market position and hospital closure is explored by considering the effects of service configuration within three service domains: basic, high-tech, and outpatient/outreach. These areas represent major hospital service domains and have been used to describe service capabilities among rural hospitals (Prospective Payment Assessment Commission 1991). Basic services are defined as primary acute medical services that are generally associated with "traditional" hospital inpatient activity (e.g., respiratory therapy, general medical/surgical care). High-tech services are specialized clinical services involving the use of advanced technological facilities (e.g., cardiac catheterization lab). Outpatient/outreach services are those nonacute services that are often used to supplement or replace acute care services (e.g., ambulatory surgery, hospice).

Using our market position framework, it is important to consider a rural hospital's position in these service domains relative to other hospitals in the market. The focus, therefore, is not on the absolute number of services provided in a particular service domain, but the relative number. For example, rural hospitals responding to declining admissions in inpatient care may expand into outpatient/outreach services (Prospective Payment Assessment Commission 1991). An increase of services in this area relative to other hospitals in the market may differentiate the focal hospital from potential competitors and lower its risk of closure. By contrast, rural hospitals offering relatively fewer services in the outpatient/outreach area will be disadvantaged and have higher risk of closure because of limited capacity

to attract sufficient patients and physicians and intense competition from other hospitals. Similar arguments apply to the areas of basic and high-tech services.

> **Hypothesis 3.** Compared to other rural hospitals in a given market, rural hospitals providing more services in basic, high-tech, or outpatient/outreach service areas have lower risk of closure.

METHODS

DATA

This study employed a longitudinal, panel design (Menard 1991). The sample consisted of all rural, nonmetropolitan community hospitals operating from 1984 through 1991 ($N = 2{,}780$) with the exception of sole-provider hospitals. Sole providers, defined as the only hospitals operating in geographically defined markets, were eliminated from the study because these hospitals reside in monopolistic markets where competition does not exist ($N = 401$). Hospitals converting to other health care facilities (e.g., outpatient clinics, nursing homes) or exiting the study due to merger or acquisition were included in the study ($N = 135$). Data were drawn from four sources: American Hospital Association (AHA) annual surveys of hospitals, Health Care Financing Administration (HCFA) cost reports, the Area Resource File (ARF), and Geographic Inc. AHA annual hospital surveys contain hospital characteristics such as ownership, services, and bed size. HCFA cost reports include hospital financial and statistical records. ARF is a national database containing information about population characteristics of each U.S. county. A fourth file was constructed by Geographic Inc., listing the latitude and longitude of each rural hospital's address. Coordinates were used to compute the straightline distance between each rural hospital and the nearest neighboring community hospital (rural and urban).

We constructed a pooled, time-series data set containing annual observations for each rural hospital. Since the effects of predicting variables on hospital closure were unlikely to be instantaneous and to enhance causal explanation, predictors were lagged by one year. The final data set consisted of 14,652 hospital year observations.

MARKET AREA

Failure to specify market area properly may lead to spurious conclusions about competition in a market area and its effects on rural hospital closure

(Goody 1993). Empirical studies using nationwide hospital data tend to consider county as a measure of rural market area (Lillie-Blanton, Felt, Redmon, et al. 1992; Williams, Hadley, and Pettengill 1992). However, this approach tends to understate the actual size of rural markets and does not consider that patients in rural areas typically draw from geographic areas broader than one county (Goody 1993; Wright, Frye, and Errecart 1989; Williams, Hadley, and Pettengill 1992). Further, the use of county as a proxy for rural markets fails to consider the local community's demographic characteristics that are important in determining the scope of rural markets (Connor, Kralewski, and Hillson 1994; Goody 1993; Williams, Hadley, and Pettengill 1992; Wright and Marlor 1990; Phibbs and Robinson 1993).

In this study, we employed a variable-radius approach to defining rural hospital markets (Wright and Marlor 1990). We incorporated information about the population density (generally considered in the literature as a proxy for service demand) in areas surrounding the focal hospital to construct a variable radius ranging from 10 to 35 miles. The 10-mile lower bound was selected because it represents the average of two distances (15 miles and 5 miles) generally considered as the radii of urban hospital markets (Luft and Maerki 1984). The 35-mile upper bound represents the distance to the nearest hospital over which a hospital is designated as a sole community hospital (Office of Technology Assessment 1990). To account for broad patient travel, population density was calculated by averaging the total number of residents per square mile for the focal county and all contiguous counties (Bronstein and Morrisey 1990). The market area for each rural hospital was determined by weighting the mean of the population density in the county in which the hospital operates and the surrounding counties according to the following equation:

$$\frac{R_f^2 - (10)^2}{(35)^2 - (10)^2} = \frac{P_f - P_{max}}{P_{min} - P_{max}} \quad ,$$

where R_f is the radius of the focal hospital's market area; P_f is the average population density in the focal hospital's home county and surrounding counties; P_{max} is the highest value of average population density in our rural hospital sample; and P_{min} is the lowest value of average population density in our sample. Thus, rural hospitals operating in areas with lower population density were assigned a larger radius and a larger market area.

The resulting market areas were used to identify all urban and rural hospitals within each rural hospital's market area and to identify sole community providers. The market areas were used as the basis for constructing

all measures of competition (i.e., market density, market concentration, and market position).

MEASUREMENT

Hospital Closure. The dependent variable was hospital closure, defined as the permanent closing of a hospital facility. Hospital closures were identified from the AHA annual surveys and validated by the Hospital Research and Educational Trust (HRET). HRET requested validation for each identified closure from a state and regional hospital association. Hospitals that closed and reopened within a year of closure were not classified as closures. However, if the time span from closure to reopening was greater than one year, the event was classified as a closure.

Competition. To examine the effects of competition on rural hospital closure, we constructed two sets of competition measures: market level competition measures and market position. Comparison of these two types of competition is expected to highlight the relative importance of market position and market level competition as they affect rural hospital closure.

1. *Market level competition* was represented by two variables, market density and market concentration. Market density was defined by the number of hospitals within the focal hospital's designated market area, excluding the focal hospital. To assess market concentration, we used the Herfindahl index (H), calculated by summing the squared market share for all hospitals in the market (Phibbs and Robinson 1993):

$$H = \sum_i P_i^2 \quad ,$$

where P_i is the market share of the ith hospital in the market. The direction of this variable was coded in reverse by subtracting the score of each hospital from 1. This maintained consistency with market density so that higher values of H represented lower levels of market concentration and thus higher levels of market competition. Because the Herfindahl index was affected by both the distribution of market share and the number of hospitals in the market, we standardized the index by the number of hospitals to facilitate comparison across markets (Teachman 1980).

2. *Market position* measured the focal hospital's position in the market relative to other hospital providers (differentiation). Differentiation of the focal hospital was captured along three dimensions: geographic distance, hospital size, and service configuration. Geographic differentiation was defined by the straight-line distance between the focal hospital and the nearest community

hospital (Adams and Wright 1991). Hospital size was measured by the total number of beds authorized and staffed. Service configuration was assessed according to three service domains: basic, high-tech, and outpatient/outreach (Prospective Payment Assessment Commission 1991). We classified those services that appeared consistently in the AHA annual survey during the study period into three service domains based on the advice of a panel of experts in health services research and management. The resulting scales were then evaluated using several analytic techniques (see Appendix). Based on these scales, each rural hospital was assigned a value for the number of services offered in each service domain.

Differentiation in size and service domain was calculated using a variant of the Euclidean distance to indicate how an individual hospital was differentiated from the group of hospitals in a market (Jackson, Brett, Sessa, et al. 1991):

$$\sum_{j=1}^{n} \frac{S_i - S_j}{n-1} \quad ,$$

where n is the number of hospitals in a market; S_i is the focal hospital's value on size or services; and S_j is the jth hospital's value on the corresponding attribute. Different from the standard Euclidean distance that uses the squared difference score, our measure indicates the direction of the difference and whether the focal hospital was positioned above or below the market average.

CONTROL VARIABLES

We incorporated hospital and market level variables known to affect hospital closure rates as control variables in the analysis. These included financial performance, size, ownership, multihospital system affiliation, population density, and per capita income (Lillie-Blanton, Felt, Redmon, et al. 1992; Mullner et al. 1989).

- *Financial performance* was measured by cash flow, or the ratio of net assets and depreciation to total assets. This measure captures both profits earned and cash-based activities, and is better suited for comparison among hospitals of different ownership (Kane 1991).
- *Size* was measured by the total number of beds set up and staffed.
- *Ownership* included three categories: investor-owned, government, and private not-for-profit. Two dummy variables were constructed to identify investor-owned and government hospitals. Private not-for-profit hospitals constituted the reference group.

- *Multihospital system membership* was a dichotomous variable. Rural hospitals affiliated with a multihospital system were coded as 1, and 0 otherwise.
- *Population density* indicated the number of residents per square mile.
- *Per capita income* represented the average personal income of all county residents. Both population density and per capita income were constructed by averaging the values of the focal and contiguous counties to account for services provided for patients from neighboring counties (Bronstein and Morrisey 1990).

ANALYSIS

The study used discrete-time logit modeling, a method appropriate for analyzing longitudinal data with a dichotomous dependent variable (Blossfeld, Hamerle, and Mayer 1989; Yamaguchi 1991). Different from the traditional regression analysis, logit modeling is able to account for right censoring. Right censoring occurs when the length of time until a hospital experiences the event is unknown (Yamaguchi 1991). In this study, right censoring happened if hospitals exited the study for reasons other than closure (e.g., conversion or merger) or when hospitals were still open at the end of the study period. Further, logit modeling is preferred over continuous time models when the exact date of event is not known (we had access to year of closure rather than the exact date of closure) and when large time intervals such as years are being used (Blossfeld, Hamerle, and Mayer 1989; Yamaguchi 1991).

Logit models estimate the probability that a particular observation falls into one of two mutually exclusive categories or events (e.g., closure or nonclosure) during particular time intervals (e.g., year). The resulting conditional probability indicates whether a hospital experiences a closure given the covariates for those hospitals that have survived to the beginning of the time interval. A simple form of the model is:

$$\log(P[t; X_k]/1 - P[t; X_k]) = a + \sum_k b_k X_k \quad ,$$

where $P(t)$ is the conditional probability that an observation will experience closure at time t; X_k are covariates; and b_k are the estimated parameters (Yamaguchi 1991).

When analyzing longitudinal data composed of repeated observations of study subjects, biases may occur because of the correlation among these repeated observations (Zeger and Liang 1992). In general, ignoring correlations may lead to overestimated significance of covariate effects. To account for such correlations, we employed the generalized estimating equations

(GEE) approach (Karim and Zeger 1988). GEE controls for within-subject correlation by separating its effects from the estimation of regression coefficients. This approach yields consistent estimates of parameters (Zeger and Liang 1992).

RESULTS

Descriptive statistics and correlations for study variables are presented in Table 1.

Table 2 presents the results of two nested models used for testing hypotheses. Model 1 is the baseline model that includes control variables and two market-level measures of competition. Model 2 introduces variables presenting the focal hospital's market position relative to those of other hospitals in the same market. Significant change in likelihood ratio chi-square and significant coefficients would render support for the hypothesized effects of competition on hospital closure.

The effects of control variables and market level competition measures on rural hospital closure are shown in Model 1. Consistent with previous studies, financial performance, hospital size, and for-profit ownership were significantly related to rural hospital closure. Rural hospitals characterized by higher cash flow and larger size were at lower risk of closure. For-profit rural hospitals had higher risk of closure than their private, not-for-profit counterparts. Population density, per capita income, government control, and multihospital system membership were not significantly related to rural hospital closure. Of the two market level competition measures, only market density was positively and significantly related to rural hospital closure. Rural hospitals operating in markets with a higher number of hospitals had higher risk of closure. Market concentration was not statistically related to rural hospital closure.

Tests of Hypotheses 1 through 3 are presented in Model 2. Hypothesis 1 predicted that geographic differentiation would lower risk of rural hospital closure. This hypothesis was supported: rural hospitals more distant from the nearest hospital experienced lower risk of closure.

Hypothesis 2 predicted that rural hospitals larger than the market average would experience lower risk for closure than other rural hospitals in the market. Contrary to our predictions, a significant relationship was not found between size differentiation and rural hospital closure.

According to Hypothesis 3, rural hospitals that offered more services (i.e., basic, high-tech, and outpatient/outreach) than the market average would

Table 1: Descriptive Statistics and Pearson Correlation Matrix†

Variables	*Mean*	*S.D.*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
1. Closure	0.01	0.08	–													
2. Cash flow	0.08	0.27	−.09	–												
3. Per capita income	12215.30	2362.95	−.01	−.06	–											
4. Population density	58.09	60.37	−.01	.01	.10	–										
5. For-profit	0.09	0.29	.05	.04	−.13	.03	–									
6. Government	0.42	0.49	−.01	−.03	.00	−.13	−.27	–								
7. Hospital size	83.85	66.51	−.05	.08	−.08	.21	−.00	−.20	–							
8. System affiliation	0.38	0.49	−.00	−.00	.01	−.06	.27	−.23	−.00	–						
9. Market density	4.80	2.08	.03	.01	−.12	−.19	.08	.04	−.07	−.03	–					
10. Market concentration	0.91	0.09	.00	.00	−.04	−.04	.01	.03	−.12	.01	.21	–				
11. Differentiation by distance	15.27	7.34	−.04	−.03	.08	−.36	−.16	.18	−.24	−.03	−.27	−.11	–			
12. Differentiation by size	−7.97	78.19	−.04	.06	−.01	−.02	−.05	−.06	.71	−.01	−.09	.06	−.09	–		
13. Differentiation by gen. serv.	−0.09E−3	1.65	−.04	.06	−.01	−.01	−.05	−.04	.15	.03	−.02	.02	−.02	.20	–	
14. Differentiation by tech. serv.	−0.09	1.30	−.04	.07	−.00	−.01	−.02	−.10	.49	.01	−.07	.04	−.09	.67	.26	–
15. Differentiation by O.P. serv.	−0.08	1.47	−.02	.06	−.01	−.03	−.02	−.07	.37	.01	−.06	.03	−.07	.51	.20	.49

Note: Correlations greater than .02 or less than −.02 are significant at $p < .05$.

†N = 14,562

Table 2: Results from Discrete Time Event History Analyses: Effects of Competition and Controls on Rural Hospital Closure†

	Model 1		*Model 2*	
	β	*S.E.*	*β*	*S.E.*
Intercept	−3.66***	1.49	−1.19	1.68
Controls				
Cash flow	−1.11****	0.29	−1.11***	0.33
Population density	0.02E−1	0.03E−1	−0.04E−1	0.03E−1
Per capita income	−0.05E−3	0.07E−3	−0.05E−3	0.05E−3
For profit ownership	1.23****	0.30	0.81***	0.31
Government ownership	−0.24	0.27	−0.21	0.28
Hospital size	−0.03****	0.06E−1	−0.03****	0.06E−1
System affiliation	−0.19	0.26	−0.13	0.25
Market-Level Measures of Competition				
Market density	0.14***	0.07	0.06	0.06
Market concentration	−0.19	1.43	−0.65	1.52
Relational Measures of Competition				
Differentiation by geographic distance			−0.11****	0.02
Differentiation by hospital size			0.04E−1	0.03E−1
Differentiation by general services			−0.18***	0.05
Differentiation by high tech. services			−0.43***	0.16
Differentiation by outpatient services			−0.03E−1	0.10
Likelihood-ratio chi-square (d.f.)	135.83(9)		185.94(14)	
Change in likelihood-ratio chi-square (d.f.)			50.11(5)****	

Note: $E - a = 10^{-a}$.

* < .10; ** < .05; *** < .01; **** < .001.

†$N = 14{,}562$.

have lower risk of closure than other rural hospitals in the market. This hypothesis was partially supported: hospital differentiation based on both basic and high-tech services was significantly and negatively related to rural hospital closure; rural hospitals offering more of these services than other rural hospitals in the market experienced lower risk of closure. Significant effects were not found for outpatient/outreach services.

Change in the likelihood ratio chi-square between Model 1 and Model 2 ($G = 47.44$, $p < .01$) indicates that including market position of the focal hospital significantly improved the fit of the model. Further, the effect of market density on rural hospital closure became nonsignificant after incorporating measures of market position competition.

Our results showed negative, linear effects of basic and high-tech differentiation on rural hospital closure. However, it remains unclear whether advantages of market differentiation are associated only with rural hospitals operating above the market average. To evaluate the patterns associated with service differentiation, we assigned rural hospitals into three groups based on their position relative to the market average. Two dummy variables identified whether the focal hospital was positioned around or below the market average. The reference group comprised rural hospitals positioned above the market average. Market average was defined as one-half standard deviation around the mean of the hospital sample, a decision used to evenly classify rural hospitals into three groups. With respect to basic services, 22 percent of the hospital sample were positioned around the market average. Those positioned above or below the market average constituted 40 percent and 38 percent of the study sample, respectively. For high-tech services, 26 percent of the hospitals were around the market average. Rural hospitals positioned above or below the market average constituted 32 percent and 41 percent of the sample, respectively.

As presented in Table 3, results showed that rural hospitals that offer more basic services than the market average were less likely to close than those positioned below the market average and those positioned around the market average. With respect to high-tech services, rural hospitals offering more services than the market average were less likely to close compared to those positioned below the market average ($p = .07$). These analyses supported our expectations that differentiation on the basis of basic and high-tech services provided competitive advantage only for rural hospitals positioned above the market average. Findings also indicated that rural hospitals offering more basic services than the market average were significantly less likely to close than those rural hospitals positioned around the market average.

DISCUSSION

Results from this study indicate that distinct market positions can offer rural hospitals better prospects for survival. These findings render support for programs (e.g., EACH/RPCH and rural hospital networks) that encourage differentiation among rural hospitals. These findings may also encourage individual rural hospitals to depart from the "follow the leader" strategies and to establish distinct market niches that can alleviate direct competition with other hospitals in the same market (Mick, Morlock, Salkever, et al. 1993).

Table 3: Results from Discrete Time Event History Analyses: The Pattern of Relationships Between Basic and High-Tech Services Differentiation and Rural Hospital Closures†

	β	*S.E.*
Intercept	−2.48	1.84
Control		
Cash flow	−1.04****	0.32
Population density	0.04E−1	0.03E−1
Per capita income	−0.03E−3	0.05E−3
For profit ownership	0.81****	0.31
Government ownership	−0.19	0.28
Hospital size	−0.03****	0.06E−1
System affiliation	−0.12	0.25
Market-Level Measures of Competition		
Market density	0.04	0.06
Market concentration	−0.43	1.54
Relational Measures of Competition		
Differentiation by geographic distance	−0.10****	0.02
Differentiation by hospital size	0.02E−1	0.02E−1
Differentiation by outpatient/outreach services	−0.04	0.10
Differentiation by basic services		
Around market average	0.77***	0.35
Below market average	1.07***	0.32
Differentiation by high-tech services		
Around market average	−0.06	0.47
Below market average	0.80*	0.43
Likelihood-ratio chi-square (d.f.)	192.65(16)	

Note: $E - a = 10^{-a}$.

* < .10; ** < .05; *** < .01 ; **** < .001.

†N = 14,562.

Moreover, our results indicate that consideration of market position is critical when evaluating the competitive dynamics in rural areas. Failure to consider hospitals' market position can bias empirical findings and provide misleading information to decision makers concerned with rural hospital survival. For example, a count of hospitals in the market may mistakenly include noncompeting hospitals in the evaluation of competition and suggest excess capacity in the market.

Several specific findings warrant discussion. First, rural hospitals offering more basic or high-tech services than other hospitals in the market experienced lower risk of closure. Based on these findings, rural hospitals

disadvantaged in the market may explore strategies related to differentiation in these service domains. However, reconfiguration of basic and high-tech services may also undermine the needs of the local community if important services are abandoned. Thus, a rural hospital considering differentiation to manage competitive pressures should consider the attributes of other hospitals in the market, the needs of the local community, and the hospital's capacity for change.

Contrary to our expectations, hospital differentiation based on outpatient services was not significantly related to risk of closure. It might be that the low profits often associated with outpatient/outreach services did not improve the viability of rural hospitals (Shortell 1988; Cleverley and Harvey 1992). Thus, rural hospitals considering the conversion of underused inpatient facilities to outpatient/outreach services should be informed that adopting such strategies may not have the expected positive impact on the prospects for their survival.

Another unexpected finding is that rural hospitals larger than the market average did not hold an advantage in the market. This finding may indicate that although relatively smaller rural hospitals are vulnerable to competition, they are more likely to be targets of interventions designed to prevent rural hospital closure (e.g., Grant Program for Rural Health Care Transition). These programs provide subsidies to smaller rural hospitals and may offset the advantaged market position of those rural hospitals larger than the market average (Woolbridge, Chen, Holden, et al. 1994).

Our longitudinal study design and population sample strengthen the credibility of this study. However, two limitations are worth mentioning. We assessed hospital differentiation by taking into account the attributes of each hospital relative to others in a geographically defined market area. These measures served only as approximations to distinguish competing and noncompeting hospitals in the market. More accurate assessments of differentiation might be determined with detailed information about the choice of hospitals by patients and physicians, or with information that assesses the rural hospital administrator's perceptions of competing hospitals.

Second, our measure of market areas is constructed by considering the average population density in the area surrounding each rural hospital. Other hospital and market properties might also determine the scope of markets. For example, larger hospitals may have broader markets than their smaller counterparts. Such information may be needed to construct a better measure of market areas.

Despite these limitations, our findings can inform alternative ways to conceptualize competition in rural markets. However, further research is needed to identify other attributes that provide opportunities for differentiation among rural hospitals. In addition, studies may examine how hospital differentiation affects cooperative relations among rural hospitals. Given pressures to coordinate care in rural areas, future research should examine whether differentiation facilitates or inhibits cooperation and coordination of care in rural areas.

APPENDIX

Validation techniques were applied to ensure that service scales met three criteria: (a) scale validity; (b) internal reliability; and (c) low interscale association. To ensure scale validity for each scale, we employed multidimensional scaling (MDS) and confirmatory factor analysis (CFA). MDS can be used to identify "common factors" among a set of binary items (Kruskal and Wish 1978). MDS results confirmed the three service groupings identified by the panel of experts. Similar results were obtained using CFA, thus corroborating both MDS findings and expert groupings. To assess scale reliability, we used Cronbach alpha tests. Findings demonstrated acceptable reliability scores (basic = .63; high-tech = .67; outpatient/outreach = .65). Finally, we assessed interscale association by correlation analysis in order to ensure relative independence among explanatory variables. Results indicated low interscale correlations ($r_{basic/high-tech} = .24$; $r_{basic/outpatient} = .20$; and $r_{high-tech/outpatient/outreach} = .43$). Service scales are specified as

Basic Services	High-Tech Services	Outpatient/Outreach Services
•Respiratory therapy	•CT scanner	•Psychiatric emergency outpatient care
•Pediatric acute care	•Cardiac catheterization lab	•Ambulatory surgery
•Obstetric care	•Diagnostic radioisotope	•Psychiatric outpatient care
•Physical therapy	•X-ray radiation therapy	•Rehabilitation outpatient services
•Cardiac intensive care	•Megavoltage radiation therapy	•Alcohol/Chemical dependency care
•General medical/surgical care	•Psychological partial hospitalization	
•Medical/Surgical intensive care	•Trauma center	
•Ultrasound facilities	•Hospice	

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