An Empirical Analysis of Community Center Rents

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Abstract

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This study empirically models the determinants of community center rent. It employs a two-stage model that estimates center vacancy in the first stage and then includes predicted vacancy in a second stage demand model investigating endogenous and exogenous determinants of community center rent. The data includes information on maximum and minimum square foot rent for 118 community centers in Atlanta, Georgia. Maximum community center rent is highly correlated with a center's predicted vacancy rate and location within the Atlanta area. Additionally, rent at both maximum and minimum levels is influenced by trade area purchasing power, property age and to a lesser extent by proximity to a regional mall, center design and neighborhood factors.

Introduction

There continues to be a need to empirically evaluate the multiple theories of retail activity. With the exception of a few studies of the determinants of retail sales activity and rental rates, much of the theory of retail behavior has not been rigorously tested. This is untenable given the variety of retail activity, including the sale of various types, levels and qualities of goods and consumer services, the emergence of new types of retail presentation, inclusive of big box tenancies and the prospect of interaction with electronic retailing. While the research presented in this article cannot address all of the retail issues needing empirical investigation, it does provide insight into the determinants of rent for one retail property type—community centers. By empirically testing the determinants of in-line community center rent using a model consistent with existing retail theories, the structure of community center rent can be evaluated along with the applicability of central place, demand-externality and agglomeration theories. The article broadens existing empirical research on retail activity that has focused on malls and neighborhood centers. It is one of the first articles to rigorously evaluate community center rental formation.

Literature Review

Retail Theory

There has been substantive theory development related to retail activity (Eppli and Benjamin, 1994). Three related theoretical streams are evident—central place theory, agglomeration theory, and demand externality theory. Early central place theory (Losch, 1954; and Christaller, 1966) remains a foundation for retail modeling, but has been expanded and modified with additional constructs. Concurrently, Hotelling's (1929) initial agglomeration model has been expanded to include related postulates such as multipurpose shopping opportunities (Ghosh, 1986) and the possible benefits that accrue to aggregation of higher and lower tiered market participants (De Palma, Ginsburgh, Papageorgiou and Thisse, 1985). Ingene and Gosh's (1990) proposition that retail center specific attributes affect retail performance forms the basis for demand externality theory. This theory acknowledges the possibility that center specific characteristics such as tenant mix and center design impact center performance. Within an economic or investment framework, Brueckner (1993) and Miceli, Sirmans and Stake (1998) postulate that center attributes can improve center sales and that such improvement should be captured, at least in part, as rent. Taken in their totality, these theoretical constructs manifest a complex retail market where location specific attributes such as the size and purchasing power of a center's trade area, the presence of competing retail centers and a center's physical characteristics influence economic performance.

Empirical Investigations of Retail Rent

Although there have been many studies of retail activity, only limited empirical research on non-regional-mall retail rental rates is evident. An early study by Benjamin, Boyle and Sirmans (1990) using a data set composed of retail leases indicates that the base rent for leases is affected by tenant profile and the interaction of lease term and percentage rents. Sirmans and Guidry (1993), using data undifferentiated by retail property sub-type, show that size, age and tenancy impact base rental rates. Also using a small data set undifferentiated by retail property subtype, Gatzlaff, Sirmans and Diskin (1994) and Sirmans, Gatzlaff and Diskin (1996) show that the loss of an anchor tenant impacts a center's vacancy and rental rates. Hardin and Wolverton (2000, 2001) use a relatively large data set from one large SMSA to investigate the determinants of rent for the neighborhood center retail subtype. Taken together, these two studies indicate partial support for neighborhood center agglomeration, benefits from proximity to higher order retail centers, a positive correlation between trade area purchasing power and rents, and some demand externality benefits based on center specific characteristics including accessibility and design. The studies also reveal very little benefit from the trade name identity of a neighborhood center's grocery anchor tenant. Instead a neighborhood center's anchor tenant appears to proxy for purchasing power and other center trade area economic attributes.

The empirical analysis provided in this study builds on this small, but important and growing base of literature by focusing on the community center retail property subtype. The questions of interest remain similar, however, relying on the theoretical constructs serving as the base for retail activity modeling to evaluate the determinants of community center rental rates.

Model and Data

Model

Much of the foundation for the empirical evaluation of property specific retail performance and related theory comes from early work by Huff (1964) indicating that retail centers attract consumers based on center specific attributes. Building on work by Reilly (1931), Huff's initial gravity model intimates that a center's drawing power and subsequent performance are a function of consumer travel time and the relative size of the center. It implicitly recognizes subsequent retail property type differentiation based on the number of anchor tenants and corresponding changes in center size. Huff's base model is as follows:

$$P_{ij} = \frac{\dfrac{S_j}{T_{ij}^{\lambda}}}{\displaystyle\sum_{j=1}^{n} \frac{S_j}{T_{ij}^{\lambda}}} \qquad (1)$$

Where:

P_{ij} = The probability of consumer i shopping at shopping center j;
S_j = The size of shopping center j;
T_{ij} = The travel time for consumer i to shopping center j;
n = The number of competing retail locations; and
λ = A parameter reflecting the effect of travel time on various types of shopping trips.

The model sets the framework for the empirical analysis of retail performance. Importantly, the Huff model can be adjusted for subsequent theoretical constructs, inclusive of demand externalities and multipurpose shopping opportunities as proposed by Nevin and Houston (1980). The incorporation of these additional theoretical attributes to the base model allows for the postulation of the following model, which is similar to that used by Hardin and Wolverton (2001).

$$P_{ij} = \frac{\frac{S_j I_j M_j}{T_{ij}^{\lambda}}}{\sum_{j=1}^{n} \left[\frac{S_j I_j M_j}{T_{ij}^{\lambda}} \right]} \tag{2}$$

Where:

I_j = The image of shopping center j; and
M_j = Multipurpose shopping opportunities at shopping center j.

In the context of retail center rent determination, this model of retail activity can be adjusted, as noted by Hardin and Wolverton (2001), to integrate shopping activity and economic rents at the center level as postulated by Brueckner (1993) and Miceli, Sirmans and Stake (1998). This is shown, along with expected signs on the right hand side variables, in Equation (3).

$$R_j = f\left(\frac{\overset{[+]}{S_j}}{\sum_{j=1}^{n} S_j}, \overset{[+]}{I}, \overset{[+]}{M_j}, \overset{[-]}{T_{ij}}, \overset{[+]}{C_{ij}} \right) \tag{3}$$

Finally, the functional model used in this study, which concentrates on the community center retail subtype, is presented in Equation (4) in a slightly modified form, including size as a component of the multipurpose shopping opportunity variable.

$$R_j = f\left(\overset{[+]}{I_j}, \overset{[+]}{M_j}, \overset{[-]}{T_{ij}}, \overset{[+]}{C_j} \right) \tag{4}$$

Where:

R_j = The quoted rent for in-line shop space at community center j;
C_j = The purchasing power in the trade area of community center j; and
T_{ij} = Various delineations of the consumer trade area of community center j.

The relationships shown in Equation (4) become a community center specific tenant space model given appropriate data permitting the evaluation of center specific characteristics and economic performance. The image [I_j] vector includes center specific attributes such as design, accessibility, age, renovation status, and the amount of space available for rent within the center.[1] The multipurpose shopping vector [M_j], which is determined at the community center trade area level, includes community center size, distance to the closest regional mall, the number of community centers within one mile and the number of neighborhood shopping centers within one mile.[2] Three different demographic trade area delineations [T_{ij}] are modeled, including 1, 2 and 3 mile radii from each site. Purchasing power and percentage of households on public assistance for each trade area radius are included in the purchasing power vector [C_j] along with community center longitude and latitude coordinates to control for any other spatially correlated differences in location.

The operationalization of the demand model is similar to other recent research in that two-stage regression is used. The first stage is a vacancy model and the second stage is a rent model using the predicted vacancy rate from the first stage as a regressor.[3] This modeling structure controls for trade area space supply, which is fixed in the short term, variation in property management skills and discontinuities in available suite size at the center level, which may mask the vacancy rate attainable under typical management, and spatially related influences. Discontinuity in available suite size is measured by the difference between maximum and minimum available square footage. The two stage empirical model is therefore:

Stage One:

$$Vacancy_j = f(S_j, \textit{Trade Area Vacancy}, \textit{Suite Size Difference}, \textit{Longitude}, \textit{Latitude}). \quad (5)$$

Stage Two:

$$Rent_j = f(\textit{Predicted Vacancy}_j; I_j, M_j, T_{ij}, C_j, \textit{Longitude}, \textit{Latitude}). \quad (6)$$

The Data

Community center data for the study is provided in part by Dorey Publishing and Information Services, Inc. The database from which the community center observations is taken essentially represents a census of retail space for the Atlanta metro area. This allows for the inclusion of variables to control for the interaction between retail categories (malls, community centers and neighborhood centers) within each trade area. The Dorey data is augmented by community center site visits to obtain physical and demand externality information and Caliper Corporation's 1997 census update. The data includes 118 community center observations (see Exhibit 1).[4]

The average maximum quoted rent per square foot for the sample is $14.35 with a range of $4.50 to $25.00.[5] The average minimum quoted rent per square foot is $12.23 and ranges from $2.00 to $25.00. The mean community center size is 212,053 square feet. The smallest community center in the sample is 85,075 square feet and the largest community center is 491,000 square feet. The average community center vacancy rate is 7.25% with a range of 0% to 63.48%. The three mile community center trade area vacancy rate averages 3.02% and ranges from 0% to 14.62%. There are 1.54 neighborhood centers and 1.01 directly competitive community centers within a one mile radius of the typical community center. The number of neighborhood centers within one mile of a community center ranges from 0 to 6 and the number of community centers ranges from 0 to 3.

The purchasing power surrounding each community center is measured at 1, 2 and 3 mile radii. One mile purchasing power averages $161.3 million and ranges from $3.9 to $679.4 million. Two mile purchasing power averages $668.0 million and ranges from $15.0 to $1,835.7 million. Three mile purchasing power averages $1,473.3 million and ranges from $33.4 to $3,915.1 million. Percentage of households on public assistance is also measured at 1, 2 and 3 mile radii. The one mile public assistance percentage averages 3.90 with a range of 0 to 21.5. Two mile public assistance percentage averages 3.08 with a range of 0.6 to 22.0, and three mile public assistance percentage averages 3.87 with a range of 1.0 to 21.1.

Average community center age is 15.6 years with a range of 1 to 44 years. Minimum space available within a community center ranges from 0 to 24,000 square feet and averages 2,200 square feet. Maximum space available within a community center ranges from 0 to 64,950 square feet and averages 8,761 square feet. Twenty-two percent of the centers have been renovated since originally built. The average community center accesses 1.39 major roads with a range of 0 to 3. The dominant design types are 'L' configuration (41.5%) and strip configuration (33.0%).[6]

Empirical Results

As a preliminary measure, White's (1980) test for heteroskedasticity is performed and variance inflation factors are generated. Based on these metrics, the models do not present problems of heteroskedasticity or multicollinearity. A pair of two-stage least square regression models are run for each of the three demographic trade area sizes (1, 2 and 3 mile radii) with the log of the maximum rent and log

Exhibit 1 | Community Center Descriptive Statistics

Variable	Mean	Std. Dev.	Min.	Max.
Rent				
Maximum rent p.s.f.	14.35	4.56	4.50	25.00
Minimum rent p.s.f.	12.23	4.75	2.00	25.00
Vacancy				
Vacancy (%)	7.25	11.77	0.00	63.48
Trade area vacancy (%)	3.02	2.66	0.00	14.62
Multipurpose Shopping				
Center size (s. f.)	212,053	89,651	85,075	491,000
Distance to mall (miles)	4.91	4.38	0.14	18.48
Community centers (1 mile)	1.01	1.05	0.00	3.00
Neighborhood centers (1 mile)	1.54	1.53	0.00	6.00
Purchasing Power				
Purchasing power ($1,000's per 1 mile)	161,265	112,430	3,925	679,413
Purchasing power ($1,000's per 2 mile)	667,996	417,647	14,969	1,835,685
Purchasing power ($1,000's per 3 mile)	1,473,258	915,546	33,482	3,915,127
Public assistance (1 mile)	3.90	3.37	0.00	21.54
Public assistance (2 mile)	3.08	1.73	0.56	22.04
Public assistance (3 mile)	3.87	3.45	0.98	21.10
Longitude	−84,347,305	184,745	−84,854,004	−83,983,542
Latitude	33,848,206	171,422	33,383,791	34,274,285
Image				
Age	15.63	12.09	1.00	44.00
Max. contiguous Space	8,761	12,965	0.00	64,950
Min. contiguous Space	2,200	3,735	0.00	24,000
Renovation	0.22	0.41	0.00	1.00
Major road Access	1.39	0.58	0.00	3.00
U configuration	0.076	0.266	0.00	1.00
Strip configuration	0.330	0.472	0.00	1.00
L configuration	0.415	0.494	0.00	1.00
Other configuration	0.179	0.391	0.00	1.00

Note: $N = 118$.

of the minimum rent as the second stage regressands. The results from the various first- and second-stage models are provided in Exhibit 2 and Exhibit 3. The signs and magnitudes of the coefficients are generally as expected.

Although the structure of community center vacancy is not the focus of this study, the vacancy rate model signs are reasonable. Vacancy is inversely associated with center size and directly associated with the trade area community center vacancy rate. The suite size difference variable impacts community center vacancy as expected, with a larger discontinuity being indicative of better occupancy. Such a discontinuity may also be indicative of signaling by the property manager that the center is positioned predominately for regional tenants that require relatively large suites, causing an unwillingness to subdivide the available space. The latitude control variable is positive and statistically significant consistent with the associated maximum rent models.

For the three maximum rent models found in Exhibit 2, the results are as expected. The predicted vacancy variable is negative and highly significant in all three demand models, indicating that low vacancies are associated with centers able to command the highest rents.[7] Within the group of multipurpose shopping variables, community center size and the number of nearby neighborhood and community centers are insignificant in all three models. The reciprocal mall distance variable is positively signed and statistically significant in the 1-mile trade area model, but not in the two larger trade area models. This result may indicate that the multipurpose shopping benefit of a nearby mall dissipates as households become more distant therefore closer to competing regional malls. As also shown, 2- and 3-mile distant purchasing power is significant and directly correlated with community center rent. However, the 2- and 3-mile coefficients on purchasing power diminish as predicted by theoretical gravity models. The percentage of households on public assistance variable is negative and marginally significant in the 1-mile model only. This inverse association with rent could be indicative of a reticence by relatively more wealthy shoppers in outlying locations to patronize community centers in a less affluent local trade area. The latitude variable is positive and statistically significant, capturing the general growth trend in the Atlanta SMSA given that the centroid for the data is slightly east of the city center.

Other than center age, community center image has little impact on maximum rent as might be expected given current neighborhood center research. The age variable captures community center depreciation and obsolescence, and is negative and statistically significant. A possible image effect generated by a specific anchor tenant cannot be ruled out, but prior research on neighborhood centers would make such a claim seem unlikely. The large number of extant anchor tenants and the confounding influence of a variety of anchor tenant combinations does not allow an empirical test of the impact of a specific set of anchor tenants.

The results from the three minimum rent models are found in Exhibit 3. Predicted vacancy is not a primary determinant of the minimum rent in a community center in any of the three models. This is consistent with the idea that space poorly

Exhibit 2 | Two-stage Regression Models of Vacancy and Maximum Rent

Variable	Model 1 Vacancy	Model 2.1 Log of Max. Rent	Model 2.2 Log of Max. Rent	Model 2.3 Log of Max. Rent
Intercept	−3.924	−12.521	−10.383	−7.890
	(−0.8)	(−1.1)	(−0.9)	(−0.7)
Predicted center vacancy		−3.684***	−3.696***	−3.736***
		(−9.7)	(−9.6)	(−9.6)
Multipurpose Shopping				
Com. center size (10,000 s. f.)	−0.0020*	−0.0005	−0.0020	−0.0028
	(−1.9)	(−0.2)	(−0.8)	(−1.0)
Trade area com. center vac.	0.643*			
	(1.8)			
Com. centers (1 mile)		0.012	0.011	0.010
		(0.6)	(0.4)	(0.4)
Neigh. centers (1 mile)		−0.0078	−0.012	−0.014
		(−0.5)	(−0.7)	(−0.8)
Reciprocal mall distance		0.045**	0.035	0.030
		(2.0)	(1.6)	(1.4)
Purchasing Power				
Purchasing power (1 mile)		0.011***		
		(4.8)		
Public assistance (1 mile)		−0.013 *		
		(−1.7)		
Purchasing power (2 miles)			0.0030***	
			(4.5)	
Public assistance (2 miles)			−0.014	
			(−1.5)	
Purchasing power (3 miles)				0.0013***
				(4.4)
Public assistance (3 miles)				−0.012
				(−1.4)
Longitude (100,000)	−0.0003	−0.0006	0.0009	0.0034
	(−0.5)	(−0.1)	(0.1)	(0.3)
Latitude (100,000)	0.011**	0.043***	0.041***	0.039***
	(2.0)	(3.2)	(3.0)	(2.8)
Image				
Age		−0.014***	−0.013***	−0.012***
		(−5.4)	(−5.0)	(−4.8)
Difference (max. & min. space)	−0.223***			
	(−6.4)			
Renovation		0.056	0.051	0.044
		(0.8)	(0.7)	(0.6)
Major road access		0.029	0.018	0.028
		(0.7)	(0.4)	(0.7)

Exhibit 2 | (continued)

Two-stage Regression Models of Vacancy and Maximum Rent

Variable	Model 1 Vacancy	Model 2.1 Log of Max. Rent	Model 2.2 Log of Max. Rent	Model 2.3 Log of Max. Rent
U configuration		−0.129	−0.129	−0.111
		(−1.4)	(−1.4)	(−1.2)
Strip configuration		−0.086*	−0.084	−0.078
		(−1.6)	(−1.6)	(−1.4)
Other configuration		0.073	0.088	0.092
		(1.1)	(1.3)	(1.3)
Adj. R^2	0.27	0.69	0.68	0.67
F-Statistic	9.62	18.27	17.40	16.85

Note = The first-stage regression models center vacancy rate and the second-stage regression models the log of the community center's maximum rental rate. Three versions of the second-stage regression model are provided that control for purchasing power within one, two and three mile trade areas.
$n = 118$.
* Significant at .10 or better.
** Significant at .05 or better.
*** Significant at .01 or better.

located within a given community center is very difficult to rent regardless of overall space demand at that center. Two of the multipurpose shopping variables are statistically significant and appropriately signed. In all three models, community center size positively impacts minimum rent, which provides support for an on-site agglomeration effect on lower order, local tenants. In the 1- and 2-mile models, the reciprocal mall distance variable is positive and significant, with the 1-mile model significance being the greatest. This outcome is similar to the mall distance effect demonstrated in the maximum rent model. The results from the trade area purchasing power variables across the models are also similar to those from the maximum rent model configurations. As with the maximum rent model, age is associated with lower rent. There may also be marginally significant design effects (U-shaped centers often include space in ''blind'' interior corners). The latitude control variable is insignificant in the minimum rent model, indicative of the overarching importance of site and building specific factors in determination of a center's lowest rent levels.

Taken together, the maximum and minimum rent models suggest that community center rental rates are most impacted by the purchasing power found within their trade areas, which appear to extend outward for at least three miles. Additional important rent determinants are proximity to a regional mall and a property's age. There is also weak evidence that building configuration may be a factor in rent

Exhibit 3 | Two-stage Regression Models for Vacancy Rate and Minimum Rent

Variable	Model 1 Vacancy	Model 2.1 Log of Min. Rent	Model 2.2 Log of Min. Rent	Model 2.3 Log of Min. Rent
Intercept	−3.924	5.031	6.863	9.363
	(−0.8)	(0.4)	(0.6)	(0.8)
Predicted center vacancy		0.397	0.379	0.336
		(1.0)	(1.0)	(0.9)
Multipurpose Shopping				
Com. center size	−0.002*	0.0086***	0.0070**	0.0064**
(10,000 s. f.)	(−2.0)	(3.1)	(2.5)	(2.3)
Trade area com.	0.643*			
center vac.	(1.8)			
Com. centers		0.011	0.010	0.008
(1 mile)		(0.5)	(0.4)	(0.4)
Neigh. centers		−0.011	−0.015	−0.017
(1 mile)		(−0.7)	(−0.9)	(−1.0)
Reciprocal mall		0.053**	0.041*	0.035
distance		(2.4)	(1.9)	(1.6)
Purchasing Power				
Purchasing power		0.012***		
(1 mile)		(4.9)		
Public assistance		−0.009		
(1 mile)		(−1.2)		
Purchasing power			0.0032***	
(2 miles)			(4.7)	
Public assistance			−0.0099	
(2 miles)			(−1.1)	
Purchasing power				0.0015***
(3 miles)				(4.7)
Public assistance				−0.008
(3miles)				(−0.9)
Longitude (100,000)	−0.0003	0.0041	0.0053	0.0078
	(−0.1)	(0.3)	(0.4)	(0.6)
Latitude (100,000)	0.011**	0.002	0.0001	−0.0012
	(2.0)	(0.2)	(0.0)	(−0.1)
Image				
Age		−0.013***	−0.013***	−0.013***
		(−5.3)	(−4.9)	(−4.7)
Difference (max. &	−0.223***			
min. space)	(−6.4)			
Renovation		0.081	0.075	0.068
		(1.2)	(1.1)	(1.0)
Major road access		0.041	0.030	0.039
		(1.0)	(0.7)	(0.9)

Exhibit 3 | (continued)

Two-stage Regression Models for Vacancy Rate and Minimum Rent

Variable	Model 1 Vacancy	Model 2.1 Log of Min. Rent	Model 2.2 Log of Min. Rent	Model 2.3 Log of Min. Rent
U configuration		−0.155*	−0.159*	−0.141
		(−1.7)	(−1.7)	(−1.5)
Strip configuration		−0.057	−0.056	−0.049
		(−1.1)	(−1.0)	(−0.9)
Other configuration		0.095	0.109	0.111
		(1.4)	(1.6)	(1.6)
Adj. R^2	0.27	0.49	0.48	0.47
F-Statistic	9.62	8.63	8.28	8.04

Note: The first-stage regression models center vacancy rate and the second-stage regression models the log of the community center's minimum rental rate. Three versions of the second-stage regression model are provided that control for purchasing power within one, two and three mile trade areas. $n = 118$.
* Significant at .10 or better.
** Significant at .05 or better.
*** Significant at .01 or better.

collection. Furthermore, location in a less wealthy neighborhood may have a negative impact on the maximum rent a community center can charge. Larger centers appear to be able to charge more than smaller centers for their least desirable space. Finally, low vacancy rates are an indication of a successful center capable of garnering the highest maximum rents.

Conclusion

This empirical study reveals the complexity of the community center rental market. It appears that elements of central place theory, agglomeration theory and demand externality theory all apply to retail rent production at a community shopping center. The availability of both maximum and minimum asking rent at each community center provide an opportunity to look deeper into these theoretical relationships than would have otherwise been possible.

Several insights apply to both maximum and minimum rent collection. For example, proximity to a higher tiered retail center such as a regional mall benefits all available suites—those producing maximum and minimum rent levels. However, the benefit of such proximity seems to dissipate as distance from the community center to households increases. This is a reasonable result because more distant households will be in closer proximity to alternative shopping opportunities. Additionally, the gravity model seems to hold for both maximum and minimum rent models. Purchasing power in 1, 2 and 3 mile radii are all significant in determining rent collections, but the coefficients on purchasing power decline as more distant households are included in the model just as predicted by retail gravity models. Finally, both maximum and minimum rent decline with shopping center age as has been shown with respect to neighborhood centers. Hence, image deterioration that comes with depreciation and obsolescence affects rent at all price points. Interestingly, although renovation has the expected positive sign, the impact of renovation on rent is not statistically significant. This may be a data adequacy problem, however, since the data contains no information on the date of renovation. Many of the renovations could have occurred too long ago to have any remaining beneficial impact on rent.

The minimum rent model offers three unique insights. First, there is some evidence that minimum rent may be lower on average at U-shaped centers. U-shaped centers include ''blind'' interior corners that offer space without any corresponding visibility from the center's parking lot or adjacent street. Many traditional community center tenants have no interest in occupying such space. Second, minimum rent levels are significantly higher at larger community shopping centers. It seems, therefore, that large community centers function as central places attracting more shoppers and providing greater benefits to the marginal tenants demanding lower priced space. Third, a center's vacancy rate is insignificant in affecting the center's minimum rent level. This suggests that poorly configured and located space is difficult to rent regardless of overall demand for a given center. All of the above strongly suggests that site location and building layout matter. Developers must therefore pay attention to center size and layout as a means of raising minimum space rent to the highest possible level.

The maximum rent model also offers several development lessons. First, the affluence of a center's immediate surroundings seems to impact the maximum rent level expectation. The highest rent paying tenants appear to be associated with those community centers having the lowest percentage of public assistance households within the nearby 1-mile radius trade area. Second, there is weak support for the hypothesis that maximum rent will be lower when the building is designed in a strip configuration. This may be due to greater distances between anchors and shop tenants as compared to more compact building designs. Additionally, other site specific physical characteristics have little affect on rental rates. Finally, low vacancy is a good indicator of an ability to charge high rent. A location that is in high demand is also most attractive to high rent paying tenants.

One additional point is the importance of including spatial information in rental market models. The latitude variable was significant in the vacancy models and in the three maximum rent models. This variable is capturing underlying features of the market affecting rent and occupancy that vary and improve as one moves north and westward from the Atlanta community shopping center centroid. The models would not have been as well specified had the spatial information been excluded from the analysis. Furthermore, inclusion of geographic information made it much more feasible to compute trade area purchasing power, percentage of households receiving public assistance, regional mall distance and competitive shopping center counts within each trade area. All of this crucial information is necessary to sufficiently model retail rent production given that these factors are the primary determinants of rent for this type of retail center.

Finally, it should be noted that empirical research on retail activity, sales and rental rates has not be sufficiently developed. There are numerous retail subtypes that warrant investigation. Concurrently, the interaction of the various retail submarkets and submarket participants needs investigation. This would allow for a better comprehension of the linkages between retail activities and other forms of economic activity. The substantial amount of retail theory needs to be evaluated and expanded by continued empirical analysis. Studies of all types of retail activity are needed as retail real estate is not a generic property type.

Endnotes

1 The image variables used in the analysis of this construct are demand externality variables that have been shown in prior research to be important determinants of in-line shop rent. The empirical models used in this analysis are reduced form models. The demand externality variables that have not been shown to impact rent, such as traffic lights, curb cuts, number of parking spaces and corner location, are dropped from the models to reduce degree of freedom constraints. Also, additional OLS regressions are used as filters to identify any physical variables that might be needed in the reduced form equations. These regressions confirm prior research from neighborhood centers that indicates that center specific physical characteristics have a minimal affect on rents. See Hardin and Wolverton (2000).

2 The community center's primary trade area is defined as a one-mile radius. The community center's secondary trade area is defined as a three-mile radius and is used to create each community center's community center trade area vacancy rate variable. Support for the use of these definitions comes from Vernor and Rabianski (1993), Gatzlaff, Sirmans and Diskin (1994) and others.

3 It is argued that this two-stage model is more reflective of the actual retail real estate market. The space available for rent within community centers is not continuously divisible, the creation of shop space in anchored centers is limited and each community center specific trade area might suffer from exogenous factors that impact short-term vacancy. An example of this last situation is when a retailer makes a strategic decision to exit a market even though some store specific operations are profitable. The space will be vacated due to a factor exogenous to the actual center specific retail market.

4 The total database includes 132 community centers with full rental data available for 118 centers. The data do not appear to have any specific ownership concentrations. The data also benefits in that it is not generated from the operations of a single property owner, which might increase idiosyncratic measurement error. It is common for individual neighborhood and community center owners to standardize leases within their portfolios to meet internal efficiency needs and lender requirements.

5 The Atlanta market generally quotes leases on a triple net basis. Percentage rental clauses are very unusual for non-anchor users of this type property and tenant profile. In-line

shop leases typically have three-year terms with escalation clauses for renewals. One can note with Mills (1992) that effective rental rate would be the best measure, but that data is usually proprietary.

[6] Following Hardin and Wolverton (2000), *strip* design indicates that all space is parallel and facing the primary street. *L-shaped* centers are those that form an L indicating that part of the center does not face the primary access street. The *U-shaped* design defines those centers where two portions of the center do not face the primary access street. Any other design is classified as *other* design.

[7] In a community center trade area specific retail market, characterized by a lack of homogeneity in space, a lack of continuous divisibility in space, and large lags and limits in supply relative to shifts in demand, the actual sign on the vacancy variable is ambiguous.

References

Benjamin, J. D., G. W. Boyle and C. F. Sirmans, Retail Leasing: The Determinants of Shopping Center Rents, *Journal of the American Real Estate and Urban Economics Association*, 1990, 18, 302–12.

Brueckner, J. K., Inter-Store Externalities and Space Allocation in Shopping Centers, *Journal of Real Estate Finance and Economics*, 1993, 7, 5–16.

Christaller, W., Translated by C. W. Baskins, *Central Places in Southern Germany*, Englewood Cliffs, NJ: Prentice Hall, 1966.

De Palma, A., V. Ginsburgh, Y. Y. Papageorgiou and J. F. Thisse, The Principle of Minimum Differentiation Holds under Sufficient Heterogeneity, *Econometrica*, 1985, 53, 767–81.

Eppli, M. J. and J. D. Benjamin, The Evolution of Shopping Center Research: A Review and Analysis, *Journal of Real Estate Research*, 1994, 9, 5–32.

Gatzlaff, D. H., G. S. Sirmans and B. A. Diskin, The Effect of Anchor Tenant Loss on Shopping Center Rents, *Journal of Real Estate Research*, 1994, 9, 99–110.

Ghosh, A., The Value of a Mall and Other Insights from Revised Central Place Theory, *Journal of Retailing*, 1986, 62, 79–97.

Hardin III, W. G. and M. L. Wolverton, Micro-Market Determinants of Neighborhood Center Rental Rates, *Journal of Real Estate Research*, 2000, 20, 299–322.

——., Neighborhood Center Image and Rents, *Journal of Real Estate Finance and Economics*, 2001, 23, 31–46.

Hotelling, H., Stability in Competition, *Economic Journal*, 1929, 39, 41–57.

Huff, D. L., Defining and Estimating a Retail Trade Area, *Journal of Marketing*, 1964, 28, 34–38.

Ingene, C. A. and A. Gosh, Consumer and Producer Behavior in a Multipurpose Shopping Environment, *Geographical Analysis*, 1990, 22, 70–93.

Losch, A., *The Economics of Location*, New Haven, CT: Yale University Press, 1954.

Miceli, T. J., C. F. Sirmans and D. Stake, Optimal Competition and Allocation of Space in Shopping Centers, *Journal of Real Estate Research*, 1998, 16, 113–26.

Mills, E., Office Rent Determinants in the Chicago Area, *Journal of the American Real Estate and Urban Economics Association*, 1992, 20, 273–87.

Nevin, J. R., and M. J. Houston, Image as a Component of Attraction to Intraurban Shopping Areas, *Journal of Retailing*, 1980, 56, 77–92.

Reilly, W. J., *The Law of Retail Gravitation*, New York, NY: Knickerbocker Press, 1931.

Sirmans, G. S., D. H. Gatzlaff and B. A. Diskin, Suffering the Loss of an Anchor Tenant, In J. D. Benjamin (Ed.), *Megatrends in Retail Real Estate*, Research Issues in Real Estate, Volume 3, Norwell, MA: Kluwer Academic Publishers, 1996.

Sirmans, C. F. and K. A. Guidry, The Determinants of Shopping Center Rents, *Journal of Real Estate Research*, 1993, 8, 107–15.

Vernor, J., and J. Rabianski, *Shopping Center Appraisal and Analysis*, Chicago, IL: Appraisal Institute, 1993.

White, H. A., Heteroscedasticity-Constant Covariance Matrix Estimator and a Direct Test for Heteroscedasticity, *Econometrica*, 1980, 48, 817–38.

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