

# THE EFFECT OF MERCHANDISE SPACE ALLOCATION ON RETAIL SALES IN ENCLOSED SHOPPING CENTERS

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## **Overview**

This research assesses the effect of merchandise space allocation on retail sales across 12 different merchandise categories in 65 enclosed shopping centers. To measure the impact of large specialty retailers on the sales of other retailers that carry similar merchandise we construct a standardized measure of space allocation—the Index of Merchandise Space Allocation. Using this index, we measure the effect of merchandise space allocation on retail sales per square foot to determine if large specialty retailers are beneficial (increase sales per square foot) or detrimental (decrease sales per square foot) for similar merchandise type retailers. The findings reveal that for seven of the 12 merchandise categories the existence of one or more large space occupiers positively and significantly affects sales per square foot. Generally speaking, large specialty retailers in regional shopping centers are complementary to, not competitive with, smaller retailers selling similar merchandise.



## ■ Introduction

The objective of this research is to assess the effect of one or more large specialty retailers on the sales per square foot of a merchandise category. The question we address is whether differences in the allocation of space among retailers in a merchandise category have an effect on consumer patronage. Does the presence of a large women's apparel store, for example The Limited, which generally occupies much more retail floor area than other similar stores, increase or decrease average retail sales for the women's apparel merchandise category? Or, does the presence of a large shoe store, for example Famous Footwear, which usually occupies more space than other similar stores, increase or decrease average retail sales for the shoes merchandise category?

Merchandise space allocation is of interest to shopping center owners and retailers as larger specialty stores enter the tenant mix in enclosed shopping centers. To compete successfully with retailers in power and community centers, some specialty retailers in enclosed shopping centers are increasing the size of the space that they occupy. Today, it is not uncommon to see retailers such as The Gap, The Limited, or F.A.O. Schwarz, among others, occupying a relatively large share of space compared to other retailers in their merchandise category. To measure whether the presence of large specialty retailers affects the sales per square foot of a merchandise category, we use a standardized measure of retail space allocation. Specifically, we construct the Index of Merchandise Space Allocation (IMSA) to explain sales per square foot for 12 different merchandise categories across 65 enclosed shopping centers.<sup>1</sup>

With a data set of over 4,000 individual retailer records, our results reveal that merchandise space allocation positively and significantly affects average sales per square foot for the entire merchandise category in seven out of 12 categories. For six merchandise categories (family apparel, specialty apparel, men's apparel, women's apparel, gifts and leisure/entertainment), the relationship is linear and positive, indicating that the presence of one or more large specialty retailers increases the average sales per square foot for the entire merchandise category. For jewelry stores the relationship is non-linear, convex, indicating that the presence of one or more large specialty retailers is beneficial to the entire merchandise category over certain ranges of space allocation. None of the significant relationships between merchandise space allocation and sales per square foot maintained a negative relationship.

These results have important implications both for specialty retailers and shopping center owners. Specialty retailers that occupy an average amount of space should embrace the addition of larger specialty retailers as the larger specialty retailers generally benefit the sales of other similar

merchandise retailers. Similarly, owners should recognize that larger specialty retailers may have some negotiating leverage since they create a customer draw for the entire merchandise category and possibly the shopping center.

## ■ Defining Merchandise Space Allocation

The concept of merchandise space allocation is explained graphically in exhibit 1. Consider three space allocation patterns, A, B, and C. In pattern A, space is evenly allocated among five retailers in the merchandise category. In pattern B, retailer 1 holds a larger proportion of space than the other four retailers, and in pattern C, retailers 1 and 2 capture most of the space in the merchandise category. In each of the three cases, the merchandise category has the same total square feet of leasable area and the same average square feet of leasable area per retailer. However, each case shows different allocations of space among the five retailers in the merchandise category.

Our analysis of merchandise space allocation focuses on the distribution of space among similar non-anchor retailers, instead of the allocation of space between anchor and non-anchor tenants. Space allocation among non-anchor retailers in a merchandise category is critical in the context of enclosed shopping centers. To compete effectively with retailers in power and community centers, some retailers in enclosed shopping centers are increasing merchandise floor area. Examples of stores that hold larger proportions of space than other similar retailers include Kids 'R' Us (family apparel), The Gap (specialty apparel), Structure (men's apparel), The Limited (women's apparel), Victoria's Secret (women's specialty apparel), Famous Footwear (shoes), and F.A.O. Schwarz (leisure/entertainment), among others.

The effect of one or more large specialty retailers on similar retailers may be complementary (increase merchandise sales per square foot) or competitive (decrease merchandise sales per square foot). In a complementary relationship, larger specialty retailers may act much like mini-anchors that could increase sales per square foot of other retailers in that merchandise category. Greater allocation of space to larger specialty retailers could be a factor that reduces consumer search time and costs and thereby increases the customer drawing power of a center. Under this "mini-anchor" argument, consumers may be willing to bypass a closer shopping center without these larger specialty stores and patronize the center with greater merchandise space concentration, thus increasing the sales per square foot of entire merchandise category.

Conversely, in a competitive relationship larger specialty retailers may act much like a category killer, albeit at a smaller level, which could

### EXHIBIT 1. GRAPHICAL EXAMPLES OF MERCHANDISE SPACE ALLOCATION

Space Allocation Pattern	Retailers in Merchandise Category	Proportion of Space per Retailer	Graphical Representation <sup>(a)</sup>
A	1	20%	
	2	20%	
	3	20%	
	4	20%	
	5	20%	
B	1	48.3%	
	2	12.9%	
	3	12.9%	
	4	12.9%	
	5	12.9%	
C	1	55%	
	2	30%	
	3	5%	
	4	5%	
	5	5%	

(a) The graphs represent the leased area to retailers of a hypothetical merchandise category.

reduce sales per square foot of other retailers in that merchandise category. A strong specialty retailer with a broad and deep selection of merchandise at lower prices may compete with other specialty retailers that carry similar merchandise. Under this “category killer” argument, consumers may patronize the larger specialty retailers that maintain the most complete merchandise selection and forego the opportunity to shop at other similar retailers, thus decreasing the sales per square foot performance of the entire merchandise category.

## ■ Assessing the Effect of Merchandise Space Allocation on Retail Sales

We set out to assess the effect of merchandise space allocation in two steps. First we develop a conceptual framework to measure the relative distribution of space by merchandise category in enclosed shopping cen-

ters and construct the Index of Merchandise Space Allocation (IMSA). Using the IMSA as a measure of space allocation, we then recommend a regression model to test the effect of space allocation on retail sales. The regression model includes control variables that account for differences in shopping center size, anchor tenancy, and market trade area so that we are able to focus on the effect that merchandise space allocation has on sales per square foot.

### The IMSA

To assess the effect of merchandise space allocation on similar retailer sales we construct a measure that reflects the relative distribution of space among retailers in a merchandise category. Our measure, the IMSA, is defined as

$$IMSA_m = \left( \sum_{i=1}^n [S_i]^2 \right) n. \quad (1)$$

This expression presents the IMSA for a merchandise category  $m$ . The IMSA is a function of the square of the leased area,  $S$ , allocated to each retailer,  $i$ , in a merchandise category,  $m$ , and the number of retailers in the category,  $n$ . The reason for squaring  $S$  is to place a greater weight on larger retailers. Multiplying the term in parentheses by  $n$  standardizes by the number of retailers in the merchandise category.<sup>2</sup> When all retailers in the merchandise category occupy the same square footage of space, i.e. a low degree of spatial concentration, the IMSA is 1. The more merchandise space that is allocated to one or multiple retailers the higher the IMSA.<sup>3</sup>

To illustrate the IMSA as a measure of merchandise space allocation, consider again exhibit 1. Under merchandise space allocation pattern A in exhibit 1, all retailers hold the same share of space. In other words, there is no concentration of space in the hands of large specialty retailer(s). As a result, the  $IMSA_A$  of this group of retailers is 1 ( $\{0.2^2 + 0.2^2 + 0.2^2 + 0.2^2 + 0.2^2\} * 5 = 1.0$ ). Under space allocation pattern B, retailer 1 captures almost 50% of the space. The  $IMSA_B$  in this case is 1.50 ( $\{0.483^2 + 0.129^2 + 0.129^2 + 0.129^2 + 0.129^2\} * 5 = 1.50$ ), reflecting the presence of one relatively large specialty retailer in the group. Under space allocation pattern C of exhibit 1, retailers 1 and 2 are significantly larger than the other retailers in the merchandise category. The  $IMSA_C$  for pattern C is 2.0 ( $\{0.55^2 + 0.30^2 + 0.05^2 + 0.05^2 + 0.05^2\} * 5 = 2.0$ ), reflecting the larger proportion of space allocated to retailers 1 and 2. Exhibit 1 reveals that an increase in the allocation of space to one or more specialty retailers increases the IMSA, or concentrates the control of the space in the hands of large specialty retailer(s).

## *Merchandise Category Performance as a Function of the IMSA*

Our objective is to measure the effect of large specialty retailers on the sales per square foot of similar retailers in enclosed shopping centers. To address the effect of merchandise space allocation on retailer sales, we specified the regression model

$$SALES_m = f(IMSA_m, Z). \quad (2)$$

This equation indicates that the level of sales per square foot, *SALES*, for a merchandise category, *m*, is dependent on the IMSA of that merchandise category and a set of control factors, *Z*. We include a set of control variables to account for non-anchor tenant, anchor tenant, and market characteristics that may affect shopping center sales. By controlling for these factors we can focus on the effect of merchandise space allocation on merchandise sales per square foot. We account for these factors as follows:

$$Z = (MNSLEA, SFANCH, MEDINC). \quad (3)$$

The first control variable is the average occupied area for the retailers in a merchandise category, *MNSLEA*. The inclusion of *MNSLEA* improves the interpretation of the IMSA variable by keeping fixed the average occupied space in the merchandise category.<sup>4</sup> The relationship between sales per square foot and mean square feet of floor space is expected to be negative, as retailers with larger occupied space have reduced costs through economies of scale.<sup>5</sup> Another control variable is the anchor tenant size, *SFANCH*. Conventional wisdom is that larger anchor tenants create greater agglomeration benefits to the center thereby increasing sales per square foot in the non-anchor tenants. Lastly, the median household income in the 10-mile radius retail market, *MEDINC*, accounts for the differences in the demographic makeup among shopping centers. Controlling for median household income is important because the performance of a merchandise category can be affected by the purchasing power of the shopping center's market.<sup>6</sup>

## ■ The Data

Detailed tenant-by-tenant information on over 4,000 retailers in 65 shopping centers across the U.S. was obtained from a large institutional real estate investor. Summary statistics on the subject centers are provided in exhibit 2; all summary statistics are reported at the shopping center level. Non-anchor sales per square foot average \$326.03 and vary from \$78.18

**EXHIBIT 2. SUMMARY STATISTICS 65-ENCLOSED SHOPPING CENTERS, 1995**

<b>Characteristic</b>	<b>Mean</b>	<b>S.D.</b>	<b>Minimum</b>	<b>Maximum</b>
Non-Anchor Tenant Sales/sq. ft. (\$)	326.03	102.11	78.18	718.09
Number of Anchor Tenants	3.40	1.18	1.00	6.00
Anchor Tenant Area (000 sq. ft.)	457.84	195.98	111.03	914.51
Non-Anchor Tenant Area (000 sq. ft.)	311.58	191.19	68.97	1596.01
Shopping Center Total Area (000 sq. ft.)	769.42	335.60	296.93	2480.04

to \$718.09. On average, there are slightly more than three anchor tenants per center; anchor tenants occupy 457,840 square feet, and non-anchor tenants occupy 311,580 square feet.

An overview of the merchandise categories is presented in exhibit 3. The first column presents 16 commonly defined non-anchor tenant categories. In alphabetical order, the retailer categories are: drug/variety, family apparel, fast food, gifts, home furnishings, jewelry, leisure/entertainment, men's apparel, restaurant, services, shoes, specialty apparel, specialty food, women's specialty apparel, women's apparel, and miscellaneous. The second column reports the retailer sub-categories included in each of the 16 merchandise categories. The third column shows the mean and standard deviation of the leasable space allocated to each merchandise category across the shopping centers in the data set.<sup>7</sup>

Additional information on the 16 merchandise categories is provided in exhibits 4 and 5. Exhibit 4 reveals the average number of retailers in each merchandise category, which varies from 1.61 for restaurant to 9.53 for leisure/entertainment. Total and average space allocated to each of the merchandise categories is presented in exhibit 5. The average amount of space in square feet allocated to the merchandise categories ranges from 3,610 for specialty food to 42,808 for women's apparel. Similarly, the average space allocated per retailer in a merchandise category ranges from 1,029 square feet for jewelry to 10,299 square feet for miscellaneous.

The leased space per retailer varies widely across all merchandise categories, revealing that tenant mix and floor space per retailer is not uniform across enclosed shopping centers. Exhibit 5 includes the standard deviation of retailer space and the range between the minimum and the maximum space allocated to a retailer in each of the 16 categories. The variability of retailer space reflects the mix of large and small stores across merchandise categories. As an example, the family apparel category may combine a large store such as Kids "R" Us with a small store such as Gymboree. Similarly, the men's apparel category may combine a large store such as Structure with a small store such as Chess King.<sup>8</sup>

**EXHIBIT 3. DEFINITION OF MERCHANDISE CATEGORIES AND MERCHANDISE SPACE ALLOCATION IN THE AVERAGE SHOPPING CENTER**

Merchandise Category	Tenant Sub-Categories	Mean <sup>(a)</sup> (%)	S.D.
Family Apparel	Children's Wear, Family Wear, Men's and Women's Wear, Family Wear	6.46	3.71
Specialty Apparel	Athletic Clothing, Formal Wear/Rental, T-Shirt Shop, Furs, Uniforms, Jean Shop, Western Wear, Leather Apparel	4.64	2.39
Men's Apparel	Men's Wear	2.93	2.51
Women's Apparel	Ladies' Larger Sizes, Ladies' Ready-to-Wear	21.09	6.59
Women's Specialty Apparel	Bridal Shop, Ladies' Specialty, Hosiery, Maternity	2.07	1.83
Shoes	Athletic Footwear, Ladies' Shoes, Children's Shoes, Men's and Boy's Shoes, Family Shoes, Outdoor Footwear	9.97	3.28
Gifts	Art Gallery, China and Glassware, Arts and Crafts, Candles, Imports, Cards and Gifts	8.20	4.78
Jewelry	Jewelry, Costume Jewelry	3.68	1.52
Restaurant	Cocktail Lounge, Restaurant with Liquor, Italian Food, Restaurant without Liquor, Mexican Food	2.48	3.16
Fast Food	Cafeteria, Food Court, Chicken Shops, Food with Arcade, Chinese Food, Hot Dog Shops, Cookie Shop, Ice Cream Parlor, Deli and Bakery, Pretzel Shop, Delicatessen, Sub Shops, Fast Food/Carry Out, Yogurt Store	6.46	5.88
Specialty Food	Bakery, Health Food, Candy and Nuts, Doughnut Shop, Steak Shops	1.74	0.79
Home Furnishings	Appliances, Clock Shop, Frame Shop, Cutlery Shops, Furniture, Fabrics, Gourmet Cookware, Floor Coverings, Home Improvements, Flowers/Plants, Mattress/Bedding Shops	1.52	2.36
Leisure/Entertainment	Arcade Hobby, Audio and Video, Musical Instruments, Bike Shops, Phone Stores, Books, Records and Tapes, Books and Stationery, Sporting Goods, Camera and Equipment, Tobacco Shop, Coin Shop, Toys, Computer/Calculator, Video Tapes and Equipment, Family and Religious Books	14.82	4.05
Drug/Variety Services	Beauty Supplies, Drug Cosmetics, Super Drug, Discount Department Store, Variety Store Automotive (TB&A), Medical Dental, Optometrist, Barber, Photo Copy/Fast Print, Beauty, Photo Finishing, Cleaner and Dryer, Photographer, Convenience Market, Shoe Repair, Curl & Blow Hair Stylist, Telephone Service, Eyeglasses (Optician), Travel Agent	4.59	9.03
Miscellaneous	Bed and Bath Shop, Catalog/Showroom, Pet Shop, Sunglasses, Junior Department Store, Supermarket, Luggage and Leather	4.83	2.40
		4.60	6.43

(a) Percent of occupied space in the average enclosed shopping center.



**EXHIBIT 4. NUMBER OF RETAILERS BY MERCHANDISE CATEGORY**

Merchandise Category	Mean	S.D.	Min.	Max.
Family Apparel	4.00	3.28	1	24
Specialty Apparel	4.27	2.18	1	11
Men's Apparel	2.68	1.80	1	8
Women's Apparel	8.01	3.43	2	22
Women's Specialty Apparel	2.36	1.54	1	6
Shoes	7.81	3.81	1	19
Gifts	6.44	7.45	1	58
Jewelry	7.09	3.04	1	16
Restaurant	1.61	1.27	1	8
Fast Food	8.76	5.15	1	34
Specialty Food	3.10	2.19	1	16
Home Furnishings	2.03	1.32	1	6
Leisure/Entertainment	9.53	4.95	1	36
Drug/Variety	1.86	1.57	1	11
Services	5.20	2.02	1	10
Miscellaneous	3.03	2.76	1	21

Sales performance across the merchandise categories is presented in exhibit 6. Total sales for each of the merchandise categories range from \$1.055 million for specialty food to \$6.817 million for women's apparel. Similarly, average sales per square foot by merchandise category range from \$157 for women's apparel to \$657 for jewelry. Merchandise categories that show low variability of sales per square foot are women's apparel, shoes, and women's specialty apparel. Merchandise categories that show high variability of sales per square foot are home furnishings, miscellaneous and jewelry.

Household income data for the subject centers' 10-mile radius ring were provided by National Decision Systems (NDS) and are presented in exhibit 7. Aggregate household income in the 10-mile radius ring ranges from \$0.72 to \$127.41 billion and maintains an average of \$10.08 billion. Similarly, median household income in the 10-mile radius ring ranges from \$21,200 to \$69,900, with an average of \$34,000.

## ■ Findings

Using the estimated IMSA for each merchandise category at each center and data presented in the prior sections we assess the impact of large specialty retailers on similar specialty retailer sales per square foot. Does the presence of large specialty retailers in a merchandise category increase or decrease the average sales per square foot of all retailers in a merchan-

EXHIBIT 5. SPATIAL CHARACTERISTICS BY MERCHANDISE CATEGORY

Merchandise Category	Space Allocated to Merchandise Category (000 Sq. Ft.)			Space per Tenant in Merchandise Category (000 Sq. Ft.)				
	Mean	S.D.	Min.	Max.	Mean	S.D.	Min.	Max.
Family Apparel	14.554	15.708	1.800	115.368	3.456	1.076	1.306	8.509
Specialty Apparel	10.407	8.091	1.440	45.864	2.381	1.438	1.000	11.466
Men's Apparel	8.247	5.701	1.355	25.285	3.188	1.271	1.355	7.424
Women's Apparel	42.808	21.247	10.207	136.553	5.332	1.324	3.189	10.993
Women's Specialty Apparel	6.632	4.532	0.682	19.154	2.826	1.344	0.682	6.924
Shoes	18.847	8.835	3.000	60.914	2.529	0.563	1.461	3.984
Gifts	14.612	19.217	2.734	150.825	2.281	0.695	1.351	6.217
Jewelry	7.176	3.393	1.194	16.576	1.029	0.231	0.625	1.760
Restaurant	8.148	9.999	0.494	45.853	4.629	2.880	0.494	14.872
Fast Food	11.838	6.983	0.780	29.129	1.571	1.061	0.446	5.606
Specialty Food	3.610	2.223	0.120	14.812	1.190	0.272	0.120	1.900
Home Furnishing	4.440	3.963	0.160	16.804	2.302	2.002	0.160	8.615
Leisure/Entertainment	31.256	27.948	3.737	230.000	3.216	1.175	1.604	9.828
Drug/Variety	8.885	12.973	0.300	84.797	5.915	12.158	0.300	84.797
Services	9.367	4.775	0.640	25.196	1.773	0.615	0.640	3.689
Miscellaneous	28.321	38.824	0.143	183.209	10.299	16.185	0.143	86.882

**EXHIBIT 6. TOTAL SALES AND SALES PER SQUARE FOOT BY MERCHANDISE CATEGORY**

Merchandise Type	Total Sales (000 \$)				Sales per Square Foot			
	Mean	S.D.	Min.	Max.	Mean	S.D.	Min.	Max.
Family Apparel	3,842	6,439	235	4,659	253.5	123.3	89.3	577.3
Specialty Apparel	3,173	3,479	58	21,092	284.8	122.5	79.6	756.9
Men's Apparel	2,183	3,300	219	18,421	211.3	110.7	60.1	605.4
Women's Apparel	6,817	5,920	1,138	28,785	157.2	63.3	65.1	397.8
Women's Specialty Apparel	2,007	1,834	1,374	7,857	270.6	109.6	38.6	494.2
Shoes	4,567	3,198	113	20,696	262.1	107.9	37.5	735.3
Gifts	3,474	6,038	324	44,875	271.1	123.3	79.6	662.9
Jewelry	4,299	2,826	485	14,717	657.5	252.1	197.3	1,193.8
Restaurant	2,280	3,339	124	18,267	272.4	112.3	89.1	558.0
Fast Food	3,788	3,232	99	21,183	396.6	183.3	32.8	1,135.1
Specialty Food	1,055	968	104	7,095	309.9	130.4	115.1	864.0
Home Furnishing	1,238	1,219	71	6,021	460.1	519.0	115.9	2,113.7
Leisure/Entertainment	7,149	5,994	207	39,002	258.8	117.1	37.8	786.9
Drug/Variety	1,623	1,967	72	10,528	303.1	222.9	65.2	1,346.1
Services	2,301	1,535	136	7,049	294.5	116.4	91.3	695.0
Miscellaneous	4,512	7,780	68	51,273	638.7	462.3	39.8	2,050.8

**EXHIBIT 7. AGGREGATE AND MEDIAN HOUSEHOLD INCOME IN A 10-MILE RADIUS RING OF SAMPLE SHOPPING CENTERS, 1995**

Income Measure	Standard			
	Mean	Deviation	Minimum	Maximum
Aggregate Household Income (\$ billion)	10.08	19.23	0.72	127.41
Median Household Income (000 \$)	34.0	7.8	21.2	69.9

dise category? The findings are presented in two steps: first we use equation (1) to estimate the IMSA for each of 12 merchandise categories and then we estimate the multiple regression equation (2) using the IMSA estimates and the previously described data.

### *Constructing the IMSA*

The IMSA is estimated to measure the level of spatial allocation for each of 12 different merchandise categories across 65 enclosed shopping cen-

ters. It should be noted that we do not estimate the IMSA for four merchandise categories—home furnishings, drug/variety, services, and miscellaneous. These four categories are not included in any subsequent analyses because their heterogeneity may render the results meaningless. For instance, the home furnishings category combines large furniture and floor covering stores with frame and clock shops, making the IMSA irrelevant. While none of the merchandise categories is without some degree of heterogeneity, the 12 categories remaining in the analysis maintain a more homogeneous set of retailers.

Exhibit 8 reveals that the IMSA ranges from 1.07 for restaurants to 2.07 for fast food. Merchandise categories with a high IMSA indicate that one or more retailers in that category occupy a proportionately larger share of space than other retailers in that category. Merchandise categories that maintain a high IMSA include fast food, gifts, leisure/entertainment, and women's apparel. Merchandise categories with a low IMSA maintain a relatively uniform allocation of space across retailers. Retailers with a low IMSA include restaurant, men's apparel, specialty food, and family apparel.

**EXHIBIT 8. ESTIMATED IMSA BY MERCHANDISE CATEGORY**

Merchandise Category	Mean	S.D.	Minimum	Maximum
Family Apparel	1.1496	0.1817	1.0000	1.9606
Specialty Apparel	1.2994	0.3349	1.0000	3.1337
Men's Apparel	1.1001	0.1563	1.0000	1.8795
Women's Apparel	1.3121	0.2186	1.0319	1.9649
Women's Specialty Apparel	1.1970	0.2887	1.0000	1.9532
Shoes	1.2150	0.1611	1.0000	2.1502
Gifts	1.3747	0.4305	1.0000	3.9478
Jewelry	1.2639	0.1730	1.0000	1.6665
Restaurant	1.0758	0.1866	1.0000	1.8192
Fast Food	2.0741	1.1314	1.0000	4.5779
Specialty Food	1.1185	0.1061	1.0000	1.4458
Leisure/Entertainment	1.3254	0.5138	1.0000	4.8460

### *Estimating the Effect of Merchandise Space Allocation on Retail Sales*

Here we estimate the effect of merchandise space allocation on retail sales per square foot by merchandise category, following equation (2). The dependent variable is average sales per square foot, *SALES*, in the merchandise category, *m*. The independent variables include the IMSA and the set, *Z*, of non-anchor tenant, anchor tenant, and market characteris-

tics. We test this relationship for 12 merchandise categories by estimating both linear and non-linear models.<sup>9</sup> The linear model assumes that the independent variables maintain a constant relationship to sales, or that sales are a straight-line function of IMSA and the controlling variables in expression (3). The non-linear model allows the IMSA variable to have a changing relationship with sales per square foot.

In seven of the 12 merchandise categories the IMSA is an important linear or non-linear predictor of sales per square foot. For six merchandise categories, family apparel, specialty apparel, men's apparel, women's apparel, gifts, and leisure/entertainment, the relationship is linear and positive, indicating that the presence of one or more large specialty retailers increases the average sales per square foot for the entire merchandise category. For jewelry stores the relationship is non-linear, convex, indicating that the presence of one or more large specialty retailers is beneficial to the entire merchandise category over certain ranges of space allocation. None of the significant relationships between merchandise space allocation and sales per square foot maintained a negative relationship.

The linear regression results are presented in exhibit 9. This exhibit shows the regression coefficients for the 12 merchandise categories included in the analysis. Statistical significance for the coefficients is indicated with an asterisk. In those merchandise categories where the coefficient of the IMSA variable is significant, the results indicate that an increase in the proportion of space allocated to large specialty retailers in a given merchandise category increases average sales per square foot at a constant rate. The r-square of the linear models ranges from 15 to 49%.

In interpreting the regression coefficients, consider again the meaning of the IMSA. When all retailers in the merchandise category occupy the same square footage of space, i.e., a low degree of spatial concentration, the IMSA is 1. The more merchandise space that is allocated to one or multiple retailers the higher the IMSA. The estimates imply, for example, that increasing the proportion of space allocated to a large family apparel retailer increases the average sales per square foot for that category. More specifically, an increase of 0.1 in the IMSA for family apparel increases average sales per square foot for that category by approximately \$31. Similarly, increasing the proportion of space allocated to a large leisure/entertainment retailer increases the average sales per square foot for that category. The results show that an increase of 0.1 in the IMSA for leisure/entertainment increases the average sales per square foot for that category by approximately \$7.

Exhibit 10 graphically depicts the linear relationship between estimated sales per square foot and the IMSA for the family apparel, specialty apparel, men's apparel, women's apparel, gifts, and leisure/entertainment categories. Estimated average sales per square foot are plotted on the

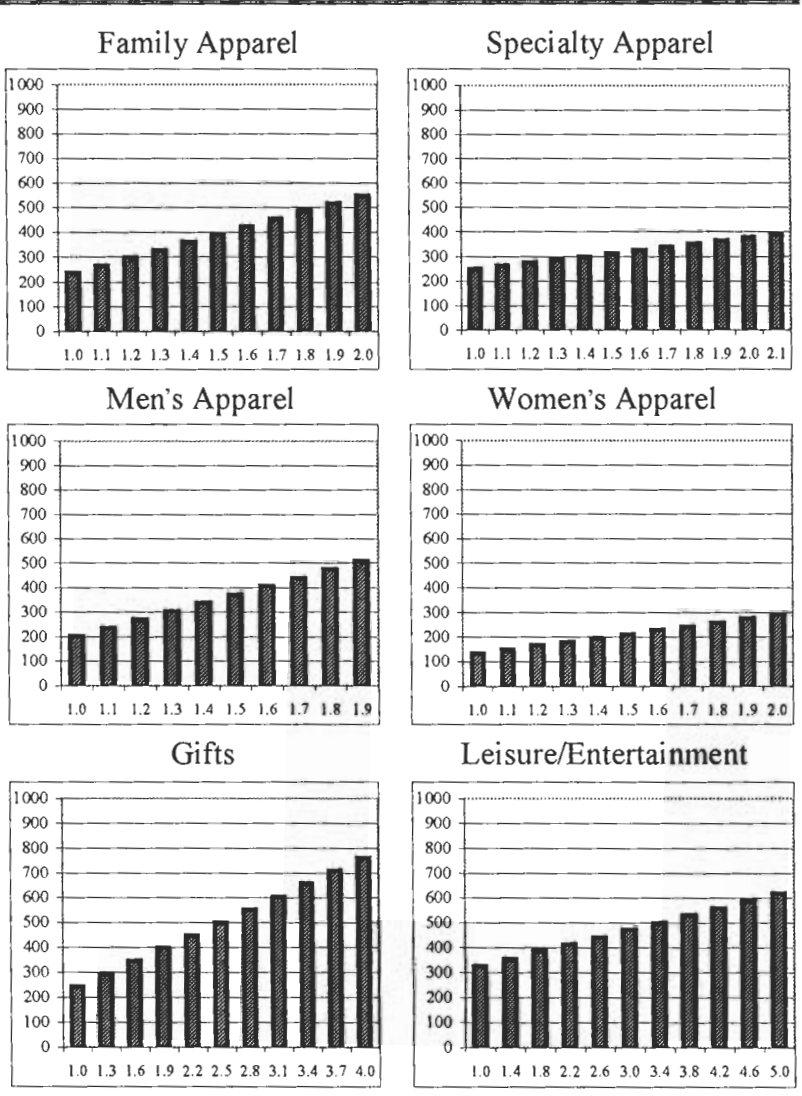
EXHIBIT 9. EXPLANATION OF RETAIL SALES PER SQUARE FOOT

Merchandise Category	Intercept	IMSA	MNSLEA	SFANCH	MEDINC	r-square
Family Apparel	-106.9	310.8*	-47.34*	0.117	3.23*	0.341
Specialty Apparel	67.3	128.3*	-12.61	0.151*	0.25	0.155
Men's Apparel	-246.9*	339.8*	-10.99	0.061	2.58	0.376
Women's Apparel	-100.0*	156.4*	-13.93*	0.083*	2.55*	0.486
Women's Specialty Apparel	-34.5	89.7	-0.36	0.191*	2.82	0.252
Shoes	237.8*	48.9	-69.38*	0.095	2.84*	0.288
Gifts	141.5*	174.5*	-92.32*	0.096	1.66	0.455
Jewelry <sup>(a)</sup>	290.1	8.8	-318.38*	0.548*	12.67*	0.450
Restaurant	75.0	39.8	5.69	0.169*	1.17	0.162
Fast Food	24.9	13.2	-36.16*	0.358*	6.97*	0.323
Specialty Food	480.0*	-28.1	-231.97	0.208*	1.21	0.307
Leisure/Entertainment	-39.1	73.3*	-35.15*	0.140*	7.34*	0.474

\*Significant at the 0.1 level.

(a) When a non-linear model is estimated for the jewelry merchandise category, the IMSA variable is significant. The estimated non-linear, quadratic equation for the jewelry merchandise category is:  $3,182 - 4,157(\text{IMSA}) + 1,716(\text{IMSA}^2) - 344.58(\text{MNSLEA}) + 0.624(\text{SFANCH}) + 13.36(\text{MEDINC}) + \epsilon$ .

EXHIBIT 10. GRAPHICAL REPRESENTATION OF SALES PER SQUARE FOOT (Y AXIS) VS. IMSA (X AXIS)



Y-axis and the IMSA is plotted on the X-axis. The estimated average sales per square foot are derived using average values of the independent variables in the regression model. The graphs presented are for the range of IMSA values that were found in the shopping center data set. For the family apparel, specialty apparel, men's apparel, women's apparel, gifts,

and leisure/entertainment categories, the graphs confirm that an increase in the proportion of space allocated to large specialty retailers in a given merchandise category increases average sales per square foot at a constant rate.

The effect that IMSA has on sales per square foot is not significant in the linear or non-linear models for five merchandise categories. These categories are women's specialty apparel, shoes, restaurant, fast food, and specialty food. A non-significant relationship implies that retail sales per square foot are not strongly positively or negatively affected by spatial concentration. Statistically, this result implies that we cannot be reasonably confident that the relationship between IMSA and sales per square foot for these categories can be represented by a function different from a horizontal line.

However, it is worth commenting on the relationships between merchandise space allocation for these five non-significant categories. First, women's specialty apparel is positively affected by increasing levels of IMSA; however, the level of significance was just outside the 10% level at 13%. With a larger sample, women's specialty apparel would likely become positively and significantly affected by increasing level of IMSA. For fast food, restaurant and specialty food categories it makes sense that larger retailers do not significantly increase the sales of other fast food, restaurant and/or specialty food purveyors in part because consumer visits to these retailers are impulse-driven and not destination-driven. We cannot fully explain why shoe stores did not maintain a positive and significant relationship with IMSA. One reason why the model is not significant for the shoe merchandise category may be the degree of price and quality heterogeneity among retailers in this category.

## ■ Conclusion

Using the IMSA, we measure the effect of one or more large specialty retailers on the sales of all retailers in a merchandise category. We find that increasing levels of spatial allocation increase sales per square foot in seven of 12 merchandise categories. For the remaining five merchandise categories, the relationship between the level of space allocation and the merchandise category sales per square foot is positive (specialty food excepted), although the coefficients are not significant.

In summary, large specialty retailers enhance sales per square foot for all specialty retailers in a merchandise category (specialty food excepted).

Several things can be learned from the analysis. Small specialty retailers should not fear the inclusion of larger specialty retailers as retail



sales per square foot of specialty retailers are positively and significantly affected by the presence of large specialty retailers that sell similar merchandise. Shopping center owners need to consider the effect of the customer draw of large specialty retailers when constructing a non-anchor mix of tenants. In short, we present hard evidence that large specialty retailers can have a positive impact on the sales per square foot performance of other similar retailers in a merchandise category.

## ■ Notes

1. By constructing the IMSA we address differences in leased area among retailers in a merchandise category. Price or quality differences among retailers are not addressed in this paper.

2. The IMSA can be interpreted as an interactive variable. The use of interactions in retail research has increased since the introduction of the Multiplicative Competitive Interaction (MCI) model of Nakanishi and Cooper (1974). Under this type of interactive framework retail attributes jointly explain changes in consumer patronage. An alternative formulation of the IMSA may include  $n$  as an additive, controlling term. However, having  $n$  as a multiplicative term appears to be more appropriate given that merchandise space allocation is a relative measure that changes not simply as a result of the distribution of space among retailers but also as a result of the number of retailers in a merchandise category.

3. The functional form of equation (1) used to construct the IMSA is also found, for example, in studies of market concentration. One measure of market concentration with a similar specification is the Herfindal-Hirshman Index HHI. The HHI is usually defined as the sum of squared market shares for firms in an industry. For a discussion on HHI, see Rhoades (1993), Lustgarten (1975), McGuckin and Chen (1976), Kantarelis and Veendorp (1987), Daskin and Wolken (1989), and Cotterill (1985). For a discussion on variants of the HHI, see Schmalensee (1977).

4. Cotterill (1986) studies the effect of space allocation on price structure in the retail food industry. This study looks at the relation between price level and market share, while controlling for a number of variables. Cotterill controls for spatial variables, such as store size and distance to the primary distribution center, and for market variables, such as population and income.

5. The use of MNSLEA as a controlling variable improves the interpretation of the IMSA variable. By keeping fixed the average occupied space in the merchandise category, the effect of the IMSA is not confounded with the effect of the overall size of the retailers in the merchandise category.

6. The level of income in the retail market area not only accounts for the demographic characteristics of the retail market but also serves as a proxy for differences in aggregate shopping center sales. Since the income variable captures the aggregate sales potential of a shopping center, an aggregate sales variable is not included in the analysis.

7. The data are divided into 16 general merchandise categories commonly found in the literature. More specific categories could arguably be used to derive more homogeneous groups of retailers. However, doing so would affect the regression estimation by significantly reducing the sample of retailers per merchandise category.

8. Looking at the shopping centers in the data set, Kids "R" Us and Gymboree have an average leased area of 18,800 and 1,200 square feet, respectively. Similarly, Structure and Chess King have an average leased area of 5,600 and 1,980 square feet, respectively.

9. The non-linear model is estimated using a quadratic term for the IMSA.

## ■ References

- Cotterill, R.W. (1986), "Market Power in the Retail Food Industry: Evidence from Vermont," *The Review of Economics and Statistics*, 68(3), 379-386.
- Daskin, A.J. and J.D. Wolken (1989), "An Empirical Investigation of the Critical Herfindahl Index in Banking," *Journal of Economic Business*, 41(2), 95-105.
- Kantarelis, D. and E.C.H. Veendorp (1987), "Buyer Concentration and Counter-vailing Power," *Quarterly Journal of Business and Economics*, 26(3), 42-56.
- Lustgarten, S.H. (1975), "The Impact of Buyer Concentration in Manufacturing Industries," *The Review of Economics and Statistics*, 57(2), 125-132.
- McGuckin, R. and H. Chen (1976), "Interactions between Buyer and Seller Concentration and Industry Price-Cost Margins," *Industrial Organization Review*, 4(3), 123-133.
- Nakanishi, M. and L.G. Cooper (1974), "Parameter Estimate for Multiplicative Interactive Choice Models: The Least Square Approach," *Journal of Marketing Research*, 11(3), 303-311.
- Rhoades, S.A. (1993), "The Herfindahl-Hirschman Index," *Federal Reserve Bulletin*, 79(3), 188-189.
- Schmalensee, R. (1977), "Using the H-Index of Concentration with Published Data," *The Review of Economics and Statistics*, 59(2), 186-193.

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