Retail Concentration and Shopping Center Rents—A Comparison of Two Cities

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Abstract

This study aims primarily at testing whether, and to what extent, retail concentration within regional and super-regional shopping centers affect rent levels, as well as the differential impact it may exert for various goods categories and sub-categories and in different urban contexts. In this paper, 1,499 leases distributed among eleven regional and super-regional shopping centers in Montreal and Quebec City, Canada, and negotiated over the 2000–2003 period are considered. Unit base rents (base rent per sq. ft.) are regressed on a series of descriptors that include percentage rent rate, retail unit size (GLA), lease duration, shopping center age, as well as 31 retail categories while the Herfindahl index is used as a measure of intra-category retail concentration. Findings suggest that while, overall, intra-category retail concentration affects base rent negatively, the magnitude and, eventually, direction of the impact varies depending on the nature of the activity and the market dynamics that prevail for the category considered.

Objective and Context of Research

This study aims primarily at testing whether, and to what extent, retail concentration within regional and super-regional shopping centers affects rent levels, as well as the differential impact it may exert on various goods categories and sub-categories and under different urban contexts. Other assumptions relative to major rent determinants are also tested for in the light of previous research.

As discussed later on, while the professional literature on the retail sector encompasses a wide range of topics, relatively few authors have investigated the rent structuring process through a modeling approach. Essentially, a shopping center is an autonomous retail structure designed at maximizing individual stores' sales, and therefore rents accruing to the landlord, through an optimal tenant mix. As such, it is a most relevant application of the agglomeration economies

concept—a form of externality—and rests on the theory of cumulative attraction which states that ''a given number of stores dealing in the same merchandise will do more business if they are located adjacent or in proximity to each other than if they are widely scattered,'' (Nelson, 1958).

Optimizing tenant mix, in turn, involves choosing the right tenant, with the right size, selling the right product at the right spot. For that reason, maximizing externalities derived from agglomeration economies in shopping centers is intrinsically linked to the tenant mix issue and, ultimately, to retail concentration within store categories. Indeed, as suggested by Yuo, Crosby, Lizieri, and McCann (2003) in the conclusion of their study on the management of positive inter-store externalities in shopping centers in the United Kingdom, a relevant avenue for further exploring tenant mix issues would be to incorporate ''measures of tenant variety and tenant quality in the models, perhaps using some diversity or concentration index like a Herfindahl index.''

This is the background and justification for this study, which is part of a research program based on physical and financial information obtained for various categories of shopping centers in Montreal and Quebec City, Quebec, Canada. In this paper, 1,499 leases negotiated over the 2000–2003 period are being considered, involving over 5.3 million square feet of gross leasable area (GLA) distributed among eleven regional and super-regional shopping centers in Montreal (6 centers, 2.3 M. sq. feet) and Quebec City (5 centers, 3.0 M. sq. feet). Seven shopping centers are centrally located while four are found in either near or remote suburban areas.

Agglomeration Economies and Retail Concentration—A Brief Review of the Literature

The academic literature on shopping centers has evolved around various theories of urban spatial structure (Hotelling, 1929; Christaller, 1933; Lösch, 1940; and Alonso, 1964) with strategies relating to mall configuration and store location within shopping centers replicating those observed at the urban level (Vandell and Lane, 1987; Pearson, 1991; Brueckner, 1993; Roulac, 1996; Brown, 1999; Yuo, Crosby, Lizieri, and McCann, 2003; and Carter and Vandell, 2005).

Over the past two decades, the retail sector, and shopping centers in particular, have given rise to a vast body of literature (DeLisle, 2005),[1] which encompasses a wide spectrum of topics. On the demand side, issues addressed range from overall location—demographic, socioeconomic, and neighborhood—and accessibility considerations (Sirmans and Guidry, 1993; Hardin, Wolverton, and Carr, 2002; Des Rosiers, Thériault, and Ménétrier, 2005; and Hardin and Carr, 2005) to consumers' shopping motivations (Kim, 2006), household mobility (Baker, 2000; Gobillon, Selod and Zenou, 2003; and Ibrahim and McGoldrick, 2006) and choices of retail formats (Kim, 2004; Carpenter and Moore, 2005; and Biba, Des Rosiers, Thériault, and Villeneuve, 2006). On the supply side, they

mainly deal with tenant mix (Brown, 1992; Kirkup and Rafiq, 1994; Anikeeff, 1996; and Yuo, Crosby, Lizieri, and McCann, 2004), product differentiation (Lee, Atkins, Kim, and Park, 2006), store and shopping center brand and image (Mazursky and Jacoby, 1986; Grewal, Krishnan, Baker, and Borin 1998; Mejia and Benjamin, 2002; and Dennis, et al., 2002), interior design (Brown, 1999), and Internet shopping issues (Baen, 2000; Taylor and Cosenza, 2000; Worzala and McCarthy, 2001a, 2001b; and Kim and Kim, 2005).

In contrast to what prevails in the residential market and office sector where the rent issue has been widely investigated, studies on the dynamics of commercial rent structuring remain embryonic, mostly because of the confidential nature of the required information.

Percentage Rents and the Risk-sharing Issue

The mechanics underlying additional, or overage rents—expressed as a percentage of yearly sales over and above a given, pre-negotiated threshold—are among the issues raised by authors (Hartzell, Shulman, and Wurtzebach, 1987; Benjamin, Boyle, and Sirmans, 1990; Brueckner, 1993; Colwell and Munneke, 1998; Wheaton, 2000; and Chun, Epli, and Shilling, 2001, 2003). Benjamin et al. (1990) were the first to apply hedonics to the analysis of commercial rent. In their study, base rents derived from 103 commercial leases pertaining to national, local, and independent stores are regressed against sales, discount rates, overage rents, lease terms, lease provisions, etc. Results suggest that while base rents are lower where higher overage rent rates apply, they rise with higher sales thresholds. Authors merely see percentage rents as an alternative to base rent.

Several authors though consider percentage rents as a risk-sharing device between landlord and tenants. According to Miceli and Sirmans (1995), the type of rent charged depends upon the relative risk-aversion of both landlord and tenant. Thus, a base rent will apply where the tenant does not bother with risk while the landlord is risk-averse. In contrast, a percentage rent will be charged where both parties are risk-averse, a position supported by Brueckner (1993). Authors also point out that setting a minimum sales threshold acts as an incentive for tenants to optimize inter-store externalities. As for Chun, Epli, and Shilling (2003), they argue that firms displaying a higher-than-average debt-to-asset ratio will generally favor percentage rent over base rent; indeed, the former not being a firm financial commitment for the company, it need not be written down as a liability.

In contrast with Benjamin, Boyle, and Sirmans' (1990) findings, Wheaton's (2000) study involving 1,035 leases from 20 regional shopping centers located on the American East Coast concludes that percentage rent is positively related to base rent. The author argues that non-anchor stores' financial success being highly dependent upon the retail mix agreed on by the landlord, resorting to a percentage rent—over and above a given sales threshold—acts as guarantee that the latter will always manage with the tenant's interests in mind and that the spatial setting

and retail mix of the shopping center will be designed so as to maximize overall sales. Wheaton finally suggests that percentage rent mirrors the nature and magnitude of externalities generated by the store.

Shopping Center Age and Customers' Fidelity

Most authors agree on the fact that shopping center age does affect rents and value negatively, provided that derelict structures and outdated facilities are not compensated for by proper renovation (Sirmans and Guidry, 1993; Gatzlaff, Sirmans, and Diskin, 1994; and Eppli and Tu, 2005). Tay, Lau, and Leung (1999) investigate the Hong Kong commercial market, using a database that includes 405 stores distributed among nine high-rise shopping centers. The authors find that rent level is positively related to the age of a shopping center due to both customers' fidelity, which tends to grow with time, and continuous improvements to buildings. Looking at the age issue from another perspective, Fisher and Lentz (1990) discuss the economic basis for the existence of business enterprise value in a shopping mall. They show that successful tenants who have long been established in the mall agree to have their lease renewed at a higher base rent than the one a new tenant would be charged; this is a way for the landlord to reap the benefits of the going concern value that has been created over time.

Thus, the direction of the impact exerted by shopping center age on base rents depends on several factors such as tenant mix, building improvement strategy, regional competition among centers, and customers' behavior.

Agglomeration Economies, Inter-Store Externalities, and Retail Mix

With location theories as the conceptual background (Weber, 1929), sales, and hence rent, potential in shopping centers are looked upon through the concepts of agglomeration economies and inter-stores externalities derived from the presence of anchor tenants (Eaton and Lipsey, 1983; Mulligan, 1983; West, Von Hohenbalken, and Kroner, 1985; Ghosh, 1986; Ingene and Ghosh, 1990; Brueckner, 1993; Fisher and Yezer, 1993; and Eppli and Benjamin, 1994), as well as from tenant mix and product diversity (Pashigan and Gould, 1998; and Mejia and Benjamin, 2002). Underlying the concept of agglomeration economies—defined as the benefits ensuing from a clustering of economic activity, in this case retail stores—is the reduction in consumer search and uncertainty costs. Such advantages allow major tenants to negotiate lower rents with shopping centers' owners (Anderson, 1985), the fact that their departure may cause rental income to drop substantially—by as much as 25% according to Gatzlaff, Sirmans, and Diskin (1994)—greatly enhancing their bargaining power. While some authors argue that the magnitude of agglomeration economies generated by anchor stores is somehow overestimated, thereby leading to excessive rent reductions at the

expense of non-anchor tenants (Yeates, Charles, and Jones, 2001), the clustering of similar, non-anchor, stores still leads to an increase in the overall sales level of a shopping center, thereby contributing to its financial success (Nelson, 1958; Eppli and Shilling, 1996; and Yuo, Crosby, Lizieri, and McCann, 2003).

Whether agglomeration economies ensuing from tenant mix strategies will translate into higher base rents for shopping center operators though ultimately depends on how profits are shared between landlord and non-anchor tenants; this, in turn, addresses the bargaining power, and hence the retail concentration, issues.

Retail Concentration

Few studies have looked specifically at retail concentration and its impact on shopping center rents. Yuo, Crosby, Lizieri, and McCann (2004) have recently addressed that issue. Based on 148 regional shopping centers (some 1,800 stores) in the U.K., their study identifies two concentration indices based on both retail categories and product brands. Shopping center size, number of units, average unit size, number of retail categories, and number of product brands are also included in the models as control variables. As expected, all emerge as statistically significant and positively related to rents. Using factor analysis, the initial number of retail categories is reduced from around 90 to 28. Factor analysis is also used to extract ''core retail categories'' capable of generating the greatest agglomeration economies: the first group of stores (Factor1, 40% of variance), termed ''Fashion & Comparison Variety,'' namely includes clothing, footwear, accessories and jewelry, gifts, and art, as well as sporting goods; the second ''core'' group (Factor2, 13% of variance), termed ''Selective Goods, Information & Health,'' includes large department stores, telecommunications, electrical and computer goods, books and stationery, as well as pharmacy, health, and beauty stores. Findings suggest that the higher the concentration with respect to retail categories, the higher the potential for agglomeration economies and the higher the rents. When product brand is used as the concentration criterion though, the relationship is reversed, which implies that a reduction in brand diversity tends to lower rents. Finally, shopping centers offering a high level of concentration in the fashion, special goods, information, and health products categories tend to raise agglomeration economies, hence rents.

The effects of both retail concentration and agglomeration economies on rents have also been investigated by Des Rosiers and Thériault (2004), who use a database of 1,007 retail units located in eight community, regional, and super-regional shopping centers in Quebec City and representing some 4.4 million square feet of GLA. Preliminary findings suggest that agglomeration economies impact positively on base rents while retail concentration has the opposite effect, due to the higher bargaining power of dominant tenants. They also suggest that both phenomena impact differently on rents depending on the retail category or sub-category considered, which tends to corroborate Hardin, Wolverton, and Carr's (2002) findings about the existence of distinct retail submarkets.

This paper is a follow-up of the preliminary work by Des Rosiers and Thériault (2004), in the light of Yuo, Crosby, Lizieri, and McCann (2004). While focusing exclusively on retail concentration, it also compares two substantially different retail markets, namely Quebec City and Montreal. It raises two questions: firstly, do fewer, but larger, tenants holding greater control over category, or sub-category, sales command higher overall base rents or, on the contrary, lower rents as a consequence of their stronger bargaining power? Secondly, is the effect on rents uniform or varying with the type of product?

Data Bank Structuring

Sample Size, Base Rent, and Other Basic Descriptors This study is part of a research program on shopping center economics and focusing on retail rent modeling. In this paper, 11 regional and super-regional shopping centers located in Montreal (6) and Quebec City (5) are used, totaling 1,499 stores and nearly 5.4 million square feet of GLA (excluding storage space). The Montreal sub-sample includes 653 retail units (2.3 million square feet) while Quebec City's has 846 (3.0 million square feet). Base rents were obtained for some 1,499 ongoing leases initiated or renewed over the 2000–2003 period. Base rent is defined as the net rent to the landlord and is therefore free of any expense or additional charge transferable to the tenant. Where applicable, base rent also reflects escalator clauses or rental ''steps'' as specified in the initial lease. While mean unit base rent for the overall sample amounts to $57.18/sq. ft. (Canadian dollars), it reaches $67.46/sq. ft. in Montreal as opposed to $49.25/sq. ft. in Quebec City. Mean percentage rent rate[2] stands at 4.2% of yearly sales, with the maximum rate reaching 15%.

Other descriptive attributes include *retail unit size* (GLA, in square feet), *lease duration* (in years) since the first landlord-tenant negotiation took place, as well as *shopping center age*, weighted to account for expansions and modifications to the building (Eppli and Tu, 2005). A time variable (*time elapsed since January 1971*, in years) is also designed so as to capture rent inflation over time. For the overall sample, mean GLA per store stands at 3,579 square feet while, on average, tenants have been in operation for roughly nine years (lease duration). Mean shopping center age stands at slightly below 26 years (21 years for Montreal centers as opposed to 29 years for Quebec City's).

Defining Retail Categories Retail categories are defined in accordance with the North American Industry Classification System (NAICS), which has now replaced the U.S. Standard Industrial Classification (SIC) system and reflects, in a much more explicit way, the recent growth and diversification of services in the economy. In this paper, 31 retail categories are identified, 14 of which are actually groupings of basic categories counting too few stores. Their definition and frequencies are displayed in Exhibit 1, together with basic descriptive statistics for the overall sample. As can be seen, no category has fewer than 10 occurrences, except for ''Beer, Wine and Liquor Stores,'' which includes only seven cases. Once

Exhibit 1 | Descriptive Statistics

	Min.	Max.	Sum	Mean	Std. Dev.
Base Rent ($/sq. ft.)	0.22	2,500.00		57.18	107.63
Percentage Rent Rate (decimals)	0.000	0.150		0.042	0.032
Gross Leaseable Area (sq. ft.)	9	163,034	5,345,363	3,579	11,619
Lease duration, in years	0.07	46.85		9.07	5.42
Time elapsed since Jan. 1971, in years	0.76	32.42		25.93	5.12
Shopping center weighted age taking into account expansions and additions	1.00	39.00		25.56	8.88
Shopping center is located in Quebec City	0	1	846	0.56	
Shopping center is located in Montreal	0	1	653	0.44	
Camera and Photographic Supplies Stores	0	1	20	0.01	
Beer, Wine, and Liquor Stores	0	1	7	0.00	
Optical Goods Stores	0	1	25	0.02	
Men's Clothing Stores	0	1	74	0.05	
Women's Clothing Stores	0	1	245	0.16	
Children's and Infants' Clothing Stores	0	1	25	0.02	
Family Clothing Stores	0	1	44	0.03	
Clothing Accessories Stores	0	1	30	0.02	
Other (Unisex) Clothing Stores	0	1	98	0.07	
Shoe Stores	0	1	99	0.07	
Luggage and Leather Goods Stores	0	1	28	0.02	
Sporting Goods Stores	0	1	25	0.02	
Hobby, Toy, and Game Stores	0	1	18	0.01	

Exhibit 1 | (continued)

Descriptive Statistics

	Min.	Max.	Sum	Mean	Std. Dev.
Sewing, Needlework, and Piece Goods Stores	0	1	13	0.01	
Gambling Industries	0	1	15	0.01	
Full-Service Restaurants	0	1	12	0.01	
Limited-Service Restaurants (Fast Food)	0	1	182	0.12	
Furniture and Home Furnishings Stores—Gr. 1	0	1	68	0.05	
Electronics and House Appliance Stores—Gr. 2	0	1	34	0.02	
Speciality Food Stores—Gr. 3	0	1	42	0.03	
Drug, Health and Personal Care Stores—Gr. 4	0	1	61	0.04	
Grocery Stores—Gr. 5	0	1	19	0.01	
Jewellery and Luggage Stores—Gr. 6	0	1	76	0.05	
Music and Book Stores—Gr. 7	0	1	28	0.02	
Department and Discount Department Stores—Gr. 8	0	1	41	0.03	
Office Supplies, Stationery and Gift Stores—Gr. 9	0	1	17	0.01	
Telecommunications—Gr. 10	0	1	32	0.02	
Banking, Finance, Insurance and Real Estate—Gr. 11	0	1	34	0.02	
Hair, Nail and Skin Care Services—Gr. 12	0	1	23	0.02	
Travel Agencies—Gr. 13	0	1	14	0.01	
Dry-cleaning and Footwear Repair—Gr. 14	0	1	15	0.01	
Concentration Index (GLA-based Herfindhal Index)	0.030	1.00	440.68	0.29	

Notes: $N = 1{,}499$; valid N (listwise) $= 1{,}497$.

the database is split into the Montreal and Quebec City sub-samples, the number of categories with fewer than 10 occurrences then amounts to 6 and 11, respectively. This being said, 27 retail categories include 15 or more units, ''Women's Clothing'' and ''Fast Food'' being by far the two dominant ones with 245 and 182 stores each.

Measuring Retail Concentration Within Categories Finally, the level of retail concentration is measured using the Herfindahl index (AmosWeb, 2003; Yuo, Crosby, Lizieri, and McCann, 2003; Wikipedia, 2003; and Des Rosiers and Thériault, 2004), which is a measure of the concentration of the production in an industry and is calculated as the sum of the squares of each firm's market share. In this case, it is computed for each retail category and each shopping center on the basis of the individual retail units' GLA. The index may stand anywhere between 0 (absence of store in a given retail category) and 1 (all retail activity is concentrated in the hands of a single tenant). As put by Yuo, Crosby, Lizieri, and McCann (2004), the major benefit of using the Herfindahl index for measuring retail concentration is that it gives more weight to larger, dominant tenants, who may exert some control over retail categories and sales. It is expressed as follows:

$$CONCINDX_{ij} = \sum_{k=1}^{n} [GLA_{ij}^{k}/GLA_{ij}]^2, \quad (1)$$

where:

$CONCINDX_{ij}$ = Concentration Index for any given retail category in a given shopping center;
i = Identifies the retail category or sub-category;
j = Identifies the shopping center;
k = Identifies the store within category or sub-category i in shopping center j;
n = Number of stores within category or sub-category i in shopping center j;
GLA_{ij}^{k} = Gross leasable area of any k store belonging to category or sub-category i and located in shopping center j; and
GLA_{ij} = Gross leasable area of all premises belonging to category or sub-category i in shopping center j.

Research Hypotheses and Analytical Approach

General Issues and Specific Research Hypotheses

While the testing of formal research hypotheses is confined to the prime objective of this paper, which focuses on the retail concentration issue, several general issues

still need being addressed on the grounds of previous research findings. These are as follows:

1. **Retail Unit Size (GLA):** As suggested by the literature, rent per square foot should be inversely related to retail unit size; therefore, *the higher the store's GLA the lower the base rent.*
2. **Percentage Rent Rate:** Not all authors agree on the direction of the relationship between base rent and percentage rent. While most state that the two are substitutes for one another, and hence negatively linked (Benjamin, Boyle, and Sirmans, 1990), Wheaton (2000) argues that the opposite is true and that percentage rent mirrors the nature and magnitude of externalities generated by a store. The expected sign of the Percentage Rent Rate coefficient *is therefore indeterminate.*
3. **Lease Duration:** According to Fisher and Lentz (1990), long established, successful tenants should be ready to renew their lease at a higher base rent than would a new tenant in order to benefit from the going concern value they have created over time; therefore, the longer the lease duration the higher the base rent.
4. **Overall Inflation (Time Elapsed since January 1971):** In the long term, retail rents should be expected to adjust to inflation; therefore, base rents should increase over time.
5. **Shopping Center Age:** By and large, and despite some research findings suggesting that retail rent raises with shopping center age due to customer increasing fidelity (Tay, Lau, and Leung, 1991), most studies conclude that rent levels tend to decrease with center age due to derelict structures, inadequate tenant mix, and fading image (Sirmans and Guidry, 1993; and Gatzlaff, Sirmans, and Diskin, 1994); therefore, *the older the center the lower the base rent*.

Turning to the focus of this paper, four specific research hypotheses pertaining to agglomeration economies and retail concentration are designed and tested for.

1. **Hypothesis 1 ($\mathbf{H}_1$)**: Montreal and Quebec City greatly vary in size, with metropolitan populations standing at roughly 3.5 million and 700,000, respectively. It should therefore be expected that agglomeration economies at stake in either region impact differently on retail rent levels, *with Montreal shopping centers generating higher agglomeration economies, and hence higher overall rents, than Quebec City centers.*
2. **Hypothesis 2 ($\mathbf{H}_2$)**: Based on Yuo, Crosby, Lizieri, and McCann's (2004) findings, ''core retail categories'' capable of generating the greatest agglomeration economies (fashion clothing and footwear, leather goods, accessories and jewelry, gifts and art goods, telecommunications, electrical and computer goods, books and stationery, fast food and specialty foods stores, pharmacy, health and beauty stores, financial and

related services) should be expected to display a positive relationship with base rent while lower order categories (discount department stores, sewing and needlework stores, dry-cleaning and footwear repair services) should translate into negatively signed coefficients. By and large then, *the higher the retail category order, the higher the base rent, and vice-versa*.

3. **Hypothesis 3 (H_3)**: The Herfindahl index developed above tests for retail concentration within categories of goods and services. It should give rise to an interpretation similar to the one developed by Yuo, Crosby, Lizieri, and McCann (2004) and based on product brand. Despite higher agglomeration economies accruing from the presence of fewer, but larger stores, the stronger control, and hence bargaining power, that such retailers may exert on a given goods category should, on the whole, drive rents down; therefore, *the higher the retail concentration index, the lower the base rent*.
4. **Hypothesis 4 (H_4)**: As a corollary to the former, it is assumed that *retail concentration does not affect all retail categories similarly, with the magnitude and, eventually, the direction of its impact on base rent depending on the nature of the activity and the market dynamics that prevail for the category considered.*

The Functional Form Issue This paper focuses on modeling the impact of retail concentration on the rent setting process prevailing in shopping centers, using unit base rent (base rent/sq. ft.) as the dependent variable (*BaseRent*). Considering the statistical distribution of base rents as shown in Exhibit 2, and in line with the current real estate literature on retail modeling, regression models are calibrated using a log-linear functional form. Similarly, a logarithmic transformation is applied to the store size (*GLA*) variable, whose regression parameter is therefore expressed as the size-elasticity of unit rent.

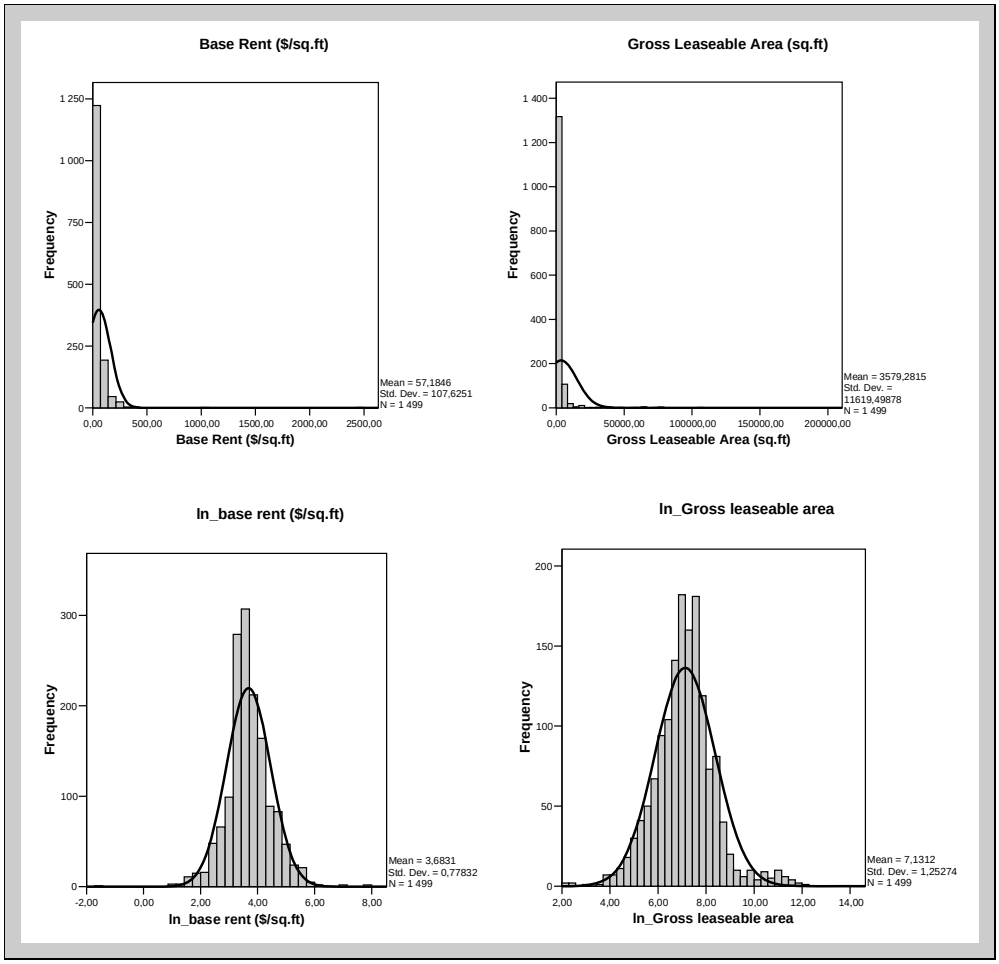
The general formulation of the hedonic equation underlying the current empirical investigation can be expressed as follows:

$$BaseRent = e^{B_0+B_1*Percent+B_2*\mathrm{Ln}Size+B_3*Age+B_4*Duration+B_5*Time+B_6*Mix+B_7*Conc+\varepsilon}, \quad (2)$$

where *Percent*, *Size*, *Age*, *Duration*, *Time*, *Mix*, and *Conc*, respectively account for the percentage rent rate, store size, shopping center age, lease duration, time elapsed since 1971, retail categories, and concentration index.

This, in turn, can be put as:

Exhibit 2 | Base Rent and GLA Distributions Before and After Log Transformation



$$\begin{aligned} \text{Ln}BaseRent = {} & B_0 + B_1 * Percent + B_2 * \text{Ln}Size \\ & + B_3 * Age + B_4 * Duration + B_5 * Time \\ & + B_6 * Mix + B_7 * Conc + \varepsilon. \end{aligned} \tag{3}$$

Data Selection and Regression Procedure

The standard multiple linear regression procedure is used throughout, with a filter on the database so as to select only non-zero base rent and GLA values, as well

as non-storage cases. The listwise deletion procedure, whereby only cases with full information are included in the analysis, is also used throughout the analysis. All models discussed below have been netted out of extreme residuals in excess of ± 3 SEE. Finally, wherever relevant, Montreal is used as the reference for location variables (Models 1 and 5) while Men's Clothing is used as the reference for retail categories (Models 1 to 4). Once filtered and netted out of extreme residuals, the overall sample size stands at 1,473 valid cases, with the Montreal and Quebec City sub-samples including 639 and 835 cases, respectively. As a general rule, and subject to the few exceptions mentioned above, no variable is created unless at least ten cases are reported.

In order to test for the above-defined research hypotheses, a three-step approach is resorted to. Firstly, the natural logarithm of base rent is regressed on basic descriptors, retail categories and the concentration index. A single, overall concentration index (Model 1), as well as two location-specific concentration indices (Model 2) are used alternately in order to test for differences between Montreal and Quebec City. Then, segmented models are calibrated for Montreal (Model 3) and Quebec City (Model 4) shopping centers. Finally, interactive terms combining retail mix attributes with category-specific concentration indices are substituted for basic retail categories (Model 5) as a means for testing whether goods and services categories behave differently with respect to retail concentration.

Main regression results are reported in Exhibits 3–7 (Models 1 to 5). Exhibit 8, finally, provides a summary of major issues addressed in the literature and of related findings from this study.

Main Regression Findings

Findings Pertaining to General Issues

With nearly 62% of the Ln*BaseRent* variance explained and an F-value of 65, the overall performance of Models 1 and 2 can be said satisfactory, in spite of a relatively large SEE (.454), which makes it rather hazardous to use these models for predictive purposes. Since the two models only differ by the retail concentration index used, the regression parameters are similar in almost every respect. As can be seen, variance inflation factors (VIFs) are well within acceptable limits, with the highest VIF standing at 3.455 (Model 1, Lease Duration). Several conclusions emerge from our study:

1. In line with Wheaton's (2000) findings, the percentage rent rate coefficient proves highly significant and displays a positive sign in all models, suggesting it acts as a complement to, rather than as a substitute for, base rent. As shown by the standardized, Beta coefficient (.132 for Model 1), it ranks third in importance as a base rent determinant. Quite interestingly

Exhibit 3 | Model 1: Global Model with Overall Concentration Index

Model Summary

Model	R	R^2	Adj. R^2	Std. Error of Estimate
1	.792	.628	.618	.4536

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	499.905	37	13.511	65.658	.000
Residual	296.322	1,440	0.206		
Total	796.227	1,477			

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	t	Sig.	VIF
Constant	6.395	0.160		40.062	0.000	
Percentage Rent Rate	3.032*	0.463*	0.132*	6.545*	0.000*	1.562*
ln_Gross leaseable area	−0.393*	0.014*	−0.659*	−27.971*	0.000*	2.145*
Shopping center weighted age taking into account expansions and additions	−0.019*	0.002*	−0.231*	−11.595*	0.000*	1.537*
Shopping center is located in Quebec City	0.079*	0.031*	0.054*	2.550*	0.011*	1.712*
Time elapsed since Jan. 1971, in years	0.009*	0.004*	0.063*	2.180*	0.029*	3.198*
Lease duration, in years	0.015*	0.004*	0.109*	3.631*	0.000*	3.455*

Exhibit 3 | (continued)

Model 1: Global Model with Overall Concentration Index

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	*t*	Sig.	VIF
Camera and Photographic Supplies Stores	0.272*	0.111*	0.043*	2.442*	0.015*	1.185*
Beer, Wine, and Liquor Stores	0.810*	0.194*	0.070*	4.183*	0.000*	1.089*
Optical Goods Stores	0.364*	0.101*	0.064*	3.594*	0.000*	1.223*
Women's Clothing Stores	0.106*	0.058*	0.053*	1.810*	0.071*	3.353*
Children's and Infants' Clothing Stores	0.002	0.101	0.000	0.018	0.986	1.212
Family Clothing Stores	0.252*	0.082*	0.058*	3.063*	0.002*	1.403*
Clothing Accessories Stores	0.331*	0.096*	0.064*	3.466*	0.001*	1.306*
Other (Unisex) Clothing Stores	0.200*	0.066*	0.068*	3.020*	0.003*	1.952*
Shoe Stores	0.145*	0.066*	0.049*	2.189*	0.029*	1.977*
Luggage and Leather Goods Stores	0.220*	0.098*	0.040*	2.235*	0.026*	1.243*
Sporting Goods Stores	0.084	0.102	0.015	0.821	0.412	1.241
Hobby, Toy, and Game Stores	−0.092	0.117	−0.014	−0.786	0.432	1.179
Sewing, Needlework, and Piece Goods Stores	−0.564*	0.135*	−0.072*	−4.173*	0.000*	1.145*
Gambling Industries	0.582*	0.139*	0.077*	4.183*	0.000*	1.303*
Full-Service Restaurants	−0.018	0.145	−0.002	−0.123	0.902	1.111
Limited-Service Restaurants (Fast Food)	0.136*	0.062*	0.061*	2.210*	0.027*	2.913*
Furniture and Home Furnishings Stores—Gr. 1	−0.046	0.072	−0.014	−0.687	0.492	1.595
Electronics and House Appliance Stores—Gr. 2	0.024	0.089	0.005	0.263	0.792	1.290

Exhibit 3 | (continued)

Model 1: Global Model with Overall Concentration Index

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	*t*	Sig.	VIF
Speciality Food Stores—Gr. 3	0.086	0.086	0.019	0.997	0.319	1.424
Drug, Health and Personal Care Stores—Gr. 4	0.067	0.073	0.018	0.912	0.362	1.527
Grocery Stores—Gr. 5	0.326*	0.118*	0.049*	2.759*	0.006*	1.209*
Jewellery and Luggage Stores—Gr. 6	0.225*	0.071*	0.068*	3.151*	0.002*	1.790*
Music and Book Stores—Gr. 7	0.231*	0.097*	0.043*	2.384*	0.017*	1.252*
Department and Discount Department Stores—Gr. 8	−0.063	0.095	−0.014	−0.665	0.506	1.621
Office Supplies, Stationery and Gift Stores—Gr. 9	0.279*	0.119*	0.041*	2.344*	0.019*	1.160*
Telecommunications—Gr. 10	0.503*	0.094*	0.100*	5.333*	0.000*	1.354*
Banking, Finance, Insurance and Real Estate—Gr. 11	0.429*	0.095*	0.084*	4.502*	0.000*	1.339*
Hair, Nail and Skin Care Services—Gr. 12	−0.238*	0.105*	−0.040*	−2.265*	0.024*	1.210*
Travel Agencies—Gr. 13	−0.015	0.130	−0.002	−0.112	0.911	1.148
Dry-cleaning and Footwear Repair—Gr. 14	−0.542*	0.128*	−0.074*	−4.234*	0.000*	1.184*
Concentration Index (GLA-based Herfindhal Index)	−0.213*	0.067*	−0.077*	−3.182*	0.001*	2.284*

Notes: The dependent variable is *ln_base rent* ($/sq. ft).
*Coefficients are significant at the 10% level or below.

Exhibit 4 | Model 2: Global Model with Location Specific Concentration Indices

Model Summary

Model	R	R^2	Adj. R^2	Std. Error of Estimate
2	.792	.627	.617	.4544

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	498.909	37	13.484	65.307	.000
Residual	297.318	1,440	0.206		
Total	796.227	1,477			

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	t	Sig.	VIF
Constant	6.469	0.157		41.223	0.000	
Percentage Rent Rate	2.696*	0.440*	0.117*	6.123*	0.000*	1.406*
ln_Gross leaseable area	−0.395*	0.014*	−0.661*	−28.089*	0.000*	2.138*
Shopping center weighted age taking into account expansions and additions	−0.018*	0.002*	−0.214*	−11.378*	0.000*	1.369*
Time elapsed since Jan. 1971, in years	0.008*	0.004*	0.055*	1.911*	0.056*	3.146*
Lease duration, in years	0.015*	0.004*	0.107*	3.564*	0.000*	3.454*
Camera and Photographic Supplies Stores	0.271*	0.111*	0.043*	2.432*	0.015*	1.186*

Exhibit 4 | (continued)

Model 2: Global Model with Location Specific Concentration Indices

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	*t*	Sig.	VIF
Beer, Wine, and Liquor Stores	0.803*	0.194*	0.070*	4.139*	0.000*	1.090*
Optical Goods Stores	0.366*	0.101*	0.064*	3.607*	0.000*	1.225*
Women's Clothing Stores	0.105*	0.059*	0.053*	1.787*	0.074*	3.365*
Children's and Infants' Clothing Stores	0.009	0.101	0.002	0.086	0.931	1.212
Family Clothing Stores	0.247*	0.082*	0.057*	2.998*	0.003*	1.403*
Clothing Accessories Stores	0.342*	0.096*	0.066*	3.578*	0.000*	1.304*
Other (Unisex) Clothing Stores	0.202*	0.066*	0.068*	3.041*	0.002*	1.957*
Shoe Stores	0.144*	0.067*	0.049*	2.161*	0.031*	1.980*
Luggage and Leather Goods Stores	0.223*	0.098*	0.041*	2.266*	0.024*	1.243*
Sporting Goods Stores	0.083	0.102	0.015	0.813	0.416	1.242
Hobby, Toy, and Game Stores	−0.080	0.117	−0.012	−0.682	0.495	1.176
Sewing, Needlework, and Piece Goods Stores	−0.565*	0.136*	−0.072*	−4.165*	0.000*	1.147*
Gambling Industries	0.565*	0.139*	0.075*	4.060*	0.000*	1.302*
Full-Service Restaurants	−0.012	0.145	−0.001	−0.080	0.936	1.111
Limited-Service Restaurants (Fast Food)	0.135*	0.062*	0.060*	2.188*	0.029*	2.918*
Furniture and Home Furnishings Stores—Gr. 1	−0.050	0.072	−0.014	−0.702	0.483	1.595
Electronics and House Appliance Stores—Gr. 2	0.011	0.089	0.002	0.124	0.901	1.288
Speciality Food Stores—Gr. 3	0.084	0.086	0.019	0.979	0.328	1.424

Exhibit 4 | (continued)

Model 2: Global Model with Location Specific Concentration Indices

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	*t*	Sig.	VIF
Drug, Health and Personal Care Stores—Gr. 4	0.066	0.073	0.018	0.893	0.372	1.527
Grocery Stores—Gr. 5	0.324*	0.119*	0.048*	2.736*	0.006*	1.210*
Jewellery and Luggage Stores—Gr. 6	0.225*	0.072*	0.068*	3.144*	0.002*	1.790*
Music and Book Stores—Gr. 7	0.235*	0.097*	0.044*	2.417*	0.016	1.252*
Department and Discount Department Stores—Gr. 8	−0.077	0.095	−0.017	−0.812	0.417	1.615
Office Supplies, Stationery and Gift Stores—Gr. 9	0.292*	0.119*	0.042*	2.443*	0.015*	1.159*
Telecommunications—Gr. 10	0.489*	0.094*	0.097*	5.189*	0.000*	1.348*
Banking, Finance, Insurance and Real Estate—Gr. 11	0.411*	0.095*	0.080*	4.317*	0.000*	1.331*
Hair, Nail and Skin Care Services—Gr. 12	−0.232*	0.105*	−0.039*	−2.213*	0.027*	1.210*
Travel Agencies—Gr. 13	−0.023	0.131	−0.003	−0.173	0.863	1.147
Dry-cleaning and Footwear Repair—Gr. 14	−0.545*	0.128*	−0.074	−4.246	0.000*	1.184*
Concentration Index (GLA) for Quebec City centers	−0.182*	0.078*	−0.059*	−2.340	0.019*	2.461*
Concentration Index (GLA) for Montreal centers	−0.273*	0.073*	−0.089*	−3.743	0.000*	2.189*

Notes: The dependent variable is *ln_base rent* ($/sq. ft).
*Coefficients are significant at the 10% level or below.

Exhibit 5 | Model 3: Segmented Model for Montreal Shopping Centers

Model Summary

Model	R	R^2	Adj. R^2	Std. Error of Estimate
3	.815	.665	.645	.4490

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	242.049	36	6.724	33.345	.000
Residual	121.990	605	0.202		
Total	364.039	641			

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	t	Sig.	VIF
Constant	6.330	0.283		22.331	0.000	
Percentage Rent Rate	5.494*	0.936*	0.188*	5.870*	0.000*	1.857*
ln_Gross leaseable area	−0.402*	0.022*	−0.659*	−18.589*	0.000*	2.270*
Shopping center weighted age taking into account expansions and additions	−0.021*	0.002*	−0.239*	−9.602*	0.000*	1.119*
Time elapsed since Jan. 1971, in years	0.014*	0.006*	0.085*	2.132*	0.033*	2.886*
Lease duration, in years	0.013*	0.006*	0.084*	2.005*	0.045*	3.148*

Exhibit 5 | (continued)

Model 3: Segmented Model for Montreal Shopping Centers

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	*t*	Sig.	VIF
Camera and Photographic Supplies Stores	0.200	0.174	0.029	1.148	0.251	1.188
Beer, Wine, and Liquor Stores	1.001*	0.243*	0.105*	4.127*	0.000*	1.159*
Optical Goods Stores	0.295*	0.148*	0.053*	1.995*	0.047*	1.273*
Women's Clothing Stores	−0.026	0.089	−0.013	−0.298	0.766	3.304
Children's and Infants' Clothing Stores	−0.055	0.166	−0.009	−0.335	0.738	1.206
Family Clothing Stores	0.191	0.116	0.049	1.640	0.101	1.610
Clothing Accessories Stores	0.334*	0.159*	0.055*	2.101*	0.036*	1.236*
Other (Unisex) Clothing Stores	0.117	0.101	0.037	1.156	0.248	1.896
Shoe Stores	0.089	0.098	0.030	0.901	0.368	2.049
Luggage and Leather Goods Stores	0.145	0.143	0.027	1.018	0.309	1.287
Sporting Goods Stores	0.171	0.148	0.031	1.156	0.248	1.279
Hobby, Toy, and Game Stores	−0.024	0.200	−0.003	−0.118	0.906	1.179
Sewing, Needlework, and Piece Goods Stores	−0.950*	0.237*	−0.099*	−4.007*	0.000*	1.107*
Gambling Industries	0.720*	0.206*	0.099*	3.500*	0.000*	1.452*
Full-Service Restaurants	−0.004	0.274	0.000	−0.015	0.988	1.112
Limited-Service Restaurants (Fast Food)	0.038	0.093	0.016	0.404	0.686	2.966
Furniture and Home Furnishings Stores—Gr. 1	−0.187	0.114	−0.048	−1.632	0.103	1.557
Electronics and House Appliance Stores—Gr. 2	−0.007	0.126	−0.002	−0.054	0.957	1.388

Exhibit 5 | (continued)

Model 3: Segmented Model for Montreal Shopping Centers

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	*t*	Sig.	VIF
Speciality Food Stores—Gr. 3	0.026	0.131	0.006	0.199	0.842	1.414
Drug, Health and Personal Care Stores—Gr. 4	0.031	0.111	0.008	0.280	0.780	1.526
Grocery Stores—Gr. 5	0.127	0.168	0.020	0.756	0.450	1.240
Jewellery and Luggage Stores—Gr. 6	0.097	0.107	0.029	0.909	0.364	1.877
Music and Book Stores—Gr. 7	0.297*	0.155*	0.051*	1.921*	0.055*	1.281
Department and Discount Department Stores—Gr. 8	0.070	0.136	0.016	0.512	0.609	1.787
Office Supplies, Stationery and Gift Stores—Gr. 9	0.264	0.199	0.034	1.331	0.184	1.162
Telecommunications—Gr. 10	0.496*	0.141*	0.099*	3.509*	0.000*	1.449*
Banking, Finance, Insurance and Real Estate—Gr. 11	0.675*	0.149*	0.135*	4.540*	0.000*	1.606*
Hair, Nail and Skin Care Services—Gr. 12	−0.455*	0.155*	−0.078*	−2.946*	0.003*	1.281*
Travel Agencies—Gr. 13	−0.025	0.217	−0.003	−0.117	0.907	1.154
Dry-cleaning and Footwear Repair—Gr. 14	−0.424*	0.187*	−0.059*	−2.267*	0.024*	1.203*
Concentration Index (GLA) for Montreal centers	−0.271*	0.100*	−0.099*	−2.718*	0.007*	2.373*

Notes: The dependent variable is *ln_base rent* ($/sq. ft).
*Coefficients are significant at the 10% level or below.

Exhibit 6 | Model 4: Segmented Model for Quebec City Shopping Centers

Model Summary

Model	*R*	R^2	Adj. R^2	Std. Error of Estimate
4	.781	.610	.592	.4552

ANOVA

	Sum of Squares	df	Mean Square	*F*	Sig.
Regression	258.447	36	7.179	34.647	.000
Residual	165.558	799	0.207		
Total	424.005	835			

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	*t*	Sig.	VIF
Constant	6.343	0.205		30.973	0.000	
Percentage Rent Rate	1.818*	0.586*	0.085*	3.099*	0.002*	1.533*
ln_Gross leaseable area	−0.385*	0.019	−0.663*	−20.244	0.000*	2.192*
Shopping center weighted age taking into account expansions and additions	−0.012*	0.003*	−0.124*	−4.027	0.000*	1.954*
Time elapsed since Jan. 1971, in years	0.004	0.006	0.026	0.574	0.566	4.240
Lease duration, in years	0.017*	0.006*	0.135*	3.007*	0.003*	4.127*
Camera and Photographic Supplies Stores	0.332*	0.145*	0.056*	2.298*	0.022*	1.194*

Exhibit 6 | (continued)

Model 4: Segmented Model for Quebec City Shopping Centers

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	*t*	Sig.	VIF
Beer, Wine, and Liquor Stores	0.588*	0.332*	0.040*	1.771*	0.077*	1.061*
Optical Goods Stores	0.404*	0.139*	0.070*	2.897*	0.004*	1.198*
Women's Clothing Stores	0.172*	0.079*	0.090*	2.171*	0.030*	3.549*
Children's and Infants' Clothing Stores	0.040	0.128	0.008	0.312	0.755	1.238
Family Clothing Stores	0.370*	0.120*	0.077*	3.095*	0.002*	1.281*
Clothing Accessories Stores	0.360*	0.121*	0.077*	2.987*	0.003*	1.371*
Other (Unisex) Clothing Stores	0.244*	0.089*	0.087*	2.751*	0.006*	2.042*
Shoe Stores	0.156*	0.091	0.053*	1.717*	0.086*	1.970*
Luggage and Leather Goods Stores	0.258*	0.135*	0.046*	1.906*	0.057*	1.217*
Sporting Goods Stores	0.018	0.141	0.003	0.128	0.898	1.220
Hobby, Toy, and Game Stores	−0.105	0.145	−0.018	−0.729	0.466	1.194
Sewing, Needlework, and Piece Goods Stores	−0.384*	0.166*	−0.056*	−2.309*	0.021*	1.185*
Gambling Industries	0.563*	0.193*	0.072*	2.912	0.004*	1.253*
Full-Service Restaurants	−0.021	0.172	−0.003	−0.124	0.901	1.129
Limited-Service Restaurants (Fast Food)	0.189*	0.083*	0.087*	2.269*	0.024*	2.986*
Furniture and Home Furnishings Stores—Gr. 1	0.023	0.092	0.007	0.254	0.800	1.635
Electronics and House Appliance Stores—Gr. 2	0.060	0.129	0.012	0.465	0.642	1.265
Speciality Food Stores—Gr. 3	0.126	0.113	0.029	1.110	0.267	1.440

Exhibit 6 | (continued)

Model 4: Segmented Model for Quebec City Shopping Centers

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	*t*	Sig.	VIF
Drug, Health and Personal Care Stores—Gr. 4	0.093	0.097	0.026	0.958	0.338	1.536
Grocery Stores—Gr. 5	0.507*	0.168*	0.073*	3.027*	0.003*	1.206*
Jewellery and Luggage Stores—Gr. 6	0.285*	0.097*	0.086*	2.943*	0.003*	1.764*
Music and Book Stores—Gr. 7	0.207*	0.125*	0.041*	1.662*	0.097*	1.252*
Department and Discount Department Stores—Gr. 8	−0.203	0.136	−0.041	−1.495	0.135	1.561
Office Supplies, Stationery and Gift Stores—Gr. 9	0.319*	0.150*	0.051*	2.126*	0.034*	1.176*
Telecommunications—Gr. 10	0.569*	0.128*	0.113*	4.444*	0.000*	1.319*
Banking, Finance, Insurance and Real Estate—Gr. 11	0.279*	0.130*	0.054*	2.149*	0.032*	1.273*
Hair, Nail and Skin Care Services—Gr. 12	−0.123	0.144	−0.021	−0.855	0.393	1.189
Travel Agencies—Gr. 13	0.048	0.164	0.007	0.290	0.772	1.155
Dry-cleaning and Footwear Repair—Gr. 14	−0.639*	0.175*	−0.087*	−3.642*	0.000*	1.177*
Concentration Index (GLA) for Quebec City centers	−0.235*	0.100*	−0.086*	−2.357*	0.019*	2.695*

Notes: The dependent variable is *ln_base rent* ($/sq. ft).
*Coefficients are significant at the 10% level or below.

Exhibit 7 | Model 5: Global Interactive Model

Model Summary

Model	R	R^2	Adj. R^2	Std. Error of Estimate
5	.784	.614	.605	.4617

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	489.248	37	13.223	62.027	.000
Residual	306.979	1,440	0.213		
Total	796.227	1,477			

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	t	Sig.	VIF
Constant	6.515	0.150		43.436	0.000	
Percentage Rent Rate	3.078*	0.461*	0.134*	6.676*	0.000*	1.494*
ln_Gross leaseable area	−0.401*	0.013*	−0.672*	−30.472*	0.000*	0.817*
Shopping center weighted age taking into account expansions and additions	−0.020*	0.002	−0.245*	−12.197*	0.000*	1.511*
Time elapsed since Jan. 1971, in years	0.009*	0.004*	0.063	2.132*	0.033*	3.214*
Lease duration, in years	0.016*	0.004*	0.116*	3.821*	0.000*	3.418*
Shopping center is located in Quebec City	0.102*	0.032*	0.069*	3.228*	0.001*	1.696*

Exhibit 7 | (continued)

Model 5: Global Interactive Model

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	*t*	Sig.	VIF
*Concindx*Camera*	0.157	0.185	0.014	0.847	0.397	1.043
*Concindx*Liquor Stores*	0.585*	0.220*	0.044*	2.666*	0.008*	1.031*
*Concindx*Optical*	0.324*	0.174*	0.031*	1.864*	0.063*	1.050*
*Concindx*Men's Clothing*	−0.237	0.245	−0.017	−0.969	0.333	1.120
*Concindx*Women's Clothing*	0.151	0.573	0.005	0.264	0.792	1.392
*Concindx*Children's and Infants' Clothing*	−0.228	0.197	−0.019	−1.157	0.248	1.054
*Concindx*Family Clothing*	0.275	0.181	0.026	1.518	0.129	1.100
*Concindx*Clothing Accessories*	0.328	0.204	0.027	1.606	0.108	1.069
*Concindx*Unisex Clothing*	0.484*	0.300	0.028	1.611	0.107	1.166
*Concindx*Shoe Stores*	0.144*	0.325	0.008	0.444	0.657	1.171
*Concindx*Luggage and Leather Goods*	0.056	0.197	0.005	0.283	0.777	1.050
*Concindx*Sporting Goods*	−0.091	0.176	−0.009	−0.520	0.603	1.094
*Concindx*Hobby, Toy, and Game*	−0.356*	0.158*	−0.038*	−2.261*	0.024*	1.041*
*Concindx*Sewing, Needlework, and Piece Goods*	−0.939*	0.171*	−0.091*	−5.478*	0.000*	1.025*
*Concindx*Gambling Industries*	0.506*	0.193*	0.046*	2.618*	0.009*	1.141*
*Concindx*Full-Service Restaurants*	−0.167	0.194	−0.014	−0.858	0.391	1.028
*Concindx*Fast Food*	0.667*	0.301*	0.042*	2.214*	0.027*	1.356*
*Concindx*Furniture and Home Furnishings*	−0.322*	0.187*	−0.030*	−1.719*	0.086*	1.110*

Exhibit 7 | (continued)

Model 5: Global Interactive Model

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	*t*	Sig.	VIF
*Concindx*Electronics and House Appliance*	−0.300*	0.165*	−0.031*	−1.819*	0.069*	1.069*
*Concindx*Speciality Food*	−0.161	0.174	−0.016	−0.924	0.356	1.089
*Concindx*Drug, Health and Personal Care*	−0.214	0.156	−0.024	−1.372	0.170	1.119
*Concindx*Grocery Stores5*	0.089	0.135	0.011	0.658	0.510	1.036
*Concindx*Jewellery and Luggage*	0.594*	0.269*	0.039*	2.209*	0.027*	1.138*
*Concindx*Music and Book Stores*	0.260	0.170	0.026	1.533	0.126	1.083
*Concindx*Department and Discount Department Stores*	−0.531*	0.211*	−0.046*	−2.521*	0.012*	1.217*
*Concindx*Office Supplies, Stationery and Gift Stores*	0.214	0.189	0.019	1.136	0.256	1.036
*Concindx*Telecommunications*	0.681*	0.171*	0.069*	3.988*	0.000*	1.107*
*Concindx*Banking, Finance, Insurance and Real Estate*	0.431*	0.169*	0.044*	2.549*	0.011*	1.101*
*Concindx*Hair, Nail and Skin Care Services*	−0.764*	0.180*	−0.071*	−4.244*	0.000*	1.054*
*Concindx*Travel Agencies*	−0.309	0.204	−0.025	−1.521	0.129	1.047
*Concindx*Dry-cleaning and Footwear Repair*	−0.841*	0.163*	−0.086*	−5.172*	0.000*	1.042*

Notes: The dependent variable is *ln_base rent* ($/sq. ft).
*Coefficients are significant at the 10% level or below.

Exhibit 8 | Major Issues Addressed, Results from the Literature and Study Findings

Issue Addressed and Authors Involved	Results from the Literature	Study Findings
Panel A: Store Size & Percentage Rent Rate		
	Base rent is inversely related to store size.	
Hartzell et al., 1987; Benjamin et al., 1990; Brueckner, 1993; Colwell et al., 1998; Wheaton, 2000; Chun et al, 2001, 2003	While base rents are inversely related to overage rent rates, they rise with higher sales thresholds (Benjamin et al., 1990).	
Brueckner, 1993; Miceli and Sirmans, 1995	The type of rent charged depends upon the relative risk-aversion of landlord and tenant.	Base rent is inversely related to store size (GLA).
Chun et al., 2003	Firms displaying a higher-than-average debt-to-asset ratio will generally favor percentage rent over base rent in order to reduce liabilities.	In line with Wheaton's (2000) findings, study suggests that the percentage rent rate acts as a complement to, rather than as a substitute for, base rent, both being positively related.
Wheaton, 2000	Percentage rent mirrors the nature and magnitude of externalities generated by the store and is positively related to base rent.	

Exhibit 8 | (continued)

Major Issues Addressed, Results from the Literature and Study Findings

Issue Addressed and Authors Involved	Results from the Literature	Study Findings
Panel B: Shopping Center Age, Customers' Fidelity, Lease Duration, and Inflation		
Sirmans and Guidry, 1993; Gatzlaff et al., 1994; Eppli and Tu, 2005	Shopping center age affects rents and value negatively where derelict structures are not compensated for by proper renovation.	
Tay et al., 1999	Rent level is positively related to the age of a shopping center due to both customers' fidelity and continuous improvements to buildings.	In line with Fisher and Lentz's (1990) assumption regarding long established, successful tenants, the longer the lease duration the higher the base rent.
Fisher and Lentz, 1990	Long established tenants agree to have their lease renewed at a higher base rent in order to reap the benefits of the going concern value created over time.	Base rent tends to adjust, at least partially, to inflation over time.

Exhibit 8 | (continued)

Major Issues Addressed, Results from the Literature and Study Findings

Issue Addressed and Authors Involved	Results from the Literature	Study Findings
Panel C: Agglomeration Economies, Inter-Store Externalities, and Retail Mix		
Eaton and Lipsey, 1983; Mulligan, 1983; West et al., 1985; Ghosh, 1986; Ingene and Ghosh, 1990; Fisher and Yezer, 1993; Eppli and Benjamin, 1994; Brueckner, 1993; Pashigan and Gould, 1998; Mejia and Benjamin, 2002	Agglomeration economies and inter-stores externalities in shopping centers derive from the presence of anchor tenants as well as from tenant mix and product diversity.	
Anderson, 1985; Gatzlaff et al., 1994	The reduction in consumer search and uncertainty costs that follows tend to boost major tenants' bargaining power, thereby allowing them to negotiate lower rents.	While greater agglomeration economies may be generated in a retail environment, these do not automatically translate into higher rents, which suggests that other factors—linked, namely, to local market structure as well as landlord's and tenants' strategies and constraints—are at stake.
Nelson, 1958; Eppli and Shilling, 1996; Yeates et al., 2001; Yuo et al., 2003	While rent discounts granted to anchor stores at the expense of non-anchor tenants may be excessive (Yeates et al., 2001), the clustering of similar, non-anchor, stores still contributes to the financial success of a shopping center.	
Yuo et al., 2004	Core retail categories capable of generating the greatest agglomeration economies display a positive relationship with base rent while lower order categories translate into rent discounts.	In line with Yuo et al.'s findings, the higher the retail category order, the higher the base rent, and vice-versa.

Exhibit 8 | (continued)

Major Issues Addressed, Results from the Literature and Study Findings

Issue Addressed and Authors Involved	Results from the Literature	Study Findings
Panel D: Retail Concentration		
Yuo et al., 2004	The higher the concentration with respect to retail categories the higher the potential for agglomeration economies and the higher the rents; the relationship is reversed though if product brand is used as the concentration criterion.	The higher the level of intra-category retail concentration, as measured by both global and location-specific Herfindahl indices, the lower the base rent; overall, individual category base rent is also affected downwards by a higher degree of retail concentration.
Des Rosiers and Thériault, 2004	Retail concentration impacts negatively on base rent; the impact varies depending on the retail category or sub-category considered.	Retail concentration does not affect all categories similarly, with the magnitude and, eventually, the direction of its impact on base rent depending on the nature of the activity and the market dynamics that prevail for the category considered.

though, percentage rent emerges as being substantially more prominent a descriptor for Montreal shopping centers (Model 3), where it is a common feature, than it is for Quebec City's (Model 4).

2. As expected, the negative, and highly significant, relationship between base rent and store size clearly emerges and suggests that a 10% increase in GLA results in a rent discount of roughly 4%. Not surprisingly, store size is by far the most prominent determinant of shopping center rents (Beta coefficient at −.659).
3. In line with Sirmans and Guidry's (1993) and Gatzlaff, Sirmans, and Diskin's (1994) findings, the age of a shopping center unambiguously affects rents downwards, which stresses the importance of both renovation and image enhancing strategies for shopping center investors. As shown by the Beta coefficient (−.231), this variable ranks second to store size in the list of main retail rent determinants.
4. The temporal coefficient (Time elapsed since January 1971) is positively signed, which suggests, in line with expectations, that retail rents tend to adjust, at least partially, to inflation as they grew at an overall annual rate of slightly below 1% over the period considered (1.4% in Montreal); however, findings also indicate that the coefficient is not statistically significant for Quebec City centers (Model 4).
5. Findings also suggest that lease duration impacts positively on rents, which tends to corroborate Fisher and Lentz's (1990) assumption regarding the ability of shopping center landlords to capture through higher rents part of the business enterprise value generated by successful, long established tenants. Overall, every additional year in lease duration translates into a 1.5% rise in base rent (Models 1 and 2), with the impact proving more substantial on Quebec City center rents (1.7%, Model 4) than on Montreal's (1.3%, Model 3).

Testing for Research Hypotheses

Turning to research hypotheses regarding the effect of agglomeration economies and retail concentration on base rents, our findings can be summarized as follows:

1. While it is reasonable to assume that retail rents in Quebec City shopping centers are, by and large, lower than in Montreal due to lower agglomeration economies at the local level, the findings rather show the opposite, with centers located in Quebec City commanding a rent premium varying between 7.9% (Model 1) and 10.2% (Model 5). Such findings suggest that, while greater agglomeration economies may be generated in a retail environment, these *do not automatically translate into higher rents* and that other factors—linked, namely, to local market structure as well as landlord's and tenants' strategies and constraints—are at stake. Research hypothesis H_1 is thus rejected.

2. Most retail categories generate highly significant coefficients, which suggests that related base rents differ from Men's Clothing stores' used as the reference, either positively or negatively. Quite interestingly, most significant and positively signed categories fit the description that Yuo, Crosby, Lizieri, and McCann (2004) give of ''core retail categories,'' which refer to *higher order* goods and services. In our case, these include: camera, electronics, and computer goods; optical services; most fashion clothing categories, shoe stores, leather goods, jewelry, and luggage stores; liquor, specialty food and grocery stores; music and book stores; office supplies, stationery, and gift stores; gambling and fast food services; and finally, telecommunications, as well as financial and related services. On the other hand, significant and negatively signed categories clearly refer to *lower order* goods and services that might be necessary to cover all customers' needs but that rather characterize community and neighborhood malls: sewing, needlework, and piece goods stores; hair, nail, and skin care services; dry cleaning and footwear repair stores. In short, our findings tend to confirm that retail categories do capture the agglomeration economies effect brought forward by Yuo, et al. (2004), or the lack of it, and, consequently, that *the higher the retail category order the higher the base rent, and vice-versa*. Research hypothesis H_2 is therefore confirmed.
3. The findings clearly suggest that while intra-category retail concentration, as measured by the Herfindahl index, significantly affects shopping center rents, its impact is on the whole negative. Using location-specific concentration indices (Model 2) rather than a single, overall concentration index (Model 1) does not modify this conclusion. Results from Models 2, 3, and 4 also suggest that the magnitude of the index parameter is somewhat greater for Montreal shopping centers than for Quebec City ones. On these grounds, research hypothesis H_3, which states that *the higher the retail concentration index the lower the base rent*, cannot be rejected. Such findings tend to corroborate our interpretation regarding the way retail concentration operates within shopping centers. More precisely, while the variety of goods and services in a shopping center will enhance its attraction power and generate agglomeration economies, a high level of retail concentration in a given category may provide dominant tenants with enough bargaining power to negotiate favorable rental agreements with the landlord: hence the negative sign obtained. The same rationale may apply to retail concentration based on brand diversity (Yuo, Crosby, Lizieri, and McCann, 2004).
4. Our fourth and final research hypothesis H_4 states that *retail concentration does not affect all retail categories similarly, with the magnitude and, eventually, the direction of its impact on base rent depending on the nature of the activity and the market dynamics that prevail for the category considered*. This is clearly confirmed by Model 5 findings, which suggest that retail concentration impacts significantly on several goods

and services categories, although base rent is not affected in a majority of cases. While significant interactive coefficients display signs that are similar to those obtained using straight retail categories (i.e., positive for higher order goods and negative for lower order goods), rent premiums are, by and large, affected downward by a higher degree of retail concentration whereas rent discounts are raised. Overall then, retail concentration is found to affect base rents negatively. These results are further discussed below.

What Do Segmented Models Tell Us?

Turning to Models 3 and 4 where Montreal and Quebec City shopping centers are modeled separately, it can be seen that while most basic descriptors emerge as being statistically significant and with expected signs—safe for the inflation descriptor (Time elapsed since Jan. 1971) whose coefficient is not significant for Quebec City centers—the number of goods category variables displaying significant coefficients is substantially reduced for the Montreal sub-sample when compared to global models (Models 1 and 2). Moreover, while those categories that still exert a significant influence on Montreal centers' base rent exhibit coefficient signs in line with the findings of Models 1, 2, and 4, the magnitude of their impact greatly differs and is, by and large, enhanced. This is particularly true for higher order categories such as ''Beer, Wine and Liquor stores'' (1.001), ''Gambling Industries'' (.720), ''Banking, Finance, Insurance, and Real Estate'' (.675) and, in the case of lower order categories, for ''Sewing, Needlework, and Piece Goods Stores'' (−.950) and ''Hair, Nail, and Skin Care Services'' (−.455). In contrast, ''Optical Goods Stores'' and ''Telecommunications'' exert a stronger impact on shopping center rents in Quebec City (.404 and .569, respectively) than in Montreal (.295 and .496).

In line with Hypothesis H_2, such findings suggest that the process whereby agglomeration economies generated in a shopping center are captured and internalized into rents will vary depending on the retail context prevailing in the establishment and, eventually, in the urban area where the shopping center is located. Thus, identical goods and services categories may give rise to dissimilar rent setting strategies that mirror both landlord's priorities regarding retail mix and tenants' constraints with respect to space availability, market visibility, retail chain policies, etc. The local structure of the retail market also acts as a determinant of shopping center rents. In Quebec City for instance, where a significant share of all retail sales is captured through regional and super-regional shopping centers, it is a must for major businesses to locate within such establishments; hence the harsh competition for space that provides shopping center operators with a strong bargaining power that drives base rent upwards for a majority of categories (17, according to Exhibit 6—Model 4). In contrast, Montrealers are offered more options for fulfilling their shopping needs, with a great number of shops being scattered along commercial streets, namely in the

downtown area. Consequently, only a few retail categories display significant, positively signed coefficients (7, according to Exhibit 5—Model 3).

On such grounds then, the rent premium assigned to Quebec City shopping centers in Models 1 and 5 does make sense. So do the magnitude and sign of significant category coefficients as reported in Models 3 and 4. As can be seen, categories such as ''Beer, Wine, and Liquor Stores,'' ''Gambling Industries,'' ''Telecommunications,'' as well as ''Banking, Finance, Insurance, and Real Estate''—in the Montreal case at least—tend to generate the highest rent premiums for mall operators, a reflection of the financial benefit that such businesses reap from locating in shopping centers, particularly in Montreal. Furthermore, in the case of both gambling industries and telecommunication businesses, most stores are actually kiosks that occupy the malls' central alley and, consequently, command higher-than-average unit rents. Finally, retail categories that are assigned significant—and substantial—rent discounts, namely ''Sewing and Needlework Stores,'' ''Hair, Nail, and Skin Care Services'' (in Montreal centers), as well as ''Dry-cleaning and Footwear Repair'' refer to lower order goods and services whose presence in the shopping center is needed as part of the retail mix strategy despite the limited sales revenues they generate.

Discussing Interactions Between Retail Categories and Concentration Indices

Results from the global interactive model (Model 5) are reported in Exhibit 7 and should be interpreted in the light of Models 1 and 2 coefficients. A notable advantage of using interactive terms is that it helps reducing multicollinearity, thereby stabilizing regression coefficients while improving the reliability of statistical tests.

In the first place, it should be noticed that basic attributes display parameter estimates that are identical in all respect to those reported in Exhibits 3 and 4, with even higher *t* values. Then, interacting the 31 retail categories with their concentration indices provides us with as many estimates of the marginal contribution of each category index to base rent. While the number of statistically significant interactive terms remains limited (14 retail categories) when compared with straight category variables (20 categories for Models 1 and 2), the former display coefficient signs that are in line with previous findings. Moreover, several goods and services categories that did not emerge as significant rent determinants when used in isolation do once their specific concentration index is considered: this is the case for ''Hobby, Toy & Game Stores,'' ''Furniture & Home Furnishings,'' ''Electronics & House Appliance,'' as well as ''Department & Discount Stores,'' all four indices exerting a downward influence on base rent.

Most interestingly, accounting for specific concentration indices results, by and large, in previously identified rent premiums being lowered (''Beer, Wine, and Liquor Stores,'' ''Optical Goods Stores,'' and ''Gambling Industries'') whereas rent

discounts assigned to lower order goods and services categories are being substantially enhanced (''Sewing, Needlework, and Piece Goods Stores,'' ''Hair, Nail, and Skin Care Services,'' and ''Dry-cleaning and Footwear Repair''). Save for a few categories that do not follow that pattern as related base rent is either affected positively (''Fast-food Businesses,'' ''Jewelry and Luggage Stores,'' and ''Telecommunications Stores'')[3] or unaffected (''Banking, Finance, Insurance, and Real Estate'') by retail concentration, Model 5 findings corroborate research hypotheses 3 and 4: on the one hand, intra-category retail concentration tend to affect base rent negatively as a result of the increased bargaining power enjoyed by dominant tenants; on the other end, it does not affect all retail categories similarly, hence the relevance of resorting to category-specific retail concentration indices.

As a conclusion to this study, it can be said that, of all four research hypotheses, only H_1, which states that higher agglomeration economies should translate into higher base rents, could not be supported. Instead, statistical evidence suggests that other factors, such as local retail market structure, are at stake in the rent setting process. Research hypotheses H_2, H_3, and H_4 are confirmed. Thus: (1) the higher the retail category order, the higher the base rent, and vice-versa; (2) by and large, the higher the retail concentration index the lower the base rent; and, finally, (3) retail concentration does not affect all retail categories similarly, with the magnitude and, eventually, the direction of its impact on base rent depending on the nature of the activity and the market dynamics that prevail for the category considered.

Summary of Findings and Suggestions for Further Research

This study aims primarily at testing whether, and to what extent, retail concentration within regional and super-regional shopping centers affects rent levels, as well as the differential impact it may exert in different urban contexts. In this paper, 1,499 leases negotiated over the 2000–2003 period are considered, representing over 5.3 million square feet of gross leasable area (GLA) distributed among 11 regional and super-regional shopping centers in Montreal (6 centers, 2.3 million sq. feet, 653 retail units) and Quebec City (5 centers, 3.0 million sq. feet, 846 units), Canada. Unit base rents (base rent per sq. ft.) are regressed on a series of descriptors that include percentage rent rate, retail unit size (GLA, in square feet), lease duration (in years) since the first landlord-tenant negotiation took place, as well as shopping center age, weighted to account for expansions and modifications to the building. A time variable (time elapsed since January 1971, in years) is also designed so as to capture rent inflation over time. In addition, 31 retail categories or category groupings based on the North American Industry Classification System (NAICS) are defined while the Herfindahl index is used as a measure of intra-category retail concentration. Regression models are calibrated using a log-linear functional form; a logarithmic transformation is also applied to the store size (*GLA*) variable.

On the basis of the academic literature, a series of four research hypotheses are tested that address the agglomeration economies and retail concentration issues. Analysis is performed in three steps. Firstly, the natural logarithm of base rent is regressed on basic descriptors, retail categories, and the concentration index. A single, overall concentration index (Model 1), as well as two location-specific concentration indices (Model 2) are used alternately in order to test for differences between Montreal and Quebec City. Then, segmented models are calibrated for Montreal (Model 3) and Quebec City (Model 4) shopping centers. Finally, interactive terms combining retail mix attributes with category-specific concentration indices are substituted for basic retail categories (Model 5) as a means for testing whether goods and services categories behave differently with respect to retail concentration.

With respect, firstly, to basic descriptors, the main findings can be summarized as follows:

- In line with Wheaton's (2000) findings, the percentage rent rate coefficient proves highly significant and positive in sign, suggesting it acts as a complement to, rather than as a substitute for, base rent.
- As expected, store size, by far the most prominent determinant of shopping center rents, affects rents negatively, a 10% increase in GLA resulting in a rent discount of roughly 4%.
- In line with Sirmans and Guidry's (1993) and Gatzlaff, Sirmans, and Diskin's (1994) findings, the age of a shopping center unambiguously affects rents downwards, which stresses the importance of both renovation and image enhancing strategies for shopping center investors.
- As expected, retail rents tend to increase over time with general inflation. The findings indicate that, overall, base rents have increased at an annual rate of roughly 1% over the period considered, although the figure is higher for Montreal centers (1.4%).
- Lease duration impacts positively on rents, which tends to corroborate Fisher and Lentz's (1990) assumption regarding the ability of shopping center landlords to capture through higher rents part of the business enterprise value generated by successful, long established tenants.

With respect to research hypotheses H_1 to H_4, the study yields the following:

- In contrast with research hypothesis H_1, higher agglomeration economies do not automatically translate into higher base rents. Instead, statistical evidence suggests that other factors, such as local retail market structure, as well as landlord's and tenants' strategies and constraints, are at stake in the rent setting process.
- Findings tend to confirm that retail categories do capture the agglomeration economies effect brought forward by Yuo, Crosby, Lizieri, and McCann (2004), or the lack of it, and, consequently, that the higher the retail category order the higher the base rent, and vice-versa.

- They also clearly suggest that while intra-category retail concentration, as measured by both global and location-specific Herfindahl indices, significantly affects shopping center rents, its impact is on the whole negative as a result of the increased bargaining power enjoyed by dominant tenants; thus, the higher the level of retail concentration, the lower the base rent.
- Finally, while several goods and services categories have their base rent affected downward by a higher degree of retail concentration, the study also suggests that retail concentration does not affect all categories similarly, with the magnitude and, eventually, the direction of its impact on base rent depending on the nature of the activity and the market dynamics that prevail for the category considered.

As a conclusion, the findings emerging from this research are most helpful at providing a better understanding of the structural link that exists between agglomeration economies generated in shopping centers, intra-category retail concentration, and base rent. More than anything though, the study brings out the complexity of such a relationship that requires addressing a series of issues, from retail mix strategies, bargaining power between parties, and competition for shopping center space to retail chain marketing constraints and policies, as well as local market structures for various goods and services. All these dimensions deserve further investigation.

Endnotes

[1] While quite extensive, DeLisle's (2005) review of past research on the retail sector is confined to articles published in the *Journal of Shopping Center Research* over the 1993–2005 period, with few, if any, studies referred to addressing the rent setting process through a modeling approach.

[2] While overage rents are—as in the U.S. —a common feature of Canadian shopping center rent rolls, they may not apply systematically. As an example, Place Laurier, the largest super-regional shopping center in the Quebec Metropolitan Area, which was acquired a few years ago by the SITQ, the real estate arm of the public pension fund *Caisse de dépôt et placement du Québec* (CDPQ), uses three types of lease agreements, namely base, percentage, and excess rent. In contrast, its direct competitor, Les Galeries de la Capitale, formerly owned by *Les Développements Iberville Inc*., a private, family-run business owning some 100 shopping centers throughout the province, resorts to nothing but base rent.

[3] In those cases, it is assumed that the competition for scarce space within regional and super-regional establishments combined with the high level of agglomeration economies resulting from that location works at the advantage of shopping center operators in the rent setting process.

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