The Impact of Retail Trade and Rental on Demand for Floor Space

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1. Introduction

1.1. This short paper explores the relationship between business sales receipts, retail rents and demand for retail floor space. The results show that demand for floor space by the *entire* retail sector responds positively but inelastically to changes in business income, and negatively and elastically to variation in shop rentals. In addition, adjustments in rentals pertinent to changes in business environment would take place rather quickly.

2. Hints from the Data

2.1. This study uses annual data as the stock of floor spaces and certain sectoral production related information are not available at higher frequencies. Prices, rents, stocks and vacancy figures are available from the RVD while sectoral sales and engagement figures can be found in Annual Surveys of Wholesale, Retail and Import and Export Trades, Restaurants and Hotels prepared by the C&SD.

2.2. We sum up our observations with the following:

[1] Changes in overall retail sales and retail rentals are highly synchronized (see Chart 1) indicating that any adjustments in rentals in relation to changes in business climate will be relatively quick to occur (*within a year* based on cross-correlation assessment).

[2] Retail floor space and retail employment appear to be complementary (see Chart 2), so one cannot easily substitute one for the other in the production process. In the diagram, higher unemployment is accompanied by higher retail property vacancy.

[3] Sector-wise, the general retail trade sector is more sensitive in altering its renting and hiring decisions *in response to rental changes* than food and restaurants (see Charts 3 and 4). The latter sub-sector, for instance, experienced more twists and turns in the number of persons engaged over the course of the sample period but the trend tracks the rental index less closely as compared to the retail trade counterpart.

3. Specification of the Framework

3.1. Whether the above are simply anomalies or are facts consistent with economic theory is what we try to find out in this section. The foundation of our analysis is the theoretical model of Hendershott *et al.* (2013). It is a simple demand and supply model of retail space:

$$Q_t^d = A_0 R_t^{\alpha_1} B_t^{\alpha_2}, \qquad (1)$$

$$Q_t^s = (1 - v_t) S_t. \qquad (2)$$

where the superscript d and s represent demand and supply respectively and the subscript t denotes time period, R indicates retail rent, B is business receipts or retail sales, v is the vacancy rate and S is the stock of retail space in the market. α_1 is the rental elasticity of demand for floor space while α_2 is the income elasticity. A_0 is an unknown constant of proportionality.

Chart 1. Retail Sales and Rents Track One Another Closely

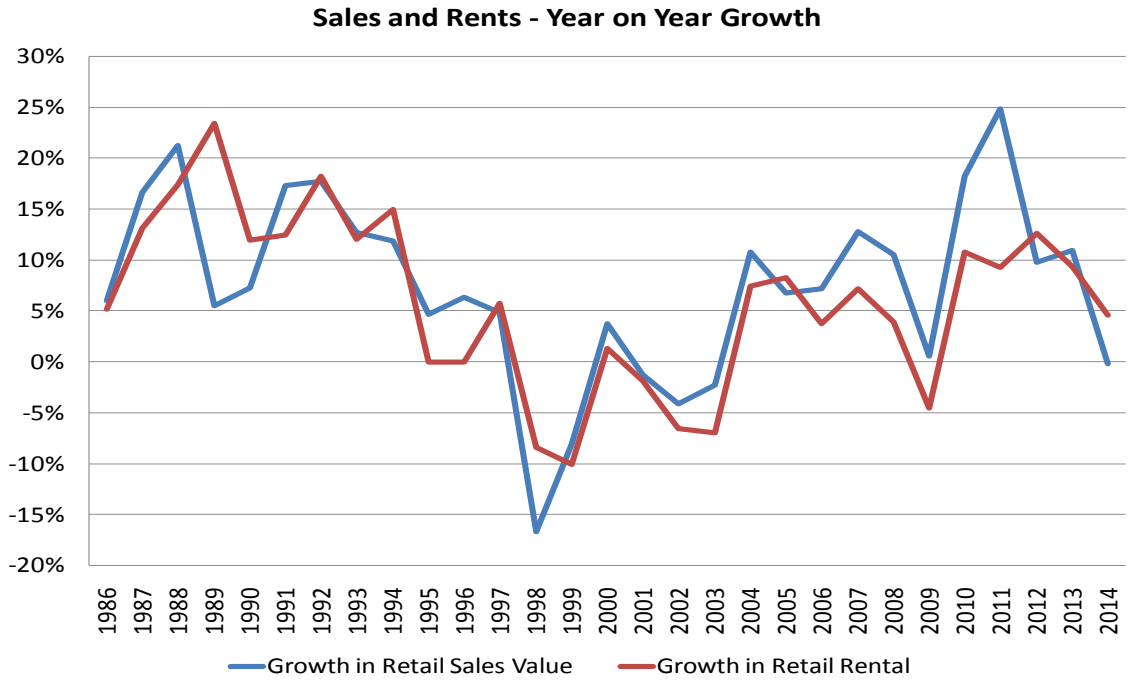


Chart 2. Floor Space Take-up and Employment Go Hand in Hand

Chart 3. Food and Restaurants Fluctuate More Often But Tracks Rental Less Closely Than General Retail Trade

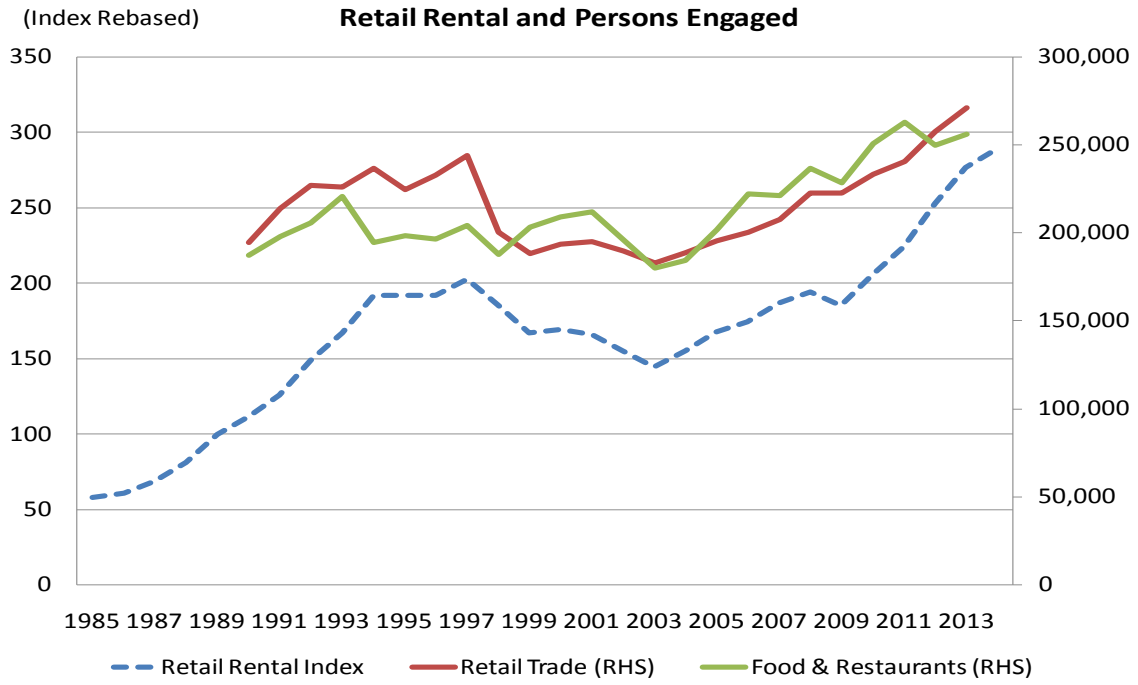
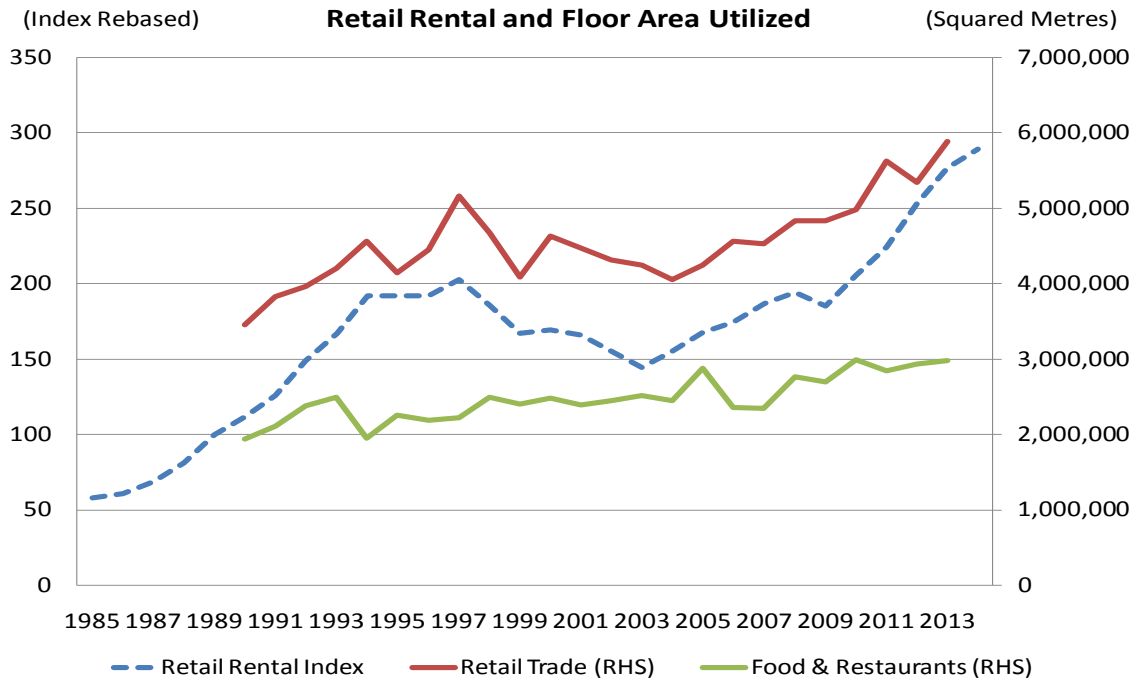


Chart 4. General Retail Trade Tracks Rentals More Closely Than Food & Restaurants In Terms Of Floor Space Utilization



3.2. Equation (1) says that the demand for retail space is of Cobb Douglas form which depends on rent and business income. Equation (2) is the supply schedule which is essentially exogenous in that it does not depend on retail rent. Take logs of both equations, impose the market clearing condition (demand equals supply) and rearrange terms yield:

$$logR_t = \beta_0 + \beta_1 logB_t + \beta_2 logS_t + \beta_2 \log(1 - v_t). \qquad (3)$$

where the parameters of (1) and (3) are related as follows:

$$\alpha_1 = \frac{1}{\beta_2}, \qquad \alpha_2 = -\frac{\beta_1}{\beta_2}. \qquad (4)$$

3.3. Equation (3) is of a form that is easy to estimate and equation (4) says that we can retrieve the elasticities of interest by manipulating the estimation results.

3.4. We made two major modifications to the demand-supply model before performing the estimation. The first concerns the demand equation. Our observation in paragraph 2.2 [2] suggests that production activities in the retail sector would probably require a mix of both labor and land input. From the duality of cost and production, equation (1) can be considered as an implicit form of the retailer's production function with business sales being the output. Introducing labor input not only strengthens the theoretical argument, but also, as we will see later, improves notably the significance of the estimates. Similar to growth accounting regression, we also find that expressing factor inputs on a per unit labor basis produce the most appropriate specification in terms of model adequacy.

3.5. The second refinement concerns the vacancy rate v_t. The original model considers a time invariant (i.e. constant) "natural" rate of retail vacancy which prevails in market equilibrium. Such a natural rate is, of course, not observable (and not identifiable) and is absorbed into the intercept term of the regression equation. The constancy restriction does not sound reasonable, and more importantly, it ignores the fact that the equilibrium vacancy should be endogenously determined with floor space demand. To resolve this issue, we estimated equation (3) by

first filtering out the cyclical component of the vacancy series using the HP filter.

3.6. To assess the robustness, we also ran a separate estimation of the model using the instrumental variable approach. We chose unemployment rate as the instrument for vacancy (see Chart 2), regressed vacancy on the chosen instrument and other exogenous variables, and replaced v_t in (3) with the predicted vacancy before performing the ultimate estimation. The filtered vacancy approach and the instrumental variable approach produce extremely similar results in terms of estimates and significance. We picked the former for presentation given its marginally higher level of model fit.

3.7. After deflating rents and business income[1] by CCPI, we ran the regression using the Cochrane-Orcutt method. The result is summarized as follows:

Table 1. Regression Results for Overall Retail Market

Parameters	Estimates	p-values	Other Statistics	
β_0	26.331	0.000	R^2 (Cochrane-Orcutt)	0.615
β_1	0.456	0.001	Durbin-Watson	1.963
β_2	-0.683	0.000	1st order autocorrelation	0.814

Recall that the Cochrane-Orcutt regression runs on partially differenced data and the reported R^2 here is lower than what we would have obtained when running on data in levels. The differencing procedure eliminated the serial correlation of residuals, and produced estimates that are significant and have the correct signs.

3.8. From the relationships in (4), we can calculate the demand elasticities:

$$rental\ elasticity\ of\ demand\text{:}\ \ \alpha_1 = \frac{-1}{0.683} = -1.464,$$

[1] It is the sum of business receipts of the two subsectors rather than aggregate retail sales.

$$income\ elasticity\ of\ demand\colon\ \ \alpha_2 = \frac{-0.456}{-0.683} = 0.668.$$

That is, *the demand for retail space is elastic to changes in retail rent* (on a per person engaged basis) and *inelastic with respect to changes in business income* (on a per person engaged basis). On the other hand, if one cares about the impact of a drop in business on retail rent, the coefficient $\beta_1 = 0.456$ gives us a clue. According to it, a 10% deterioration in business prospects will result in approximately 4.6% drop in retail rents, to be realized probably within a year (see paragraph 2.2 [1]).

3.9. Finally, we extended the analysis by performing sector by sector regressions. We applied the same methodology to data from the general retail trade sector and the food & restaurant sector separately. The results are tabulated below:

Table 2. Regression Results by Individual Sectors

Retail Trade			**Food & Restaurants**		
Parameters	Estimates	p-values	Parameters	Estimates	p-values
β_0	40.643	0.000	β_0	45.414	0.000
β_1	0.335	0.099	β_1	0.805	0.009
β_2	−0.214	0.104	β_2	−1.066	0.000
R^2	0.165		R^2	0.554	
Durbin W.	2.489		Durbin W.	2.501	
Autocorr.	0.841		Autocorr.	0.755	
α_1	−4.673		α_1	−0.938	
α_2	1.565		α_2	0.755	

We can see that the findings differ substantially across the sectors:

- The estimates for the restaurant sector are significant at the 1% level. Rental elasticity of demand is more or less unit elastic while income elasticity is strictly inelastic.

- The estimates of the non-intercept parameters for the retail trade sector are only marginally significant at the 10% level, and the overall model fit is substantially lower than that of the restaurant sector. In addition, the retail trade sector is much more responsive to rental changes and income changes, with respective elasticities that are 4 times and 2 times those of the restaurant counterparts.

3.10. These findings echo our observations stated in paragraph 2.2 [3]. Restaurants are *relatively* insensitive to rent changes and income changes when compared with general retail trade. We attribute this to the following:

[1] Rents of retail trade are higher than rents of restaurants. The former was about 1.5 times the latter per square metre in 2011. In per unit labor terms, the ratio was even higher at 3.3 times (up from about 2.3 times back in 1990). This phenomenon could owe to the arguably heavier weight of luxuries in retail trade as opposed to food and beverages and the scarcity of prime district retail floor space.

[2] A 2013 retail report by Savills indicated that the share of food and beverages occupants was about 17% in prime district retail outlets while the proportion in neighborhood areas was over 30%. The corresponding ratios for apparel were pretty much the other way round, at 36% (prime districts) and 8% (neighborhood) respectively. Department stores, likewise, had ratios of 11% (prime districts) and 1% (neighborhood). So, retailers, potentially those selling high end products and services, would have a higher likelihood of paying premium rents that can only be justified with respectable sales income. Sharp retrenchment in sales would therefore prompt drastic reactions by the retailers in core shopping areas.

3.11. The above notwithstanding, the radical rent corrections mentioned in the introduction section would most likely be outliers and the aggregate or average rent levels would be much less as long as the dip in retail sales is contained in the single digit level.

Reference

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