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Retail Productivity: Concept and Analysis for an Emerging Retail Sector

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Introduction

In this study, there are three major objectives. Firstly, I intend to conceptualize the construct "Retail Productivity" and develop a model to measure it from the existing literature. Secondly, I want to validate it with appropriate industry feedback to establish its usability in current retail scenario and emerging economies. Finally, I want to extend the theoretical and practical (on-field) dimension of retail productivity academically and develop few propositions as directions for this line of study further.

One of the prime reasons for undertaking the study of retail productivity is the existing retail scenario all over the world and specifically in emerging economies like India. All over the world, there is lack of growth in retail sector and retailers in India are showing rather poor results for the last few years in spite of quite creditable growth. According to ICRIER (2008), the GDP of India was expected to grow at 8 – 10 % per annum in the next 5 years. Consequently, the retail business in India was estimated to grow at 13% per annum (from USD 309 billion in 2006 – 07 to USD 496 billion in 2011 – 12. However, during this period, we have observed steady decline in year – on – year sales growth from 62% to 11% (KPMG, 2009). We have also observed increase in working capital, decline in inventory turnover and rather drastic reduction of net profit margin (3.9% in 2007 December to 0.3 % 2008 December) during this period (KPMG, 2009).While looking at their performance data and analyzing the reasons, one gets quite confounded with the lack of commensurability of their performance score. Even though majority of them do talk about retail productivity as the performance measure, probably each one of them means different things by it. Retail productivity is equated to store productivity, profit, sales per square foot, employee turnover or even return on investment. Interview with the store owners / managers failed to clarify this multiplicity of retail productivity concept. Hence, there is complete lack of clarity for retail productivity at the conceptual level and the powerful construct that it is; there is surely a need to explore it further.

Apart from the fact that there is lack of clarity in conceptualization and lack of standardization in measurement and interpretation of retail productivity, there are other reasons for the continued interest in retail productivity. Appropriate analysis and interpretation of retail productivity provides

significant strategic as well as tactical input to retail business. Both micro as well as macro level application makes retail productivity one of the most significant retail performance measurement tool. With business sector, productivity could provide vital input to decision making at most levels viz., tactical, strategic as well as policy level (Moreno, 2008; Misterek, Dooley and Anderson 1992). Dubelaar, Bhargava and Ferrarin (2001) have clearly highlighted the usage of productivity at strategic and tactical levels of decision making for any business sector. On a strategy level, the decisions of differentiation, positioning, growth as well as diversification, to a large extent, would draw its resources from productivity data (Walters and Laffy, 1996). Further a macro level study of productivity (Ingene, 1984; Ortiz – Buonafina, 1992; Nooteboom, 1983) would yield inter – firm and inter – industry performance comparison within / between countries and this could lead to government policies as well as strategic directions (say employment issues, development of the farmers and traders etc.).

Beyond the literature, there could be another reason to revisit retail productivity. The retail sector has also undergone a sea change. The macro level environments as well as the extraneous variables for the retail sector have changed significantly. With increasing globalization, free information exchange and global sourcing, the competitiveness in the retail sector has become rather dynamic. Due to the obvious differences in the micro (elements of retail business and the different stakeholders etc.) and macro (Customer demographics and psychographics, government policies, technology development etc.) level environments between countries with matured retail sector and nascent retail sector, the retail operations and growth models of both the economies may not overlap (evidences are already observable with Asian and south American countries). For example, technology might cease to be a source of sustainable competitive advantage with cloud computing and remote data storage facilities available at affordable cost; on the contrary, an innovative merchandising or value based marketing might be more sustainable. Therefore, it is significant to validate the existing retail performance measures and productivity models against the emerging retail sectors and check their relevance.

At this point, it would quite prudent to formally understand and explain the construct productivity in general and retail productivity specifically. Productivity is essentially an economic concept of relation between output and input that evolved over time based on the requirements of the academicians as well as practitioners. As the early economic theories are based on manufacturing systems, the concept of productivity draws its usage from production function highlighting the significance of the production (manufacturing) process (Tangen 2002; Singh, Motwani, and Kumar 2000). One of the most frequently used methods of measuring productivity is as a ratio of output to

input. However, there has been some lack of clarity or overriding generality regarding the input as well as output constructs and consequently their measurement processes.

A retail council of Canada study (1978) defined productivity as "operating and economic performance of any business". In retail sector, one can identify the usage of retail productivity for more than half a century in retail literature although always not with the same conceptualization, usage or interpretation. Most of the earlier studies focused on the performance of distributive trade and provided direction towards including the intangible service component in measuring productivity. Subsequently, the concept of retail productivity underwent some changes as per the requirements of the business and changing environment. One can find some of the most significant works on retail productivity with Arndt and Olsen (1975), Ingene (1982 and 1985), Ratchford and Brown (1985), Ratchford and Stoops (1988), Kamakura, Lenartowicz and Ratchford (1996), Reardon, Hasty and Coe (1996), Reardon and Vida (1998), Keh and Chu (2003). While all these studies conceptualized retail productivity as a ratio of output to input, their scope of study, its subsequent computation method and usage displayed no common pattern. As per Koss and Lewis, 1993; Forrester, 1993; Misterek, Dooley and Anderson 1992, the definition, method of measurement and context of usage of the term productivity have always not been the same.

Before proceeding further with the study, let me present a snapshot of it. The rest of the paper is organized as follows. "Literature review" section summarizes some of the relevant papers chronologically in a tabular format. In the model development section, I develop a model for measuring retail productivity based on the significant studies in literature review. Subsequently I validate the model empirically by creating and using data from Indian retail sector. In the industry feedback section I carry out some forms of experimental designs to validate the model created in the previous section. Subsequently, in background extrapolation section, I developed and established a few propositions that clarified the concept of retail productivity as well as its constituents and correlates and provide scope for furthering this study.

Literature review

A time series based content analysis of the relevant papers (from retail productivity view point) are presented in a tabular format below.

Table 1

Year of Publication	Author	Journal	Frame of reference	Output factors	Input factors	Method
1968	L.J.Konopa	Journal of Retailing	Census of Business data normalized based on consumer purchase power index	Sales	1. No. of Establishment 2. no of paid employees	Ratio
1975	**Arndt, Olsen**	**Swedish Journal of Economics**	**10% sample of all grocery stores and general stores that were in operation throughout 1971 in selected trade area of Norway**	**Gross Profit**	**1. No. of Persons engaged 2. Floor space**	**Fitting Cobb – Douglas function, Regression**
1977	Takeuchi, Bucklin	Journal of Retailing	Census of Business data 1967, USA and Census of Commerce data 1968, Japan	Sales	1. no. of. Establishments 2. no. of. employees	Multiple linear Regression
1982	**C.A. Ingene**	**Journal of Marketing**	**Retail grocery trade data for Standard Metropolitan Statistical Areas, Census of Retail Trade data**	**Sales (monetary value)**	**1.Retail Wage rate 2.Household income 3.Household mobility 4.Average store size**	**Ridge Regression**
1982	B. Nooteboom	European Economic Review	Grocery chain	Sales	1. No. of Employees 2. Labor hours	OLS Regression
1984	Achabal, Heineke, McIntyre	Journal of Retailing	N.A.	Capability to make sales	N.A.	Retail executives' interview
1984	W.S. Good	Journal of Retailing	From the comprehensive database of Newfoundland and Ontario firms; stratification based on number of employees; 32 stores in Newfoundland and 64 in Ontario	Value Added	N.A.	Multiple Regression
1984	R.F. Lusch,	Journal of Retailing	NRHA questionnaires for Hardware store operators;	Value Added	Total no of employees	Multiple Regression

	Moon Soo Young		sample size 751			
1985	**C.A. Ingene**	**Journal of Marketing**	**Retail grocery trade data for Standard Metropolitan Statistical Areas, Census of Retail Trade data**	**Gross Margin**	**1.Wage rate 2.Capital Intensity 3.Household income 4.Household Size**	**Regression with removal of collinearity**
1985	B.T. Ratchford, J. R. Brown	Marketing Science	Grocery Chain	Value Added	Labor,Capital	1. Extreme case analysis 2. Optimization 3. Regression
1988	B.T. Ratchford, G. T. Stoops	Journal of Retailing	9 outlets of one retailer	Labor hours requirement	1. Quantity sold, 2. Shelf space, 3. customer interaction time	Ehrlich and Fisher Model, log – linear regression
1996	W.A.Kamakura, T. Lenartowicz, B.T. Ratchford	Journal of Retailing	188 branches from a commercial bank in Latin America within a large metropolitan area	Deposits, Service fees, in – transit funds	Labor, Area in square meters	Cluster wise translog function, Data Envelopment Analysis
1996	**J. Reardon, H. Ron, C. Barbara**	**Journal of Retailing**	**A non-probability sample of 521 retailers in Dallas – Fort Worth CMSA as defined by US census of Retail Trade**	**Value Added**	**Labor, Capital, Components of Information Technology**	**Modified Cobb – Douglas with Trans-log function**
1998	N. Donthu, B. Yoo	Journal of Retailing	24 outlets of a fast food restaurant chain in a major metropolitan city	Sales/Profit, Value added	Environmental condition, customer factors, managerial efforts, Employee factors	Data Envelopment Analysis

1998	J. Reardon, I. Vida	International Review of Retail, Distribution and Consumer Research	A non-probability sample of 521 retailers in Dallas – Fort Worth CMSA as defined by US census of Retail Trade	Value added (monetary value) and physical units separately	Labor and square feet area	Cobb – Douglas, Series of multiple regression equations
2001	C. Dubelaar, M. Bhargava, D. Ferrarin	Journal of Business Research	354 Pharmacy retailers in New Zealand and 336 from Australia	Retail performance, Labor type and size, demand, competition parameters		Structural Equation Modeling

Few factors are quite obvious from the content analysis table above. In the early years, retail productivity was measured as a ratio whereas later on regression analysis (and its different variants) seems to be the most preferred tool for measuring retail productivity. Data envelopment analysis and structural equation modeling constitute some of the recent developments for the measurement of retail productivity. Sales, profit and value added seem to be the major choices as output parameters where as labor (hour, number, wages etc.) and capital constitute the most accepted independent variables. There is no standardization in the frame of reference; however, most of the papers are based on macro level data or macro level analysis. Therefore to develop some clarity regarding selection of the methodology, dependent as well as independent variables, I need to test the validity of available retail productivity model against the current retail scenario in evolving markets.

As there is lack of agreement among the studies earlier regarding the methodology, I need to highlight the methodological challenges for this study. In order to test the retail productivity model, the dependent and independent variables, suggested model and estimation methods need to be identified and developed from the available literature. If needed, the control variables need to be defined for ensuring the validity of the study. For empirical study, the sampling frame and method need to be determined.

Model Development

From the literature review it is pretty clear that as an output of retail productivity, there is equal preference for sales and value added. Because of ease of data availability and subsequent data interpretation, I can consider sales as the output (dependent) variable. To identify independent variables I can refer to few significant studies from Table 1 and develop a comprehensive input framework. However, one needs to be careful about the frame of reference and uniqueness of each study and pick up input variables that are universally available and applicable. Arndt and Olsen (1975) took labor and capital as independent variables where labor is measured in terms of number of employees and capital in terms of total floor space. Ingene (1982 and 1985) too selected labor and capital as independent variables; however, he was more elaborate than the previous studies. He measured labor in terms of annual retail wage rate and capital in terms of store size in thousands of square feet and capital intensity (total grocery store floor space in thousands of square feet divided by number of employees). Apart from that Ingene also identified consumer categories and store size as well as store type as possible confounding variables and hence chose grocery stores for his study and included consumer as well as competition related factors in input variables (viz., income, household size, population growth, labor efficiency / competitiveness, retail space saturation, sales / employee etc.). Reardon, Ron and Barbara (1996) took labor, capital and IT (Information Technology) as input variables and found support for all three in there model. They measured each of the three input variables in numbers as well as cost.

Based on the discussion above, I may consider labor and capital as the obvious input variables. I will also consider IT for the input variable as in the current era technology plays a very significant role in retail business and specifically, it would help improving the merchandise tracking and turnover. The relevant hypotheses regarding input variables are given below.

H_1: *Labor has a positive and significant effect on the output of retail stores.*

H_2: *Capital has a positive and significant effect on the output of retail stores.*

H_3: *IT has a positive and significant effect on the output of retail stores.*

However, I will also need to take care of the control variables which can confound the results. Analysis of the studies in Table 1 indicates three potentially confounding parameters. They are Consumer characteristics and store size. The relevant hypotheses are given below. Store type is also a confounding parameter and therefore, I have decided to focus our study on apparel and lifestyle stores.

H_4: Different segments of consumers have different choice so far retail stores patronization is concerned and hence they contribute differently to retail productivity. I can expect different models for the same.

If I consider retail sales as the dependent variable and labor, capital as well as IT as the independent variables, it would be extremely difficult to collect customer segment specific empirical data for the same. Therefore, I would accept store location as the proxy for consumer characteristics. This is due to fact that retail stores are essentially location based businesses and primary trading area is essentially within five to fifteen kilometer vicinity (India Retail Report, 2009). Of course the specific size of the trading area and the type of consumers patronizing the store would depend upon the type of geographic location. I can consider prime location based stores as proxies for SEC A (Socio-Economic Classification) consumers and neighborhood (non-prime) based stores as proxies for SEC B consumers.

H_5: Different store sizes warrant different allocation of the elements of retail mix and hence different turnover of merchandise. Therefore, I can expect different productivity models for the same.

I can categorize types of stores where within each category; the store size would be homogenous. Based on the type of store prevalent in the study area, I choose to categorize stores as small (less than 3000 square feet store space) and medium (less than 25000 square feet store space) and collect empirical data separately for testing the hypothesis. Both these definitions of the small and medium sized stores are constructed based on the empirical evidence in the study area.

Cobb – Douglas productivity function has been the most preferred modeling basis for retail productivity (Table 1) and therefore, I intend to use the same for our model development. The estimation method has been linear regression. The proposed model is given below.

$$S = AL^{\alpha}K^{\beta}IT^{\gamma} \qquad \ldots\ldots\ldots(1)$$

Where

S = Sales output to retail productivity

A = Total factor productivity

L = Labor input to retail productivity

K = Capital input to retail productivity

IT = Information Technology input to retail productivity

α = Elasticity of labor

β = Elasticity of capital

γ = Elasticity of IT

Research methodology for model validation

As there is no existing database available for retail stores, I decided to develop the database for small and medium stores. I used a publicly available data source (retailangle.com) to develop the name and address of stores. As our definition of apparel and lifestyle stores and the definition of the website did not match accurately, I decided to include denims, discount brands, fashion brands, kids wear, lifestyle retailers, men's wear and women's wear categories of stores in our database. The website database not only provided the store name, address and telephone number, but also their location in the city with a map. For development of an adequate sample frame I decided to focus on cities with relatively large number and different sizes of apparel and lifestyle store and for feasibility sake I needed to concentrate on a few cities. Therefore, I decided to consider Bangalore, Mumbai and New Delhi (in India) for our study. Bangalore yielded 287 stores, Mumbai 395 stores and New Delhi 486 stores. These 1168 stores formed our initial frame of reference. Due to the availability of the Google map of the store locations, I could segregate them into prime and non-prime location stores. However, I had no real information on the store size. Therefore, I used telephonic interview as well as physical check to categorize them into small and medium stores. I also sought their permission to participate in this survey. After the store dropouts and elimination due to inaccuracies, I created a sample frame of 461 stores. The number of stores per category is given in Table 2. Subsequently, I carried out a simple random sampling for each category of store and chose 50 stores for survey from each category.

Table 2

	Prime location stores	Non – Prime location stores	Total
Small size stores	70	128	198
Medium size stores	146	117	263
Total	216	245	461

Model Validation

As mentioned in the research methodology, I considered 50 stores each in survey for each of the four categories (Table 2). I developed the regression model based on Cobb-Douglas production function with sales as dependent variable and labor, capital and IT as the independent variables. The result for each category is discussed separately below.

Small size stores Prime location

Table 3a

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.410[a]	.168	.114	1.8700168	.168	3.100	3	46	.036

a. Predictors: (Constant), Log Labor, Log IT, Log Capital

Table 3b

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-12.439	9.690		-1.284	.206		
	Log IT	.359	1.030	.047	.349	.729	.992	1.008
	Log Capital	2.836	.948	.407	2.992	.004	.977	1.024
	Log Labor	-.009	1.171	-.001	-.008	.994	.969	1.032

a. Dependent Variable: Log New Sales

Tables 3a and 3b indicate not – too - good model fit for retail productivity (R^2 =.168). There is not enough evidence to support the two hypotheses H_1 and H_3. Neither of the two independent variables, labor or IT can be considered for influencing retail productivity in small sized stores situated in prime locations. However, capital is considered a significant independent variable for retail productivity

(β = .407). Therefore, H_2 cannot be rejected. It is also significant to observe the poor efficiency level (45%) in the performance of small sized stores situated in prime locations. Sum of the beta values for all the three independent variables is .453 only.

Small size stores non-Prime location

Table 4a

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.469[a]	.220	.169	1.6602151	.220	4.323	3	46	.009

a. Predictors: (Constant), Log Labor, Log IT, Log Capital

Table 4b

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-13.259	7.809		-1.698	.096		
	Log IT	-.614	1.060	-.076	-.579	.565	.995	1.005
	Log Capital	1.871	.935	.274	2.000	.051	.903	1.107
	Log Labor	2.338	1.089	.295	2.146	.037	.900	1.111

a. Dependent Variable: Log New Sales

Tables 4a and 4b indicate not – too - good model fit for retail productivity (R^2 =.220). There is not enough evidence to support the hypothesis H_3. IT as an independent variable cannot be considered for influencing retail productivity in small sized stores situated in non-prime locations. However, both H_1 as well as H_2 cannot be rejected and hence both labor and capital can be considered as significant variables for influencing retail productivity in case of small sized stores located in non - prime locations. Again the lack of efficiency in store performance here is also quite noticeable (49%).

Apart from the above mentioned facts, it is quite interesting to find support for H_4. Observations from Tables 3 (a, b) and Tables 4 (a, b) make the difference of retail productivity models and significant independent variables quite obvious. Therefore, customers are significant influencing parameters in retail productivity in small sized stores. By controlling for location of the store as the proxy in the model, I have been able to account for the customer parameter in the model.

Medium size stores Prime location

Table 5a

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.267[a]	.071	.011	.0865655	.071	1.179	3	46	.328

a. Predictors: (Constant), Log Labor, Log Capital, Log IT

Table 5b

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	4.335	1.617		2.680	.010		
	Log IT	.215	.156	.198	1.378	.175	.979	1.022
	Log Capital	.157	.147	.153	1.069	.291	.985	1.015
	Log Labor	.068	.166	.059	.413	.682	.989	1.011

a. Dependent Variable: Log New Sales

Tables 5a and 5b indicate not – too - good model fit for retail productivity (R^2 =.071). There is not enough evidence to support the hypothesis H_1. Labor as an independent variable cannot be considered for influencing retail productivity in medium sized stores situated in prime locations. However, both H_2 as well as H_3 cannot be rejected and hence both capital and IT can be considered as significant variables for influencing retail productivity in case of medium sized stores located in prime locations. Again the lack of efficiency in store performance here is also quite noticeable (41%).

Medium size stores non-Prime location

Table 6a

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.375[a]	.141	.085	.1685876	.141	2.509	3	46	.070

a. Predictors: (Constant), Log Labor, Log Capital, Log IT

Table 6b

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.079	3.021		.357	.723		
	Log IT	-.131	.317	-.057	-.412	.682	.971	1.030
	Log Capital	.215	.331	.090	.650	.519	.984	1.016
	Log Labor	.956	.371	.359	2.579	.013	.962	1.040

a. Dependent Variable: Log New Sales

Tables 6a and 6b indicate not – too - good model fit for retail productivity (R^2 =.141). There is not enough evidence to support the two hypotheses H_2 and H_3. Neither of the two independent variables, capital or IT can be considered for influencing retail productivity in medium sized stores situated in non-prime locations. However, significance of labor is quite clear and hence, H_1 cannot be rejected. The efficiency level for the medium sized stores in non-prime locations is about 39% and hence there is lots of scope for improvement.

Apart from that, significance of the customers in retail productivity of medium sized stores is quite noticeable due to the difference of model structure and significant variables in Tables 5 (a, b) and Tables 6 (a, b). Therefore, I could conclude that there is enough evidence for the support of H_4 again. It is easily observed that the models and significant variables are not the same for small and medium sized stores even in similar locations (Comparison of Tables 3 – a, b and 5 – a, b; 4 – a, b and 6 – a, b) and

hence store size can be considered a significant parameter influencing retail productivity. It could be easily ascertained that there is support for H_5. By controlling for store size, I have been able to account for the influence of store size.

As there is low model fit with the often used linear regression, it is rather difficult to conclusively comment on the methodology or model for retail productivity. Multiple issues could be involved in the concept and model development of retail productivity. Therefore, I decided to bring in field level implementation of the empirical evidences based on the already available regression results. This will not only revalidate the retail productivity model, it would also provide the perspective of the most significant stakeholders – the retailers.

Industry Feedback

I sought permission of the stores (both small and medium stores already used by us for empirical study) for an experimental study over two month period based on our empirical results. In order to make the experimentation feasible (store cooperation), I decided to manipulate the variables without making any significant change to the store operations or incurrence of cost. The store type and the experimental variables (obtained from the empirical study highlighted in tables 3, 4, 5, 6) are given below.

Table 7

Store size Location	Prime	Non-Prime
Medium	Capital	Labor
	IT	
Small	Capital	Labor
		Capital

Research Design

Here sale is the dependent variable and capital, labor, and IT are the independent variable. In the regression models described earlier (equation 1), the input variables labor, capital and IT are considered as their respective cost (expenses) figures. As I have decided against any significant manipulation of cost (for practical reasons), it was decided to identify measurable / observable levels of the input variables and subsequently use it for experimentation. For this purpose, first I studied the

SOPs (standard operating procedures) of three small stores and two medium stores. From that I listed the major observable activities of the employees in the store.

I carried out a survey among the consumers of these stores (already selected and used for prior empirical study) to identify the most significant activities of store employees that they have visited and the activities that influence them the most. Number of employees, customer interaction and cash counter handling emerged as the most significant labor activities in the store. Out of these three activities, cash counter handing being a key store activity, faced opposition from the stores for manipulation. I decided to focus upon the other two i.e. number of employees and customer interaction in the store.

For IT, I followed (Reardon, Hasty, Coe, 1996) study to identify the possible usages of IT in retail sector. Reardon et.al has identified 19 different IT usages in retail stores and from that I chose 2 usages for our study (based on significance and feasibility of implementation). They are presence of systems and processes (i.e. POS, MIS, EDI, Inventory tracking and ordering etc.) and number of terminals in the store.

Capital is the most difficult variable to manipulate within feasibility limits. Therefore, I decided to control for capital element without actually changing / manipulating it based on the available data and comparing sales data with it to arrive at any conclusion.

Small Stores in Non-Prime locations

For small stores situated in non-prime locations, capital and labor should influence sales. Both the variables under consideration are rather impossible to manipulate in small stores. I have already discussed about the difficulty of manipulating capital and its usage as control variable. In small store situated in non-prime locations, there are 1 to 3 employees and there is rather high turnover period of employees (3 – 6 months). Hence, it was impossible get any cooperation from stores regarding manipulation of labor force. With our inability to carry out random assignment of stores to treatments, it can no more be a true experimental design. However, there are significant variations in the static data that I used for empirical analysis of equation 1 (capital has an Rs.7, 20,194 /- range per annum and labor Rs.1, 15, 461/-). I did code them into dummy variables and test it against sales to verify the incumbent hypotheses.

H_6: Higher capital leads to higher sales.

H_7: Higher investments in labor lead to higher sales.

The univariate 2 way analysis of variance was carried out the results are given in Table below.

Table 8a

Between-Subjects Factors

		N
Labor	1	10
	2	22
	3	14
Capital	1	13
	2	18
	3	15

Table 8b

Tests of Between-Subjects Effects

Dependent Variable:New Sales

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7.492E13	7	1.070E13	2.081	.070
Intercept	5.219E14	1	5.219E14	101.468	.000
Labor	8.779E12	2	4.389E12	.853	.434
Capital	2.162E13	2	1.081E13	2.101	.136
Labor * Capital	5.007E13	3	1.669E13	3.245	.032
Error	1.955E14	38	5.144E12		
Total	8.340E14	46			
Corrected Total	2.704E14	45			

a. R Squared = .277 (Adjusted R Squared = .144)

At 0.05 level, for degrees of freedom 7 (model) and 38 (error) the critical F value is 2.25 (approx). The calculated F value is below it (2.081) and hence, the null hypothesis could not be rejected. Therefore, there is no significant difference between the sales of stores with different capital and labor investments. H_6 and H_7 could not be accepted.

Small stores in Prime locations

For small stores situated in prime locations, capital should influence sales. I have the capital and sales data for 45 stores (from empirical study of equation 1). If capital influences sales in a positive way, then higher capital should display higher sales.

H_8: Higher capital leads to higher sales in case of small stores situated in prime locations.

To carry out this test, I converted the capital invested data into categorical variable and carried out one way ANOVA. The result is given below.

Table 9a

Descriptives

New Sales

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
4.0000	6	3.231697E6	1.0999938E6	4.4907059E5	2.077324E6	4.386070E6	1.8043E6	4.7866E6
5.0000	21	3.858912E6	3.1925809E6	6.9667828E5	2.405667E6	5.312158E6	125595.4587	1.0187E7
6.0000	18	3.401888E6	1.9843810E6	4.6772308E5	2.415079E6	4.388698E6	181260.6316	6.7330E6
Total	45	3.592474E6	2.5215841E6	3.7589556E5	2.834906E6	4.350042E6	125595.4587	1.0187E7

Table 9b

ANOVA

New Sales

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.926E12	2	1.463E12	.222	.802
Within Groups	2.768E14	42	6.592E12		
Total	2.798E14	44			

At 0.05 level, for degrees of freedom 2 and 42 the F value is 3.20 (approx). The calculated F value is much below it (0.222) and hence, the null hypothesis could not be rejected. Therefore, there is no significant difference between the sales of stores with different capital structure. H_8 could not be accepted.

Medium stores in Non-Prime locations

For medium stores situated in non-prime locations, labor should influence sales. The two significant labor parameters here are number of employees and levels of customer interaction in the stores. Here I have 2 independent variables with 2 levels of treatment each (employee number normal and more – 10% extra; customer interaction regular and improved) per variables. The interaction between the treatment variables is possible. Therefore I decided on a 2*2 factorial design to study the impact of labor on sales in medium stores in non-prime locations. The design is given below (Table 10)

Table 10

Number of Employees	Normal	More (10% extra)
Customer interaction		
Regular		
Improved		

From the 50 stores in our empirical database (for medium stores in non-prime locations), I randomly assigned 10 stores to each cell (Regular – Normal, Regular - More, Improved – Normal and Improved – More). The stores with more employees as treatment variable hired some part time employees for 2 months and the new recruits were given rigorous on - the –job training for two weeks. The study started only after the successful induction of the new recruits. I identified some key sections (men formals, ladies accessories, ladies Indian, ladies western etc.) where only one sales person was manning multiple sections. In those sections the new recruits were stationed (so that with high foot fall rate of the customers the difference would be noticeable). For customer interaction variable, I identified 2 key constituents of customer interaction. They are ability to locate the merchandise and present the customer quickly (2 minutes) with his / her requirements, and customer complaint handling. I trained the employees of the stores with improved customer interaction treatment for 2 weeks and the study started only after the reporting of improvement by independent experts. I chose a normal period of sales (without any special events like festivals, discounts etc.) for our study and it lasted for almost 2 months. The incumbent hypotheses and the subsequent analysis results (2 way univariate analysis of variance) are given below.

H_9: More number of employees in the store leads to improved sales.

H_{10}: Improved customer interaction by employees in stores leads to improved sales.

Table 11a

Between-Subjects Factors

		N
Labor no	1	20
	2	20
Customer Interaction	1	20
	2	20

Table 11b

Tests of Between-Subjects Effects

Dependent Variable:Sales

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2.386E12	3	7.955E11	.590	.625
Intercept	1.736E15	1	1.736E15	1288.219	.000
Laborno	1.206E12	1	1.206E12	.895	.351
CustomerInteraction	9.238E10	1	9.238E10	.069	.795
Laborno * CustomerInteraction	1.088E12	1	1.088E12	.807	.375
Error	4.852E13	36	1.348E12		
Total	1.787E15	40			
Corrected Total	5.091E13	39			

a. R Squared = .047 (Adjusted R Squared = -.033)

At 0.05 level, for degrees of freedom 3 (model) and 36 (error), the F value is 2.88 (approx). The calculated F value (0.590) is much below it and hence, the null hypothesis could not be rejected. Therefore, there is no significant difference between the sales of stores with different number of employees and different customer interaction. H_9 and H_{10} could not be accepted.

Medium Stores Prime Locations

For medium sized stores situated in prime locations, capital and IT should influence sales. Based on our feasibility criteria (no extra cost or change of processes for the stores), it is rather difficult to implement experimentation. Both capital and IT variables proved impossible to manipulate in the short run with the prevailing market condition in India. With our inability to carry out random assignment of stores to treatments, it can no more be a true experimental design. However, there are significant variations in the static data that I used for empirical analysis of equation 1 (capital has an Rs.10, 000, 00 /- range per annum and IT Rs.30, 000, 00/-). I did code them into dummy variables and test it against sales to verify the incumbent hypotheses.

H_{11}: Higher capital leads to higher sales.

H_{12}: Higher investments in IT lead to higher sales.

The univariate 2 way analysis of variance was carried out the results are given in Table below.

Table 12a

Between-Subjects Factors

		N
Capital	1	14
	2	14
	3	22
IT	1	10
	2	22
	3	18

Table 12b

Tests of Between-Subjects Effects

Dependent Variable: Sales

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6.099E13	8	7.624E12	1.191	.328
Intercept	6.277E15	1	6.277E15	980.265	.000
Capital	1.826E13	2	9.131E12	1.426	.252
IT	1.322E13	2	6.612E12	1.032	.365
Capital * IT	3.161E13	4	7.902E12	1.234	.312
Error	2.626E14	41	6.404E12		
Total	8.518E15	50			
Corrected Total	3.235E14	49			

a. R Squared = .189 (Adjusted R Squared = .030)

At 0.05 level, for degrees of freedom 8 (model) and 41 (error), the F value is 2.18 (approx). The calculated F value (1.191) is less than it and hence, the null hypothesis could not be rejected. Therefore, there is no significant difference between the sales of stores with different capital and IT investments. H_{11} and H_{12} could not be accepted.

Conceptual extrapolation

As it is quite evident that the existing model fails to satisfy the retail productivity framework (equation 1) in its current form, there could be various reasons for the same. I did some

analysis of the literature (Table 1) and interacted with the retailers (Store owners and managers – 10 from each category). Some of the reasons are highlighted below.

i) There is a discrepancy in the way the variables are treated in the model and the way it is construed at the store level.

ii) There could be more independent variables that affect retail productivity and that is quite evident from the poor efficiency level of the retail stores. In that case, even the significant variables (as identified in the empirical analysis) cannot be relied upon. Hence, it would not be possible to develop strategies or form tactics from the study inference for individual store managers / owners.

iii) Sales may not be the optimal output for measuring retail productivity as it is an aggregate level measure of retail performance. While it certainly includes all significant variables, it could be influenced by many external / uncontrollable parameters. There could be more than single output in case of modeling retail productivity; it could also be some non-demand based measure.

iv) The model structure and implementation might need some modification in case of immerging retail economies.

As mentioned earlier, objective of this study was to develop, test and apply the retail productivity model to an emerging retail sector like India and help developing stable retail strategy for sustainable growth. However, the available model and the subsequent sensitivity analysis failed to provide any conclusive solution. To provide future direction to the retail productivity model, I propose some logical and conceptual viewpoints that will help in the progress of this topic.

Over the years, retail industry has evolved quite dynamically and consequently, the retail theories have grown out of field experience as well as academic insight. Therefore, many of the available theories and parameters in retailing are liable to be updated / modified based on the latest findings or academic introspection. I propose to elaborate some of the key propositions based on the literature study, theoretical as well as field level understanding of the concept (retail productivity) and application parameters. Some of the propositions in the retail productivity concept are presented below with their academic progression, analysis and development. These conceptual propositions would form the basis for subsequent clarification of the concept and help development of the model.

Proposition 1: Retail productivity is the ratio of retail output to retail input and it determines the efficacy of the conversion process (from input to output).

Productivity as a concept borrows its existence from the manufacturing sector (early twentieth century onwards) and the economic necessity to understand the performance of the manufacturing process. As most manufacturing business deals with conversion of raw materials (input) to finished goods (output) by machines, productivity of the manufacturing process deals with the relationship (ratio) between output and input. Hence, the performance of any manufacturing business can be easily determined by productivity (ratio of output to input). Here, assuming the quality of input to be constant over a period of time, the term productivity refers to the efficacy of the production process (machines, installed processes, fuel etc.) only.

However, the situation gets complicated when productivity is applied to retail sector. While conceptually retail productivity would still be the ratio of retail output to retail input (Table 1), the definition of both output as well as input are open to interpretation. The output in case of retail business is surely the physical items (merchandise) that consumers purchase from stores. However, the embedded service component (time utility, place utility, availability, variety as well as assortment etc.) adds value to the merchandise. Consequently, the conversion process involves procuring the merchandise and adding service component to provide the end consumer value added merchandise. Because of the obvious subjectivity in the whole definition and interpretation of output component, the measurement process is rather varied and dynamic. The input factors in the retail productivity construct automatically depend upon the treatment of the output and hence have different dimensions too. They could be single or multiple (labor, capital etc.); with or without considering the influence of confounding factors (size of store, type of store, micro and macro consideration etc.). Also, researchers used productivity study for different purposes. However, retail productivity can still be defined as the ratio of retail output to retail input and it does indicate how adequately the raw input has been converted to the output.

Proposition 2: Retail performance is a multidimensional construct. Retail productivity index is definitely a necessary component for the measurement of retail performance; however, it is not sufficient. I need additional measures to adequately gauge retail performance.

Any business performance measurement is a multidimensional construct as highlighted by Lewin and Minton (1986). Apart from the traditional measures like profit or ROI (Return on investment)

etc. which are mainly financial in nature, there are many other constituents of business performance viz., HR performance, operational performance, ability to adapt to situations and integrate with internal processes, ability to innovate, ability to achieve the goals etc. At this point I can argue that all the other constituents of organizational performance (viz., HR, Operations, Finance, and Adaptability etc.) are tools for the achievement of overall organizational objectives / goals. Therefore, one can conclude that any business concern would be considered successful if it achieves / adheres to its missions, visions and objectives and in order to achieve the same, it must measure the various dimensions of the organizational effectiveness (namely Finance, HR, Operations etc.). I can subsequently term organizational performance as organizational effectiveness and in case of retail business, it can be called retail effectiveness. I will explain and illustrate retail effectiveness a little later. From the literature study (Table 1) it is evident that retail productivity does not measure all these dimensions of retail performance and hence it cannot be equated with retail effectiveness.

As per Bucklin (1978) and Ingene (1982) "Total ratio productivity is the ratio of all outputs to all inputs. Partial input productivity is the ratio of all outputs to a single input". Hence, the former one could be explained by any total factor productivity model where as the later one is illustrated by labor productivity / capital productivity. However, conceptually, retail productivity (total / partial) is aimed at determining the efficacy of the unit under consideration (store / chain / organization / industry). It does not consider the performance of competitors. As per Achabal, Heineke and McIntyre (1984), "efficiency deals with the allocation of resources across alternative uses". Sellers-Rubio and Mas-Ruiz (2007) clarify the efficiency concept and opine that relative efficiency is the alternative approach to the measurement of retail performance in which the retail productivity of the best performer (or some standard / benchmark) is compared against the average performers. Therefore one can safely summerize that productivity is a rather technical description of input and output as well as their inter-relationship; however, efficiency explains the above mentioned relationship (output to input) and helps modifying / improving the relationship by considering all the available inputs as well as outputs. Hence, the allocation of resources can be efficient only when

a) The same amount of input can produce superior output
b) The same amount of output can be produced with less input

It also brings another key differentiator between productivity and efficiency to the forefront. It is possible to determine the productivity of each of the input resource (say, labor productivity); however, it does not make any sense to determine efficiency of any one of the input without considering the

other ones. For example, it is futile to increase the efficiency of the labor force (by increasing / reducing their number, training programmes etc.) without considering its impact on service level or overall cost / profit structure (overall efficiency). As efficiency involves resources allocation across inputs to modify / improve output, one would also need to determine the efficiency of the competitors, develop benchmarks / ideal efficiency point and try to achieve it over a period of time. This helps defining another difference between productivity and efficiency. While productivity involves the input as well as output of one organization / system, efficiency would consist of analysis of multiple organizations or multiple branches / stores of the same corporate entity. Finally, one can say productivity is "in-built" with efficiency; however, high productivity does not guarantee a superior efficiency too. Consequently, there are different methods for measuring efficiency. Some key ones are "Data Envelopment Analysis", "Stochastic Frontier Analysis" etc. Sellers-Rubio and Mas-Ruiz (2007 - Tables 1, 2 and 3) in their study provide a detailed description of retail productivity and efficiency measures in the last decade.

Achabal, Heineke and McIntyre (1984), Bucklin (1978, 1978a), Lusch and Young (1984), Ingene (1984, 1985), Takeuchi and Bucklin (1977) have discussed the concept of productivity from different dimensions, identified the appropriateness of the same and accepted the economic concept of output – to - input ratio as a robust definition of productivity. Subsequently, this view has been accepted by many others. What it means is that a productivity score only highlights the performance of the processes, systems, materials and labor etc. that are required for the conversion of input to output. A higher score of productivity would involve a superior performance in conversion. Automatically, it also means that a productivity score neither talks about the overall performance of the organization nor does it talk about the comparison of its performance against the competitors. Precisely, for the same reason, I would like to differ from the generic viewpoint of productivity (that it is equivalent to overall performance) as considered by Marchione and English (1983), Samiee (1990). As the focus of this study is retail productivity rather than efficiency, I would like differentiate our work from that of Donthu and Yoo (1998) as well as Keh and Chu (2003) as they compare the overall performance across stores and suggest improvements. However, our work differs from the works of Achabal, Heineke and McIntyre (1984), Bucklin (1978, 1978a), Lusch and Young (1984), Ingene (1984, 1985), Takeuchi and Bucklin (1977) on the application front. While they have focused on partial productivity, the focus of this paper is total factor productivity; apart from that, the empirical evidence of the above mentioned studies are on the macro level while in our study the empirical unit is individual store.

In contrast, effectiveness deals with "getting the work done" or "achievement of the pre-defined objectives". Klassen, Russell and Chrisman (1998) opine "productivity includes valuation, efficiency involves comparison to a standard, and effectiveness refers to achievement of goals". "Lewin and Minton (1986) have provided an elaborate chronological literature on organizational effectiveness. From their analysis it is pretty clear that there are different dimensions of organizational effectiveness (viz., human resources, operations, administration and policy making, contingency theory etc.) and over a period of time, different researchers have identified each of these dimensions. Subsequently, they have gone ahead to develop a measure of their prescribed dimension and evaluate the organization on the same. Campbell (1977) suggested determination of criterion measures for organizational effectiveness and comparison of organizations based on the same. Subsequently, one can determine which characteristics of the organizations are significantly associated with the organizational effectiveness construct. Based on those characteristics, organizational effectiveness can be determined. His list of effectiveness criteria included both productivity as well as efficiency. There have been subsequent developments of models by Scott (1977), Seashore (1979) and Cameron (1979) for measuring organizational effectiveness. Hence, if I try to determine organizational effectiveness from a retailer's point of view, one might observe "Maximizing long term return of investment" "achievement of x% market share or profitability" etc. as the typical objectives of the retail stores and subsequently the achievement of these objectives would lead to effectiveness of the organization. While achievement of the desired level of efficiency involves competitor analysis, technical analysis of the productivity and modification of plans at the business / tactical level, realizing the desired effectiveness would involve corporate SWOT analysis (Strength, Weakness, Opportunity and Threat), planning and strategy development. The implementation of the above mentioned strategy would lead to improved productivity, efficiency and effectiveness. Therefore, efficiency is a necessary condition for effectiveness; but not sufficient. A superior efficiency might ensure the organization's productivity better than its competitors; however, it might still not be sufficient to achieve 10% market share or 12% long term return on investment (may be due to poor strategy). One can identify the confounding as well as the influencing variables from the data analysis and decisions above; subsequently, using the influencing variables and controlling for the confounding factors; the retailer can quantitatively determine / modify the organizational effectiveness. Achabal, Heineke and McIntyre (1984) opined "the real effectiveness problem is one of determining how to use available resources so that the return on invested capital is maximum". According to them, the reason for considering long term ROI (Return on investment) maximization is the subsequent focus on earning growth and current ROI. Similar overall

effectiveness perspective is also accepted by Cameron (1981, 1981a), Nadler and Tushman (1980) and Scott (1977).

Proposition 3: Output of retail productivity should be availability of merchandise for selling (single / multiple). It could be measured as physical units or cost.

I propose to exclude the demand based performance measures from the constituents of retail productivity output and the simple reason for not including the demand based performance measures for output of retail productivity function is the probability of too many confounding variables being present. The difference of sales of two retail firms could be due to the difference of the merchandise mix sold or the service factor associated with it. It also could be due to the difference in local economic conditions, type of clientele patronizing the retail store, location difference, or external competition. Alternatively, any change in any of these factors might upwardly modify the productivity of any retail store (by displaying higher output). However, none of these things are under the control of the retail store and hence are extraneous in nature. Therefore, any demand based performance measure (sales, profit, value added, turn over etc.) should not be used as the output for retail productivity. Historically, the output function has been sales, number of transactions or value added. However, both sales and value added produce equivalent result as they both generate from the same source. The cost based measures (ROI, gross margin etc.) indirectly include demand in the expression. Apart from that, the cost based measures are conceptually more inclusive than productivity and they more effectively indicate the achievement of long term objectives as well as sustenance of the firm. Productivity is a necessary condition for the same; but surely not sufficient.

Carey and Otto (1977) opined "preferred output index for retail trade industries would be obtained from the data on the quantities of various goods sold by the industry, each weighted (that is multiplied) by the employee hours required to sell one unit of each good in some specific base period". Subsequently Achabal et al. (1984) favored ability to make sales rather than actual sales as the output for retail productivity. Betancourt and Gautschi (1988) also mentioned "the first category of outputs of a pure retail system is, of course, the provision of goods or services for purchase". Analysis of Table 1 indicates equal preference for sales as output value added as output and some other form of financial performance measure (viz., profit, gross margin, turn over etc.) as output. Bucklin (1978) and Ingene (1984) clearly highlight few reasons for such anomaly. The major reasons seems to be the lack of data on the number of transactions of retail firms and the embedded difficulty in measuring one of the most

significant retail outputs – the service component. Therefore, I propose to consider availability of merchandise for sales with their respective service components as the potential output parameter.

Proposition 4: Output of retail productivity would be multiple rather than single.

The discussion of proposition 3 clearly emphasizes the significance of service component in the retail productivity output. It can also be proven logically as well as empirically (proposition 5). Therefore, clearly, the retail productivity output is multiple (merchandise and service). Apart from that, even the merchandise categories are multiple and they need to be treated differently. Obviously, each retail store sales items / merchandise and that is why they exist. However, all the items in the retail store do not belong to the same category and all of them do not serve similar purpose in the retail store. As per Levy, Weitz (2008) and Berman, Evans (2009), the fundamental principle of merchandise management involves identification of the key categories of merchandise (say yellow, orange and white goods) for any retail store; ascertain their purpose (say, crowd puller, staple and impulse) and subsequently develop the procurement as well as the delivery plan along with the planogram of the stores under consideration. The underlying philosophy here is that every category of item contributes differently to the overall revenue and hence profitability; correspondingly, every category of item incurs some cost for its procurement, storage and presentation inside the retail store. Over and above all these, there is consumer preference and supplier availability which also guides the merchandise mix of the retail store. At the end of these, the numbers must make sense for the retailer to continue his business. This gets ascertained by the retailer during the merchandise management phase (which is under consideration here). Obviously, it means there is distinct categorization of the retail merchandise with the retailer.

This brings us to the first confounding variable in retail productivity. Type of retail store has been identified as a confounding variable in the earlier studies (Table 1) and the empirical analysis in this study. The type of retail store would surely influence the merchandise categorization to a large extent. Apart from the type of retail store, the size of retail store would be another confounding variable that influences the number of items (SKU level) in a retail store. For example, a small apparel and lifestyle based store which is about 1000 – 3000 square feet size would have about 250 core SKUs, 600 fashion SKUs and about 150 accessories on an average over a three year period of time. Therefore, if I can control for the store type and the store size and make an empirical study of the different retail stores over a period of time, I would be able to determine "the products / items / merchandise that are available for selling in various retail stores". However, because of the presence of the different

categories of items and their associated service levels as well as confounding variables, I can safely assume that the output of retail productivity construct need to multiple rather than single.

Proposition 5: Output of retail productivity must include the embedded service component. The service component is better explained when expressed in exponential manner.

Let us start with Bucklin (1978) classification of services in any distributive business. They are logistical, informational and product functional respectively. Betancourt and Gautschi (1988, 1993) suggest the following five service categories. Accessibility of location (saving on time and transport cost for the consumer), level of product assortment (breadth and depth of any category; saves time and transportation costs of the consumers due to multiple trips to retail stores), assurance of immediate product delivery in the desired form, at the desired place and desired time (saves the costs of waiting time, non-availability of items, associated storage requirements if the product is not available in the desired quantity at the desired time), information (on price, availability and other characteristics of goods and services) and ambience (discount stores have it low whereas luxury stores have it high and hence is the associated costs). The works of Oi (1990), Mathewson and Winter (1986), Smith and Hitchens (1985) on services components in retail output agree with the above classification and description directly or indirectly (aspects or in derived forms). Hence, taking the Betancourt and Gautschi (1988, 1993) classification as the basis of service component in the retail output, one can easily identify the third confounding factor in retail productivity: the customers. Different segments of consumers attach different levels of significance to these multiple service factors of the retail output. Therefore, if I can map the consumer groups with the relevant service levels, I would be able to determine the intangible value component of the products / items / merchandise that are available for selling in various retail stores.

Therefore, I can determine the categories of merchandise in retail stores in numbers / cost and I can determine the associated service components too. I have identified the store type, store size and the customer characteristics to be the confounding variables and hence I need to control for these extraneous variables. However, the relationship between the output category and its corresponding service factor need not be associated with the weighted average method. This is because, the different categories of output elements are totally distinct from each other and each one of them carries out different objective for the retailer / retail business. Therefore, I propose the relationship to be exponential in nature. This also makes retail business sense as follows. Assuming the same merchandise

categories to be input (which is anyway true for any distributive business too), the strength of the service component decides the value of output parameter.

Say merchandise category is A. The associated service component is α. I propose the output component here to be A^{α}.

Case 1

$\alpha = 1$

Interpretation: Input is equivalent to output. Retail productivity is 1. The retail store is equivalent to any other competitor (assuming others to be at 1); it does not add any value.

Case 2

$\alpha < 1$

Interpretation: Output is poorer than input due to extremely bad service (say items not available or store pretty dirty etc.). Retail productivity is less than 1. The retail store is poorer in comparison to its competitors (assuming others to be at 1); it is unlikely to succeed.

Case 3

$\alpha > 1$

Interpretation: Output much better than the input due to the good services that adds value to the merchandise. Retail productivity is more than 1. The retail store is doing better than its competitors (assuming others to be at 1); it might go on to succeed.

The basic model for determination of total factor productivity would be based on Cobb – Douglas production function. I have enough evidence of the successful application of Cobb-Douglas model in the estimation of retail productivity (Table 1). However, the extended Cobb-Douglas production function (KLEM model i,e. capital, labor, energy, materials) / any other modified version might be used as per the requirements of the scenario.

Determination of input factors

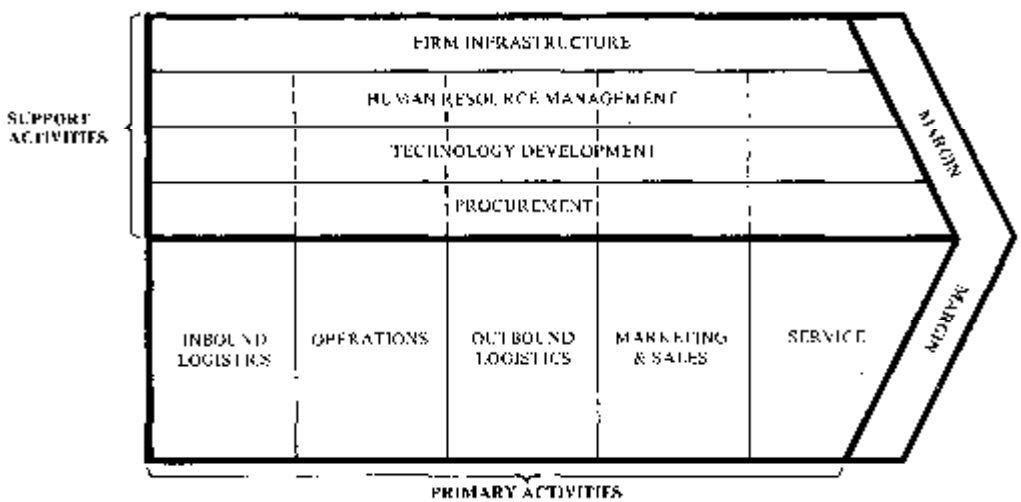
Traditionally, input to retail productivity has been labor (number, labor hours, skill level etc.) and capital (number of stores, square feet area etc.) and most often not more than two factors at a time (Table 1). However, few researchers have deviated from the “labor, capital as input factors”; they tried to include other significant (IT, customer issues, environmental issues etc.; Table 1) factors that would

explain productivity better and provide greater insight to improve the same. Few significant efforts are Reardon et.al (1996) and IT, Donthu et.al (1998) and customer issues, Dubbelaar et.al (2001) and environmental issues. Based on this discussion, the first challenge would be to decide whether the input factors in retail productivity be single or multiple. Like any other similar scenario, I would attempt to solve it based on two key factors of decision making: necessity and sufficiency.

The question here would be "how many factors are necessary to explain the retail productivity construct?" In other words, to get the desired output, which input factors are required?

I would answer this question both theoretically as well as empirically. For theoretical problem solving, I would consider a few well established models of business strategy / retail strategy and map it up to the situation at hand. As per Michael Porter (1985) "the value chain disaggregates a firm into its strategically relevant activities in order to understand the behaviour of costs and the existing and potential sources of differentiation". Obviously enough, the value chain deals with the business model / revenue model of any business and highlights the primary as well as support activities involved. As sales is the key to the revenue model, a generic value chain, when applied to retail business, would still hold good with either sales or availability of items on the shelf as the output. A typical value chain model would consist of primary (inbound logistics, operations, outbound logistics, marketing and sales, services) and support (firm infrastructure, human resource management, technology development, procurement) activities. A close observation of the generic value chain model and its subsequent application to retail business would reveal the following:

Figure 2: Generic value chain model



a) The firm infrastructure would constitute the capital component and the human resource management would constitute the labor component in the existing retail productivity literature.
b) Apart from that, technology development (point – of – sales; merchandise planning system; inventory management system and different other IT interventions etc.) and procurement (merchandise planning; vendor selection; buying systems; quality management etc.) are also significant support activities (relevant for retail business). Reardon et.al (1996) did consider IT as the third element of retail productivity input and found relevance for their model.
c) Various primary activities as mentioned in the generic model of value chain are also quite relevant for retail business. Potentially, inbound logistics (logistics, warehouse management, inventory management etc.), operations (fittings, fixtures, equipments, systems and processes etc.), marketing and sales (layout, design, ambience, salesmanship etc.), outbound logistics (retail stores with home delivery business models) and services (demonstration, counseling, alterations, returns, installations etc.) could also be considered as significant factors for determination and improvement of retail productivity. As per the model, all these factors contribute to the overall margin and margin varies directly as sales and hence availability of items on shelf.
d) However, based on our study here, I need to categorize these significant factors as input, output and external (generic) parameters. From the value chain model one can safe identify labor, capital, IT (information technology), systems and processes (internal as well as external), Store interiors (fittings, fixtures, equipments, lay out design etc.), store operations etc. as potential inputs for retail productivity.

Finne and Sivonen (2009) in their typical grocery shopping process and the various touch points discussion corroborate the findings of retail value chain, input and output factors. Therefore, I can easily conclude, there is a necessity of multiple input factors and those factors could very well be identified from the inventory of primary activities and support activities of the retail value chain model.

Having established the necessity part, I would now move to the sufficiency part. Hence, the necessary question here would be “whether labor and capital are sufficient as input factors to explain the retail productivity?” “Would analysis of labor and capital be sufficient to improve retail productivity or sales of any store?” I will try to answer these questions empirically from secondary as well as primary data.

At this point it would quite prudent to specify our assumption clearly. In the absence of available retail productivity data and due to our modified retail productivity measurement process, I assume sales / growth to be the proxy for retail productivity. It is easy enough to realize that retail productivity as envisaged by us is a precondition for superior sales / retail growth; however, it may not be sufficient. ICRIER (2008), the real GDP of India was expected to grow at 8 – 10 % per annum in the next 5 years. Consequently, the retail business in India was estimated to grow at 13% per annum (from USD 309 billion in 2006 – 07 to USD 496 billion in 2011 – 12. However, during this period, I have observed steady decline in year – on – year sales growth from 62% to 11% (KPMG, 2009). I have also observed increase in working capital, decline in inventory turnover and rather drastic reduction of net profit margin (3.9% in 2007 December to 0.3 % 2008 December) during this period (KPMG, 2009). Even the sales per square feet ratio in retail stores in India has been terribly low in comparison their USA counterparts (Table 8). However, as per India Retail Report (2009), during this period the retail space in India has increased by 18% on an average and employment status (employment number, number of man-hours, attrition rate etc.) has remained constant. Hence, it is rather easy to see the lack of sufficiency of labor and capital data to explain the drop in retail productivity.

Table 13 (Retailer benchmarking in India: India Retail Report 2009)

Store Format	Sales per Sq. ft. (RS.) per month in India	Sales per Sq. ft. ($) per month in USA
Apparel and Accessories	1500 - 3000	339 (RS.15,450/-)
Home Furnishing	1191	258 (Rs.11,758/-)
Discount Stores	500	634 (Rs.28,895/-)
Luxury retail stores (jewellery)	10,000 +	1225 (Rs.55829/-)

Therefore, I can safely conclude that retail productivity has multiple input constituents. With this proposition, I would also be able analyze retail productivity with all its constituents and determine their relative significance. Hence, it would be possible to manipulate / modify retail productivity (input to retail strategy) rather than just observe and explain any retail productivity based phenomenon. Therefore a total factor productivity model would be valid for explaining retail productivity (develop and

manipulate the productivity model till the unknown factor becomes insignificant). Theoretically, even partial productivity is valid (with one or two input factors); but it fails to relate to the issues in retail store / sector from a planning and implementation (problem solving) point of view.

Research methodology for determination of input parameters

As it was established beyond doubt that the input factors for retail productivity would be multiple and it could be derived from the retail value chain model, I decided to determine the input factors empirically (based on primary survey). A list of all the potential input factors was created from the literature (Finne and Sivonen 2009, value chain etc.) and expert opinion survey (retail consultants and trainers). After ascertaining content validity, the list was converted to a likert type questionnaire. The reliability of the questionnaire was ensured (Chronbach alpha .79). The questionnaire was administered to the 45 retail managers of medium sized stores (from the sample frame). A factor analysis was conducted on the response data and the output revealed the potential input parameters for our retail productivity model. The result was again discussed with the experts (retail consultants and trainers) and modified. Table 14 summarizes the final input factors and the confounding variables.

Table 14

Serial Number	Input Factors	Confounding variables
1.	Labor	Type of retail store
2.	Capital (infrastructure)	Size of retail store
3.	Retail merchandise	Characteristics of the consumers
4.	Store interiors	Income level of the consumers
5.	Systems and processes	
6.	IT and point of sales	

Conclusion

The most significant findings of this study are the gradual rediscovery of the concept retail productivity and the subsequent suggestions for a crisp model. The significance of retail productivity in the current business scenario and specifically for an emerging retail sector like India was established. The available retail productivity model using Cobb – Douglas production function did not yield positive fit and the subsequent empirical as well field level analysis confirmed the same. Subsequently, I tried to define the reasons for deviations from established models and proposed many dynamic changes to the retail productivity thought process and visualize the concept from the retailer's point of view. On a

theoretical level, clarity has been provided on different levels of measuring retail performance and productivity has been methodologically differentiated from efficiency and effectiveness. In a way, one can say that this study categorically highlighted the inadequacies in the retail productivity framework for emerging economies and provided scope as well as future direction for right form and effective usage of retail productivity.

Study Limitations and further research

Like any other study, this study also suffers from many limitations. The major limitation is the lack of availability of credible secondary data for retail stores. Therefore, I had to spend lots of time trying to develop a database with sufficient number of cases for appropriate model fit. Even while developing the database, in many cases I had to rely on observations and calculated assumptions as not enough cooperation is forthcoming from the retailers. Hence, even though I achieved internal validity by controlling for store size and location (clientele) and external validity by randomizing retailer selection for the study (from the sample frame), there is surely a tradeoff between the two. I would have preferred a complete list of all the retailers (in the small and medium segment) in any city along with their telephone numbers for complete randomization.

The other limitation would be the inability of the study to include the large format retailers in the study (even though that was the initial plan). However, lack of enough number of large format stores (more than 80,000 sq.ft.) led us to drop the idea. Probably, in future, including the data from a few similar cities (metros / tier 1 / tier 2 etc) could help us to generate a database for large format stores.

In the experimental design study, I could not carry out true experimental designs due to lack of our ability to create appropriate treatments and carry out random assignments. Also our study was for a short period of time and hence there is certainly scope for improvement in research design for future.

Apart from these limitations, I have a couple of things in mind for studies in future. Firstly the function of each input variable and output variable need to be ascertained as per the propositions and appropriate database need to be developed for empirical study. Subsequently, appropriate model need to be developed for retail productivity. This should help development of retail policies and strategies for growth oriented economies.

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