AN IMPROVED METHODOLOGY FOR THE ANALYSIS OF RETAIL TRADE AREAS

BY

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DECLARATION

I, the undersigned, hereby confirm that the attached thesis is my own work and that any sources are adequately acknowledged in the text and listed in the bibliography.

I accept the rules of the University of Pretoria and the consequences of transgressing them.

This thesis is submitted in fulfilment of the requirements for the PhD (Real Estate) degree at the University of Pretoria. It has not been submitted before for any other degree or examination at any university.

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Abstract

Title: AN IMPROVED METHODOLOGY FOR THE ANALYSIS OF RETAIL TRADE AREAS

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Market analysis is a key component of a sound real estate investment analysis process. Traditional market analysis techniques do not reflect complex trade area attributes and socio-economic realities, such as retail market structure, degree of diversity within the retail market structure, supply-demand saturation levels, the spatial distribution of demand and the composite effect of trade area growth variables on future asset performance.

The validity of central place theory, among other things, is analysed. It was revealed that the theory of central places is not supported by its base research and fundamental errors exist in the mathematical relationships that were developed to support this theory. These errors are perpetuated in various urban and regional planning theories, market analysis techniques, models and retail/business hierarchy documents and policies – including but not limited to the research of Berry on urban centres. Notwithstanding these errors, Christallerian principles of central place theory are still widely accepted as correct and remain influential in theory and practice.

As basis for the analysis of central place theory, the Fischer-DiPasquale-Wheaton (FDW) model is used. This model conceptualises the relationship between variables that represent the micro-foundations of economic behaviour in property and asset markets.

Primary research on stated and revealed preferences by consumers and shopping centre owners revealed further shortcomings of central place theory. Incorrect assumptions associated with the nearest centre postulate and the so-called 'six-for-six' principle are interrogated, together with the diseconomies of centralisation/concentration (i.e. increasing costs with greater concentration) which appear not to have been considered by Christaller. A number of qualitative and quantitative research techniques are deployed, including interviews with shopping centre owners and developers, proportionally stratified consumer surveys, statistical analysis of shopping centre performance data and analyses of the frequency distribution of shopping centres.

Based on the findings, an improved methodology for the analysis of retail trade areas is presented. The improved methodology incorporates four techniques, namely the Multi-Criteria Saturation Index (MCSI), Retail Diversification Index (RDI), Demand Density Analysis (DDA) and Growth Matrix (GM). A test for validity was developed, based on a comparison of actual versus forecast shopping centre sales data. The negligible difference observed between actual and forecast sales for the centres analysed validates the proposed improved methodology for the analysis of retail trade areas.

Keywords: market analysis, retail trade areas, central place theory, market saturation, retail demand potential, multi-criteria saturation index (MCSI), retail diversification index (RDI), demand density analysis (DDA), growth matrix (GM)

CHAPTER 1

INTRODUCTION

1.1. BACKGROUND

Market analysis is a key component of a sound real estate investment analysis process. Traditional market analysis techniques do not reflect complex trade area attributes and socio-economic realities such as retail market structure, degree of diversity within the retail market structure, supply-demand saturation levels, the spatial distribution of demand and the composite effect of trade area growth variables on future asset performance (the concept of a trade area is defined in Chapter 7). Pyhrr (1989, p. 409) argues that faulty market analysis was a major contributor to the financial failure of real estate projects in the United States between 1980 and 1989. Whereas investment decisions in various real estate sectors are informed by market analysis reports, the focus of the research presented in this thesis is on the retail market – although the findings and recommendations may also find application in other real estate market sectors and geographic localities beyond South Africa.

Market analysis incorporate theories, techniques and methods that were derived from the study fields of urban and regional planning, urban geography and economics. Appropriate trade area analysis and demand modelling are central constructs of a market analysis. The first known literature on the subject matter was produced by Von Thünen who, in 1826, analysed the development of concentric agricultural belts around a central market town. Later research by, among others, Walter Christaller (1930's – Central Place Theory) expanded on earlier literature, seeking to develop increasingly complex and sophisticated models to understand, explain and predict market behaviour, firm location and by implication, human behaviour. An array of analytical and urban modelling instruments have since been developed.

Applebaum (1966, p. 134 – 141) was among the first urban geographers to publish research on the development of trade area techniques designed to calculate retail store potential. The analogue technique was designed by Applebaum to incorporate demographic variables such as population size, household income, household expenditure profiles and sales proxy's for comparable retail stores – comparable in respect of store location, size, target market and trade area (i.e. simplified as consumer) profile. The consumer profile is only one element or dimension of a trade area that determines store (or site) potential (Pyhrr, 1989, p. 408 – 412). The consumer profile explains only certain trade area attributes.

Other variables that influence site potential include macro (national), meso (provincial or regional) and local (municipal) economic trends, real estate market structure and trends, financial market structure and trends, as well as policies and politics. The traditional analogue technique is not designed to respond to these market attributes – nor does application of the technique offer insight into aspects such as retail market structure, the degree of diversity within the market structure, demand-supply saturation levels, the spatial distribution of demand and the composite effect of trade area growth variables on future asset performance. More sophisticated techniques are required to improve trade area analysis and forecasting of demand potential.

Consumer behaviour is shaped in a broader market environment that is characterised by complex interaction between various economic role players. Demand and supply side attributes that reflect the relationship between economic role players are illustrated in the general economic equilibrium equation, also referred to as the Keynesian Multiplier (compare Dernburg, 1985, pp. 9, 39 – 41; Lombard *et al*, 1986, pp. 15 – 17; Lombard *et al*, 1989, pp. 181 – 215; and Gnos and Rochon, 2008, p. 10):

$$\mathbf{Y = C + I + G + (X – Z) = GDP}$$

where: –

Y = total production or total demand

C = Private consumption expenditure

I = Investment

G = Government Expenditure

X = Exports or outflows

Z = Imports or inflows

GDP = Gross Domestic Product (or value ad).

The general economic equilibrium equation portrays the relationship between economic role players at the macro or national level. The equilibrium equation also portrays economic demand and supply relationships on a smaller geographic scale.

1.2. THE PROBLEM AND ITS SETTING

1.2.1. Problem Statement

Traditional trade area analysis techniques include the *per capita*, residual and analogue techniques. Traditional techniques designed for the analysis of trade areas oversimplify the relationship between population and expenditure, while pertinent variables that influence demand and potential are left unaccounted for. Inappropriate model specification, incomplete portrayal of market realities and faulty market analysis give rise to poor investment decision making on account of incomplete and incorrect models.

Traditional techniques emphasise only certain attributes of “C” in the Keynesian Multiplier, e.g. household retail expenditure, in isolation from other economic variables that influence consumption expenditure and demand. The estimation of market demand is effectively reduced to the multiplication of population and retail expenditure (cf. Kiel and Haberkern, 1998, pp. 1138 – 1154). Traditional techniques simplistically relate supply to demand and are not responsive to the complexities of market structure, including the degree of diversity or, conversely, concentration within the market structure and the effects thereof on trade area saturation. Simplified linear population growth forecasting in markets with complex

structural growth attributes, disregard for the time value of money and dated theoretical foundation contribute to faulty market analysis. Traditional techniques are also limited in the ability to facilitate analysis of the spatial distribution of demand. The composite effect of trade area growth variables on asset performance is not calculated by means of the application of traditional techniques.

The inadequacy of traditional approaches is illustrated by a seemingly increasing number of ailing and failing shopping centres, residential and other developments. Data on ailing developments is generally not published, although the author has encountered numerous such developments over the years. Data published by Stanlib is one example of rarely published case study data on ailing and failing centres. Stanlib (*ibid*) identified a selection of shopping centres in South Africa that have failed on account of inadequate market research and/or marketing considerations, incorrect design, legal non-compliance (e.g. inappropriate town planning rights) and location/access constraints. This research (*ibid*) identifies Bel Air Shopping Mall, Design Quarter, Irene Village Mall, Cedar Square, Atholl Square, WorldWear Fashion Mall, Bedford Centre, Stoneridge Lifestyle Centre, Melrose Arch Shopping Centre and Maponya Mall. A number of additional project failures have since materialised, including The Villa Mall, Carltonville Mall, Rolling Hills Golf Estate, The Hills Estate, Euphoria Golf Estate, Zilkaats Estate and Highland Gate Golf and Trout Estate. The initial failure of the latter development schemes can be more specifically traced to either faulty market analysis (e.g. Carletonville Mall and The Villa Mall), the complete absence of prior market research (e.g. Euphoria) and/or a developer who did not heed the recommendations and red flags identified in the market research (e.g. The Villa).

In terms of The Villa, a financial disaster, an initial report compiled by Fernridge (2007) identified total retail potential of 141 335m^2 and an unqualified market growth rate of 17% – yielding a "gross balance undersupply" of 112 343m^2 in 2009. In contrast, a subsequent market analysis in 2008 by the author of this thesis found no economic basis in terms of which the development could be substantiated. The developer was subsequently advised that, in terms of a spatial demand density analysis, approximately a quarter (±20 – 25%) of the trade area

constituted a nature reserve, which could not accommodate future urban growth and densification – hence, the growth reported in the initial analysis was considered to be unattainable. Accordingly, the developer was advised that the locational considerations were not sound and that, should the developer nevertheless be desirous to proceed with the scheme, development should be delayed by at least a decade. The advice was not heeded, with dire consequences. Although significant asset depreciation and resale enabled investors to reposition some of these assets – e.g. Irene Village Mall, The Hills and Highland Gate – the extent of the initial financial trauma could have been minimised (or even avoided), had the investment decision and subsequent design been preceded by proper market analysis.

More sophisticated trade area analysis and forecasting techniques are required to add depth and insight where traditional techniques have been found wanting.

1.2.2. Contextualising the problem

The problems outlined above are not unique to trade area analysis in developed economies such as the United States, but also typify trade area techniques applied in developing markets, including South Africa. Faulty market analysis attributed to improper model specification is amplified by:

1. Oversimplified demographic bias, including population updates and forecasts based on historic growth rates observed between two census dates (e.g. 2001 and 2011), creating a sustained linear or even exponential growth expectation when, in reality, real growth has tapered or is receding);
2. Disregard for demand drivers, including the economic base of an area, economic growth, sectoral growth, growth in consumption expenditure and disposable income;
3. Inflationary pressures are not accounted for;
4. Assumptions are based on the nearest centre postulate;
5. Disregard for spatial economic realities, including the spatial distribution of demand, location of major employment nodes and daily commuting patterns;

6. The economic significance of the informal sector is not properly accounted for in *inter alia* employment and household income data;
7. Incorrect statistical treatment of income variables in demand modelling; and
8. Dated and flawed theoretical foundation.

The literature survey indicates that dated theory continues to influence market analysis. Theory holds true under the exposition of specific assumptions and researchers should be mindful of contextual realities when making inferences. Mooya (2016, Chapter 5) refers to underlying structures, powers and networks within societies and cultures that influence the course of events. Central place theory, as one of the most influential and recognisable urban planning theories, provided the basis for the development of a multitude of related urban planning theories and policies. It is necessary to contemplate the historic time and political context that influenced the formulation of central place theory. In pre-World War 2, the German "national economic State" set out to conduct scientific research to find the theoretical economic foundations for rational administrative State construction and a new division of the German Reich (Nicolas, 2009, pp. 10 – 12). Subsequent fundamental amendments to the initial work of Christaller were made by *inter alia* Jörg Güssefeldt, Dirk Fittkau and Edwin von Böventer – each progressing the disconnect between theory and reality by "rearranging" and "manhandling reality" to fit the 'model' (*ibid*, pp. 11 – 14).

In the English translations most of the numerical data, the original German bibliography and references to political ideology were omitted (*ibid*, p. 11). In the original research, Christaller is known to have actively participated in attempts to modify reality forcibly by putting his ideas on land use at the service of the political ideology of the time (*ibid*, p. 7). Regardless, central place theory and the use of a central place as instrument to control (*viz* totalitarian order) remains influential and continues to form the basis of town and regional planning frameworks, urban renewal initiatives, market analysis in general and trade area analysis in particular – whether through the work of Lösch, Von Thünen, Burgess, Hoyt, Alonso, Izard, Mills, Muth or more recently Reynaud, Lepetit, Clark and Lobley Berry.

Accurate market analysis reduces investment risk and strengthens asset performance. Although factors not directly related to the market (e.g. design and accessibility) contribute to asset performance, accurate market analysis enables an investor to position a product in accordance with market demand and consumer preferences. The market analysis report provides a platform of knowledge from which the investor can formulate appropriate responses to trade risk and opportunity. The decisions can relate to initial real estate investment or subsequent refurbishment, re-tenanting and/or repositioning of an asset. It follows that the trade area analysis techniques applied in the market analysis will determine the extent to which the outcomes of the market analysis are accurate and representative.

The degree of accuracy of the market report holds far reaching financial and economic implications. Not only asset returns are affected, but also broader aspects such as job creation, economic growth and various forms of taxation. Whereas faulty market analysis contributes to financial failure, accurate market analysis contributes to prosperity.

Market analysis influences private as well as public sector investment decision making processes. The application of market analysis techniques is not limited to private sector real estate: public sector decision making in regards to policy, infrastructure investment, expenditure programmes and taxation are informed by a form of market analysis. Decisions on certain types of public sector programmes and interventions are influenced by the quality and accuracy of market analysis and also by the appropriateness of the selected analytical techniques.

1.2.3. Purpose of the Study

The purpose of the research presented in this thesis is to propose an improved methodology for the analysis of retail trade area. The proposed methodology extends trade area analysis beyond the demographic dimension by introducing analytical instruments that account for *inter alia* the structural, spatial and economic dimensions of the market.

The development of the proposed new methodology requires insight, not only of the basic relationship between economic role players as portrayed in terms of the Keynesian economic equilibrium equation, but more specifically of the complexities that characterise real estate and asset market interaction. The seminal work of Adam Smith (1776, revised 2003) on *inter alia* land rent (pp. 78 – 79 & 198 – 237), the relationship between town and countryside (pp. 519 – 536) and of the principles of the mercantile system (pp. 539 – 567) remain of consequence.

The research presented in this thesis proposes to integrate the fundamental principles garnered from a broad theoretical base into trade area analytical techniques that respond to market realities in a more comprehensive and representative manner than traditional residual, analogue and *per capita* approaches. The proposed improved methodology for retail trade area analysis includes four analytical techniques, namely:

1. Retail Diversification Index (RDI)
2. Multi-Criteria Saturation Index (MCSI)
3. Demand Density Analysis (DDA)
4. Growth Matrix (GM).

The techniques can be applied individually, but accuracy is enhanced when these techniques are applied as components of an integrated method.

1.2.4. Formulating the Hypothesis

The hypothesis formulated is that estimates of market demand can be improved by factoring:

1. demographic attributes;
2. pertinent economic indicators;
3. supply-side structural attributes of the retail market; as well as
4. spatial distribution and intensity of demand; coupled with the

5. integrated effects of multiple growth attributes of the trade area

as opposed to demographic attributes only.

The proposition that traditional trade area analysis and demand modelling approaches are inadequate stem from the assertion that these models are inappropriately specified to respond to complex market dynamics.

1.2.5. Guiding questions

The questions outlined below guide the research presented in this thesis:

1. Are traditional approaches to trade area analysis sufficiently responsive to market realities and dynamics?
2. To what extent can traditional approaches account for the effects of trade area growth attributes on asset performance?
3. To what extent are traditional approaches to trade area analysis influenced by early theoretical thinking, including central place theory?
4. Is the theory and underlying principles of central places still valid and to what extent does this theory remain relevant and applicable to trade area analysis?
5. Over and above demographics, including population and income, what other market related factors determine demand and asset performance? Can the effects of such factors be qualified and quantified?
6. To what extent could the scope and depth of market analysis be broadened to more comprehensively account for the complex interaction between the layers of socio-economic, structural and spatial market dimensions?
7. What manner of improved trade area analysis techniques would add value and depth to the relatively limited specification and corresponding confined outcome of traditional approaches?
8. Can an improved methodology be successfully developed to add meaningful insight and understanding to aspects of market structure, market depth and

degree of saturation, the spatial manifestation of demand and the intricate and hidden effects of market growth variables on asset performance?

9. To what extent can geographic information systems (GIS) technology be applied to augment the proposed trade area analysis methodology?
10. GIS technology has incorporated elements of central place theory as rent bid functions, Thiessen's polygons and gravitation models. In view of the research findings, are there noteworthy pitfalls that should be observed in the application of GIS technology?

Albeit that the answer to Question 1 is largely addressed in Chapter 1 (Problem Statement), Questions 1 and 2 permeate each chapter of the thesis and are ultimately answered in Chapter 9. Questions 3 and 4 are largely addressed in Chapters 3 and 4. Answers to Question 5 are offered in Chapters 4 through to 8. Research questions 6 and 7 are primarily addressed in Chapters 7 and 8. Questions 8, 9 and 10 are addressed in Chapter 9.

1.2.6. Delimitations and limitations

The focus of the applied research presented in this thesis is on the retail sector in a South African market context. Research findings hold implications for market analysis on other real estate sectors.

Research on the theory of real estate and capital markets, central places, firm location and trade area analysis is predominantly based on international literature. The interpretation of theory should remain cognisant of contextual aspects, including the time and place in which the theory was formulated and the subject matter that informed the research. Due sensitivity to geographic, economic, cultural and political context is also advisable.

The centres that ultimately serve as case studies for model development (Chapter 9) are geographically distributed between five provinces (Gauteng, Kwazulu-Natal, Limpopo, North West and Mpumalanga) and cover a combination of urban (i.e. formal) and rural (i.e. tribal/traditional) markets – both inland and coastal.

1.2.7. Significance of the Study

The research and findings presented in this thesis should contribute to an understanding of the complex interaction between factors that shape the space economy and augment existing trade area analysis techniques.

Principles and concepts derived from central place theory continue to influence trade area analysis and GIS-based modelling. This thesis presents research findings that refute central place theory and indicates that said theory nevertheless continues to influence and misguide urban and regional planning theory and practice, as well as trade area analysis.

The principal concept presented in this research is that economy, more so than centrality and transport cost, determines location. Policy influences may have a bearing on location decisions and patterns, but if the role and influence of the state overrides economic logic, system efficiency is compromised (also see Smith, 1776, pp. 537 – 878). Smith conceived of the economy as a system in which regular patterns emerged from people interacting in markets and argued that order, not chaos, would result if individuals were left to their own devices (*ibid*, p. xi). Research by Smith (1976) and Nicolas (2009) indicate possible undesirable consequences when centralised state intervention overrides economic rationale and manhandles reality forcibly to serve the political ideology of the time.

It is contended that the location decision(s) of an economic subject(s) and subsequent spatial economic patterns should therefore ideally be governed by economic behaviour and economic rationale. Economic behaviour, in turn, appears to be characterised by the attributes of:

1. reciprocity – the behaviour of one economic subject affects the other economic subjects;
2. rationality (or a degree of rationality) – economic subjects evaluate options and implications (compare, for instance, Kahneman and Tversky, 1979, pp. 263 – 291 & Kahneman, 2011, pp. 48 – 49, 278 – 288 and 411 – 412); and

3. complexity – multiple subjective and objective factors influence economic behaviour and location decisions.

In terms of the above proposition, it follows that the spatial distribution of economic activity is not determined solely and unilaterally by the size of a centre or node, nor by the distance and associated transport costs to and from its locale. Technology reconfigures economic behaviour and reduces the need for economic participants to converge on a central place or market. Economic behaviour may be predictable only up to a point and theory transposed to simplistic diagrams neither fully explains nor predicts (or governs) such behaviour.

Socio-political and cultural considerations also come into play as certain societies tend to be more private transport orientated, whereas others are distinctly public transport orientated. Mooya (2016, Chapter 6) reiterates that outcomes in the real world are also influenced by structures, powers, mechanisms and tendencies.

The spatial economic pattern that can be observed is a function of complex interaction between economic subjects. Measurable attributes of the space economy include *inter alia* system saturation, internal market structure (i.e. degree of diversity), spatial demand density and a variety of measurable growth indicators of a market or trade area – distance and transport costs explain only two aspects of a complex system. By virtue of the quantifiable qualities of the aforementioned system attributes, the instruments proposed in this thesis have descriptive and predictive capabilities. These capabilities should improve the quality of decision making.

1.3. DOCUMENT OUTLINE

Subsequent paragraphs provide a summary of the focus and content of the respective thesis chapters.

- **Chapter 2 – Methodology**

The overarching research methodology, including type of research design, data sampling, data analysis, methods for achieving validity and interpretation of research findings are outlined in Chapter 2. A combination of qualitative and quantitative research techniques were deployed in researching the theory, analysing data and developing the proposed new method for analysing retail trade areas. The research methodology deployed for each component of the thesis is discussed in detail in the appropriate chapter.

- **Chapter 3 – Economic Framework**

Chapter 3 presents the Fischer-DiPasquale-Wheaton (FDW) quadrant model as a framework to illustrate the interrelationships between property and asset market variables. The FDW model conceptualises demand and supply factors that influence the flow of real estate, including endogenous and exogenous variables. A framework independently proposed by Fisher illustrates factors that affect space and capital market equilibrium. The economic framework provides the theoretical base for describing the complexities that govern interaction between role players in the real estate space. Albeit that the framework is not a location model *per se*, it serves to confirm that real estate investment decisions, including those that pertain to location, cannot be reduced to a simplified distance and value correlation.

- **Chapter 4 – A Critical Appraisal of Central Place Theory**

Central place theory has had a marked effect on geography theories and models – informing *inter alia* bid rent theory, a variety of business hierarchical systems and associated policies (including South African spatial development frameworks) governing decisions regarding the spatial distribution of shopping centres and business nodes. There is, however, little practical research on which this theory is said to have been based. As a consequence, urban geographic models and hierarchical systems have incorporated diagrams and numeric values that do not

closely resemble modern-day urban realities and have furthermore been found to be fundamentally incorrect from a mathematical/statistical and diagrammatical perspective, rendering the theory unsubstantiated in terms of its own base research.

Research findings hold fundamental implications for the genetic descendants of central place theory, in particular the business hierarchical models and parameter based approaches that unknowingly incorporated hereditary attributes and, by default, contain certain genetic defects – defects that continue to influence policy and decision making. Chapters 7 and 8 more specifically speak to the negative reinforcing phenomenon associated with parameter based approaches.

- **Chapter 5 – Perceptions on the Impact of Dual and Multiple Food Grocer Anchorage on Shopping Centre Performance**

The proposition that market or trade area size – and hence the distance an average consumer is willing to travel to a particular facility – is not simplistically determined by the size of a node, centre or facility is investigated in Chapters 5 and 6. These chapters consider the effects of the nature of the offering on market demand and support, with specific emphasis on food grocer anchor tenants.

Chapter 5 presents research on the perceptions of shopping centre owners, food grocer retailers and consumers regarding the impact of dual and multiple food grocer anchorage on the performance of shopping centres in South Africa.

- **Chapter 6 – The Impact of Dual and Multiple Food Grocer Anchorage on the Performance of Shopping Centres in South Africa**

Chapter 6 considers the quantifiable impacts of dual and multiple food grocer anchorage on shopping centres.

Major food retail chain groups have historically insisted on exclusive trading rights. However, many developers who had conceded to exclusivity clauses in the 1980s and 1990s are reconsidering the implications of such clauses on their centres, and more specifically the potential effects of excluding a segment of the consumer market by virtue of tenant selection and consumer brand preferences. Legal inquiries ensued, including contract law and the rights of the tenant; common law and the potential effects of denying the consumer access to preferred brands; as well as potential anti-competitive practices by virtue of the exclusion of certain tenants from a shopping centre.

The quantifiable impacts of dual or even multiple food grocer anchorage on shopping centre performance are investigated in this chapter.

- **Chapter 7 – Techniques for the analysis of trade areas: Retail Diversification Index**

In Chapter 7, the first of a number of techniques to supplement traditional market demand assessment techniques is explained. The technique proposed is the Retail Diversification Index (RDI), a quantitative technique that is suitable for macro and meso level area analyses. The literature review to this chapter includes a discussion on trade area definitions and related concepts, as well as the concept of diversity.

The RDI is proposed to measure the degree of diversification or, conversely, concentration, in a particular market area. The basis for the evaluation is the relative size of retail classes, as reflected by the country or region's unique retail classification system and data.

- **Chapter 8 – Further techniques for the analysis of trade areas: Multi-Criteria Saturation Index, Demand Density Analysis and Growth Matrix**

In the analysis of the trade area of shopping centres, the level of diversification or concentration observed in the retail structure of the market area provides a measure of the latent potential that may exist in the market. A more complete

analysis of the trade area ideally requires an analysis of the level of market saturation, the spatial distribution of demand and the inherent growth prospects of the trade area. This chapter proposes techniques suitable for the determination of the latter three aspects: namely the Multi-Criteria Saturation Index, Demand Density Analysis and Growth Matrix.

The commonly-used measure of market saturation, *viz.* floor space *per capita*, is extended to incorporate GDP *per capita*, which is positively correlated with disposable household income and is known to be one of the primary drivers of retail demand.

In addition, the Demand Density Analysis technique is proposed. The DDA is a quantitative technique combined with the visual presentation abilities of GIS technology. The technique assists in identifying and spatially representing geographic market gaps and, in so doing, locating development opportunities for further investigation.

To identify and analyse the integrated implications of complex trade area growth dynamics on asset performance, the Growth Matrix was developed. The Growth Matrix is a measure that maps the combined effects of:

1. long term market area growth in total retail spend and forecast annual growth in the retail demand threshold; *versus*
2. minimum trading density growth required to sustain market related rental growth of income generating assets.

- **Chapter 9 – Proposed Improved Methodology**

Chapter 9 describes the proposed improved methodology for the analysis of retail trade areas. The methodology integrates four proposed analytical techniques, namely the Retail Diversification Index (RDI), Multi-Criteria Saturation Index (MCSI), Demand Density Analysis (DDA) and Growth Matrix (GM). Refinements to the analogue model are also formulated.

A test for validity is developed and the results of this tests are summarised.

- **Chapter 10 – Summary of Main Findings and Direction for further Research**

The thesis concludes with a summary of main observations and suggestions are offered to provide direction for further research.

CHAPTER 2

RESEARCH METHODOLOGY

2.1. INTRODUCTION

Chapter two describes the overarching research methodology, including the type of research design, data sampling methods, data analysis strategies, methods for achieving validity and interpretation of research findings.

Qualitative and quantitative techniques were deployed in researching the respective subject matter of each chapter. The methodology deployed to research the respective theory, data and analytical techniques pertaining to each subject is detailed in the relevant chapter.

2.2. THEORETICAL FRAMEWORK

The theoretical framework for the research is informed by the work of respectively, DiPasquale and Wheaton (1992, pp.181 – 197) and Roulac (Fisher, 1992, pp. 161 – 180).

The research presented by aforementioned authors was progressed by respectively Du Toit and Cloete (2004). Boshoff (2013) also made a research contribution to the subject matter. These contributions provide the basis for the research in general and a critical appraisal of central place theory in particular.

From this theoretical base, the research was progressed into themes related to trade areas, including aspects that influence the extent of trade areas and techniques for the analysis of trade areas.

2.3. TYPE OF DESIGN AND THE ASSUMPTIONS THAT UNDERLIE THE DESIGN

The research design is structured on a theoretical description and analysis, supplemented with primary and secondary data research in which the theory, based on clearly stated underlying assumptions, is tested in practice. The research methods are quantitative and qualitative in nature.

The research investigates the validity of central place theory in the cities of Pretoria and Johannesburg. Primary research is then conducted in respect of the influence of shopping centre diversity (as opposed to size) on consumer behaviour, trade area support base and shopping centre performance. Food grocer anchorage is selected as variable. A combination of qualitative and quantitative techniques are applied to assess the impact of single food grocer anchorage *versus* dual and multiple food grocer anchorage on patronage and shopping centre performance. Qualitative aspects measured in the research include perceptions and preferences of consumers, shopping centre owners and food grocer retailers. Quantitative measures of performance analysed in the research include foot count and trading density data.

In response to the complexity of trade area dynamics observed, a number of techniques are proposed for the quantitative measurement of trade area attributes, namely the degree of diversity, saturation, mapping of demand density and calculating the composite effects of trade area growth indicators on asset performance.

2.4. DATA SAMPLING AND DATA COLLECTION

Primary data was collected by means of random sample surveys of shopping centre owners, food grocer retailers, shopping centre patrons and households. The scope of interviews with the respective role players are detailed in individual chapters.

Secondary data utilised in the development of the Retail Diversification Index (RDI) and Multi-Criteria Saturation Index (MCSI) was sourced from country fact sheets compiled by the International Council of Shopping Centres (ICSC). These sources are, similarly, detailed in individual chapters. Secondary data was also sourced from The World Fact Book (Central Intelligence Agency, 2017).

2.5. DATA ANALYSIS STRATEGIES

Primary and secondary data are analysed by means of conventional statistical methods, including data series analysis, tabulation and graphic representation by means of histograms, pie charts, scatter graphs and GIS mapping techniques.

Specialised data analysis techniques are also deployed, including indexing, weighted statistical techniques and the application of regression analysis. Econometric techniques, i.e. regression analysis, lend empirical support to data analysis, assists in obtaining numeric results and aid in the development of mathematical models to represent the behavioural relationship between variables.

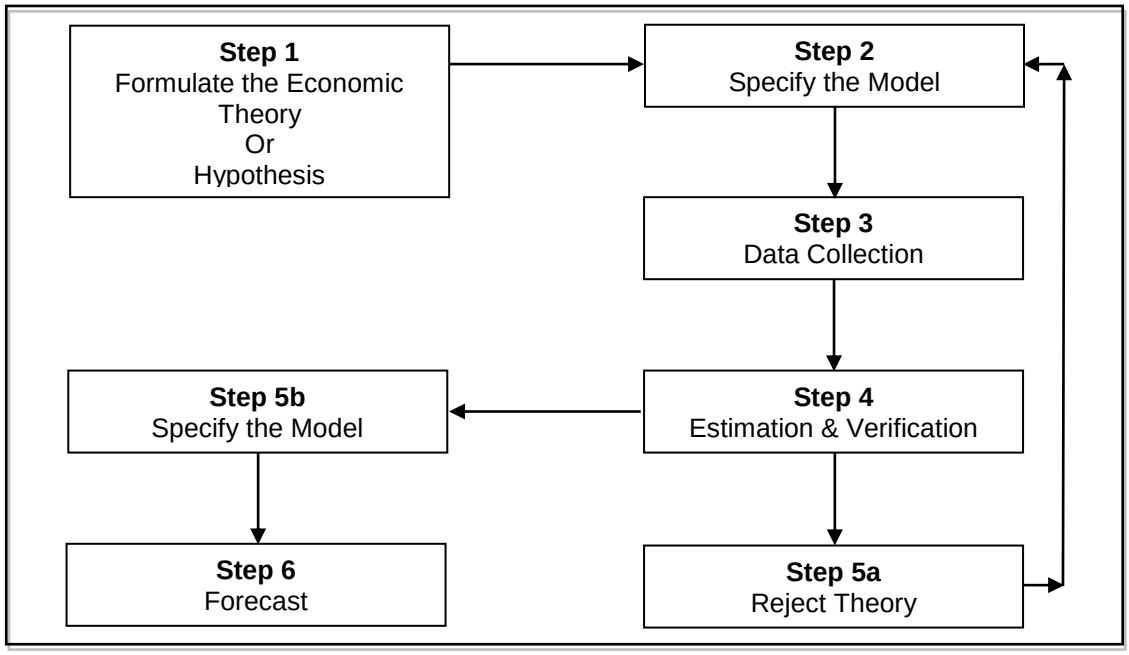
The significance of economic theory to accurately reflect reality is reiterated by Cassidy (1981, p.5) and Silbiger (2004, p. 172), stating that the purpose of regression analysis is to quantify and then apply the behavioural relationships between variables. Regression analysis therefore exhibits descriptive as well as predictive capabilities.

Regression analysis is a systematic process that requires the formulation of a basic theory or hypothesis, followed by data assimilation and application of analytical procedures and statistical techniques to test specific findings.

Steps in the application of regression analysis are discussed by Cassidy (1981, p. 19 – 30), Katz (1982, p. 3 – 9), Silbiger (2004, pp. 172 – 179), Chiang (2004) and Levine *et al* (2011, pp. 554 – 593) among others. The main steps involved in regression analysis are (refer to Figure 2.1):

1. Step 1 – Formulate the economic theory or hypothesis
2. Step 2 – Specify the mathematical model
3. Step 3 – Data collection
4. Step 4 – Estimation and verification
5. Step 5 – Reject or accept the theory or hypothesis
6. Step 6 – Forecast.

Figure 2.1: Steps in Regression Modelling



Source: Adapted from Cassidy, Katz, Silbiger, Levine & Chiang (ibid)

Regression analysis can be applied to develop a new model or to test the validity of an existing model with independent (i.e. new or alternative) data sets. The former method is applied in this research, i.e. new model development.

2.6. METHODS OF ACHIEVING VALIDITY

Validity is achieved by multiple methods through various stages of the research, including scientific survey sampling, statistically sound analytical techniques, by comparing results with the opinions of industry leaders (including shopping centre owners and retailers) and by multiple method overlap – i.e. assessing congruence by comparing the outcome of various techniques.

Data analysis was performed methodically in terms of the following general steps:

1. Organisation of data by subject
2. Categorisation of data according to formula requirements
3. Interpretation of single instances and outliers, including explanations
4. Identification of patterns
5. Synthesis and generalisations.

2.7. INTERPRETATION OF RESEARCH FINDINGS

2.7.1. Relationship to literature and theory

The theoretical framework presented in Chapter 3 concurs with independent research published by DiPasquale and Wheaton (1992, pp.181 – 197), Fisher (1992, pp. 161 – 180), Fisher *et al* (1993), as well as Du Toit and Cloete (2004) and Boshoff (2013). Research findings and conclusions in respect of the critical appraisal of central place theory is consistent with independent research published by Nicolas (2009, pp. 1 – 20).

2.7.2. Relationship to practice

Relationship and relevance to practice was established by deploying a combination of primary and secondary research methods.

Research presented in Du Toit and Cloete (2004) incorporate the factors that affect space and capital market equilibrium proposed by Fisher (Roulac, 1996) and progresses the theoretical FDW framework (initially conceived as pedagogical aid) to research applied in practice by means of the development of an Integrated Property and Asset Market Model (IPAM). Findings of the practical application of the IPAM are published with the Pretoria office market and associated data as research subject. The theoretical framework presented in this thesis, which is

based on the foundational work of aforementioned researchers, inherently incorporates the findings of independent practical (and published) research.

Consistency was observed in trends concerning the spatial distribution of land value patterns in the cities of Pretoria and Johannesburg. Observations pertaining to the spatial distribution of nodes (measured by *inter alia* shopping centre anchored nodes in Gauteng Province, South Africa) are consistent the proposition and findings in Nicolas (2009): i.e. that the numeric expressions in the spatial and mathematical models developed by *inter alia* Christaller and Lösch (in particular the so-called K-values and associated “six-for-six” principle) bear no resemblance to spatial reality.

Primary research was conducted to ensure that research remained relevant to practice. Comparative research on the measurable impacts of dual and multiple *versus* single food grocer anchorage, specifically in terms of shopping centre performance, could not be sourced. Results and findings of the research were subsequently tested in terms of revealed as well as stated preferences. In terms of stated preferences, interviews were conducted with randomly selected food grocer retailers and shopping centre owners. Revealed preferences by developers, in turn, were measured by analysing spontaneous market behaviour: changes in time series data on the number of dual and multiple *versus* single food grocer anchored centres developed, were measured and observed.

Consumer preferences were similarly tested in terms of stated and revealed preferences. Stated preferences were measured by means of random sample surveys with shopping centre patrons and households. Revealed consumer preferences were measured by analysing independent shopping centre data on foot counts and trading densities. Consistency observed in results of the various methods lend credence to the research findings.

The development of a proposed new and improved trade area analysis methodology is borne from a need that was identified in practice to address the limitations of traditional trade area analysis techniques. This need that was identified by the author was informed by experience gained in compiling market

research reports, submitting specialist evidence at hearings and tribunals, by performing evaluations of independent market research reports since 1994 and through continuous education. The proposed techniques that constitute the new improved methodology were found to have application value in practice, either individually or as part of an integrated method.

2.8. CONCLUSIONS

Chapter 2 articulated the broad approach that provides the foundation for an assessment of demand and supply factors that influence the flow of real estate (Chapter 3) which, in turn, provides a platform for the evaluation of central place theory (Chapter 4) from an economic perspective. These chapters lay the foundation for further more in-depth analyses of the quantifiable factors (other than size and the distance deterrence function) that influence the appeal and performance of shopping centres. Research on each individual subject requires a methodology that is tailored to the needs of the subject matter: Chapters 4 to 8 therefore respectively commence with a focused literature review and description of the research methodology applicable to the subject matter of that particular chapter.

Chapter 3 describes an economic framework that explains the complex interaction between economic role players in general and the real estate environment in particular.

CHAPTER 3

ECONOMIC FRAMEWORK

3.1. INTRODUCTION

Relevant economic and real estate concepts are analysed in Chapter 3. The analysis is based on two conceptual real estate frameworks:

1. The Fischer-DiPasquale-Wheaton (FDW) real estate model (DiPasquale and Wheaton, 1992, pp. 181 – 197); and
2. A Strategic Real Estate Framework, conceptualised by Fisher (1992, pp. 161 – 180).

The Fischer-DiPasquale-Wheaton (FDW) quadrant model illustrates the interrelationships between property and asset market variables. The model conceptualises the relationship between variables that represent the micro-foundations of economic behaviour in property and asset markets. A framework independently proposed by Fisher complements the FDW model and illustrates factors that affect space and capital market equilibrium.

Albeit that the FDW model was conceived as a pedagogical aid, further independent research advanced the concepts into functional relationships (Du Toit and Cloete, 2004, pp. 341 – 367), cf. also Boshoff (2013, pp. 383 – 394).

3.2. ECONOMICS AND HUMAN BEHAVIOUR

Levitt and Dubner (2005, p. 13) describe economics as "… a thicket of information about jobs and real estate and banking and investment". In an introduction to economics and regression analysis, Cassidy (1981, p. 1) states that economics is essentially a study of human behaviour (cf. Kahneman, 2011). In terms of Tobler's

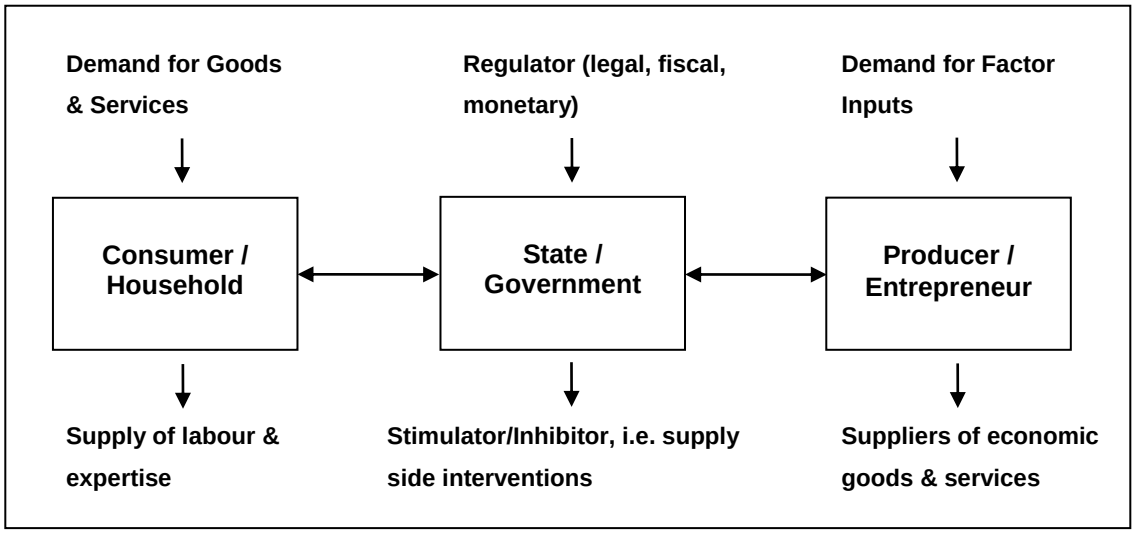
First Law of Geography (1970, pp. 234 – 240) "… everything is related to everything else, but near things are more related than distant things". Tobler's law is consistent with economics effects agglomeration described by Weber (Latham, 1979, p. 9) and nodal clustering, as articulated in Fotheringham and O'Kelly (1989).

Human beings and human behaviour form the basic building blocks of society and act out various roles – either as entrepreneurs, households or the state, i.e. the three main economic role players identified in the Keynesian multiplier (or general economic equilibrium equation). The relationship between these role players is defined by, *inter alia*:

1. the spectrum of needs and wants of the consumer;
2. scarce resources required to produce economic goods and services;
3. government regulatory system; and
4. production and pricing structures.

The aforementioned encompasses the three main processes of production, distribution and consumption. These relationships can be conceptualised as follows (Figure 3.1).

Figure 3.1: Conceptualising Economic Role Players & Relationships



The household (i.e. consumer) creates demand for a spectrum of economic goods and services – *inter alia* retailing, entertainment, healthcare, education, housing, transport and utilities. The household is simultaneously consumer as well as the source of labour and entrepreneurship in the economy. Adam Smith (1776, p. 423) asserted that the "sovereign (meaning the state) … are unproductive labourers. They are the servants of the public, and are maintained by a part of the annual produce of the industry of other people. Their service, how honourable, produces nothing for which an equal quantity of service can afterwards be produced".

The State acts as regulator of interaction between economic role players through monetary and fiscal policy, and state law that governs interaction between natural and legal persons. The private sector represents the creative and productive centre of an economy, creating new products and services with the use of factor inputs. As such, private consumption expenditure (i.e. "C" for consumption expenditure in the Keynesian multiplier) and investment (i.e. "I") are the fundamental drivers behind economic activity – what Levitt and Dubner summarise as jobs, real estate, banking and investment.

3.3. DEFINING REAL ESTATE AND RELATED CONCEPTS

3.3.1. Real Estate

Pyhrr *et al* states that "…(a) real estate investment is often perceived as a physical product or entity" (1989, p. 3). In this context, Wurtzebach and Miles defines real estate as follows: "(r)eal property (and real estate, which is treated as synonymous) consists of physical land as well as structures and other improvements that are permanently attached" (1996, p. 7). The same source refines the definition by adding that it also entails "… a bundle of rights to use and dispose of land and its improvements subject to various restrictions" (1996, p. 8). Hence, there are many claims on real estate, made by a spectrum of interested parties. The government, for example, claims taxes and imposes use restrictions by means of zoning regulations and title deeds. Lenders claim interest and

repayment of a loan, whilst the residual claim, or property ownership, confers upon the owner the right to receive cash flow from the property, subject to any prior claims.

The latter introduces the concept of converting real estate space into monetary flows over time – which suggests that the concept of real estate can be understood, not merely in terms of its physical dimension, but in terms of three dimensions, namely space, time and money (Pyhrr *et al*, 1989, p. 4).

A simple definition of real estate could therefore conclude that real estate is the national stock of buildings, the land on which they are built and all vacant land (DiPasquale and Wheaton, 1996, p. 1). For the purpose of this analysis it is necessary to comprehend real estate as a three dimensional concept: the FDW Model focuses on each of the three dimensions of real estate, namely space, time and money.

3.3.2. Real Estate Market

The real estate market is the market for the use of space, also referred to as the user market or the market for tenant space (Fisher, 1992, p. 161).

In terms of the FDW Model, the real estate market represents the current stock of real estate, in other words the supply of real estate floor space, as well as rentals at which this stock is made availed to prospective tenants (DiPasquale and Wheaton, 1996, p. 8).

This market and its subcomponents form an integral part of the FDW Model. The real estate market includes any type of commercial real estate, such as retail space, office space and industrial space, as well as residential real estate (DiPasquale and Wheaton, 1992, p. 182).

The literature on which this chapter is based is not specific on the role of public sector real estate. It does, however, appear as though the concepts, terms and

relationships in the FDW Model focus predominately on the private sector. The forces and motives that influence private sector and public sector investment are different: private sector motives are largely profit-driven whereas government supposedly embraces social motives (compare Maisel and Roulac, 1976, pp. 514 – 421, and Wurtzebach and Miles, 1996, pp. 708 – 710).

3.3.3. Asset Market

In the context of the FDW Model, asset market refers to those sub-markets concerned with the monetary value of real estate as an asset. Two important sub-markets are identified as part of the asset market, namely the market for asset valuation and the construction market (DiPasquale and Wheaton, 1996, pp. 8 – 10 and 1992, pp. 185 – 189).

The market for asset valuation is the market in which the value of real estate is determined. DiPasquale and Wheaton argue that real estate is both a durable and capital good (i.e. an economic 'good' which has inherent monetary value) and that its production and price are determined in an asset (or capital) market (1996, p. 6 and 1992, pp.185 – 186). Hence, the capitalisation technique is a prominent feature in the process of determining asset values within the framework of the FDW Model.

The sub-market depicting real estate construction is primarily concerned with construction costs and more specifically the minimum monetary value required to stimulate some level of new development (DiPasquale and Wheaton, 1996, pp. 8 – 9 and 1992, pp. 188 – 189).

3.3.4. Flow of Real Estate

DiPasquale and Wheaton (1996, p. 3) define the flow of real estate as "…the value of new buildings put in place each year, less losses from the stock through depreciation or demolition". It is important to note that the aforementioned authors

regard land as being non-reproducible and it is therefore a stock variable, not a flow variable (1996, p. 3). Flow of real estate, in the context of the FDW Model, therefore refers to the net value of all new development, less stock loss through depreciation, demolition and other withdrawals.

In this thesis, the author contends that land and land value are implicit in the calculation of overall real estate quantum as well as capital value and should be considered as part of the flow of real estate. The motivation for this view is explained as follows. The aggregate supply of land is fixed, i.e. completely inelastic. However, 'new' land for development is made available through legal processes to procure development rights for new township developments. Demolitions and brownfields redevelopments also release 'new' land back into the equation. The net additional demand for (and subsequent supply of) real estate, which constitutes the flow of real estate, therefore includes not only newly developed buildings, but also the newly zoned and newly released land on which new buildings are to be constructed. In response to increased demand, the concomitant increase in supply of real estate stock requires space in terms of both land and buildings (albeit not in equal proportion).

3.3.5. Endogenous Variables

These variables are measures of real estate market outcomes (DiPasquale and Wheaton, 1996, p. 2). Prices, rents and sales are endogenous, i.e. the real estate market determines them.

Endogenous variables are therefore a product or consequence of interaction between various factors in either the real estate market or asset market. For example, real estate values are a function of the prevailing capitalisation rate in a particular market area. Real estate values, in turn, dictate whether real estate is a profitable investment in relation to other investment options. An endogenous variable has an impact on the market and is, in itself, influenced by the market – be it the real estate market or capital market.

3.3.6. Exogenous Variables

Exogenous variables are factors that "…influence real estate market outcomes but are not influenced by the real estate market" (DiPasquale and Wheaton, 1996, p. 2). In the context of the FDW Model exogenous forces include *inter alia* world trade, land use regulations, tax legislation, interest rates, economic growth (or decline), population growth, firm production levels and income (therefore also expenditure) levels. Even climate is regarded as an exogenous variable (DiPasquale and Wheaton, 1996, p. 2).

Wurtzebach and Miles (1996, p. 676) identify three macroeconomic changes that typically introduce exogenous shocks to the real estate market. These macroeconomic variables are:

1. general level of economic activity;
2. employment;
3. inflation (or deflation).

3.4. FACTORS AFFECTING SPACE AND CAPITAL MARKETS – AND EQUILIBRIUM

Preceding paragraphs defined overarching real estate concepts and touched on correlations and causality between certain market indicators. These correlations (and causality) are the consequence of a complex sequence of processes, linkages and decisions by various role players in the market place – the market place broadly defined includes the economy, real estate and financial markets. Roulac (1996, pp. 323 – 346) identify factors or forces that create and influence these processes, linkages and decisions.

According to Roulac, the economy and real estate markets reflect a series of strategic interactions between suppliers and users of space, resulting in real estate transactions (Roulac, 1996, p. 337). Roulac maintains that market participant

transaction decisions "… start with the decisions by developers and deal makers considering the critical sell-or-buy, build-new-or-buy-existing deal initiative, set off against the space users' decision to rent or buy and, if buy, to purchase existing property or build a new structure" (1996, p. 337).

The causality in the process as suggested by Roulac is, however, not as simplified and involves a multitude of complex, interactive considerations including *inter alia* consumer demand and preferences, evaluations of locality, aesthetics, price (i.e. cost – direct/immediate acquisition costs and long term operational costs), availability and timing of the opportunity.

Roulac argues that the "… confluence of the initiatives and decisions of those who utilise space with those who are involved in creating and controlling it, are filtered through a series of transaction interaction forces, including:

1. Property market conditions;
2. Space user strategies, resources and priorities;
3. Competing investment performance;
4. Service provider and developer/deal-maker initiatives;
5. Capital market conditions;
6. Economic activity;
7. Business consumer confidence;
8. Public sector policies, priorities and programmes" (1996, p. 337 and 345).

The net effect of these interacting forces can be traced to financial input-output relationships in the property and asset market. Such interactions between economy and asset markets are also explained in terms of the Fischer-DiPasquale-Wheaton Four Quadrant Model.

The research conducted by Roulac identifies factors that affect property and asset market equilibrium, including interactive processes between space users, investors, owners/managers, service providers, developers and the public interest (1996, pp. 323 – 346). Fisher (1992, pp. 161 – 180) developed a framework that identifies and categorises macro factors that influence capital and space market

equilibrium. The framework within which these macro changes occur and its relation to user and capital market equilibrium is illustrated in Figure 3.2.

Fisher (1992, pp. 163 – 166) identified spatial and non-spatial macroeconomic impacts that influence the supply of and demand for real estate space and assets. These impacts on the general market equilibrium are introduced by *inter alia*:

1. international oil prices;
2. level of industrial production;
3. defence spending;
4. export earnings;
5. inflation;
6. exchange rates;
7. interest rates;
8. tax and other laws.

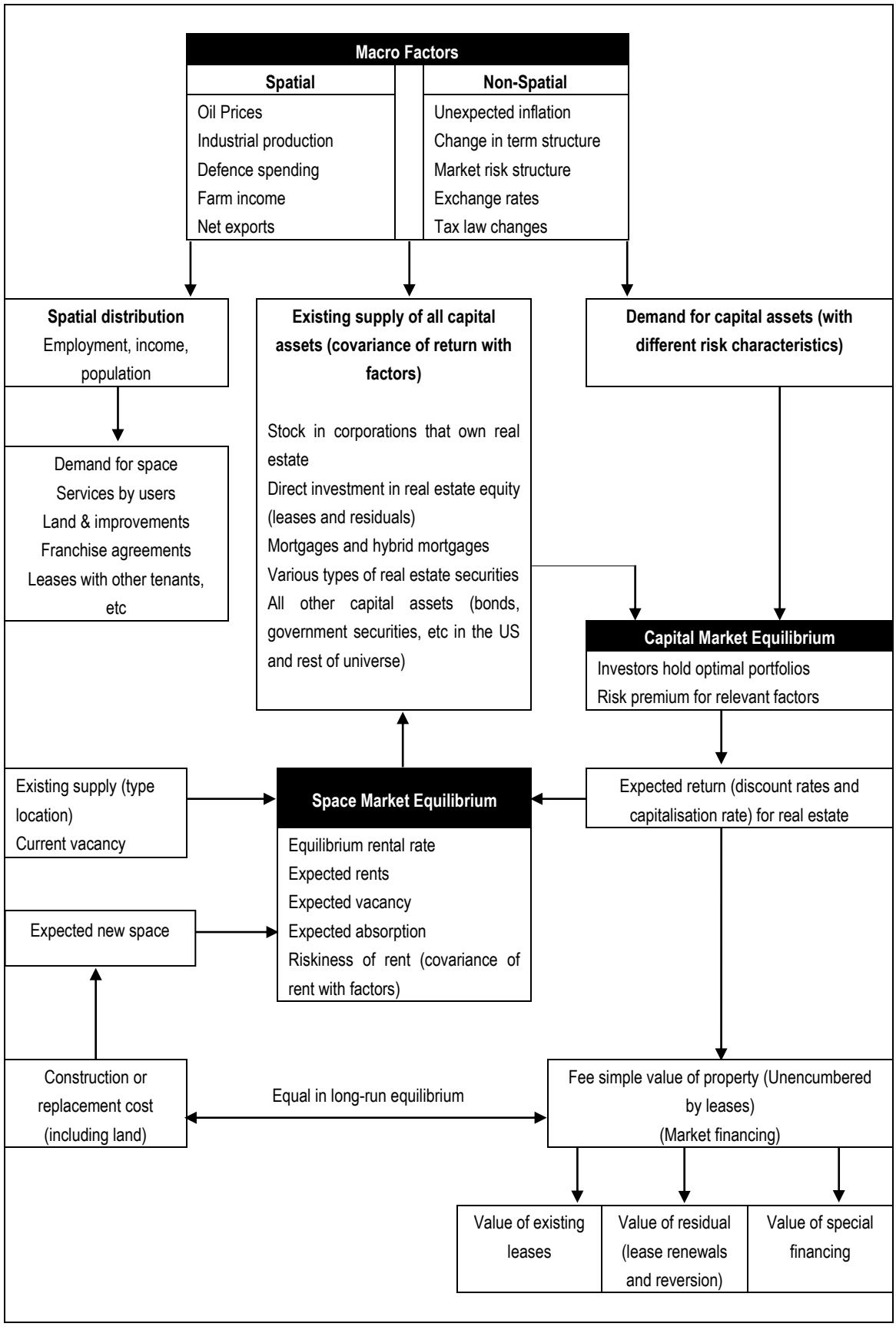
To the aforementioned, a host of additional exogenous variables can be added, including:

1. levels of indebtedness (affecting state and private sector, i.e. ‘G’ and ‘C’ in the Keynesian multiplier);
2. consumer confidence;
3. business confidence;
4. personal consumption expenditure;
5. final demand;
6. cyclicality (short term market cycles *versus* long term structural market changes);
7. labour volatility, including industrial action (labour protests and strikes).

In addition to macro aspects, local market equilibrium is influenced by localised market dynamics including:

1. local economic base and growth;

Figure 3.2: Factors affecting Space and Capital Market Equilibrium



Source: Fisher, 1992, p. 164

2. demographic profiles and trends (including cultural aspects, psychographics, life stages, life styles, structural dynamics and trends);
3. local governance considerations, including policy stance and certainty, safety perceptions, efficient service delivery, perceived stability, quality of life considerations;
4. quality and appeal of nodes and associated rentals commanded;
5. vacancy rates and profiles;
6. absorption rates;
7. area risk profiles (real and perceived);
8. investor appetite and portfolio focus, including returns required (which vary between investors);
9. infrastructure availability and capacity;
10. major development projects and its catalytic effects;
11. incentives and other special government projects and interventions (in the South African environment these may, for instance, include *inter alia* Special Economic Zones and Strategic Infrastructure Projects).

The refined techniques for trade area analysis (Chapters 7 & 8) as well as the refined model (Chapter 9) are configured to be responsive the factors outlined in this section.

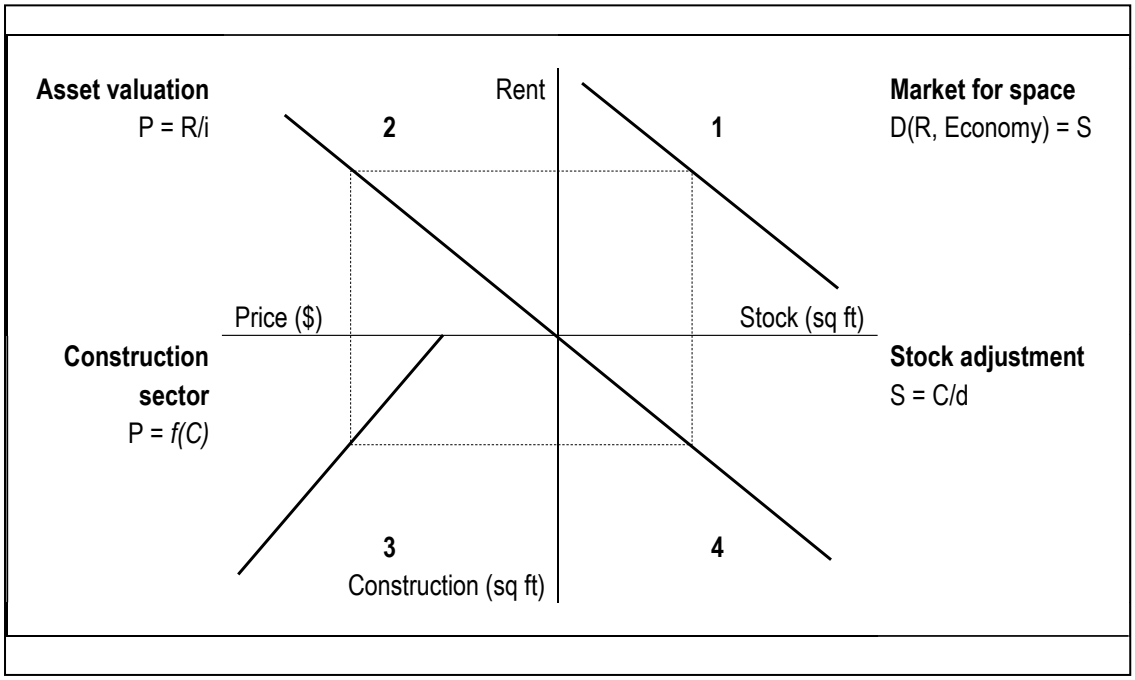
3.5. RELATIONSHIP BETWEEN REAL ESTATE AND ASSET MARKETS

3.5.1 Defining the Model

The relationship between real estate and asset markets is described in terms of the so-called Fischer-DiPasquale-Wheaton (FDW) Four Quadrant Model. In Urban Economics and Real Estate Markets, the FDW Model is described as a "… simple conceptual framework …" (DiPasquale and Wheaton, 1996, p. x). The FDW Model is a quadrant model that traces the relationships between real estate market and asset market variables, as well as the adjustments that take place to establish

equilibrium in the supply of and demand for real estate (refer to Figure 3.3). The model can be applied for static-comparative analysis.

Figure 3.3: The Four Quadrant FDW Model



Source: DiPasquale and Wheaton, 1996

The FDW framework is essentially founded on the principles of demand and supply modelling: in a state of equilibrium, therefore, the demand to own real estate must equal supply (DiPasquale and Wheaton, 1996, p. 6). Hence, the primary objective of the model is to determine market equilibrium: i.e. the amount of floor space required and supplied at a given price or rent. The model is grounded in the basic premise of Keynesian economics – i.e. that the market continuously aspires to a general state of equilibrium.

In an equilibrium state, the supply of real estate space should be equal to demand at a specific price level (**Quadrant 1**). The price paid for real estate assets by an investor is a function of real or imputed rent (Achour–Fischer, 1999, p. 34). Rent is translated into property values when, in the capital market, rentals are capitalised at an appropriate capitalisation rate (**Quadrant 2**). Through the capitalisation rate, the model therefore implicitly takes market risk into account. The difference between property values and replacement cost per unit triggers the supply of new development (**Quadrant 3**). In this respect, the model is open to interpretation and

it could be reasoned that “build new or occupy existing” considerations apply. Hence, availability of existing stock, quality, grade and vacancy rates could be specified as additional variables. Even in strictly static conditions, a certain level of construction is required to maintain stock at the required equilibrium: a portion of stock is always subject to demolition, withdrawal or deterioration (**Quadrant 4**). Stock adjustments, i.e. new construction minus losses, are added to the long-term stock of real estate space (back to Quadrant 1).

The model and composition of each quadrant is explained in terms of mathematical functions. The function for each quadrant is outlined in the text box below.

DFW Model Functions
Quadrant 1: D(R, Economy) = S **Quadrant 2:** P = R/i **Quadrant 3:** P = *f*(C) **Quadrant 4:** S = C/d
where: – **D** is demand **S** is supply **R** is rent per unit **P** is price or value per unit **i** is the capitalisation rate **C** is construction **d** is a depreciation rate

Each function in the FDW Model portrays the relationship between specific endogenous and exogenous variables. Subsequent paragraphs provide a description of each quadrant and present the mathematical functions that embody the relationship between relevant real estate space and asset market variables pertaining to each quadrant.

3.5.2 Model Assumptions

Neither the textbook by DiPasquale and Wheaton, nor the articles published on the FDW Model describe or identify the assumptions, limitations and parameters on which the framework is based. Hence, these assumptions were determined by means of inference. DiPasquale and Wheaton do, however, indicate that the reader needs to be reacquainted with the principles of "… simple supply and demand analysis" (1992, p. 2). The economic laws of demand, supply, market equilibrium and competition are briefly outlined.

The law of demand states that if the price of a product decreases while all other factors remain constant, the quantity of that product demanded in the market will increase, and vice-versa (see e.g. Lombard *et al*, 1986, p. 23 and Samuelson, 1980, pp. 53-55). The position of the market demand curve is also determined by the following factors, among others:

1. Consumer tastes. In the context of the FDW Model, 'consumer' can be interpreted to be the tenant or other occupiers of space.
2. Consumer income and expenditure. In terms of the FDW model, consumers could entail respectively private households or commercial tenants.
3. The price level of other commodities (Mansfield, 1988, pp. 22 – 23). Real estate markets are competitive environments in which multiple users and suppliers of space interact to determine market pricing levels and/or rentals for various products across a spectrum of nodes (i.e. spatial localities).

Demand can be elastic or inelastic. The demand for a commodity, such as real estate, is said to be elastic if the percentage change in quantity demanded resulting from a one percent (1%) change in price were greater than one percent (Mansfield, 1988, p. 27). On the other hand, the demand for a commodity is said to be inelastic if the percentage change in quantity demanded resulting from a one percent change in price were less than one percent (Mansfield, 1988, p. 27). Similar definitions are provided in Lombard *et al* (1986, p. 26) and Samuelson (1980, p. 357).

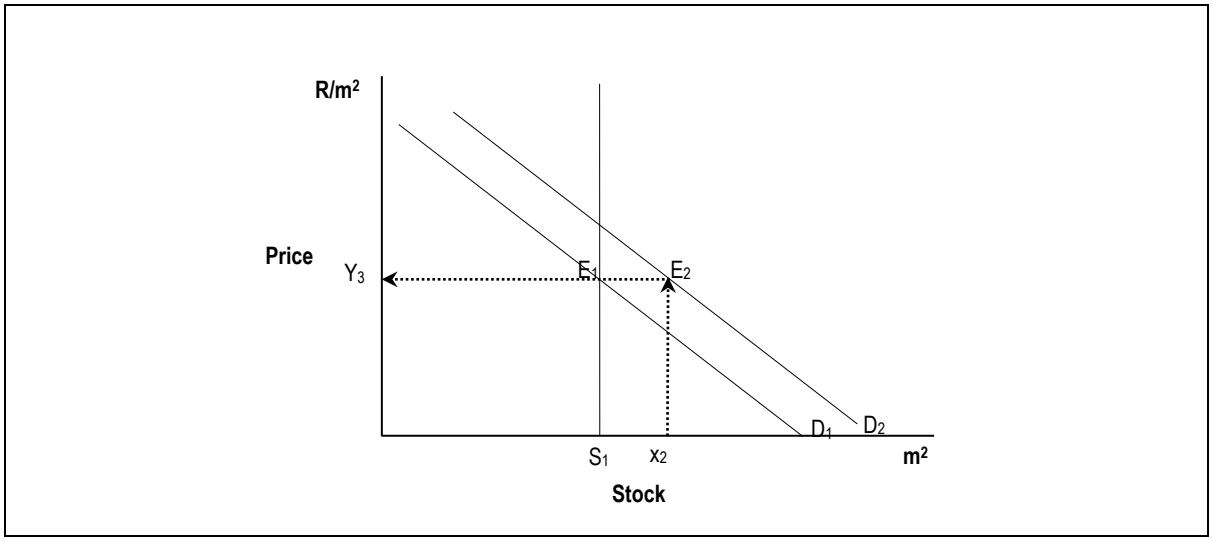
In essence, demand elasticity therefore refers to the degree to which a consumer market is price sensitive. If, for instance, supply is limited or demand is bullish, the market may be relatively more inclined to take whatever space is available, even if it meant that prevalent market prices for a given office grade in a certain geographic area are exceeded. In this manner, a new equilibrium price is set. The converse also holds true. Lease terms (which tend to be medium to longer term, i.e. 3-5 years or even 5-8 years) create a degree of inelasticity, i.e. even if a business enterprise requires additional space to expand over the short term, it may not be able to exit from an existing lease agreement with immediate effect to address the increased demand requirement.

The same principles outlined above apply to the supply of real estate space. In terms of the law of supply, if the price of a product were to increase while all other factors remained constant, the quantity supplied on the market would increase and vice-versa (see e.g. Lombard *et al*, 1986, p. 26 and Samuelson, 1980, pp. 55 – 56). In a similar vein, the supply of a commodity can be either elastic or inelastic. Price elasticity is a gauge of the degree to which variances in price may affect the corresponding quantum of supply.

Real estate supply is known to be relatively inelastic (refer to Figure 3.4). Due to a number of factors, new (net additional) supply of real estate takes time to become available. These factors include:

1. due diligence exercises including feasibility studies, traffic impact studies, fund raising (bank financing and seeking of equity partners), environmental impact assessments;
2. administrative planning and approval processes, including rezoning advertisements and approval processes, tribunals and appeals, drafting and approval of site development plans and building plans;
3. construction tender processes, lead times, site preparation, construction, rain and other delays;
4. negotiating final terms with funders and investors; and
5. protracted lease negotiations, coupled with the requirement of most financial institutions to be at least a certain minimum percentage (e.g. 70%) pre-let.

Figure 3.4: Inelasticity of Real Estate Supply



In terms of Figure 3.4, should the demand for real estate increase from D_1 to D_2, it may take the supply curve and hence market equilibrium some time (which may be several months or even years) to adjust in response to higher demand levels. The supply side is, however, not perfectly inelastic as a certain amount of unproductive space is almost always available for conversion.

The inelasticity of real estate supply inevitably creates timing challenges: bringing appropriate levels of supply to the market at the right price at the most opportune time. To overcome timing challenges, larger development companies implement one or a combination of the following strategies:

1. create a pipeline of projects; and/or
2. pursue opportunities in multiple geographic markets; and/or
3. pursue opportunities across real estate market segments/sectors.

Other mechanisms deployed by the market to address, at least in part, supply-side inelasticity include:

1. vacated stock – companies moving to bigger (or smaller) premises or to a different region / sub-market, thereby 'creating' readily available space for potential new takers;
2. stock conversions – refurbishment and rejuvenation of old stock;

3. home-to-office conversions – adding supply-side stock by creating affordable space for smaller companies at sub-par prices/rentals (remains largely dependent on municipal planning policies and by-laws).

Real estate market demand-supply relationships are both intricate and complex. Smaller development companies often find it difficult to adapt to cyclical market fluctuations and are typically the first casualties in market downturns.

Equilibrium, in theory, is the point at which demand and supply intersect and "… where there is no tendency for change; in other words, it is a situation that can persist" (Mansfield, 1988, p.32). Equilibrium, by definition, is based on the assumption of perfect competition. The FDW Model contains similar, arguably imperfect, assumptions. The four main characteristics of perfect competition are:

1. Perfect competition assumes that there is a large number of suppliers (i.e. building owners and developers) and users (i.e. tenants and potential owner occupiers) that are, on their own, too small to influence the market price of a commodity (i.e. real estate) by varying its quantity (Lombard, Du Pisanie and Steyn, 1986, p. 239; and Mooya, 2016, Chapter 1 & 2).
2. Products (e.g. office space within a certain market area) are completely homogenous and undifferentiated. This implies that the products on offer (e.g. office space inclusive of all services such as utilities, security and parking) must be identical to all consumers, i.e. tenants and owner occupiers (Lombard, Du Pisanie and Steyn,1986, p. 61).
3. All suppliers and consumers have complete and free access to and from the market. Individual consumers must, furthermore, have complete freedom and equal opportunity to acquire and/or dispose of the commodity (i.e. enter into or terminate lease agreements). Resources must therefore be completely flexible (*Ibid*, 1986, p. 61 and Mansfield, 1988, p. 239).
4. All consumers, firms and resource owners have perfect knowledge of the relevant economic and technological data (Mansfield, 1988, p. 239; and Mooya, 2016, Chapter 1 & 2).

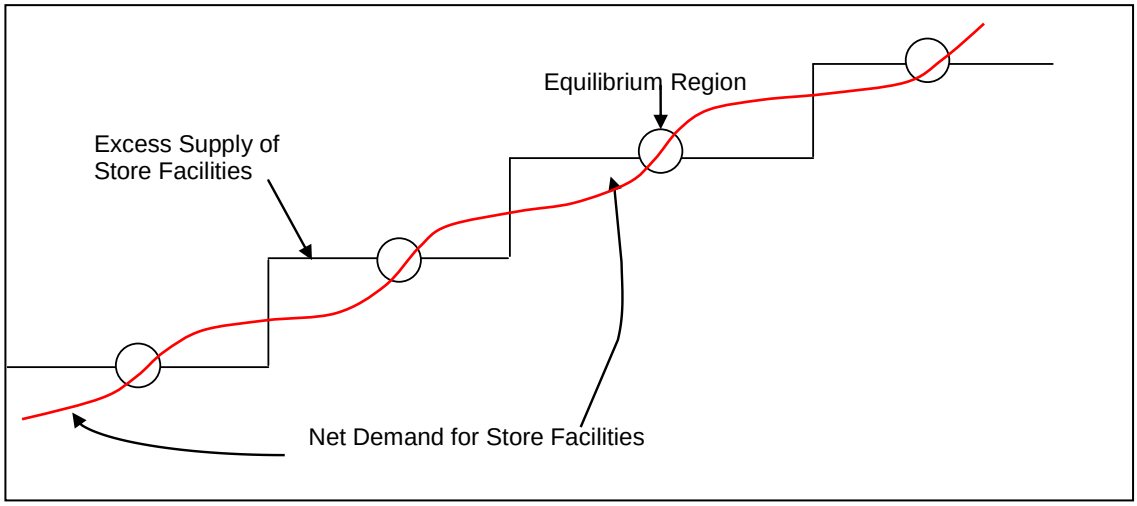
In real estate, these assumptions imply that a single developer or tenant is not, by itself, able to influence the market price of real estate, whether it be its market value or rental rate per unit. This assumption does not hold true in real estate as the so-called pioneer (or highest new) rental commanded in a node is always set by one particular developer/landlord. It is furthermore assumed that real estate within a particular market is completely homogenous, which in reality it is not. The effects of individual bargaining and trade-offs are not accounted for. All developers, tenants and potential real estate owners do not have equal access to the market by virtue of the same credit rates, quality of labour, quality of materials, type of equipment and technology. Firm size and asset base are among the factors that create unequal access to market. Perfect market knowledge is a notional concept and not all tenants have complete and accurate market knowledge of aspects such as rentals, quality and quantity of space on offer, ancillary facilities and services on offer or have a full and complete inventory of all available and new projects – existing, ongoing and proposed.

In an imperfect market, a high degree of market knowledge may well be possible, but perfect market knowledge is improbable. Assumptions based on perfect market conditions, perfect knowledge, perfect competition and perfect (i.e. symmetrical) distribution of economic factors inputs are equally oversimplified. Mooya (2016, Chapter 5) offers a comparable critique of the oversimplified assumptions of the pillars of neoclassical economic theory (*ibid*, Chapter 1 & 2). On account of aspects such as imperfect market knowledge and demand-supply lags, it is propositioned that the existence of an exact equilibrium point at a given moment in time is improbable: market equilibrium is not static but dynamic and in a constant state of flux. Certain proponents (Fisher, 1992, p. 167) argue the existence of a natural vacancy rate, although the concept is not defined nor quantified. It can furthermore be theorised, given fluctuating vacancy rates over time, that there would instead be an equilibrium region (refer to Figure 3.5). In terms of this theory, it follows that there is no single equilibrium price point, but rather an equilibrium price range.

Figure 3.5 illustrates the inelastic real estate supply curve and periodic increases in supply. Compare Pyhrr *et al*, 1989, p. 492 and Applebaum & Cohen (1961, p.

97). The research illustrates a systematically increasing demand base in a sustained quasi-linear trajectory over time. Demand tends to increase in tandem with economic growth, although with periodic leads and lags. The notion of an equilibrium region propositioned in this thesis is consistent with the conceptualisation of the demand-supply relationship illustrated by aforementioned authors. The sustained demand trajectory will, however, not be universally observed in all markets.

Figure 3.5: Dynamic Nature of Demand and Supply for Retail Centres



Source: Adapted from Pyhrr, 2014

The sustained linear demand trajectory is an embodiment of the earlier thinking and modelling concepts developed by Applebaum and subsequently perseveres in traditional trade area analysis and modelling techniques. In markets characterised by low, though positive population and income growth, inflationary economic effects create a receding demand base. Traditional trade area analysis techniques are not responsive to this dynamic. To this end, the Growth Matrix technique is proposed in this thesis.

In terms of supply, development projects tend to occur in a pipeline-type manner and market supply never completely seizes (i.e. 'flatlines'). The pipeline project principle ensures a flow of projects over time (albeit inconsistent) and, coupled with timeous stock conversion, is more likely to correspond to market behaviour illustrated by means of a fluid line over time. Increased supply-side activity increases periodic vacancy to above the natural vacancy rate – although neither

Fisher nor DiPasquale and Wheaton definite or quantify natural vacancy and there appears to be no consensus view on the quantum of the concept, other than the notion that it is a value that reflects the long term vacancy aspiration of an area.

The assumptions and concepts outlined in this paragraph communicate fundamental principles of the FDW Model and serve as point of departure for a detailed description of each quadrant.

3.5.3 Quadrant Description and Interaction

Subsequent paragraphs describe each of the FDW Model quadrants. The unit of measurement was adjusted from the original text by DiPasquale and Wheaton (1992) to the metric system. Quadrant 2, 3 and 4 are presented in the conventional x-y orientation as opposed to the inverted quadrant format. The respective quadrants of the model are:

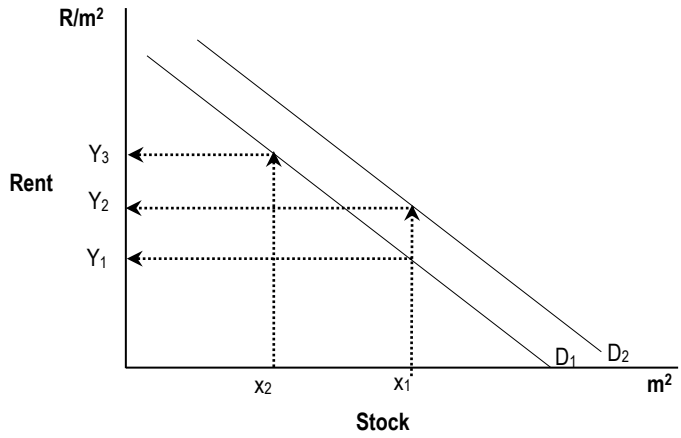
1. Quadrant 1 – Market for Space
2. Quadrant 2 – Asset Valuation
3. Quadrant 3 – Construction sector
4. Quadrant 4 – Stock adjustment.

Quadrant 1 and 4, i.e. the two quadrants to the right (east) of the y-axis, reflect property market variables. Quadrant 2 and 3, i.e. the two quadrants to the left (west) of the y-axis, reflect asset market variables.

Quadrant 1: Market for Space

Quadrant 1 portrays the demand for real estate space in the classic demand-supply configuration in which the quantum of demand and supply are shown in terms of various price levels, save the FDW model does not explicitly indicate the supply curve. The market for space is also referred to as the user market. The demand curve (refer to Figure 3.6) is a function the level of economic activity which, in turn, influences rental rates and real estate stock levels.

Figure 3.6: Quadrant 1 – Market for Space



D (R, Economy) = S
S = E(b-aR)

where: –

D is demand
S is supply
E is the number of office workers
R is rent per unit
a is a parameter
b is a parameter

The x-axis denotes the long-run demand/supply of space (m^2). The y-axis, in turn, reflects the price of space, i.e. rentals (e.g. R/m^2 or $\$/ft^2$). The demand curve offers a range of market equilibrium solutions for stock in demand at prevailing market prices. The economic demand function is presented as an equilibrium line that denotes multiple possible rent-to-stock equilibrium points situated along the line, i.e. the amount of real estate space commanded and supplied at a given price.

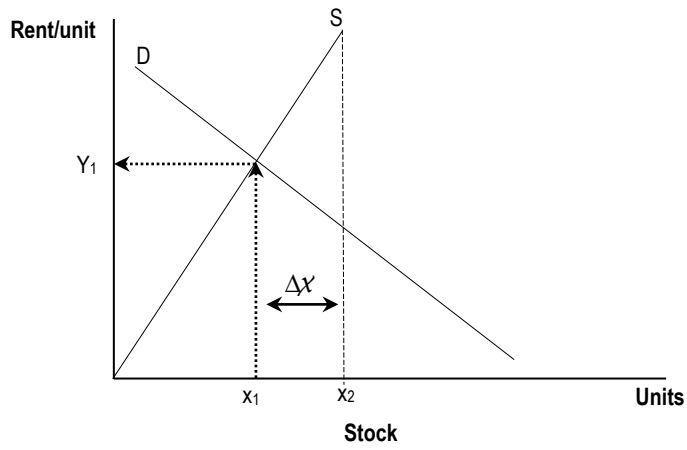
Shifts along the demand curve typically occur with fluctuations in rentals or supply of stock. In terms of the FDW Model these shifts should be interpreted conceptually, e.g. at RY_1/m^2, the market demands X_1m^2 of space. At a higher

rental of, say, RY_3/m^2, real estate becomes more costly and the market demands less floor space (X_2m^2) at this higher rental rate.

The converse holds true – at least in theory – i.e. at reduced rental rates, the market will absorb more floor space. In reality, however, a significant downward adjustment of rentals across the board is most unlikely. Hence, a distinction is made between real rent and imputed rent. The FDW Model demonstrates the latter.

The FDW Model does not show a separate supply curve. Fisher (1992, pp. 161 – 180), however, incorporated a long-term supply curve into an adapted version of the quadrant (refer to Figure 3.7). Real estate supply leans toward relative inelasticity.

Figure 3.7: Long term Space Market and Equilibrium vacancy



where: –

x_1 = space leased
x_2 = existing stock
Δx = equilibrium vacancy

Consistent with economic principles set out in the model assumptions, demand can be elastic or inelastic. If tenants demand virtually the same amount of space regardless of rental levels (supply is constrained, e.g. in a monopolistic supply

environment), demand is inelastic and the graph is more vertical (i.e. the angle is greater / steeper than 45°). On the other hand, if space usage is highly sensitive to rental fluctuations, demand is elastic and the graph is more horizontal (i.e. the angle is less than 45°). The latter would hold true in a competitive supply environment in which ample real estate stock options are available and tenants can relocate with relative ease.

The second type of shift that can occur in the user market is a shift of the demand curve itself. Should the economy expand, the demand curve shifts outward to D_2 (Figure 3.6). An economic expansion signifies increased demand for real estate space. Due to inelasticity of supply and subsequent time lags between increased demand and concomitant expansion of real estate stock, supply will remain relatively fixed at X_1m^2 over the short term (Figure 3.7). Consistent with the laws of economics, increased demand of a commodity with an inelastic supply tendency will fuel the competitive forces for space demand and, as a consequence of active bidding for available limited space, these competitive forces will inevitably place upward pressure on prices (i.e. rent). As a consequence, at a short term fixed level of supply (X_1m^2), prices will increase from RY_1/m^2 to RY_2/m^2. A contraction in economic activity will have the converse effect.

Consistent with the laws of the Keynesian Multiplier, factors that may cause the demand curve to shift include:

1. economic growth (or contraction); and/or
2. increase (or decrease) in sector-specific employment; and/or
3. increase (or decrease) in levels of government expenditure; and/or
4. increase (or decrease) in levels of investment; and/or
5. increase (or decrease) in levels of national earnings as a consequence of reduced import costs or increased export volumes or earnings; and/or
6. increase (or decrease) in short term interest rates.

The FDW model accounts for a variety of economic factors that influence the market for space (i.e. supply) and the user market (i.e. demand). Macroeconomic variables and factors exogenous to the real estate market are outlined in Figure

3.2. Exogenous factors include *inter alia* political stability (or instability), political economic factors, exchange rates, financial ratings and its impact on mood (as reflected in the levels of consumer and business confidence).

The north-east quadrant therefore depicts the equilibrium amount of space in demand at a given rental level. In equilibrium, the demand for space (D) equals the supply of space (S). No mention is made in the original FDW Model of real estate vacancy. Fisher (1992, pp. 166 – 168) provides a possible solution that incorporates vacancy into the space market. This solution is illustrated in Figure 3.8. Fisher (1992, p. 167) suggests that there is a so-called equilibrium vacancy in the market: this is regarded as a 'normal' or 'natural' vacancy rate that constantly prevails in the market and can be attributed to space that is "… deliberately held vacant by owners in anticipation of higher market rents in the future" (1992, p. 166). Dated stock also contributes to natural vacancy. Other plausible explanations of natural vacancy include:

1. business foreclosures;
2. periodic maintenance and renovations;
3. time delays between contract cancellations and new occupations;
4. unattractive or functionally obsolete space that may simply no longer be appealing to prospective tenants.

Fisher indicates that, even in a state of equilibrium, a certain percentage of stock would always remain vacant, but does not venture into a quantum of this so-called natural vacancy. Vacancies are correlated with the economy and associated real estate cycle. Vacancy seldom remains perfectly constant. Although demand increases at a steady rate in an economic expansion phase, new construction tends to come on stream in bulk (i.e. substantial volume) and exceeds demand and absorption levels, giving rise to overbuilding (refer to Figure 3.5). A phase of overbuilding in the real estate cycle is typically accompanied by higher than normal vacancy (Pyhrr *et al*, 1989, pp. 485 – 489). Introducing a market equilibrium vacancy rate to the model should therefore heed the pitfalls associated with market cyclicality. Normal or natural vacancy could possibly be defined as the long term average vacancy rate of a particular market area – provided the time

period analysed makes provision for at least one complete long cycle with at least two troughs and peaks.

Equilibrium supply and demand of stock occurs at a given rental rate. The prevailing equilibrium rental rate is transmitted to the capital/asset market via the y-axis. Capital/asset market effects are introduced in the form of asset valuation (Quadrant 2) and new construction activity (Quadrant 3).

Quadrant 2: Asset Valuation

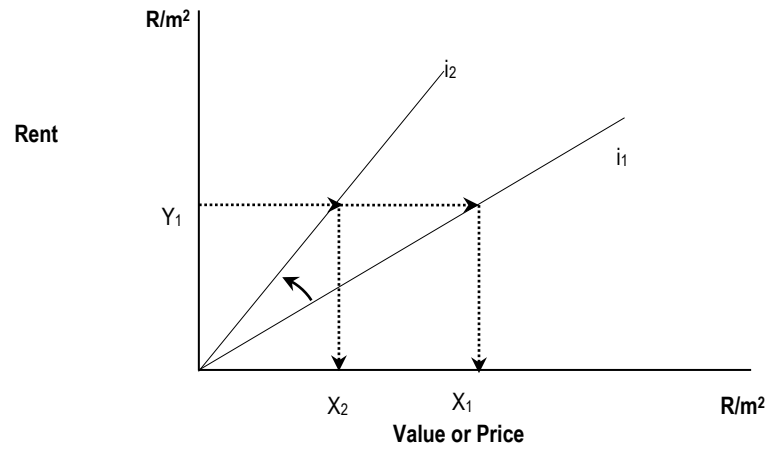
In Quadrant 2, real estate rentals are factored into real estate values (refer to Figure 3.8). The y-axis denotes the imputed rent transmitted from Quadrant 1. Real estate values are shown on the x-axis. Similar to rent, real estate values are expressed as value per unit, e.g. Rand/m^2. The ray emanating from the origin (i_1) represents the capitalisation rate. DiPasquale and Wheaton (1996, p. 9) refer to the capitalisation rate for real estate assets as the ratio of price-to-rent.

Rentals generate an annual income stream and in Quadrant 2 the income stream is converted into real estate values by means of capitalising rental income at an appropriate capitalisation rate. The author of this thesis contends that net operating income (a function of rent) – as opposed to rent – serves as correct basis for capitalisation.

Net operating income and real estate values are positively correlated, i.e. as rental income (and therefore net operating income) increases, so does property value and *vice versa*. The phenomenon is self-reinforcing: higher valued properties command higher rentals.

The positive slope of the curve is furthermore "… an assumption that diminishing returns exist in construction – in other words, as more offices are built, marginal costs rise because of production conditions in office building" (Ball *et al*, 1998, p. 31).

Figure 3.8: Quadrant 2 – Asset Valuation



Function
P = R/i

where: –

P is price or value per unit
R is rent per unit
i is the capitalisation rate

The capitalisation rate is informed by four elements, namely:

1. Long term interest rate;
2. Growth in rentals;
3. Risk associated with rental income;
4. Treatment of real estate in the national taxation system (DiPasquale and Wheaton, 1996, p. 9).

The capitalisation rate is essentially a risk indicator and indicates minimum expected first year returns for certain real investments in a particular environment, i.e. the 'cap rate' is unique to specific types of real estate and varies from one geographic locality to the next, depending on area profile, perceived risk and expected first year investment returns. The four elements outlined above are exogenous variables and cannot be controlled by the investor:

1. long term interest rates in South Africa are determined by the South African Reserve Bank (SARB);
2. acceptable margins of growth in rentals (benchmark rental escalation rates) are governed by market forces and general economic conditions;
3. although certain risks can be managed and mitigated, an individual investor can do little to e.g. reverse a neighbourhood cycle (large scale redevelopment interventions can, over time, positively influence neighbourhood cycles); and
4. tax, as sole domain of the sovereign state.

In this context, the FDW Model takes the capitalisation rate as an exogenous variable, based on interest rates and returns in the broader capital market for all assets – including stocks, bonds and short term deposits (DiPasquale and Wheaton, 1992, p. 187). Office capitalisation rates are available for selected nodes in the South African Market.

Rental fluctuations (and therefore changes in net operating income) will result in a shift, either up or down, along the price-to-rent curve. A change in any of the above mentioned four variables will result in a rotation of the ray: if interest rates rise and all other factors remain constant, the capitalisation rate will increase and, at prevailing market rental rates, downward pressure will be exerted on real estate values. Under these market conditions, the price-to-rent curve will rotate in a clockwise direction. A decrease in interest rates will have the opposite effect.

Capitalisation rates are regularly measured and available for selected real estate market segments (e.g. offices) and monitored nodes in SA. The capitalisation technique has been criticised, mainly for its assumption that the first year's income stream will remain constant in perpetuity (compare e.g. Alcock, 1999, pp. 3 – 8; Viruly, 2000, pp. 42 – 45; and Penny, 1999, pp. 13 – 16). The capitalisation rate is a composite, though single-value indicator of risk in a particular market. Given the availability of capitalisation rate, rental and operating expense data parameters for monitored nodes, the data requirements of the capitalisation technique are minimal. On account of the reliance on general, parameter based market data and assumptions, the technique does not accurately account for locational

idiosyncrasies or varying cash flow considerations over time. The technique is considered to be simplistic in comparison with other more sophisticated valuation techniques and remains in use for basic estimation.

Quadrant 3: Construction Market

Quadrant 3 illustrates the creation of new real estate assets through construction activity. The curve, f(C), represents the replacement cost of real estate (Figure 3.9). This curve is a function of construction costs. The y-axis denotes the annual level of new construction and the x-axis portrays the construction unit cost, correlating with real estate value (price per unit) transmitted from Quadrant 2. In Quadrant 3, the model assumes that replacement cost per square meter equals construction cost per square meter:

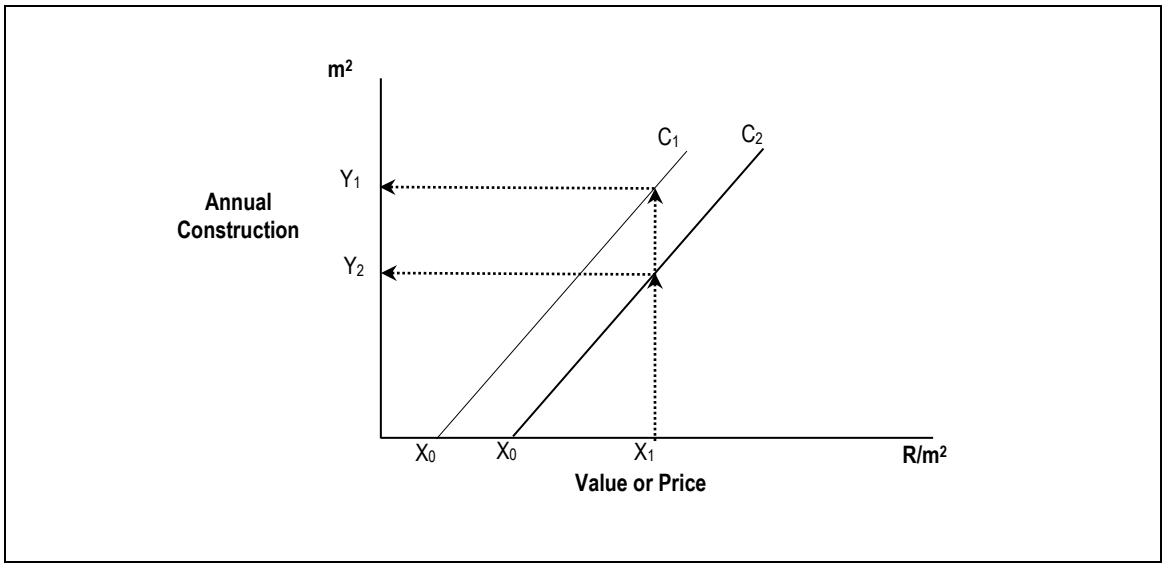
P = Replacement Cost = f(C)

where: –

P = price or value per unit

C = annual volume of new construction (DiPasquale and Wheaton, 1992, p.189).

Figure 3.9: Quadrant 3 – Construction Market



Function
C = (P – B)/x
***where*: –** **C** is total annual construction **P** is value or price per unit **B** is a parameter of the construction function **X** is a parameter of the construction function

In the model it is assumed that capitalised value, replacement cost and construction cost values are exactly the same, which in practice is seldom the case.

The construction curve intersects the x-axis at a minimum value (R/m^2) required to justify some level of new development. New development is assumed to only occur if the real estate value per unit exceeds construction cost per unit. This point on the x-axis is located at R X_0/m^2. The difference between the two values is accounted for by factors such as:

1. developer's profit; and
2. agents' commissions.

All other factors being equal, higher real estate values and therefore profits (transmitted from Quadrant 2) will entice developers in the market to increase output. Hence, construction volumes increase. Construction cost inflation will bring about an outward shift in the construction curve: as construction costs rise, the curve C_1 shifts outward to C_2 and vice-versa. Under these market conditions, if other factors remain equal, annual construction volumes decrease from Y_1 to Y_2.

The construction function can be elastic or inelastic, depending on market conditions. If new construction can be supplied at any level, at virtually the same cost, the construction function is elastic and the ray is more vertical. In reality, however, the construction industry is marred by construction bottlenecks, scarce

land and other impediments (DiPasquale and Wheaton, 1996, p.9) and construction supply tends to be inelastic, creating a more horizontal ray.

A number of assumptions were made by DiPasquale and Wheaton in order to simplify and simulate the relationship between the construction sector in the model *versus* reality. The following aspects should be borne in mind when applying and interpreting findings of the model:

1. in practice, the three valuation methods mentioned (i.e. capitalisation, replacement cost and construction cost) seldom yield exactly the same result;
2. the straight-line representation of the construction function in the model is an oversimplification and is, at best, suitable for comparative static analysis (in reality, the sector is characterised by cyclicality); and
3. various techniques incorporated into the model are parameter based and are not responsive to localised idiosyncrasies, save for subjective adjustments made by the analyst based on personal interpretation and experience.

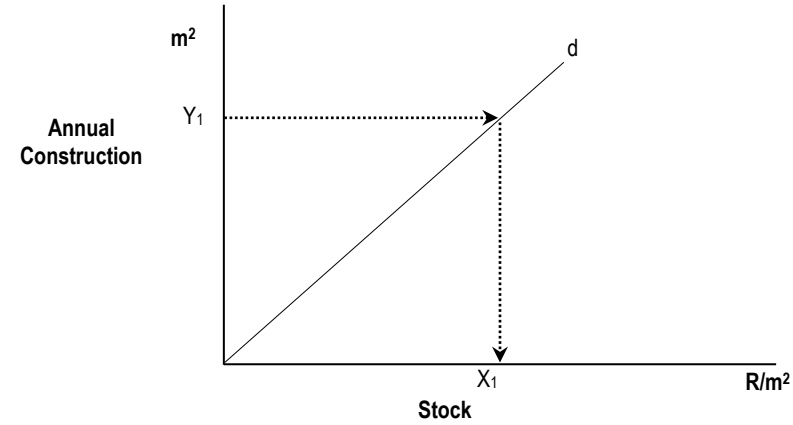
At a given market value and construction cost per unit, a certain level of new annualised construction will occur. This value, say Y_1m^2 in Figure 3.9, represents the annual flow (i.e. volume) of new construction. This value is transmitted to Quadrant 4, the market for stock adjustment and annual construction is converted into a long-run stock of real estate space. The effects of annual depreciation and stock losses are factored in Quadrant 4.

Quadrant 4: Stock adjustment

Quadrant 4 in the model introduces the impacts and effects of depreciation, demolition and stock withdrawals on the real estate market (Figure 3.10). The y-axis represents the values transmitted from Quadrant 3 – the volume of annual new construction in units (e.g. m^2).

The ray represents the depreciation rate. The x-axis serves as interface between Quadrant 4 and Quadrant 1: the values transmitted to Quadrant 1 represent the long-run supply of real estate stock in response to market demand.

Figure 3.10: Stock Adjustment



Function
S = C/d

***where*: –**

S is supply or stock
C is total annual construction
d is the depreciation rate

Quadrant 4 therefore factors a certain level of annual construction (imputed from Quadrant 3) and determines the level of stock that would result if that specific volume of annual construction were to continue in perpetuity (DiPasquale and Wheaton, 1992, p. 189 and 1996, p. 10). The assumptions of the perpetuity calculation, i.e. that market structure remains constant over time, is an oversimplification.

The depreciation rate is, similarly, assumed to remain a constant percentage of existing stock (Achour-Fischer, 1999, p.37). This value is assumed to remain constant over time when, in reality, fluctuations occur.

The value transmitted from Quadrant 3 (say Y_1m^2) via the y-axis is transmitted over the ray (d) to the x-axis, which yields a certain level of long-run stock (say X_1m^2 of real estate space). This value is transmitted to Quadrant 1, the market for space, and completes the 360-degree counter clockwise rotation of interactions around the quadrant model.

Market equilibrium can be observed – that is, until impacts are introduced to the market. If the original starting value of stock in demand (Quadrant 1) exceeds the finishing value (Quadrant 4), rentals, prices and construction must rise to meet increased demand and establish equilibrium, and *vice-versa*.

3.5.4 Application Possibilities

DiPasquale and Wheaton state that the FDW Model can "… trace the various impacts of the broader economy on the real estate market, for instance:

1. the economy can grow or contract;
2. long-term interest rates or other factors can shift the demand for real estate assets;
3. change in short-term credit availability or government regulations can alter the cost of supplying new space.

Each impact creates repercussions which can be determined by examining alternative solutions within the quadrant diagram. In each instance, the analyst identifies which quadrant is initially affected, traces the impacts through other quadrants and arrive at a new long-run equilibrium. The model is thus suited to comparative static analysis through the comparison of various long-run solutions.

Dernburg (1985) has constructed a multitude of quadrant models and concludes that "… such analysis does not attempt to ask how the variable behaves during the transition from one equilibrium to another, how long it will take to get to the new equilibrium, or whether it will in fact get there or possibly depart in another direction; these issues are matters of "dynamic" analysis. A dynamic model is one

that explicitly makes assumptions about how variables behave when they are not in equilibrium" (1985, p. 21).

Tracing the effects of impacts through the respective quadrants can simulate market conditions in a simplified manner. However, the model does not account for time lags that invariably occur in the process of re-adjusting to market equilibrium. Other model assumptions that oversimplify market conditions have also been identified.

3.5.5 Introducing Impacts to the FDW Model

Preceding paragraphs identified the variables that influence each of the quadrants in the model individually. The objective of this paragraph is to reassemble the quadrants and to illustrate the combined effect of impacts that typically occur between property (i.e. space) and asset (i.e. capital) markets. These impacts occur as a consequence of the complex sequence of processes, linkages and decisions in the market between economic role players – which serve as basis to demonstrate that consumer behaviour cannot be reduced to simplistic size and distance correlations, as suggested in central place theory. The framework presented by Fisher (Figure 3.2) highlights some of the complexities associated with these processes, linkages and decisions. Combined with the realities of imperfect market knowledge, imperfect competition and asymmetric resource distribution, the proposition of perfect, symmetrically spaced nodes and hexagons to describe and predict the net spatial result of interaction between economic subjects appears highly improbable.

In terms of DiPasquale and Wheaton (1992, pp. 190 – 197 and 1996, pp. 10 – 18), impacts on the market can be classified in the following three broad categories:

1. economic growth and the demand for real estate space;
2. long term interest rates and the demand for real estate assets; and/or
3. short term credit availability, construction costs and the supply of new space.

Fluctuations in these variables can result in either a proportionate shift, a disproportionate shift or a unilateral shift in a specific quadrant of the model (also refer to AIREA, 1987, pp. 34-39). Each impact introduces repercussions throughout the model. The introduction of impacts requires the analyst to firstly identify the quadrant that is initially affected. The impacts can then be traced through each of the remaining three quadrants. Each iteration of quadrant adjustments is followed by the model settling in a new equilibrium state. Impacts can be quantified and measured by comparing the various model equilibria, effectively facilitating comparative static analysis.

The analyst should be mindful that the model does not account for time delays that accompany market adjustments, neither does the model track or seek to explain the behaviour of variables during this adjustment period.

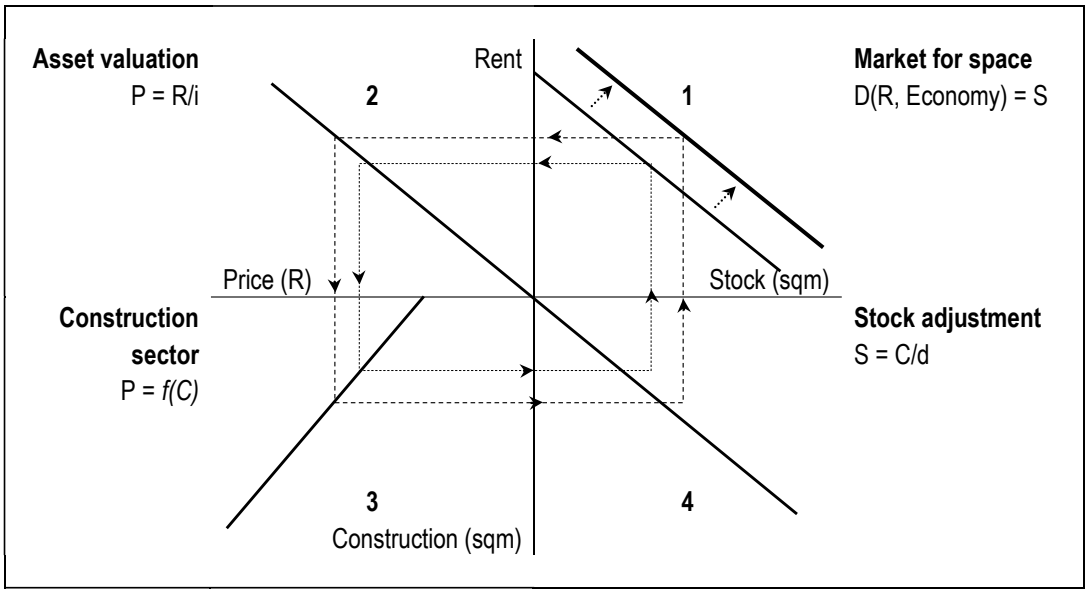
Economic growth and the demand for real estate use

Economic growth, in terms of the FDW Model, translates into increases in production, employment, household income and/or the number of consumers, which may also be defined as households or people (DiPasquale and Wheaton, 1992, pp. 190 – 193 and 1996, pp. 11 – 13).

Increased demand caused by one or a combination of economic factors will shift the demand curve outward (Figure 3.11). An economic expansion of this nature will have the effect that more space is demanded at current rentals. Supply is relatively static (inelastic) over the short term. In terms of the laws of supply and demand, increased demand against fixed supply will inevitably place upward pressure on rentals (prices). Higher rentals, in turn, translate into higher operating incomes and by implication, increased asset prices (Quadrant 2). Increased asset prices (values), in turn, encourage new construction (Quadrant 3). Over time, new construction increases available stock (Quadrant 4) and the market tends toward a new equilibrium state.

The shift in equilibrium brought about by an economic expansion need not necessarily be a proportional shift: the nature of the shift that occurs is a function of the elasticity and hence, slopes of the various curves.

Figure 3.11: Property and Asset Markets – Property Demand Shifts



Source: Adapted from DiPasquale and Wheaton, 1996

An economic expansion therefore increases all equilibrium variables in the real estate market. In general, a recession is characterised by higher vacancy and lower levels of construction. Conversely, during an economic recovery, vacancy is lower and construction activity increases (DiPasquale and Wheaton, 1996, p. 13). Caution should be taken not to generalise this statement. Pyhrr *et al* (1989, pp. 485 – 489) indicates that a period of overbuilding in the real estate cycle, which is characteristic of an economic expansion, is initially accompanied by higher than normal vacancy rates (construction vacancy). Thereafter, as take-up increases, vacancy decreases to at or below natural vacancy. This state is maintained into the initial phase of an economic recession, when construction activity declines and space utilisation increases, thereby further reducing vacancy. Prolonged periods of economic decline during a recession, accompanied by a general decline in business activity, will eventually give rise to higher vacancy rates.

The FDW Model does not provide an accurate account of these intermediate stages of market adjustment. Hence, as outlined, as model designed for the

purpose of comparative static analysis, it falls short of describing the behaviour of variables in its transition from one equilibrium to the next.

These shortcomings should be borne in mind when applying and interpreting findings of the model.

Long Term Interest Rates and the Demand for Real Estate Assets

The demand for real estate assets is determined by real estate yields in relation to the after tax yield of fixed income securities and other investments. As is the case in the evaluation of investment alternatives, it is calculation of risk *versus* return. Real estate yields are influenced by *inter alia*:

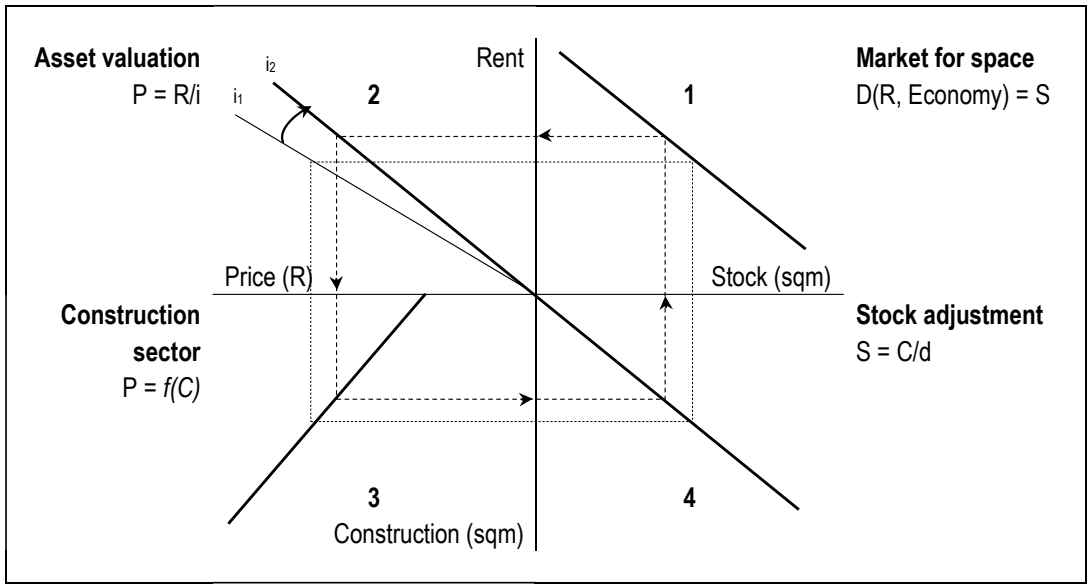
1. long term interest rates;
2. growth in rentals (escalation rates);
3. risk;
4. taxation.

The aforementioned aspects are inherently factored into the capitalisation rate. These parameters influence the slope of the curve in Quadrant 2.

If interest rates in the economy were to rise, property risk increases and with it, capitalisation rates as investors demand a higher return from real estate. Higher returns cannot be realised from prevalent rentals. Consequently, with rising interest rates, the yields from real estate becomes low compared with the yields of other investment options. Investors will therefore shift their funds from real estate to other investment instruments at their disposal – differentiating their portfolios. Under these conditions, the capitalisation rate rises and the ray in Quadrant 2 rotates in a clockwise direction, placing downward pressure on real estate asset prices as investors turn their attention to other asset classes and investment instruments (Figure 3.12).

Greater perceived risk and adverse tax conditions have a similar effect on the curve in Quadrant 2. The converse may occur, causing asset prices to rise – the ray rotates in a counter clockwise direction.

Figure 3.12: Property and Asset Markets – Asset Demand Shifts



Source: Adapted from DiPasquale and Wheaton, 1996

Figure 3.12 illustrates the effects of lower asset prices on the remaining quadrants. Due to downward pressure on asset prices, construction activity contracts (Quadrant 3) which, in turn, causes a deceleration in the annual supply of new stock (i.e. construction activity decelerates). In the long run, as less stock enters the market (Quadrant 4) and available space is taken up (i.e. vacancy decreases), upward pressure is exerted on rentals (Quadrant 1) and the market settles into a new equilibrium at higher rental levels.

DiPasquale and Wheaton assumes (1996, p. 14) that capital market efficiency adjusts the prices of assets. In this context, the two recurring limitations of the FDW Model can be reaffirmed:

1. the FDW model does not track the intermediate stages of price adjustments in the market;
2. the model is time insensitive and does not reflect market adjustment leads or lags;

3. the model assumes that each investment earns a common, risk-adjusted after-tax total rate of return.

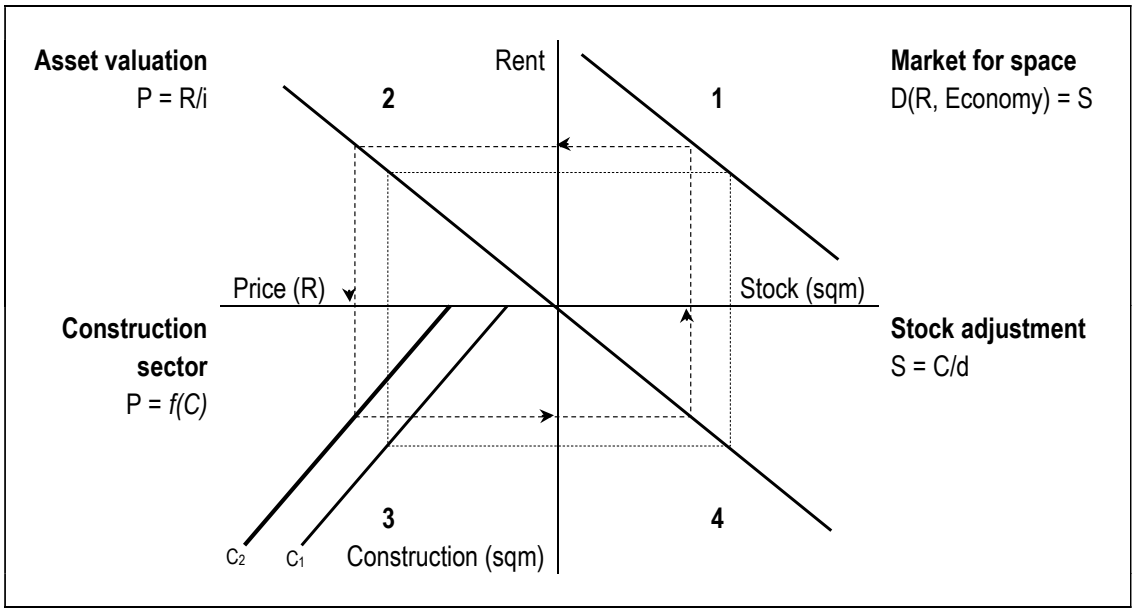
Short Term Credit Availability, Construction Costs and the Supply of New Space

Short term credit availability (including short term interest rates) and construction costs influence the supply schedule for new construction activity (Quadrant 3). Construction costs may rise due to a number of factors, including:

1. higher short term interest rates;
2. scarcity of construction financing;
3. stricter zoning and planning regulations (including e.g. increased density requirements); and/or
4. shortage of building materials.

If any of these factors were to deteriorate, construction costs rise and profitability decreases, resulting in a unilateral outward shift of the construction function (Figure 3.13).

Figure 3.13: Property and Asset Markets – Asset Demand Shifts



Source: DiPasquale and Wheaton, 1996

Under these conditions, the current minimum (or base) value (R/m^2) required to entice property developers to enter the market and develop new stock is perceived to be too low and hence, not sufficiently lucrative/profitable. The minimum construction value (R/m^2) required to justify new development increases. Upward adjusted construction prices, in turn, place further downward pressure on construction activity (Quadrant 3). In Quadrant 4, depreciating stock is not replaced. Real estate space becomes relatively scarce, creating upward pressure on prices (rentals) in Quadrant 1. Asset prices rise (Quadrant 2) – albeit not instantaneously, but rather systematically over time, thereby bringing the market to a new equilibrium state.

3.6. CONCLUSIONS

The FDW Model provides a theoretical framework that illustrates the complexities of real estate and asset market interaction – complexities that also influence the interaction between economic subjects and the spatial economy. Model assumptions were compared to and found to be consistent with general economic principles and the assumptions that characterise perfect competition and market equilibrium. Albeit that these assumptions have been critiqued by the author and others (e.g. Mooya, 2016) the model offers a useful visualisation of market interactions – even if only to serve as point of departure for further model development and refinement.

Mooya (*ibid*) offers an extensive critique on valuation theory and reiterates that outcomes in the real world are also influenced by factors that are not always easily quantifiable, e.g. structures, powers, mechanisms and tendencies. Mooya concurs with Parker & Filatova (2008) that economic agents have 'bounded' computational ability, memory and perception. Although the critique by Mooya, to a certain extent, overlaps with that offered by the author of this thesis, the critical appraisal by Mooya is ultimately described as a 'thought experiment' (*ibid*, Chapter 6 & 7) and does not culminate in a substantive model or framework that might aid in the advancement of refined trade area analysis techniques, as pursued in this thesis. Mooya (*ibid*, Chapter 1) stresses that "… it is the presence of empirical regularities

which make scientific knowledge possible. Learning is possible only in so far as the past does contain information about the future".

The framework developed by Fisher (Figure 3.2) complements the FDW Model and identifies specific factors that influence space and capital market equilibrium. This framework distinguishes spatial and non-spatial factors and its influence on space market equilibrium. The framework is process orientated and does not portray market interactions by means of functional relationships. The identified space and capital market processes articulate corresponding aspects of the FDW Model, e.g. demand for space, supply considerations, asset valuation and construction activity.

The FDW Model is structured in terms of functional relationships which add practical value to model interpretation. The framework developed by Fisher does not offer this advantage.

In applying the FDW model the analyst should remain cognisant of the following:

1. The capitalisation technique provides an acceptable though basic mechanism to model the relationship between net operating income, asset value and expected initial return (as a measure of risk).
2. There appears to be a definitive minimum rate, expressed as construction cost per unit (e.g. R/m^2) that will be required to render any new construction activity sufficiently attractive, although perceptions of what this value is, would probably differ from one construction company to the next.
3. The model is insensitive to the nature and structure of the construction industry and its local idiosyncrasies.
4. Even in the unlikely event of perfectly static market conditions, a certain minimum level of construction would be required to maintain market equilibrium. This can be ascribed to the fact that a portion of stock is always subject to demolition, withdrawal or deterioration. The FDW model assumes that these real estate stock losses can be measured and expressed in terms of a constant depreciation rate (Achour–Fischer, 1999, p. 37), i.e. fixed percentage of existing stock.

5. As pedagogical aid, the diagrammatic FDW Model assumes a straight-line simplification of the relationship between relevant variables in each quadrant (compare Viezer, 1999, p. 504).
6. In the model, it is assumed that there is a set ratio of labour to floor space utilisation rate in the real estate market. Independent research by Hakfoort and Lie (1996, pp. 183 – 196) affirm that there are distinct utilisation rates for each individual real estate sector. These ratios may furthermore vary around a sector average over time.
7. The model assumes that development is uniformly private sector driven. The impacts of government interventions, incentives and large scale infrastructure investments in, for instance, Special Economic Zones (SEZs) and the Urban Development Zone Tax Incentive Scheme (2008) – an accelerated depreciation scheme – are not considered. Catalytic economic interventions could simultaneously impact Quadrant 1, 2 and/or 3 of the model. Also refer to Hendershott & Ling (1984, pp. 297 – 317).
8. Due to the interactive manner in which the quadrants are linked, the model may create the impression that there are no time lags involved in the process of re-adjusting to equilibrium. The model is therefore suitable for comparative-static analysis.
9. As far as the relevance and applicability of the model is concerned in a market dominated by owner-occupied real estate, it is assumed that the decisions of owner-occupiers and tenants are influenced by the same economic and capital market conditions; that these owner-occupiers have the same investment motives as tenants; and that the model therefore behaves identical in both types of markets (DiPasquale and Wheaton, 1996, pp. 10 – 11). This assumption, similar to other model assumptions outlined, constitutes an oversimplification of market behaviour.

A critical appraisal of the FDW Model and framework developed by Fisher reveal underlying economic assumptions of perfect competition and market equilibrium. Albeit that the FDW Model is not a spatial model *per se*, the functional relationships outlined cannot be divorced from spatial consequences. The extent and complexity of factors that influence the behaviour of and interaction between economic subjects suggest that decision making processes extend beyond

simplistic distance and size considerations. Market realities contrast the overly simplistic assumptions of perfect competition. Together with the realities of imperfect market knowledge, imperfect competition and asymmetric resource distribution, the proposition of perfect symmetrically spaced nodes and hexagons to describe and predict the spatial result of interaction between economic subjects appears highly improbable.

Market complexity contradicts the notion of neatly organised spatial patterns comprised of perfect hexagons, triangles and a perfectly predictable order of central places along the vertexes. Furthermore, due to the influence of modern technology the traditional patterns of interaction between economic subjects have changed and there is no longer a universal need to converge on a central place in order to perform certain economic functions. The sustained dominance of a primate CBD is also questionable.

An analysis of individual quadrants of the FDW Model reveals *inter alia* the notion of a sustained linear demand trajectory – a concept which continues to influence location theory and trade area demand analysis: the sustained linear demand trajectory is an embodiment of the earlier thinking and modelling concepts developed by Applebaum and has persevered in traditional trade area modelling techniques. A sustained demand trajectory will not be universally observed in all types of markets.

The complexity that characterises interaction between economic subjects in space and capital markets lend theoretical context and foundation to a critical appraisal of central place theory.

CHAPTER 4

A CRITICAL APPRAISAL OF CENTRAL PLACE THEORY

4.1. INTRODUCTION

Central place theory is arguably one of the oldest and most recognisable of neo-classical theories in the disciplines of urban geography or spatial economics. It proposes that cities and other prominent settlements tend to self-organise into a particular format with distinct higher order and lower order settlements (Doran and Fox, 2015). The theory integrates the aspects that influence regional development, including consumer choice, firm agglomeration and functional hierarchy of these centres. (Mulligan *et al*, 2012 & Blanco, 2014).

This chapter investigates the origins of the theory of central places, as well as the underlying principles, concepts, diagrams and formulae. Practical examples are cited to indicate how the theory continues to shape policy and decision making.

The investigation concludes with practical research that relates modern day urban form and structure to the original concepts and values of central place theory, in particular the hexagon as structuring element and the associated K values.

4.2. LITERATURE REVIEW

Certain proponents (e.g. Davies, 1977, p. 141) maintain that the field of study referred to as retail potential or store location and trade area analyses, is traditionally associated with the work of a school of marketing and urban geographers in the United States. The earliest of theoretical contributions to this field of study, however, was made by Von Thünen in 1826 (Neenan, 1981, p. 37).

Since the early 1930's, a number of further theoretical contributions were made by, *inter alia*, Hansen and Reilly in 1929 (Reilly, 1929), Christaller (1933) and Losch in 1954 (Richardson, 1979). Chasco and Otero (1998, p. 2) concur that Reilly was, however, the first to research the trade area delimitation problem in 1931, based on the Newtonian law of gravitation. The concept of a central place with surrounding trade area of diminishing influence was researched in subsequent years by *inter alia* Christaller (1933), Applebaum and Cohen (1961), Huff (1963), Jones and Mock (1984), Fotheringham and O'Kelly (1989), Rust and Donthu (1995) as well as by Alonso (1975), who formulated Bid Rent theory. The work of Christaller, Lösch, Applebaum and Cohen focus to a large extent on the theory of central places and the development of descriptive-deterministic models, including primary trade area models, empirical observation techniques and gravitation models.

Subsequent sections synthesise the contributions made by the most influential of these early spatial theories – more specifically the work of Von Thünen, Weber, Lösch, Christaller and Alonso.

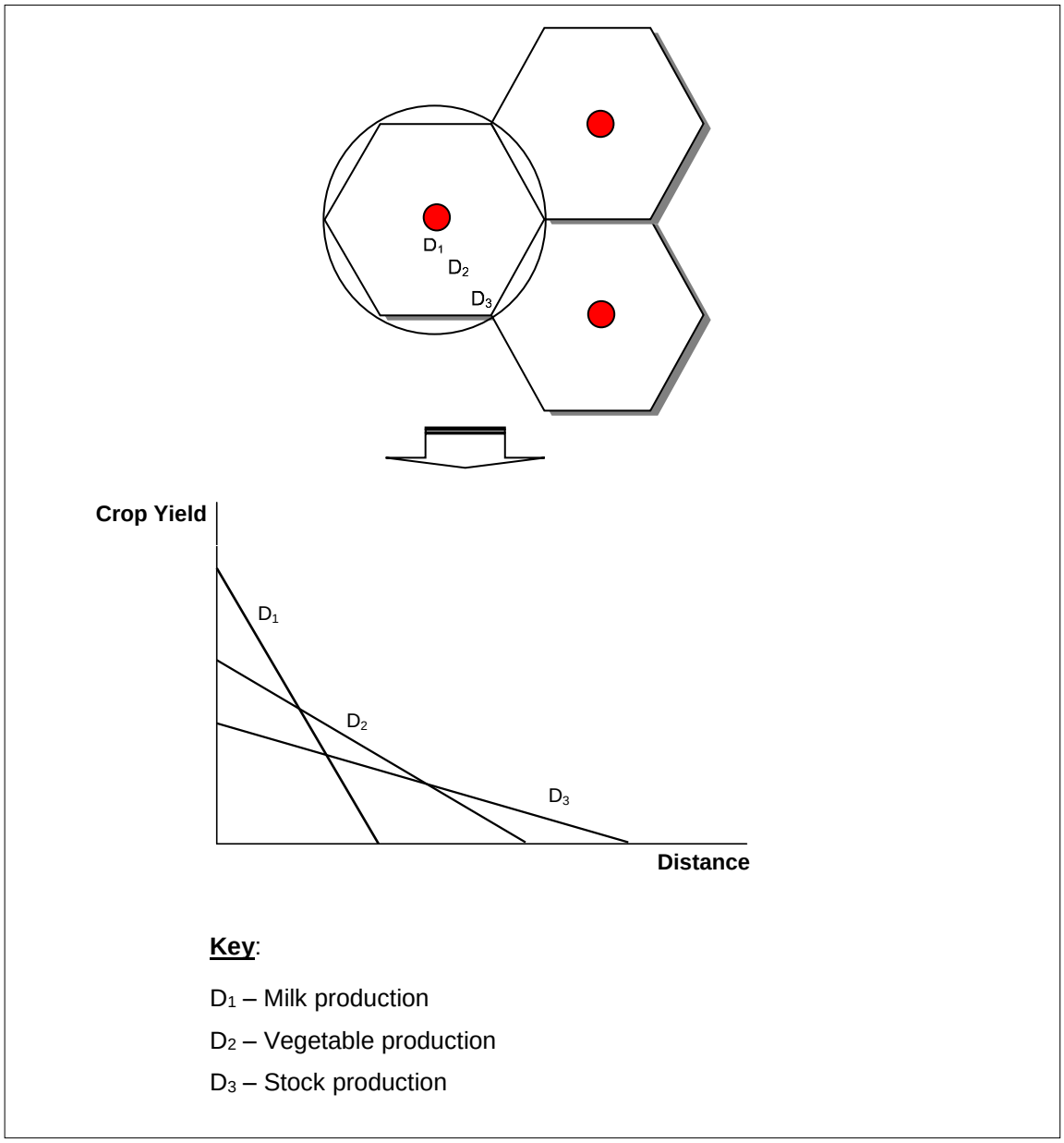
4.2.1 Von Thünen – The Market Town and Concentric Circles

In 1826, in establishing the extent of a firm's market area, Von Thünen developed a model based on concentric circles around a centrally located market town (Neenan, 1981, p. 40). The theoretical construct on which Von Thünen based his model, was that an individual would maximise its profits by locating in the most central and accessible site of an under- or unserved region. Transportation costs to and from this central location would be minimised and, in so doing, the firm would initially serve a concentric shaped market.

Over time, the opportunity for more market areas would emerge. New firms, in turn, would seek locations where supply could be dominated – at least for a while. Such new locations would therefore be situated at a distance from the initial

market or central place. Firm density would increase over time and with it, effect changes to the shape of the initial circular shaped market areas to hexagonal market areas (Figure 4.1). Von Thünen assumed that all land around the central market place was equally fertile and arable. The concept of the hexagonal market area was born.

Figure 4.1: Conceptualising Market Area Configuration



Source: Adapted from Neenan, 1981

In this concentric circle model, Von Thünen was the first to capture the intricate interrelationships between consumer demand, distance, transport costs, land

yields and land prices (or rent). Von Thünen, Lösch and others have argued that the hexagon was the optimal shape that enabled residents to reduce transport costs – as opposed to squares and triangles. This network of hexagons (also referred to as 'tessellations') would become a vigorously contested topic in years (and decades) to follow.

Implicit and increasingly problematic to the central premise on which these theories are based, is the concept of the nearest centre postulate, i.e. the assumption that a consumer would always elect to patronise the nearest facility – including the subsequent 50% cut-off points between nodes or centres to delineate trade areas and which effectively gave rise to the hexagonal shape. Trade areas were implicitly impermeable and often illustrated with solid lines.

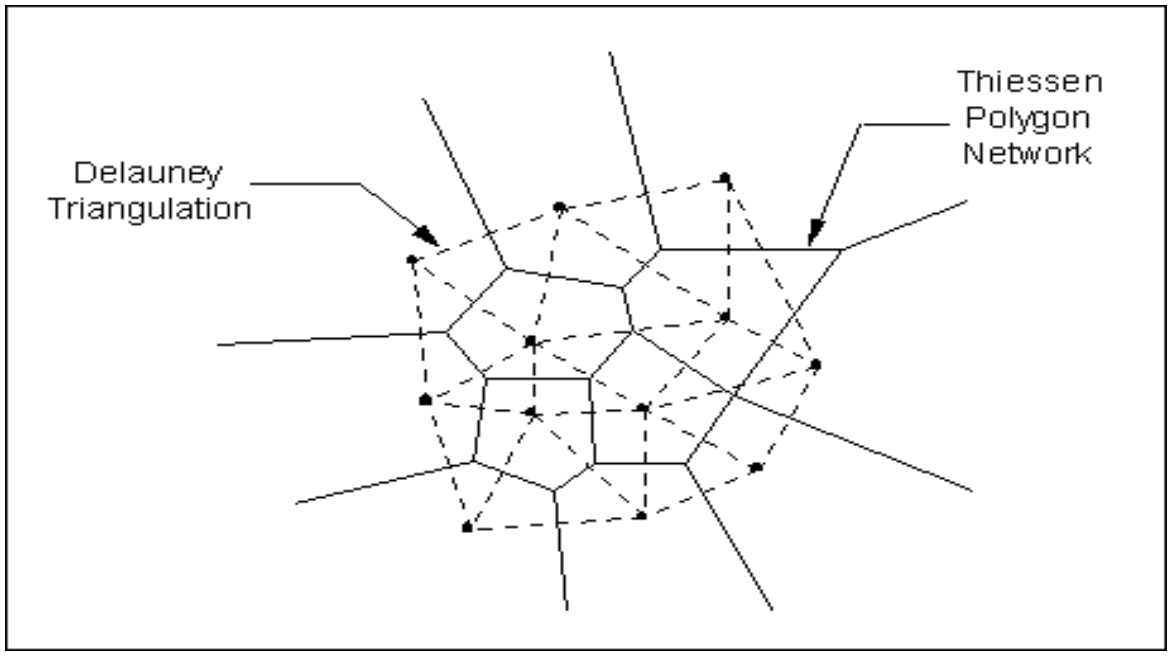
An important limitation of the early work of Von Thünen is that, although he recognised the densification phenomenon of firms, the theory was never refined and progressed into a dynamic, evolving system. Nodes were not functionally differentiated in this early model. A further significant limitation implicit in this network system – which simultaneously became increasingly pronounced and problematic in the later Thiessen's polygons – is the fact that no provision is made or recognition given to the phenomena of multiple trade areas and trade area overlap (compare Dennis *et al*, 2002).

These concepts were subsequently refined into bid rent functions and polygon based trade areas, referred to in certain instances as Thiessen's Polygons – illustrated in Figure 4.2.

4.2.2 Weber – Critical Isodapanes and Agglomeration

Similar to the work of Von Thünen, the work of Friedrich Weber focused on regional economics. Weber asserted that an activity could either be market orientated or materials (i.e. input) orientated – transportation cost was the deciding factor (Neenan, 1981, pp. 53 – 54).

Figure 4.2: Market Area Configuration Conceptualised



Source: www.ems-i.com

Weber was the first to focus on the economic effects of agglomeration, i.e. the benefits that accrue due to the spatial clustering together of certain activities (Latham, 1976, p. 9). Although agglomeration theory and input cost considerations were formulated based on case studies for manufacturing concerns, the concept of agglomeration holds true for retail and other business establishments. In fact, agglomeration is a key consideration not only in the diversified offering of a node, but also in the diversified tenant offering of a shopping centre.

4.2.3 Lösch – Market Areas and Spatial Structure of the Economy and Christaller – Central Place Theory

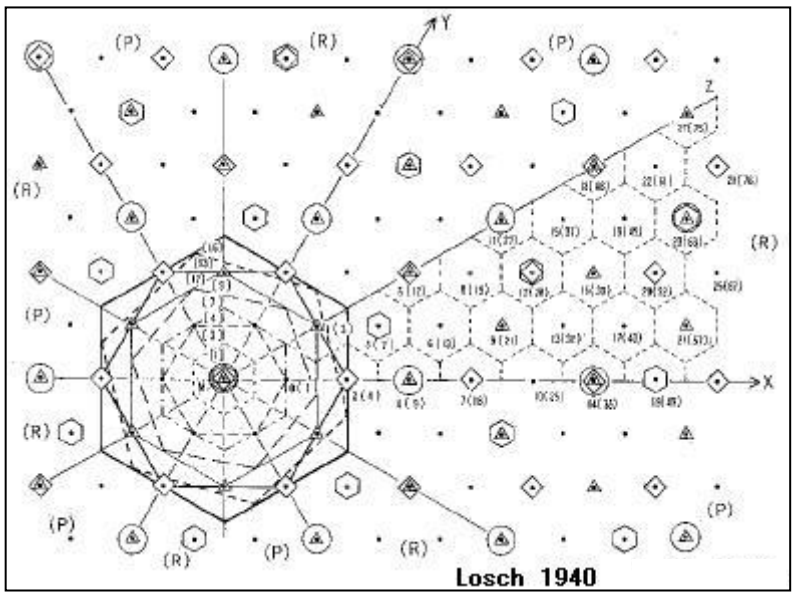
The work of Lösch and Christaller are closely related and the discussion of their respective theories is dealt with in an integrated manner.

Whereas the work of Weber was concerned with firm location, August Lösch was the first to focus his work on the theory of market areas. His work has been described as "… the fulcrum on which turn the various spokes of the

understanding of regional structure and development" (Alonso, 1975, p. 1). Alonso furthermore contends that "… it (the work of Lösch on the theory of market areas) constitutes the principal tool for understanding the empirical regularities that concern Brian Berry, among others" (Alonso, 1975, p. 1). Other literature sources concur with the view that the work of Lösch "… is not a theory of location at all but of the spatial structure of the economy built in abstract fashion upon an empty plain characterised by spatial homogeneity" (Richardson, 1979, p. 53).

The work of Lösch is based on highly simplified assumptions of a market area (Richardson, 1979, p. 70). On these assumptions, Lösch argued that the largest number of service based activities should be concentrated together. This yields a system of 30° sectors (Figure 4.3) of which each alternate sector contains a concentration of urban centres, whereas others have hardly any urban centres. Economic activities clustered together at a location (or locations) that enabled these firms to maximise profits. In this manner, a network of market places emerged over time.

Figure 4.3: Conceptualising the Lösch theory of Market Areas, 1940



Source: http//:yaplog.jp/img/107/losch.jpeg

According to Lösch, the hexagonal pattern ('tessellations') that had now become characteristic of central place and associated theories, was not static but in a constant state of flux. Isard suggests that "… superimposing the Löschian

framework upon a Thünen arrangement leads to a hierarchical pattern of sites within each city region and generates interregional as well as increased intraregional trade" (Isard, 1965, p. 17).

Capozza and Van Order (1978, p. 896) concluded that these assumptions based on the principles of 'perfect competition' do not accurately depict entrepreneurial behaviour, which is regarded by them as being closer to the way firms behave in most real world situations.

Lösch (not Walter Christaller) introduced the use of the letter "K" to denote the properties of the places on the hexagons:

1. K = 3 denotes the market principle
2. K = 4 denotes the transport principle
3. K = 7 denotes the administrative principle.

For a full hexagon, the value "3" for the market principle is calculated as follows: one unit for the central place and 6 times one third for the surrounding central places situated at the vertexes. Thus:

$$\mathbf{K = 1 + (6 \times {}^{1}/_{3}) = 3}$$

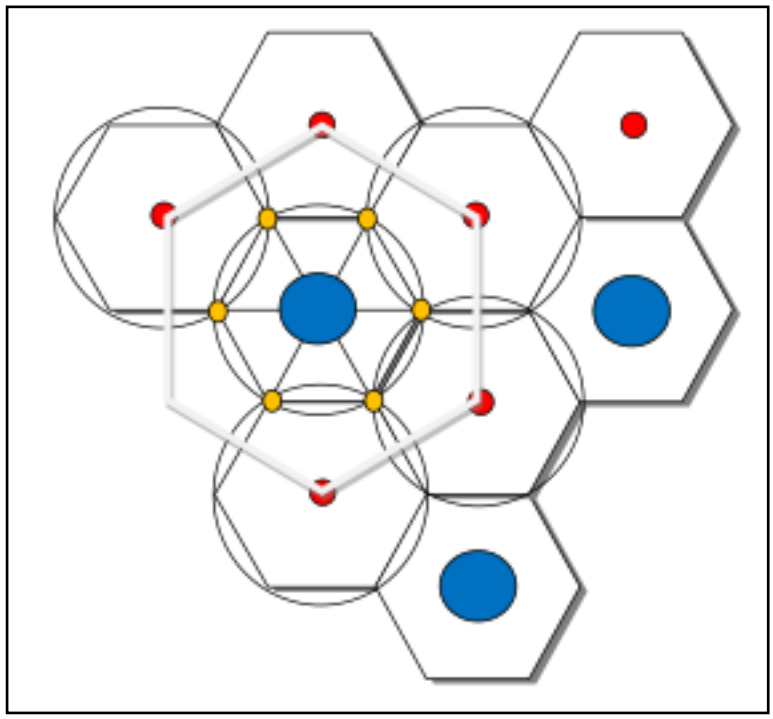
Further to the above, each main central place serves six smaller (lower order) central places at the vertexes which, in turn, serve 6 lowest order central places. Each central place situated on one of the six sides is then, in turn, catered to in equal part (50%, i.e. half) by the central place on either side. For a full hexagon, the number attached to the transport principle is therefore: one unit for the main central place and 6 times one half for the lowest order central places situated on the sides. Thus:

$$\mathbf{K = 1 + (6 \times {}^{1}/_{2}) = 4}$$

To better understand the implications of what Lösch suggested, it is useful to consider the small variations between the theoretical model developed in 1933 by

Walter Christaller and the model developed by Lösch. These subtle differences are illustrated respectively in Figure 4.4 and 4.5.

Figure 4.4: The Walter Christaller Central Place Principle Illustrated



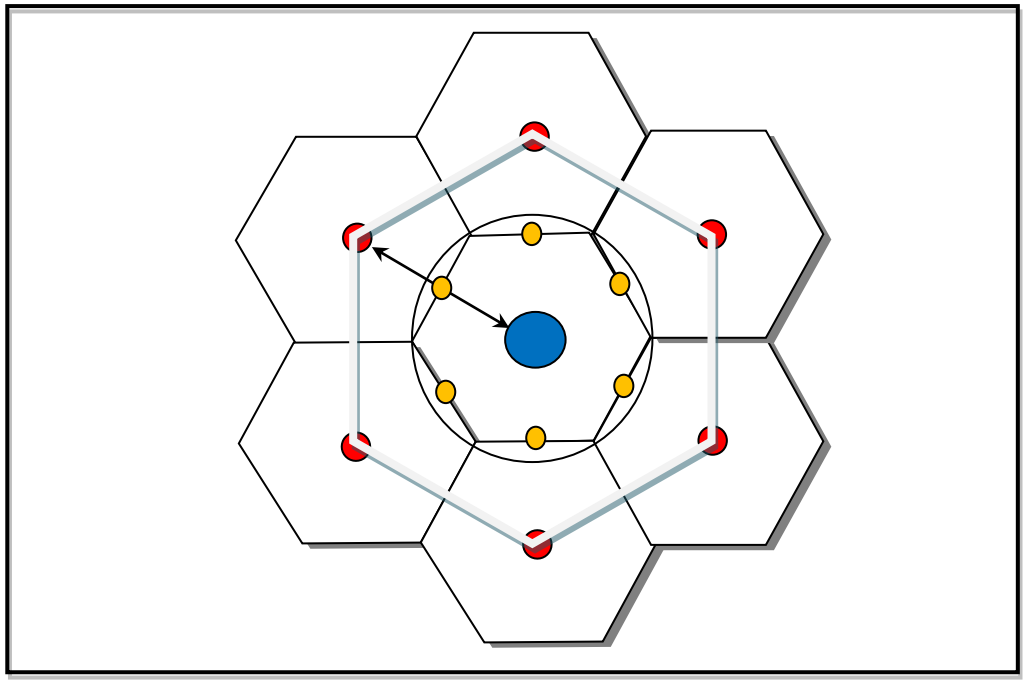
Note that in terms of Christaller's theoretical model, the central places are all situated on the vertexes. In terms of Losch's original work, the lowest order central places are situated halfway between the main central place and the second order central place. This subtle difference is illustrated in Figure 4.5. It is on this configuration that Lösch based his K = 4 transport principle.

Subtle as these changes may appear to the naked eye, these go the heart of the mathematical errors made by these early theorists – and numerous successors – who have created the foundation on which modern-day retail/business hierarchies are based.

So apparently insignificant are these differences that many scholars have either not noticed or deemed it worthy to more closely investigate the mathematical correctness and hence overall validity of these theories. Yet, in many countries including South Africa, these very principles and mathematically flawed

assumptions inform the basis of retail hierarchical documents on which fundamentally important development decisions are made.

Figure 4.5: The Lösch Central Market Place Principle Illustrated



In terms of the administrative principle, Lösch suggested that the main central place exerts its political and administrative power on **6** lowest order central places. The number attached to the administrative principle is therefore: one unit for the main central place and 6 for the second order central places situated on the sides. Thus:

K = 1 + 6 = 7

So serious are these errors that Nicolas (2009, p. 15) "… contends that the amputation and graft process has continued without interruption since the end of World War II, … (t)he view that this geometrization was objective has encouraged and consolidated ideological interpretations based on a central hexagon representation … the idea of 'centre' has become a toxic geographic concept" (*ibid*, p. 1). "Furthermore, the authoritative sway of very ancient metaphors and of their symbols in geovisions tends to paralyze critical faculties to such an extreme that there is blindness in the face of pseudo-scientific theories. A full half-century

elapsed before the elementary mathematical errors made by Walter Christaller, August Lösch and Brian Joe Lobley Berry were discovered" (*ibid*, p. 24).

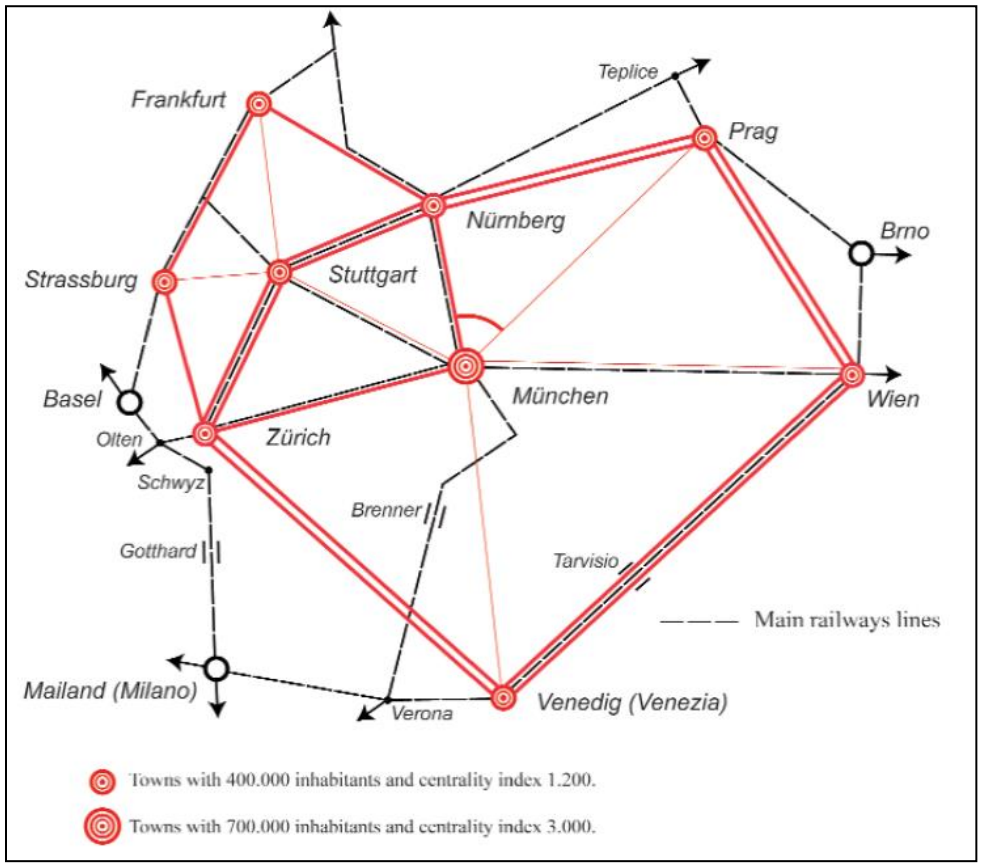
Early on in his assessment, Nicolas argues that "… the numerical expression of these principles … are no more than numerology, i.e. using numbers in an attempt to foretell the future" (*ibid*, p. 4).

The first principle on which the work of Christaller is invalidated, is on the geographic focus area of his base case study material. Christaller based his entire analysis on the South of Germany: "Die Zentralen Orte in Suddeutschland, 1933" (*ibid*, p. 6). In his theoretical model, the normal theoretical distance between central places measures 186 kilometres (Figure 4.6). In reality, the distances between towns analysed varied from 107 kilometres to 360 kilometres, yielding an average of 156 kilometres. Certain cities, e.g. München, yielded hexagonal shapes around them, while others e.g. Stuttgard yielded a five-sided polygon. Nicolas advances that "… in 1933, W. Christaller was therefore unable to verify in Southern Germany (including therein Strasbourg and Zurich!) that the 'central places' were geographically situated according to his 'principles' (*ibid*, p. 6).

Nicolas contends that Christaller "… advocate(s) deduction based on irrefutable 'principles' while he is actually practicing induction … after which he can give a 'static' description of the 'central places system'" (*ibid*, p. 12). Nicolas refers to this method as *'exquisite corpses'*: "The 'exquisite corpse' method consists in putting together ideas considered to be 'true', with ideas that are known to be false, in the belief that the true will cancel out the 'false' and make them come 'true'" (*ibid*, p. 15).

Berry (1956 & 1967) sought to refine and advance the earlier work of Walter Christaller. He stated that Christaller's assertions regarding the hexagonal shaped network of central places is justified in theorem – but he does not interrogate this so-called theorem (also see Nicolas, 2009, p. 8). These errors made by Berry are graphically set out in Figure 4.7.

Figure 4.6: Walter Christaller's construction of the South Germany Central Place System, 1933

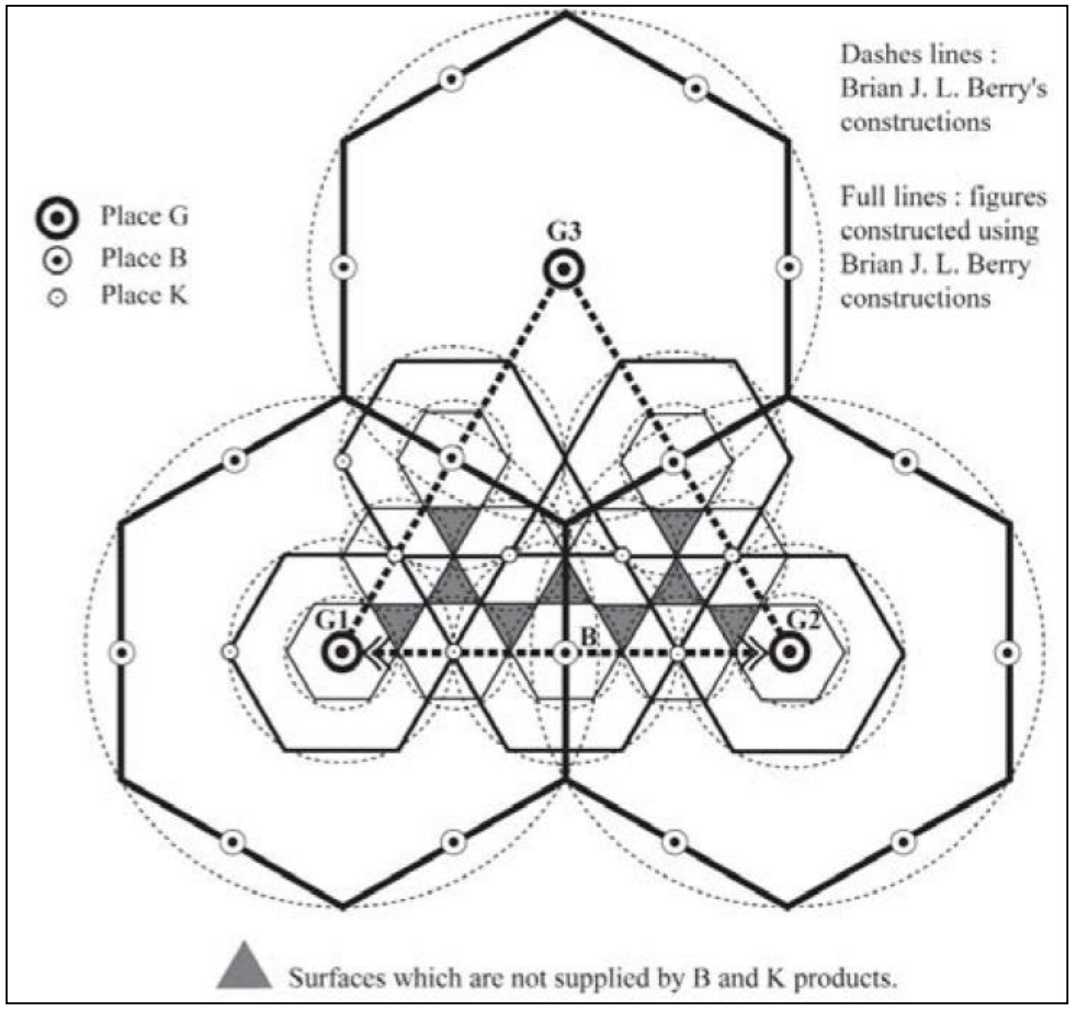


Source: Nicholas, 2009

Arguably his first major error was to not independently and vigorously scrutinise and dissect the work of Christaller but, instead, to simply assume its mathematical equations and implications. The fatality of the work generated by Berry on this basis stems from the fact that its entire mathematical base was subsequently proven to be defunct.

The second gross oversight on the part of Berry (*ibid*) is the fact that, in his reconstruction of the Christaller diagrams, the sides of his hexagons were not drawn contiguous. Hence, there were vast aggregate surfaces left unserviced (sum total of all the grey triangles – Figure 4.7) by Berry's central places (compare Chen, 2011).

Figure 4.7: The Mathematical and Graphic errors made by Berry based on the work of Walter Christaller, 1956



Source: Nicholas, 2009

The significance of these mathematical and schematic errors can be transposed directly to modern day retail theory in South Africa, where retail hierarchies developed over the years – in particular the later versions of the South African Council of Shopping Centres' Retail Hierarchy (Prinsloo, 2010) – are grounded in the work of, respectively, Christaller and Berry.

> "… it can clearly be seen based on the above mentioned that there is a definite hierarchy … the theory behind the hierarchy of shopping centres is based on the Central Place Theory of Christaller. The basic principle in this case is that for every large super-regional centre there could be six smaller regional centres

around the larger centre. For each regional centre there could be six community centres and for each community centre there could be six neighbourhood centres. The whole hierarchy is built accordingly" (Prinsloo, 2014, p. 8). (Own underlining).

Important errors in assumption made in an attempt to progress the work of Berry is that the original work of Lösch (and, by default, Christaller) – from where the generic 'six-for-six' was gleaned – did not focus on the functional differentiation between different types of shopping centres (in fact, the work of Lösch was not even conceived to explain shopping centre distribution *per se*). Furthermore, the reference by Urban Studies to the work of Christaller seems oblivious to the pioneering work of Von Thünen and Lösch in this regard – not to mention the fact that little consideration is afforded to the fact that Christaller's 'centres' were cities and towns (not nodes or shopping centres) and were situated vast distances apart (150+ kilometres) – compared with the average shopping centre trade area radii that vary from only ±1 kilometre to 10 kilometres. The veracity of the number '6' in this generalised 'numerological' assumption seems not to have been questioned at all – in spite of the obvious evolutionary progression that has taken place since the 1930s. In fact, Lösch did not even denote a K value of "6".

The typical prescriptive-deterministic application of shopping centre hierarchies (in town planning environments, in particular) compound the significance of the problem outlined above and serves to assert that conventional wisdom is not always correct (Dolega *et al*, 2016; Levitt and Dubner, 2005, p. 11; McLaughlin, 2009 & Sonis, 2005).

The generic and foreign (i.e. Southern Germany) nature of Christaller's base data – but perhaps even more importantly, the fundamentally incorrect mathematical assumptions on which his theory is premised – affirm that the so-called 'six-for-six' principle holds no practical or mathematical credence and can and should, at best, be interpreted as generic and highly conceptual – by no means rigid and absolute. Prescriptive-deterministic application of business hierarchies is therefore equally inappropriate. Market evolution and network densification need to be accounted

for. Similarly, trade area parameters need to be revised to account for market evolution.

4.2.4 Alonso, Muth & Mills – Bid Rent Theory

The earlier location theories outlined above were mostly concerned with regional markets, the distribution of cities on a regional scale and subsequent hierarchies of central places that emerged on a regional scale. Practitioners such as William Alonso and Edwin S Mills built on these earlier theories and refined these frameworks into bid rent functions that focused more closely on urban environments and on explaining urban structure.

Alonso developed the concept of a bid rent curve in the 1960's, based on a similar framework developed by Von Thünen in 1826, suggesting that 'value' gradually diminishes from the centre of the city to the periphery.

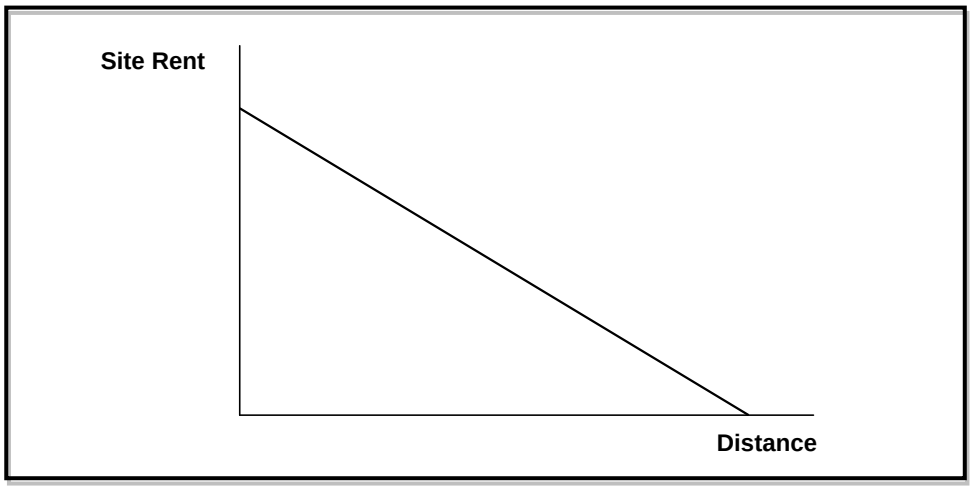
Correlated with the notion of diminishing value from the city centre to the periphery, Alonso developed a series of formulae based on the positive correlation between distance and transportation cost, assuming increasing transportation costs from the city centre to the periphery. Alonso did not factor the effects of systematically increasing congestion costs over time which would erode the appeal of the city centre ad alter its hierarchical functionality.

Alonso focused his research on the trade-off between, on the one hand, value (defined in terms of site rent) and transportation cost and, on the other, competition for land that inevitably emerges over time between residential, business and agricultural land uses – more simply stated, the competition and resultant strained synergies that evolve between residential and non-residential land uses.

Central place theory, inclusive of the concept of diminishing site value as distance from a central point increases, was conceived in an age and urban context when many (if not most) urban examples available for study were, at the time, still mono-

centric. In the context of this reality, coupled with the fact that Alonso's theory is essentially rooted in these earlier theories, Alonso contends that transportation costs are lowest for firms located near the CBD (or central place) and highest for firms located at the periphery – although scale economies (and savings) are not accounted for – neither are increasing congestion costs over time. Conversely, land value (expressed in the Alonso model as site rent), is highest at the city centre and lowest at the periphery (Figure 4.8). The curve of site rents – sloping from top left to bottom right (i.e. a typical demand curve) – is considered to be an economic map of a community (Wurtzebach & Miles, 1996, p. 71).

Figure 4.8: Alonso's Bid Rent Curve



Source: Wurtzebach & Miles, 1996, p. 74

The focus of Alonso's model was on demand. In assessing the validity of the Alonso model, one should consider the following assumptions on which the model is based:

1. the city is a flat plain;
2. the focus is on *residential* land use;
3. all production and distribution activity in a community takes place at a single point – the central business district (CBD);
4. the cost of building and maintaining houses is constant throughout the city;
5. population is socially homogenous and of the same income level; and

6. site rent, rather than land value, is the basic measure. The rationale being (or at least so it was argued) that the rental market is more active and therefore more knowledgeable compared with the buy-and-sell market.

Considering that residential use is, almost without exception, the lowest 'bidder' for land, one has to question Alonso's use of residential transactions as basis for his bid rent function. The relevance of the remaining assumptions are equally questionable.

A further critique of Alonso's work stems from the notion that the spatial economic landscape is increasingly shaped by non-spatial attributes of a policy or administrative nature: incentives, government competency, infrastructure availability and labour force stability have become primary location drivers, following resource availability. Aspects such as culture and climate also influence urban form: Schaefer and Lamm (1989, p. 510) explained why cities in the colder northeast of the United States tend to have more dense population concentrations compared with cities in the sun belt further south.

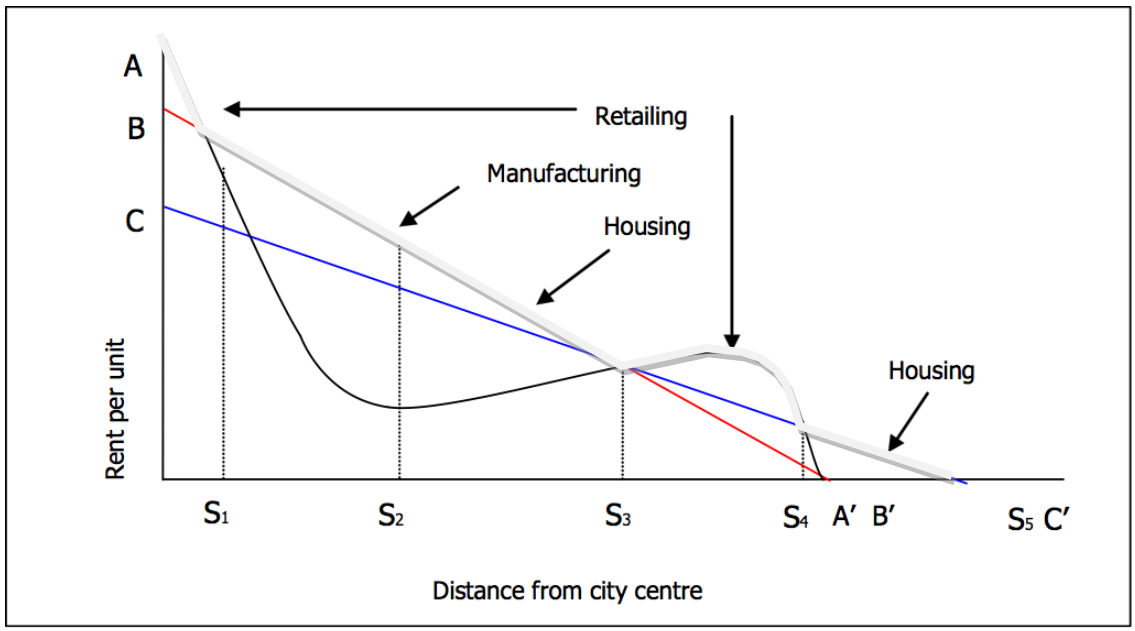
Mills (in 1969) and Muth (in 1972) presented similar research (Wurtzebach & Miles, 1996, p. 71 – 74), albeit that their focus and subsequent contributions were on supply side theory. Mills developed a refined concept that accounted for multiple nuclei urban environments by adding supply curves for various competing land uses (Figure 4.9).

Figure 4.9 illustrates the highest land rent that would be bid by each of the respective competing economic activities at various distances from the city centre. An equilibrium land use pattern emerges from the above as land will, over time, be devoted to the land use prepared to pay the highest rent for a particular site – and in which its productivity is therefore highest. This curve, i.e. the outline of the respective supply-side graphs of each respective land use (or economic activity), represents the equilibrium land use pattern.

Considering the value added by Mills and Muth, a number of key questions remain. Is the most central location in an urban environment able to sustain the

highest site rent commanded (i.e. value) in the urban landscape over time? To what extent is transportation costs a deciding factor for non-manufacturing, service sector based enterprises? To what extent do congestion costs affect the appeal of the city centre over time? Can functionally obsolete real estate stock in the city centre effectively compete with modern real estate? To what extent can the city centre realistically absorb growth through redevelopment in rapidly expanding economies, given inelasticity realities, the effects of timing delays and real estate pricing repercussions?

Figure 4.9: Rent-Bid Functions for Urban Land Uses



Source: Adapted from Neenan, 1981

Prescriptive-deterministic application of Christaller-based central place theories and location models is, in view of the above, questionable and inappropriate. The test of a sound theory, grounded in scientific research is, arguably, whether such theory will withstand not only professional scrutiny, but in particular the test of time. If it were to emerge that theory and practice are visibly diverging, it would signal the diminishing significance and predictive capabilities of static, Christaller-based central place theories and models in the present day environment. It would furthermore call for a revision of policies and plans formulated on this basis. Research findings hold fundamental implications for the hierarchy of shopping centres proposed in Prinsloo (2010) – including assumptions and interpretations –

as well as urban development models developed for, respectively the City of Tshwane and Johannesburg, based on Alonso's Bid Rent theory.

4.2.5 Other Theoretical Contributions – Burgess, Hoyt, Harris & Ullman

Sources claim that concentric zone theories originated in the ecological school of thought, based in Chicago's School of Urban Sociology, in the 1920s. Compare, for instance, Schaefer & Lamm (1989, p. 511): "With few exceptions, urban ecologists trace their work back to the concentric-zone theory devised in the 1920s by Ernest Burgess". Also McCarthy and Smith (1984, p. 11): "The Ecological approach to the analysis of urban land use originated in the so-called Chicago School of Urban Sociology, which became established and flourished in the 1920s and 1930s at the university of Chicago".

The work of the Chicago-based school of urban ecologists can be traced back to the earlier recorded research of Robert Park (between 1916 and 1936) and Ernest Burgess (around 1925). The focus of these early 'urban ecologists' was on studying city life by drawing analogies with plant and animal communities. The city of Chicago was the subject of their largely sociological research. In regard to the theoretical basis of the ecological paradigm, Scott & Dear (1980, p. 60) commented as follows: "In this (ecological) work the city is seen as forming a system of natural regions, or ecologies, each occupying a characteristic locational niche relative to others, and each with its characteristic complex of socio-psychological qualities. The logic of the city as a whole is then alleged to be decipherable in terms of the natural laws governing the interaction of these ecologies". Animal and insect communities (e.g. bee hives and ant hills) typically centre around one central figure – the queen. Modern societies and cities long since do not have this orientation. Save for a basic division of labour that may be observed in certain instances, animal behaviour differs markedly form that of humans: the spectrum of resources utilised in the animal kingdom are comparatively limited, technology is relatively unsophisticated and stable over

extended time periods; the value of land is not a factor, neither is any form of land tenure; no monetary system exists – or any form of trade/economy; no class system exists and no aspirational values (or ambition) are evident; no spatial differentiation of residential markets exists; transport is perfectly uniform – and relatively unsophisticated; there are no complex institutional structures to speak of; level of intelligence is comparatively limited.

Nevertheless, on the basis of the analogy with animal communities, Burgess developed a concentric zonal mode of city structure that illustrated the spatial distribution of socially stratified communities and sub-communities that soon gained momentum as a descriptive device for typical urban patterns in the United States. Scott & Dear (1980, p. 69) point out that social stratification was assumed as a given, the city was viewed as an evolving system based on the constant struggle of each community to secure for itself a life sustaining urban environment, and the. The 'struggle for survival' implicit in the Burgess social model created an environment in which those who are able, migrate from Zone II (Zone in Transition) to Zone III (Zone of Working Men's Homes). McCarthy & Smith (1984, p. 33) set out to disprove concepts implicit in neo-classical theory by quoting correlation coefficients calculated by Hart and Boaden for the City of Johannesburg. The latter authors made use of regression analysis in an attempt to assess the existence of correlations between property sales and distance factors. McCarthy & Smith (*ibid*) admit that these calculations are based on formulae with inadequately specified variables, but nevertheless proceed to criticise neo-classical theory in its entirety on the basis of this inadequate set of calculations.

McCarthy & Smith criticise the neo-classical approaches of Von Thünen, Alonso and others for having too great an emphasis on equilibrium land use patterns and for ultimately suggesting that the system is fundamentally in (or aspiring to) a state of harmony (1984, pp. 11 – 48). Said authors indicate that another approach was emerging at the time, an approach fundamentally based on the notion that there is ongoing conflict, struggle and disharmony between individual decision makers in the urban system. This disharmony, it is argued, ultimately manifests in urban structure. In spite of (or perhaps because of) their criticism of neo-classical theory

in the absence of presenting a viable alternative, the work of McCarthy & Smith did not gain traction in practice.

In the 1930's through to the 1960s, Homer Hoyt identified certain limitations and gross generalisations in the Burgess model and developed an amended conceptual model on this basis. Homer Hoyt explored, in particular, the impact of transportation on urban form. In 1945, CD Harris and Edward L Ullman developed a multiple- nuclei theory. The theory reflected the tendency of metropolitan regions, such as Boston, Philadelphia, Los Angeles and Washington to develop urban centres, of which each node addresses a particular urban need or activity (compare Schaefer & Lamm, 1989, p. 512 – 513 and McCarthy & Smith, 1984, p. 17 – 18). In this manner, the conceptual model indicated that the city may develop with a variety of specialised nodes over time, each with a distinct role and function: for instance a financial district, manufacturing zone, entertainment centres, waterfront area, etc. Specific types of businesses and housing typologies would gravitate and naturally cluster around each distinctive node.

The theories and models that emerged from urban sociologists and the ecological school of thought lean towards qualitative approaches. Ecological theory does not translate into quantifiably and/or verifiable research and findings. On a conceptual level, these theories resonate with Christallerian concentric elements in its structural resemblance of earlier urban environments, but makes no contribution in respect of analytical and/or predictive instruments. The value of these theories to the present study is therefore limited.

Neo-classical approaches are decidedly concerned with the economic decisions made by role players in the market/economy (urban and rural), largely based on factor input (i.e. resource) considerations. Neo-classical approaches recognised the existence of different economic role players (*inter alia* the importance of the division of labour referred to by Adam Smith, 1776, pp. 9 – 22) and it furthermore recognised that the various economic role players are characterised by different motivating forces, decision making criteria and processes, differences in the applications of capital, diverging views on economic progress and prosperity, diverging ambitions and aspirations. The quantifiable attributes of neo-classical

theory render it simultaneously accessible and appealing to measurement and testing. Subsequent paragraphs set out to test the validity of central place theory in the present day urban environment.

4.3. THEORIES TESTED

Apart from apparent flaws and critique associated with the essential basis of the central place theory, the theory neglects several crucial and highly relevant considerations. Some of the neglected considerations and criteria include (adapted from Akamagune, 2016 and University of Washington, 2000):

1. The economic effects and considerations associated with congestion costs.
2. Modern day societies are seldom homogenous.
3. The influence of consumer preferences and perceptions.
4. The highly different dynamics associated with a rural development landscape and an urban development context.
5. Rigidity of the model challenges its applicability and relevance to modern day development.
6. The model does not reflect reality – settlements are not structured in the way described by Christaller's theory.
7. Equality among population and transport is not realistic.
8. The model is rigid and inflexible and does not allow for flexible application in different modern day contexts.
9. The model fails to comprehensively consider the impact of actual human behaviour.
10. The model is applied in a static environment which is unrealistic – markets are dynamic and ever-changing.

Most location theories, including central place theory, fail to comprehensively consider the impact of actual human behaviour (University of Washington, 2000). Human behaviour, preferences and perceptions are often decisive in the dynamics of modern property markets.

4.3.1 Methodology

The relevance of theory in practice is tested by means of a quantitative assessment of the frequency distribution of shopping centres (by type) in Gauteng Province, South Africa. The investigation incorporates all of 710 listed shopping centres in the province in 2014.

The practical alignment of Alonso's Bid Rent theory to a modern-day environment is then tested by means of an analysis of property transaction data for the two largest urban centres in Gauteng Province, namely the City of Johannesburg and Pretoria.

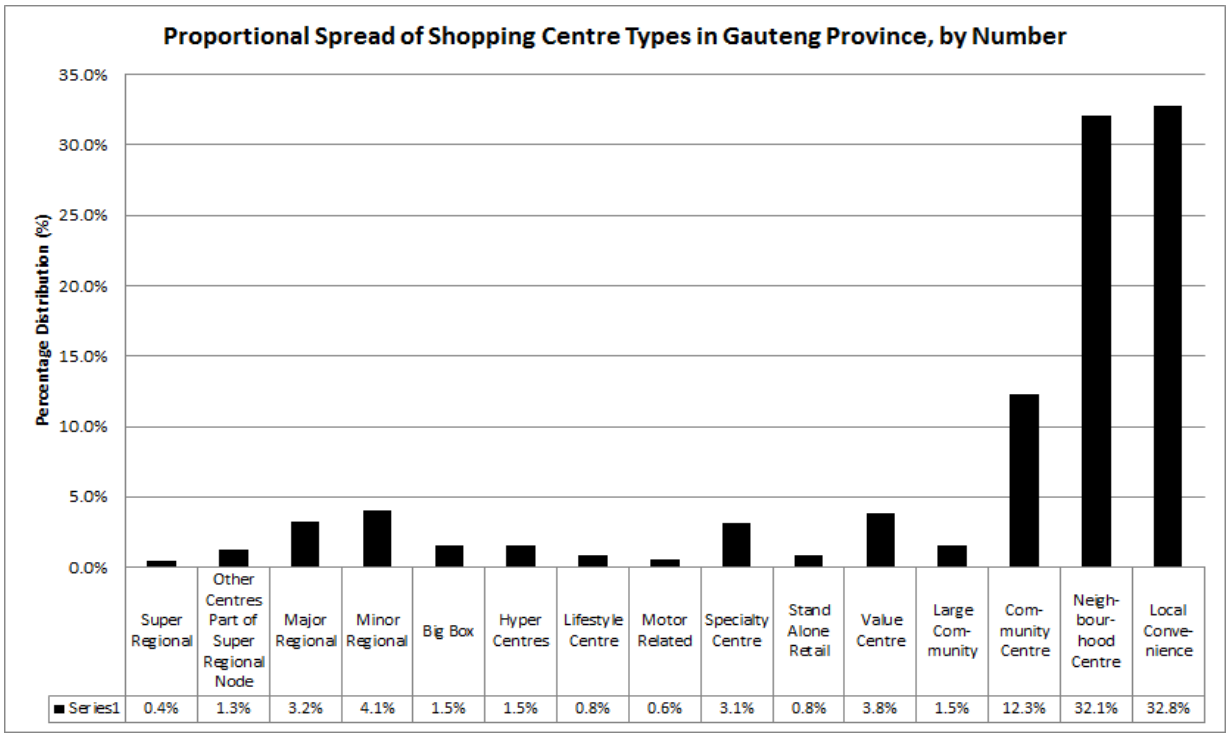
4.3.2 Central Place Theory Tested

There were approximately 710 listed shopping centres in Gauteng Province in 2014. Although it is generally accepted that this database accounts for the bulk of retail floor space in South Africa – in particular all new stock added over the past 2 decades – it is common cause that street-front retail is not accounted for in full. Although participation is voluntary, the SACSC database is nevertheless regarded as an accurate reflection of the domestic retail industry. Du Toit and Cloete (2017a) observed a degree of stability in retail market structure over time, on account of which interim variances will not affect subsequent findings.

The frequency and proportional distribution of 710 listed shopping centres in Gauteng Province is illustrated in Figure 4.10 and summarised in Table 4.1.

Notably, the largest proportion (64.9%) of centres are comprised of local and neighbourhood convenience type centres. Other noteworthy concentrations include regionals (minor and major), speciality and value centres.

Figure 4.10: Summary of Gauteng Shopping Centres by Type, 2014



Source: Calculations based on South African Council of Shopping Centres, 2014

Table 4.1: Summary of Gauteng Shopping Centres by Type, 2014

Shopping Centre Type	Number	Percentage
Super Regional	3	0.4%
Other Centres Part of Super Regional Node	9	1.3%
Minor Regional	29	4.1%
Major Regional	23	3.2%
Big Box	11	1.5%
Hyper Centres	11	1.5%
Lifestyle Centre	6	0.8%
Motor Related	4	0.6%
Specialty Centre	22	3.1%
Stand Alone Retail	6	0.8%
Value Centre	27	3.8%

Shopping Centre Type	Number	Percentage
Large Com-munity	11	1.5%
Community Centre	87	12.3%
Neighbourhood Centre	228	32.1%
Local Convenience	233	32.8%
Total	**710**	**100.0%**

Source: Calculations based on South African Council of Shopping Centres, 2014

Insightful as this summary may be, it does not yet articulate the possible underlying ratios alluded to by the likes of Christaller and his loyalists. Closer inspection does, however, reveal certain identifiable ratios. Table 4.2 summarises a variety of ratio configurations (illustrated in Figure 4.11). The author is extremely weary of ratios, as these have a tendency to be interpreted in a rigid, prescriptive-deterministic manner which belies the dynamic and evolving nature of the market. Results should therefore be interpreted as comparative-static assessment at a given point in time. Nevertheless, in the context of the 'six-for-six' notion (incorrectly attributed to Christaller), the quantitative research revealed quite distinct – and different – identifiable ratios (Table 4.2).

Table 4.2: Summary of Gauteng Shopping Centres by Type, 2014

Centre Type	Ratio	Interpretation
Major Regional to Super Regional	8	For every super-regional, there are 8 major regionals
Minor Regional to Super-Regional	10	For every super-regional, there are 10 major regionals
Regional (Minor & Major) to Super-Regional	**17**	For every super-regional, there are **17** regionals (minor & major)
Speciality, Value, Big Box & Hyper to Regional (Minor & Major)	1	For regionals (minor, major and super) and speciality/value/big box/hyper centres, there is a 1:1 correlation

Centre Type	Ratio	Interpretation
Community to Regional (Minor & Major)	**2**	For every regional centre, there are **2** community centres
Neighbourhood to Community	**3**	For every community centre, there are **3** neighbourhood centres
Neighbourhood to Minor Regional	8	For every minor regional centre, there are 8 neighbourhood centres
Local Convenience to neighbourhood convenience	1	The correlation between neighbourhood and local convenience is 1:1
Convenience (neighbourhood & local) to community	**5**	For every community centre, there are **5** convenience centres
Convenience to Minor Regional	16	For every minor regional centre, there are 16 convenience (neighbourhood & local) centres

Source: Calculations based on South African Council of Shopping Centres, 2014

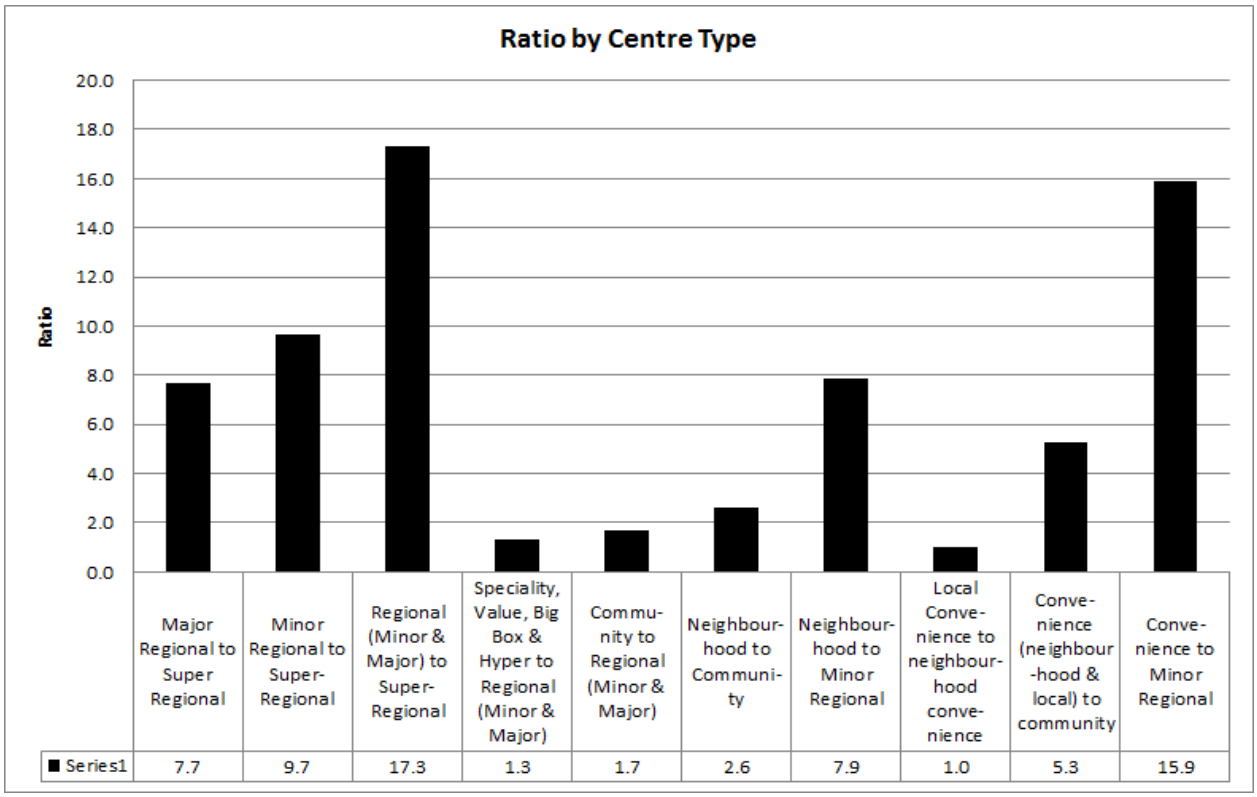
The aforementioned ratios are graphically illustrated in Fig. 4.11.

Findings and Implications:

The aforementioned quantitative analysis of the shopping centre frequency distribution revealed the following noteworthy correlations and ratios:

1. For every super-regional, there are **17** regionals (minor and major).
2. For every regional (minor & major) there are **2** community centres.
3. For every community centre, there are **5** convenience centres (local and neighbourhood).
4. The ratio of speciality and value centres to regionals (major and minor) is more or less **1:1**, indicating a close numerical correlation.

Figure 4.11: Summary of Gauteng Shopping Centre Ratios by Type, 2014



Source: Calculations based on South African Council of Shopping Centres, 2014

The above correlations are not only numeric, but geographic clustering has also been observed: specialised retail formats tend to gravitate towards regional nodes (and follow their development curve), affirming that the principles of economic agglomeration outlined by Weber, also apply to retail enterprises.

The analysis dispels the universal 'six-for-six' principle across the spectrum of centre types as suggested by Prinsloo (2014) – regardless of the fact that Lösch did not even denote a K value of "6". The research findings furthermore found no basis upon which a K value of "3" (for the market principle) could be determined in a developing, modern day market environment. In fact, research by Applebaum (1961 & 1966) and Ghyoot (1992) on consumer behaviour and trade area characteristics dispel the notion of trade areas as rigid and impermeable, hexagon-shaped polygons – instead, multiple trade areas and trade area overlap are common. The ratios calculated furthermore preclude any possibility of a conceptual graphic representation of market areas in the shape of a hexagon.

The research therefore not only invalidates the Lösch-Christaller K values, but the entire hexagonal schemata and associated service polygons upon which the theory is premised.

4.3.3 Bid Rent Theory Tested

Bid rent theory is a practical and theoretical extension of central place theory. In this section, the practical alignment between Bid Rent theory and modern-day urban environments is tested. The assessment is conducted by means of an analysis of a cross-section of average property transaction values for, respectively, the City of Tshwane (Pretoria) and Johannesburg.

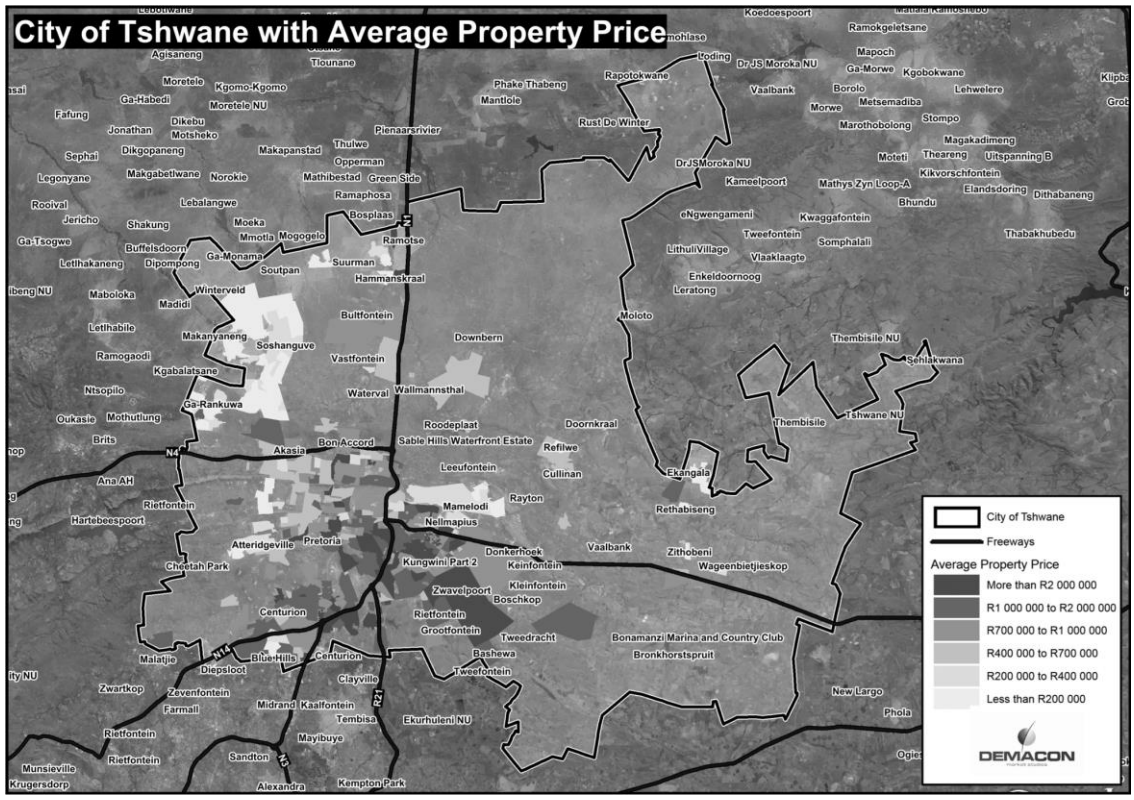
Figure 4.12 illustrates property values (Rand per square metre) for the City of Tshwane, based on 2014 transaction data recorded by the Deeds Office. Figure 4.12 is supplemented by Figure 4.13, which provides a west-to-east cross-section of transaction data for the city.

Transaction data offers insight into what the respective users of land are willing to 'bid' for such land in a present day environment under prevailing market conditions, given unique area and associated attributes. As such, transaction values recorded by the Deeds Office offer a meaningful comparison to Alonso's bid rent concept. The cross-section of property transaction values for the city reveals a distinctly different pattern, though, compared with the highly simplified bid rent theoretical concepts. The following observations can be made in this respect:

1. the effect of east-west ridges (i.e. geographic barriers) in the Pretoria environment is visible;
2. the central business nucleus (primate CBD) is hardly identifiable from the dataset, although decentralised nodes of Brooklyn (including Muckleneuk), Menlyn and Centurion can be identified;
3. in general, real estate values tend to diminish towards the outer extremities, in particular in the direction of outlying Second Economy/township areas;

4. however, high value zones can be observed towards the south-east (including *inter alia* Zwavelpoort and Garsfontein) and south-west (including *inter alia* Centurion) – in this respect, a correlation with high-income residential suburbs (Figure 4.14) can be observed;
5. value is not solely determined by accessibility;
6. spatial remnants of former Apartheid City planning policies are noticeable, as are the effects of lifestyle choices by the higher income earning segments of society.

Figure 4.12: Property Transaction Data for the City of Tshwane, 2014



Source: DEMACON, 2014a

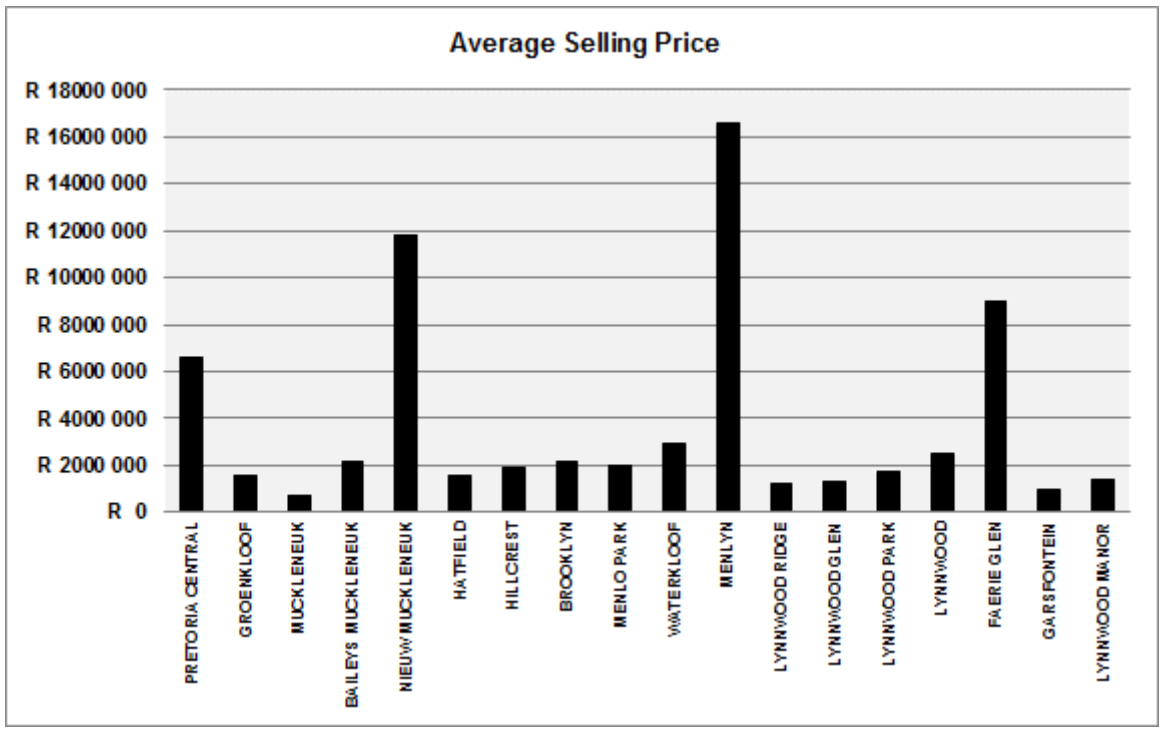
If interpreted with an understanding of dominant urban growth trends over time – primarily towards the east, south-east and south – this spatial schemata reveals interesting location choices (and future options) for residential and non-residential (i.e. commercial) land use.

This spatial manifestation of value in a modern day urban environment, as defined by property transaction data, raises a number of pertinent issues with regard to

Alonso's Bid-Rent Theory. In a developing, multi-nuclei urban environment, property values tend to rise and fall over time in visible geographic waves. Distance from the primate CBD *per se* appears not to be the determinant of value. Determinants of value appear to include:

1. location choices (and preferences) exercised by consumers on account of economic ability, lifestyle preferences and value considerations;
2. the effects of consumer demand on the geographic distribution of basic and non-basic economic activities, which are apparent in real estate value patterns around nodes and corridors; and
3. freeways and provincial routes, which may create corridor development opportunities – although vast sections of undeveloped corridor landscape affirm that commercial viability does not solely depend on accessibility and sight value (this finding suggests correlation rather than causality).

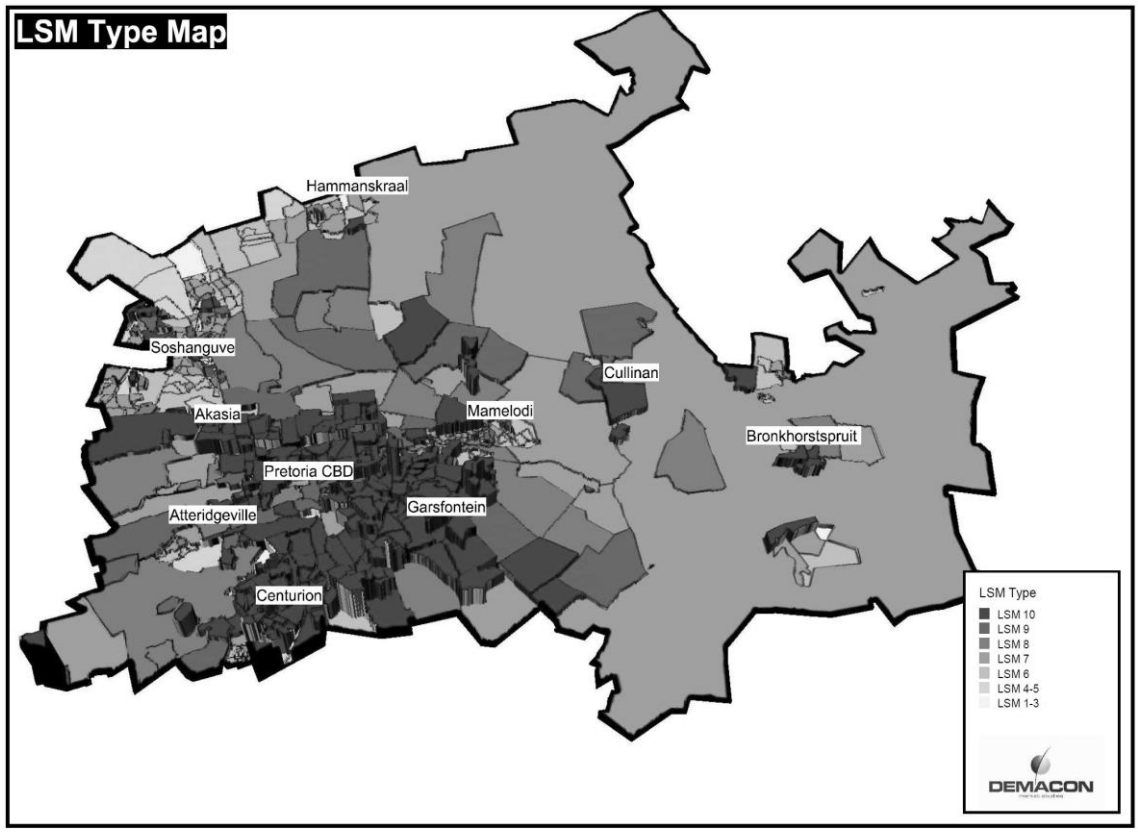
Figure 4.13: Property Transaction Data for the City of Tshwane, 2013



Source: DEMACON ex Deeds Data, 2014a

The above hold fundamental implications for simplistic, modern day bid rent models, computer simulations and city development models founded on Alonso's Bid Rent theory.

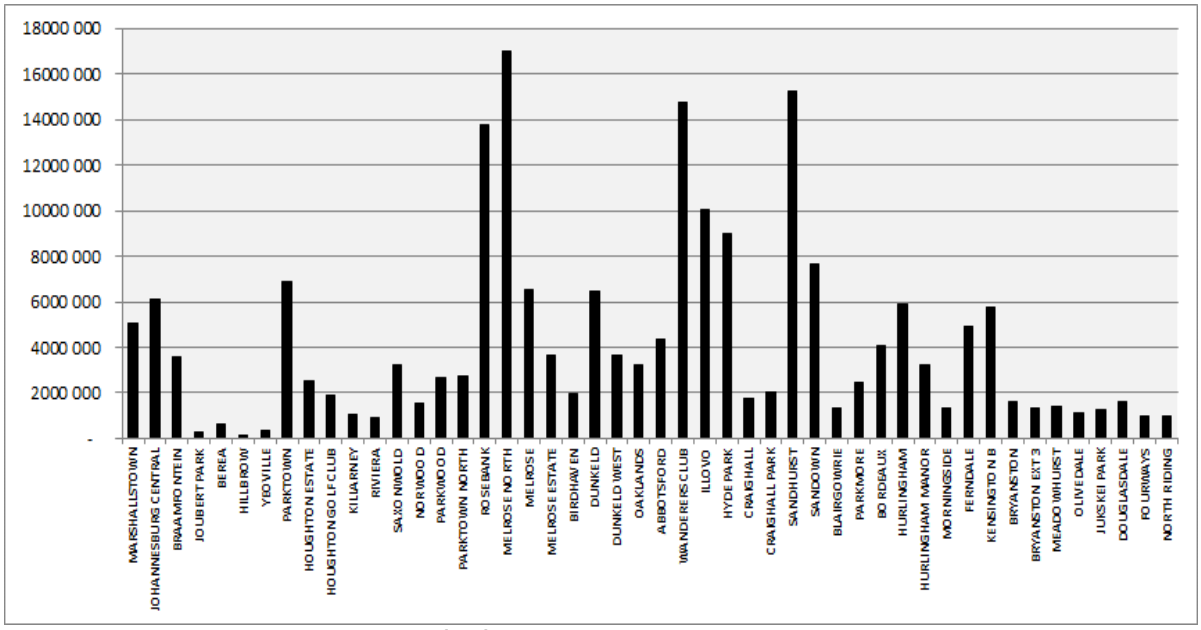
Figure 4.14: City of Tshwane LSM Profile, 2012



Source: DEMACON, 2015

A similar assessment of a cross-section of property transaction data (Figure 4.15) was conducted for the City of Johannesburg, which yielded comparable results.

Figure 4.15: Property Transaction Data for the City of Johannesburg, 2013



Source: DEMACON ex Deeds data, 2014a

A pattern similar to that which has been observed in the City of Tshwane data can also observed in the cross-section data for the City of Johannesburg. Similarities include the diminished transaction values of the primate CBD and surrounding environment, as well as the visible value spikes at popular locations at regular intervals from the CBD.

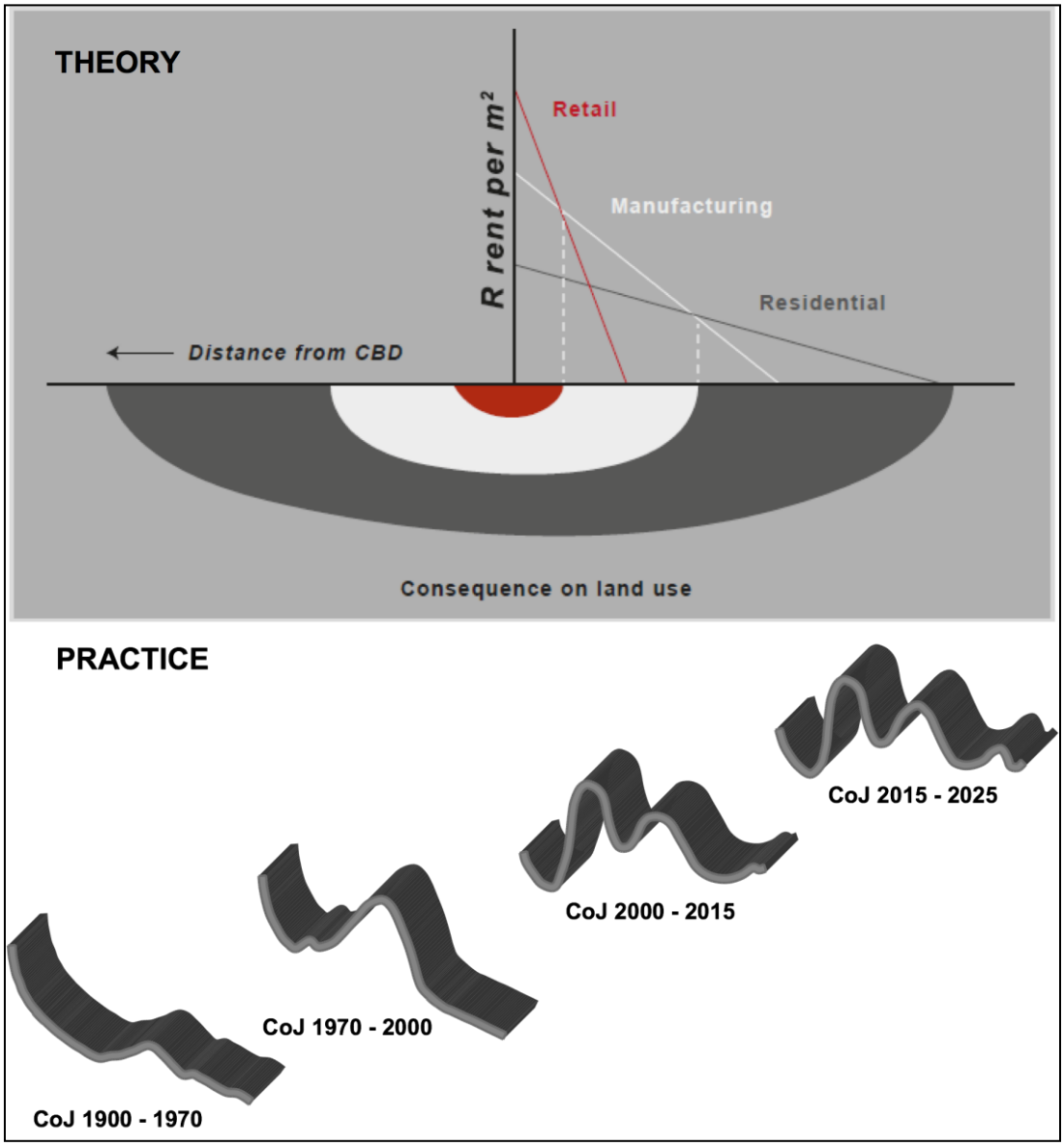
Figure 4.16 illustrates that the early South African cities, with Johannesburg as example, may initially have revealed a *degree of correlation* with Alonso's original bid rent theory – especially during the late agricultural era, progressing into the early mining and industrial era from the early 1900's up to the 1970's. In the context of this timeline it is noteworthy that these theoretical concepts were formulated in the 1960's and refined throughout the 1980's – i.e. when global cities had already revealed signs of maturing into multi-nuclei environments, driven by serviced based economic activity.

Service based economic activity generates a comparatively higher degree of interaction between economic role players, compared with agricultural of industrial activity – as illustrated by for instance higher parking ratios for office parks and shopping centres, compared with industrial parks. Services based economic activity places a comparatively higher premium on accessibility and efficient urban scale is therefore influenced by congestion costs: it is progressively more expensive to build vertically than horizontally.

Todaro and Smith (2009, pp. 329 – 331) explain the effects of urban congestion costs on urban form as a product of interaction between the opposing "centripetal forces of urban agglomeration" and the "centrifugal forces of diseconomies" (increasing costs with greater concentration). Due to congestion costs, nodal frequency and density increases throughout the post-industrial era.

There were already noticeable signs of multiple 'value spikes' in urban environments when Alonso formulated Bid Rent theory and premised it on a single sloping graph – which should have already raised questions at the early theory formulation stage.

Figure 4.16: Bid Rent Theory *versus* actual Land Value Assessment, City of Johannesburg

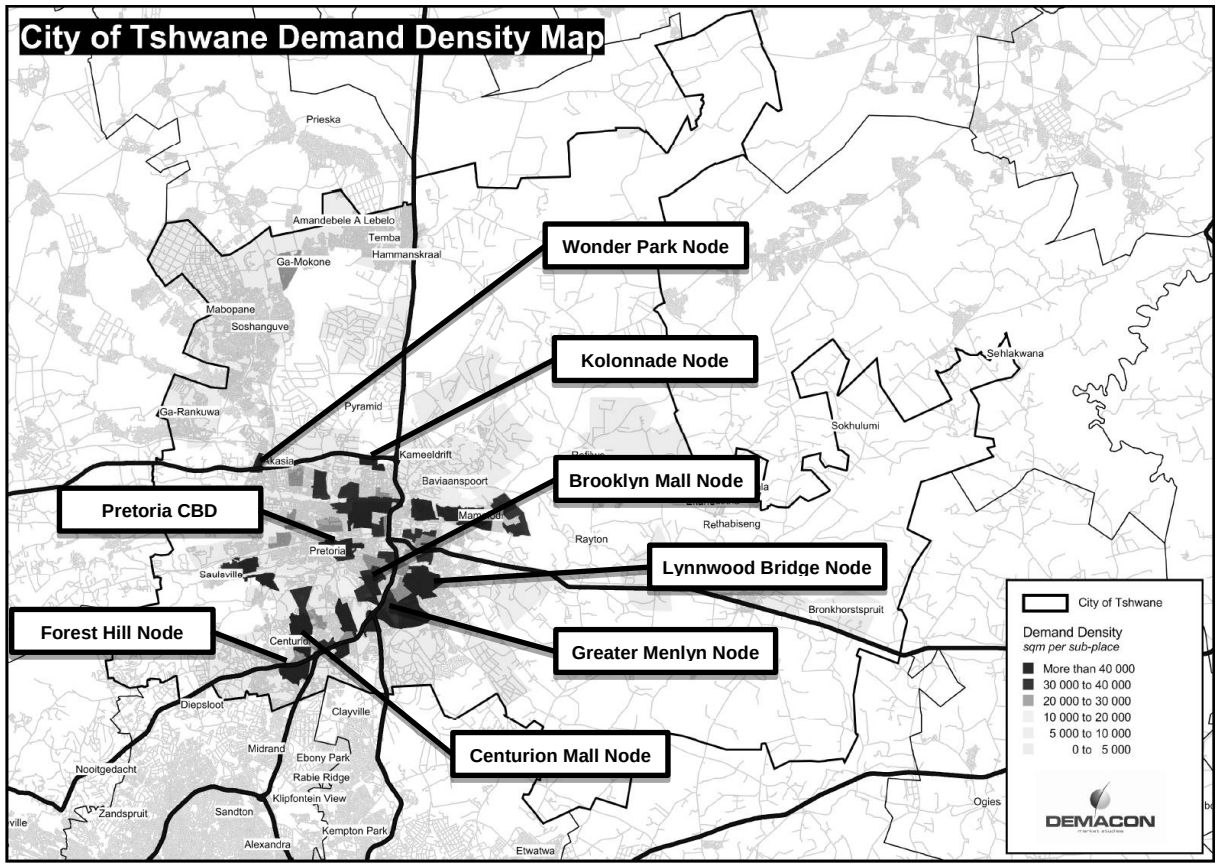


In view of the above, the mapping of consumer demand density (Figure 4.17) reveals a correlation with the spatial distribution of transaction values (Figure 4.12) and service sector nodal activity.

At a macro scale, the spatial distribution of higher order land uses, such as commercial economic activity, in Tshwane reveals a correlation with regional access considerations. The correlation between preferred localities for commercial activity as function of distance from the city centre appears to be weak. The

research findings affirm the significance of congestion cost considerations and the impact thereof on the spatial distribution of economic activity.

Figure 4.17: City of Tshwane Consumer Demand Density and selected nodes, 2013



Source: DEMACON, 2014b & 2015

4.4. CONCLUSIONS

The study of central places is essentially a study of the location behaviour of individual economic role players. Central place theory, in general, adds value to a basic understanding of market areas, but offers limited further insight into the complexities exhibited by spatial/urban systems – a problem aggravated by the foundational research subjects and associated mathematical and diagrammatical errors made by Christaller and company. These errors informed a lineage of genetic descendants, including urban development theories, models and hierarchies. The findings presented in this chapter correlate with the findings of other independent researchers.

The research presented in this chapter affirms the basic principle of the existence of higher order localities and settlement or nodal hierarchies. In respect of the spatial distribution of economic activity, central place theory places considerable emphasis on spatial settlement in terms of a nodal configuration together with the absolute and sustained dominance of a primate central business core. Assumptions are made in regards to transportation cost, purely on account of distance, whereas the impact (both time and cost) of increasingly concentrated convergence on a single central place and subsequent effects thereof on diseconomies of centralisation are not considered. Alternative spatial configurations that may offer possible solutions to increasing diseconomies of centralisation were not investigated by the early founders of central place theory, i.e. Von Thünen, Christaller or Lösch.

Modern day policy and theory need to remain sensitive to the time and context within which central place theory was conceived. During and shortly after the Christaller era, monocentric settlements dominated an otherwise undeveloped landscape and centrality was interpreted in absolute terms. The evolution of urban landscapes and settlement hierarchies transformed the concept of centrality from absolute into relative terms, thereby displacing the notion that a primate CBD is and remains at the centre of business activity and hence, at the top of a settlement hierarchy.

General misconceptions of the relevance and predictive capabilities of central place theory are widely prevalent. Genetically flawed theoretical concepts that were demonstrated to be obsolete include the simplistic hexagonal Thiessen's-like polygons and associated rigid and impermeable trade areas, the oversimplified 50% cut-off points between nodes, the so-called 'six-for-six' hierarchical principle and the widely accepted though ill-informed planning concept related to perpetual dominance of the primate city centre. The research indicated that these concepts are still widely accepted as conventional wisdom and remain embedded as theoretical constructs in *inter alia* urban planning, market analysis and GIS technology.

Research findings presented in this chapter hold, among others, the following fundamental implications for urban planning, policy formulation and capital expenditure programmes:

1. The research findings that dispel the universal ‘six-for-six’ principle also preclude any possibility of a conceptual graphic representation of market areas as hexagons or similar symmetrical shaped figures.
2. The use of simplistic diagrams (Euclidian, fractal or otherwise) deployed for urban and regional planning purposes and in which a dominant (or primate) urban core is surrounded by a landscape comprised of hierarchical and symmetrically distributed (subservient) nodes can most probably only result in an inaccurate portrayal of reality and furthermore does not posses reliable predictive capability.
3. The use of oversimplified concentric circles to portray market areas is equally inaccurate and inappropriate.
4. Economic, geographic, climatic and resource idiosyncrasies – combined with the complexities of human behaviour – render the simplified approaches outlined above invalid.
5. Research findings furthermore affirm that attempts to predict urban spatial settlements patterns based on the ‘six-for-six’ nodal concept has no theoretical foundation.
6. Rigid application of a hierarchy of retail facilities (such as suggested by Prinsloo, 2010) is similarly invalidated – the very theoretical basis of this hierarchy, including the research of Berry and Christaller’s central place theory, has been refuted.
7. Provincial and city wide spatial development frameworks in which it is suggested, for instance, that a system of symmetrical ring roads and nodes should be developed (or completed) purely on the basis of a visual appraisal and to complete a conceptual schemata of a symmetrical urban system, is invalidated.
8. The unintended consequences of extensive public transport infrastructure investment programmes that seek to improve mobility between the primate city centre and low income townships on the urban periphery need to be recognised and carefully evaluated – considering the above points in the

context of what Todaro refers to as urban giantism (a consequence of hub-and-spoke transportation systems (2009, pp. 331 – 335).

9. Closely related to the above, are the consequences of oversimplified town planning arguments that simplistically equate much needed growth in productive, rateable real estate assets (that takes place towards the urban periphery) to urban sprawl. An approach that is sensitive to, appropriately informed and tailored to the unique socio-economic growth phase of a nation, region and city or town in relation to its spatial economic requirements (and the implications thereof) is needed.
10. Public expenditure programmes that seek to promote and protect central business districts at the cost of allowing new real estate development and investment to take place on developable land, is not responsive to spatial economic realities and fiscal complexities of the time. A fundamental shift in policy paradigm would be required to redress the unintended consequences of the prevailing policy regime.

In spite of the oversimplified geometric representation of reality, central place theory provided an early precursor to the intuition that there is scale and hierarchy identifiable in human settlements. Fractal geometry developed by Mandelbrot (1982) is based on the premise that natural constructs are better characterised using fractal geometry, as opposed to Euclidean representations. As an example, every little fern leaf has the same shape and character as the whole fern leaf. This notion has some value and relevance, although it is the author's contention that the research contained in this thesis clearly illustrates that the spatial manifestation of demand and supply is influenced by complex interaction between economic subjects, which may differ from area to area on the basis of market attributes, geographic and environmental characteristics, climatic conditions as well as socio-cultural and political considerations. The development of fractal geometric representations based on mature markets (e.g. metropolitan regions and cities) may offer some insight into probable (and conceptually illustrated) future hierarchical evolutions that could be expected in less developed environments (e.g. South Africa's tribal / traditional areas). However, on account of localised idiosyncrasies, geographic and otherwise, it is argued that the predictive

capabilities of such approaches are bound to remain limited. Further research in this regard may prove insightful.

The proposition that market/trade area size – and hence the distance an average consumer is willing to travel to a particular facility – is not simplistically determined by the size of a node, centre or facility is investigated in Chapters 5 and 6. These chapters consider the effects of the nature of a shopping centre's tenant offering on patronage, with specific emphasis on food grocer anchor tenants.

Chapter 5 presents qualitative research on the perceptions of shopping centre owners, food grocer retailers and consumers regarding the impact of dual and multiple food grocer anchorage on the performance of shopping centres in South Africa.

CHAPTER 5

PERCEPTIONS ABOUT THE IMPACT OF DUAL AND MULTIPLE FOOD GROCER ANCHORAGE ON THE PERFORMANCE OF SHOPPING CENTRES IN SOUTH AFRICA

5.1. INTRODUCTION

It is common cause in the retail industry that supermarkets serve as anchors in shopping centres. Food anchors were historically afforded the sole rights to trade as food and grocery retailers in shopping centres by virtue of incorporation of exclusivity clauses in long term lease agreements. These exclusivity clauses typically included restrictions on the type of food related non-supermarket tenants that would be allowed (or not) to trade in the centre. These restrictions applied to other national food chains and to the smaller brands – smaller, perhaps, in terms of floor space and individual capitalised value but, in aggregate terms, significant in an overall economic context. Small businesses directly affected by subsequent constraints on their product range and offering included bakeries, confectionaries, butcheries and associated part-line stores.

On 29 June 2009, the Competition Commission (The Commission) formally initiated an investigation into exclusivity clause practices by South Africa's major food retail chain groups, including Pick n Pay, Shoprite/Checkers, Woolworths and Spar, as well as Massmart and Metcash for alleged contraventions of the Competition Act, 89 of 1998 (Smidt, 2014, p. 1). The focus of the investigation was on the alleged uncompetitive practices by aforesaid retailers and specifically the negative effects that long term exclusivity clauses (sometimes as long as 15-20 years) are believed to have in preventing small business enterprises from entering and competing effectively in the retail environment. The Commission also raised

concerns regarding the effects such exclusivity clauses had in terms of concentrating consumer buying power as well as related issues pertaining to, *inter alia*, category management and information exchange. The Commission concluded part of its investigation on 27 January 2011. The Commission noted that there was insufficient evidence to affirm contraventions in terms of the Competition Act. Concerns were, nevertheless, raised regarding the perceived negative effects of exclusivity clauses in long-term leases.

The topic of single *versus* dual/multiple grocer anchorage in South African shopping centres continues to be contested and controversial. In the absence of industry research on the subject matter, the author investigates the perceptions of shopping centre owners and customers about dual and multiple grocer anchorage *versus* single grocer anchorage. The analysis is concluded with views expressed by prominent national food grocer retailers on the subject matter.

The purpose of the research presented in this chapter is twofold: to assess whether respectively shopping centre owners, consumers and food grocer retailers perceive dual and/or multiple food grocer anchorage to be beneficial for a shopping centre; and to establish the extent to which the perceived power of attraction of a shopping centre is determined by its offering – and more specifically single *versus* dual/multiple food grocer anchorage. Research findings potentially inform the specification of certain coefficients in the proposed model (Chapter 9).

5.2. LITERATURE REVIEW

Since publication of the early work of Reilly in the 1920's (Richardson, 1979) significant advancements were made towards refining the quantifiable attributes that render certain centres more attractive than others – the later work of Huff in the 1960's (Huff, 1963, pp. 81 – 90 & Timmermans, 1993, pp. 343 - 377) sought to quantify aspects such as the distance deterrence function and associated attributes (i.e. key differentiators) that render certain centres more appealing to the consumer compared with centres that may be either larger or situated closer (i.e. more conveniently) to the consumer. In developing his model, Huff applied Luce's

so-called choice axiom which states that "… when faced with several choice alternatives, the probability of an individual choosing a particular alternative is equal to the ratio of the utility of that alternative to the sum of utilities of all alternatives considered by the individual" (Timmermans, 1993, p. 349 – 350). Utility is the key consideration. The question follows: what constitutes utility to the consumer.

In 1976, Rosenbloom (p. 58) developed a comprehensive framework that, in view of the consumer profile, enables a retailer to plan and adjust a store's retailing mix strategy in response to the market environment. Rosenbloom developed an analytical matrix that creates a coherent overview of the market environment in terms of:

1. *goods and services variables*, including variety, parking, sales service, customer service, credit, price lines, alterations and adjustments and delivery;
2. *communication variables*, including personal selling, advertising, window display, interior display, public relations, store layout, catalogues and telephone sales; and
3. *physical distribution variables*, including store location, distribution centres, inventory control, transportation and handling goods (*ibid*, p. 60-61).

Rosenbloom's matrix juxtaposes the aforementioned variables against the geographic and demographic attributes of a store's trade area. Rosenbloom contends that this matrix can assist the retailer in sorting and weighting trade area data (*ibid*, p. 64 – 65).

Shopping centre functionality is another important consideration to both the consumer and retailer. In terms of broad functionality, shopping centres can be categorised as predominantly convenience orientated or predominantly destination orientated. In the context of the above, centre size alone is not the sole determinant – tenant composition, product offering and design are among the defining elements that position a centre in terms of its perceived utility – and ultimately, its functionality.

Table 5.1 summarises broad shopping centre functionality, based on the main shopping centre types distilled from various contemporary retail hierarchies that were developed and published by and in conjunction with the International Council of Shopping Centres (ICSC).

Table 5.1: Shopping Centre Functionality – Synthesised

Classification	Size	Trade Area (Approximate Total Travel Time)*	Functionality
Super Regional	More than 100 000m²	20 – 30min	
Regional	50 000m² -100 000m²	10 – 20min	
Small Regional	25 000m² - 50 000m²	5 – 15min	
Community Centre	12 000m² - 25 000m²	5 – 10min	
Neighbourhood Centre	5 000m² - 12 000m²	3 – 5min	
Small Convenience Centre	500m² - 5 000m²	<3min	

Source: Adapted from various hierarchies and primary research

Further to the above, food grocer retailers should be defined and categorised. Although there are no formal industry definitions for, or classification of food grocer retailers, Cloete (2015) read in the context of contemporary practices in the food grocer retail environment may offer the following consolidated definitions:

- *Supermarket* – a large shop (measures 1 500m^2 – 6 000m^2) that sells a wide range of food products and a small proportion of non-food products operated on a self-service, low price, low margin basis. Examples include Pick n Pay Supermarkets, Spar's and Super Spars, Checkers stores, Boxer Supermarkets and Shoprite stores. Some formats range between 1 500m^2 – 2 500m^2, but many were found not to be viable in a changing market environment and were discontinued, e.g. Pick n Pay Mini. The new format of the Woolworths Food Store (measuring 2 000m^2 – 3 200m^2) is a new entrant to this segment of the market.

- *Hypermarket* – offers a wider product range than a supermarket (measures 6 000m^2 – ±14 000m^2). Two SA retailers in particular have developed hypermarket store formats, namely Pick n Pay and Checkers. President Hyper (recently acquired by the Shoprite group) and Choppies are emerging as a new market entrants, but its market penetration is mainly limited to certain portions of Gauteng, North West Province and the Northern Cape.
- *Superette* – a food-orientated shop which sells a limited variety of groceries and impulse goods (measures <1 500m^2). Examples include KwikSpar, Woolworths Food stores, USave and OK Mini Mark.

A fourth grouping could potentially be added, namely the greengrocer. Greengrocers have a more limited product range, compared with supermarkets and hypermarkets. The primary focus is on fresh food. Examples include Food Lover's Market, Fruit and Veg City and smaller localised green grocers. Greengrocers typically measure 50m^2 – 2 500m^2. The larger store formats may include fresh fruit, vegetables, nuts, cheeses, meat and biltong selections. Green grocers do not offer a full-line product range. In this context, when retailers and developers refer to a "full-line" grocer anchor, it implies a supermarket size upwards of 1 500m^2 – 2 000m^2 which, by virtue of size, provides a comprehensive and competitive product offering that spans all or most of the following product categories (confirmed by Gomes, 2014):

1. Groceries
2. Personal care section
3. Fresh produce & perishables
4. Bakery
5. Butchery
6. Wines
7. Frozen foods
8. Sweets
9. Coffee counter
10. Cheese section
11. Seafood section
12. Cigarette counter.

A number of greengrocers (including new store formats) in malls are faltering, revealing ongoing problems with the concept and refinements required in respect of sizing, composition, location (i.e. most suitable centre type and in-centre positioning) as well as realistic rentals (relative to sales and overhead cost structure). References to dual and multiple food grocer retailers, in the context of this research, excludes greengrocers. Market research findings with reference to dual and multiple grocer anchorage in subsequent analyses refer specifically to the full-line grocer types.

5.3. A PERSPECTIVE ON CONSUMER BEHAVIOUR

Consumer behaviour can be determined in one of two ways, namely stated preference and by inference, based on a study of actual food grocer sales data. Perales (2002, p. 14 – 35) identifies consumer preference models as one possible method to determine store location and selection. Consumer preference models directly incorporate consumer preferences (*ibid*, p. 21 – 22). This may be by means of:

1. *stated preferences* – in which consumers freely state their preferences through structured interviews or formal questionnaire responses; or
2. *revealed preferences* – in which actual market data is studied to observe consumer behaviour (this could be achieved through, for example, stores that have a loyalty card system, or by analysing and comparing actual store trading or relevant market data).

Consumer Preferences – More than a Product of Centre Size

The concept of the nearest centre postulate was observed as early as 1826 in the work of Heinrich Von Thünen, who produced arguably the first recognised literature on the configuration of central market places and the establishment of a firm's market area, which can also be observed in the work of Weber (in 1929), Christaller (in 1933), and Lösch (in 1940) (Neenan, 1981, p. 40 – 54). Notably, in

these early pre-industrialisation environments, the delineation of a trade or market areas was a relatively uncomplicated matter, supply and competition levels were comparatively low, urban environments were still by-and-large mono-centric and not yet private vehicle dominated. Communications technology was relatively unsophisticated and human interaction required physical presence in time and space. Clearly the opposite of the modern-day urban environment.

Although remnants of the above dated and overly simplistic theoretical concepts are observable in modern-day normative retail hierarchies, more recent efforts have been made to identify factors other than size that influence shopping centre appeal and consumer choice. Further to the analytical matrix developed by Rosenboom, Perales (2002, p. 58 – 60) contends that consumer store choice considerations can be divided into five blocks of variables, namely:

1. *convenience*, relates to store accessibility, store layout, store atmosphere and trading hours;
2. *customer service* includes aspects such as financial services (club cards, credit, etc), consumer service desk, home delivery, baby facilities, checkout services (speed, express checkout), personnel services and additional services (restaurants or cafeterias);
3. *merchandise*, including quality, presence of well-known brands, product range in terms of width and depth;
4. *pricing policies*, including consumer preferences towards either lower prices or product quality;
5. *location*, including store distance and travel time (increasing mobility levels have made travel distance progressively less important over the years and the so-called “nearest centre postulate”, i.e. the notion that the consumer will always support the nearest store, has long since been abandoned).

Research findings presented in Eroğlu (2013, pp. 43 – 59) identify similar factors that affect consumer preferences: quality (products and brands), price (level, store cards and discount days, location (closer to home *versus* work), product variety, store ambiance, services (including waiting times), store personnel (number, attitudes) and brand image (including advertising).

5.4. RESEARCH METHODOLOGY

The opinions of major stakeholders in the retail industry on the topic of food grocer anchorage remain deeply divided. To ensure broad representation of these diverging views, the research set out to assess the dual *versus* single grocer anchor controversy from three perspectives:

- firstly, the perspective of the shopping centre owner;
- secondly, views expressed by food grocer retailers (who, it should be noted, remain cautious about openly airing views in this regard, given recent events); and
- thirdly, perceptions and preferences expressed by consumers.

The investigation utilizes a combination of primary and secondary data. In respect of primary data, shopping centre owners, listed funds and shopping centre development companies were consulted (Table 5.2).

Table 5.2: Listed Funds and Development Companies Consulted

Abland	McCormick Property Development
Anaprop	Old Mutual Property
Christodoulou Holdings	Pareto Limited
Flanagan & Gerard	Resilient Property Income Fund
Growth Point Properties Limited	Retail Africa
Hyprop Investments Limited	Twin City Development (Pty) Ltd
Jacobs Trust	

Further primary data was collected by means of interviews with food grocer retailers. In the context of the Competition Commission investigation, food grocer retailers remain cautious about openly expressing their views on exclusivity clauses and dual or multiple food grocer anchorage. Certain views were inferred through work experience with specific national food retailers over the years.

Involvement in legal proceedings concerning food grocer exclusivity clauses provided insight to the matter. Two pertinent legal proceedings are cited, namely:

- in the Arbitration between Pietersburg Property Development (Pty) Ltd (Claimant) and Pick n Pay Retailers (Pty) Ltd (Defendant), Expert Notices and Affidavits (2014); and
- in the High Court of South Africa (Western Cape Division, Cape Town), Case No 17764/13, In the Matter between Shoprite Checkers (Pty) Ltd (Plaintiff) and Mass Stores (Pty) Ltd, Expert Notices and Affidavits (2014).

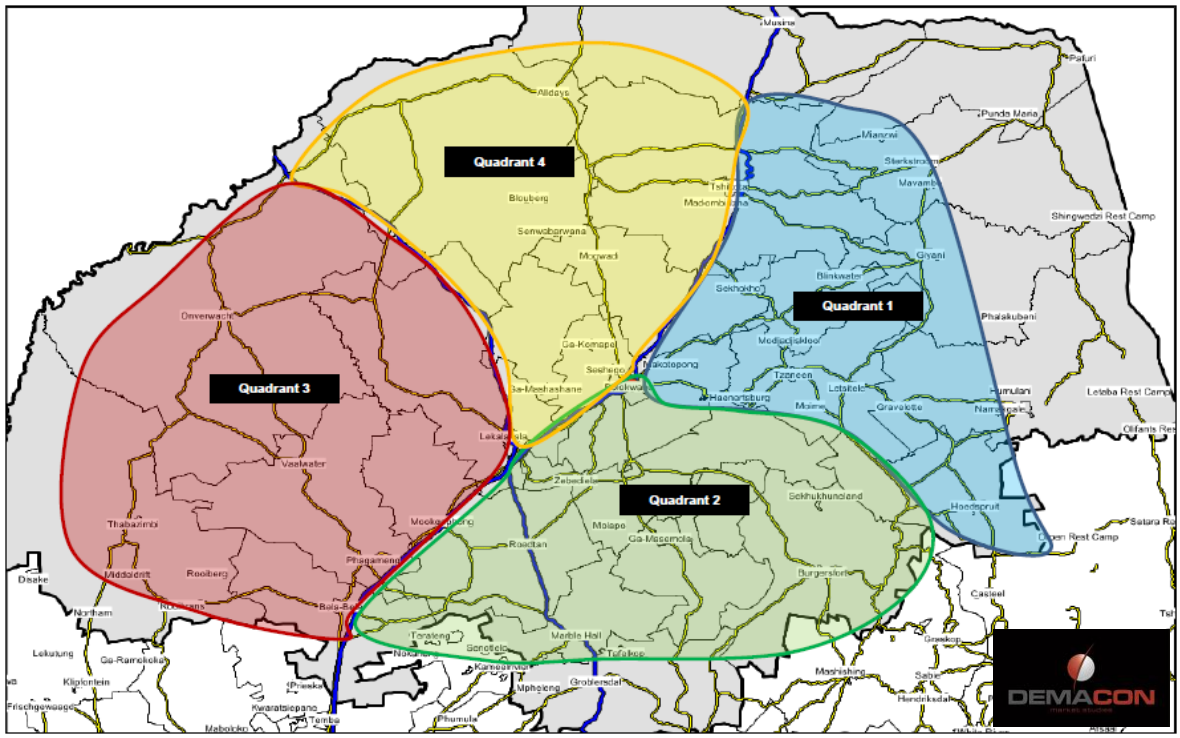
Further to the above, the author compiled an independent market research report for the Pietersburg Development Company (who have granted permission for selected data use in this thesis). Consumer surveys covered urban and rural Limpopo Province (Map 5.1). The primary research (i.e. household and shopper surveys) focused on analysing perceptions and preferences of the market, focusing specifically on the two main decentralised malls in the area, namely Savannah Mall and Mall of the North. The base data provides case study material for this chapter and lends a perspective that is not limited (or unique) to Savannah Mall, but relevant to a larger market. The relevance and usefulness of the primary dataset lies in its extensive regional coverage. The regional market was segmented into distinct, geographic sub-regions. Primary data collected for aforesaid investigation included:

- 304 face-to-face shopper profile surveys at Savannah Mall (mid-month and month-end, Wednesday to Sundays, February-March 2013);
- 500 random sample household surveys in Polokwane and regional market (Mondays to Fridays, February-March 2013) – 100 were conducted in Polokwane and a further 100 in each of the quadrants in the regional market surrounding Polokwane (Map 5.1).

The household survey targeted broad representation of a regional market across income segments. Only comprehensively completed questionnaires were utilised and incomplete surveys were discarded. The objective of the survey was to test consumer behaviour, preferences and perceptions with regard to food grocer

anchorage in the Polokwane retail environment in general, with special emphasis on Savannah Mall. Ultimately, the aim was to ascertain whether a second full-line grocer could potentially benefit the centre and to inform a tenanting strategy – in view of the exclusive grocer anchorage held by Pick n Pay.

Map 5.1: Delineation of the Polokwane and Regional Survey Regions



Source: DEMACON, 2013a

The household and shopper survey proper was preceded by a pilot survey with 30 respondents each to test the veracity of the questionnaire regarding clarity of questions, questionnaire length and time required to complete. These were not the first surveys of its kind and the questionnaire had been refined through previous research. Shopper profile surveys are challenging to execute as it interrupts a shopping excursion and time management is crucial.

The total sample of 804 fully completed questionnaires across the catchment (including a total of 52 360 households) has a:

1. 95% confidence level; and
2. a 3.5% margin of error.

Reliability was increased through a combination of pilot surveys and by comparing results to similar surveys conducted elsewhere in the country. Ultimately, the test for reliability is reflected in the consistency of findings. In this regard, the research revealed a consistent pattern – not only in regards to the revealed consumer perceptions and preferences (compared with survey findings in other geographic locations), but also at a higher level between the findings of consumer, shopping centre owner and listed fund interviews.

The aforementioned research findings are augmented with findings from research (DEMACON, 2015a) on the subject matter conducted in the Gauteng City Region. A further 364 random telephone household surveys were conducted in this region – the heartland of the South African economy.

5.5. RESULTS: PERSPECTIVE OF SHOPPING CENTRE OWNERS AND INVESTORS

The anchor role of food grocer and fashion retailers in shopping centres is not disputed. Food grocer anchors in SA malls typically include Shoprite, Checkers, Pick n Pay, Boxer, Spar, Woolworths Food, Choppies and President Hyper. Fashion majors, on the other hand, include *inter alia* Edgars, Woolworths, Truworths, Foschini and Mr Price. Cloete (2003, p. 365) describes an anchor tenant as a destination tenant: "… these can be tenants that attract the customer to the centre in the first place such as supermarkets …". Anchor tenants, in turn, create opportunities for so-called impulse tenants who are "… fully dependent on the number of shoppers passing their stores" (*ibid*). Yim (1993, p. 19), who also cites Applebaum (1968) in this matter, refers to the latter dynamic as "suscipient" market attraction.

In the absence of historic and recent quantitative research on the value or impact of multiple grocery anchors in a shopping centre in the South African environment (and in spite of the escalating debate since 2009), it was not surprising to note the ambivalence and diverging views among shopping centre developers, owners and investors on the topic of single *versus* dual and multiple grocer anchorage. The results of interviews with representatives of shopping centre development

companies and listed funds in South Africa can be categorised and summarised as follows:

1. *Larger funds (including Old Mutual and Resilient)* generally reveal no distinct preference and aspiration towards dual or multiple grocery anchorage. It is important to note that these larger funds often acquire existing assets and do not always develop new centres. Super-regional malls traditionally include a hypermarket grocery anchor (measuring ±6 000m^2 or more) and a Woolworths Food component in most of its larger stores – the latter measuring from as little as 240m^2 up to 1 000m^2. In recent years, certain Woolworths Food stores in malls were expanded to ±1 500 – 2 000m^2. By default, certain older malls (e.g. Southgate) then qualify to have three full-line grocers – i.e. Checkers, Pick n Pay and an extended Woolworths Food section. Over the past decade, the food grocer anchorage function of super-regional malls has come under increasing pressure (Muller, 2015; Flanagan, 2013; and Caplin, 2009 & 2013). In certain instances (e.g. Menlyn Park), the funds (e.g. Old Mutual) considered removing large food grocer anchors from super-regional centres – the rationale being a combination of comparatively low rental rates and trading densities, coupled with increasing market penetration of more conveniently located food grocers in neighbourhood centres. Understanding the logic behind the consumer food shopping trip is key to this rationale. In the ongoing 2015 refurbishment of Menlyn Park – and in line with market research and recommendations for the centre (DEMACON, 2009b & 2013b) – Old Mutual relocated the Checkers Hyper to a standalone building, which also includes Pick n Pay, New World, selected restaurants and smaller line shops. Pick n Pay was not a pre-refurbishment tenant in the centre. Muller (2015) indicated that not only exclusivity clauses, but also ‘options to renew’ were presenting challenges.

   The larger listed funds may not have revealed a clear and uniform preference in favour of dual or multiple grocer anchorage in 2009 when the initial interviews were conducted, but this sentiment appears to be shifting.

2. *Smaller funds and syndicates (including Flanagan & Gerard, Twin City and McCormick Properties)* actively pursue dual grocer anchorage in their community centre, small regional and regional mall portfolios: for these entities, dual/multiple grocer anchorage is considered an imperative in increasingly competitive retail environments (urban and rural). Dual or multiple food grocer anchorage is regarded as a critical success factor and vital ingredient to secure above par market share and to regulate foot flow (Flanagan, 2014 and Visagie, 2014). Both Flanagan and Visagie indicated that they would not engage a new development without dual or multiple grocer anchorage – grocer exclusivity clauses are no longer entertained. Visagie (*ibid*) indicated that, in certain instances, their (i.e. Twin City Development) shopping centres accommodate up to four viable full-line grocers. In the context of these entities no longer entertaining food grocer exclusivity in their new developments, Visagie (*ibid*) indicated that Twin City would, at best, only consider a grocer exclusivity clause if it were explicitly related to a certain centre size, i.e. should the centre be expanded to such an extent that it would alter the centre functionality, the exclusivity clause would lapse. Dual or multiple food anchorage is also regarded as critical success factor for these owners when refurbishing and/or re-tenanting an existing centre.

   Dual or multiple food grocer anchorage does, however, remain challenging in smaller centres on account of grocer size and comparatively low rentals in relation to total centre size. Mr Johan Jacobs (2015) indicated that, not only was dual or multiple food grocer anchorage important from the perspective of increasing centre market share in an increasingly competitive market environment, but it was also a vitally important risk mitigation measure: established national food grocers are willing to enter into long term leases (up to 10 years), whereas line shops and the smaller, new food grocer market entrants cannot meet this standard.

   From the perspective of the smaller shopping centre development syndicates and funds, food grocers are distinctly differentiated. Over and above lease

considerations, consumer brand preferences and consumer profiles influence grocer selection. Flanagan (2013), Visagie (2014) and Jacobs (2015) indicated that an expanded and thereby differentiated food grocer offering enabled their centres to attract a wider consumer audience. In so doing, dual/multiple food grocer anchorage broadened the target market and enabled these centres to increase market share.

In summary, the aforementioned interviews indicated that dual and even multiple grocer anchorage is regarded as a critical success factor by smaller shopping centre development funds and syndicates. It is worthy to note that these entities have historically developed and on-sold assets to larger funds.

5.6. RESULTS: PERSPECTIVE OF FOOD GROCER RETAILERS

The second perspective on food grocer anchorage is that of the major national food grocer retailers. Interviews were held with representatives of Pick n Pay, Spar, Shoprite/Checkers, Woolworths and Massmart.

Save for Woolworths who have historically been less set on exclusivity and considered the brand as complementary to other food grocer retailers, there is consistency in the views of the majority of national food retailers. In short, food grocer retailers are naturally averse to dual or multiple grocer anchorage and would generally not pass on an opportunity to gain exclusivity in a centre, although few developers still conceded to such clauses in new developments.

In addition to views expressed in interviews, the views of certain retailers on exclusivity clauses became apparent through their behaviour. Flanagan (2014), Heyneke (2014), Honeyborne (2014), Jacobs (2014), Kriek (2014), McCormick (2014) and Visagie (2014) indicated that in 2014, following numerous legal suites and mooted multi-grocer developments and redevelopments, Pick n Pay issued notices to all shopping centre owners in South Africa, informing them of said food retailer's intentions to defend their exclusivity clauses countrywide.

In spite of distinct, revealed consumer brand preferences over the years, coupled with studies by for instance AC Nielsen (2007) on product and price differentiation, food grocer retailers maintain that their range of products and services are largely homogenous. Baladakis (2013), Gomes (2014) and Nicolau (2015) – respectively involved with Pick n Pay, Shoprite/Checkers and Spar – generally concurred in this view – as did Muller (2015).

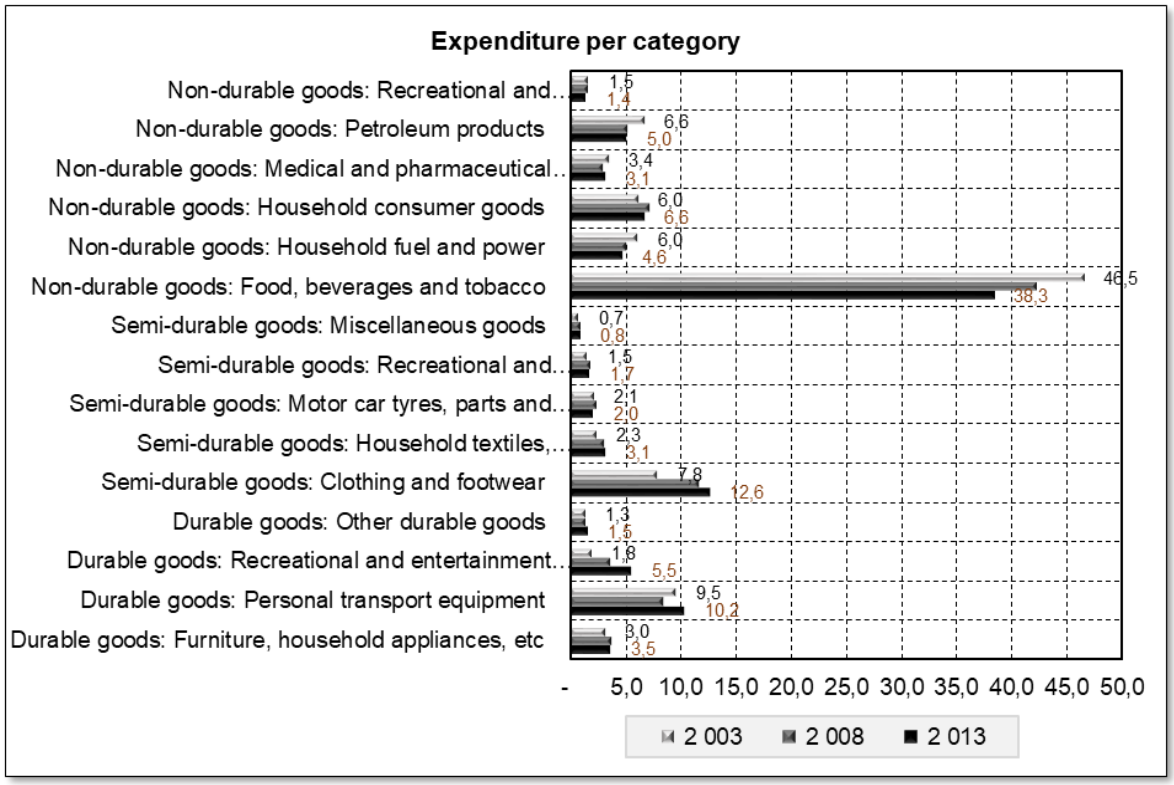
Massmart, on the other hand, who operate their stores on a different cost structure (higher volumes, lower margins) and site selection models to the aforementioned food grocers, but Doug Jones (2014) maintains that their stores are competitive and uniquely positioned in the discount food grocer environment. Massmart will endeavour to increase its exposure in this segment of the market through, *inter alia*, its FoodCo concept in Game stores (these stores are mainly located in regional malls) – albeit that this initiative has been met with resistance from the major food grocer retailers.

Fierce competition among the relatively small number of food grocer retailers for market share should be contextualised by the significance of consumer spend on food and groceries – as indicator of demand. Figure 5.1 illustrates that household expenditure on food, beverages and tobacco (non-durable items) remain the single largest (38.3%) expenditure category for the South African consumer. Consequently, new branded market entrants (including for example FoodCo, Choppies, President Hyper (Synodinos, 2015), as well as the Woolies Supermarket store format) are bound to exert competitive supply-side forces on the retail environment.

5.7. RESULTS: STATED CONSUMER PREFERENCES

Market data was gathered by means of 804 consumer surveys (refer to Section 2, Research Methodology) conducted in the greater Polokwane market, coupled with a further 364 consumer surveys conducted in the Gauteng City Region.

Figure 5.1: National Household expenditure per category (constant 2005 prices)

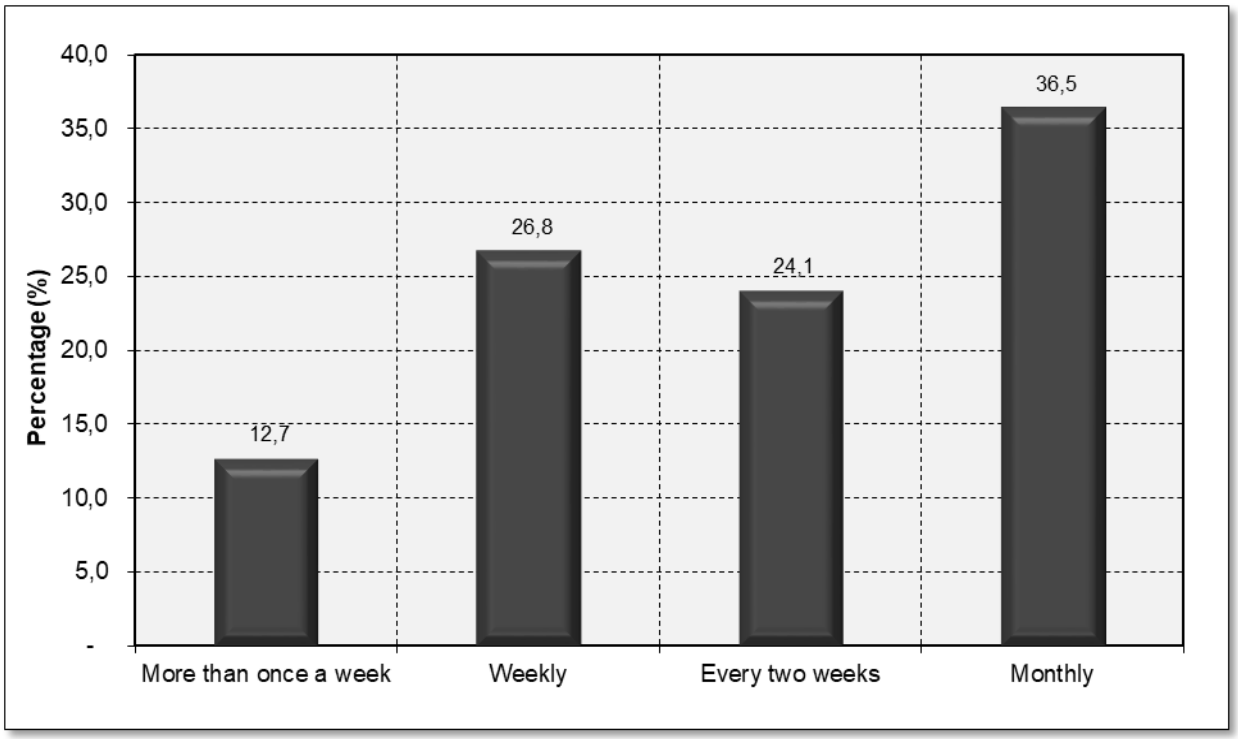


Source: Calculations based on Quantec electronic database, 2015

Note: durable goods include goods such as furniture, household appliances and personal transport equipment. Semi-durable goods include footwear, clothing and household textiles. Non-durable goods include food, beverages, tobacco, household consumer goods, medical and pharmaceutical products.

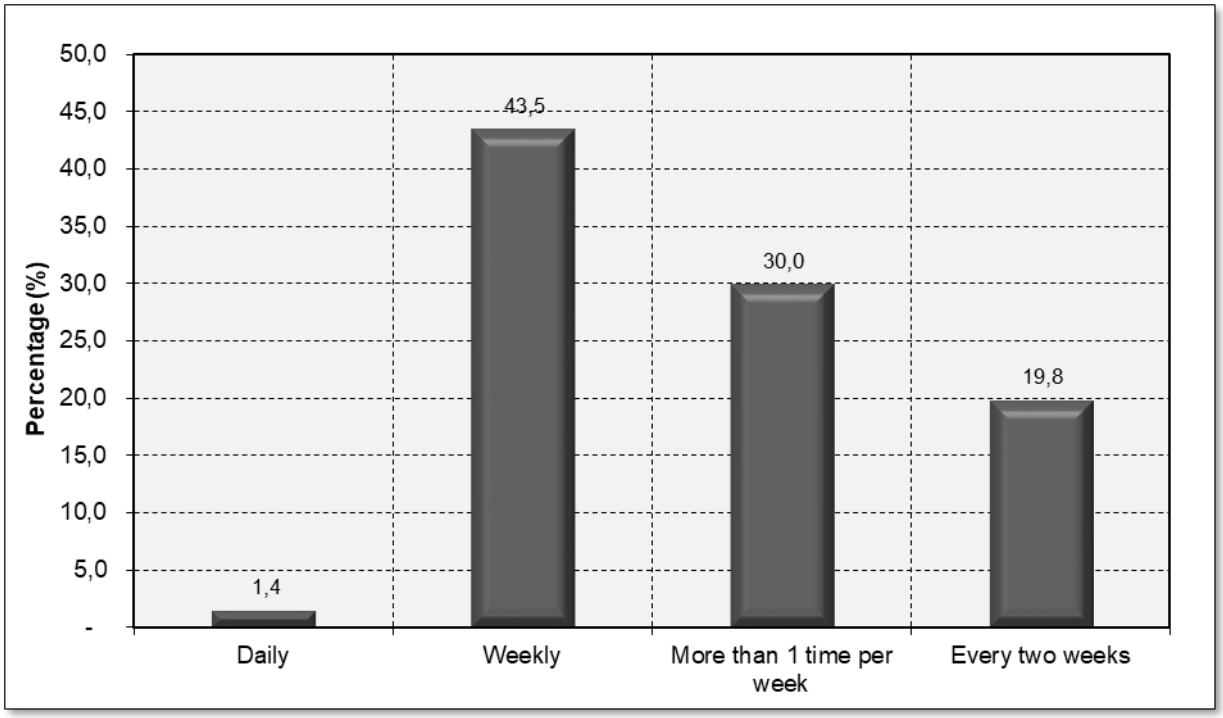
Consumer behaviour and preferences in respect of food and grocery shopping is firstly contextualised in terms of the frequency and location preferences of such excursions. Concerning the frequency of food and grocery shopping, respondents indicated that bulk food and grocery shopping is mostly (36.6%) conducted on a monthly basis (Figure 5.2). A smaller proportion (26.8%) of respondents indicated that they conduct bulk food and grocery shopping on a weekly basis. Top-up food and grocery shopping (Figure 5.3), on the other hand, is conducted at higher frequencies – typically weekly (43.5%) and even more often than weekly (30.0%) – totalling 73.5%.

Figure 5.2: Please indicate the frequency of your bulk food and grocery shopping



Source: DEMACON Consumer Research Database, 2015a

Figure 5.3: Please indicate the frequency of your top-up food and grocery shopping



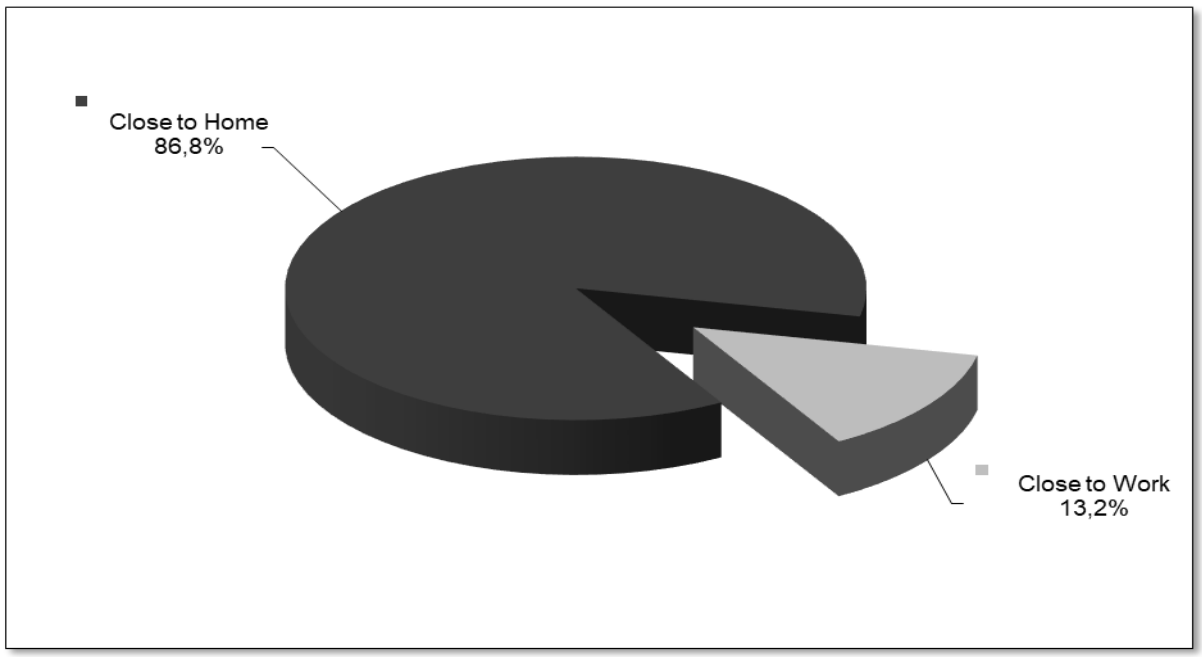
Source: DEMACON Consumer Research Database, 2015a

Findings regarding the frequency of food and grocery shopping trips correlate with research findings published by the SA Council of Shopping Centres (2013, p. 8 – 11), in which it was indicated that 78% of consumers visit convenience neighbourhood centres on a weekly basis. These results affirm the important convenience benefits of smaller shopping centres.

It may be beneficial to, in future research, analyse consumer responses against the backdrop of the local market shopping centre supply-side network density, which may either broaden or limit the shopping options available to the consumer – and, in turn, the frequency of such trips and associated behaviour. Baladakis (2013), Flanagan (2014), Kriek (2014), Nicolau (2015) and Visagie (2014) indicated that this behaviour could also be influenced by generational and life stage consumer characteristics.

In terms of what consumers consider to be the most convenient location for food and grocery shopping (Figure 5.4), the largest proportion of respondents indicated that food and grocery purchases are typically conducted closer to home (86.8%).

Figure 5.4: Indicate the preferred location where you conduct food and grocery shopping

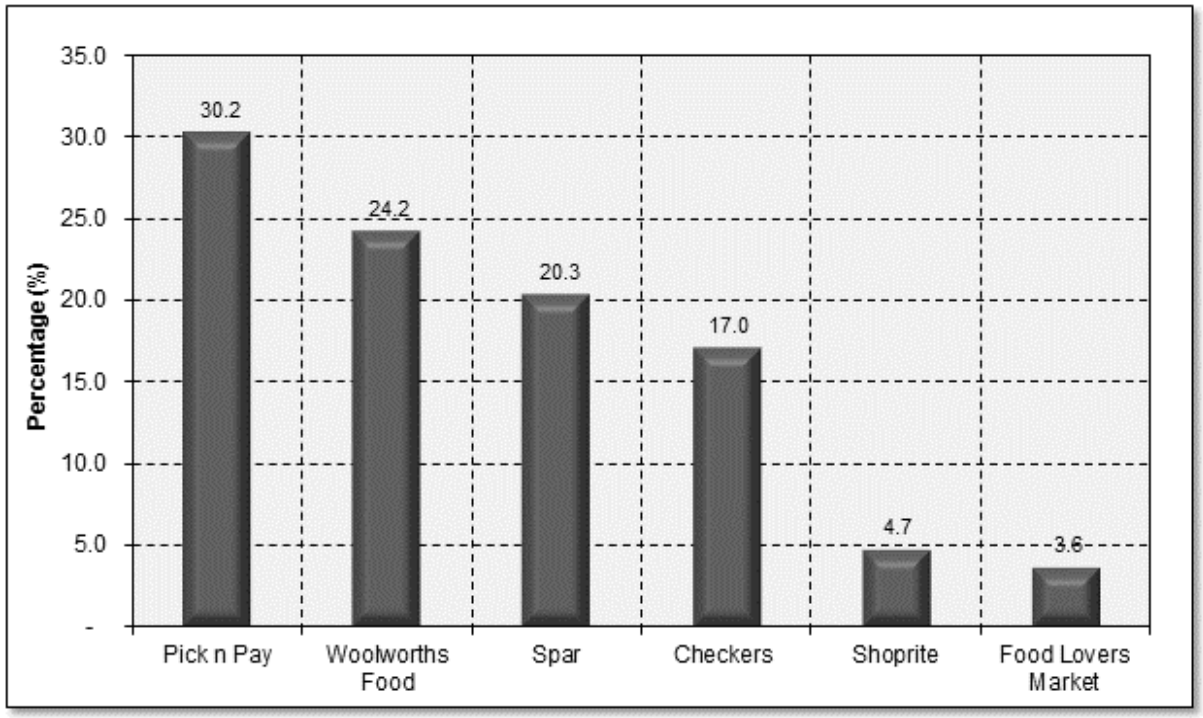


Source: DEMACON Consumer Research Database, 2015a

Given the above findings, certain obvious deductions can, by inference, be made regarding the timing of such purchases, as well as associated practical considerations. Convenience orientated shopping facilities (including convenience stores at filling stations) may benefit from strategic positioning (i.e. a left in and out manoeuvre) and intercept of the work-to-home based afternoon trip.

Strong and decisive food grocer retailer brand preferences prevail in the market (Figure 5.5). It is worthy to note that these stated preferences are likely not to correlate 100% with actual, sales based market shares at a given point in time. Diverging pricing strategies and store attributes (including *inter alia* size, offering, age and location/positioning), among other factors, create continuous fluidity in the market. Also, food grocers tend not to be equally represented across geographic market segments.

Figure 5.5: Stated Food Grocer Retailer Brand Preferences



Source: DEMACON Consumer Research Database, 2015a

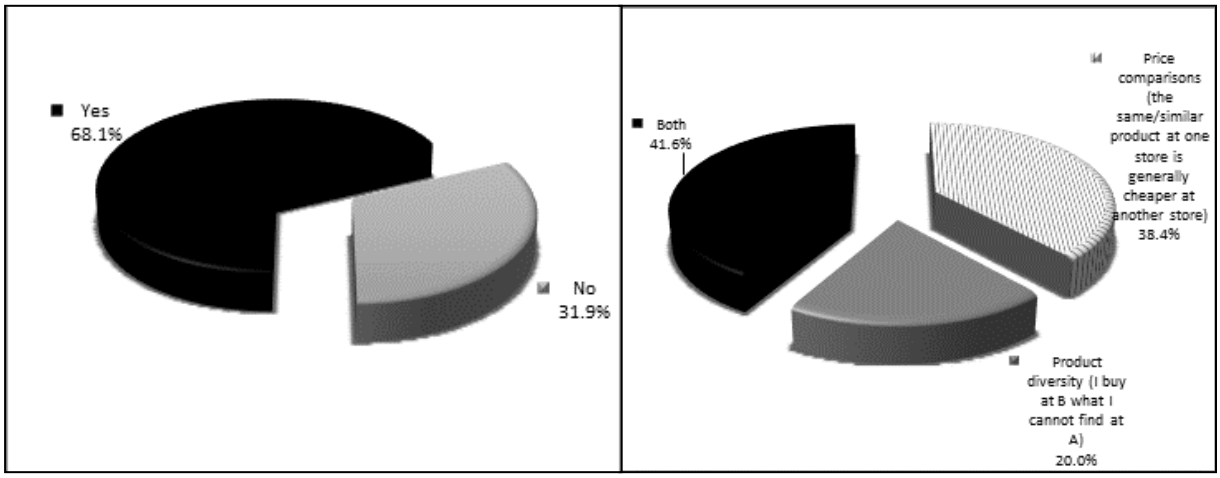
Further to the above, consumers were asked whether they patronise different food grocer brands on a weekly basis. If the response was positive ("Yes"), the consumer was then asked to indicate if – all other factors being equal, including

level of service, credit availability and convenience – this was mainly on account of:

1. product offering (including breadth and depth of brands);
2. pricing; or
3. a combination of the two factors (Figure 5.6).

The largest proportion of survey respondents (68.1%) indicated that they typically support more than one food grocer brand on a weekly basis. A combination of product offering (breath and width of brands) and price considerations (41.6%) was indicated as the most prevalent reason. Price considerations on its own were sighted by 38.4% of respondents. These findings affirm that South Africans (in particular the middle class who bear the brunt of economic fluctuations) are increasingly price sensitive. In as far as the pricing of certain products are concerned, this variable also appears to – under certain circumstances – have the ability to override brand loyalty considerations.

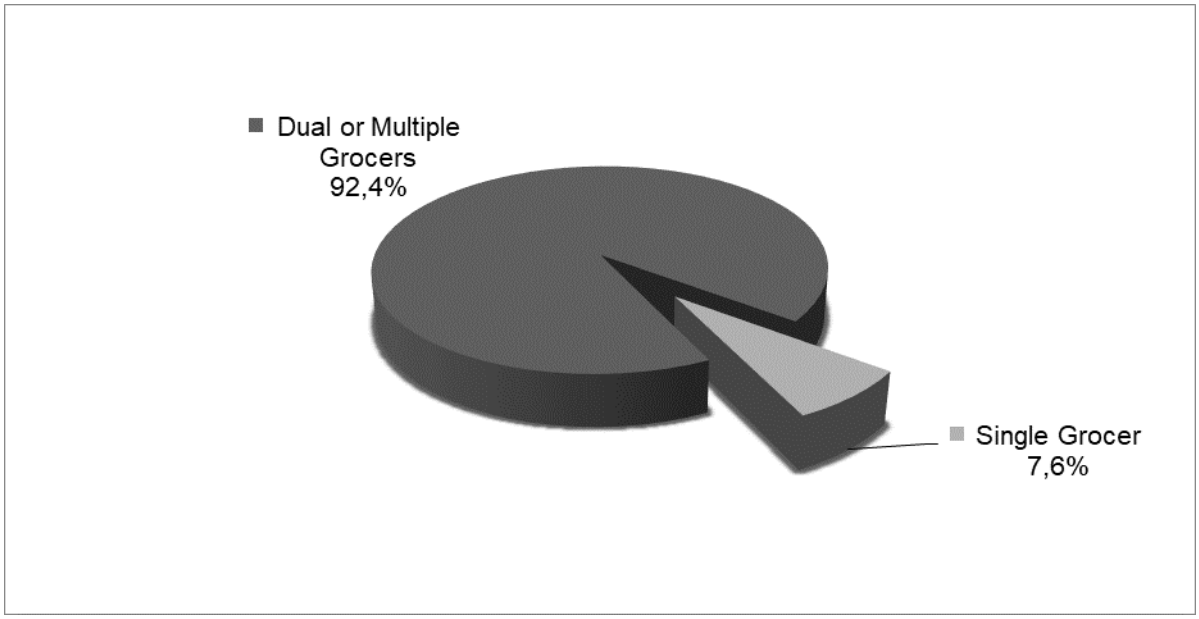
Figure 5.6: Do you patronise different food grocer brands on a weekly basis and, if Yes, is it mainly on account of product offering or pricing



Source: DEMACON Consumer Research Database, 2015a

Consumers were furthermore asked to state their preference, respectively towards shopping centres anchored by one or more food grocer brands (Figure 5.7).

Figure 5.7: Stated Consumer Preferences in respect of single, dual or multiple food grocer anchored shopping centres



Source: DEMACON Consumer Research Database, 2015a

Even on a separate comparison of these responses in the two regional markets, results were closely correlated and varied by only 2.9 percentage points (higher in the Gauteng survey responses). These results suggest that one could reasonably extrapolate findings and make conclusions and deductions in regards to consumer preferences in the SA market.

In the context of the aforementioned research findings, the following can be stated in summary in regards to consumer food and grocery shopping behaviour and preferences:

1. a combination of demand side growth, coupled with supply-side expansion (i.e. retail network densification) broaden the choice spectrum and shape consumer behaviour, preferences and expectations in dynamic ways over time;
2. convenient store location and more specifically the strategic positioning of a store in relation to daily consumer movement patterns and the work-to-home based trip intercept will become an increasingly important consideration for food grocer retailers;

3. the consumer market is, traditionally, decidedly segmented along well-defined lines of food grocer brand preferences. However, the consumer appears to, from time to time, reveal a willingness to override brand loyalty in the face of economic considerations and in response to what is perceived to be attractive opportunities at stores other than the regular favourite – to draw benefit from product and/or price variations between food retailers that may occur from time to time. This behaviour does, however, appear to be periodic and temporary, with the propensity towards permanent brand swopping seemly low;
4. research findings furthermore suggests that the average consumer patronises two food grocer brands on a regular basis – one could deduce that the one brand would typically be for bulk purchases of longer lasting pre-packed goods and the other brand for fresh products (i.e. perishables) and day-to-day necessities.

5.8. CONCLUSIONS

Shopping centre tenant mix is a critical ingredient to the successful functioning of any shopping centre, regardless of convenience or destination orientation. Although a degree of ambivalence was observed in a segment of the development fraternity, interviews with developers – in particular the small to medium sized funds and shopping centre development companies – revealed an increasing inclination towards dual and multiple food grocer anchored centres. The ambivalence can perhaps best be described as a cautious response in view of limited scientific information on the subject matter – cautious also, perhaps, on account of the delicate landlord-tenant relationship. Nevertheless, the market place appears to be at the crossroads in as far as exclusivity clauses are concerned.

Shopping centre owners indicated that a second, third or even fourth food grocer anchor would be beneficial to a centre on account of consumer brand loyalty, the diverse SA consumer landscape and the concomitant additional patronage that

can be drawn into a centre. The considerations had little, if nothing, to do with the conventional notion of comparative shopping.

In the most recent lease negotiations, there appears to be an inclination by the country's leading shopping centre development companies to concede to exclusivity clauses for a limited time period only and only while a centre is below a certain size and functionality. Such an approach can be beneficial to both shopping centre owner and consumer. An important consideration in the context of long leases signed with leading national food grocers (albeit at comparatively low rental rates), is that it serves as vitally important risk mitigation mechanism, which cannot be mimicked by the small retailer.

Stated consumer preferences reveal distinct, perceived benefits to the consumer associated with dual or multiple food grocer anchored centres. The primary determinants of consumer behaviour appear to be brand preferences and associated brand loyalty considerations – which, in itself, is a complex subject. As secondary determinants, aspects which may include but not be limited to product and price variations may, from time to time, sway the consumer to periodically override loyal brand support behaviour. Key differentiators include, *inter alia*, merchandise variables, marketing and communication variables, physical and design orientated store attributes, convenience aspects, service, pricing policies and location attributes. Erwin Rode testified on behalf of Pick n Pay in the arbitration matter of Pietersburg Development Company (Pty) Ltd and Pick n Pay Retailers (Pty) Ltd (2014) that food grocer retailers are "quite homogeneous" and that it is "just too much trouble" for consumers to compare products between food retailers (2014, p. 5). The above research findings, however, read in conjunction with the work of Rosenbloom (1976), Perales (2002) and Eroğlu (2013) affirm (i) the complexity of consumer decision making processes, (ii) that consumers do, ultimately, differentiate between food grocer brands and (iii) that differentiating consumer shopping behaviour can be observed as consumers actively seek to exploit brand and price differences.

These research findings have been observed to be consistent with retail theory and principles as outlined in the work of Huff as well as Luce's Choice Axiom.

Findings also resonate with the work of Rosenbloom (1976), Perales (2002) and Eroğlu (2013).

The complexity that characterises the behaviour and interaction (including store location choices) of individual economic role players is apparent from the research presented in this chapter. Research findings affirm the notion that the power of attraction of a node/centre/shop is not simplistically correlated with size and distance: aspects such as functionality and product offering (including tenant composition, merchandising and pricing) are key considerations that determine consumer choices and behaviour – as well as the associated influence sphere of a node, centre or shop.

In addition, consumer behaviour is susceptible to influences exerted by communication variables, convenience considerations, customer service considerations as well as store pricing policy and tactics.

CHAPTER 6

THE IMPACT OF DUAL AND MULTIPLE FOOD GROCER ANCHORAGE ON THE PERFORMANCE OF SHOPPING CENTRES IN SOUTH AFRICA

6.1. INTRODUCTION

A supermarket group that obtained exclusive rights to be the food grocer anchor in a shopping centre has an obvious advantage over its competitors (Raven and Lunsford 2015; Marsh 2016).

The topic of single *versus* dual/multiple grocer anchorage in South African shopping centres continues to be contested and controversial. Qualitative, perception based research findings presented in Chapter 5 revealed distinct preferences of shopping centre owners and consumers towards dual and multiple food grocer anchored centres. In contrast, food grocer retailers in general appear reluctant to relinquish exclusive trading rights, mainly on account of the fear of potential future loss of market share and sales.

In the absence of known, quantitative industry research on the subject matter, the research presented in Chapter 6 adds a quantitative dimension to the perception based findings of Chapter 5. Chapter 6 presents data regarding the quantitative impact of dual and multiple *versus* single grocer anchorage on shopping centre performance in terms of foot count and trading density data. Research findings influence the quantitative specification of selected variables in the proposed model (Chapter 9).

6.2. RESEARCH METHODOLOGY

The present study investigates possible correlations between trading density and foot count data (as performance indicators) for single *versus* dual and multiple food grocer anchored centres. In brief, the methodology entails:

1. first, a quantitative assessment of shopping centre data in time series format to establish whether there is an increasing incidence of dual and multiple food grocer anchored centres compared with single grocer anchored centres;
2. secondly, the correlation between grocer anchorage and shopping centre performance for specific categories of the shopping centre hierarchy is investigated.

Quantitative analyses were conducted to assess, firstly, whether the frequency of dual and multiple food grocer anchored is increasing and secondly, to assess whether there is a discernible difference in performance data between, respectively, single and dual/multiple food grocer anchored centres.

In a comparative assessment, data for shopping centres operational prior to 2002 was compared with data for shopping centres developed from 2003 to 2013 – affording a decade long analytical time frame, which is sufficient to identify noteworthy sustained long term, structural market changes. In total, this part of the analysis included 1 460 centres.

The next level of the investigation is focused on specific categories of the shopping centre hierarchy. The objective was to assess whether correlations existed between foot count and trading density data as performance indicators, respectively for single and dual/multiple food grocer anchored centres. The focus is on centres measuring 25 000m^2 to 50 000m^2. Even though dual food grocer anchorage may be observed in convenience neighbourhood centres (5 000m^2 to 12 000m^2) and small community centres (12 000m^2 to 25 000m^2), reliable performance data is not readily available – in particular foot count data, as too few centre owners in this segment of the market install foot counters. The significance

of the trend on neighbourhood shopping centre level is, however, not disputed. In turn, trading density data suggests that super-regional malls are losing market in respect of food and grocery purchases. Super-regionals therefore did not form part of this part of the investigation. However, a subsequent section investigates the correlation between foot count and trading density data for single, dual and multiple food grocer anchored centres measuring from 12 000m^2 to 160 000m^2.

Various deductions can be made and inferences can be drawn from the respective analyses – all of which reveal a degree of congruence.

6.3. DEFINITIONS AND CONCEPTS

The nature and size of the food grocer should relate to the size and functionality of the shopping centre. Functional shopping centre differentiation can be observed in trading density data per merchandise category and by centre type – a quantitative indicator of revealed consumer behaviour. Table 6.1 summarises trading density data for the main shopping centre types, across the range of merchandise categories.

Table 6.1: National Trading Densities (R/m^2/month) per merchandise category, 2013/2014

	Apparel R/m²/month	Department Stores R/m²/month	Food R/m²/month	Food Service R/m²/month	Home Décor R/m²/month
Super Regional	**4 552.70**	**3 609.90**	2 641.80	**3 667.90**	**3 153.30**
Regional	3 186.60	3 105.50	2 752.10	3 249.90	2 131.00
Small Regional	2 539.80	2 637.80	2 986.70	2 657.20	1 832.90
Community	2 285.80	3 217.80	**4 518.90**	3 009.20	1 606.80
Neighbour-hood	1 658.60	2 314.70	**3 901.80**	2 760.60	1 219.70
Category Includes:	*Menswear, womenswear,*	*Department stores, mini*	*Grocery/ supermarket,*	*Restaurants, coffee shops,*	*Home furnishings,*

	Apparel R/m²/month	Department Stores R/m²/month	Food R/m²/month	Food Service R/m²/month	Home Décor R/m²/month
	children's wear, unisex wear, accessories	*department stores, junior department stores*	*food speciality, sweets, bottle stores*	*takeaway, pizzerias, ice cream parlours, pubs*	*art, antiques, décor*

Source: MSCI, Q4 2014. Note: Monetary units in South African Rands

Trading density data affirms the prominence of (and, by implication, consumer preference for) neighbourhood and community type centres in respect food and grocery shopping: trading densities of R3 901.80/m^2/month to R4 518.90/m^2/month are notably higher for the smaller neighbourhood and community centre types, compared with appreciably lower trading density values of R2 641.80/m^2/month to R2 752.10/m^2/month for regional and super-regional malls – a difference that accounts for 32.29% to 39.09% higher food and grocery trading densities in community and neighbourhood centres. Although smaller grocery stores may command marginally higher product unit prices, this price differential is, in itself, not sufficient to account for the difference in trading density values. Conversely, regional and super-regional shopping centres reflect higher trading densities in durables and semi-durables.

Trading density data affirms the functional differentiation between convenience and destination orientated shopping centres. The data furthermore illustrates revealed consumer preferences at various shopping centre types. The data suggests that, in respect of food and grocery shopping, the convenience offered by the smaller and conveniently located neighbourhood and community shopping centres remains a key consideration to the consumer.

Muller (2015) affirmed the diminishing convenience factor associated with food and grocery shopping in regional and super-regional malls, but indicated that office development around the mall has, in their experience, countered this trend.

Market research findings with reference to dual and multiple grocer anchorage in subsequent analyses refer specifically to the full-line grocer types, as defined by Du Toit and Cloete (2016): namely a supermarket upwards of 1 500m^2 – 2 000m^2 which, by virtue of size, provides a comprehensive and competitive product offering that spans all or most of the following product categories (confirmed by Gomes, 2014) groceries, personal care, fresh produce and perishables, bakery, butchery, wines, frozen foods, sweets, coffee counter, cheese section, seafood section and cigarette counter.

6.4. QUANTITATIVE ANALYSIS

6.4.1 Comparative Assessment of Single *versus* Dual/Multiple Grocer Anchored Shopping Centres, 2002 – 2013

Quantitative analyses were conducted to assess, firstly, whether changes have occurred in the incidence of dual and multiple food grocer anchored centres and secondly, to assess whether there is a discernible difference in performance data between, respectively, single and dual/multiple food grocer anchored centres.

A comparative static assessment was conducted of shopping centres operational in 2002 and those completed in the decade hence – up to and including 2013 – respectively for single and dual/multiple food grocer anchored centres (Table 6.2). The full spectrum of shopping centres across the hierarchy formed part of the analysis. A total ±1 460 centres were analysed. The comparative-static data analysis revealed the following quantifiable trends:

1. In 2002, 57 (5.9%) out of 972 shopping centres were anchored by dual/multiple food grocer stores;
2. over the next decade, an additional 56 centres with dual/multiple food grocer anchors were built – this represents an increase of 98.2% over the 10 year period (a compound rate of 7.1% *per annum*);

3. Similarly, single grocer anchored centres increased from 686 (70.6%) in 2002, by 323 centres to 1 009 over the same period – this represents an increase of 47.1% (the proportional contribution decreased from 70.6% to 66.2%);
4. Centres with no food grocer anchor (for instance certain specialist centre types) increased by a marginally higher aggregate rate of 47.6% over the same period;
5. Evidently, by far the greatest real and proportional increases can be observed in respect of the increase in dual/multiple food grocer anchored centres.

Table 6.2: National Comparative Analysis of Single and Dual/Multiple Grocer Anchored Shopping Centres, 2002 & 2013

Number	Number of Centres (2002)	Distri-bution (%)	Number of New Centres (2013)	Distri-bution (%)	Total Number of Centres	Increase (2002 to 2012/'13)
Single Grocer	686	70.6	323	66.2	1009	47.1%
Dual / Multiple Grocer	57	5.9	56	11.5	113	98.2%
No grocer	229	23.6	109	22.3	338	47.6%
Total	**972**	**100.0**	**488**	**100.0**	**1 460**	

Source: Calculations based on South African Council of Shopping Centres (SACSC) Electronic Database, 2014

It is evident that there has been a noticeable increase in the development of dual/multiple grocer anchored centres over the time period analysed. This quantifiable trend reveals the interrelatedness between consumer demand and the free-market supply-side response.

The comparative-static analysis was progressed to a more focused and in-depth quantitative assessment of selected performance indicators (foot count and trading

density data) available for, respectively single and dual/multiple food grocer anchored centres.

6.4.2 Foot Count and Trading Density Data Analyses

Delimiting the Investigation

Having established that there has been a noticeable long term increase in the incidence of dual and multiple food grocer anchored centres, the assessment was then focused on specific segments of the shopping centre hierarchy.

The focus on centres larger than 25 000m^2 is mainly because of data availability. Furthermore, certain shopping centre categories were deliberately omitted. Big box retailers, such as for instance Makro, are mostly located in standalone boxes and food grocer anchorage is neither clearly distinguishable, nor measurable. Also, the product range associated with a typical full-line grocer is not on offer at bulk retail warehouse type outlets. These centres were therefore excluded from the analysis. Reliable foot count data is also not generally available for smaller convenience centres.

For purposes of the assessment, the quantitative analysis was focused on centres measuring approximately 25 000m^2 and 50 000m^2. On a national scale, the aspiration to dual/multiple food grocer anchorage appears to be most active in respect of centres within this size bracket, i.e. the large community and small regional centre. Refurbishment plans aimed at modernising and expanding centres typically involve centres of this size category. Legal proceedings in regard to exclusivity clauses also appear to have a higher frequency in these size segments of the market. Comparative and reliable shopping centre performance data is available for this market segment. The analysis of this range of centre sizes allows for a practical spread of centre functionality, including the convenience elements associated with the larger community type centres and the gradually diminishing rate of perceived convenience to the consumer in small regional malls – consistent with food grocer trading density data analysed in the previous section.

Regardless of the fact that dual food grocer anchorage can be observed in convenience neighbourhood centres and small community centres, reliable performance data is not readily available – in particular foot count data, as too few centre owners in this segment of the market install foot counters. The significance of the trend on neighbourhood shopping centre level is not disputed. However, its prevalence is masked by the fact that developers can, for practical reasons (including food grocer store size and comparatively low rentals in relation total centre size and rental through-rates required), not always incorporate a second full-line food grocer anchor *in the same centre*, especially in smaller than ±10 000m^2 – which would allow for one full-line grocer of ±3 000m^2 and, at best, only a Woolworths Food store no larger than 500m^2 to 750m^2 (which would therefore not classify as a full-line grocer). These grocery anchors would account for ±40% of total centre lettable area. The remaining ±60% would be occupied by smaller line shops (paying higher rental rates). The earlier convenience centres developed in the late 1990s and early 2000's followed this approach.

Incorporating two full-line grocers in a neighbourhood convenience centre can be challenging. Practical considerations and financial constraints are sometimes overcome by developing a second neighbourhood convenience centre in close proximity to the first, quite often on contiguous sites, but with a differentiated food grocer offering. Interviews with *inter alia* Johan Jacobs (Jacobs Trust), Jason McCormick (McCormick Properties), Johan Visagie (Twin City) and Jannie Moolman (Moolman Group) revealed that this is a carefully planned approach. Examples include *inter alia* Glen Acres (Spar) and Woodbridge (Woolworths Food) in Kempton Park, Glen Village North (Pick n Pay) and Glen Village South (Woolworths Food) in Pretoria, Bochum Plaza (Score) and Blouberg Mall (Shoprite) in Bochum (Limpopo Province) and Cycad Centre (Pick n Pay) and Platinum Park (Spar) in Polokwane. Respondents indicated that aspects such as consumer profiles, demand thresholds, site size and concomitant centre size, land and construction costs, as well as minimum rental through-rates required, influence the consideration.

It is beyond the scope of this chapter to assess business sales impacts, with specific reference to the impact of a new food grocer – in a shopping centre with

an established food grocer – on the sales of the latter. This does, nevertheless, remain a relevant consideration and could be investigated in future research papers. Interviews with aforesaid company representatives indicated that such business sales impacts are a function of *inter alia*:

1. the brand of the new grocer;
2. consumer profile, origin and spatial distribution;
3. store location, age, size and offering (including *inter alia* product range breadth and depth, pricing and service); and
4. centre age, layout and design.

Business sales impacts can furthermore be distinguished in terms of the magnitude and duration of such impacts. Jason McCormick (2014) and Visagie (2014) indicated that, based on rent roll and turnover clause sales data, the average impact associated with the introduction of a 2nd, 3rd or even 4th food grocer on an existing grocer within the same centre typically varies between 0% and 10%. The impact has, in instances where management was pro-active, been mitigated in full (i.e. around 0%). In instances where decisive mitigation measures were not implemented or where centres were dated and not timeously repositioned (i.e. refurbished and re-tenanted), impacts where greater (up to 17.6%) and recovery periods were extended (18 to 24 months, compared with average impacts that typically do not exceed 12 to 18 months – quite often even shorter). In certain instances, the existing food grocer retailer in a centre introduced periodic specials to compete against the new food grocer in the centre. Subsequent analyses revealed no discernible and sustained negative impact in the sales figures of the original food store – suggesting that impacts can be managed and mitigated.

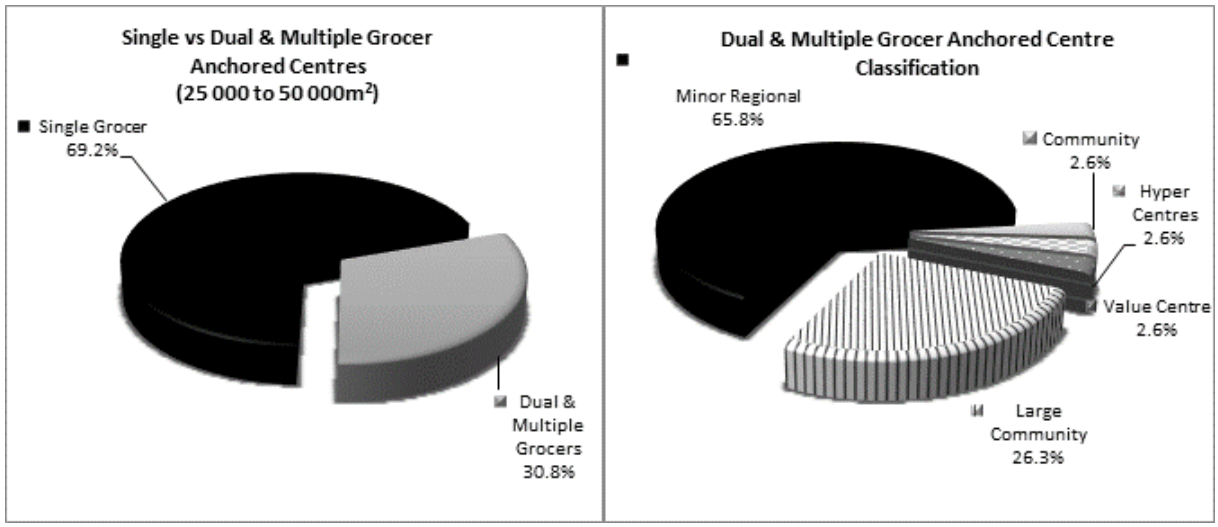
Respondents furthermore indicated that business sales impacts on an existing food grocer tend to be more pronounced when the centre and/or retailer are older than 10 years and no efforts to refurbish (modernise) the centre and rival store have been made. Mitigation measures may include a centre refurbishment, store refurbishment (and a possible expansion), as well as adjusted pricing strategy – which may include periodic sales offered by the rival food grocer. It was the view

of aforementioned interviewees that the ultimate perceived benefits to the centre outweighed the potential short term impacts on an individual retailer.

Foot Count and Trading Density Data Analysis for Centres measuring 25 000m^2 to 50 000m^2

Figure 6.1 illustrates the prevalence of single *versus* dual/multiple grocer anchored centres in the 25 000 – 50 000m^2 size range. The graph furthermore illustrates the functional differentiation of centres within this size range, as per SACSC database (2014).

Figure 6.1: Dual and Multiple Food Grocer Distribution by Centre Type for centres measuring 25 000m^2 to 50 000m^2



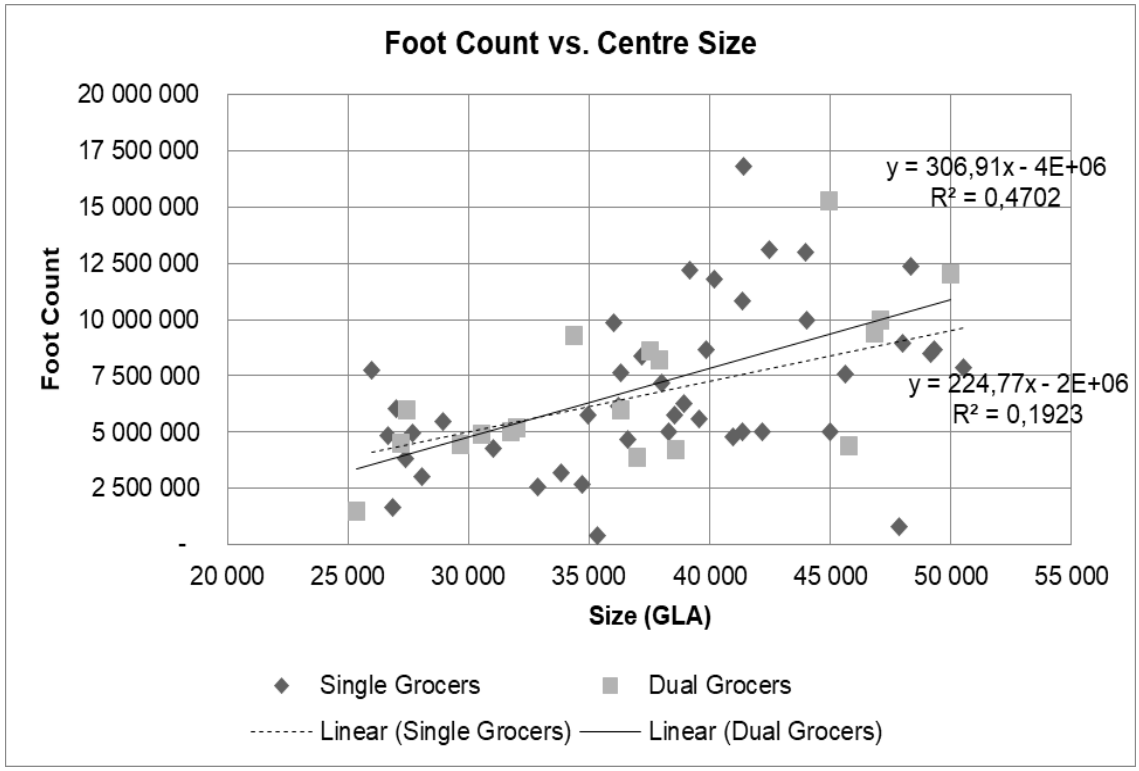
Source: Calculations based on SACSC data, 2014

In terms of the data set analysed, 30.8% of centres between 25 000m^2 and 50 000m^2 are anchored by dual/multiple food grocers. In this size range, dual/multiple food grocer anchorage is most prevalent among centres classified as minor regionals (65.8%). Dual/multiple food grocer anchorage is deployed to *inter alia* strengthen a centre's competitive edge against, respectively, the food and grocer offering at smaller, convenience orientated neighbourhood centres on the one hand and, on the other, the destination orientated comparative offering of larger regional and super-regional malls.

6.4.3 Analysis of foot counts in relation to food grocer anchorage (centres between 25 000m^2 and 50 000m^2)

The aforesaid dataset was subsequently analysed in terms of the two most readily available, widely used and comparable performance indicators, namely foot counts and trading densities. Results are plotted respectively on Figures 6.2 and 6.3. The relationship between foot count and centre size, respectively for single and dual/multiple grocer anchored centres, is graphically illustrated in Figure 6.2. Figure 6.3, in turn, illustrates the relationship between foot counts and the total number of shops in the centre.

Figure 6.2: Foot Counts and Centre Size*



Source: *Calculations based on SACSC data, 2014*

** Note:* *reflects centres with available foot count data*

These type of regression lines do not represent a so-called viability line – as suggested by Rode – that centres above the line would be viable and those below

the line, not (Pietersburg Property Development and Pick n Pay, 2014). The purpose of the analysis is to test the relationship and correlation between variables, to establish whether a trend is discernible and then to determine whether the data is positively or negatively correlated.

The following observations can be made from Figure 6.2:

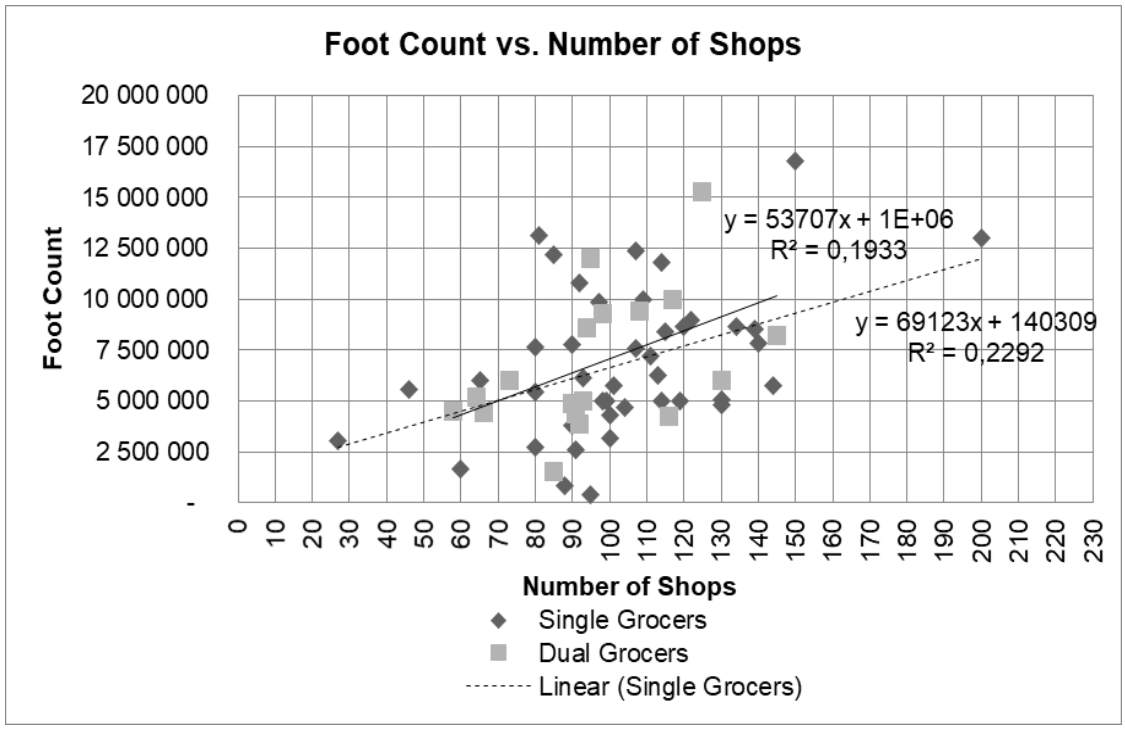
1. A positive relationship exists between centre size and foot counts (regardless of single, dual or multiple food grocer anchorage) – these two variables are therefore positively correlated;
2. R^2 values reflect on the best fit regression line, as well as the spread of data points around this line. In this respect, the best fit correlation was found to be linear. The R^2 values are low due to the natural aspiration of data around the regression line. As such, it is a product of the spread of data and does not detract from the positive slope of the best fit regression line – and neither from the positive nature of the correlation between foot count and centre size. Given the unique nature of *inter alia* shopping centre assets, locational idiosyncrasies and associated market dynamics, a perfect spread (i.e. $R^2 = 1$) is, in any event, improbable. In short, the correlation is positive, but neither perfect nor absolute.

In respect of Figure 6.3, the following can be noted:

1. A positive relationship can similarly be observed between the total number of shops in a shopping centre and foot counts (regardless of single, dual or multiple food grocer anchorage) – these two variables are therefore also positively correlated;
2. Patronage is therefore positively correlated with both centre size and total number of shops in the centre;
3. Both regression lines – respectively for single and dual/multiple grocer anchored centres – reveal a positively sloping trajectory, which is consistent with the principles outlined in the work of Huff and Luce's Choice Axiom (Chapter 5);

4. The regression line for dual/multiple grocer anchored centres does, however, reveal a steeper slope, compared to that of single grocer anchored centres (considering that the y-axis is measured in millions, the difference in slope is appreciable);
5. These findings indicate that dual/multiple food grocer anchored centres exert a greater power of attraction and consequently yield higher foot counts, compared with their single food grocer anchored counterparts.

Figure 6.3: Foot Count and Number of Shops*



Source: *Calculations based on SACSC data, 2014*

** Note:* *reflects centres with available foot count data*

Further statistical analysis of the above data, segmented into arbitrary 5 000m^2 intervals, reveal an interesting phenomenon (Table 6.3). It appears to be particularly centres between 30 000m^2 and 35 000m^2 and again those between 45 000m^2 and 50 000m^2 that derive proportionally the greatest benefit form dual/multiple food grocer anchorage. This may not be pure coincidence. Insight offered by development companies may ad meaning to these apparent arbitrary figures.

Table 6.3: Foot Count Comparisons – Net gain/loss

Centre Size (m^2)	Single Grocer Anchored (Avg foot count/annum)	Dual Grocer Anchored (Avg foot count/annum)	Difference (feet per annum)	% Difference (per annum)
25 000 to 30 000	4 689 754	4 115 890	-573 864	-12.2
30 000 to 35 000	**3 157 020**	**6 087 170**	**2 930 150**	**92.8**
35 000 to 40 000	7 283 881	6 178 212	-1 105 669	-15.2
40 000 to 45 000	10 032 140	9 834 595	-197 546	-2.0
45 000 to 50 000	**7 473 166**	**10 155 202**	**2 682 035**	**35.9**
Net gain/loss			**3 735 107**	

Source: Calculations based on SACSC data, 2014

Anastasi (2013), Flanagan (2014), Kriek (2014) and McCormick (2014) respectively indicated that the first phase aspiration for a destination mall (in instances where site and associated constraints prevail (including aspects such as immediately available site size, town planning regulations and market size constraints) is typically a minimum 30 000m^2 to 35 000m^2, with a second phase expansion that would take the centre up to regional scale and significance, i.e. around 45 000m^2 to 60 000m^2.

Dual/multiple food grocer anchored shopping centres attracted, on aggregate, 3.7 million more customers per annum, compared with their single food grocer anchored counterparts.

6.4.4 Analysis of trading density data in relation to foot counts and grocer anchorage

Subsequent data sets illustrate the correlation between foot counts and centre trading densities, respectively for single and dual/multiple food grocery anchored centres.

The availability of trading density data is more constrained than foot count data. The data utilised in this assessment differs from the assessments under section 6.4.2 and 6.4.3 in that trading densities were not readily available for all centres with foot count data. Subsequent analyses are based on a dataset of 31 malls, of which ten (i.e. 32.26%) are anchored by dual/multiple food grocer anchors and 21 (i.e. 67.74%) are anchored by single food grocer anchors. The sample includes centres than range from 12 000m^2 to 160 000m^2. This sample profile is consistent with the national frequency distribution of dual/multiple food grocer anchored centres *versus* single food grocer anchored centres and is regarded as representative.

Aforementioned list of 31 centres was first analysed to ensure data consistency and integrity. Certain centres were then isolated from the list analysed. The author motivates these omissions on account of the following:

1. super-regional malls – the one super-regional mall in the dataset was omitted on account of the diminishing significance of food grocer anchorage in super regional malls (paragraph 6.3);
2. specialised tourist centres – the tourist orientated centre in the sample has a distinct tourism patronage bias and, given the rare occurrence of such centres coupled with the outlier foot counts, this centre was omitted from the sample;
3. commuter based centres – a dominant commuter based centre was omitted, on account of the fact that a subterranean intermodal facility reportedly funnels an estimated 700 000 commuters through the centre on a daily basis, which significantly distorts foot counts in relation to sales;
4. student centres – a prominent student centre was omitted on account of the fact that the centre generally reflects disproportionally high daily foot counts in relation to lower sales and also because the centre operates on a counter-cyclical basis, with unusually low trade during the extended student holiday months (which affects up to 4-5 months of a year).

With these four centres omitted, the list of centres analysed totalled 27. The foot count and trading density datasets for these centres were subsequently analysed utilising two techniques, namely:

1. statistical correlations; and
2. a comparison of weighted averages.

Table 6.4 summarises the analysis of foot counts and trading densities for all centres across the size spectrum in the sample. Table 6.4 indicates that, in terms of the sample, dual and multiple food grocer anchored centres recorded 22.9% higher foot counts, but trading densities were, on aggregate, 5% lower. The effects are influenced by inclusion of centres in the 50 000m^2 to 100 000m^2 size bracket, i.e. full-fledged regional malls that are known (Table 6.1) to have comparatively low food and grocer trading densities on account of a diminishing perceived convenience value to the consumer in regards to, specifically food and grocery shopping. On account of this reality, a further refinement of the dataset was made and only centres between 25 000m^2 and 50 000m^2 were analysed, i.e. large community and small regional malls.

Table 6.4: Weighted Average Foot Counts and Trading Density (Full Sample)

Average Weighted Figures	Single	Dual/Multiple	Net Gain/ Loss	% Gain/ Loss
Foot Counts	11 542 408.17	14 189 889.20	2 647 481.03	22.9
Trading Densities (R/m²/annum)	27 844.80	26 440.23	-1 404.58	-5.0

Source: Calculations based on DEMACON Shopping Centre Database, 2014

Tables 6.4 and 6.5 summarise findings of the analyses for centres within the 25 000m^2 to 50 000m^2 size range – respectively based on the weighted average technique (which accounts for the actual proportional representation of the centre size frequency distribution, i.e. it accounts for the unique structure of the market) and statistical correlations. In applying the actual market structure (i.e.

proportions), the weighted calculation correctly accounts for the varying contribution of differentiated centre sizes across this size spectrum.

Table 6.5: Weighted Average Foot Counts and Trading Density (Centres of 25 000m^2 to 50 000m^2)

Average Weighted Figures	Single	Dual	Net Gain/ Loss	% Gain/ Loss
Foot Counts	6 454 362.78	7 705 081.57	1 250 718.79	19.4
Trading Densities (R/m^2/annum)	28 003.62	31 506.67	3 503.05	12.5

Source: Calculations based on DEMACON Shopping Centre Database, 2014

Based on the weighted average technique, centres within the 25 000m^2 to 50 000m^2 size bracket reveal notably higher foot count and trading density results for dual/multiple food grocer anchored centres: centres in this size range recorded an average of 1.25 million more feet per annum and trading densities of R3 503.05/m^2/*annum* higher, compared with data for single food grocer anchored centres. In terms of the data, foot counts are 19.4% higher for dual/multiple food grocer anchored centres and trading densities are 12.5% higher, compared with their single food grocer anchored counterparts.

In the instance that different segments of the market contribute disproportionally to market composition, a calculation that reflects actual market structure (i.e. a proportionally weighted calculation) is superior to one that assumes a perfectly equal distribution across the size spectrum (i.e. a so-called straight mathematical calculation and average). Rosenbloom (1976, p. 64 – 65) in the 1970's already made use of weighting trade area data – this is one of the first retail-specific research studies that refers to the weighting of data. Weighted calculations are, however, an everyday practice in accounting (Gitman, 1998, pp. 443 – 445) and business calculations (Zidel, 2001, pp. 112 – 114). Gitman (*ibid*, p. 445) distinguishes three types of weights, namely:

1. book value or market value weights, that uses accounting values and may be future estimates;

2. historic weights, that use actual market structure proportions; and
3. target weights, that use a desired or aspirational weight.

The weighting of categories in e.g. indices to reflect market structure is widely accepted in practice. See for instance Laspeyres Index, Paasche Index and Fisher Index in Mathematics Support Centre (retrieved 2017), DBSA (2001) as well as Steyn, Smit and Du Toit (1989).

Mohr (2016, p. 13) sights an example relevant to the present discussion: "Weighted averages are calculated when different observations are not equally important, with the result that their values should not simply be added and their sum divided by the number of observations. Suppose, for example, a consumer purchases two goods only, namely food, which costs R10 per unit, and clothing, which costs R100 per unit. Suppose further that 90% of the consumer's income is spent on food and 10% on clothing. To determine the average price paid by the consumer per unit of goods purchased it would be wrong to simply add the unit price of food to the unit price of clothing and divide the answer by two. The correct procedure is to weigh each price by the portion of the consumer's income spent on the goods in question. The weighted average price is thus obtained as R[(10 x 0.90) + (100 x 0.10)] = R(9 + 10) = R19. Mohr concludes the weighting is also important when, for instance, price indices are compiled".

In terms of statistical correlations (Table 6.6), the actual (i.e. true proportional) structure of the market is not accounted for.

Table 6.6: Foot Count and Trading Density Correlations for single against dual/multiple food grocer anchored centres (25 000m^2 to 50 000m^2)

Variable	Correlation (Single to Dual/multiple)
Foot Counts	-0.99882
Trading Densities (R/m²/annum)	-0.84352

Source: Calculations based on DEMACON Shopping Centre Database, 2014

Statistical correlations, nonetheless, demonstrate 15.65% higher trading densities for dual/multiple food grocer anchored centres, compared with their single food grocer anchored counterparts. The difference in foot count data, in terms of this less sophisticated technique, appears to be less pronounced.

Considering the differentiated and unique structure of the market, the weighted technique – which accounts for actual market structure – accurately reflects the market inclination based benefits (real and perceived) offered by dual/multiple food grocer anchored centres over their single food grocer anchored counterparts.

The benefits of dual/multiple food grocer anchorage to a shopping centre are within a range of 12.5% to 15.65% higher trading densities and up to 19.4% higher foot counts, all other factors being equal (and externalities assumed to remain constant).

6.5. CONCLUSIONS

Quantitative research was conducted to establish whether there are identifiable differences in the performance of single food grocer anchored centres *versus* their dual food grocer anchored counterparts.

A number of techniques, including regression modelling, weighted average calculations and correlations revealed consistent results. These results indicate that dual and multiple food grocer anchored centres outperform their single food grocer peers with, on average, 12.5% to 15.65% higher trading densities and up to 19.4% higher foot counts.

The research was based upon data for shopping centres in South Africa. As a limited number of national food grocers exist in South Africa, conclusions may be different in countries where a larger number of food anchors exist. In addition, the research was limited to shopping centres with Gross Lettable Areas between 25 000 m^2 and 50 000 m^2; conclusions may differ for smaller or larger centres.

It is suggested that similar investigations be undertaken in other countries to determine whether the requirement of national food anchors that they be the only grocer in a centre is to the benefit of the consumer.

In Chapter 7, the research is progressed into the development of improved trade area analysis techniques.

CHAPTER 7

TECHNIQUES FOR THE ANALYSIS OF TRADE AREAS: RETAIL DIVERSIFICATION

7.1. INTRODUCTION

Christallerian principles of centrality, including the market principle, transport principle and administrative principle, influence traditional trade area delineation and market analysis techniques. The present research demonstrates that Christaller based principles no longer hold true and are therefore no longer appropriate for descriptive and predictive purposes. The arguments advanced in Chapters 7 and 8 progress the theory and research critique on central places, market areas and the interaction between economic role players into proposed techniques designed to supplement trade area analysis.

In the analysis of retail markets, the selection of a suitable site is preceded by country, region and/or area selection. The market analyst is typically briefed when area and/or site selection has occurred – the initial area appraisal that preceded this process tends to be fairly unsophisticated and tends to be dictated by an investors knowledge of a particular area. In the traditional market appraisal, the focus is primarily on the trade area demographic profile, population growth, residential expansion, competing schemes and a subjective appraisal of selected qualitative trade area attributes. It is only once the new scheme is operational that underlying trade area dynamics (other than demographics) which impact the scheme are revealed through the performance of the asset. Traditional trade area analysis techniques are not designed to model or predict these impacts. In Chapter 7, a technique is proposed to supplement the traditional market demand assessment.

The technique proposed in Chapter 7 is the Retail Diversification Index (RDI), a quantitative technique that is suitable for macro and meso level area analyses. The RDI is proposed to measure the degree of diversification or, conversely, concentration, in a particular market area. The basis for the evaluation is the relative size of retail classes, as reflected by the country or region's unique retail classification system and data.

7.2. LITERATURE REVIEW

The literature review contained in this chapter investigates two concepts, namely trade areas definitions and the concept of diversity.

Defining Trade Areas and related Concepts

The concept of a trade area is a central construct and point of departure in site-specific, trade area based retail market analyses. An accurate profile of a centre's trade area is critical for investment decision making concerning existing and planned shopping centres. Research on trade areas has its roots in the earliest works on the theory of central places, arguably commencing with the research of Von Thünen in 1826. An entrenched, though highly simplified assumption at the time was that consumers revealed a tendency to simply gravitate towards the nearest central place or service centre – hence the nearest centre postulate. Kiel (1998, p. 1144 – 1145) commented on the nearest centre postulate assumption as highly oversimplified due to complex consumer behaviour in an ever increasingly competitive landscape characterised by a considerable degree of trade area overlap.

Applebaum & Cohen (1961, p. 75) characterised a trade area as a "nodal region (i.e. it contains a focus – the store – which is the node of organisation and the surrounding area is tied to the focus by lines of transportation). Its features include:

1. cores
2. morphology – shape, size and arteries of movement
3. competing stores
4. internal components
5. external boundaries.

Shopping centre trade areas is a much debated concept, in particular the issue as to whether it should be defined as a percentage of a centre's total sales generated from within a defined geographic area, or whether a trade area should be defined in terms of the percentage of consumers from within a certain geographic area who would patronise a particular centre (compare Kiel, 1998, p. 1143 – 1145, Davies, 1977, p. 148 and Applebaum, 1966, p. 124). Cloete (2003 & 2015, p. 112) contends that a primary trade area can be defined as the geographic area, typically within a 10 minute isochrone, from which 60% of a centre's clientele are drawn.

Applebaum (1966, p. 124) defines a centre's primary trade area as the core area closest to the centre which generates 60 – 70% of a centre's customers; the secondary trade area is situated beyond the primary trade area and generates 15 – 25% of a centre's customers; and the tertiary trade area accounts for the remainder of sales, say 5 – 15%. Drummey (1984) provides a similar view, in that he describes a primary trade area as the area which accounts for 70-80% of centre sales. Jones and Mock (1984), Dawson (1983) and Kiel (1998) concur with this view, although Davies (1977, p. 148) maintains that Applebaum defined a trade area as the zone where 50 – 70% of the population are likely to be customers and the secondary trade area as the zone where 20 – 30% of the population are likely to be customers. Kiel (1998, p. 1144) contends that "Davies is confusing the trade area of a shopping centre with its market share".

The concept of a tertiary trade area is less well defined in the literature. Most researchers mentioned above seem to concur that the tertiary trade is the furthest of the outlying zones and typically accounts for no more than 5 – 15% of total centre sales. Interestingly, tertiary trade appears to be the only zone which is defined as a percentage of total centre sales (trade). Kiel (1998, p. 1144)

furthermore introduces the concept of rogue expenditure: expenditure by day-trippers, contract workers and tourists. In border cities it may also include cross-border trade.

Table 7.1 provides an integrated summary of the abovementioned research findings in respect of shopping centre trade areas.

Table 7.1: Summary of trade area definitions and shopping centre support base (% of customers and sales)

	Primary	Secondary	Tertiary	Other (Rogue)
Applebaum	60 – 70%	20%	5 – 15%*	n/a
Drummey	70 – 80%	20 – 30%*	n/a	n/a
Jones & Mock	60 – 70%	15 – 25%	n/a	n/a
Dawson	60 – 70%	15 – 20%	n/a	n/a
Kiel	60 – 70%	20%*	n/a	10 – 20%

** Note: Source literature silent on this aspect; determined by interpretation as a residual value*

A trade area is not a solid and fixed line but rather a soft permeable boundary, which may vary in shape and size over time as consumer behaviour adjusts to changes in retail product offer, infrastructure projects and associated alterations in accessibility characteristics of the site in question. Ghyoot (1992, p. 60) identified a number of trade area characteristics, among which the following:

1. **Potentially illuminative**. Consistent with principles of retail gravitation theory. Professor Reilly (1929) was among the first to research and document the trade area delimitation problem in 1931, based on the Newtonian law of gravitation. The work of Reilly (Richardson, 1979) reflects the dominant thinking of the time, which was centred around the nearest centre postulate. The simplified 'nearest centre postulate' is intrinsic in most variations of the shopping centre hierarchy.
2. **Not sharply defined**. With the exception of physical barriers such as an impassable mountain range or coastline, trade areas are not sharply defined, but rather tend to have permeable boundaries.

3. **Trade area overlap**. Research performed by Bucklin (1971) affirms this notion and points out that in particular centres providing comparative or destination shopping goods – including fashion and home ware goods – can be expected to have highly overlapping trade areas. Kiel (1998, p. 1145) concludes that this appears to be particularly relevant to regional shopping centres. Higher population concentrations, coupled with higher socio-economic status, appear to correlate to a higher degree of trade area overlap.
4. **Functional differentiation and Competitive Strength**. Centres of similar size may not necessarily be characterized by similar sized trade areas due to aspects such as store or brand differences, target market characteristics (including income level and mobility), as well as the structure and the level of competition in the surrounding retail landscape.
5. **Agglomerative powers**. Weber was the first to focus on the economic effects of agglomeration (Latham, 1976, p. 9). The principle of agglomeration is echoed in Tobler's First Law of Geography "… everything is related to everything else but near things are more related than distant things" (1970, pp. 234 – 240). Conventional retail hierarchies and shopping centre trade areas are nor responsive to the effects of nodal agglomeration and the impact of scale benefits created by nodal clustering.
6. **Relative Inertia**. Trade areas are fairly stable and change slowly over time. Customer patronage levels reveal relatively high levels of loyalty to a particular store or brand, adapt slowly over time and tend to normalise over time following the introduction of a new centre or store to the market area.
7. **Multiple trade areas**. A shopping centre typically contains a varying mix of convenience and destination orientated goods and services. Applebaum & Cohen (1961, p.78) elaborates on the concept of store associations and points out that the trade area of the most powerful store will serve as the trade area of all other stores.

Davies (1977, p. 147) distinguishes three types of trade areas, namely potential, probable and actual trade areas:

1. **Potential trade areas**. These trade areas are delimited on maps in crude ways and are mainly drawn on the basis of experience or rules of thumb.
2. **Probable trade area**. These are typically more quantitative in nature and delimited on the basis of more rigorous modelling techniques – may include drive-time isochrones.
3. **Actual trade areas**. Actual trade areas reflect known patterns of patronage of existing stores or centres.

Potential trade areas are the least practical and accurate, mainly due to its coarse nature. Hence, its usefulness and application possibilities are confined to generalized, basic analyses. Probable trade areas are more suited to proposed centres and stores, utilising a combination of empirical techniques and analogues, whereas actual trade areas relate to established centres and serve as basis for developing analogues.

A distinction can be drawn between three trade area delineation techniques (Kiel, 1998, p. 1146 – 1149). The three techniques vary in terms of input data required and its level of accuracy. The three techniques are:

1. parameter based methods;
2. empirical or primary research based methods; and
3. gravity models.

Parameter based methods are arguably the most simplified version of the three methods and reflect derivatives of empirical based assessments. These methods include ‘rule of thumb’ applications of, for instance, retail hierarchy parameters that identify average trade area radii for various centre types, based on aspects such as size and generalized tenant composition.

Empirical or primary research based methods can be applied to refine proxy based trade areas. Survey techniques suitable to retail market analysis include household and in-centre surveys. In-centre surveys are useful in assessing client perceptions and preferences. Results can, however, not be applied to calculate market shares or serve as basis for trade area extrapolations. Kiel (1998, p. 1148)

concurs with this view: research results of an in-centre survey reflect on the patronage of a particular centre and not on trade area attributes.

A notable limitation of parameter based trade area methods applied in isolation, is a disregard for the potential impacts of nodal agglomeration, as well as key differentiating factors between same or similar sized centres and market structure.

Research by Fotheringham and O'Kelly (1989) affirm that agglomeration at nodal level may increase the power of attraction of a centre beyond the conventional (i.e. theoretical) parameter based influence sphere of same or similar sized centres.

The Concept of Diversity

It is generally acknowledged that the diversity of a system contributes to the resilience of that system – refer to *inter alia* Holling (1973 & 2001), DeGeus (1997), Reggiani (2002), Fiksel (2003), Vale and Campanella (2005), McGlade *et al* (2006), Sendzimir (2006), Walker (2006), Harrison and Klein (2007), Meadows (2008), Sanders (2008), Pike *et al* (2010), Bettencourt and Kaur (2011), Page (2011) and Davoudi (2012). In addition to the degree of connectedness within the system, the sustainability of a complex system is enhanced by having sufficient diversity in the system. Consideration of a number of resilient systems, including engineering systems, led Fiksel (2003, pp. 5330 – 5339) to conclude that "Characteristics such as diversity and adaptability may not have an obvious relationship to system performance but may contribute to the system's longevity and ultimate success." This is of obvious interest to developers and investors in shopping centres.

The term diversity can be used to describe the distribution of differences among the members of a unit with respect to a common unit, for example the different retail types of various sizes in a country.

Van den Berg and Pietersma (2015, pp. 3 – 7) identify diversification is a key component of competitive strategy. According to Pearce and Robinson (1994, pp.

235 – 236) the motivations for diversification are financial as well as economic, and include increased growth, value gains, risk reduction, portfolio stability, more balanced product offering and increased efficiency. These gains to be had through diversification are not confined to business strategy: Todaro and Smith (2009, pp. 120 – 121 & 320 – 335) articulate structural changes and patterns of development as a consequence of urban economic growth over time. A number of urban growth and development theories and models, including the empirical research of Chenery (Todaro & Smith, 2009, pp. 121 – 131), Rostow's Growth Stages and the Harrod-Domar Growth Model (ibid, pp. 110 – 115) have established the existence of correlations between economic development, urbanisation, technological progress, system complexity and diversity.

A variety of measures of diversity have been proposed in different disciplines. However, "…synthesis is made difficult because, as a term, diversity … is seldom explicitly defined. Researchers use a variety of labels, often interchangeably, to refer to diversity, including dispersion, heterogeneity, dissimilarity, disagreement, divergence, variation, and inequality, or their opposites, including homogeneity, similarity, agreement, consensus, convergence, and equality." (Harrison, 2007, pp. 1201).

The different types that had variously been proposed have been categorized by Scott Page (2011) and by Harrison and Klein (2007). These categorisations are briefly summarised. Page (2011) differentiates among five types of measures: variation, entropy, distance, attribute and population measures. Entropy measures consider the number of types and the distribution among those types. The so-called Shannon entropy is a special case of the class of generalised entropy functions (*ibid*, p. 69).

Harrison and Klein (2007) distinguish three fundamental types of diversity constructs: separation, variety, and disparity. The three types differ in their substance, shape, maxima, and implications. Separation describes differences among unit members in their position on a horizontal continuum. Variety describes differences among unit members from different categories, reflecting access to unique sources of knowledge. Disparity describes differences among unit

members in their portion of a valued resource. Harrison and Klein (2007, p. 1223) conclude their analysis of diversity by urging “...future investigators to specify the diversity types they are studying, and to align them with specific, appropriate operationalisations. By systematically asking and answering "what's the difference?" management scholars may reveal a clearer, more cumulative understanding of diversity in organisations.”

Chapter 7 attempts to achieve exactly that, by specifying a measure of diversification that will be useful in the characterisation of the shopping centres in a specific market environment. The research proposes that system diversity is a measure of the complexity of human interaction and its effects on the urban system. Comparative static analysis over time and subsequent comparison of results enable the measurement of system progression (i.e. evolution). Results contrast oversimplified Christallerian systems.

An index is a composite statistic, i.e. a compound indicator that aggregates multiple indicators – an index summarises and ranks specific observations in relation to others. As such, it is a measure of relativity (Steyn, Smit & Du Toit, 1989, pp. 191 – 192). Indexes can be simple or complex, weighted or unweighted. In statistics three index types can be identified, namely the Laspeyres Price Index, Paasche Price Index and Fisher Index (*ibid*, p. 142). The aforementioned are relatively simple indices and are not suitable for purposes of analysing complex market structures. A more suitable form of index can be found in economics where the Tress index measures the level of diversification or, conversely, concentration in a regional economy (DBSA, 2001). The research in this chapter proposes the development of a complex index to measure the degree of diversity or concentration in the retail structure of a particular market area.

7.3. RESEARCH METHODOLOGY

The Retail Diversification Index (RDI) is proposed, to measure the degree of diversification or, conversely, concentration, in a particular market area. The basis for the measurement is the relative size of retail classes, as reflected by the

country or region's unique retail classification system and data. The index can be adapted to each country or region's unique classification system, which renders it completely neutral to retail hierarchical differences: the index measures the spread of centres or floor space between the respective retail classes and neutralises the effects of hierarchies with dissimilar classification systems or hierarchies. Consequently, the score achieved by a particular country or region is directly comparable with that of another region or country, regardless of classification idiosyncrasies. The RDI is the first in a series of proposed measures that could be employed to create an improved, multilayered market analysis methodology. Additional measures are proposed in Chapter 8.

7.4. DATA ANALYSIS

A comparative static analysis was conducted for 7 randomly selected countries, including Australia, France, Malaysia, South Africa, Turkey and the United States of America (International Council of Shopping Centres, 2014 – 2017). China was also analysed for purposes of developing this index (as well as a retail saturation index), but sufficient, up-to-date data reflecting the distribution of shopping centre floor space per category was not available.

An analysis of the Australia data set (ibid) is provided as example. The proposed technique entails the following steps:

1. Compile a synthesized data table, indicating the respective shopping centre categories as well as the square metre and percentage spread across the spectrum;
2. Rank the categories from smallest to largest;
3. Calculate minimum and maximum index scores by, respectively, perfectly equal spread and perfectly unequal spread;
4. Calculate the minimum-maximum difference and denominator;
5. Cumulative scoring;
6. Cumulative score, less minimum-maximum difference;
7. Index calculation (result of 6, divided by denominator).

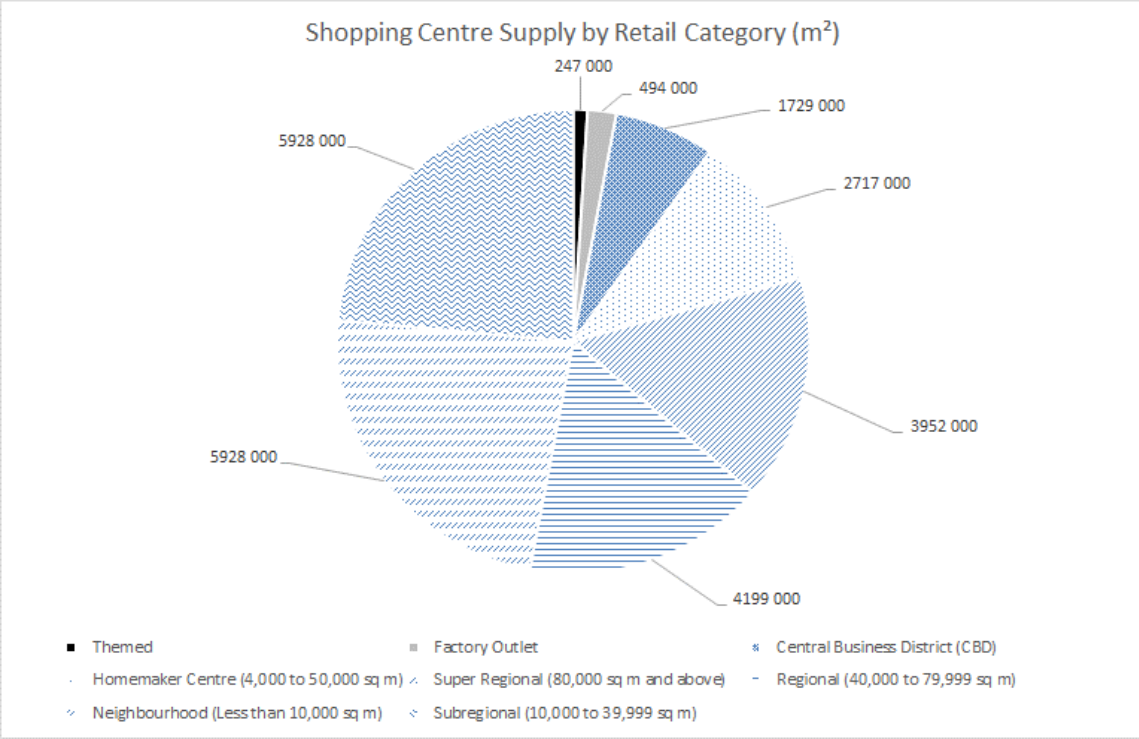
The results of each step are illustrated below, commencing with a synthesis of the Australian retail structure (Table 7.2, Figures 7.1 & 7.2).

Table 7.2: Australian Retail Industry Composition, 2015

Retail Category	Total Square Metres	Percentage distribution (%)
Themed	247 000	1.0%
Factory Outlet	494 000	2.0%
Central Business District (CBD)	1 729 000	6.9%
Homemaker Centre (4,000 to 50,000 sq m)	2 717 000	10.8%
Super Regional (80,000 sq m and above)	3 952 000	15.7%
Regional (40,000 to 79,999 sq m)	4 199 000	16.7%
Neighbourhood (Less than 10,000 sq m)	5 928 000	23.5%
Subregional (10,000 to 39,999 sq m)	5 928 000	23.5%
TOTAL	25 194 000	
Standard deviation	*2 231 804*	*8.9%*

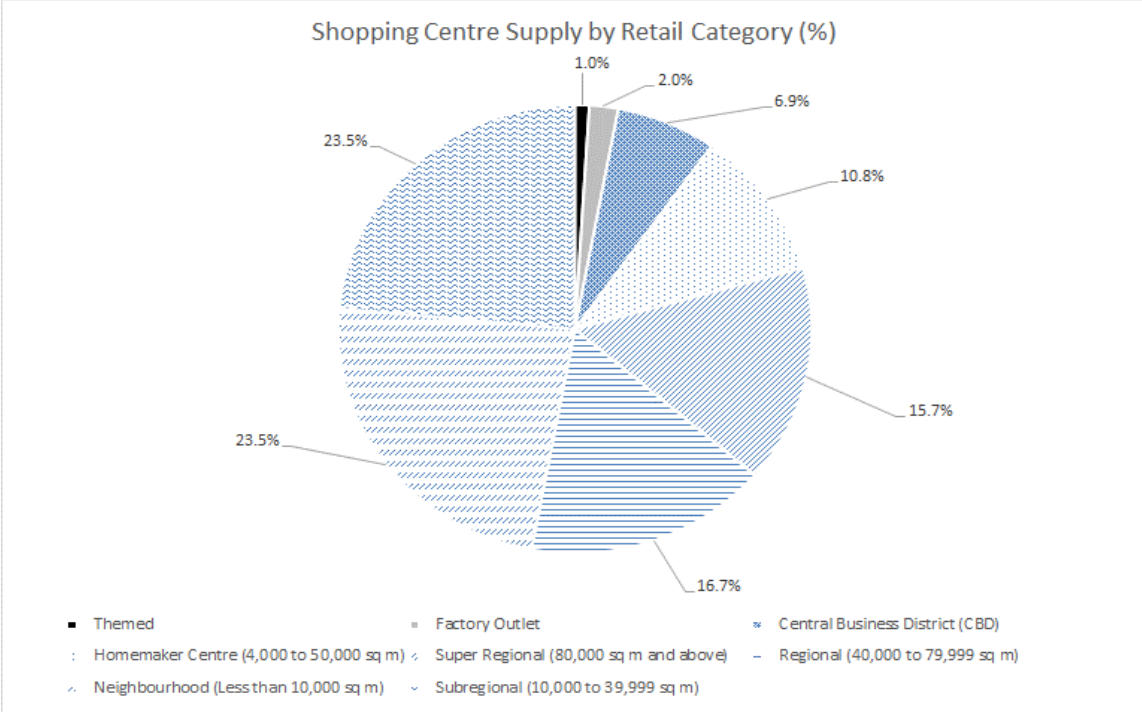
Source: Calculations based on ICSC, 2016

Figure 7.1: Australian Retail Industry Composition (by Square meters), 2015



Source: Calculations based on ICSC, 2016

Figure 7.2: Australian Retail Industry Composition (percentage distribution), 2015



Source: Calculations based on ICSC, 2016

The next step in the process is to calculate minimum and maximum index scores, respectively based on a perfect or equal distribution across the spectrum, and on a perfectly skewed or unequal distribution.

Results of the perfectly equal distribution are shown in Table 7.3. The cumulative score is calculated, based on a hypothetical perfect or equal distribution of retail floor space across the retail spectrum.

Table 7.3: Calculation of Minimum Index Score

Category	Perfectly Equal Distribution (m^2)	Percentage Distribution (%)	Rank	Cumulative Score
Themed	3 149 250	12.5%	0.000	0.00
Factory Outlet	3 149 250	12.5%	1.000	12.50

Category	Perfectly Equal Distribution (m^2)	Percentage Distribution (%)	Rank	Cumulative Score
Central Business District	3 149 250	12.5%	2.000	25.00
Homemaker Centre	3 149 250	12.5%	3.000	37.50
Super Regional	3 149 250	12.5%	4.000	50.00
Regional	3 149 250	12.5%	5.000	62.50
Neighbourhood	3 149 250	12.5%	6.000	75.00
Subregional	3 149 250	12.5%	7.000	87.50
Total	**25 194 000**	**100.0%**		**350.00**

Source: Calculations based on ICSC, 2016

Conversely, results of the perfectly unequal distribution are shown in Table 7.4. Similar to the above, the cumulative score is calculated, but based on a hypothetical perfectly unequal distribution of retail floor space across the spectrum.

Table 7.4: Calculation of Maximum Index Score

Category	Perfectly Unequal Distribution (m^2)	Percentage Distribution (%)	Rank	Cumulative Score
Themed	0	0.0%	0.000	0.00
Factory Outlet	0	0.0%	1.000	0.00
Central Business District	0	0.0%	2.000	0.00
Homemaker Centre	0	0.0%	3.000	0.00
Super Regional	0	0.0%	4.000	0.00

Category	Perfectly Unequal Distribution (m^2)	Percentage Distribution (%)	Rank	Cumulative Score
Regional	0	0.0%	5.000	0.00
Neighbourhood	0	0.0%	6.000	0.00
Subregional	25 194 000	100.0%	7.000	700.00
Total	**25 194 000**	**100.0%**		**700.00**

Source: Calculations based on ICSC, 2016

The summarised values are shown in Table 7.5.

Table 7.5: Calculation of Minimum-Maximum Difference and Denominator Value

Variable	Value
Classes / Categories	8
Minimum Index Score	350
Maximum Index Score	700
Minimum-Maximum Difference	350
Denominator	3.5

Step 5 entails cumulative scoring. The cumulative score for the Australian data set is 417.89 (Table 7.6).

Table 7.6: Calculation of Cumulative Score

Retail Category	Size (m^2)	Distribu-tion (%) *(a)*	Rank *(b)*	Index Score *(a*b*100)*	Cumu-lative Index Score
Themed	247 000	1.0%	0	0.00	0.00

Retail Category	Size (m^2)	Distribu-tion (%) *(a)*	Rank *(b)*	Index Score *(a*b*100)*	Cumu-lative Index Score
Factory Outlet	494 000	2.0%	1	1.96	1.96
Central Business District	1 729 000	6.9%	2	13.73	15.69
Homemaker Centre	2 717 000	10.8%	3	32.35	48.04
Super Regional	3 952 000	15.7%	4	62.75	110.78
Regional	4 199 000	16.7%	5	83.33	194.12
Neighbourhood	5 928 000	23.5%	6	141.18	335.29
Subregional	5 928 000	23.5%	7	164.71	500.00

Results of step 5 inform the final step – calculation of the Australian RDI value (Table 7.7). The value is a score between 0 and 100. In terms of the calculation, an index value of around 50 or less denotes a comparatively well diversified and balanced retail structure with limited or no fundamental imbalances.

Table 7.7: Calculation of Australian RDI Value, 2015

Variable	Value
Cumulative Score	500.0
Cumulative Score, less minimum-maximum difference	150.00
Australia Retail Diversification Index (RDI)	**42.86**

KEY:

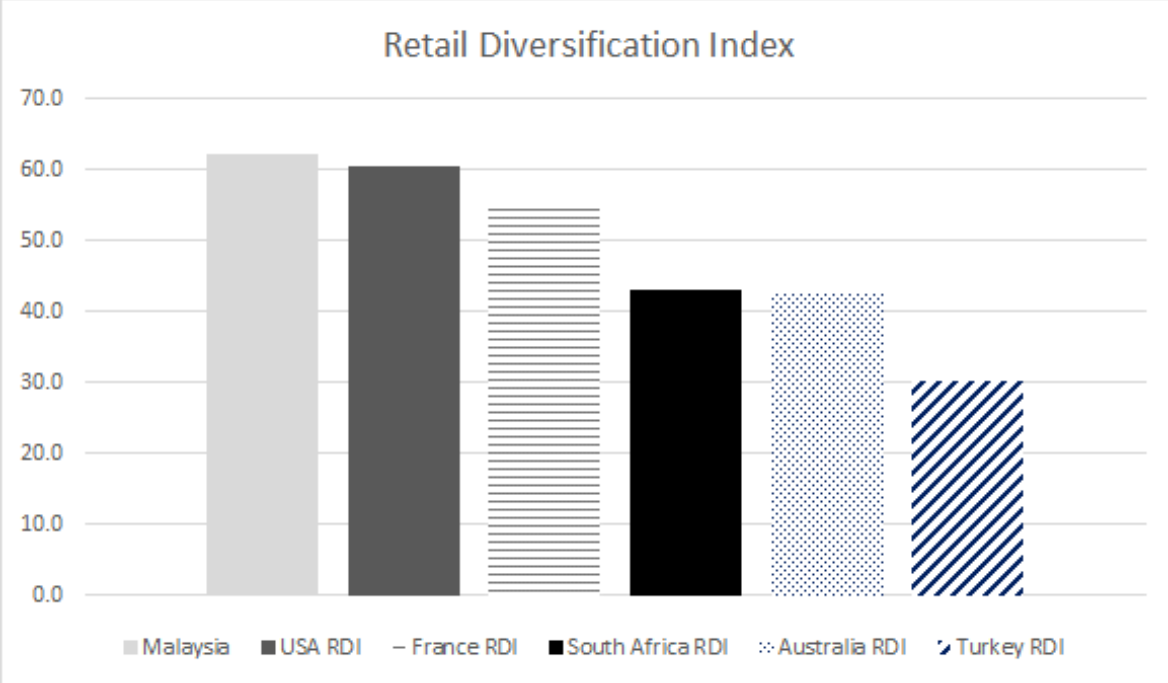
More diverse, less concentrated	*< 50*
Less diverse, more concentrated	*50 – 100*

The market has evolved over time and specialized categories have emerged. In such a market, diversification and specialization opportunities may emerge, but a

key indicator of future opportunities will be related to population growth and in-migration to urban regions, coupled with sustained levels of economic growth and job creation. Conversely, an index value closer to 100 denotes a market with fundamental imbalances. Imbalances may reflect but not necessarily imply a relatively immature and/or developing retail structure. It could also reflect on a mature, but imbalanced (i.e. overly concentrated) market.

RDI values were calculated by the same procedure for the remaining 5 sample countries – France, Malaysia, South Africa, Turkey and the United States – i.e. the countries for which suitable data could be sourced. Results are shown in Figure 7.3. Suitable data was not available to calculate a RDI for China.

Figure 7.3: Summary of RDI Country Index Values, 2015*



** Note: except France and South Africa for which the latest available ICSC datasets are dated 2014; for the United States 2016 data is available but 2015 data was used in the calculation.*

7.5. INTERPRETATION OF FINDINGS

The RDI is the first in a series of quantitative techniques developed to assist in the identification of sectoral investment gaps and opportunities. The RDI is a method that enables the analyst to, in effect, calculate the degree of diversification or, conversely, concentration in a particular country or regional retail structure. The RDI reflects on the structure of a particular market environment.

Country fact sheets are not necessarily available for the same base year. Short term stability observed in the RDI index for certain countries suggest structural stability and inelasticity. Minor base year variances are therefore not considered to be an obstacle in comparing country data, provided the researcher does so with circumspection.

The RDI value of 62.2% for Malaysia reflects a relatively concentrated and imbalanced market structure. There are only three categories in the Malaysian retail structure, of which one category dominates with a contribution of 72.2%. The United States retail market revealed an equally high RDI value of 60.6%. In the US market, two categories together contribute 56.2% to the industry: neighbourhood centres with a contribution of 30.8% and community centres contributing 25.4%. Although these two market segments are comprised of a proportionally larger number of smaller centres, the high RDI reflects on a proportionally concentrated and imbalanced retail market structure. The RDI values for South Africa (43.2%), Australia (42.9%) and Turkey (30.3%) are comparatively low, indicating a proportionally more diversified and balanced retail market structure in these countries.

A higher RDI value indicates a concentrated market in which returns hinge on the performance of a limited number of dominant categories. Such overdependence may expose the market to certain vulnerabilities. Proportional dominance may also be indicative of oversupply in certain segments, which would serve as pointer for further analysis. A high RDI could be addressed through market diversification and redevelopment opportunities. Conversely, a lower RDI value indicates a

proportionally more balanced and diversified retail market structure with income generating assets spread in a relatively more balanced manner across the spectrum. A market with a lower RDI value should be comparatively more resilient.

In either instance, the result is neutral and does not reflect on the quality of the retail environment or quality of market structure. The RDI simply denotes a state of market structure which may, on the one hand, render a particular market structure susceptible to certain risks and, on the other, open to certain opportunities. The RDI also does not appear to reflect directly on market age, although inferences could be drawn, based on the RDI value in relation to the general economic status of the region (Table 7.8 and Figure 7.4).

Table 7.8: Summary of RDI Country Index Values and Economic Status

Country	Standard Deviation (m^2)	Percentage Deviation	Economic Classification	RDI Value	RDI Classification
Australia	2 231 804	8.9%	Developed	42.9	More diverse
France	2 660 945	16.8%	Developed	55.1	More concentrated
Malaysia	4 574 435	33.9%	Developing	62.2	More concentrated
South Africa	2 063 592	9.0%	Developing	43.2	More diverse
Turkey	1 305 344	12.0%	Developing	30.3	More diverse
United States	75 986 419	10.7%	Developed	60.6	More concentrated

By inference, the USA RDI value suggests that future development opportunities will, in all probability, hinge on:

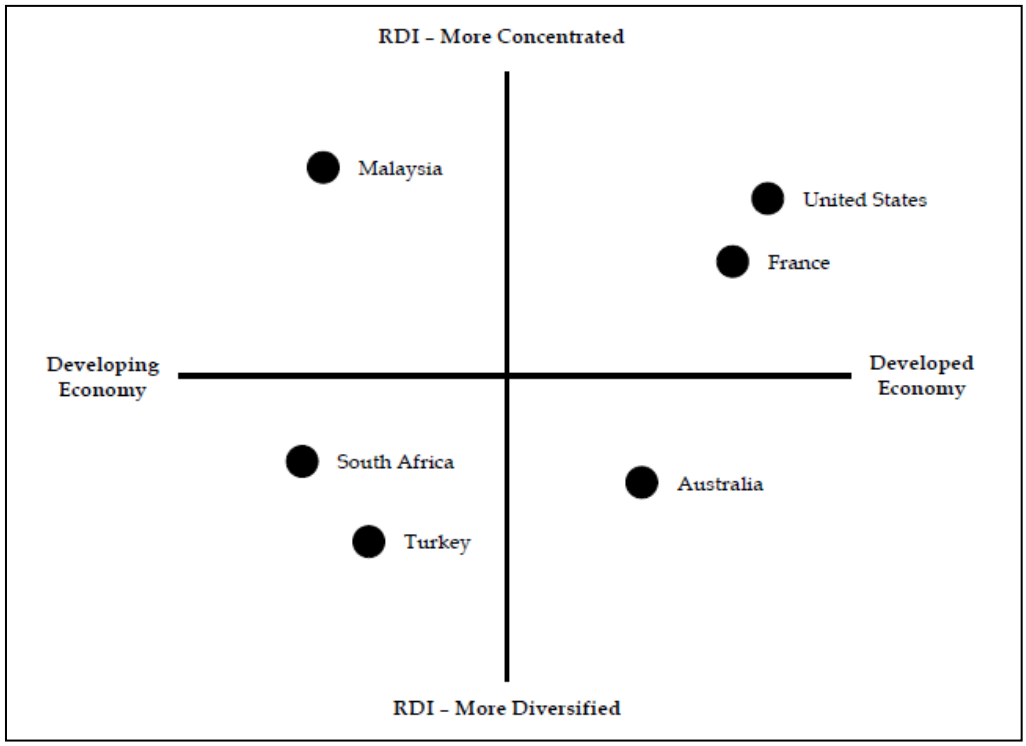
1. First and foremost, niche opportunities and redevelopments that may see the addition of specialised retail formats to existing nodes;
2. To a lesser extent, general (i.e. more conventional) retail formats as part of new nodes in high growth geographic markets, e.g. areas that experience high rates of sustained urbanization through in-migration create opportunities

for demand led growth and the emergence of new nodes – although the developed market status would suggest that such remaining opportunities of scale might be comparatively limited; and

3. untapped geographic markets, e.g. new mining towns, new airports, tourist destinations, etc – in a mature market (i.e. developed economy), such opportunities may continue to emerge, but could be expected to be limited and highly localised.

The Malaysian retail structure is highly concentrated in a small number of categories. Given the developing status of the economy, appreciable opportunities for network expansion and diversification exist.

Figure 7.4: Graphic illustration of RDI Country Index Values and Economic Status*



**Note:* *Developed Economy – in terms of the World Bank (2016) and Wikipedia (2018), a sovereign state that has a post-industrial economy, is characterised by advanced technological infrastructure, sustained economic growth and has a Gross National Income per Capita above $12 000.*

Developing Economy – in terms of the World Bank (2018) and Wikipedia (2018), a sovereign state that either has a pre-industrial or industrialising (even agrarian) economy, is characterised by limited technological infrastructure, no

sustained but instead erratic economic growth and has a low Gross National Income per Capita. The CIA World Fact Book (2017) classifies Turkey as developed whereas Dow Jones, FTSE and MSCI classify it as developing.

In the developing economies of South Africa and Turkey, both markets reveal relatively balanced and diversified retail structures. The relatively diverse market structure suggests that a response to retail opportunities has already occurred in these developing economies – more so when compared to Malaysia – and market saturation should be monitored. Future opportunities for growth in generalized retail formats, i.e. retail network expansion, will be closely correlated with localised economic growth prospects. Network expansion, in turn, create new opportunities for network densification (i.e. diversification) over time. As these markets mature, redevelopment opportunities may emerge.

The developed Australian economy offers a relatively well diversified and balanced retail structure. Aspects such as economic growth and market size will determine the rate and scale of network expansion. Continued structural diversification is likely to occur.

The RDI reflects on market structure and, more specifically, the internal organisation of market structure. In itself, the RDI does not indicate or denote market potential. The RDI provides an indication of the degree of diversity or, conversely, concentration. Inferences could be made regarding possible structural market gaps and development or redevelopment focus. Closer inspection of a particular market structure may also point towards saturation in certain segments which, in turn, should guide further investigation.

The RDI technique in itself evidently has value, but ideally needs to be supplemented with additional quantitative techniques, because market based investment and development opportunities (and subsequent decisions) are influenced by a number of factors, including:

1. retail market structure and depth
2. the quantum and spatial distribution of disposable income

3. economic growth dynamics
4. political considerations, e.g. stability and policy certainty.

The RDI technique should ideally be applied to supplement traditional demand modelling approaches. Having developed the RDI technique to assess market structure, the Multi-Criteria Saturation Index (MCSI) provides an appraisal mechanism to aid the assessment of market depth and the existence of latent development potential.

Subsequent paragraphs illustrate results of the application of the RDI on a city/town scale.

7.6. RETAIL DIVERSIFICATION INDEX APPLIED TO INTER-CITY COMPARISON

The RDI technique was applied to a selection of small cities and large towns, within South Africa, namely Nelspruit (Mbombela), Witbank (eMalahleni), Bushbuck Ridge, Kimberley (Sol Plaatje), Mafikeng (Mahikeng), Klerksdorp (Matlosana), Pietersburg (Polokwane), Rustenburg and Soweto.

The combined results of the RDI analysis, coupled with a shopping centre based nodal ratio analysis (as per Chapter 3) and a shopping centre floor space *per capita* indicator (as supplementary measure of comparison) are summarised in Table 7.9. Detail data tables are contained in Annexure A.

Table 7.9: RDI Comparison for selected Areas in South Africa

Area	RDI Value	Nodal Ratio	Floor Space parameter (sqm/*capita*)
Polokwane	68.4	1.2	1.07
Rustenburg	71.6	1.0	0.49
Nelspruit	72.9	0.8	2.62
Witbank	74.2	0.6	0.82
Kimberley	76.3	1.0	0.50

Area	RDI Value	Nodal Ratio	Floor Space parameter (sqm/*capita*)
Klerksdorp	78.4	0.5	0.62
Soweto	83.4	0.2	0.18
Mafikeng	86.5	0.3	0.59
Bushbuck Ridge	93.0	0.2	0.49
AVERAGE			**0.82**

Source: Calculations based on SACSC, 2015/16

The following observations can be made in regards to the modelled research findings:

1. The average shopping centre supply *per capita* across the sample of 9 markets is 0.82m^2 *per capita*.
2. An inverse correlation can be observed between the RDI value and the nodal ratio, affirming that a higher degree of concentration in the retail structure (i.e. less structurally divers) can be associated with lower levels of nodal formation – inferences can be made in respect of area economic characteristics, i.e. developed and mature *versus* developing, the expected level of competition, market diversification opportunities, etc.
3. The lowest nodal ratios and square metre *per capita* ratios can be observed in former township and rural areas, including Soweto, Mafikeng and Bushbuck Ridge – which is indicative of appreciable latent market potential.
4. Nelspruit has the highest shopping centre supply *per capita* (2.62m^2 *per capita*) but the town is served by an extensive secondary regional catchment – of which the demographic was not factored into the calculation.
5. Disparities can also be observed between urban areas and areas with a distinct rural character.
6. The diverging range of parameters suggest inherent latent market capacity in various markets.

The research demonstrates that the application of a combination of techniques enhances market insight and articulates attributes of the retail environment that

are not reflected through the application of traditional trade area analysis techniques alone. The proposed techniques offer potential managerial decision support solutions.

The research furthermore highlights an important inherent limitation of simple *per capita* approaches. Progression, evolution and systematic retail network densification can be observed in developing (i.e. emerging) markets over time. In contrast, *per capita* methods tend to be applied in a rigid, inelastic manner – especially when applied by state entities to appraise development applications for e.g. shopping centres and hospitals. The rigid, inelastic application of *per capita* parameters creates a negative reinforcing phenomenon: i.e. by repeatedly applying the same (low) parameter, network growth and densification (i.e. evolution and progression) is inhibited and growth is inadvertently constrained.

7.7. CONCLUSIONS

This chapter articulated a proposed technique designed to aid the analysis of trade areas, namely the Retail Diversification Index. The RDI is a method that supplements the conventional trade (or market) area demand assessment and the technique enables the analyst to calculate the degree of diversity, conversely concentration, in a particular retail market structure. The net result reflects the internal market structure and, as such, may be indicative of structural imbalances, market gaps and development opportunities.

By itself, the RDI does not indicate or quantify market potential. The RDI provides an indication of the level of diversity that can be observed in a particular market at a given point in time which, when combined with insight into the economic development trajectory of the market, may reveal structural retail market opportunities, i.e. whether the market structure offers scope for retail network expansion (i.e. the addition of generalised retail formats) and/or network densification (i.e. the addition of specialized and niche retail formats).

Trade area analysis is a complex, multi-layered exercise that should be responsive to the multi-faceted nature of the development environment – an environment in which more than demographics and local area planning policies shape the nature, extent and pace of development. The descriptive and predictive capabilities of the RDI technique deviates from those presented by Christallerian techniques. Christaller-based models analytically simplify reality: it projects an oversimplified version of reality onto a homogeneous spatial plain and then proposes this image as a suitable structure for other environments. The RDI is primarily an analytical instrument and is best suited to perform comparative static analysis. An analysis of result are informative, but does so without imposing or projecting a particular spatial aspiration/pattern onto a dynamics landscape. The results are unique to local market conditions and do not superimpose generalisations.

The RDI is not a spatial model *per se* – nor is it designed as market potential estimation instrument: the RDI is designed to aid existing trade area analysis and demand modelling techniques. The RDI reflects on internal market structure that may, in turn, hold spatial implications. The combined application of the proposed trade area analysis techniques yields results that portray unique localised market conditions. It is proposed that the analytical and descriptive RDI be augmented by the following techniques (discussed in Chapter 8):

1. Multi-Criteria Saturation Index (MCSI)
2. Demand Density Technique (DDT)
3. Growth Matrix (GM).

The above mentioned proposed analytical instruments have spatial capabilities when combined and may assist to enhance spatial analysis and modelling of market environments. Refinements to traditional market demand models to improve responsiveness to economic conditions are also advisable.

CHAPTER 8

FURTHER TECHNIQUES FOR THE ANALYSIS OF TRADE AREAS: SATURATION, DEMAND DENSITY AND GROWTH

8.1. INTRODUCTION

As indicated in Chapter 7, the level of diversification or concentration observed in the retail structure of the market area (the RDI) provides a measure of the latent potential that may exist in the market. In addition to the demand assessment, a more complete analysis of the trade area ideally requires an analysis of (i) the level of saturation, (ii) the spatial distribution of demand and (iii) the inherent growth prospects of the area. Chapter 8 proposes techniques suitable for the determination of these three aspects, namely the Multi-Criteria Saturation Index, Demand Density Analysis and Growth Matrix, respectively.

The commonly-used measure of market saturation, *viz*. floor space *per capita*, is extended by the proposed Multi-Criteria Saturation Index to incorporate GDP *per capita*. The latter is positively correlated with disposable household income which is known to be one of the primary drivers of retail demand.

In addition, the Demand Density Analysis technique is proposed. The DDA is a quantitative technique combined with the visual presentation capabilities of GIS technology. The technique assists in identifying and spatially representing geographic market gaps. In so doing, geographic development opportunities for possible further investigation can be identified.

To identify and analyse the integrated implications of complex local area growth dynamics on asset performance, the Growth Matrix was developed.
The Growth Matrix is a measure that maps the combined effects of:

1. long term market area growth in total retail spend and forecast annual growth in the retail demand threshold; *versus*
2. minimum trading density growth required to sustain market related rental growth of income generating assets.

8.2. LITERATURE REVIEW

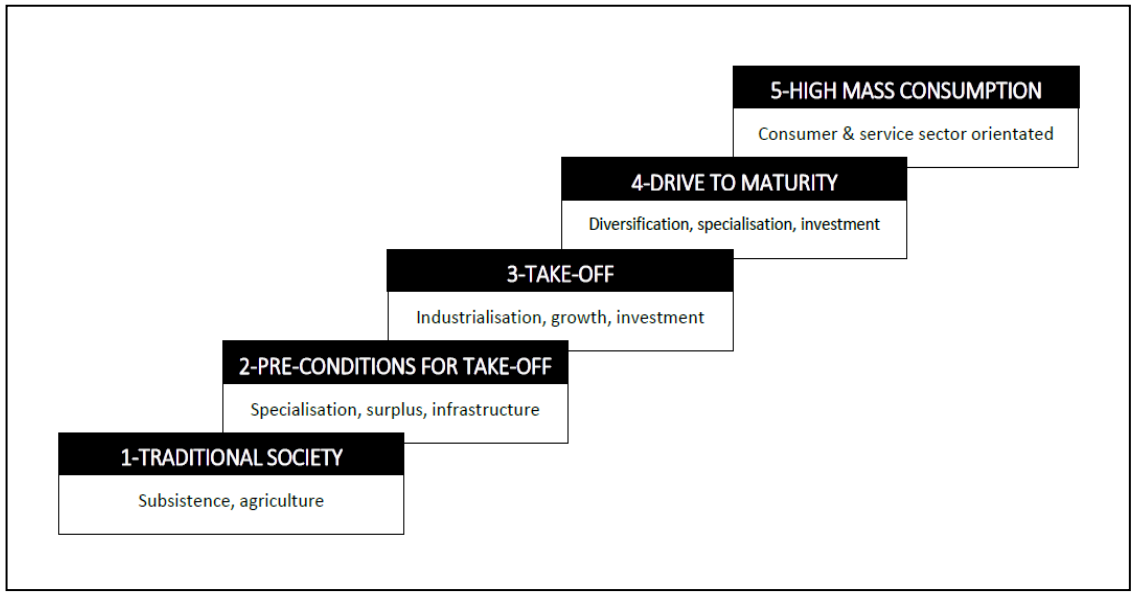
Market saturation and cannibalisation remain much discussed topics in the retail industry in general and the South African market in particular – it is often contended that the market is overtraded, that retailers have too much space and are cannibalising, examples of de-malling in the USA being cited as an impending prospect for the South African market cf. Aviore (2017), Bentel (2017), Flanagan (2017), Gomes (2014), Jones Lang Lasalle (2016), Kriek (2014), Christodoulou (2017), McCormick (2014), Moolman (2017), Navigare (2017), Prinsloo (2016a & b), PSG (2017) and Visagie (2014).

The degree of market saturation is a characteristic that distinguishes developed from developing markets. Todaro (1989, pp. 27 – 61 and Todaro & Smith, 2009, pp. 39 – 108) articulates a spectrum of aspects that distinguish developing from developed nations, including *inter alia* lower levels of living, lower levels of productivity and lower levels of industrialisation. It is not within the scope of this thesis to explore the complexities that underlie development disparities. For purposes of this thesis it is considered sufficient to point out that such disparities exist and may present certain opportunities.

Comparatively lower levels of production in developing markets correspond with comparatively lower concentrations of commercial activity and floor space. An assessment of commercial floor space data in general and shopping centre floor space in particular, respectively for developed and developing countries, affirm this notion (International Council of Shopping Centres, 2014 – 2017).

Development economists analyse a multitude of indicators (Todaro & Smith, 2009, pp. 43 – 47) to quantify and model the developmental differences between and trajectories of developed and developing markets, including the causes behind such differences, and to formulate possible remedies. The terminology used to denote and contrast differing levels of development often create the impression that one is implicitly better than the other and that the stages of development follow a rigid order. Linear growth stages theories, e.g. Rostow's Stages of Growth and (Figure 8.1) the Harrod-Domar Growth Model are two examples (Todaro, 1989, pp. 64 – 68, Todaro & Smith, 2009, pp. 110 – 115 and De Souza, 1979, pp. 482 – 487).

Figure 8.1: Rostow's Growth Stages Model



Source: Adapted from De Souza, 1979, p. 484

The notion of an economic development continuum has attracted significant criticism (*ibid*, p. 487). In real estate terms, however, what may be considered by development economists to be a comparatively underdeveloped market, may paradoxically be evaluated by the investor as an unsaturated market which could offer lucrative development and investment opportunities.

Measuring the level of market saturation requires the existence of an identifiable geographic area, i.e. a market area or trade area, in which the relationship between demand and supply variables can be quantified.

The earliest quantitative models recognised that the power of attraction exerted by a centre was not determined solely by its size (e.g. gross leasable area). Since publication of the research of Reilly in the 1920's (Richardson, 1979) and the research by Huff in the 1960's (Huff, 1963, pp. 81 – 90 & Timmermans, 1993, pp. 343 – 377), urban geographers have attempted to quantify the distance deterrence function and attributes that render certain centres more appealing than others. The concept of the nearest centre postulate was ultimately abandoned.

The 1920's work of Reilly (Richardson, 1979) reflects the dominant thinking of the time, which was centred around the nearest centre postulate: i.e. when confronted with a choice between two centres of the same or similar size a consumer was thought to always gravitate towards the nearest centre. The mathematical expression of Reilly's hypothesis is as follows (*ibid*):

$$\frac{B_a}{B_b} = \frac{P_a}{P_b}\left(\frac{D_b}{D_a}\right)^2$$

where: –

B_a, B_b = the proportion of trade drawn to the centres a and b
P_a, P_b = the population sizes of cities a and b
D_a, D_b = the distance from the intermediate town to cities a and b

The work of Huff (1960's) forms the basis of gravitation based urban interaction models. Even though Huff developed a refined hypothesis that incorporated hypothetical probability indicators and utility functions, he identifies three main limitations of gravity models, including:

1. the use of breaking points, which create the impression that trade areas have rigid, fixed boundaries;
2. coupled to the naïve assumption of Reilly's exponent 2; and
3. the fact that intra-urban gravity models pose very little theoretical content and do not examine actual behavioural aspects (1963, p. 84 – 85).

In developing his model, Huff applied Luce's choice axiom (Chapter 4) which states that "… when faced with several choice alternatives, the probability of an individual choosing a particular alternative is equal to the ratio of the utility of that alternative to the sum of utilities of all alternatives considered by the individual" (Timmermans, 1993, p. 349 – 350). Applied to the choice of shopping, this axiom translates into the following function:

$$P(x,x_i) = \frac{a_i F(d(x,x_i))}{\sum^{n}_{j-1} a_j F(d(x,x_i))}$$

---

where: –

P	*Probability of a consumer visiting a particular store*
$d(x,x_i)$	*Network distance between a user at X and a store i*
a	*Attractiveness of the store*
F	*Distance deterrence function, i.e. a monotonously decreasing function with respect to distance*

The need to quantify utility remains challenging and highly subjective. On account of the limitations outlined by Huff (*ibid*), coupled with the extent of assumptions required, gravitation models have not found favour in all markets, including South Africa.

Research on trade areas and demand measurement methods currently favoured in the South African market is presented in *inter alia* Lu & kie (2005, pp. 62 – 68), Kiel & Haberkern (1998, pp. 1138 – 1154), Davies (1977, pp. 141 – 157),

Applebaum & Cohen (1961, pp. 73 – 101) and Applebaum (1966, pp. 127 – 141). The three generally applied demand methods include:

1. *Per capita approach*. The *per capita* approach calculates total *per capita* square meter supply levels for a predefined market area. *Per capita* parameters can be applied to calculate and compare demand levels for homogeneous market areas. Supply based *per capita* parameters can serve as measure of market saturation. The *per capita* approach is suited to country, region and area wide scan and selection processes, but is not appropriately refined to provide site-specific solutions. The approach is not responsive to localised income and associated socio-economic idiosyncrasies.
2. *Residual approach*. The residual approach calculates the effective market gap between total market area demand and supply. The approach is suitable for macro and meso-level analyses and results are map-able. On account of the coarseness of this approach, it is not recommended for site-specific demand potential analysis.
3. *Analogue or share approach*. The analogue or share technique makes use of comparable market data to estimate the expected market share or capture rate of a particular development or store. Application of the approach is data intensive and is recommended only for the experienced and knowledgeable analyst.

The latter two approaches share similar attributes which can be summarised in terms of the following functional relationship:

$$NED_{ret} = (D_R / TD) – S_{ret}$$

where: –

NED_{ret}	Net or residual demand for retail floor space (m^2 GLA)
D_R	Market demand, expressed as Rand value
TD	Turnover density
S_{ret}	Supply of retail floor space (m^2 GLA)

Closer inspection reveals that the characteristics of each approach render it useful for different, though possibly complementary, analytical purposes. In considering potential complementarity, one would have to consider that site selection and market demand analysis are also informed by:

1. market structure
2. market depth
3. spatial distribution of disposable income
4. growth attributes.

The Retail Diversification Index proposed in Du Toit and Cloete (2017c) provides a quantitative method to assess market structure and ideally needs to be supplemented with additional quantitative techniques. Chapter 7 does that by specifying measures of market depth (saturation), spatial distribution of demand through trend surface mapping and by modelling the composite and often hidden effect of various market growth indicators.

The retail saturation index provides an appraisal mechanism for market depth and latent potential. Chasco and Otero (1998, pp. 16 – 18) are among the researchers who refer to the simple floor space *per capita* approach as a retail saturation index (RSI). This single criterion approach may be relevant in comparing homogenous markets, but lacks the specification to account for heterogeneous markets in which purchase power disparities exist.

In order to more adequately reflect the foundational economic realities that underlie each of the geographic markets under consideration, the proposed multi-criteria saturation index (MCSI) incorporates the gross domestic product (GDP) *per capita* – which is positively correlated with disposable household income and a primary driver of retail demand – to establish purchase price parity between regions. Market analysis of regions within the same country (i.e. where domestic currency variations do not distort inter- and intra-regional economics), purchase power parity adjustments to account for currency and associated variances are not required.

Trend surface mapping is a technique which permits mapping or modelling an observed surface by fitting planes or curves with known geometric properties. Trend surface mapping *per se* is not a new technique and initial literature on the subject dates back to the 1950's through 1970's (Box, 1954, pp. 16 – 60, Chorley & Haggett, 1968, pp. 195 – 217 and Peterson, 1974, pp. 338 – 342).

The Demand Density Analysis technique maps demand attributes with the assistance of geographic information systems (GIS) technology. This technique assists in identifying geographic demand concentrations which, in turn, assists in localising demand opportunities of highest concentration. As such, the results reflect investment possibilities.

Trade area analysis is supplemented with another proposed technique, the Growth Matrix (GM). Once a site-specific and trade area based market analysis has been performed, careful consideration needs to be afforded to the complex interaction and demand effects of socio-economic growth indicators, which often possess a hidden longer term prognosis for asset appreciation – as determined by rental income growth, i.e. annual escalations.

The Growth Matrix is a quantitative instrument that graphs the combined effect of market growth indicators, including real growth in aggregate consumer spend, against minimum required and inflation adjusted trading density growth that would be necessary to support market related rental escalations over time. In short, the technique establishes whether positive population growth in itself is sufficient to ensure sustained asset appreciation (i.e. rental escalations over time).

8.3. RESEARCH METHODOLOGY

The Multi-Criteria Saturation Index (MCSI) is proposed to measure the degree of saturation or, conversely, latent potential in a particular market area. The basis for the evaluation is the total offering of shopping centre floor size, as reflected by the country or region's unique retail classification system and data. The MCSI is neutral in respect of the internal organisation of each country or region's unique

retail structure, which renders it completely neutral to retail hierarchical differences.

The Retail Diversification Index (RDI), on the other hand, measures the spread of centres or floor space internally between the respective retail classes of a hierarchy. The MCSI is designed to complement the RDI in regional market analysis, comparison and selection.

The MSCI incorporates economic variables that enable statistically neutral market comparison by eliminating purchase power disparities that exist on account of, for instance, currency variances between countries or regions. To establish purchase power parity, the index incorporates a comparable indicator, such as gross domestic product (GDP) *per capita* – which is positively correlated with disposable household income which, in turn, is known to be one of the primary drivers of consumer demand.

Country or regional selection is refined by means of the proposed Demand Density analytical technique. Demand density analysis translates localised income data for known statistical entities, such as sub-places, into map-able retail demand, using trading density as conversion factor. The technique combines quantitative and visual approaches to trade area analysis.

The Growth Matrix is a quantitative technique that supports localised trade area analysis. Demographics in itself do not explain the complexity of trade areas. Trade area analysis is therefore more comprehensively informed by a local economic base, as well as time series economic and trade sector growth analyses. In addition to the effects of population (or household) growth, the technique incorporates the following inflation adjusted time series growth indicators to account for non-demographic trade area growth attributes:

1. disposable income
2. final consumption expenditure.

8.4. DATA ANALYSIS

8.4.1 Multi-Criteria Saturation Index (MCSI)

A comparative static analysis was conducted for 7 randomly selected countries, including Australia, China, France, Malaysia, South Africa, Turkey and the United States of America (International Council of Shopping Centres, 2014 – 2017).

Development of the proposed multi-criteria saturation index entailed the following steps:

1. Compile a synthesised table, indicating the shopping centre floor space *per capita* for each country or region;
2. Tabulate the purchase power parity (PPP) gross domestic product (GDP) *per capita* for each country or region;
3. Calculate the GDP/*capita* to GLA/*capita* ratio for a selected year;
4. Index calculation;
5. Rank results.

The results of each step are illustrated below. Table 8.1 and Figure 8.2 provide a summary of the shopping centre floor space *per capita* for the selection of countries. The retail floor space for seven countries are shown from 2009 to 2014 (2015 ICSC data is not available for all countries).

Comparatively lower to negative levels of change can be observed in the developed countries of the United States (-0.19%/a), France (1.13%/a) and Australia (2.71%/a). Comparatively higher rates of annual change can be observed in developing markets such as Turkey (9.79%/a), Malaysia (6.19%/a) and South Africa (4.54%/a).

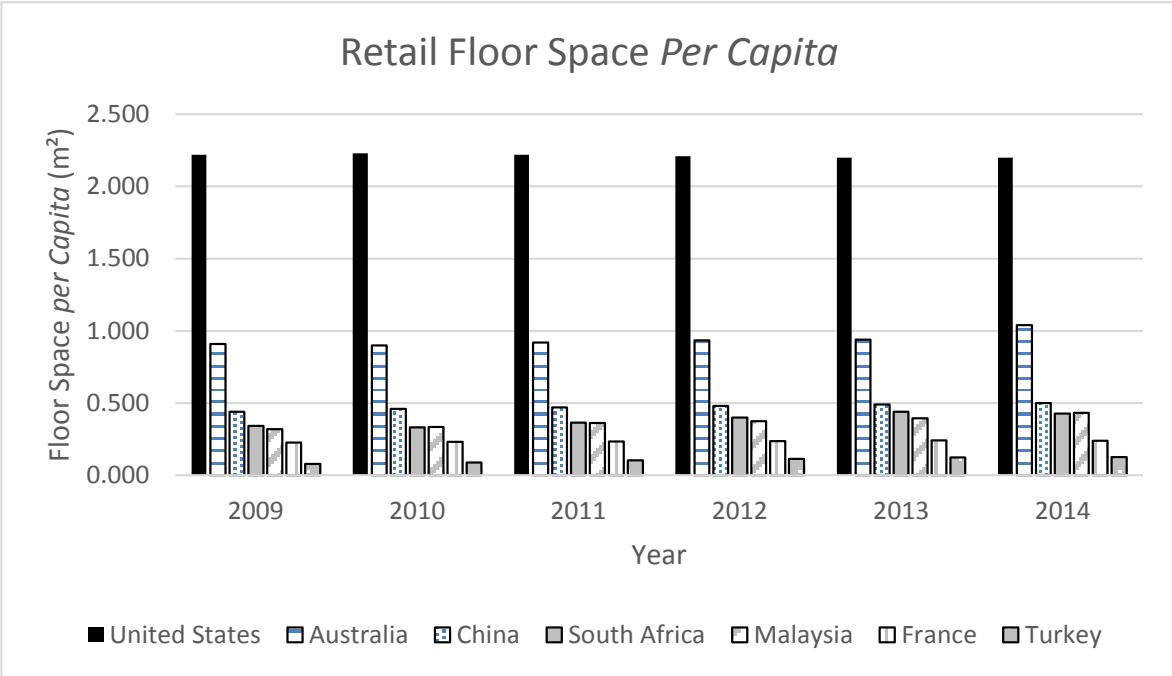
Table 8.1: Retail Floor Space *per Capita* for selected countries, 2009 – 2014

Country	2009	2010	2011	2012	2013	2014	Change per annum (%)
United States	2.220*	2.230	2.220	2.210	2.200	2.199	- 0.19
Australia	0.910	0.900	0.920	0.934	0.940	1.040	2.71
China	0.440	0.460	0.470	0.480*	0.490*	0.500*	2.59
South Africa	0.342	0.331	0.365	0.399	0.440	0.427	4.54
Malaysia	0.320	0.333	0.362	0.375	0.394*	0.432	6.19
France	0.225	0.232	0.234	0.236	0.240	0.238	1.13
Turkey	0.079	0.088	0.102	0.114	0.124	0.126	9.79

Source: ICSC Country Fact Sheets, 2014 - 2017

*Note: * Estimate*

Figure 8.2: Retail Floor Space *per Capita* for selected countries, 2009 – 2013



Source: Calculations based on ICSC Country Facts Sheets, 2014 – 2017

The results of Step 2 and 3 are summarised in Table 8.2. From the table it can be observed that, given purchase power parity adjusted GDP *per capita* (as integrated consumer productivity and demand indicator), the data for France reveals the widest gap of GDP *per capita* in relation to shopping centre floor space supply *per capita*, followed by Turkey and Malaysia.

A comparison of 2013 and 2014 data revealed structural stability (i.e. short term inelasticity) and no change in ranking.

Table 8.2: GDP *per Capita* : GLA *per Capita* Ratio for selected countries, 2014

Country	GDP *per capita* (PPP adjusted)*	GDP *per Capita* : GLA *per Capita* Ratio	Rank
United States	55 800	25 375	7
Australia	47 800	45 962	4
China	13 400	26 800	6
South Africa	13 400	31 382	5
Malaysia	25 700	59 491	3
France	41 700	175 210	1
Turkey	20 100	159 524	2

**Source:* *Central Intelligence Agency, 2017*

The results of step 3 are indexed and ranked (Table 8.3). The United States offers the highest shopping centre floor space *per capita* ratio (2.2 square meters *per capita*, Table 8.1) and thus serves as basis from which the index is calibrated (100.0 points).

Table 8.3: GDP *per Capita* : GLA *per Capita* Index for selected countries, 2014

Country	GDP/c : GLA/c ratio	Ratio	Percentage	Index	Rank
United States	25 375	0.048	4.8	100.0	7
Australia	45 962	0.088	8.8	181.1	4
China	26 800	0.051	5.1	105.6	6
South Africa	31 382	0.060	6.0	123.7	5
Malaysia	59 491	0.114	11.4	234.4	3
France	175 210	0.335	33.5	690.5	1
Turkey	159 524	0.305	30.5	628.7	2
Total	523 743	1.000	100.0		

Table 8.4 provides a comparison of ranking results. In terms of all three techniques, the data indicates that the United States is comparatively the most developed and, on account of receding m^2/*per capita* growth observed, also the most saturated of the 7 markets analysed. The data furthermore indicates that due to the effects of purchase power disparity, direct comparison between m^2/capita values between countries remains inappropriate. In order to facilitate statistical comparison between countries, an adjustment to account for purchase power parity (PPP) has to be made.

Table 8.4: Comparison of Country Ranking Results

Country	m^2 *per capita* Rank	GDP *per Capita* : GLA *per Capita* Rank	MCSI Rank
United States	7	7	7
Australia	6	4	4
China	5	6	6
South Africa	3	5	5
Malaysia	4	3	3

Country	m^2 *per capita* Rank	GDP *per Capita* : GLA *per Capita* Rank	MCSI Rank
France	2	1	1
Turkey	1	2	2

The United States market was assumed as basis for establishing the parameters of a comparatively mature and developed market, at or near saturation. On this basis, the PPP adjusted floor space parameters for the remaining 6 countries were calculated. Table 8.5 provides a summary of purchase power parity adjusted *per capita* floor space parameters for the 7 countries analysed.

Table 8.5: Adjusted Floor space *per capita* parameter per country, 2014

Country	Unadjusted m^2 *per capita* parameter	GDP *per Capita* (PPP adjusted)	Adjustment Ratio	PPP Adjusted m^2 *per capita* parameter
United States	2.199	55 800	1.000	2.2
Australia	1.040	47 800	1.167	1.2
China	0.500	13 400	4.164	2.1
South Africa	0.427	13 400	4.164	1.8
Malaysia	0.432	25 700	2.171	0.9
France	0.238	41 700	1.338	0.3
Turkey	0.126	20 100	2.776	0.3

The difference between the PPP adjusted *per capita* floor space parameter could be interpreted as measure of the extent to which latent potential exists for future retail market densification. The proviso would be that the subject markets should continue to aspire to a Western model of shopping centre development. On account of a PPP adjusted calculation, the markets that reveal the greatest gap

between the adjusted and unadjusted parameter are, in order: South Africa, China and Malaysia. By interpretation, these three markets offer comparatively the greatest scope for retail market growth and densification through new development.

It can be postulated that, in homogeneous markets the saturation index will reflect the general state of the market. Conversely, in developing markets characterised by heterogeneous conditions and dualistic economic development tendencies, potential will be localised in concentrated geographic pockets within cities and sub-regions. Historic growth observed in the floor space *per capita* parameter may offer additional insight into market conditions and development prospects.

8.4.2 Demand Density Analysis

The RDI and MCSI offer insight into market structure and saturations levels but neither technique offers insight into the spatial distribution of demand. Trend surface mapping ads a spatial dimension to market data. The demand density analysis is proposed as such an approach.

Census household income data per sub-place is the basis for the demand density analysis. A sub-place is the geographic unit for which Statistics South Africa releases census data. Demand density analysis proposed in this paper entails the following steps:

1. Compile a database with census-based income per sub-place for a selected market area;
2. Adjust for growth;
3. Calculate retail spend (in SA Rands) per sub-place;
4. Convert retail spend to demand (turnover density)
5. Map results.

Quantitative results are database centred and extensive. Figure 8.3 provides an extract of the provincial income database. Figure 8.4 provides an extract income to demand density conversion database.

Figure 8.3: Mpumalanga Province Income database extract, 2011

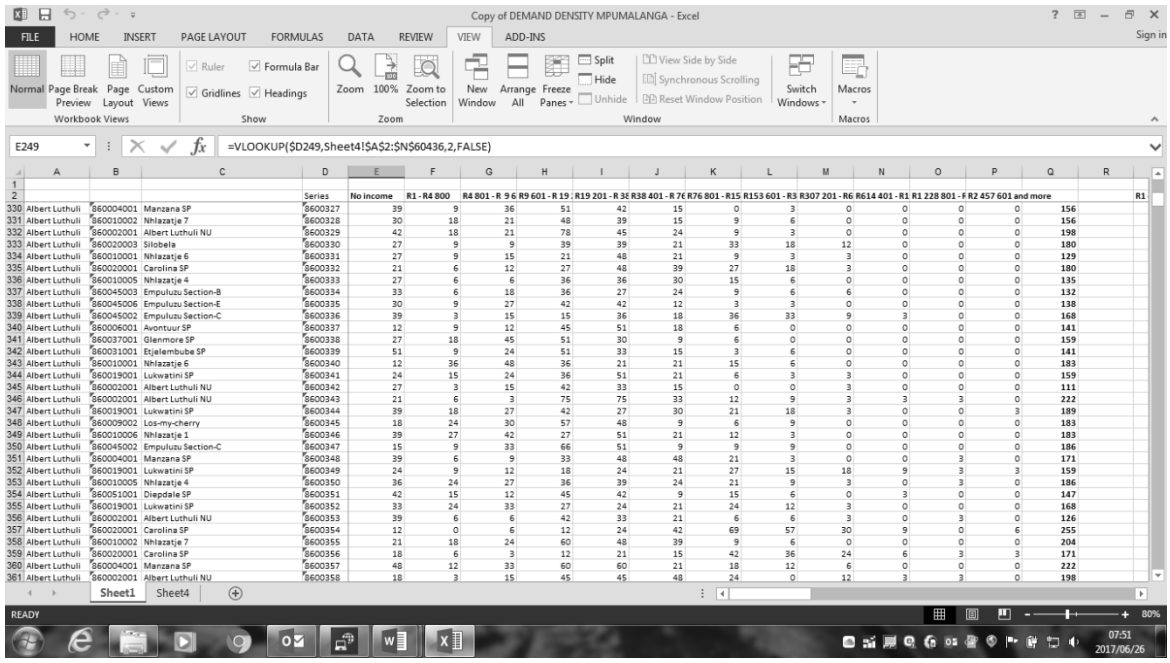
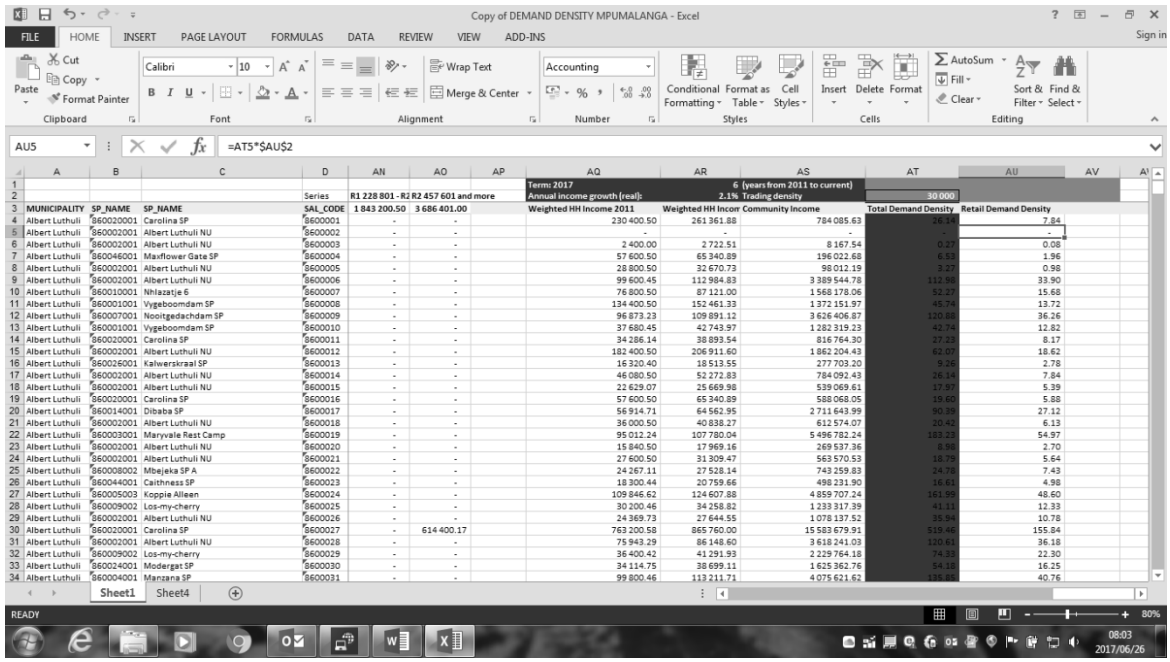
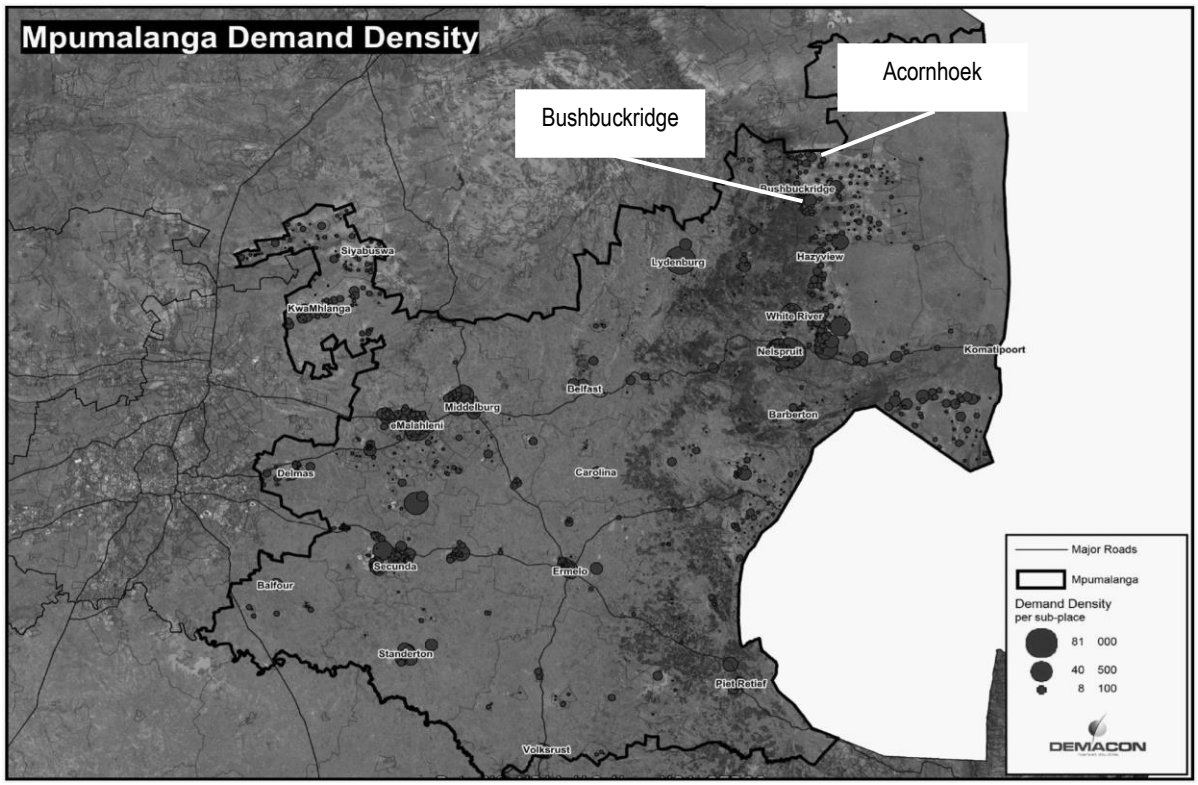


Figure 8.4: Mpumalanga Province Income-to-Demand-Density Conversion Database extract, 2017



Results of a GIS based demand density analysis for Mpumalanga Province in South Africa are illustrated in Figure 8.5 and 8.6. GIS technology offers a variety of presentation formats. This paper illustrates 2-dimensional and 3-dimensional options.

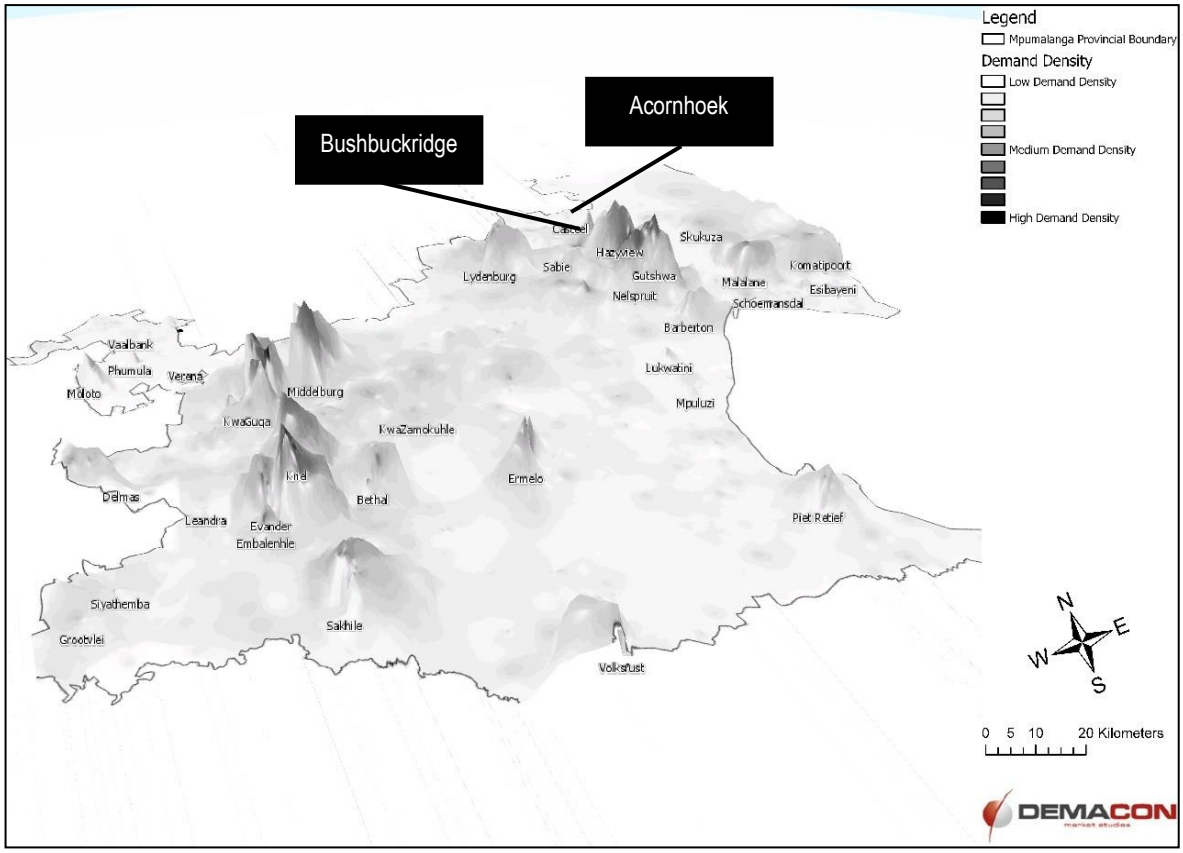
Figure 8.5: Mpumalanga Province 2-Dimensional Demand Density Analysis, 2015



The difference between the PPP adjusted *per capita* floor space parameter is interpreted as measure of the extent to which latent potential exists for future retail market densification. The assumption is that the developing markets under consideration continue to aspire to a Western model of shopping centre development – which is highly probable, given trends observed in these markets.

On account of a PPP adjusted calculation, the markets that reveal the greatest gap between the adjusted and unadjusted parameter are, in order: South Africa, China and Malaysia. By interpretation, these three markets offer comparatively the greatest scope for retail market growth and densification through new development.

Figure 8.6: Mpumalanga Province 3-Dimensional Demand Density Landscape, 2017



From the Figure 8.5 and 8.6, it can be observed that demand is concentrated in and around the main urban centres of the province, including Nelspruit, Middelburg, Witbank (eMalahleni) and Secunda. A comparatively more dispersed demand pattern can be observed in the populous, although relatively lower income rural areas of KwaMhlanga, Nkomazi (south of Komatipoort) and Bushbuckridge.

Bushbuckridge and Acornhoek are indicated on Figure 8.5 and 8.6 to augment the Growth Matrix discussion.

8.4.3 Growth Matrix

A hypothetical developer with a keen interest in rural shopping centre development identified two prospective development sites in the greater Bushbuckridge area. One site is situated in the Bushbuckridge CBD, the southernmost node in the area, which accommodates commercial and administrative functions, as well as a

regional hospital. The second site is situated in Acornhoek, the northern node in the area, which similarly includes a regional hospital, a comparatively more limited commercial offering and intermodal transport facilities. Trade area based calculations indicated a similar quantity of shopping centre development potential for both areas: approximately 30 000m^2. In both areas, modest levels of growth and development can be visually observed and both schemes appeal to retailers. The questions posed were:

1. do the growth prospects differ between the two areas and, if so, to what extent; and
2. how would the respective area growth prospects influence the future income generating potential of a shopping centre asset?

Essentially, which area should ideally be selected for the development? The Growth Matrix was developed to provide insight to the impact of trade area growth attributes on asset income growth generating potential.

Market growth is not simplistically determined by household growth only, but also by income growth (and by implication household expenditure and disposable income growth), as well as minimum required trading density growth (which should account for the applicable inflation environment, i.e. 5-6% annual consumer price inflation in South Africa. Real growth of 3% is required to yield sustainable rental escalations of 8%-9% (an absolute minimum of 7% has been observed in presently market conditions). Inflation adjusted consumer spend and trading density growth was calculated for both areas (Figure 8.7 and 8.8).

On face value, both markets are growing. Similarly, in both instances a widening gap between consumer expenditure on retail goods and services, and trading densities can be observed – which is ideal, but is it sufficient to sustain the desired rental escalations? In Bushbuckridge, long term household growth calculates to 0.65% *per annum*, final consumption expenditure growth averages 0.4% *per annum* over the long term and disposable income growth averages 1.0% *per annum*. In Acornhoek, long term household growth averaged 1.0% *per annum*,

final consumption expenditure growth averaged 1.2% *per annum* over the long term and disposable income growth averaged 0.8% *per annum*.

Figure 8.7: Bushbuck Ridge Consumer Spend and Trading Density Growth, 2014 - 2024

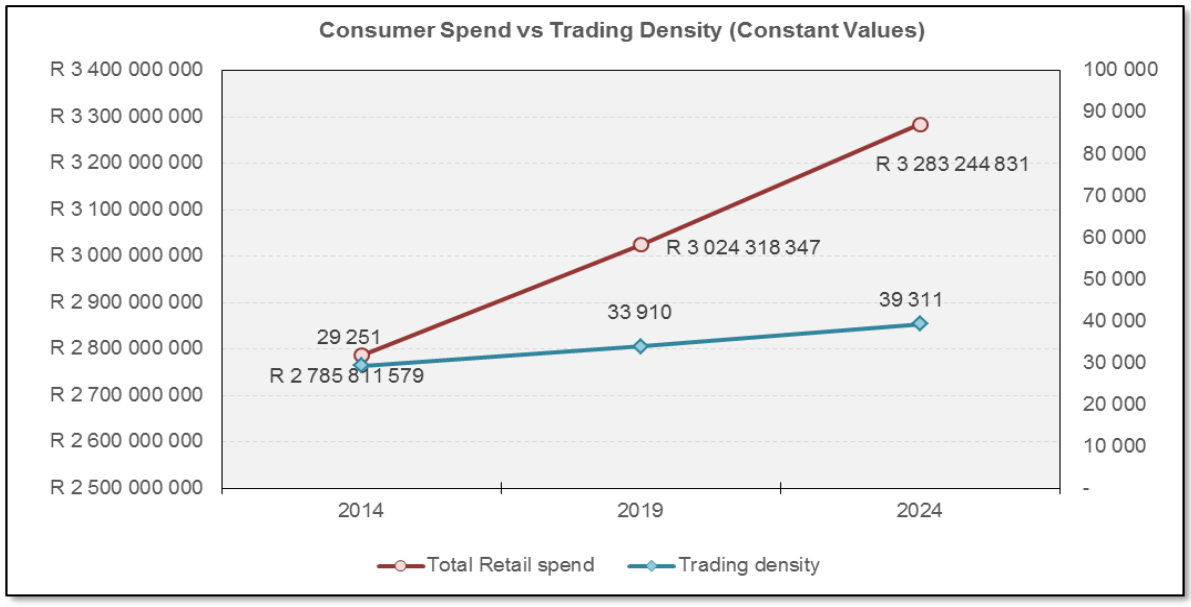
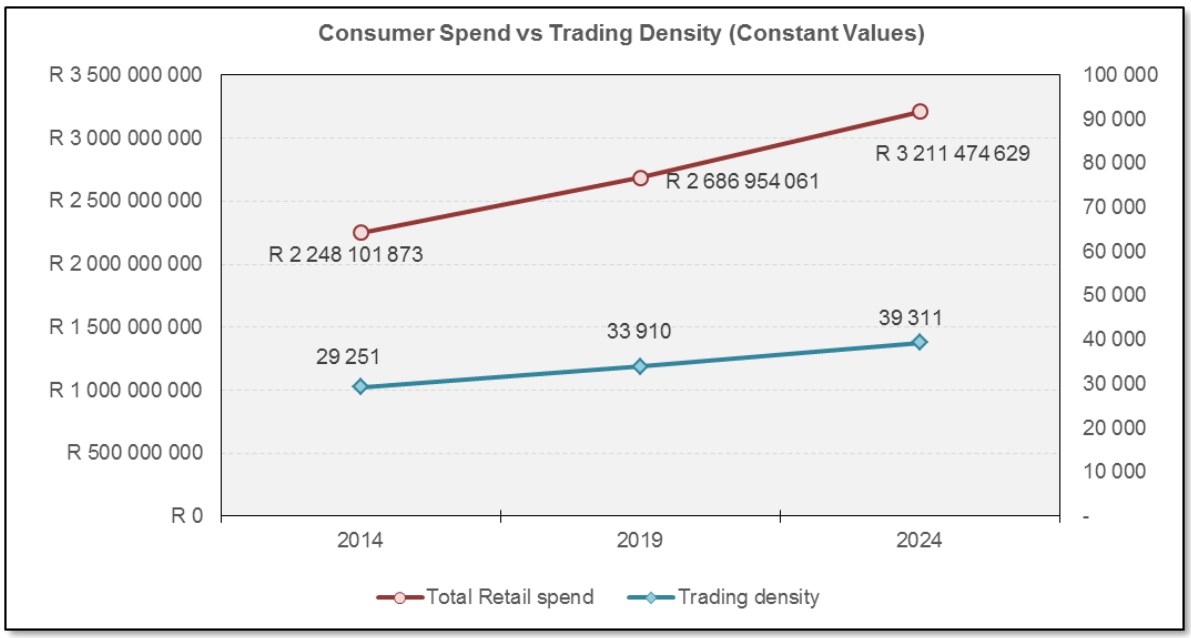
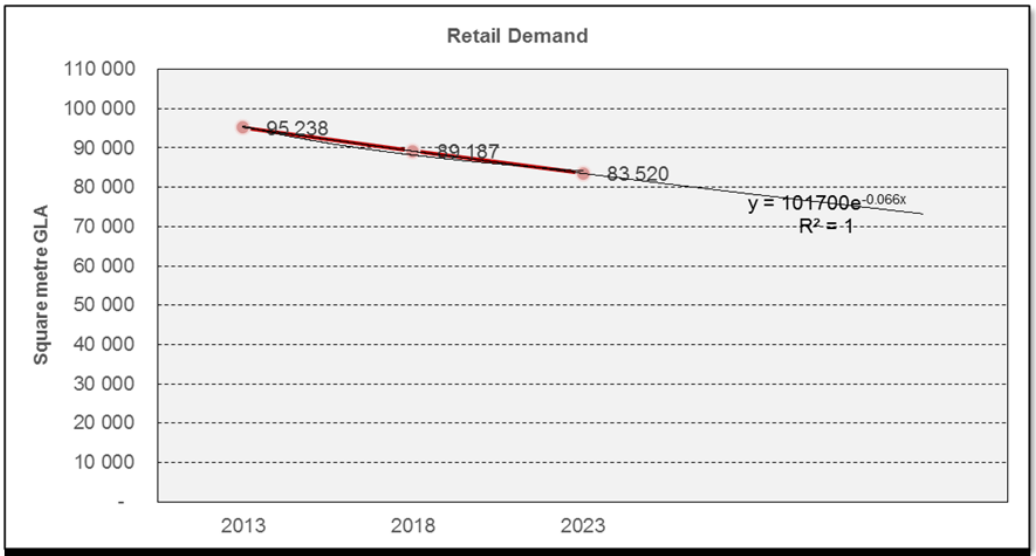


Figure 8.8: Acornhoek Consumer Spend and Trading Density Growth, 2014 - 2024



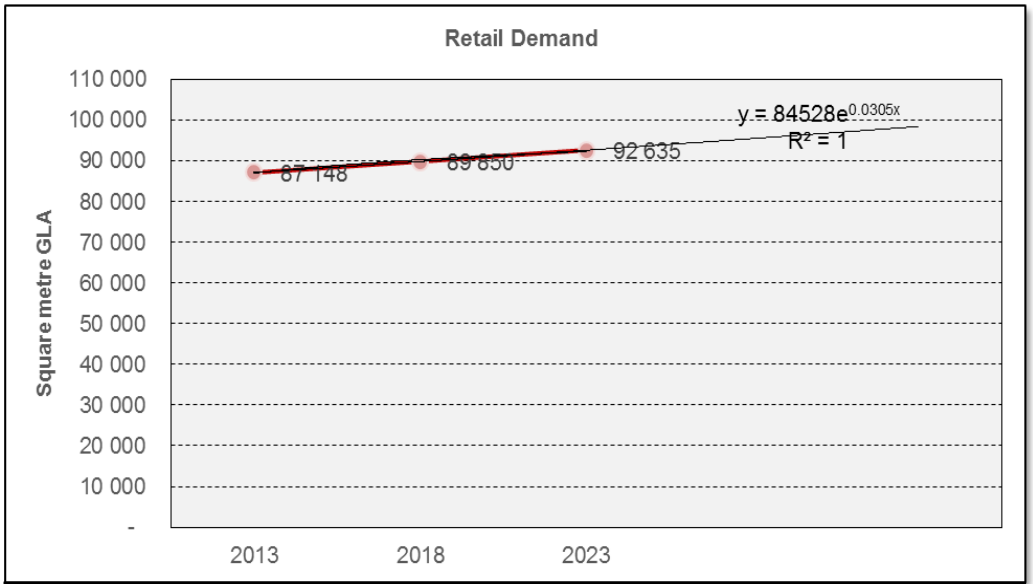
Retail demand is calculated by dividing an annualised benchmark turnover density into annual consumer spend. Figure 8.9 & 8.10 illustrate extracts from the growth matrix model.

Figure 8.9: Bushbuckridge Retail Demand Summary, 2014 – 2024



	2014	2019	2024
Total Retail spend	R 2 785 811 579	R 3 024 318 347	R 3 283 244 831
Compound annual growth			1.66
Trading density	29 251	33 910	39 311
Compound annual growth			3.00
Demand Threshold	95 238	89 187	83 520
Compound annual growth		-	1.30

Figure 8.10: Acornhoek Retail Demand Summary, 2014 – 2024



	2014	2019	2024
Total Retail spend	R 2 248 101 873	R 2 686 954 061	R 3 211 474 629
Compound annual grow th			3.63
Trading density	29 251	33 910	39 311
Compound annual grow th			3.00
Demand Threshold	87 148	89 850	92 635
Compound annual grow th			0.61

In the Bushbuckridge market, the combined effect of household and disposable income growth translates into an annualised 1.66% increase in household retail spend. Accounting for the effects of inflation, the demand base recedes at a rate of -1.3% *per annum*. Aggregate growth prospects in Acornhoek are marginally positive and the demand base expands at 0.61% *per annum*.

The area growth attributes are synthesised and graphically illustrated by means of the Growth Matrix (Figure 8.11 and 8.12). The Growth Matrix plots the combined effects of selected area growth variables, synthesized into two planes: a horisontal plane vertical plane in respect of market type (expanding or receding aggregate demand base) and consumer spend (increasing or decreasing real spend).

Figure 8.11 illustrates the base matrix. Figure 8.12 illustrates the added analytical concepts of a proposed zonal overlay to aid interpretation.

Figure 8.11: Bushbuckridge Growth Matrix

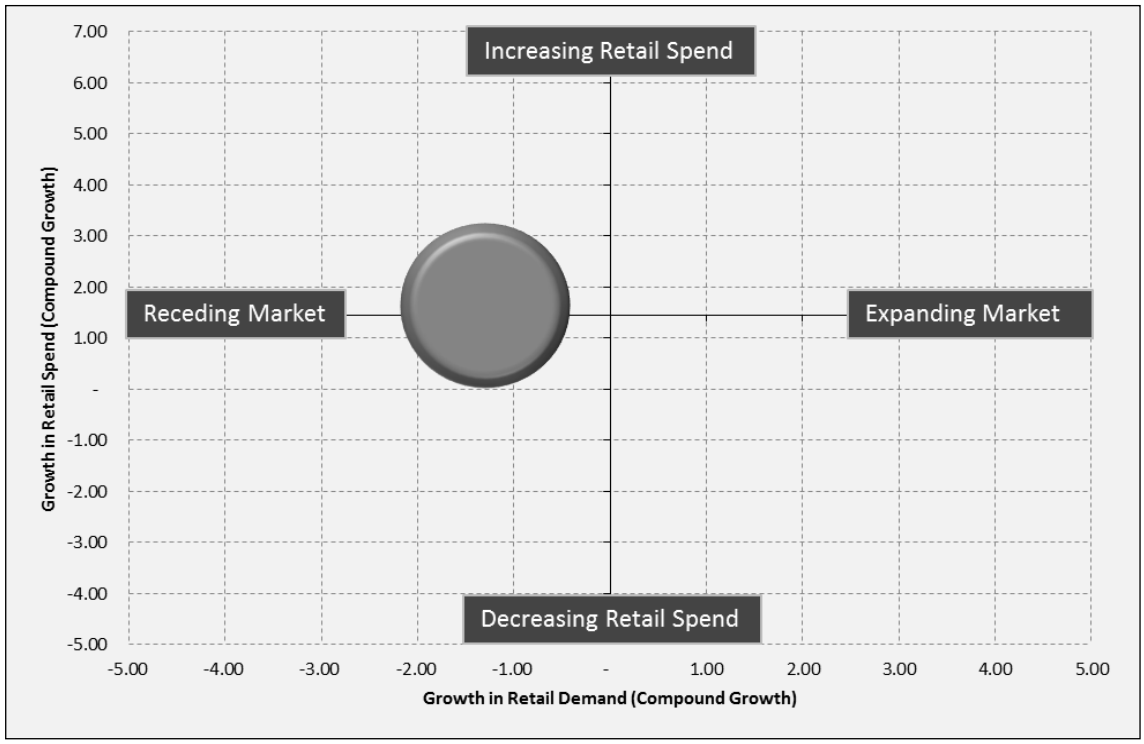
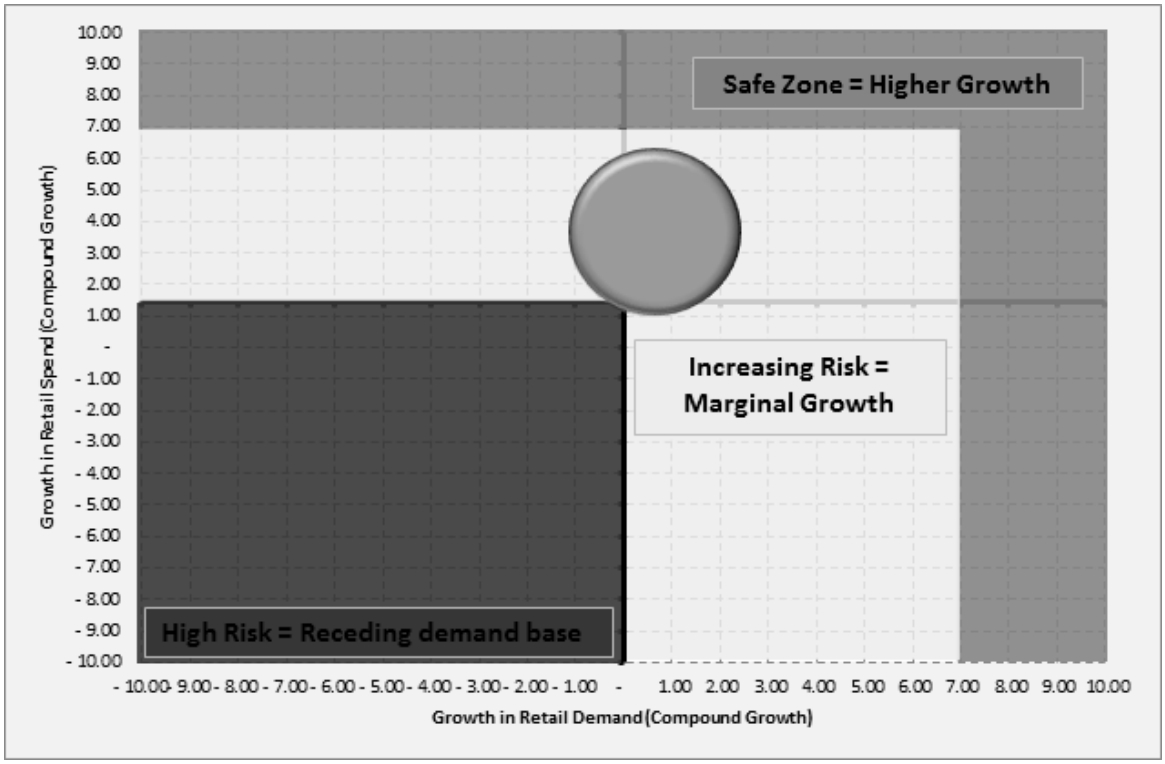


Figure 8.12: Acornhoek Growth Matrix



The suggested zonal overlays are summarised as follows:

1. *Safe Zone*. The desired result for a given centre would be to achieve market based annual rental escalations of at least 7-8%. This would locate a centre in the safe zone of the growth matrix.
2. *Zone of Increasing Risk*. Investor risk increases in this zone. Growth is positive, but constrained.
3. *High Risk Zone*. The High Risk Zone denotes market areas characterized by a receding long term demand base. The area profile and growth attributes will not be able to sustain minimum rental escalations of 7 – 8% *per annum* over the long term.

8.4.4. Interpretation of Findings

The MCSI measures the degree of saturation (i.e. latent potential) in a market area and, as such, complements the RDI in trade area analysis. The MSCI incorporates

economic variables to facilitate comparison between markets that may have differing currency and purchase power attributes.

In terms of the multi-criteria saturation index (MCSI), the difference between the purchase power parity (PPP) adjusted floor space *per capita* parameter and its unadjusted counterpart, reveal the extent to which markets could accommodate future shopping centre supply side densification. The difference between the two parameters highlight the inappropriateness of a comparison between markets with fundamentally different purchase power (and economic) characteristics, e.g. South Africa *versus* the United States.

It can be postulated that, in homogeneous markets the saturation index will reflect the general state of the market. Conversely, in developing markets characterised by heterogeneous conditions and dualistic economic development tendencies, potential will be localised in concentrated geographic pockets within cities and sub-regions. Historic growth observed in the floor space *per capita* parameter may offer additional insight into market conditions and development prospects. Comparatively lower levels of market saturation can be observed in South Africa, China and Malaysia.

Inter-regional comparison and selection are refined by means of trend surface mapping and more specifically the proposed demand density technique. The Demand Density Analysis for Mpumalanga Province in South Africa revealed visible spatial concentrations of demand density in administrative urban centres, industrial regions, mining towns and former homeland areas. A variety of GIS-based presentation techniques enabled the geographic localization of development opportunities for focused investigation.

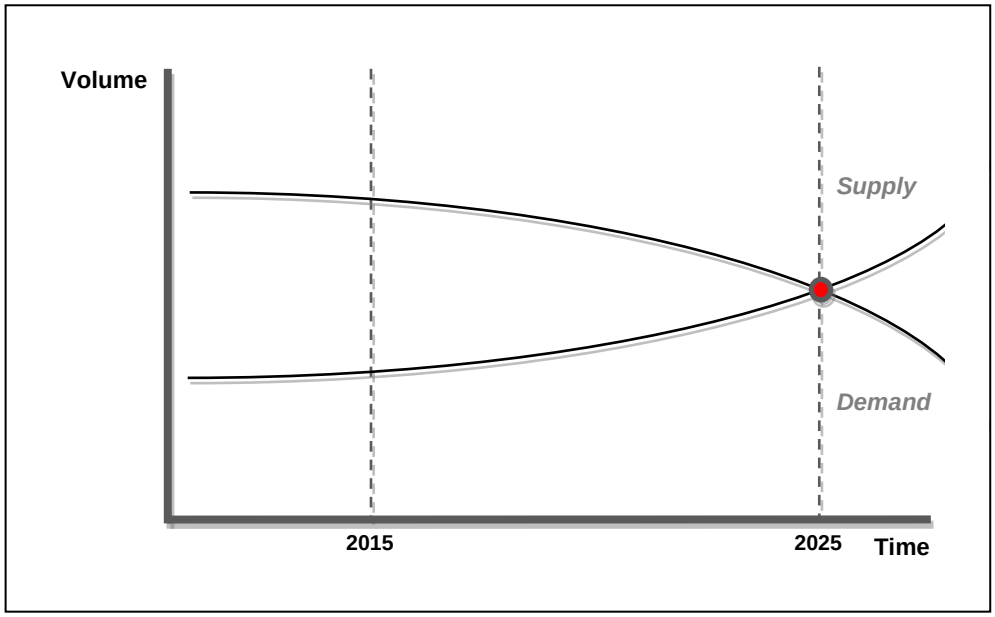
Intraregional comparison is facilitated by means of the Growth Matrix. Findings of the Growth Matrix indicated that the areas of Bushbuckridge and Acornhoek, which pose a similar quantum of demand potential, reveal different socio-economic growth attributes. The aggregate effect of diverging growth attributes render Acornhoek a marginally more appealing prospect for future retail sales growth and concomitant achievable rental escalations over time. Application of the

Growth Matrix articulates and ads dimension to the findings of traditional demand modelling approaches. Over and above the quantum of demand, the technique may inform an investor about aspects such as holding period of an asset.

The effects of decelerating income growth, rural to urban migration and a receding demand base over time have been masked by the artificial effects of government social grants and subsidies. The Growth Matrix reveals a gradually narrowing demand-supply gap in the greater Bushbuckridge area.

The effects of a systematically receding demand base and subsequent narrowing of the demand-supply gap over the medium to longer term is conceptualised in Figure 8.13.

Figure 8.13: Conceptual Demand-Supply Gap in a Receding Market



8.5. CONCLUSIONS

This chapter articulated three proposed techniques to supplement the Retail Diversification Index (RDI) and traditional demand modelling approaches. The Multi-Criteria Saturation Index (MCSI) neutralises the effects of purchase power disparities between regions and, as such, facilitates inter-regional comparison.

The Demand Density approach (DDA), in turn, is a GIS-based trend surface mapping technique that enables inter-regional comparison and area selection.

The effects of complex socio-economic growth attributes that underlie a particular market area may have a significant bearing on asset performance and sustainability. To this end, the Growth Matrix (GM) assists in articulating the impact of trade area growth attributes on asset performance. A combination of these techniques enhances area selection and decisions associated with asset holding periods.

The predictive powers of bid rent (or value) mapping – a GIS technique – as opposed to trend surface mapping, are regarded as limited and confined by the extent to which the base assumptions ascribe 'value' to certain locations over others. Bid rent mapping, which also falls prey to the base assumptions of central place theory (Chapter 4), maps value on the basis of location and accessibility parameter-based assumptions, as opposed to economics. As such, the subsequent *status quo* graphic representations and predictions of urban locational value remain subjective and unresponsive to the interaction between economic subjects.

Although every effort was made to enable the MCSI to be responsive to socio-economic differences between markets, the effects of the political economic environment was not directly factored. Aspects such as real estate ownership (i.e. property rights), or the absence thereof, may influence the appeal of a particular market to the investment fraternity, regardless of latent demand potential. The MCSI could potentially be refined to account for such risks.

Research could be expanded to cover a broader spectrum of countries. Longer term time series data collated over time could add further value to the techniques developed.

Comparatively higher floor space *per capita* parameters should prevail in urbanised areas and, conversely, lower floor space *per capita* parameters in rural areas. Refined research could assess the effects of, not only of varying income,

but also settlement density on floor space *per capita* parameters. The negative reinforcing phenomenon (Chapter 7) associated with parameter based methods could also be addressed – improvements to this method could possibly be effected by exploring the introduction of either a diminishing or increasing factor to adjust the parameter to more closely account for local idiosyncrasies, based on the growth attributes of the specific geographic market under investigation.

CHAPTER 9

PROPOSED IMPROVED METHODOLOGY

9.1. INTRODUCTION

In this chapter an improved methodology for the analysis of retail market analysis is proposed, based on insights gained through the research. The findings of a test for validity of the integrated methodology are presented.

9.2. THE HYPOTHESIS AND SPECIFICATION OF FUNCTIONAL RELATIONSHIPS

Steps in the specification of a quantitative model and a subsequent test for validity are outlined by *inter alia* Cassidy (1981, p. 19 – 30), Katz (1982, p. 3 – 9), Chiang (2004), Silbiger (2004, pp. 172 – 179), Levine *et al* (2011, pp. 554 – 593) (*ibid*, p. 25).

The hypothesis formulated (*ibid*) states that market demand (measured as square metre centre potential, total sales potential and/or sales per square metre, i.e. trading density) can be accurately estimated by factoring:

1. demographic attributes;
2. pertinent economic indicators;
3. supply-side structural attributes of the retail market; as well as
4. spatial distribution and intensity of demand; coupled with the
5. integrated effects of multiple growth attributes of the trade area;

as opposed to demographic attributes only. Isochrone based trade area delineation informs the assessment and accounts for access and transportation considerations specific to the South African market.

- **Refined Analogue Model**

In view of the above and the research presented in this thesis, the functional relationships between demand and supply variables in the refined analogue model are presented as follows.

- **Defining demand**

Retail demand is determined by consumer market attributes and are influenced by selected economic variables. The functional relationship that describes the expression of market demand is formulated as:

$$D_{ret} = f\{P_o; P_{\%}; S_Q; Y_R; Y_{\%}; E_R; C_p; C_S; S_f\}$$

where: –

P_o	=	Population size
$P_{\%}$	=	Population growth
S_Q	=	Existing quality or retail space
Y_R	=	Household income
$Y_{\%}$	=	Growth in household income
E_R	=	Household expenditure profile
C_p	=	Consumer preferences & perceptions
C_S	=	Consumer Tastes & Sophistication
S_f	=	Seasonality factors

In addition to population size and growth, income growth is specified based on local economic variables. The use of localised economic indicators accounts for local idiosyncrasies when adjusting for the time value of money.

Retail market supply side structure is already considered in the demand assessment: the quantum of supply influences (but not necessarily determines)

the localised trade area demand potential, as does retail market structure and degree of diversity (or, conversely, concentration).

- **Defining supply**

The quality, quantity and tempo of retail supply in a particular market environment is, in turn, determined by *inter alia* the following factors:

$$S_{ret} = f\{M_s; S_d; GLA_{ret}; V_{\%}; R; S_{ECS}; GGP; S_p; C_c; L_u; I_{a;} P; C_P\}$$

where: –

M_s	=	Market Saturation
S_d	=	Structural Diversity of the market
GLA_{ret}	=	Rentable floor area (quantity & quality)
$V_{\%}$	=	Retail Vacancy
R	=	Rent/m^2
S_{ECS}	=	Actual Competition: Effective Competitive Supply
GGP	=	Economic conditions – national and local
S_p	=	Speculative climate
C_c	=	Construction costs
L_u	=	Location & Surrounding land uses
I_a	=	Infrastructure availability
P	=	Government Policy
C_P	=	Comparable Projects & Markets
S_f	=	Seasonality factors

- **Coefficients**

In addition to the demand-supply functions, three coefficients have been added to the equation:

1. α = Analogue coefficient
2. β = Share Enhancer coefficient
3. γ = Income coefficient.

The analogue coefficient (α) is a quantitative variable, based on extensive research and a comprehensive time series database. The share enhancer (β) coefficient accounts for the impacts that may accrue due to aspects such as dual or multiple food grocer anchorage, consistent with the research findings of Du Toit and Cloete (2016 & 2017). The income coefficient (γ) accounts for the fact that Census-based income data may be understated for the area.

- **Refined Formulae**

The refined centre potential formulae are summarised in terms of the following three equations:

$$CP = D_{ret} * \alpha$$

$$(D_{ret})_{n+x} = ((P_o * P_{\%}) * (Y_R * Y_{\%} * E_R)) / T_D))_n * \beta * \gamma$$

$$\alpha = f \{S_C; M_s; S_d; C_P\}$$

where: –

CP	=	Centre Potential
D_{ret}	=	Trade area based demand for retail; Income (LSM) differentiated
α	=	Analogue Coefficient
β	=	Share Enhancer Coefficient
Y	=	Income Coefficient
n	=	Predefined period
n + x	=	Future point of market entry
P_o	=	Population size
$P_{\%}$	=	Population growth (factor)
Y_R	=	Household income
$Y_{\%}$	=	Growth in household income
E_R	=	Household expenditure profile

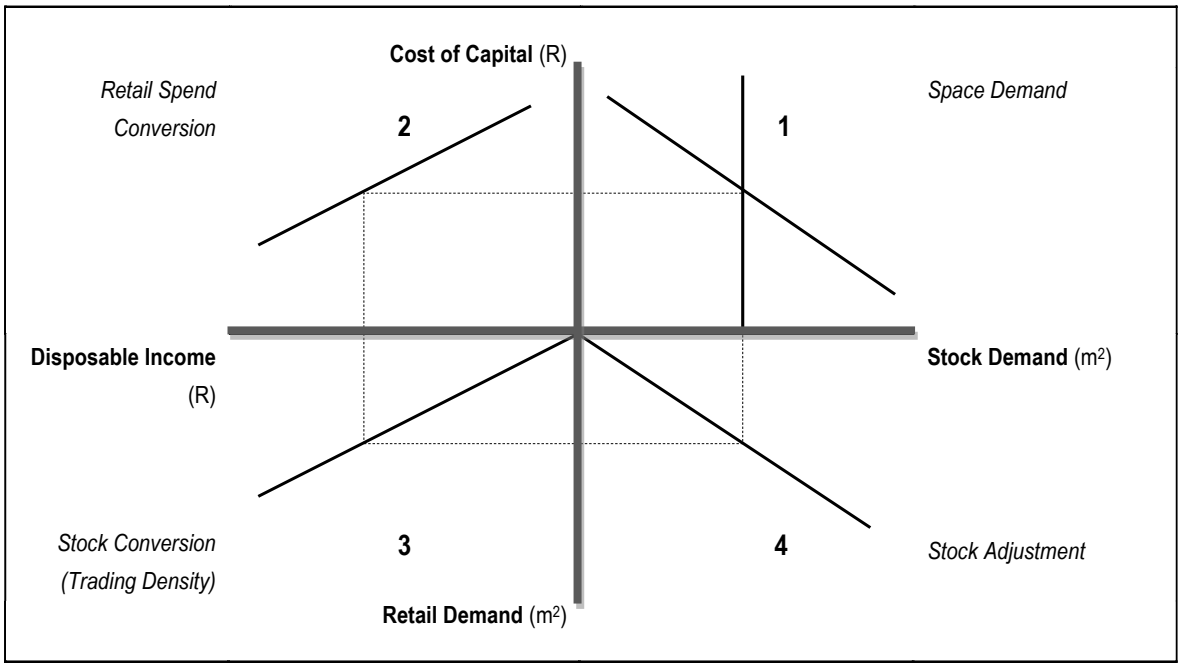
T_D	=	Benchmark Trading Density
C_p	=	Consumer preferences & perceptions
S_c	=	Effective Competitive Supply
M_S	=	Market Saturation
S_d	=	Structural Diversity of the market
C_P	=	Comparable Projects & Markets

The integrated demand relationships are also presented conceptually. The conceptual framework may also have educational value.

9.3. AN INTEGRATED, CONCEPTUAL FRAMEWORK FOR RETAIL MARKET DEMAND ANALYSIS

The theoretical and practical research presented in this thesis provides a basis for the development of a conceptual framework for retail demand market analysis (Figure 9.1).

Figure 9.1: Conceptual Framework for Retail Market Demand Analysis



Modelling Functions
Quadrant 1: D = f(economy, growth in consumption expenditure) **Quadrant 2:** Y_r = f(economy, fiscal policy, monetary policy) **Quadrant 3:** D = Y_r / TD **Quadrant 4:** S = D
where: – **Y** = Aggregate Community Income **Y_r** = Retail Spend (or disposable income) **D** = Retail demand (m^2) **TD** = Trading Density (R/m^2/annum) **S** = Supply (adjusted to new demand threshold)

The framework proposed is conceptualised as a quadrant model that provides for comparative static analysis by tracing the effects of economic variables on the consumer market, through the quadrants to the retail market – and, in turn, back to the economy.

Quadrant 1 reflects the economic equation in terms of an elastic demand curve and inelastic supply curve. Quadrant 1 incorporates endogenous and exogenous economic variables, including *inter alia* inflation, cost of capital (interest rates), growth in disposable income and final consumption expenditure. Interest rates, in turn, affect consumption expenditure and the levels of disposable income and growth, which effects can be traced to **Quadrant 2**. Consumer income and retail expenditure levels are determined in Quadrant 2.

In **Quadrant 3**, consumer expenditure is converted to retail demand by means of a trading density calculation. **Quadrant 4** is the stock adjustment quadrant. In Quadrant 4, adjusted market demand is transmitted back to Quadrant 1 – in which

an adjustment in the supply of retail stock is effected, thereby completing a 360˚ rotation around the four quadrants.

9.4. A TEST FOR VALIDITY

Market analysis is a scientific process, but does not necessarily constitute an exact science. The development and application of a test for validity needs to remain cognisant of market complexity and the fact that shopping centre performance is influenced by market-related factors as well as by factors such as design, tenanting and centre management.

A suitable measure of the predictive capabilities of an instrument is the difference between actual and forecast sales performance of an asset. To this end, a selection of twelve (12) centres in South Africa are identified and analysed in the test for validity. The centres were selected on the following basis:

1. An initial market assessment and sales forecast must have been performed for the development;
2. Sufficient time must have lapsed to allow for completion of the development (i.e. construction), the project to become operational and for sales to mature;
3. In addition to the above, the larger part of the sample should ideally comprise contested developments, i.e. an independent report compiled by an expert in which the demand and sales forecasts made by this author, are criticised on account of methodology;

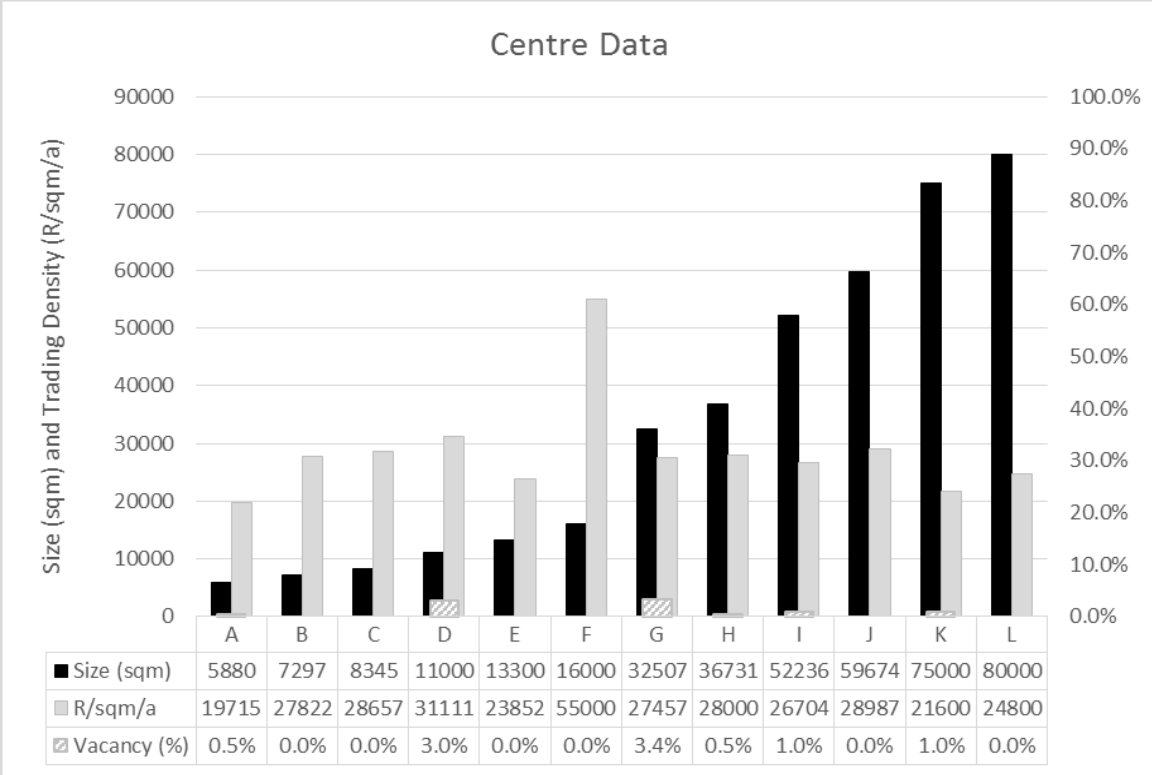
A limited number of unopposed developments for which the same approach was followed, are incorporated for purposes of comparison and to broaden the sample.

The sample of centres available for analysis was influenced by the willingness of shopping centre owners to disclose confidential information. Actual sales figures utilised in the test for validity were disclosed by owners on condition that centre names are not to be publicised. The sample subjects (Figure 9.2) analysed in the test for validity include:

1. four 4 convenience centres (measuring <12 000m^2);
2. a big box retail outlet (measuring between 2 000m^2 and 15 000m^2);
3. a value centre (measuring between 10 000m^2 and 50 000m^2);
4. a community centre (measuring between 12 000m^2 and 25 000m^2);
5. a small regional centre (measuring between 25 000m^2 and 50 000m^2); and
6. four regional centres (measuring between 50 000m^2 and 100 000m^2).

The centres are geographically distributed between five provinces (Gauteng, Kwazulu-Natal, Limpopo, North West and Mpumalanga) and cover a combination of urban and rural (i.e. tribal/traditional) markets (both inland and coastal).

Figure 9.2: Summarised centre data for the Sample of Twelve Centres



	A	B	C	D	E	F	G	H	I	J	K	L
Size (sqm)	5880	7297	8345	11000	13300	16000	32507	36731	52236	59674	75000	80000
R/sqm/a	19715	27822	28657	31111	23852	55000	27457	28000	26704	28987	21600	24800
Vacancy (%)	0.5%	0.0%	0.0%	3.0%	0.0%	0.0%	3.4%	0.5%	1.0%	0.0%	1.0%	0.0%

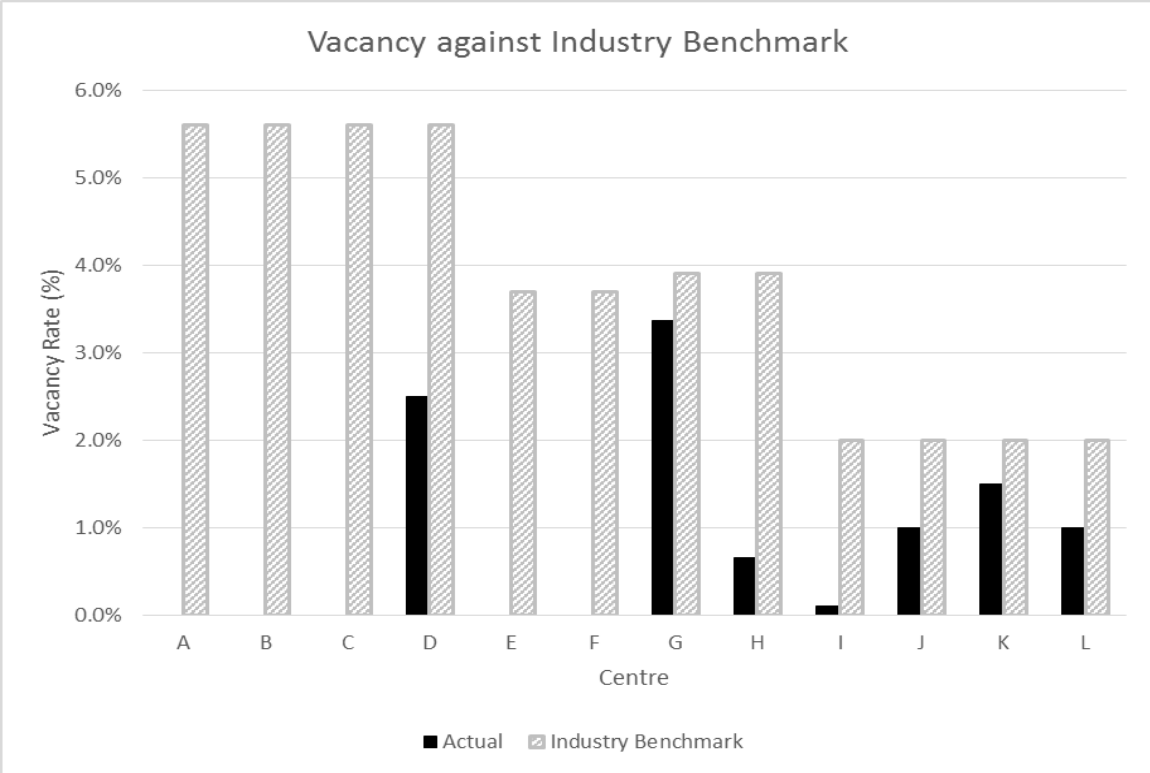
Source: Flanagan (2017), Beyers (2017), Kriek (2017), Pickard (2017), Baladakis (2017)

The emphasis of the assessment is on calculating the percentage variance between actual sales and forecast sales for a particular year – and not on actual monetary sales values for all centres in the same year. A direct timeline comparison is not required and, accordingly, accounting for the time value of money is therefore not a prerequisite in as far as the test for validity is concerned.

Market idiosyncrasies, including total market income, disposable income levels and associated purchase power variances are accounted for in the method. Performance figures are therefore comparable without further time value of purchase power parity adjustments required.

Shopping centre data for the respective centres in the sample are summarised in Figure 9.2. A comparison of centre vacancy rates against the industry benchmark per centre type is provided in Figure 9.3 and Table 9.1. Results of the test for validity are summarised in Figure 9.4 and Table 9.2.

Figure 9.3: Vacancy rate comparison for the Sample of Twelve Centres



Source: Ibid, 2017

In five instances (Centres A, B, C, E & F) vacancies were zero and in four other instances vacancies were reported to be 1% or less (Centres H, I, J & L). Low vacancy, although not an absolute indicator of analytical and predictive accuracy, serves as proxy for centre performance. Centre performance is also influenced by factors such as design, tenanting, management and market research. The significance of high quality, accurate market research was highlighted in Chapter 1. The sample centres were all developed by reputable companies and aspects

such as design, tenanting and management were considered to be of similar quality.

Table 9.1: Vacancy Rate Comparison for the Sample of Twelve Centres

Centre	Actual[a]	Industry Benchmark[b]	Std Dev.P	Std Dev.S
A	0.0%	5.6%	-100.0%	0.03960
B	0.0%	5.6%	-100.0%	0.03960
C	0.0%	5.6%	-100.0%	0.03960
D	2.5%	5.6%	-55.4%	0.02192
E	0.0%	3.7%	-100.0%	0.02616
F	0.0%	3.7%	-100.0%	0.02616
G	3.4%	3.9%	-13.6%	0.00375
H	0.6%	3.9%	-83.4%	0.02300
I	0.1%	2.0%	-95.0%	0.01344
J	1.0%	2.0%	-50.0%	0.00707
K	1.5%	2.0%	-25.0%	0.00354
L	1.0%	2.0%	-50.0%	0.00707

Source: a – Flanagan (2017), Beyers (2017), Kriek (2017), Pickard (2017), Baladakis (2017)

b – SAPOA, 2016

An appropriate measure of accuracy for predictive instruments in retailing is the measured difference between forecast sales performance and actual sales performance achieved by an asset. The individual and aggregate differences between forecast and actual sales for the sample of twelve centres are summarised in Table 9.2 and Figure 9.4. The unit of measurement is the trading density, which is measured as sales (i.e. currency, in this instance Rand) per square metre per annum that a particular centre trades at. The last column denotes the year for which the comparison is conducted.

Table 9.2: Actual *versus* Forecast Sales (Trading Density) Comparison for the Sample of Twelve Centres (R/m^2/a)

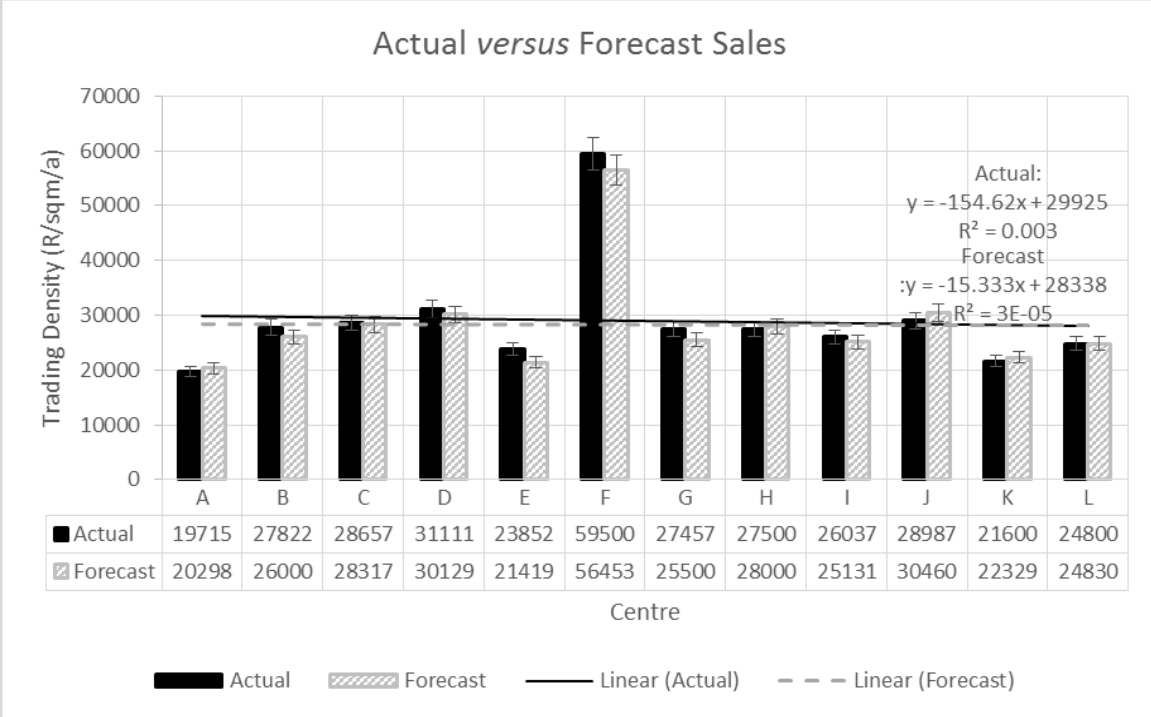
Centre	Actual	Forecast	Difference	Year
A	19 715	20 298	-2.9%	2004
B	27 822	26 000	7.0%	2012
C	28 657	28 317	1.2%	2011
D	31 111	30 129	3.3%	2015
E	23 852	21 419	11.4%	2012
F	59 500	56 453	5.4%	2013
G	27 457	25 500	7.7%	2012
H	27 500	28 000	-1.8%	2017

Centre	Actual	Forecast	Difference	Year
I	26 037	25 131	3.6%	2015
J	28 987	30 460	-4.8%	2017
K	21 600	22 329	-3.3%	2013
L	24 800	24 830	-0.1%	2017
Average			**4.4%***	
Std Deviation			**5.024%**	

Source: *Calculations based on Flanagan (2017), Beyers (2017), Kriek (2017), Pickard (2017), Baladakis (2017)*

**Note:* *Adjusted for negativity*

Figure 9.4: Actual *versus* Forecast Sales (R/m²/a) Comparison for the Sample of Nine Centres



The market analyses for eight (8) of the twelve centres (A, C, D, F, G, I, J & K) were the subject of independent scrutiny, critique and cross-examination at hearings and tribunals by specialists who deploy traditional demand modelling techniques. In each instance, the critique was stated that demand had been overestimated and that the market was saturated, on account of which the development would not be sustainable.

The markets in which these centres are situated are characterised by above average floor space *per capita* ratios which, by themselves, are not accurate

demand indicators. Floor space *per capita* ratios are not income sensitive and also do not reflect trade area in and outflow dynamics. In contrast, the RDI values of the selection of towns (Table 7.8) are indicative of a less diverse retail structure, on account of which it can be postulated that future retail sector growth and diversification pressures are probable. Local growth indicators affirm this notion.

The possible effects of externalities on centre performance were identified and isolated. The selected centres are owned by reputable and seasoned developers / investors who employ equally experienced professional teams (architects, engineers, leasing agents, etc.). It was therefore assumed that these aspects are of equal/similar standard in the sample of centres analysed (i.e. these factors are not considered to be key differentiators in the performance of centres analysed). In each instance, the comparison is based on sales figures for the third year of operations to allow for market stabilisation (Table 9.2).

All other factors being equal, the average variance between actual and forecast sales for the sample is 4.4%, with a high of 11.4% and a low of 0.1% (Standard Deviation: 5.024%). Centre E is situated in a rural/tribal area. The variance in the performance of centre E (11.4%) can be attributed to *inter alia* under-reported census income generally observed in these areas, unrecorded informal sector activity, the influence of remittances (i.e. family members sending money back home from the urban areas), income generated from backyard rental units, coupled with the effects of government subsidies and social grants. If income were to exceed a certain level, the beneficiary would no longer qualify for the subsidy. In this manner, subsidy dependence would appear to have inadvertently been incentivised. According to the 2011 Census (Stats SA, 2013) 77.7% of the population in Limpopo Province reside in tribal areas and the unemployment rate in tribal areas is 51.1%, compared with 23.8% in urban areas. Retail sales data for shopping centres in tribal and township areas continue to exceed the norm and highlights the problems associated with Census-based income data in general and, more specifically, the use of Census-based income data as quality of life indicator and to calculate the Gini Coefficient (as measure of income inequality). Significantly more pronounced differences have been observed in other tribal and township areas, including Mamelodi (DEMACON, 2016 & Fernridge, 2016),

Soweto (DEMACON, 2007, 2010a, 2010b & 2015b) and Katlehong, Tokoza and Vosloorus (DEMACON, 2009a, 2015c & 2017).

The R^2 values (Figure 9.4) are not a meaningful indicator of accuracy due to the effects of the outlier, centre F – a big box trader with above par trading density attributes compared with similar sized centres. The negligible observable delta between the actual and forecast trend line is an indication of predictive accuracy: a variance of 4.4% between forecast and actual sales was calculated for the sample of twelve centres.

In five (5) instances, forecast sales were higher than actual sales achieved by an average of 2.6%. In the remaining seven (7) instances, actual sales exceeded forecast sales by an average of 5.6%.

The small variance between forecast and actual sales performance observed is indicative of descriptive and predictive analytical accuracy – descriptive in terms of prevalent market conditions and predictive in regards to future sales and/or demand estimations.

9.5. CONCLUSIONS

This chapter translated the research findings and insights gained into an improved methodology for retail market analysis. The proposed improved methodology includes refinements made to the analogue model, the multi-criteria saturation index (MCSI), the retail diversification index (RDI), demand density analysis (DDA) and growth matrix (GM). A test for validity was developed, based on a comparison of actual *versus* forecast centre sales.

Based on the negligible margin of difference between actual and forecast sales for the sample of centres (4.4%), it is concluded that the integrated method proposed is empirically sound, affords a high degree of statistical accuracy and should ad substantive insight to retail trade area analysis and demand modelling.

The accuracy of sales forecasts enabled by the application of this methodology should aid the quality of investment decisions made, based on factors that are not revealed through the application of traditional techniques. The improved methodology, including proposed techniques, have similarly been applied to advise investors not to pursue certain investment opportunities.

CHAPTER 10

SUMMARY AND DIRECTION FOR FURTHER RESEARCH

10.1. INTRODUCTION

Chapter 10 summarises the most pertinent research findings presented in this thesis and offers direction for further research.

10.2. SUMMARY OF MAIN FINDINGS

The main objective of this thesis is to make a substantive and meaningful methodological contribution to the field of retail market studies in South Africa. The techniques developed as part of the improved methodology provide insight to retail trade areas that is not afforded by traditional techniques. The improved methodology proposed in this thesis should therefore enhance the quality of retail trade area analyses and development/investment decision making.

The research was guided by 10 research questions (Chapter 1, paragraph 1.2.5) and primarily set out to establish whether the theory of central places accurately resembles the manner in which interaction between economic subjects finds expression in the spatial realm. Findings hold important theoretical, decision making and policy implications.

The research findings illustrated that, at a basic level and at the cost of oversimplification, competitive forces between economic subjects create upward real estate price stimuli in desirable locations. Competitive forces yield higher prices in certain locations, compared with other locations which are perceived to be relatively less desirable and attractive. Since Adam Smith observed the notion of differentiated land rent in the 1700's, urban systems have progressed into

complex environments that are no longer characterised by a single dominant core. Urban growth and development have a tendency to intensify nodal distribution and configuration over time. Diseconomies of concentration (increasing costs with greater concentration) contribute towards a diminished need for daily interaction between economic subjects situated on the urban periphery *viz.* those located in the erstwhile urban core (primate CBD). Externalities such as climate, topography, culture, policy and technology also influence urban form.

Interaction between economic subjects finds expression in space and time. Changes that occur in the way economic subjects interact (as well as the timing of when they interact) have a marked influence on the configuration of urban (and rural) environments. The traditional concepts of 'a market' and 'market interaction' have entered the realm of virtual space. Advances made in communications technology, coupled with the effects of diseconomies of concentration, flexible transportation options, progressive reintegration of work and home in society and evolving consumer behaviour (including internet shopping) are some of the factors that have enabled economic subjects to (re)shape their economic behaviour as well as the subsequent configuration of urban environments. In the process, initial theories, models and subsequent policies that set out to explain, predict and even govern human behaviour in a spatial context have become obsolete. The questionable foundation of certain early theoretical concepts, which continue to permeate policy and planning, intensify the consequences of such interventions. Some of these consequences are intended, others may be unforeseen and unintended.

The extent and complexity of factors that influence the behaviour of and interaction between economic subjects affirm that decision making processes extend beyond simplistic distance and size considerations (and correlations). The research presented in this thesis revealed fundamental errors in (i) the theory of central places, (ii) the mathematical relationships developed to support the theory and (iii) the relationship between theory and practice as progressed by, in particular, Berry. Christallerian principles of central place theory are still widely accepted as conventional wisdom and remain influential in theory and practice.

The economic frameworks presented in Chapter 2 articulate capital and asset market complexities that characterise the interaction between economic role players. Market realities contradict the overly simplistic assumptions of perfect competition. Market complexities are characterised by imperfect market knowledge, imperfect competition and asymmetric resource distribution which contradict the Christallerian notion of neatly organised spatial patterns comprised of perfect hexagons, triangles and a perfectly predictable order of central places.

Central place theory informed a lineage of genetic descendants, including urban planning and development theories, models, hierarchies and policies. On account of hereditary attributes, these instruments are not responsive to market realities. The aforementioned economic frameworks assist in describing the interaction between economic subjects, although there are limitations in respect of the timing of such interactions and also in regards to the ability of these frameworks to mimic spatial responses. Supplementary techniques are required to overcome these limitations. The quantifiable attributes of the relationships/interactions between economic subjects do render these processes capable of being modelled (in space and time) by means of descriptive and predictive instruments.

Following an evaluation of the origins and abilities of traditional trade area analysis approaches (and associated demand modelling techniques), these conclusions are drawn:

1. traditional approaches to trade area analysis are heavily infused by early theoretical thinking, including central place theory;
2. the theory and underlying principles of central places are flawed and devoid of substantive fact;
3. traditional approaches to trade area analysis are unresponsive to market realities and dynamics;
4. traditional approaches do not account for *inter alia* the complex combined effects of underlying trade area growth attributes on asset performance;
5. in addition to pure demographics, an array of capital and asset market factors and processes influence the quantum of real estate demand and, ultimately, asset performance.

In response to the limitations of traditional demand modelling approaches, four specific trade area analysis techniques are proposed in this thesis. The proposed techniques offer a number of advantages. These techniques:

1. broaden the scope and depth of market analysis to more comprehensively account for the complex interaction between the layers of socio-economic, structural and spatial market dimensions;
2. add value and depth to the relatively limited specification and corresponding confined outcome of traditional approaches;
3. can be successfully developed to add meaningful insight and understanding to aspects of market structure, market depth and degree of saturation, the spatial manifestation of demand and the intricate and hidden effects of market growth variables on asset performance; and
4. can be augmented with geographic information systems (GIS) technology – albeit with caution, as elements of central place theory, bid rent modelling and gravitation modelling are embedded in GIS technology.

In summary, the test for validity revealed that the proposed techniques accurately model dimensions of demand that traditional techniques are incapable of modelling: traditional approaches yield a single dimensional demand value which does not account for market structure, saturation, diversification, spatial distribution of demand and the effects of intricate trade area growth complexities on asset performance.

The four techniques were developed to form part of an improved and integrated methodology to address the limitations of traditional approaches. The proposed techniques are the Multi-Criteria Saturation Index (MCSI), the Retail Diversification Index (RDI), Demand Density Analysis (DDA) and Growth Matrix (GM). These techniques can be applied individually or as components of an integrated method.

The improved methodology should enhance the quality of decision making by the developers and owners of shopping centres. Retailers (i.e. tenants) also stand to benefit from the insights offered by these techniques. Although the research

focused on retail, the findings and recommendations contained in this thesis may also find application in other real estate market sectors – locally and abroad.

It is concluded that the research successfully and comprehensively addressed the research questions set out in Chapter 1, including traditional market analysis techniques, the foundational theory, demand and supply complexities and possible analytical responses to these complexities. The research contained in this thesis is valid within the parameters and assumptions stated and in so far as these relate to the economic, social, cultural, political and financial structures of the country at the time.

10.3. DIRECTION FOR FURTHER RESEARCH

The research findings presented in this thesis articulate emerging socio-economic dynamics in an exceedingly complex South African landscape. These socio-economic dynamics are influenced by government interventions aimed at altering the shape of urban and rural environments and economies. The intricacy of the changing socio-economic landscape was found to be only partially reflected in conventional statistics.

Traditional market profiling and demand modelling approaches do not offer an appropriate response to the aforementioned dynamics. Incomplete and inaccurate market knowledge affects public and private sector decision making. The analytical and predictive instruments developed and presented in this thesis are designed to be responsive to South African market conditions, including:

1. large concentrations of rural communities characterised by, on the one hand decelerating population growth and, on the other, relatively uncompetitive retail (commercial) supply-side environments;
2. significant and largely unmeasured (as well as underestimated and undervalued) informal sector activity;
3. under-reported census income data on account of numerous factors listed (*ibid*), as well as government's social wage to benefit certain communities;

4. high sustained rates of rural to urban migration;
5. comparatively high economic and population growth rates observed in certain small town economies that are dominated by extractive mining activity and/or industrial clusters – economies (and appreciable real estate assets) that remain vulnerable and at risk of commodity price fluctuations and product substitution – compare Crowley (2017), McKay (2017) and Mwareya (2017);
6. rapidly expanding suburban middle class environments;
7. above par asset and income appreciation in former township markets (Second Economy areas) – more than double the growth rate recorded in SA's major metropolitan regions (Loos, 2016 & 2017); and
8. dual economy (formal *versus* informal), dual political and land tenure systems (democracy and freehold ownership in certain areas *versus* tribal and traditional systems in other areas), as well as dual land use management, municipal valuation and taxation systems create a multitude of complex (intended and unintended) consequences.

In view of the research findings presented in this thesis, coupled with the socio-economic realities, opportunities for further research include:

1. **Mode of Transport and Cultural Preferences**. The research presented in this thesis is based on South African markets. In spite of systematically increasing government investment in public transport infrastructure, the aspiration towards private vehicle ownership remains high. These realities might necessitate an adaptation of isochrone-based transport principles in the model if and when applied to other countries. Further research in this regard – and more specifically the effects on shopping habits and patterns – could be conducted. Similarly, the influence of seemingly diverging (though possibly interwoven) aspects such as cultural preferences and the effects of climatic conditions on travel and shopping patterns could be researched. As such, the research could extend into markets beyond South Africa.

2. **Relevance of the Refined Techniques for other Real Estate Sector**. The refined techniques presented in this research contain principles and concepts relevant to other real estate market sectors, including offices, industry,

residential, tourism, healthcare and education. Each sector is characterised by unique and possibly overlapping demand and supply drivers. The research could be extended to test the validity of the identified techniques in these sectors and may possibly lead to the development of supplementary techniques in response to unique sectoral drivers.

3. **Land Tenure, Economic Growth and Real Estate Investment**. Complex dual economic, political and land tenure systems prevail in the country despite various transformations, legislative and otherwise, since 1994. The impact of the tribal system on lower rates of socio-economic development, economic growth, job creation, transformation and taxation should be researched. Persistently high unemployment rates in tribal areas (Chapter 9) suggest that the tribal system in incapable of responding to the economic growth and job creation challenges facing the country. While ordinary tribal members are reported to live in poverty and unemployment, the seven (7) monarchs cost the tax payer approximately R1billion *per annum* (https://businesstech/co.za/news, 2015) – the opportunity costs to the economy and tax payer exceed this number. The extent of tribal areas in SA (also known as traditional areas, trust areas or 'the villages') was influenced by the tribal wars (Mfecane / Difaqane) and their existence predate Apartheid (Du Toit, 2018a & b). Traditional areas in SA accommodate 15 million people on 16.9 million hectares of land (*ibid*). These areas are predominantly characterised by subsistence and informal economic activity; high unemployment rates (50-60%); low to no levels of formal planning; are predominantly not covered by municipal valuation rolls or other taxation systems. Traditional areas therefore make a negligible contribution towards the fiscus (*ibid*). In the absence of any meaningful land reform measures in these areas since 1994, people in tribal areas are still precluded from gaining access to title (i.e. freehold land ownership). In terms of Mooya (2016) traditional/tribal areas would, in terms of formally registered real estate transactions, constitute 'thin' markets. The impacts to be quantified extend beyond the relatively limited contributions made by real estate development in these areas since 1994 (primarily shopping centres, public schools and public healthcare facilities) and could also quantify and evaluate the

opportunity cost of tribalism – i.e. investment opportunities and associated taxable income that have not materialised (i.e. latent potential) due to the complex restrictions (economic, social and other) that are inherent to the tribal system (see e.g. Dladla & Cloete, 2008, Puana *et al*, 2017 and Hooghiemstra & Cloete, 2015). Traditional / tribal areas should fulfil a far greater role in economic and land reform in SA. This topic offers a myriad of research opportunities.

4. **Understated income in Second Economy Areas**. Community dynamics and complexities render income statistics for township and rural communities, as reported by Statistics South Africa, fundamentally incomplete and questionable. According to the Institute of Race Relations (2017), in 2016 there were more people receiving social grants (17.1 million) than there were people with jobs (15.5 million) in SA. Extensive research is required to assess the magnitude, impact and sustainability of the government induced social wage on income – a demand-side intervention. Reasons for and the quantum of under-reported income data in specific geographic markets could be researched. Research findings by *inter alia* Prahalad (2002), Du Toit & Neves (2007), Mahajan (2009) and Loos (2016 & 2017) reveal diverging views, but articulate fundamentals that could be researched to improve decision making and policy formulation.

5. **Income *versus* Lifestyle considerations and the Gini Coefficient**. Income *per se* is not an accurate quality of life indicator. A disconnect can be observed between aspects such as reported income, house prices and retail sales in SA's lower income township and rural communities (Second Economy areas). Comprehensive, multi-layered primary research is required to assess functional differences between e.g. official census-based income data, SAARF (South African Advertising Research Foundation) data on Livings Standard Measurement (LSM) and a possible new SEM (Socio-Economic Measure) system. Income inequality expressed in terms of the Gini Coefficient remains one of the most stylised facts in development economics. The various sources of income, the extent of under-reported income data, the impact on planning, policy, taxation and real estate offers significant scope

for further research. Myths about income inequality (see e.g. Forbes, 2014) could be researched. The aspects outlined in the first three research topics are interrelated.

6. **Food Grocer Sales Impacts**. The research on dual and multiple *versus* single food grocer anchored centres focused on centre performance and not on assessing the business sales impacts on an existing food anchor after a second or third (or even a fourth) food grocer anchor was introduced to the same centre. Further research could be conducted to assess such impacts, including the sales claw-back (i.e. recovery) effect. The influence of qualitative aspects such as centre age, appearance, design, parking and access on retailer performance could be researched as integral components of such an assignment. The research could be extended to identify and analyse similar synergies in/between other merchandise categories.

7. **Revised SA Retail Hierarchy**. A series of complex research topics potentially emerge from this theme. Christallerian principles are firmly entrenched in SA retail hierarchy documents and town planning derivatives. The extent of informality in general and the less formal retail sector in particular are not reflected. The scope for research is extensive and diverse, and could commence with research on the price competitiveness of localised (less formal) retail traders and the effectiveness to which local communities are served by such enterprises. The benefits and disadvantages associated with various taxation options could be investigated, including the beneficial impacts of reduced company and personal income tax *versus* a higher value added tax (Vat) rate. A rethink of conventional retail hierarchical principles is required and scope exists for a lateral solution. Guidelines for application and interpretation of such a new hierarchy is required. The defunct theoretical base of the SA hierarchy in particular warrants a fundamental rethink of content and approach. The SA hierarchy incorporates LSM terminology and quantitative indicators which would probably also have to be revised in accordance with emerging thinking on a proposed new retail classification system, coupled with the revised LSM or SEM system.

8. **Mega Projects proposed by the Department of Human Settlements**. The Gauteng Province Department of Human Settlements (2017) and Gauteng Partnership Fund (GPF) conceived the Mega Cities Programme in terms of 800 000 new low cost and affordable houses will be built in 30 developments spread throughout South Africa's Gauteng Province. Developments will typically be scaled at 10 000 – 25 000 units per development and is said to include ancillary commercial uses and social amenities. Many of the proposed locations are on or towards the urban periphery. Due to the scale, location and composition of these predominantly subsidised mega projects, the prolonged impacts (should the Department of Human Settlements persist) on urban form, the economy, urban public finance, the social fabric of society (including race relations) could be profound. Independent research on aspects such as economic and real estate impacts, sustainable project configuration, taxation considerations and funding models to leverage, among other factors, the power of informality is required. A new, sustainable model for affordable urban development could be proposed.

9. **Impact of New Real Estate Funds**. The Public Investment Corporation (PIC) in SA has embarked on a process of economic empowerment and transformation through the funding of new, exclusively African Black owned real estate development funds. The sustainability of economic transformation and empowerment through the mechanism of preferential funding rates for fledgling real estate development companies owned exclusively by certain racial groups could be researched. The research focus could include international trends and lessons learnt, as well as implementation models to enhance economic sustainability, social equality and race relations. Simultaneously, models to transform the tribal system into a viable, productive and rateable economic system could be researched. Transformation of the tribal system as mechanism to give effect to land ownership could also be investigated. The research could explore such an approach as possible alternative to the expropriation of economically productive land, in order to circumvent the destabilising and displacement effects caused by expropriation.

10. **Improvements to increase the robustness of *Per Capita* based Methods**. Albeit that *per capita* parameter based methods tend to be simplistic, these methods may yet have a role to fulfil and there could be merit in refining both the method of deriving the parameter(s) and, by implication, also the quality of parameters. The parameter value is a function of geographic setting as well as the development stage of the market area under consideration. It can be postulated that comparatively higher floor space *per capita* parameters should prevail in urbanised areas and, conversely, lower floor space *per capita* parameters in lower density rural environments. Parameters should also reflect market evolution and progression over time. Refined research could assess the effects of varying income profiles and settlement densities on floor space *per capita* parameters. The negative reinforcing phenomenon (identified in Chapter 7) associated with parameter based methods could also be investigated in more detail. Improvements to this method could possibly be effected by exploring the introduction of either a diminishing or increasing factor to adjust a parameter to more closely account for local idiosyncrasies, based on the unique growth attributes of the specific geographic market under consideration.

11. **Trend Surface Mapping**. Further research could be conducted to develop improved methods for spatial analysis and graphic representation of market indicators and results of analytical techniques, including the methods presented in this thesis. The predictive powers of Christaller-like tessellations and bid rent mapping are considered to be limited. Similarly, on account of symmetric tendencies and a pure mathematical inclination, the author considers further research on the Christaller equations of limited use. The capabilities of bid rent mapping in particular are confined by the extent to which the base assumptions attribute value to certain locations on the basis of location and accessibility, as opposed to economic considerations. Further research could explore the possibilities of fractal geometry, although the interaction between human and natural systems may, in all probability, not necessarily result in a geometrical outcome. Fractal geometry could be applied to the analysis and comparison of hierarchies and structures observed in mature markets (e.g. metropolitan regions and cities) in relation

to hierarchies and structures (or the absence thereof) in less developed environments (e.g. South Africa's tribal / traditional areas). As such, at a basic level it could serve to create an understanding of market evolution (i.e. progression) from a geometric perspective, although the accuracy of its spatial predictive capabilities may be limited by inconsistencies and idiosyncrasies in natural systems. The possible integration of approaches and subsequent predictive capabilities could be explored and tested.

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ANNEXURE A

SHOPPING CENTRE SUPPLY FOR SELECTED AREAS – COMPARATIVE ANALYSIS

Table A.1: Retail supply – Nelspruit

	Shopping Centre Name	Classification	Size (m^2 GLA)
1	Kruger Mpumalanga International Airport	Airport Retail	500
2	Nelspruit Centre	Local Convenience Centre	1 060
3	Ellerines Centre – Nelspruit	Local Convenience Centre	1 147
4	Truworths Centre – Nelspruit	Local Convenience Centre	1 920
5	Henshall Street - Nelspruit	Local Convenience Centre	2 141
6	Steiltes Shopping Centre	Local Convenience Centre	3 650
7	Nelcity	Neighbourhood Centre	5 112
8	West End	Neighbourhood Centre	5 370
9	Orchard Shopping Centre	Neighbourhood Centre	5 564
10	Ekukhanyeni Centre	Neighbourhood Centre	6 696
11	Kings View Shopping Complex	Neighbourhood Centre	6 988
12	The Village – Nelspruit	Neighbourhood Centre	7 158
13	Promenade Shopping Centre	Neighbourhood Centre	7 275
14	Tarentaal Centre	Neighbourhood Centre	8 035
15	Pick n Pay Centre – Nelspruit	Neighbourhood Centre	8 057
16	White River Square	Neighbourhood Centre	8 200
17	Shoprite Centre - Nelspruit	Neighbourhood Centre	9 390
18	Riverside Value Mart	Value Centre	9 751
19	Lowveld Lifestyle Centre	Speciality Centre	11 170
20	Sonpark Shopping Centre	Neighbourhood Centre	11 725
21	kaNyamazane Shopping Centre	Community Centre	13 844
22	Mbombela Shoprite Centre	Community Centre	13 934
23	Besterbrown Shopping Centre	Community Centre	14 121
24	The Crossing Centre	Community Centre	14 162
25	The Grove – Riverside (212)	Value Centre	14 882
26	Makro – Nelspruit	Value Centre	17 000
27	Nelspruit Plaza	Community Centre	18 885
28	The Grove – Riverside (211)	Community Centre	22 745
29	City Centre – Nelspruit	Community Centre	25 000
30	Emoyeni Mall	Small Regional Centre	25 852

	Shopping Centre Name	Classification	Size (m^2 GLA)
31	l'Langa Mall	Small Regional Centre	48 787
32	Riverside Mall - Nelspruit	Small Regional Centre	79 776
Total			399 897m^2

Source: SACSC, 2015/16

Table A.2: Retail supply – Witbank

	Shopping Centre Name	Classification	Size (m^2 GLA)
1	Jet Centre - Middelburg	Local Convenience Centre	2 322
2	Superspar Centre - Kanonkop	Local Convenience Centre	3 000
3	Witbank Shopping Centre	Local Convenience Centre	3 200
4	Riverview Village Shopping Centre – Emalahleni	Local Convenience Centre	3 500
5	Witbank Retail City	Neighbourhood Centre	6 964
6	Reyno Ridge	Neighbourhood Centre	7 200
7	Pick n Pay Centre – Middelburg	Neighbourhood Centre	7 707
8	Middelburg Plaza	Neighbourhood Centre	7 799
9	Midwater Centre	Neighbourhood Centre	8 000
10	Checkers Centre – Middelburg	Neighbourhood Centre	9 488
11	Pick n Pay – Witbank	Neighbourhood Centre	11 037
12	Witbank Medical Centre	Neighbourhood Centre	13 889
13	Highland Mews Shopping Centre	Community Centre	17 100
14	Witbank Highveld Centre	Community Centre	19 593
15	Metropolitan Centre – Emalahleni	Community Centre	19 671
16	KG Mall (Kwa-Guqa)	Community Centre	20 443
17	River Crescent	Value Centre	24 721
18	Middelburg Mall	Small Regional Centre	43 515
19	Save Ways Crescent Centre	Small Regional Centre	49 986
20	Highveld Mall	Regional Centre	66 827
Total			345 962m^2

Source: SACSC, 2015/16

Table A.3: Retail supply – Polokwane

	Shopping Centre Name	Classification	Size (m^2 GLA)
1	Local Convenience Centre	Local Convenience Centre	1 393
2	FNB Building	Local Convenience Centre	2 370
3	Mr Price – Polokwane	Local Convenience Centre	2 376
4	Shortcut Centre – Polokwane	Local Convenience Centre	2 557
5	KFC Rissik Street – Polokwane	Local Convenience Centre	2 585
6	Madiba Park Spar	Local Convenience Centre	3 039

	Shopping Centre Name	Classification	Size (m^2 GLA)
7	Extreme Discounter Centre	Local Convenience Centre	3 097
8	Standard Bank	Local Convenience Centre	4 288
9	Joshua Doore Centre	Neighbourhood Centre	5 789
10	Taxi Centre – Polokwane	Neighbourhood Centre	5 832
11	Cycad Centre	Neighbourhood Centre	5 880
12	Serala View Convenience Centre	Neighbourhood Centre	6 751
13	Checkers Centre	Neighbourhood Centre	7 000
14	Seshego Plaza	Neighbourhood Centre	7 600
15	Library Gardens – Polokwane	Neighbourhood Centre	7 779
16	City Centre – Polokwane	Neighbourhood Centre	9 191
17	Metropolitan Centre – Polokwane	Neighbourhood Centre	9 440
18	Polokwane Lifestyle Centre	Lifestyle Centre	10 679
19	Thornhill Shopping Centre	Community Centre	12 205
20	Trador – Polokwane	Value Centre	15 001
21	Seshedo Circle	Community Centre	15 072
22	Game Centre – Polokwane	Value Centre	15 225
23	Makro – Polokwane	Value Centre	17 315
24	Limpopo Mall	Community Centre	21 934
25	Savannah Mall	Small Regional Centre	38 000
26	Mall of the North	Regional Centre	75 000
Total			307 397m^2

Source: SACSC, 2015/16

Table A.4: Retail supply – Mafikeng

	Shopping Centre Name	Classification	Size (m^2 GLA)
1	Mafikeng Centre	Local Convenience Centre	1 764
2	Mafikeng Plaza	Neighbourhood Centre	5 176
3	Shoprite Centre Mafikeng	Neighbourhood Centre	5 176
4	Choppies Centre	Neighbourhood Centre	5 218
5	Market Square – Mafikeng	Value Centre	5 218
6	Station Boulevard Centre	Neighbourhood Centre	7 370
7	The Northwest Mall	Community Centre	13 859
8	The Crossing Shopping Centre	Community Centre	17 500
9	Mafikeng Mall	Community Centre	22 329
10	Mega City Shopping Centre	Regional Centre	56 128
Total			139 738m^2

Source: SACSC, 2015/16

Table A.5: Retail supply – Kimberley

	Shopping Centre Name	Classification	Size (m^2 GLA)
1	Kimberley Airport	Airport Retail	114
2	Galeshewe Winkelsentrum	Local Convenience Centre	947
3	Kimberley Building	Local Convenience Centre	1 689
4	Roodepan	Local Convenience Centre	2 051
5	Shoprite Centre – Jan Kempdorp	Local Convenience Centre	2 062
6	Galeshewe Plaza	Local Convenience Centre	2 809
7	Rhodesdene Shopping Centre	Local Convenience Centre	2 973
8	Riviera Shopping Centre	Local Convenience Centre	3 496
9	Shoprite Centre – Kimberley	Local Convenience Centre	3 765
10	Barkley Road Shopping Centre	Neighbourhood Centre	5 052
11	Checkers Centre – Kimberley	Neighbourhood Centre	5 677
12	Old Mutual Centre Kimberley	Neighbourhood Centre	5 738
13	WB Centre	Neighbourhood Centre	7 425
14	Kim Park	Neighbourhood Centre	10 498
15	Newpark Shopping Centre	Value Centre	12 531
16	North Cape Mall	Community Centre	24 500
17	Diamond Pavilion	Small Regional Centre	34 106
Total			125 433m^2

Source: SACSC, 2015/16

Table A.6: Retail supply – Soweto

	Shopping Centre Name	Classification	Size (m^2 GLA)
1	Shoprite Centre – Dube	Local Convenience Centre	1 250
2	Crystal Mall	Local Convenience Centre	1 994
3	Dobson Points	Local Convenience Centre	3 562
4	Protea Point	Local Convenience Centre	3 863
5	Pimville Square	Local Convenience Centre	4 307
6	Tseles Centre	Local Convenience Centre	4 554
7	Meadow Point	Local Convenience Centre	4 558
8	Protea Gardens Mall	Community Centre	23 000
9	Dobsonville Shopping Centre	Community Centre	23 177
10	Protea Glen Shopping Centre	Small Regional Centre	30 000
11	Jabulani Mall	Small Regional Centre	46 855
12	Maponya Mall	Regional Centre	71 406
Total			218 526m^2

Source: SACSC, 2015/16

Table A.7: Retail supply – Matlosana

	Shopping Centre Name	Classification	Size (m^2 GLA)
1	Hobhouse Centre – Klerksdorp	Local Convenience Centre	832
2	Stilfontein Spar Centre	Local Convenience Centre	2 500
3	Slymieda Shopping Centre	Local Convenience Centre	2 500
4	Songloed Shopping Centre	Local Convenience Centre	3 000
5	Fruit & Veg City – Klerksdorp	Local Convenience Centre	3 020
6	MCC Superspar Centre	Neighbourhood Centre	6 000
7	Orkney Shopping Centre	Neighbourhood Centre	7 591
8	OK Klerksdorp	Neighbourhood Centre	7 931
9	Game Centre – Klerksdorp	Value Centre	10 455
10	Terminus Shopping Centre	Neighbourhood Centre	11 377
11	Tower Mall	Community Centre	15 283
12	Value Centre	Value Centre	18 955
13	Flamwood Walk	Community Centre	19 396
14	Checkers Hyper Centre – Klerksdorp	Value Centre	20 000
15	City Mall	Community Centre	24 638
16	Matlosana Mall	Regional Centre	63 000
Total			216 477m^2

Source: SACSC, 2015/16

Table A.8: Retail supply – Bushbuckridge

	Shopping Centre Name	Classification	Size (m^2 GLA)
1	Bushbuckridge shopping centre	Community Centre	16 899
2	Twin City Bushbuckridge	Community Centre	22 186
3	Ascension Mall	Small Regional Centre	32 763
Total			71 848m^2

Source: SACSC, 2015/16

Table A.9: Retail supply – Rustenburg

	Shopping Centre Name	Classification	Size (m^2 GLA)
1	Geelhout Park Shopping Centre	Local Convenience Centre	2 000
2	Aug Behrens Shopping Centre	Local Convenience Centre	2 200
3	Tuscany Crossing	Local Convenience Centre	3 900
4	Maroela Centre	Local Convenience Centre	4 510
5	Magalies View Shopping Centre	Neighbourhood Centre	5 185
6	Foro Mall	Neighbourhood Centre	5 439
7	Rustenburg Square	Neighbourhood Centre	7 000
8	Shoprite Centre – Rustenburg	Neighbourhood Centre	7 831

	Shopping Centre Name	Classification	Size (m^2 GLA)
9	Safari Gardens	Neighbourhood Centre	9 000
10	Lifestyle Square	Neighbourhood Centre	9 155
11	Biblio Plaza	Neighbourhood Centre	9 256
12	Shoprite Centre – Rustenburg (ex OK_	Neighbourhood Centre	9 653
13	Waterfall Value Mart	Neighbourhood Centre	10 303
14	Rustenburg Plaza	Community Centre	13 269
15	Mid Town Mall – Rustenburg	Community Centre	17 456
16	Boitekong Mall	Community Centre	17 870
17	Platinum Square	Small Regional Centre	32 306
18	Waterfall Mall	Small Regional Centre	49 215
Total			215 548m^2

Source: SACSC, 2015/16

Table A.10: Comparative Town / Area Population and Shopping Centre Supply Analysis

Town	Population (2016)[a]	Average Household Income (2016)[b]	Shopping centre supply (m^2 GLA)[c]	Shopping centre supply *per capita* (m^2 GLA)[d]
Nelspruit	152 756	All LSM: R260 790 per annum R21 733 per month LSM 4-10+: R390 552 per annum R32 546 per month	399 897m^2	2.62m^2 per person
Witbank	422 569	All LSM: R183 954 per annum R15 330 per month LSM 4-10+: R280 820 per annum R23 402 per month	345 962m^2	0.82m^2 per person
Polokwane	287 488	All LSM: R184 654 per annum R15 388 per month LSM 4-10+: R309 545 per annum R25 795 per month	307 397m^2	1.07m^2 per person
Mafikeng	234 760	All LSM: R107 742 per annum R8 979 per month LSM 4-10+: R223 955 per annum R18 663 per month	139 738m^2	0.59m^2 per person
Kimberley	252 267	All LSM: R149 157 per annum R12 430 per month LSM 4-10+: R255 508 per annum R21 292 per month	125 433m^2	0.50m^2 per person
Soweto	1 230 802	All LSM: R90 591 per annum R7 549 per month LSM 4-10+: R172 372 per annum R14 364 per month	218 526m^2	0.18m^2 per person
Matlosana	347 190	All LSM: R94 400 per annum R7 867 per month	216 477m^2	0.62m^2 per person

Town	Population (2016)[a]	Average Household Income (2016)[b]	Shopping centre supply (m^2 GLA)[c]	Shopping centre supply *per capita* (m^2 GLA)[d]
		LSM 4-10+: R180 291 per annum R15 024 per month		
Bushbuckridge	143 709	All LSM: R44 650 per annum R3 721 per month LSM 4-10+: R151 775 per annum R10 981 per month	71 848m^2	0.49m^2 per person
Rustenburg	436 364	All LSM: R119 465 per annum R9 955 per month LSM 4-10+: R194 843 per annum R16 237 per month	215 548m^2	0.49m^2 per person

Source: *a – StatsSA, 2013*

b & d – Own calculations based on a & c

c – SACSC, 2015/16