A QUANTITATIVE ANALYSIS OF THE EFFECT OF THE GROUP AREAS ACT ON RESIDENTIAL PROPERTY PRICES IN PIETERMARITZBURG

by

MICHAEL ALAN BLADES

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DECLARATION

I hereby declare that this whole dissertation, unless specifically indicated to the contrary in the text, is my own original work, and has not been submitted for a degree at any other University.

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ABSTRACT

When the 1989/90 property valuation roll was implemented for the City of Pietermaritzburg, substantial dissatisfaction was expressed by the Indian and Coloured ratepayers. They argued that the Group Areas Act was preventing the efficient functioning of the property market. This caused property prices in the Indian and Coloured areas to increase dramatically, which in turn affected the property rating system in an inequitable fashion.

Using econometric methods, this dissertation attempts to evaluate these claims. Unfortunately, no data concerning the Coloured areas were available at the time of sampling and so the quantitative analysis does not concern the Coloured areas. The data for the Indian and White areas were obtained from the local municipality in Pietermaritzburg. Within a Lancastrian demand theory framework, house prices are regressed against various components of a house. The technique known as hedonic price estimation gives coefficients of the independent variables which can be used to determine monetary values for each component. Two models are presented. In the first model, a Group Areas dummy variable is inserted into the equation along with the other explanatory variables. The empirical results provide strong evidence that the Group Areas Act was creating a monetary premium on residential properties in the Indian residential areas. The second model divides the sample into separate equations for White and Indian areas with the intention of establishing the contribution of land to overall property values. Empirical results concerning the claim that land values are higher in the Indian areas are not robust. However, they do indicate that on average, land values in the Indian areas were higher than in the White areas. On the basis of these results, it appears that the Indian ratepayers had a legitimate complaint against the fairness of the property rating system in Pietermaritzburg. Furthermore, the measures taken by the City Council to rectify the inequity in the system are found to be inadequate.

INTRODUCTION

At the end of 1989, the Pietermaritzburg City Council approved a revised rating system which incorporated a new valuation roll. These changes caused a strong reaction from Indian and Coloured ratepayers who faced substantial increases in property rates as a consequence of the relatively large increase in property valuations in these Group areas. On October 2 1989, The Natal Witness reported that the Indian and Coloured ratepayers were planning a march on the city hall to protest the massive increases in rates. This march, which took place at the end of October 1989, was organized by the Pietermaritzburg Combined Residents and Ratepayers Association (PCRRA) which comprises mostly Indian and Coloured ratepayers.

In response to these complaints, the City Council has attempted to make several concessions to the aggrieved parties. The last concession has been to grant a 25% rebate on rates payable on land. On April 18 1991, The Natal Witness reported that the PCRRA was dissatisfied with the City Council's concession and had begun legal proceedings against the latter. On May 4 1992, the Supreme Court dismissed the PCRRA's application to set aside the property rating system in the Indian and Coloured Group areas, since the court was unable to quantify accurately the effect of the Group Areas Act on land values in the Indian and Coloured areas. (The Natal Witness, May 5 1992).

The purpose of this thesis is to evaluate the claim that the Group Areas Act created an institutional bias against Indian ratepayers in the sense that they now have to pay a disproportionate share of the rates burden[1].

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[1] The only data available for the Coloured areas concerned their aggregate property values and rates income. Unfortunately, at the time of sampling , no data were available for the quantitative analysis. However, it is clear that both Indians and Coloureds use the same arguments in their protests against the City Council. Therefore, whilst comments are passed on the matter, the econometric analysis does not concern the Coloured areas.

Chapter 1 explains how property rates are determined in Pietermaritzburg. Thereafter, an attempt is made to trace the trend of assessed property values and hence rates increases in Pietermaritzburg. After examining these trends, a main hypothesis and a subhypothesis are set out.

Chapter 2 is largely concerned with establishing an appropriate theoretical framework within which the urban housing market can be explained. The purpose of the theoretical framework is to justify the equations used in the testing of the hypotheses.

Chapter 3 concerns the empirical part of this dissertation. It describes the data used in the empirical analysis and the choice of appropriate functional forms. The empirical results are used to test the hypotheses set out in chapter 1. Chapter 4 concludes the study.

CHAPTER 1

PROPERTY VALUATION AND THE DETERMINATION OF RATES INCIDENCE IN PIETERMARITZBURG

1 The determination of rates incidence in Pietermaritzburg

At this stage it would be appropriate to discuss the incidence of the property rating system. Oldham (1990, p.1) identifies two broad categories of groups which are likely to express opposition to the property rating system. Firstly, business and residential property owners may have conflicting interests. Secondly, racial groups may perceive the rating system to be unfair if property valuations differ between residential areas.

Property rates are determined in two ways. Firstly, rates are determined by a valuation roll which values property according to the market value of land and replacement cost of buildings. This roll is updated every fifth year. The principle underlying the valuation of land is willing buyer/willing seller. In other words, land values are determined by the market. In this respect the Group Areas Act played an important role because it segmented the market for White property from that of Indian and Coloured. Secondly, the City Council sets property randages for land and buildings each year. Therefore, although the City Council has no discretion over property values, it can determine or change the incidence by altering the randages or the relative value of the randages for land and buildings.

The main objections against the rates have stemmed from the revaluation of properties every five years. As the economic environment changes through time the relative values of business and residential properties alter, and when rates are calculated on the revised valuation roll, substantial shifts in the rates incidence occur. Prior to its repeal in 1990, the Group Areas Act exacerbated the problem because of an exceptionally high increase in the value of land in the Indian areas.

With this in mind, it was decided to examine quantitatively what effect (if any) the Group Areas Act has had on housing and property values in Pietermaritzburg. Before embarking on the quantitative analysis an attempt will be made to trace the trend of property values and rates increases in the White, Indian and Coloured residential areas. Then it is necessary to see how changes in the valuation of properties have affected the rates incidence.

1.1 Changes in property values and rates incidence in the residential areas

Table 1 shows the changes in assessed property values for the White, Indian and Coloured residential areas respectively after the implementation of the 1985/86 and 1989/90 valuation rolls. Property value has been separated into land value and building value.

Secondly, Table 1.1 shows the changes in rates income and the effects of the changes in the randages levied on land and buildings in the residential areas for Whites, Indians and Coloureds respectively. The randages levied on the value of land and the replacement cost of buildings are shown in Table 1.3. Of particular interest is the manner in which the City Council has altered the respective randages for land and buildings, thus shifting the tax incidence either away from or towards respective residential groups. For example, White properties on average have more extensive buildings than Indians and Coloured properties and the ratio of the value of buildings to land is higher. Therefore if the City Council intends increasing the rates incidence for people living in a White areas, they could reduce the randage for land and increase the randage on buildings. In this way the rates incidence would shift towards the Whites and away from Indians and Coloureds.

TABLE 1 CHANGES IN ASSESSED RESIDENTIAL PROPERTY VALUES (Rmill)

YEAR	LAND VALUE	% Δ	BUILDING VALUE	% Δ	PROPERTY VALUE	% Δ
WHITE RESIDENTIAL						
1984/85 1985/86	56,93 239,67	320,9%	167,55 692,75	313%	224,49 932,43	315%
1988/89 1989/90	255,63 300,04	17%	762,97 1091,36	43%	1081,61 1391,41	36,6%
INDIAN RESIDENTIAL						
1984/85 1985/86	30,98 86,87	180%	74,92 228,93	205%	105,95 315,80	198,1%
1988/89 1989/90	101,97 219,73	115%	276,65 417,57	50,9%	378,62 637,29	68,3%
COLOURED RESIDENTIAL						
1984/85 1985/86	4,45 10,54	136%	12,45 43,73	251%	16,90 54,27	221,1%
1988/89 1989/90	13,58 31,93	135%	50,83 78,99	55,4%	64,41 110,91	72,2%

Source: Residential Rates in Pietermaritzburg 1980/81 -1989/90, City Treasurer's Department, 1989

1.1.1 THE 1985/86 PROPERTY REVALUATION

New valuation rolls were implemented in 1985/86 and again in 1989/90. With the implementation of the 1985/86 property valuation roll, it is clear that land valuations had increased dramatically for all race groups. However, as Table 1 shows, those living in the White residential areas experienced the highest increase in land value - viz. a 320,9% increase as opposed to the 180% and 136% experienced by the Indians and Coloureds respectively[2]. Building values also increased substantially in the respective Group areas,

[2] This unusually large increase in land values in the White residential areas can be attributed to the fact that land in the White areas was auctioned by the municipality shortly before the revaluation and fetched very high prices. These were taken into

mainly because the replacement cost of buildings increased substantially. Table 1.2 shows that the implementation of the 1985/86 valuation roll caused the ratio of White property values with respect to Indian and Coloured property values to increase significantly. This would indicate a shift of the rates incidence towards White owned properties.

Table 1.3 shows that the increase in property valuations was accompanied by a reduction in the ratio of land to building randages viz. 2,91-1,78. The effect was that rates income from land in the White areas decreased by 3,2% compared to decreases of 36% and 45% in the Indian and Coloured areas respectively. Table 1.2 shows that the ratios of White to Indian and White to Coloured income from land also increased.

Income from buildings increased by 56% in the White areas, whilst income accruing from Indian and Coloured residential buildings increased by 14% and 32% respectively. What is important is that the ratio of White to Indian rates income from buildings showed the biggest increase viz. 2,2:1 (1984/85) to 3,0:1 (1985/86). The overall effect of the implementation of the 1985/86 property valuation roll was that total rates income increased by 26,3% for the Whites whilst the Indian and Coloured rates income decreased by 13,6% and 7,5% respectively. Thus it is evident that the White ratepayers bore the brunt of the rates incidence.

The City Council shifted the rates incidence onto buildings which in turn resulted in residents living in the White areas experiencing an increase in rates incidence much higher than those living in the Indian and Coloured areas. The shift was caused by firstly, relatively higher land and building values and secondly, a reduction in the ratio of land to building randages.

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account when the property valuation roll was revised, which explains the large increases.

1.1.2 THE 1989/90 PROPERTY REVALUATION

The implementation of the 1989/90 property valuation roll shows a complete reversal of the 1985/86 situation. Land values for White residential areas increased by 17%, whilst those of the Indians and Coloureds increased by 115% and 135% respectively. Table 1.2 shows that the ratios of White to Indian and White to Coloured land values decreased significantly - viz. 2,5:1 to 1,36:1 and 19:1 to 9,3:1. The increases in building values were relatively uniform with increases of 43%, 50,9% and 55,4% in the White, Indian and Coloured areas respectively. However, the overall ratios (property value) have decreased markedly, indicating the extent to which land values have increased in the Indian and Coloured areas respectively.

TABLE 1.1 CHANGES IN RATES INCOME IN THE RESIDENTIAL AREAS (Rmill)

YEAR	LAND.INC	% Δ	RANDAGE LAND	BUILDING INC.	% Δ	RANDAGE BUILDINGS	TOTAL RATES INCOME	% Δ
WHITE RESIDENTIAL								
1984/85 1985/86	2,82 2,73	-3,2%	4,96 1,14	2,85 4,43	56%	1,70 0,64	5,67 7,17	26,3%
1988/89 1989/90	5,37 5,04	-6%	2,1 1,68	5,94 7,25	34%	0,77 0,66	11,31 12,29	8,6%
INDIAN RESIDENTIAL								
1984/85 1985/86	1,54 0,99	-36%	4,96 1,14	1,27 1,47	14%	1,70 0,64	2,81 2,46	-13%
1988/89 1989/90	2,14 3,69	72,3%	2,1 1,68	2,15 2,77	29%	0,77 0,66	4,49 6,46	44%
COLOURED RESIDENTIAL								
1984/85 1985/86	0,22 0,12	-45%	4,96 1,14	0,21 0,28	32%	1,70 0,64	0,43 0,40	-7,5%
1988/89 1989/90	0,29 0,57	88%	2,1 1,68	0,36 0,52	45%	0,77 0,66	0,68 1,06	55%

Source: Residential Rates in Pietermaritzburg 1980/81 -1989/90, City Treasurer's Department, 1989

TABLE 1.2 RATIOS OF WHITE PROPERTY VALUES AND WHITE RATES INCOME TO INDIAN AND COLOURED PROPERTY VALUES AND RATES INCOME RESPECTIVELY

	Property Values						Rates Income					
YEAR	W:I L/V	W:I B/V	W:I P/V	W:C L/V	W:C B/V	W:C P/V	W:I L/V	W:I B/V	W:I P/V	W:C L/V	W:C B/V	W:C P/V
84/85	1,83:1	2,23:1	2,1:1	13:1	13,5:1	13:1	2,2:1	2,2:1	2:1	12,7:1	13,4:1	13,1:1
85/86	2,75:1	3:1	2,95:1	22,7:1	15,8:1	17:1	2,75:1	3,0:1	2,9:1	23:1	15:1	18:1
88/89	2,5:1	2,75:1	2,6:1	19:1	15:1	15,8:1	2,5:1	2,7:1	2,5:1	19:1	15:1	16:1
89/90	1,36:1	2,6:1	2,1:1	9,3:1	13,8:1	12,5:1	1,3:1	2,6:1	1,9:1	9:1	13:1	12:1

L/V=LAND VALUE B/V=BUILDING VALUE P/V=PROPERTY VALUE
Source: Residential Rates in Pietermaritzburg 1980/81 -1989/90, City Treasurer's Department, 1989

TABLE 1.3 RANDAGES SET ON RESIDENTIAL LAND AND BUILDINGS IN PIETERMARITZBURG

YEAR	RANDAGE LAND %	RANDAGE BUILDING %	RATIO OF LAND TO BUILDING RANDAGE
1983/84	4,28	1,45	2,95
1984/85	4,96	1,70	2,91
1985/86	1,14	0,64	1,78
1986/87	1,36	0,71	1,90
1987/88	1,58	0,83	1,90
1988/89	2,1	0,77	2,70
1989/90	1,68	0,66	2,50

Source: ibid

The rates income derived from land shows a similar trend. The land income in White residential areas decreased by 6% whilst the Indian and Coloureds increased by 72,3% and 88% respectively. Table 1.2 shows that the ratio of White to Indian income from land decreased from 2,5:1 to 1,3:1 and the White to Coloured from 19:1 to 9:1. This indicates that the Indian and Coloured shares of the rates incidence from land have substantially increased relative to that of Whites.

Rates income from buildings increased by 34% in the White areas and by 29% and 45% in the Indian and Coloured areas respectively. The ratio of White to Indian and White to Coloured income from buildings decreased from 2,7:1 to 2,6:1 and 15:1 to 13:1 respectively. It is clear that after the implementation of the 1989/90 property valuation roll, White, Indian and Coloured shares of the rates burden from buildings remained similar.

The overall increase in rates income after the implementation of the 1989/90 valuation roll for the respective residential areas was 8,6%, 44% and 55% for Whites, Indians and Coloureds respectively. Table 1.3 shows that the ratio of land to building randages has been on an upward trend since the implementation of the 1985/86 property valuation roll. With the latter ratio increasing, together with a 115% and a 135% increases in land values in the Indian and Coloured areas, it is clear that the rates incidence was shifted to people living in the Indian and Coloured areas.[3]

There are number of reasons property values have escalated significantly in the Indian and Coloured areas. Firstly, over the last decade, there has been a significant redistribution of income towards Indians and Coloureds. This has resulted in more Indians and Coloureds being able to purchase land and explains the increased property values[4]. Secondly,there has

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[3] The 1989/90 property valuation restores the relative racial shares of the rates burden to more or less what it was in 1984/85. The 'ups and downs' of market forces are bound to cause disturbances from time to time. The crucial question here is whether the Group Areas Act has discriminated against Indian and Coloured ratepayers.

[4] Over the last decade, State policy has shifted from the provision of housing to private ownership. The privatization of housing in Indian and Coloured areas partly explains increased

been increased population in the cities due to rural-urban migration. This population growth in the cities would increase the demand for property which in turn would drive up property prices. This should hold true for all the Group areas. However, the Group Areas Act, which until recently has prohibited Indians and Coloureds from purchasing property in other racial Group areas and has restricted the availability of land in these Group areas, has exacerbated the imbalance between demand for and supply of property and resulted in property values increasing significantly.

1.2 Conclusion and statement of hypothesis

Given the constraining nature of the Group Areas Act with respect to the purchase of land, it is understandable that the Indian and Coloured communities objected to the effects of the 1989/90 valuation roll. The rates incidence has shown a shift towards land which, given the dramatic increase in the 1989/90 land values in Indian and Coloured areas, translated into their experiencing a disproportionately large increase in rates. The willing buyer/willing seller principle would appear to be an equitable method of dealing with land valuations, provided market values are free to adjust to the economic forces of supply and demand. However, it is clear that in South Africa the Group Areas Act provided a serious impediment to the efficient functioning of property markets. In Pietermaritzburg, there was a shortage of land in the Indian and Coloured areas and due to the Group Areas Act, the price of land was bid up. Thus the square metre price of land is much higher in the Indian and Coloured areas than in the White areas. Because building valuation is based on the principle of replacement cost, market forces reflecting the Group Areas Act do not play a part in municipal property valuations of buildings.

Therefore the main hypothesis contends that the Group Areas Act creates a premium on property values in Indian areas.[5] In other words, because of the shortage of land in the

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property values.

[5] Recall that the econometric analysis and the testing of the hypotheses do not concern the Coloured Areas.

Indian areas, property prices in those areas have been bid up. This has translated into a shift in the rates incidence towards the latter areas.

In a subhypothesis, it is postulated that the shifts in the rates incidence towards Indian areas has primarily been caused by the increases in land values in Indian areas. Therefore, according to the property rating system : Land Value and Replacement Cost of Buildings, it is postulated that increases in assessed property values have primarily been caused by increases in the LAND VALUES and relatively less by increases in the replacement cost of buildings. Therefore in the models estimated for the separate Group areas in the following chapters, it is expected that the coefficient for land in the Indian areas will be significantly higher than the respective coefficient estimated in the White areas.

CHAPTER 2

THEORIES ON THE DETERMINATION OF HOUSE PRICES IN URBAN HOUSING MARKETS

2 Traditional theory on urban housing markets

Alonso (1964) believes that traditional theories of urban housing markets are concerned almost exclusively with housing being a location decision of CBD workers. These theories basically employ a common set of assumptions when analyzing the behaviour of urban housing markets. It is assumed that a city has a single workplace where all productive activity is located, that a city is located along a featureless plain, transportation costs are proportional to distance and all land on which housing is built is identical. Traditional theories argue that housing is a single good which enters as a single argument in household preference functions along with other goods.

Given the above assumptions, traditional theories postulate that households choose an amount of housing and a location to maximize their utilities subject to a budget constraint that includes the cost of housing, the costs of the worktrip to the CBD and the costs of other goods.

King (1976) and Kain and Quigley (1975) cast doubt over the traditional theories of the property market. They view a house as a disparate bundle of goods which consists of copper pipes, bricks, flooring and various neighbourhood attributes. King believes it is logical to view the household's purchases of housing within the framework suggested by the new Lancastrian demand theory. This Lancastrian theory is set out below.

2.1 Lancastrian demand theory

Lancaster (1966a, p.132) is of the opinion that consumer theory as explained by traditional theorists such as Slutsky and Hicks has had all the irrelevant postulates removed so that it now exists as an example of how to extract the minimum of results from the minimum of assumptions. He argues that all intrinsic properties of particular goods, for example the protein obtained from consuming red meat, have been omitted from the theory. Therefore, it could be argued that traditional theorists assume that the individual characteristics of a good are implicit to that good and are not essential in explaining consumption behaviour.

Lancaster (1966a) departs from the traditional approach which holds that goods are the direct object of utility. He suggests that it is the attributes or characteristics of the goods from which utility is obtained. Thus goods are regarded as inputs into a process of consumption which transforms the bundle of goods bought into a bundle of characteristics. For example, a consumer buys various foodstuffs and combines them to make a variety of characteristics i.e. different flavours, different nutrients and so on. Lancaster assumes then that consumers have preferences for characteristics of goods rather than the goods themselves. Gravelle and Rees (1981, p.120), like Lancaster, solve the consumer's optimization problem. The consumer will have to choose a collection of goods which will yield the desired characteristics. The consumer's choice is limited by his budget and consumption technology.[6]

Let $C = (C_1, \ldots\ldots, C_r)$ represent a bundle of characteristics.

Consumer preferences can be represented by a utility function

$$U = U(C)$$

The amount of each characteristic obtained depends on the bundles of goods chosen where a bundle of goods is represented as

$$X = (X_1, \ldots\ldots, X_n)$$

Therefore the number of characteristics obtained is

$$C_i = f^i\,(X_1, \ldots\ldots, X_n) = f^i(X) \quad \text{where } (i = 1, \ldots., r).$$

There is no limit to the amount of characteristics r that are yielded from the number of goods n. However, according to Gravelle and Rees (1981, p.120), it is usual for there to be more goods than characteristics or $(n > r)$. Therefore each good can be said to produce more than

[6] Consumption technology is the relationship between goods consumed (inputs) and the characteristics obtained (outputs) as a result of consumption of the former.

one characteristic but characteristics will be common to some goods. A cake for example produces characteristics of calories, taste, cholesterol and energy.

The budget constraint is represented as

$$\Sigma_k \, p_k \, X_k \leq Y$$

where p_k is the price of the good X_k and Y is the level of money income of the consumer.

Therefore algebraically, the consumers optimization problem is

max $u(C_1,.....,C_r)$ subject to

$$(i) \quad \Sigma p_k X_k = Y \qquad X_k \geq 0 (k=1,...,n)$$

$$(ii) \qquad C_i = f^i(X_1,....,X_n)$$

$$(i=1,....,r)$$

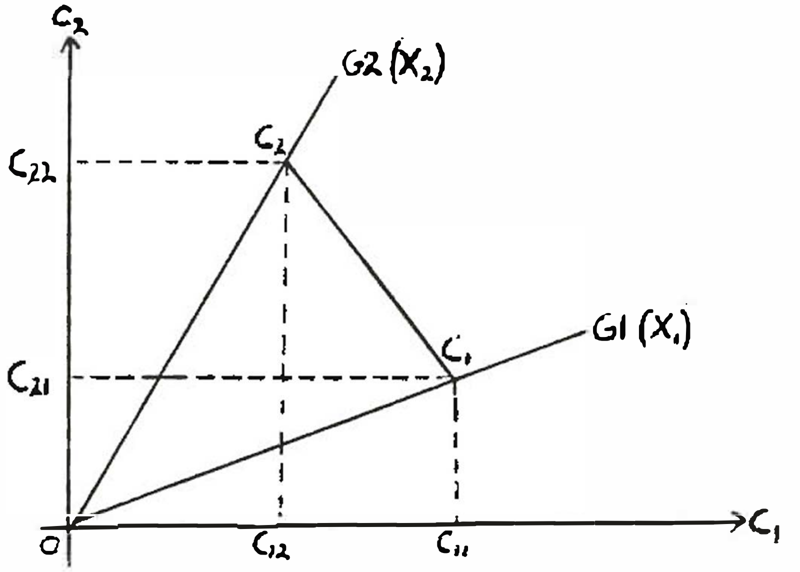
Gravelle and Rees (1981,p.121) obtain the required conditions for utility maximization. They do this by examining how an optimal bundle of goods alters when prices, income and consumption technology change. Like Lancaster, Gravelle and Rees assume that consumption technology is linear. This means that one unit of good k gives rise to β_{ik} units of characteristics i where β_{ik} is a constant independent of the level of good K or any other good. Therefore the amount of a characteristic derived from a bundle of goods is the sum of the characteristic derived from each separate good contained in that bundle.

$$C_i = \beta_{i1}X_1 + \beta_{i2}X_2 + ... + \beta_{in}X_n = \sum_k \beta_{ik}X_k \quad (i=1,.....,r) \qquad (Equation 1)$$

Gravelle and Rees (1981,p.121) have used a two-stage optimization procedure to solve $C_i = f^i(X_1,.....,X_n)$. Firstly the problem of an efficient choice of goods is solved.[7] The efficient goods bundles are determined by consumption technology, the prices of goods and the consumer's money income. Efficiency is independent of the consumer's preferences.

The second stage requires selecting the optimal bundle from the efficient set. This choice is entirely subjective as consumers will have different preferences even if they have the same incomes.

FIGURE 2.0 THE TWO-STAGE OPTIMIZATION PROCEDURE



Source: Adapted from Gravelle and Rees (1981, p.121)

The above figure has two characteristics C_1 and C_2 measured along its horizontal and vertical axes respectively. Purchasing 1 unit of good 1 will yield β_{11} units of characteristic 1 and β_{21} units of characteristic 2. Therefore X_1 units of good 1 produce $\beta_{11}X_1$ and $\beta_{21}X_1$ units of the characteristics, in equation 1.

Therefore buying of X_1 of good 1 will correspond to a bundle of characteristics in the above figure. Good 1 produces two characteristics in the constant ratio β_{21}/β_{11}. Since β_{11}, β_{21} are

9 Efficiency in this sense means that a consumer is unable to obtain more of one characteristic without simultaneously losing a proportion of another characteristic.

assumed constant, doubling X_1 will double the levels of C_1 and C_2. When only good 1 is bought, OG_1 shows the combinations of C_1,C_2 produced by varying the level of X_1. Similarly, OG_2 shows combinations of characteristics generated by varying the level of X_2 with X_1 set to 0.

Assume the consumer spends all his income Y on X_1 and is at C_1 in the above figure. Therefore, he will be able to purchase Y/P_1 units of X_1 and thus produce $\beta_{11}Y/P_1 = C_{11}$ of C_1 and $\beta_{21}Y/P_1 = C_{21}$ units of C_2. Similarly, if the consumer spends all his income Y on X_2 and is at C_2 in the above figure, he will be able to purchase Y/P_2 units of X_2 and produce $\beta_{21}Y/P_2 = C_{22}$ of C_2 and $\beta_{11}Y/P_2 = C_{12}$ of C_1. Therefore if only X_1 is purchased, the consumer will be at $C_1 = (C_{11}, C_{21})$. If all his income is spent on X_2, the consumer will be at $C_2 = (C_{22},C_{12})$ on OG_2.

The slope of C_1C_2 shows the rate at which the consumer can substitute C_1 for C_2 by varying his purchases of X_1 and X_2. Any movement along C_1C_2 must satisfy both the consumption technology and the budget constraints. Any point reached on the feasible boundary C_1C_2 will be efficient. The exact position of each bundle of goods on the frontier is determined by the subjective preferences of consumers for characteristics.

The Lancastrian demand theory appears to be very suitable for describing the demand for housing. The homogenous housing units as described by traditional theorists are fictitious. King (1976, p.1077) is of the opinion that housing is a disparate bundle of commodities - brass pipes, Italian tiles, oak doors, security and so on. Therefore it would appear appropriate to view the household's purchases of housing within the framework of Lancastrian demand theory.

However, there are some shortcomings to using Lancastrian demand theory. Firstly, housing is a durable good if not an asset. In Lancaster's theory it appears that he is dealing with non-durable consumer goods such as bread, butter, coffee and so on. Assuming that consumers are subject to a budget constraint, it is clear that they have to maximize their utility. However, if the consumer exceeds his budget or desires less of one characteristic and more of another he can, in the "shopping basket" case, simply remove one of the goods from the basket and replace it with another. But in the purchase of a house, the bundle of housing consumed is the sum of the household's consumption of each characteristic. Therefore, households seldom have the opportunity of buying individual characteristics as in the "shopping basket" case. Consumers have to choose from a large number of fixed bundles. They can modify these bundles by making additional expenditures, but the scope for changing bundle characteristics is limited.

Therefore, like King (1976), Kain and Quigley (1975) believe it is more instructive to analyse housing markets in terms of housing bundles rather than using a single homogenous good (traditional theory) or good attributes as set out Lancaster.

King (1976), Kain and Quigley (1975) and Witte et al (1979) view housing demand as the demand for specific bundles. The choice among quantities of heterogenous goods on the basis of preferences and prices subject to a budget constraint implies that consumers select goods in such a way that they receive equi-marginal satisfaction from the last rand's worth of each good. The notion of housing bundles implies that each consumer chooses from a large number of differently priced bundles, the one bundle that maximizes his utility. Therefore, it can be said that housing demand theory fits in fairly well with the theory as set out by Lancaster above, although different characteristics cannot be substituted or increased with the ease that Lancaster has suggested.

2.2 Constructing Lancastrian characteristics for the housing market

In order to construct Lancastrian characteristics from observable bundles (houses), King (1976, p.1081)) obtains the relevant characteristics and then asks how these characteristics are related to the observed bundles.

In his study on urban housing markets in New Haven, Connecticut, King combined observed housing components into Lancastrian characteristics. King assumes the housing bundle provides four characteristics. These are special structural features, exterior and interior quality, interior space and land, public services and neighbourhood quality. For example, the characteristic interior quality may include the materials used for the ceiling, floor and window frames, all of which are observable components of the housing bundle. Therefore King has used proxies for the four characteristics described above. For example, under structural features he has included whether or not there is full sanitation, the number of garages, the number of bathrooms, basements and laundry facilities[8].

King (1976, p.1081) admits that his characteristics may be inconsistent. For example, there is no guarantee that consumers necessarily consider a housing bundle to comprise just those four characteristics. However, one would expect reasonable agreement that the four characteristics represent different aspects of a housing unit.

Kain and Quigley (1975) adopt a similar approach to that of King. They divide their explanatory variables into measures of dwelling quantity, size of the property and its various structural components, neighbourhood characteristics and structure type.

Witte et al (1979) in their comparative study of urban housing markets in Greenville, Kinston, Lexington and Statesville in the USA use dwelling quality, dwelling size, lot size and neighbourhood quality as proxies for housing bundle attributes.

There is consensus in the literature as to which observed variables can be used to construct Lancastrian characteristics - it appears that there is agreement as to which proxies can be used to describe the attributes that consumers desire when purchasing a house.

In order to be consistent with related research, similar or the same proxies for characteristics have been used. Obviously, the number and types of proxies used differ according to the amount of data available.

Data were obtained from the local authority concerning lot size, the extent of dwelling area, extent of other buildings, the number of bathrooms, whether the property contains a

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[8] Observed components are used as proxies for characteristics.

swimming pool, a randage quality index determining the quality of materials used in the construction of the house, neighbourhood attributes such as distance to the CBD and educational institutions and a variable explaining neighbourhood quality. Thus the proxies are consistent with the literature and should prove adequate for explaining Lancastrian characteristics. A Group Areas dummy variable is also included depending on whether the property is situated in an Indian or White area.

2.3 The model

Triplett (1973, p.80) has noted a close link between Lancastrian demand theory and the method of hedonic price equations[9]. A linear hedonic price equation divides the price of a good into prices of the components of that good. For example, a cake consists of the components sugar, icing, cocoa, flour and baking powder. The hedonic price equation shows that if a cake has the above characteristics then it will have a market value of Rx depending on the quantities of inputs. The regression estimates are obtained by having a series of market values for cakes alongside the characteristics of these cakes. A hedonic equation breaks up the selling price of the cake into the market prices of each component used in the production of a good. Therefore, coefficients of the independent variables can be seen as the underlying market prices for the components of a complex good. The individual coefficients represent rand values for components. It is possible by the use of proxies to capture the characteristic each component supplies. The selling price of the cake is obtained by summing the appropriate rand values of the coefficients.

[9] Hedonic prices are the implicit prices of characteristics. The price for a particular characteristic is determined by the price of the component which supplies the characteristic. The word hedonic is derived from the Greek word 'Hedonikos' which means pleasure. Presumably households derive pleasure when a characteristic is consumed.

In the market for houses, the hedonic price equation may take the following form

$$sales\ price = a + \sum_{i=1} \beta X_i + \sum_{i=1} \alpha Z_i + U_i \qquad (Equation 2)$$

where: a is the constant term

X_i are continuous measures such as lot area, dwelling size

Z_i are dummy variables determining for example whether or not the property has a swimming pool

U_i is a normally distributed stochastic error term

α is the marginal price of each Z_i

β measures the marginal price of the X_i

Marginal prices are obtained by taking the first derivative of the above equation with respect to the X_i's and Z_i's. The equation can be seen as a joint function which represents both demand and supply functions. In other words, the coefficients can be viewed as the intersections of the supply and demand functions for each explanatory variable.

2.4 Problems with the model

Witte et al (1979) argue that the observations described by a joint envelope function such as the above equation cannot identify the structure of consumer preferences and producer technologies. In other words, the coefficients of equation (2) only show the market information to consumers and suppliers and reveal nothing about the underlying market structure. Therefore Witte et al (1979) take the process a step further by estimating separate equations for demand and supply functions using Rosen's two step procedure in order to identify the market structure. In estimating a demand function, Rosen makes use of the household's level of income and consumer preferences. In the estimation of the supply function Rosen uses production function parameters and the level of output of the firm.

Although this is desirable because it separates the above equation into demand and supply markets and determines whether or not the housing market is in a long-run equilibrium, it was not possible to carry this step out due to the nature and the amount of data available.

2.5 The use of the hedonic price equation in this study

Equation (2) is nonetheless useful. The coefficients of equation (2) are marginal or shadow prices of given attributes of a house. The hedonic price shows an implicit interaction of supply and demand market forces. However, Rosen (1974), as seen earlier, and Goodman (1978) point out that these implicit market prices are not necessarily equilibrium prices. The hedonic prices determined are not necessarily long-run equilibrium supply prices but rather a set of market prices that reflect the composition and location of existing stocks of residential capital and neighbourhood components. High conversion costs of capital, consumer immobility and heterogeneity of the commodity do not comply with the assumption that a housing market is in a long run equilibrium.

Straszheim (1974) however is not concerned whether or not the housing market is in long run equilibrium. He is of the opinion that it is more important to divide the housing market into homogeneous sub-markets. Most studies have primarily involved regressing house prices on housing stock and neighbourhood characteristics using data drawn from the entire metropolitan area. Straszheim (1974) argues that the urban housing market is a set of separate and dissimilar sub-markets. Each market is affected by different demand and supply influences which cause a different framework of prices in each market. In a single urban area Straszheim (1974) argues large differences are present in the kinds of housing available across sub-markets and in the demand for a particular type of house in a specific area. In Pietermaritzburg, for example, the Group Areas Act may have caused the housing market to become compartmentalized with consequent price differentials between the Indian and White housing markets.

It is possible to observe large differences in the concentration and other characteristics of housing stock in a particular location. This shows that houses have been built over a long period when factor and output prices changed. Straszheim (1974), however, argues that even though spatial differences over time in prices may change the nature and concentration of new construction, the variations are not significant enough to make it feasible to destroy existing stock. On the demand side, it is clear that consumers have vivid preferences for lot size and other characteristics of housing directly linked to the observable components of a house and that certain neighbourhood characteristics have major effects on the price households bid at any specific location.

Returning to the analysis of the effect of the Group Areas Act on housing prices, it would appear convenient to insert a race dummy variable into the regression for prices based on data drawn from a broad geographic area. However, this does not break up the data into different markets. In other words the coefficients of the remaining independent variables will not distinguish between the prices of characteristics in the separate Group areas. Straszheim (1974) contends that the quality premiums represented by other independent variables in the equation for prices may also differ for different race groups. In Pietermaritzburg there may be a scarcity premium, particularly reflected in land values, in the previously designated Indian areas, where demand for property has tended to outrun supply.

Indian and White households differ in Pietermaritzburg because of differences in income, family size and possibly tastes or preferences. The relationship between housing demands and supplies is likely to result in a very different structure of prices for similar units in the different areas.[10]

Therefore, the race dummy variable in the above equation would appear to reflect both the differences in underlying price structures and differences in the types of housing available to Indians and Whites and the sub-markets in which they are residing. Hence, using pooled data and a single race dummy would appear to provide limited insight into any possible difference between prices of comparable housing to Indians and Whites in different markets. However, the race dummy is useful in the sense that it will at least establish whether or not there is a premium to be paid for living in an Indian area.

For example, it could be argued that because of the Group Areas Act, the supply of land was relatively price inelastic in the Indian areas. This caused the prices of property to increase

[10] Obviously different White households also have different incomes, family sizes and preferences but, due to the nature of apartheid and the Group Areas Act, it is possible that there is a vivid difference between race groups.

in the Indian areas. Goodman (1978) and Straszheim (1974) would conclude that a long run equilibrium price would exist if $\partial P/\partial C_i$ was constant across the entire metropolitan area. Therefore according to the subhypothesis, one would expect $\partial P/\partial C_L$(where C_L is lot size) to be higher in the Indian areas than in the White residential areas.

With this in mind, it would appear sensible to estimate separate equations for the White and Indian areas respectively. It must be stressed that there are sub-markets within the White and Indian areas, however the size of the sample collected did not permit analysis of the latter to take place. For the purposes of this study the urban housing market has simply been divided into two separate areas - White and Indian.

2.6 Conclusion

Lancastrian demand theory suggests that consumers derive utility from the characteristics yielded by goods and not the goods themselves. Gravelle and Rees (1981) have shown how a consumer can optimize his bundle of goods within a budget constraint. The amount of each good consumed is determined by the characteristics consumers desire. If it is assumed that consumers are maximizing their utility derived from characteristics subject to a budget constraint, the amount of each attribute consumed is determined solely by consumer preferences. However, in the purchasing of a house, the bundle of housing characteristics consumed is not as interchangeable as it might be in the case of non-durable goods. Consumers' choice in the purchase of a house is limited to fixed bundles, and the opportunity for changing bundle characteristics is limited. It may also prove difficult to assert which components of a house yield certain characteristics and certain components may also yield more than one attribute. However, in this respect, the literature appears to be in agreement as to which component provides which characteristics. Notwithstanding these problems it still appears that Lancastrian demand theory is the most suitable when describing the behaviour of the urban housing market. The literature asserts that the entire housing market of a particular metropolitan area is very seldom in a state of equilibrium due to racial discrimination, workforce considerations and search costs. Therefore it is important that the market is separated into various sub-markets where separate equations can be estimated.

CHAPTER 3

EMPIRICAL ANALYSIS

3 Sources of data

A sample of 320 residential property sales in Pietermaritzburg was collected from the Municipal Estates Department in Pietermaritzburg, covering a wide distribution of houses throughout the city. The sample did not favour any particular area, suburb or street in Pietermaritzburg. The city used to be divided into seven separate zones by the municipality for the purposes of local elections. The sample was taken from Zones 2 to 6 inclusively but Zone 1 the CBD was excluded because many residential properties have been converted to business use. Zone 7 is representative of the Coloured residential areas, but unfortunately, as stated earlier, this data were not available at the time of sampling. Lastly, Zones 2 to 5 represent the White residential areas in Pietermaritzburg. Since the data was collected, the Group Areas Act has been abolished and substantial changes in property ownership and values have occurred.

Approximately 60 properties were taken as a sample from each Zone and about 100 from the Indian areas.

3.1 Description of data

From the sales record dated 28.02.1989 to 12.01.1990 data were obtained concerning the market price of the house, the land area of the property, the municipal land and building values and the age of the house. Further data was obtained from the sampled houses' respective building records. This data included a municipal quality index[11], the number of

[11] A quality index is a municipal figure assigned to each house concerning the overall quality of materials used in the construction of the house viz. the quality of window fittings, quality of roof, quality of ceilings, quality of floor. Each index has a respective randage value which is then multiplied by the extent of the house to obtain the rateable value of the property.

bathrooms[12], the size of the dwelling area, whether or not the property possessed a swimming pool, whether or not it had been a state-owned house[13] and the extent of other buildings such as garages, servants quarters, basements on the property and so on.

3.2 Specification of the models

Economic literature concerning hedonic price functions does not clearly indicate an appropriate functional form for the model. Problems with applied hedonic analyses of urban housing have been firstly the interpretation of the estimated coefficients in terms of demand and supply functions and secondly coefficient bias introduced by omitted variables.

Linneman (1980) has addressed two important sources of estimation bias that occur when estimating hedonic prices for urban housing markets. Firstly bias stems from the choice of the functional form of the hedonic price equation. The second source relates to the choice of an appropriate sample for estimating a hedonic function.

3.2.1 PROBLEMS WITH DATA SPECIFICATION

As discussed earlier, Rosen (1974) has shown that the partial derivatives of the hedonic function can be interpreted as the implicit market clearing marginal prices of characteristics of a complex good such as a house. Hedonic price functions represent the locus of supply-equal demand intersections for various levels of each characteristic or component. However, Linneman (1980) has pointed out that because many of the relevant housing characteristics are not obtainable[14] and because the production of other characteristics tends to be a joint process (viz. bathroom and dwelling area), it is difficult to establish a precise functional form for hedonic price functions.

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[12] The number of bathrooms turned out to be problematic as will be seen later. It was difficult to ascertain the exact number of bathrooms each house contained i.e whether or not the house had a full bathroom or half of a bathroom.

[13] These were properties sold to private owners at a special price by the State or City Council.

[14] Not obtainable from the data collected.

Linneman believes that because data used in hedonic price functions is not designed specifically for econometric estimation, a prime problem is omitted variable bias. In his study on urban housing markets in Chicago and Los Angeles, the data contained most relevant variables on structural housing characteristics and neighbourhood characteristics. However, the data did not include variables concerning accessibility to work, recreational or educational sites. Similar problems occurred in collecting data for Pietermaritzburg because it was not possible to obtain data about neighbourhood characteristics. Nevertheless, an attempt was made to include variables such as distance to the CBD and prime residential areas.

Considering the above problems, it would appear likely that the market clearing prices of omitted variables may be correlated with those of included characteristics causing the results to be biased.

3.2.2 PROBLEMS WITH CHOICE OF FUNCTIONAL FORM

Theory has provided little restriction on the functional forms of hedonic functions. Most researchers have used linear, log-linear and log-log functional forms. However, Linneman (1980), Goodman (1978) and Bajic (1985) have used the Box-Cox method. The Box-Cox method is a flexible functional form often used in the estimation of price indices. Linneman is of the opinion that recent research work which has specified the functional form of hedonic equations as either linear, log-linear or log-log should have examined the statistical appropriateness of these forms. He points out the possibility that there may be a bias in the marginal price estimates caused by an inappropriate specification. Box and Cox (1964) developed a statistical method which determines the functional form providing the best fit in terms of log maximum likelihood.

The Box-Cox functional form can be written as follows :

$$X^{\lambda}=\frac{X^{\lambda}-1}{\lambda}$$

$$=\log X \ \mathit{if} \ \lambda=0$$

The hedonic equation is of the form :

$$P = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \ \ldots. \ + BmXm + e$$

Using the power transformation on both sides of the equation the following is obtained:

$$P^{\lambda_1}=\sum_{i=1}^{m} \beta_i X_i^{\lambda_2}+\sum_{i=1}^{n} \alpha_i Z_i+u$$

where P is price transformed by the power λ_1 and X_i represents the continuous independent variables which are transformed by the power λ_2. Z_i are dummy variables which are not strictly positive. This means that they enter the equation as 0 or 1. In other words the dummy variables will enter the model in a linear form or when $\lambda = 1$.

Now, when $\lambda_1 = \lambda_2 = 1$, the linear functional form is obtained. When $\lambda_1 = \lambda_2 = 0$ the double log functional form is obtained. Similarly when $\lambda_1 = 0$ and $\lambda_2 = 1$ the log-linear form is obtained and when $\lambda_1 = 1$, $\lambda_2 = 0$ the linear log functional form is obtained.

One can solve, in the above equation, for maximum likelihood estimates of the respective sets of coefficient and power transformation factors.

In his study of urban housing markets in Chicago and Los Angeles, Linneman found that the maximum likelihood function was significantly more sensitive to changes in the specification of dependent variable than to changes in the independent variable. Therefore he focused mainly on the specification of the dependent variables and constrained the continuous independent variables to linear or natural logarithmic forms.

Linneman concluded that the 'best fit' model was log-linear, with the property price being expressed in logarithmic values and the independent variables in absolute terms.[15]

However, Cassel and Mendelsohn (1985) argue that the use of the Box-Cox functional form is at the expense of other important goals. The goals of most hedonic studies is to estimate the prices of individual characteristics and to measure the change in aggregate price as a result of changes in the amount of an individual characteristic. Cassel and Mendelsohn argue that the coefficients estimated with the Box-Cox functional form reduce the accuracy of any single coefficient which results in less accurate estimates of single prices. Therefore, even though a Box-Cox transformation may provide the best overall fit, it might not provide the best measure of the desired price gradient with respect to a particular characteristic or set of characteristics.

Because of the difficulty of carrying out the Box-Cox procedure, and the doubts expressed about the accuracy of the coefficients, together with the fact that Linneman found that in general the best fit was a log-linear functional form, the models presented below will take the linear, log-linear and log-log functional forms.

Kain and Quigley (1975), King (1976) and Lapham (1971) in studies of urban housing markets all chose to use linear, log-linear and log-log functional forms. Kain and Quigley (1975) found very little difference among the various functional forms in terms of overall goodness of fit. All the equation specifications explained a very large proportion of the variation in the dependent variables.

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[15] This functional form is the same as a semi-log or log linear model.

3.3 Model specification concerning the entire sample

In the light of the argument in section 2.2 it is postulated that sales price is a function of the following variables[16] :

SALES PRICE (P) = $\int (X_1, \ldots X_6, Z_1, \ldots Z_5, U)$

Where X_1 = land area in m^2

X_2 = the dwelling area in m^2

X_3 = other buildings in m^2

X_4 = the age of the property in years

X_5 = a randage quality index

X_6 = the distance of the property from the CBD in km

Z_1 = the number of additional bathrooms

Z_2 = distinguishes whether or not the property was sold privately or by the state

Z_3 = a dummy variable ascertaining whether or not the sampled property has a swimming pool

Z_4 = a dummy variable for the Indian group area

Z_5 = a dummy variable distinguishing whether or not the property is in a prime area[17]

U is a stochastic error term.

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[16] In section 2.2 most of the literature has asserted that the housing bundle provides about four characteristics. These are structural features, interior and exterior quality, interior space and land, public services and neighbourhood quality. This study has attempted to follow the literature as closely as possible. For example, under special structural features Z_1 ascertains the number of additional bathrooms. X_1 and X_2 are variables for land and interior space. X_5 is a variable which shows the quality of materials used in the building of the house. X_6 and Z_5 area neighbourhood quality variables. From the above, it is evident that the equation used in this study is very close to meeting the criteria set out by the literature.

[17] This variable was subjectively determined.

3.3.1 FUNCTIONAL FORMS OF THE MODEL

Given the functional forms suggested by the literature it was decided to estimate equations using the following functional forms :

(1) $P = A + \Sigma\beta_i X_i + \Sigma\alpha_i Z_i + u$ (Linear)

(2) $\ln P = A + \Sigma\beta_i X_i + \Sigma\alpha_i Z_i + u$ (Log linear)

(3) $\ln P = A + \Sigma \ln\beta_i X_i + \Sigma\alpha_i Z_i + u$ (Log-log)

Where P represents the sales price

X_i represents the continuous independent variables

Z_i represents the dummy variables

It is expected that all the variables should yield positive coefficients except for Z_2, X_4 and X_6 which one would expect to be a negative function of the price.

Z_4 identifies whether the properties are located in Indian or White areas.[18] The Indian owned properties were separated because of the Group Areas Act and so the coefficient, according to the main hypothesis, should be positive showing that there was a monetary premium for living in this area.

The estimated equations are shown in Table 3 below.

[18] This Group Areas variable is expected to serve the same purpose as Straszheim's race dummy which was discussed earlier.

TABLE 3 REGRESSION RESULTS FOR THE ENTIRE SAMPLE

ENTIRE SAMPLE		LINEAR			LOG-LINEAR			LOG-LOG		
INDEPENDENT VARIABLE		COEFFICIENT	STD-ERROR	t-VALUE	COEFFICIENT	STD-ERROR	t-VALUE	COEFFICIENT	STD-ERROR	t-VALUE
Constant		-2540	1,009E4	-0,252	10,09	0,106	94,842	7,15	0,613	11,574
Land Area	(X_1)	7	1,787	3,977	0,000064	0,00002	3,377	0,12	0,028	5,389
Dwelling Area	(X_2)	149	29,893	4,977	0,0014	0,0003	4,028	0,21	0,049	4,336
Other Area	(X_3)	118	38,726	3,048	0,0013	0,0004	3,408	0,06	0,022	2,689
Age	(X_4)	-95	44,891	-2,110	-0,00096	0,0005	-2,031	-0,05*	0,025	-1,832
Randage Quality Index	(X_5)	100	19,805	5,057	0,0018	0,0002	8,597	0,35	0,099	3,205
Distance-CBD	(X_6)	-939*	765,438	-1,227	-0,012*	0,008	-1,483	-0,05*	0,030	-1,707
Bathrooms	(Z_1)	35226	3441,345	10,236	0,30	0,036	8,299	0,32	0,036	8,902
State-owned	(Z_2)	-34397	5097,670	-6,748	-1,25	0,054	-23,176	-1,21	0,054	-21,825
Swimming-pool	(Z_3)	11761	3373,628	3,486	0,13	0,036	3,521	0,14	0,036	3,373
Group Area	(Z_4)	19147	4435,289	4,317	0,21	0,047	4,500	0,23	0,087	2,791
Prime Area	(Z_5)	7967	2385,721	3,340	0,09	0,252	3,604	0,09	0,025	3,790
		R-SQ (ADJ) = 0,77 n = 315 SE = 18686,390 F-Ratio = 96,811			R-SQ (ADJ) = 0,88 n = 315 SE = 0,1971 F-Ratio = 207,450			R-SQ (ADJ) = 0,88 n = 315 SE = 0,1984 F-Ratio = 204,312		

* = NOT STATISTICALLY SIGNIFICANT AT THE 5% LEVEL OF CONFIDENCE

3.3.2 STATISTICAL INTERPRETATION OF THE MODELS

All variables in the three functional forms were statistically significant at the 5% level of confidence except for X_6. In other words, proximity to the CBD is not a major consideration in buying a property. The coefficient could be insignificant because the it is not necessarily the only place to which householders commute. Consideration should be made for proximity to educational institutions, shopping malls and industrial areas not located in the CBD.

The R-SQ (Adjusted) were all satisfactorily high with the log linear and log-log functional forms showing the best fit and explaining approximately 88% of the price variation.

Tests for correlations showed that none of the variables were significantly correlated with one another. The critical F-Values in all three of the functional forms were well below the calculated F-Ratios which indicates that the regressions were overall significant. The Park test for heteroscedasticity proved negative which is substantiated by the fact that coefficients across all three functional forms were consistent with one another.[19]

3.3.3 ECONOMIC INTERPRETATIONS OF THE MODEL

In the above models, the coefficients all possess the expected sign and their magnitudes have an economically rational interpretation except for the relatively large value obtained for the additional bathroom. The coefficients across all three functional forms are consistent with one another which indicates that the model is robust.[20]

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[19] Transforming the equation into logarithms is a method of eliminating heteroscedasticity from the sample.

[20] The interpretation of the various functional form coefficients can be explained as follows. The linear coefficients show absolute increases in the dependent variable as a result of absolute increases in the independent variables. The log-linear coefficients represent semi-elasticities. In other words they measure the relative change in the dependent variable given an absolute change in the independent variable. The coefficients of the log-log functional form are in fact elasticities, that is, they measure the proportional change in the dependent variable given a proportional change in the independent variable. The dummy variables in the equation cannot be transformed into

Interpretation of the coefficients of the various functional forms of the model are set out in Tables 3.1 and 3.2 respectively. In order to be able to construct any analyses of the coefficients across all three functional forms, the mean price was used to predict changes in price as a result of changes in the independent variables.

The land area, dwelling area and other building coefficients appear to make good economic sense. The dwelling area coefficient X_2 is greater than that of other buildings which is rational since usually a greater quantity and better quality of materials is used in the construction of the dwelling area - viz. a concrete floor in a garage as opposed to an oregon pine floor.

The state-owned houses Z_2 were sold well below their market value when they were sold to private individuals.[21] Again the coefficients appear to be consistent across all three functional forms. The same can be said for swimming pools Z_3 - the coefficients indicate that if the property contains a swimming pool, the property value would be approximately R11 000 higher.

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logarithms so their coefficients constitute semi-elasticities.

[21] They could purchase a property from the State for R13 000 and then sell the same property privately for between R30 000 and R47 000.

TABLE 3.1 INTERPRETING THE COEFFICIENTS OF THE CONTINUOUS INDEPENDENT VARIABLES FOR THE LINEAR, LOG-LINEAR AND LOG-LOG FUNCTIONAL FORMS

INDEPENDENT VARIABLE	MIN	MAX	STD DEV	MEAN	LINEAR	LOG-LINEAR		LOG-LOG	
					ΔP FOR 1 UNIT ΔX	SEMI-ELASTICITY COEFFICIENT	ΔP FOR 1 UNIT ΔX	ELASTICITY CO-EFFICIENT	ΔP FOR 1 UNIT ΔX
Land Area (X_1)	162	5725	916	1147	R7	0,000064	R5	0,12	R8
Dwelling Area (X_2)	39	411	57	131	R149	0,0014	R113	0,21	R129
Other Buildings (X_3)	0	254	49	59	R118	0,0013	R105	0,06	R82
Age (X_4)	1	94	33	37	-R95	-0,00096	-R78	-0,05*	-R109
Randage Quality (X_5)	210	560	86	426	R100	0,0018	R145	0,35	R66
Distance CBD (X_6)	1	9	2	5	-R939*	-0,012*	-R969	-0,05*	-R807
PRICE (R)	13043	290000	38239	80786					

* = NOT STATISTICALLY SIGNIFICANT AT THE 5% LEVEL OF CONFIDENCE

TABLE 3.2 INTERPRETING THE COEFFICIENTS OF THE DUMMY INDEPENDENT VARIABLES FOR THE LINEAR, LOG LINEAR AND LOG-LOG FUNCTIONAL FORMS

INDEPENDENT DUMMY VARIABLE	LINEAR	LOG-LINEAR		LOG-LOG	
	ΔP WHEN Z = 1	SEMI-ELASTICITY COEFFICIENT	ΔP WHEN Z = 1	SEMI-ELASTICITY COEFFICIENT	ΔP WHEN Z = 1
Bathrooms (Z_1)	R35226	0,30	R24236	0,32	R25852
State Owned (Z_2)	-R34397	-1,25	-R20196	-1,21	-R16157
Swimming Pool (Z_3)	R11761	0,13	R10502	0,14	R11310
Group Area (Z_4)	R19147	0,21	R16965	0,23	R18581
Prime Area (Z_5)	R7967	0,09	R7270	0,09	R7270
MEAN PRICE = R80786					

The quality index coefficients are as expected positive across all three functional forms.

As stated earlier the bathroom coefficient appears to be unexpectedly high. It is important to consider exactly what the coefficient is measuring. It measures the increase in the value of the property if the house has an additional full bathroom. In other words, the coefficient assumes that each property has at least one full bathroom. The model, in all three of the functional forms predicts that an additional bathroom should increase the value of the property by R24 000 to R36 000. However, it may be feasible to suggest that the cost of adding a bathroom, if additional plumbing and building costs are taken into account, is indeed within the range of values that the separate functional forms have predicted.

The main hypothesis contends that the Group Areas Act created a premium on property prices in the Indian areas. It was argued that the Group Areas Act prevented the efficient functioning of the property market in Pietermaritzburg and created a monetary premium for land in Indian areas because of the relative shortage of land in those areas. The Group Areas dummy variable Z_4 shows, after the remaining independent variables have been controlled, that at the 5% level of statistical significance there is a positive premium. Furthermore, the coefficients of the Group Areas Act Z_4 are statistically significant at the 5% level in all three functional forms. Therefore it is clear that there is strong evidence in support of the main hypothesis at the 5% level of confidence. The premium for a property in the Indian areas varies from R16 965 to R19 147 depending on the specification of the model.

3.3.4 CONCLUDING ANALYSIS OF THE MODEL

It would appear that the explanatory variables in the model are satisfactory proxies for explaining the characteristics which households desire. Most of the variables seem to be economically sound and the prices for each implicit characteristic plausible. Each of the variables have shown how much households would be willing to pay for individual characteristics. For example, households would be willing to pay R11 000 for a swimming pool.

Straszheim (1974) has argued that the race dummy variable does not necessarily break up the data into different markets. Straszheim has contended that the quality premiums represented by other independent variables in the equation may also differ across racial groups. For example, Indian and White households differ in Pietermaritzburg because of differences in income and family size. Therefore, a relationship between housing demands and housing supplies is likely to result in a very different structure of prices in Indian areas than for similar units in the White markets.

The Group Areas dummy in the above equation would thus appear to reflect both the differences in underlying price structures for the types of housing available to Indians and Whites, and the sub-markets in which they reside. Therefore using pooled data as has been done above and a single race dummy would appear to be useful in the sense that it has indicated that there is a premium to pay if one lives in an Indian area. However, it provides little insight into any possible differences between prices of comparable housing to Indians and Whites in different markets.

3.4 Separating the model into separate Group areas

There seems to be a case for arguing that the Group Areas Act caused a premium to be established for properties in areas zoned for Indians which created an inequity in the system of property rating. The problem now is to establish which of the independent variables in the model are causing this premium. In the subhypothesis it is postulated that the increase in rates incidence towards Indian areas has primarily been caused by increases in land values. Following Straszheim (1974) it would appear sensible to separate the sample into different sub-markets and estimate separate equations for White and Indian areas respectively. By distinguishing between an Indian and White housing market, it is possible to compare the differences in underlying price structures. This will enable the model to identify which characteristics of the property market are most affected by the Group Areas Act. Although, there are sub-markets within the White and Indian areas, as stated earlier the size of the sample collected did not permit a further breakdown into smaller sub-markets.

When the 1989/90 property valuation roll was introduced, people living in the Indian areas experienced relatively large increases in assessed land values compared to Whites, viz. a 115% increase as opposed to a 17% increase. At the same time however, building values increased by a similar proportion for White and Indian areas - viz. 43% and 50,9%.

Rates income, as shown in Table 1.1, from land in the Indian areas increased by 72,3% as opposed to White rates income from land which decreased by 6%. Rates income from buildings increased by 34% and 29% in the White and Indian areas respectively. Total rates income (from land and buildings) increased by only 8,6% in the White areas and a massive 44% in the Indian areas.

The land value increases in the Indian areas resulted in increases in the rates income accruing from land. The Group Areas dummy variable has shown that there is a premium for living in an Indian area. Given that building values, in terms of replacement cost, showed similar increases across all Group areas, it would seem plausible to assume that a large proportion of the Group Areas coefficient must reflect relatively higher land values in the Indian areas.

Table 1.3 shows that the ratio of land to building randages has been on a upward trend since the implementation of the 1985/86 property valuation roll. With the increase in this ratio, and that land values in the Indian areas are relatively higher than in White areas, it is clear that properties in the Indian areas would attract a higher rates incidence than properties located in White areas.

After separating the data into Group areas the subhypothesis will be tested. The subhypothesis is that the shifts in the rates incidence towards the Indians areas has primarily been caused by the increases in land values in the Indian areas. Therefore, it is expected that the coefficient of the land area variable in the Indian areas will be significantly higher than the corresponding coefficient in the White areas. It is expected that other coefficients in the separate models should not be affeeted by distortions in the property market caused by the Group Areas Act. In other words, the coefficients of the independent variables may be different across the two Group areas for the reasons put forward by Straszheim (1974), outlined above.

3.5 Model specification concerning the equations for the separate Group areas

As in the previous model, and according to the literature set out in Chapter 2, it is postulated that sales price is a function of:

$$P_W = \int (X_1, \ldots X_6, Z_1, Z_3 \ldots Z_5, U)$$

$$P_I = \int (X_1, \ldots X_5, Z_1, Z_2, U)$$

Where P_W, P_I = the market price of house in White and Indian areas respectively. X_1,

X_1 = land area in m^2 for the respective Group areas

X_2 = dwelling area in m^2 for the respective Group areas

X_3 = other buildings in m^2 for the respective Group areas

X_4 = a continuous independent variable representing the age of the properties in the respective Group areas.

X_5 = a randage quality index for both Group areas.

X_6 = the distance of the property from the CBD in White areas.[22]

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[22] It was attempted to use this variable in the Indian area equation but this proved to be problematic.

Z_1 = a dummy variable representing the number of additional bathrooms per house in the respective Group areas.

Z_2 = a dummy variable denoting whether or not the property is state-owned[23].

Z_3 = a dummy variable indicating whether or not the property contains a swimming pool.[24]

Z_5 = a dummy variable denoting whether or not the property is located in a prime area.[25]

3.5.1 FUNCTIONAL FORMS OF THE MODEL

As in the first model, and in accordance with the literature set out in Chapter 2, it was decided to run regressions using the same functional forms. The only difference is that two separate models are being estimated for each form.

(1) $P_W = A + \Sigma\beta_i X_i + \Sigma\alpha_i Z_i + U$ (Linear)

$P_I = A + \Sigma\beta_i X_i + \Sigma\alpha_i Z_i + U$

(2) $\ln P_W = A + \Sigma\beta_i X_i + \Sigma\alpha_i Z_i + U$ (Log-linear)

$\ln P_I = A + \Sigma\beta_i X_i + \Sigma\alpha_i Z_i + U$

(3) $\ln P_W = A + \Sigma \ln \beta_i X_i + \Sigma\alpha_i Z_i + U$ (Log-log)

$\ln P_I = A + \Sigma \ln \beta_i X_i + \Sigma\alpha_i Z_i + U$

where P_W and P_I represent the sales price of the White and Indian properties respectively.

X_i represent continuous independent variables

Z_i represent the dummy variables

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23 This only pertains to the Indian area since no State-owned houses were sampled in the White areas.

24 No swimming pools were found in the Indian sample.

25 It was not possible to determine which properties in the Indian areas were located in prime areas.

It is expected that all the variables should yield positive coefficients except for X_4, X_6 and Z_2 which one would expect to be a negative function of price.

In the light of the subhypothesis, it is expected that the coefficient of X_1 ,which represents the prices of the respective land values per square metre, should be significantly higher in the Indian than in the White areas. The coefficients of the variables X_2 and X_3 should be unaffected by the Group Areas Act.[26] The estimated equations are shown in Table 3.3 below.

[26] If there is a shortage of land in the Indian areas, there could also be a scarcity premium for existing buildings in these areas. However, this does not affect the subhypothesis since rates incidence on buildings is determined by the replacement cost of buildings.

TABLE 3.3 REGRESSION RESULTS FOR THE SEPARATE GROUP AREAS

WHITE AREA		LINEAR-LINEAR			LOG-LINEAR			LOG-LOG		
INDEPENDENT VARIABLE		COEFFICIENT	STD ERROR	t-VALUE	COEFFICIENT	STD ERROR	t-VALUE	COEFFICIENT	STD ERROR	t-VALUE
Constant		-30233	2,979E4	-1,015	10,081	0,305	33,055	3,94	1,865	2,115
Land Area	(X_1)	7	2,062	3,245	0,00006	0,00002	3,009	0,10	0,034	2,828
Dwelling Area	(X_2)	189	40,138	4,708	0,0015	0,0004	3,471	0,23	0,066	3,530
Other Area	(X_3)	109	44,302	2,461	0,0013	0,0005	2,954	0,13	0,036	3,549
Age	(X_4)	-70*	54,678	-1,284	-0,0009*	0,0006	-1,606	-0,04*	0,036	-1,201
Randage Quality Index	(X_5)	148	62,040	2,390	0,0017	0,0006	2,785	0,83	0,294	2,838
Distance CBD	(X_6)	-1000*	891,982	-1,121	-0,0121*	0,009	-1,323	-0,07*	0,035	-1,928
Bathroom	(Z_1)	31321	3994,894	7,840	0,28	0,041	6,870	0,28	0,040	6,927
Swimming Pool	(Z_2)	11425	3787,163	3,017	0,12	0,039	3,183	0,13	0,039	3,363
Prime Area	(Z_3)	9922	3217,871	3,084	0,11	0,033	3,481	0,10	0,033	3,081
		R-SQ (ADJ) = 0,70 n = 220 SE = 20800,054 F-Ratio = 54,97			R-SQ (ADJ) = 0,65 n = 220 SE = 0,2129 F-Ratio = 48,061			R-SQ (ADJ) = 0,66 n = 220 SE = 0,214 F-Ratio = 48,818		

INDIAN AREA										
INDEPENDENT VARIABLE		COEFFICIENT	STD ERROR	t-VALUE	COEFFICIENT	STD ERROR	t-VALUE	COEFFICIENT	STD ERROR	t-VALUE
Constant		8723*	1,60E4	0,545	10,13	0,261	38,792	61,85	2,602	23,763
Land Area	(X_1)	7*	6,712	1,094	0,000094*	0,0001	0,859	0,16	0,047	3,314
Dwelling Area	(X_2)	29*	30,975	0,951	0,00064*	0,00006	1,267	0,27	0,061	4,419
Other Area	(X_3)	221	84,240	2,621	0,002*	0,001	1,446	0,02*	0,022	0,863
Age	(X_4)	-985	388,175	-2,538	-0,013	0,006	-2,035	-0,13	0,029	-4,339
Randage Quality Index	(X_5)	96	17,513	5,509	0,0016	0,0003	5,659	0,54	0,101	5,399
Bathroom	(Z_1)	110882	9384,950	11,815	0,80	0,153	5,215	0,14	1,806	8,023
State-owned	(Z_2)	-35891	2454,910	-14,620	-1,25	0,041	-31,174	-0,18	0,478	-39,170
		R-SQ (ADJ) = 0,9262 n = 99 SE = 87 88,21 F-Ratio = 132,105			R-SQ (ADJ) = 0,9596 n = 99 SE = 0,143549 F-Ratio = 249,002			R-SQ (ADJ) = 0,97 n = 99 SE = 0,1371 F-Ratio = 446,254		

* = NOT STATISTICALLY SIGNIFICANT AT THE 5% LEVEL OF CONFIDENCE

3.5.2 STATISTICAL INTERPRETATION OF THE MODELS

3.5.2.1 The White Areas

All variables in the three functional forms were statistically significant at the 5% level of confidence except for distance from the CBD X_6 and age X_4. The distance from the CBD is probably insignificant for the same reasons as set out in 3.3.2. The age coefficient X_4 as set out in 3.3.2 could be argued to be a non-linear function of price. This is especially so in the White areas where the ages of properties range from seven years to ninety-four years.

The R-SQ (Adjusted) were able to explain just under 70% of price variation with all three functional forms showing a 'good fit'. Tests for correlation showed that none of the variables were significantly correlated with one another. The critical F-Values were all well below the calculated F-Ratio which indicates that regressions were overall significant. Tests for heteroscedasticity proved negative which is substantiated by the fact that coefficients across all the functional forms were consistent with one another.

3.5.2.2 The Indian Areas

Initially the estimation of this model proved difficult, with a large number of the independent variables turning out to be insignificant. The Park test confirmed heteroscedasticity and the method of generalised least squares was used to eliminate heteroscedasticity. However this only proved successful with the log-log functional form. Therefore, the only meaningful comparison between the White and Indian markets is between the models estimated in the log-log functional form.

The R-SQ (Adjusted) is very high and shows that 97% of the price variation is explained by the independent variables. The calculated F-Ratio was well above the critical F-Value which indicates that the equation is statistically sound. Tests for correlation showed that none of the independent variables were significantly related to one another.

3.5.3 ECONOMIC INTERPRETATION OF THE MODELS

In the White area equation, the coefficients all possessed the expected sign and the magnitudes of the coefficients all appeared to be economically rational. As in the first model, the coefficients across all three functional forms were consistent with one another which indicates that the model is robust.

Interpretations of the coefficients of the various functional forms of the model are set out in Tables 3.4 and 3.5. As in the interpretation of the first model, the mean property price of the respective Group areas was used to predict changes in price as a result of changes in the independent variables.

As explained in the previous section, the linear and log-linear functional forms of the model estimated for the Indian areas were not statistically sound. Therefore, it would prove futile to make any comparisons of the two models across the latter two functional forms. The only functional form which allows any feasible comparison is the log-log functional form.

The model for the Indian areas in the log-log functional form appears to make good economic sense. The only variable not significant at the 5% level of confidence was other buildings X_3. All the other coefficients were significant at the 5% level of confidence and all possessed the appropriate sign.

It is interesting to note that age X_4 was significant in the Indian areas and insignificant in the White areas. This could be explained by looking at the mean ages of houses in the White and Indian areas respectively. The mean age for houses in the White areas is 50 years and the Indian areas only 6 years. It was argued that the age of the property is not a linear function of the price in the White areas due to the large range of property ages in that area. However, because the mean age of properties in the Indian areas is relatively low compared to the White areas, age in this situation could in fact be a linear function of the price. In other words, in the Indian areas, houses do not possess any 'rustic' appeal simply because they are very new.

The randage quality-index in the White areas is noticeably higher than in the Indian areas. This is probably because of the superior quality of materials used in the construction of houses in the White areas. This could be an indication of the lower income levels of Indians relative to Whites.

The bathroom coefficient in both models also appears to be economically sound. The coefficient is lower in the Indian areas which again could be an indication of the lower income levels of Indians. In other words, those living in the Indian areas have constructed bathrooms of a smaller size and lower quality which would meet a demand for relatively cheaper housing. However as mentioned in an earlier footnote, ascertaining the exact number of bathrooms was problematic, and so it is probably not worth deriving too many conclusions from this result.

TABLE 3.4 INTERPRETING THE COEFFICIENTS OF THE CONTINUOUS INDEPENDENT VARIABLES FOR THE LINEAR, LOG-LINEAR AND LOG-LOG FUNCTIONAL FORMS OF THE WHITE AND INDIAN AREAS RESPECTIVELY

WHITE AREA					LINEAR	LOG-LINEAR		LOG-LOG	
INDEPENDENT VARIABLE	MIN	MAX	STD DEV	MEAN	ΔP FOR 1 UNIT ΔX	SEMI-ELASTICITY COEFFICIENT	ΔP FOR 1 UNIT ΔX	ELASTICITY COEFFICIENT %	ΔP FOR 1 UNIT ΔX
Land m^2 (X_1)	162	5275	932	1462	R7	0,00006	R5	0,10	R6
Dwelling Area m^2 (X_2)	81	411	48	153	R189	0,0015	R137	0,23	R137
Other Buildings m^2 (X_3)	15	227	40	79	R109	0,0013	R118	0,13	R125
Age years (X_4)	7	94	31	50	-R70*	-0,0009*	-R82	-0,04*	-R72
Randage Quality Index (X_5)	R350	R560	R30	R463	R148	0,0017	R155	0,83	R163
Distance CBD (X_6)	1	9	2	5	-1000*	-0,0121*	-R1104	-0,07*	-R1277
PRICE (Rands)	23700	290000	37315	91239	LINEAR	LOG-LINEAR		LOG-LOG	
INDIAN AREA	MIN	MAX	STD DEV	MEAN	ΔP FOR 1 UNIT ΔX	SEMI-ELASTICITY COEFFICIENT	ΔP FOR 1 UNIT ΔX	ELASTICITY CO-EFFICIENT %	ΔP FOR 1 UNIT ΔX
Land m^2 (X_1)	180	1101	218	442	R7*	0,000094*	R5	0,16	R21
Dwelling Area (X_2)	39	305	45	82	R29*	0,00064*	R38	0,27	R193
Other Buildings (X_3)	0	90	15	10	R221	0,002*	R117	0,02*	R11
Age (X_4)	1	24	4	6	-R985	-0,013	-R705	-0,13	-R1273
Randage Quality Index (X_5)	210	480	111	345	R96	0,016	R940	0,54	R92
PRICE (Rands)	13403	200000	31903	58762					

* = NOT STATISTICALLY SIGNIFICANT AT THE 5% LEVEL OF CONFIDENCE

TABLE 3.5 **INTERPRETING THE COEFFICIENTS OF THE INDEPENDENT DUMMY VARIABLES FOR THE LINEAR, LOG-LINEAR AND LOG-LOG FUNCTIONAL FORMS IN THE WHITE AND INDIAN AREA EQUATION**

WHITE AREA	LINEAR	LOG-LINEAR		LOG-LOG	
INDEPENDENT DUMMY VARIABLE	ΔP WHEN Z = 1	SEMI-ELASTICITY COEFFICIENT	ΔP WHEN Z = 1	SEMI-ELASTICITY COEFFICIENT	ΔP WHEN Z = 1
Bathrooms (Z_1)	R31231	0,28	R25546	0,28	R25546
Swimming Pool (Z_3)	R11425	0,12	R10949	0,13	R11860
Prime Area (Z_5)	R9922	0,11	R10036	0,10	R9124
MEAN PRICE	R91239				

INDIAN AREA	LINEAR	LOG-LINEAR		LOG-LOG	
INDEPENDENT DUMMY VARIABLE	ΔP WHEN Z = 1	SEMI-ELASTICITY COEFFICIENT	ΔP WHEN Z = 1	SEMI-ELASTICITY COEFFICIENT	ΔP WHEN Z = 1
Bathrooms (Z_1)	R110882	0,80	R47009	0,14	R8226
State-owned (Z_2)	-R35891	-1,25	-R14690	-0,18	-R10576
MEAN PRICE	R58762				

The state-owned houses coefficient Z_2 indicates that the State or Council are selling the properties at R10 576(18%) below mean value. This is reasonably consistent with the findings in the first model. The swimming pool coefficient Z_3 and the prime area coefficient Z_5 also prove to be consistent with the first model and make good economic sense.

If one now looks at the dwelling area coefficients X_2 for the respective Group areas, the models estimates that dwelling area per square meter is also higher in the Indian areas than in the White areas. As stated in footnote 27, there may also be a scarcity premium on existing buildings as a result of the shortage of land in the Indian areas. This does not affect the argument concerning the inequity of the of the rates incidence system, however, as this is based on replacement cost of buildings and not on the market value.

The subhypothesis postulated that the shift in the rates incidence towards Indian areas had primarily been caused by increases in land values in the Indian areas. Therefore, in the two models above, one would expect the coefficient for land X_1 in the Indian areas to be significantly higher than the corresponding coefficient in the White areas. It is clear from Table 3.4 that there is evidence to support the subhypothesis. In the log-log estimates, the coefficient for land area X_1 is 0,10 in the White areas whilst it is 0,16 in the Indian areas. Initially this does not seem significantly higher, but important differences emerge if the cost of land per square metre is calculated using the mean land and property values of the respective Group areas.[27] The price of land in the Indian areas is at R21/m^2 which is 350% higher than in the White areas where it is R6/m^2.[28]

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[27] The calculation is shown as follows:

$c = (\Delta P/P)/(\Delta L/L)$
$c = \Delta P/\Delta L * L/P$
$c * P/L = \Delta P/\Delta L$
0,10 * (91239/1462) = 6 (for the White areas)
0,16 * (58762/442) = 21 (for the Indian areas)

Where P is mean property price, L is mean land area, $\Delta P/\Delta L$ is the change in property price with respect to a unit change in land area and c are the coefficients obtained from the log-log estimates.

[28] It is obvious that these values are well below the prices that one would expect to pay when buying land. It must be noted that the above values are only measuring the land per se. They

Table 3.6 shows estimates of rates payable on land using the mean areas of the land for the entire sample, the White areas and the Indian areas respectively. The Table shows two values of land for each of the three sample sizes. The first value is calculated by using the Indian per square metre price of land and the second value the White per square metre price. These prices were obtained from log-log functional forms of the separate models estimated. Table 3.6 shows that land values in the White areas are noticeably higher when the price of land per square metre for the Indian areas is used - viz. R30 702 as opposed to R8 772. Similarly the price of land is noticeably lower in the Indian areas when the price of land in the White areas is used - viz. R2 652 vs R9 282.

The randage set on land by the City Council is 1,68% of land value. Given the significantly higher price of land in the Indian areas, it is evident from the examples above, that a greater proportion of the rate incidence will devolve upon the Indian community. Table 3.6 shows that in all three Group areas Indian ratepayers would have to pay substantially more than White ratepayers in rates from land. In other words, if land in the White areas was valued at the same price as land in the Indian areas, Whites would have to pay substantially higher rates. Alternatively, if land in the Indian areas was valued at the same rate per square metre as land in the White areas Indian ratepayers would pay substantially less in property taxes.

The City Council, as stated earlier, in response to the Indian ratepayers' complaints about the inequitable rating system, granted a 25% rebate on rates from land. There is no rebate granted concerning rates from buildings. Even after this 25% rebate, it is clear from Table 3.6 that the Indian ratepayers are still experiencing a relatively greater share of the rates burden than White ratepayers. This is the reason why a Supreme Court case concerning the rates system has taken place. Thus the measure taken by the City Council to make the property rating system more equitable would appear to be far from adequate.

Table 3.6 shows that if the City Council were to grant a rebate of around 72% on rates payable on land, then the rates incidence on land would be made equitable.

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are not accounting for neighbourhood attributes and topography which increases the value of the land.

TABLE 3.6 ESTIMATES OF INDIAN/WHITE LAND RATE DIFFERENTIALS USING THE PRICE /M² OF LAND ESTIMATED BY THE SEPARATE MODELS

MEAN LAND AREA IN M²	ESTIMATED LAND VALUE IN /M²		VALUE		CITY COUNCIL RANDAGE	RATES PAYABLE		CITY COUNCIL 25% REBATE TO INDIANS	NET RATES PAYABLE BY INDIANS	RATES PAYABLE BY INDIANS IF REBATE 72%
	INDIAN	WHITE	INDIAN	WHITE		INDIAN	WHITE			
TOTAL SAMPLE 1147	R21	R6	R24 087	R6 882	1,68%	R404	R116	R101	R303	R114
WHITE AREA 1462	R21	R6	R30 702	R8 722	1,68%	R516	R147	R129	R387	R145
INDIAN AREA 442	R21	R6	R9 282	R2 652	1,68%	R156	R45	R38	R118	R44

3.5.4 CONCLUDING ANALYSIS OF THE SEPARATE MODELS

It appears that there is evidence in support of the subhypothesis. However, it must be stated that there might be a problem with the data obtained from the Indian areas. On analysing the data, it is clear that municipal land and building valuations are not entirely consistent. For example, relatively small properties often attracted much higher municipal valuations than larger properties elsewhere in the Indian areas. It may be possible that some variable has been omitted from the Indian area equation.

Further, the results should be treated with caution since, in testing the subhypothesis, the test was limited to using only the log-log functional form which reduces the overall robustness of the model.

Nevertheless, it appears that the study has been successful in as much as it has supported the subhypothesis that land values in the Indian areas are higher than in the White areas. Thus it would seem that the Indian ratepayers have a legitimate complaint concerning the property rating system.

CHAPTER 4

CONCLUSION

4 Conclusion

In Chapter 1, the determination of the rates incidence in Pietermaritzburg was discussed. Then it was shown that assessed property values in 1989/90 increased substantially in the Indian and Coloured areas relative to the White areas. It was argued that the Group Areas Act was causing a shortage of land in the latter areas which in turn resulted in property values rising as demand tended to outrun supply. It was shown that this increase in property values shifts the rates incidence towards the Indian and Coloured Group areas because firstly the randage on land is higher than on buildings and secondly the overall property valuation is higher. An annual increase of 115% in assessed land values is almost certain to attract complaints from ratepayers. At the end of Chapter 1, a main hypothesis and a subhypothesis were postulated. The main hypothesis postulated that the Group Areas Act created a monetary premium on property values in the Indian areas. The subhypothesis postulated that the increases in rates incidence towards the Indian areas has primarily been caused by the increase in land values in those areas. In order to test the hypotheses it was necessary to establish a theoretical framework within which to explain the behaviour of the urban housing market and the determination of house prices.

Chapter 2 attempted to establish this theoretical framework. Traditional consumer theory is unsatisfactory for explaining the demand for housing because it assumes that the utility derived from a particular good stems from the good as a whole, and that the characteristics implicit to that good are not essential in explaining consumption behaviour. Whilst traditional theory may be appropriate for explaining the consumption demand for certain goods, it does not seem suitable for explaining the consumption demand for houses. The most suitable framework was found to be Lancastrian demand theory. Literature describing the consumption of housing has asserted that households desire certain characteristics of a house, and the price and decision to consume a house are dependent on the characteristics it contains. It was shown how a consumer can maximize his utility subject to a budget constraint while simultaneously being able to interchange characteristics. Although

Lancastrian demand theory was the most suitable for describing the consumption of housing there are shortcomings, the most notable being that characteristics of houses are not as easily interchangeable as the characteristics of other goods. Therefore the literature has asserted that households choose, from a large number differently priced, fixed bundles of housing, the bundle that maximizes their utility subject to a budget constraint.

The next step was to construct Lancastrian characteristics from the observable components of a house. There was consensus in the literature concerning which observable components constitute the characteristics which households desire. In this dissertation it was attempted as far as possible to use the same or similar proxies as the literature. The most common method used in estimating house prices was the technique of hedonic price equations. This technique relies heavily on being able to determine the characteristics of housing which households desire when purchasing a house and explains why Lancastrian demand theory was used as a framework within which to study the urban housing market. Some researchers have taken the technique of hedonic price equations a step further by separating the equation into demand and supply equations. Although this is desirable, it was not possible to execute because of the nature and amount of data available at the time of this study.

Chapter 3 introduced the empirical analysis and the quantitative testing of the hypotheses. The literature did not suggest a specific functional form for hedonic equations although most studies have used the linear, log-linear, and log-log functional forms. More complicated forms were available but seemed beyond the scope of this dissertation. The first model concerning the entire sample predicted that there was a monetary premium for purchasing a property in an Indian area. Nearly all the coefficients across all three functional forms were statistically significant and were economically rational which indicated that the proxies used for Lancastrian characteristics were satisfactory. Overall the model appeared to be robust. The mean price of a property located in a White area was about R91 000. The model predicts that if that same property were located in an Indian area it would sell for somewhere around R109 000. This result indicated strong supporting evidence for the main hypothesis. Although this result established that there is a monetary premium to be payed when purchasing a property in an Indian area, it did not provide conclusive proof that the property rating system is unfair. The model used in testing the main hypothesis has not specified which variables in the equation are causing this monetary premium.

The next step was to identify which characteristics of a property are most affected by the Group Areas Act. In the light of the subhypothesis, it was expected that the coefficient for land in the Indian area equation would be substantially higher than the corresponding coefficient estimated in the White area equation.

While the equation representing the White areas was statistically sound, estimating a statistically sound equation for the Indian areas proved problematic. Of the three functional forms used in estimating the Indian area equation, only the log-log functional form produced satisfactory results. Therefore the only feasible comparisons made were between the log-log functional forms of the respective Group areas. Notwithstanding this, the models showed that land values in the Indian areas are significantly higher than the corresponding land values in the White areas viz. R6 $/m^2$ vs R21 $/m^2$. Although the overall robustness of the Indian area equation is debatable, the result has important implications as far as the property rating system is concerned. Rates incidence is determined firstly by a valuation roll which values property according to the market value of land and replacement cost of buildings. Secondly, the City Council sets randages on land and buildings each year. The assessed value of land in the Indian areas has increased dramatically, as has the ratio of the randage set on land relative to buildings. The empirical results support the view that land values assessed on a willing buyer/willing seller basis are substantially correct. However, if the randage applicable to White and Indian owned land is the same, this results in Indian ratepayers paying substantially higher rates on an equivalent property. This would give rise to a valid argument for a rates rebate in Indian areas.

The 25% rebate granted by the City Council, according to the calculations in Table 3.6 would appear to be inadequate. If the results of the Indian area equation are anything to go by, an equitable method of determining rates incidence would be to grant a 72% rebate to those living in the Indian areas.

The Pietermaritzburg Combined Residents and Ratepayers Association is unfortunate to have had its case dismissed by the Supreme Court on the grounds that there was insufficient evidence to quantify the effect which legislation had on land values in the Indian areas. Although the empirical findings of this dissertation have indicated that the Group Areas Act caused the rates incidence to bear unfairly on the Indian community, it might be difficult to use such evidence in a Supreme Court case where doubt could be expressed about the validity of some of the estimates. However the study has shown that institutional practice, widely regarded as equitable, in assessing rates on the basis of the market price of land and the replacement cost of buildings can be grossly distorted by government economic interventions such as the Group Areas Act.

Perhaps in the long term, now that the Group Areas Act has been repealed, the property rating system will prove to be more equitable. In other words, as the racial barriers are broken down, the separate property markets might merge into one and begin to operate efficiently. This will restore the fairness of the willing buyer/willing seller principle.

However, it would be unreasonable to assume equilibrium in the property market is going to emerge in the short run. In fact, it is unlikely that a long run equilibrium will ever exist in a property market given the various levels of income and consumer preferences. The Group Areas Act was an artificial rigidity in the urban housing market which further exacerbates the problem of attaining a market equilibrium.

Nonetheless, with the repeal of the Group Areas Act, every individual is given the opportunity to purchase property wherever he desires subject to his budget constraint. This should at least result in property prices being determined by consumer preferences in a free market and not by separate racial groups participating in different property markets.

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